Anatomia Histologia Embryologia

Volume 43 Supplement 1 July 2014

Proceedings of the XXXth Congress of the European Association of Veterinary Anatomists Cluj-Napoca, Romania July 23–26, 2014

Guest Editors:

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Aurel Damian Melania Ioana Crişan

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Anatomia, Histologia, Embryologia

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FOREWORD AND PROGRAM

XXXth EAVA Congress Cluj-Napoca, Romania 23–26/07/2014

Dear Colleagues and Friends,

It is a great honor for us to welcome you to the XXXth congress of the European Association of Veterinary Anatomists, which will be held at Cluj-Napoca, Romania, on July 23rd - 26th, 2014. It is also a great pleasure for us to introduce this supplement to *Anatomia, Histologia, Embryologia* which includes the Scientific Program of the XXXth EAVA Congress. The congress will be held for the first time in Romania. It is a great privilege that EAVA has entrusted us with this responsibility, and we are dedicated to organizing an event that will be a memorable highlight in the history of EAVA congresses.

This supplement comprises 180 scientific abstracts: 177 selected by the EAVA 2014 International Scientific Committee from the total of 211 abstracts initially submitted and 3 corresponding to the invited lecturers. The participants are from 39 countries, 86 Veterinary Faculties and 40 other research units from Europe and all over the world. Of the 177 presentations, 52 have been selected for oral communications and 125 as posters. Both oral communications and posters are grouped in 10 topics covering all the fields of macroscopic, microscopic, teaching, clinical, functional and imaging anatomy:

- Clinical, Functional and Imaging Anatomy
- Musculo-skeletal System
- Nervous System, Organs of the Senses and Common Integument and Endocrine System
- Digestive System
- Cardiovascular System and Lymphoid Tissue
- Urogenital System
- Respiratory System
- Cell Biology and Embryology
- Anatomy Teaching
- Animal Welfare in Anatomy and Miscellaneous

We are thrilled to announce that three international personalities of the Veterinary Anatomy Community have accepted to present a key note lecture at the XXXth EAVA Congress:

- Prof. Dr. Gheorghe CONSTANTINESCU (University of Missouri-Columbia, USA): The horse in art from Prehistoric to Contemporary Times
- *Prof. Dr. Jean-Marie DENOIX* (CIRALE-Veterinary School of Alfort, France): The suspensory apparatus: from normal anatomy to pathologic conditions
- *Prof. Dr. Nathalie CREVIER-DENOIX* (Veterinary School of Alfort, France): Biomechanical effects of track surfaces on the equine locomotor system

We express all our gratitude for their will and disponibility to share with us the results of their work and knowledge.

Last in sequence but not least in importance, we state our recognition to Prof. Dr. Franco Abbate, President of the EAVA and to Prof. Dr. Claudia Wolschrijn, Vice-President of the EAVA, to the members of the International Scientific Committee and to all of those who were involved in organizing this scientific manifestation. We would like to give thanks to our sponsors and partners for their support.

On behalf of the EAVA 2014 International Scientific Committee and Organizing Committee, we wish you a pleasant stay in Romania and we hope that the XXXth EAVA Congress will give you a global update on the latest issues and findings in anatomy and its related research fields.

Prof. Dr. Aurel DAMIAN and Dr. Melania Ioana CRIŞAN *Chairs of the International Scientific and Organizing Committees* **Conflicts of interest:** The authors have no potential conflicts of interest to declare.

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XXXth EAVA CONGRESS – CLUJ NAPOCA, ROMANIA 23–26/07/2014 Grand Hotel Italia

GENERAL SCHEDULE

Wednesday, 23rd July	
14:00-22:30	Registration at Grand Hotel Italia
19:00-22:30	Welcome Reception at University of Agricultural Sciences and Veterinary Medicine
	Cluj-Napoca, including the Visit of the University
Thursday, 24th July	
08:00–08:30	Opening addresses (F. Abbate, A. Damian)
08:30–09:00	European College of Veterinary Anatomy: State of Affairs (C.F. Wolschrijn)
09:00-10:15	Oral session I (1h15): Cell Biology and Embryology
	Clinical, Functional and Imaging Anatomy
10:15–10:30	Coffee break
10:30-12:45	Oral session II (2h15): Clinical, Functional and Imaging Anatomy
12:45–13:45	Lunch break
13:45–15:45	Oral session III (2h): Nervous System, Organs of the Senses and Common Integument and Endocrine System
15:45–16:15	KEYNOTE LECTURE (Gheorghe Constantinescu)
	The Horse in Art - from Prehistoric to Contemporary Times
16:15–16:30	Coffee break
16:30–18:00	Poster session 1 (1h30)
18:30–22:30	Social program
Friday, 25th July	
08:30-10:30	Oral session IV (2h): Anatomy Teaching
10:30–10:45	Coffee break
10:45–12:45	Oral session V (2h): Cardiovascular System and Lymphoid Tissue Animal Welfare in Anatomy
12:45–13:45	Lunch break
13:45–15:15	Oral session VI (1h30): Digestive System
	Urogenital System
15:15–15:45	KEYNOTE LECTURE (Jean-Marie Denoix)
	The Suspensory Apparatus: from Normal Anatomy to Pathologic Conditions
15:45–16:00	Coffee break
16:00–22:30	Social program
Saturday, 26th July	
08:30–10:30	Oral session VII (2h): Musculo-skeletal System
	Respiratory System
10:30-11:00	KEYNOTE LECTURE (Nathalie Crevier-Denoix)
	Biomechanical Effects of Track Surfaces on the Equine Locomotor System
11:00–11:15	Coffee break
11:15–12:45	Poster session 2 (1h30)
12:45–13:45	Lunch break
13:45–14:15	Romanian Anatomists throughout the World
14:15–15:30	WAVA meeting
15:30–17:30	General Assembly of the EAVA
17:30	Free activity
20:00	Gala Dinner at Grand Hotel Italia
Sunday, 27th July	
	Departure

XXXth EAVA CONGRESS – CLUJ NAPOCA, ROMANIA 23–26/07/2014 *Grand Hotel Italia*

SCIENTIFIC PROGRAM

Wednesday, 23rd July	
14:00-22:30	Registration at Grand Hotel Italia
19:00–22:30	Welcome Reception at University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, including the Visit of the University
Thursday, 24th July	
08:00–08:30	Opening addresses (F. Abbate, A. Damian)
08:30–09:00	European College of Veterinary Anatomy: State of Affairs (C.F. Wolschrijn)
09:00–10:15	Oral session I (1h15): Cell Biology and Embryology
	Clinical, Functional and Imaging Anatomy
	L 1.1. (53) Bmp2 Regulates Chicken Ebf3 Gene Expression in Pharyngeal Arches, Cranial Sensory
	Ganglia and Placodes
	Mohammed A. El-Magd, Ayman A. Saleh and Amin A. Hassanin
	L 1.2. (102) Isolation of Cells with Melanocytic Properties from the Equine Hair Follicle
	Jule K. Michler, Heike Plaue, Vuk Savkovic and Christoph K. W. Mülling
	L 1.3. (107) Comparative Anatomy of the Podocyte: a Scanning Electron Microscopic Studies on the
	Kidneys of Rat (Rattus norvegicus) and Blind Mole Rat (Spalax leucodon)
	Ismail Hakkı NUR Atila YOLDAS, Avdın ALAN and Aytac AKCAY
	1.4. (26) Calcium Binding Proteins Mediate Dioxin-Induced Motor Deficit in Sheep
	Anna Costagliola Filomena Fiorito, Pratibha Mithbaokar, Sara Damiano and Veeramani Maharajan
	L 1.5. (32) Blood Supply of the Canine Brain: a Multiway Approach with Conventional Technique.
	Corrosion Casting and Cryosectioning
	Kálmán Czeibert, Gábor Baksa, Péter Szabó, Péter Sótonvi, Bence Rácz and Örs Petneházv
10:15–10:30	Coffee break
10:30-12:45	Oral session II (2h15): Clinical, Functional and Imaging Anatomy
	2.1. (42) Indirect Radiographic Lymphography and Ultrasonography of the Lymphatic Vascular System
	of the Caudal Mammary Gland in the Domestic Cat
	Cristian C. Dezdrobitu, Ionel Papuc, Ioana D. Chirilean, Florin G. Stan, Diana S. Feier and Aurel Damian
	2.2. (46) The Qualitative and Quantitative Assessment of the Renal Echogenicity at the Clinically
	Healthy New Zealand Rabbits
	Ömer G. Dilek. Hasan Erden and Erkut Turan
	2.3. (57) The Equine Sternum Revisited: Analysis by Clinical and Micro Computed Tomography
	Carina Eydt, <u>Elisabeth Engelke,</u> Carmen Schröck, Florian Geburek, Karl Rohn, Carsten Staszyk and Christiane Pfarrer
	L 2.4. (109) A Novel Pressure-constant <i>Ex Vivo</i> Model of the Equine Larynx
	Sven Otto, Verena Tast, Jule K. Michler and Christoph K. W. Mülling
	L 2.5. (113) Practical Aspects of the Corrosion Casting Technique
	Örs Petneházy, Kálmán Czeibert, Gábor Baksa and Lajos Patonay
	L 2.6. (128) Volumetric Measurements of the Canine Cerebrospinal Fluid Using Magnetic Resonance
	Imaging (MRI)
	László Z. Reinitz, Gábor Bajzik, Rita Garamvölgyi, Örs Petneházy, András Lasso, Zsolt Abonyi-Tóth, Borbála
	Lőrincz, Bianka Benedek and Péter Sótonyi
	m L~2.7. (129) Biomechanical Properties of the Equine Digital Tendons and the Medius Interosseous
	Muscle
	Melissa Reutter and Sven Reese
	L 2.8. (154) Role of Grey Scale Ultrasound, Ceus and Elastography in Primary Lymph Node Assessment
	of Mammary Gland Neoplasia in Carnivores
	Florin G. Stan, Alexandru I. Gudea, Aurel Damian, Ionel Papuc, Ileana Bochiş and Marius Pentea
	2.9. (173) Application of X-ray Microtomography for Comparative Embryology in Teaching and
	Science
	Ingrid Walter, Sven Budik, Christine Aurich, Brian. D. Metscher and Stephan Handschuh
12:45–13:45	Lunch break

13:45–15:45	Oral session III (2h): Nervous System, Organs of the Senses and Common Integument and Endocrine
	System
	L 3.1. (18) The Anatomical Study of the Spinal Cord in Chinchillas (Chinchilla lanigera)
	Delia Bob, Irina Irimescu, Florin I. Ghiurco, Florin G. Stan, Adriana Chende and Aurel Damian
	L 3.2. (27) Chronic Maternal Morphine Alters Calbindin D-28k Expression Pattern in Neonatal Mouse
	Brain
	Anna Costagliola, Filomena Fiorito, Pratibha Mithbaokar and Veeramani Maharajan
	L 3.3. (59) Basic Principles of Neocortex Expansion during Evolution - a Cell Biological Analysis of
	Neural Stem and Progenitor Cells
	Simone A. Fietz and Johannes Seeger
	L 3.4. (60) Histomorphological Study of the Harderian Gland in the Canadian Ostrich (Struthio camelus)
	Saeedeh Frahmand and Ahmad Ali Mohammadpour
	L 3.5. (65) Anatomical Study of Cerebral Hypoxia in Normal Canine Brain: Comparison between
	Mesaticephalic and Brachycephalic Dogs
	Emilien Griffeuille, Florian Ruiz, Jean Sautet and Giovanni Mogicato
	L 3.6. (80) Preliminary Results of a Macroscopical and Histological Study of the Medulla Oblongata in
	Chinchillas (Chinchilla lanigera)
	Irina Irimescu, Pompei F. Bolfă, Raluca Vidrighinescu, Melania I. Crisan, Cristian C. Dezdrobitu and Aurel Damian
	L 3.7. (142) Morphological Research on Microglia in the Canine Cognitive Dysfunction Syndrome
	Franziska Schmidt. Alexandra Stolzing and Johannes Seeger
	13.8. (149) Histology of the Northern Elephant Seal (Mirounga angustirostris) Eve
	Hrvoje Smodlaka, Wael A. Khamas, Lauren Palmer, Bryan Lui, Josip A. Borovac and Lars Schmitz
15:45–16:15	KEYNOTE LECTURE (Gheorghe Constantinescu)
	The Horse in Art - from Prehistoric to Contemporary Times (24)
16:15–16:30	Coffee break
16:30–18:00	Poster session 1 (1h30)
18:30–22:30	Social program
Friday, 25th July	
08:30–10:30	Oral session IV (2h): Anatomy Teaching
	L 4.1. (25) Sketching Morphology: Graphical Interactivity in Large Classroom Settings
	Pieter Cornillie
	L 4.2. (40) Dissections without Formalin: the Experience of the Anatomy Department in Alfort
	Christophe Degueurce, Guillaume Gérard, Céline Robert, Nathalie Crevier-Denoix and Henry Château
	L 4.3. (52) Silicone Plastination of the Laboratory Rat with Cold Temperature
	Technique: Can Plastinated Specimens Be Effectual for Teaching Laboratory Animal Anatomy?
	Okan Ekim, Burcu Ekim, Muharrem Ayavalı and Caner Bakıcı
	L 4.4. (78) Multimodalities Approach in Teaching Veterinary Anatomy: Proposed Strategies
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	L 4.5. (112) Veterinary Anatomical Series for iPad': an Evolutionary Learning Concept
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	Alf Seljens Dalum, Håvard Bjørgen, David Griffiths, Karsten Skjødt, Ivar Hordvik, Per Gunnar Fjelldal, Charles Mc
	Press and Erling Olaf Koppang
	L 5.3. (82) Angioarchitecture of the Pig Urinary Bladder
	Jackowiak Hanna and Prozorowska Ewelina
	L 5.4. (97) Anatomical Studies Regarding the Trajectory and Distribution of the Femoral Artery in
	Chinchillas (<i>Chinchila lanigera</i>)
	Cristian O. Martonoş, Alexandru I. Gudea, <u>Cristian C. Dezdrobitu</u> , Alexandra Blendea, Vioara Mireşan, Florin G.
	Stan and Aurel Damian
	L 5.5. (144) Vascularization of the Equine Stifle Joint with Special Focus on the Menisci
	Hanna Schopper
	Circulation in Horses
	Tim Vandecasteele, Kimberley Vandevelde, Paul Simoens, Gunther van Loon and Pieter Cornillie
	L 5.7. (165) Micro-Architecture of Ovine Tonsils
	Kimberley Vandevelde, Karlijn Debusschere and Wim Van den Broeck
	m L~5.8. (148) Prospects of a Humane Veterinary Anatomy: Opportunities and Problems
10.45 10.45	Fred Sinowatz, Daniela Rodler and Rebecca Kenngott
12:45-13:45	Lunch Dreak
13:45-15:15	Oral session VI (1130): Digestive System
	Urogenital system
	L 6.1. (2) Influence of Dietary Acetic Acid Supplementation on the Broiler Performance, Intestinal Histomorphology and Hematology
	Ahsan-ul-Hag, Naasra Akram, Zaib-Ur-Rehman, Shahid-Ur-Rehman, Muhammad Ashraf and Riaz H. Pasha
	6.2. (88) Effect of Dietary Net Energy Content on Intestinal Morphology and Cell Proliferation in
	Immunocastrated Pigs in Comparison to Entire Males
	Valentina Kubale, Nina Batorek, Martin Škrlep, Vesna Točaj, Gregor Fazarinc, Marjeta Čandek-Potokar
	and Etienne Labussiere
	L 6.3. (117) Gastroesophageal Mucosal Layer Junction Disposition – Anti-Reflux Factor
	<u>Nicolae C. Popovici,</u> Dana Blidaru and Ioana D. Chirilean
	L 6.4. (133) Porcine Intestinal Mast Cells – Fixation, Histochemistry and Quantification
	J <u>uliane Rieger</u> , Hana Hünigen, Tania Fuhrmann-Selter, Barbara Drewes, Karin Briest-Forch and Johanna Plendl
	L 6.5. (39) Kidney Healing after Laparoscopic Partial Nephrectomy without Collecting System Closure in
	Sheeps
	Diogo B. De Souza, José A.D. Ferreira Filho, Amary Nascimento Junior, Fábio O. Ascoli, Deborah C. Santoro,
	Francisco J.B. Sampaio and Marco A. Pereira-Sampaio
	L 6.6. (90) Macroscopic Findings in a Multiple Congenital Anomalies from a Newborn Simmental Calf
	lbrahim Kurtul, Ramazan Gonenci, Ziya Yurtal, Lutfi Takçı and Mehmet Z.Y. Deveci
15:15–15:45	KEYNOTE LECTURE (Jean-Marie Denoix)
	The Suspensory Apparatus: from Normal Anatomy to Pathologic Conditions (41)
15:45–16:00	Coffee break
16:00–22:30	Social program
Saturday, 26th July	
08:30–10:30	Oral session VII (2h): Musculo-skeletal System
	Respiratory System
	L 7.1. (11) Quantitative Analysis of the Relative Abundance Changes Observed In Type I, III and
	V Collagen after Suspensory Ligament Injuries in Horses
	Mohamad Khir Shikh Alsook, Etienne Baise, Joelle Piret, Nassim Moula, Moustafa Salouci, Nadine Antoine, Jean-
	Marie Denoix and Annick Gabriel
	L 7.2. (30) Gross post-mortem and histological findings of deep digital flexor tendon in the equine
	distal limb
	<u>Melania I. Crişan</u> , Aurel Damian, Viorel Miclăuş, Adrian Gal, Cristina L. Ştefănuţ, Irina Irimescu, Ioana D. Chirilean
	and Jean-Marie Denoix
	L 7.3. (63) Trabecular Microarchitecture at Birth, Escape from the Wolf(f).
	Ben M.C. Gorissen, Claudia F. Wolschrijn, Bert van Rietbergen and P. René van Weeren
	L 7.4. (66) Fractal Analysis - a Complementary Method for Species Identification?
	Alexandru I. Gudea, Andrei Stefan, Cristian O. Martonos, Cristian C. Dezdrobitu and Florin G. Stan

	L 7.5. (73) Ultrastructural Evaluation of Nerves Proximal to the Ramus Communicans of the Equine
	Thoracic Limb after Transection of the Ramus
	Robert W. Henry, Fakhri A. Al-Bagdadi, Jim Schumacher, Jessi Carter, Ferenc Tóth
	7.6. (94) Anatomic variations in the Lumbosacral Disc and Arthropathies in Lumbosacral and
	Sacroiliac Joints of Barrel Racing Quarter Horses, Evaluated by Transrectal Ultrasonography
	Monica Lente-Fernandes, Patricia Monaco Brossi, Priscila Mattar Atallah, Raquel Yvonne Arantes Baccarin and
	Jean-Marie Denoix
	L 7.7. (20) Histostructural Investigation of the Nasal Cavity and Infraorbitary Sinus Mucosa During
	Posthatch Development in Japanese Quail
	Iuliana Cazimir, Nicolae Cornilă and Cristina A. Constantinescu
	L 7.8. (84) Morphometric Examination of the Equine Adult and Foal Lungs
	Laura Johnson, Julia Montgomery, Jan Philipp Schneider, Hugh Townsend, Matthias Ochs and Baljit Singh
10:30-11:00	KEYNOTE LECTURE (Nathalie Crevier-Denoix)
	Biomechanical Effects of Track Surfaces on the Equine Locomotor System (28)
11:00–11:15	Coffee break
11:15–12:45	Poster session 2 (1h30)
12:45–13:45	Lunch break
13:45–14:15	Romanian Anatomists throughout the World
14:15–15:30	WAVA Meeting
15:30–17:30	GENERAL ASSEMBLY OF THE EAVA
17:30	Free activity
20:00	Gala Dinner at Grand Hotel Italia
Sunday, 27th July	
	Departure.

ORGANIZATION OF THE POSTER-SESSIONS in the XXXth EAVA Congress, Cluj-Napoca (ROMANIA)

The congress will have two poster sessions (1 and 2) which will take place on Thursday 24 and Saturday 26 July 2014, respectively. The posters are classified into 10 theme groups divided in 5 sections per day, which will run simultaneously. All the poster sessions will be guided, meaning that the poster presenting authors will have to present the content of their poster to the Chairpersons of a Section and interested listeners in a maximum of 3 minutes, with discussion afterwards. A total of 5 minutes, answers and questions included, will be allocated per poster.

The Poster Session 1 (Thursday 24) is divided in five sections:

- A Miscellaneous and Animal Welfare in Anatomy
- B Cell Biology and Embryology
- C Nervous System, Organs of the Senses and Common Integument and Endocrine System
- D Anatomy Teaching
- E Clinical, Functional and Imaging Anatomy

The Poster Session 2 (Saturday 26) is divided in five sections:

- A Urogenital System
- B Cardiovascular System and Lymphoid Tissue
- C Musculo-skeletal System
- D Digestive System
- E Respiratory System

POSTER SESSION 1: Thursday July 24, 2014, 16:30-18:00

A. Miscellaneous and Animal Welfare in Anatomy

P 1A.1. (121)	A Morphometrical Study of Metapodial Bones in Karagouniko Sheep (<i>Ovis aries</i> , L. 1758) and Hellenic Goat (<i>Capra hircus</i> , L. 1758)
	Aris. F. Pourlis, Theodoros Chatzis and Panagiotis D. Katsoulos
P 1A.2. (122)	Comparison of Two Methods for the Measurement of Medial and Lateral Metapodial Bones in
	Karagouniko Sheep (<i>Ovis aries</i> , L. 1758) and Hellenic Goat (<i>Capra hircus</i> , L. 1758)
	Aris F. Pourlis, Theodoros Chatzis, Panagiotis D. Katsoulos
P 1A.3. (123)	Kinematic Locomotion Analysis of the Hind Limbs in Ruminants
	Miroslav Radeski, Ksenija Ilievska, Pendovski Lazo, Florina Popovska Percinic, Vladimir Petkov, Sokol Duro,
	Plamen Trojacanec and Vlatko Ilieski
P 1A.4. (126)	Ultrastructural Characterization of Diclidophora luscae and Comparison of the Metric Variables in
	Different Methodologies Applied to Species Characterization
	Paula Ramos, Fernanda Rosa, Manuela-Maria Oliveira, Ana Grade and <u>Graça Alexandre-Pires</u>
P 1A.5. (145)	Stunning of Water Buffaloes in Swiss Abattoirs
	Barbara K. Schwenk, Isabel Lechner, Matthieu Glardon, Steffen G. Ross, Dominic Gascho, Fabiano Riva, Adrian von Holzen, Beat P. Kneubühl and Michael H. Stoffel
P 1A.6. (162)	Histological and Histochemical Studies on the Lacrimal Gland of the Bilgorajska Geese
	Szara Tomasz, Joanna Klećkowska-Nawrot, Karolina Goździewska-Harłajczuk, Karolina Barszcz, Kaja Urbańska
	and Justyna Sokołowska
P 1A.7. (166)	Additional Anatomical Markers for Ageing Roe Deer in the Field
	Kimberley Vandevelde, Pieter Cornillie, Henri Lambrecht, Jane Sieben and Paul Simoens

B. Cell Biology and Embriology

P 1B.1. (3)	Expression of Epidermal Growth Factor Receptors and Epidermal Growth Factor, Amphiregulin and Neuregulin in Bovine Uteroplacental Tissues during Gestation Mehmet Erdem Akbalk and Muzaffer Avdin Ketani
P 1B.2. (22)	Histological and Ultrastructural Aspects of the Testis and Epididymis in Male Pseudo Hermaphrodite
	Pigs
	Cristina Ciornei, Corneliu V. Cotea, Catalin Todireanu, Aurel Damian and Pieter Cornillie
P 1B.3. (37)	Ultrastructure of the Testis of the Rooster
	Valerica Danacu, Nicoleta Mocanu, Nicolae Cornila, Stefania Raita,Viorel Danacu and Lucian Ionita
P 1B.4. (38)	Morphological Studies on Visceral Lymph Nodes of the Abdominal Cavity in the Rabbit
	Valerica Danacu, Stefania Raita, Viorel Danacu and Carmen Ionita
P 1B.5. (43)	In Vitro Angiogenesis of Equine Macrovascular Endothelial Cells
	Kathrin Dietze, Ilka Slosarek, Barbara Drewes, Tania Fuhrmann-Selter and Johanna Plendl
P 1B.6. (77)	Immunohistochemical Localization of Glucose Transporters in Ostriches Gastrointestinal Tract
	Piret Hussar, Aleksandra Rotmistrova, Ilmārs Dūrītis, Martin Kärner, Tõnu Järveots and Arnis Mugurevičs
P 1B.7. (79)	Radiosensitization Effects of Curcumin and Calcitriol on Canine Transitional Cell Carcinoma in Vitro
	Ryan Gaffke, Eric Green and Nongnuch Inpanbutr
P 1B.8. (95)	Oxygen Glucose Deprivation: It's Impact on Cell Viability of Bovine Claw Keratinocytes in Vitro
	Katharina Luebbe and Christoph K. W. Muelling
P 1B.9. (108)	The Morphological Features and Characteristic Activity Stages of the Cellular and Acellular Formations
	from Goat Milk
	Laurent Ognean, Viorica Chiurciu, Constantin Chiurciu, Alexandra Arion, Rodica Someşan, Alina Nasalean and
	Aurel Damian
P 1B.10. (135)	Expression of Prostaglandin Synthesizing Enzymes in the Ovary of Birds
	Daniela Rodler and Fred Sinowatz
P 1B.11. (136)	Impact on Cell Metabolism of Dog Hepatocytes when Exposed to Leishmania infantum
	Armanda Rodrigues, Graça Alexandre-Pires, David Santos-Mateus, Ana Valério-Bolas, Mariana Rafael-Fernandes,
	Maria de Aires-Pereira, Isabel Pereira da Fonseca and Gabriela Santos-Gomes
P 1B.12. (157)	Quantitative Analysis of Gold Nanoparticle Uptake by Neural Cells in Culture
	Ana Stojiljkovic, Kathrin Kühni-Boghenbor, Véronique Gaschen and Michael H. Stoffel

P 1B.13. (160)	Morphological Aspects of the Masculinization Process in Chickens <u>Cătălin Todireanu</u> , Corneliu Cotea, Carmen Solcan, Cristina Ciornei [,] Sorin Pasca and Pieter Cornillie
C. Nervous System, O	rgans of the Senses and Common Integument and Endocrine System
P 1C.1. (1)	Development of a Short-Term Canine Full-Thickness Skin Organ Culture Model - Preliminary
	Observations
	Francesca Abramo, Andrea Pirone, Carla Lenzi, Maria Paola Ricciardi, Silvia Vidali, Ralf Paus and Vincenzo
	Miragliotta
P 1C.2. (9)	About the Inguinal Gland during Gestation and After Parturition: a Glance towards Prolactin, Estradiol
	and Progesterone Receptors
	Graça Alexandre-Pires, Catarina Martins, Miguel Galvão, Ana Amaral and Graça Ferreira-Dias
P 1C.3. (14)	Basic Fibroblastic Growth Factor Inhibits Osmotic Swelling of Rat Retinal Glial (Müller) Cells
	Benjamin-Andreas Berk, Andreas Bringmann, Andreas Reichenbach and Johannes Seeger
P 1C.4. (48)	Distribution and Chemical Coding of the Rat Diaphragm-Projecting Neurons Located within the Stellate
	Ganglia
	Agnieszka Dudek, Waldemar Sienkiewicz, Anna Marciniak, Dorota Olejniczak, Jerzy Kaleczyc, Zenon Pidsudko
	and Clemens Knospe
P 1C.5. (49)	Distribution of Diaphragm-Projecting Autonomic Neurons in the Rat - Preliminary Data
	Agnieszka Dudek, Waldemar Sienkiewicz, Dorota Olejniczak, Anna Marciniak, Jerzy Kaleczyc, Michał Załęcki and
	Clemens Knospe
P 1C.6. (50)	Distribution of Primary Sensory Neurons Innervating the Belly and Tendon of the Gastrocnemius
	Muscle in the Rat - Preliminary Data
	Agnieszka Dudek, <u>Waldemar Sienkiewicz,</u> Amelia Franke-Radowiecka, Oliwia Tomaszewska, Magdalena
	Klimczuk, Pitr Podlasz and Jerzy Kaleczyc
P 1C.7. (54)	Architectonics of Nervous Apparatus of Fibrous Formations in Cattle Acropodia
	Valeriu Enciu
P 1C.8. (58)	Neurotrophic Effect of a Decenoic Acid Derivative on PC12 Cells
	Foad Farrag, All A. Mansour, Masoud Fayed, Monammed Kassab, Hidetumi Fukumitsu, Shoei Furukawa and
P 1C 0 (91)	Monantined A. El-Magu
P IC.9. (01)	
	iangeraj Irina Irimascu, Malania I. Crisan, Cristian C. Dazdrobitu and Aurol Damian
P 1C 10 (91)	Histological investigation of the eves in certain marine fish species - preliminary research
1 1C.10. (31)	Snježana Kužir. Dinko Vidušin. Tajana Trhojević Vukičević. Ivan Alić and Emil Giurčević.
P 1C 11 (99)	<u>Superana Rozar</u> , Binko vidusin, Tajana Hosperie Vakeerie, War Ane and Endopiriform Nucleus of Expression of Parvalbumin and Calbindin D28k in the Claustrum and Endopiriform Nucleus of
1 IC.II. (33)	Chinchilla
	Małoozzata Matvsek. Radosław Szalak and Marcin B. Arciszewski
P 1C.12. (116)	Expression of Calcium Binding Proteins in the Dog Claustrum
	Andrea Pirone. Carlo Cantile. Vincenzo Miragliotta. Carla Lenzi. Alessandro Baglini. Alessandra Coli. Maria Rita
	Stornelli and Elisabetta Giannessi
P 1C.13. (118)	The Pituitary-Adrenocortical Axis in Rats after Long-Term Exposure to Moderate Heat
	Florina Popovska-Percinic, Vladimir Ajdzanovic, Lazo Pendovski, Vlatko Ilieski, Branko Filipovic, Ivana Medigovic
	and Verica Milosevic
P 1C.14. (132)	Dorsal Integumentary Glands in Crocodilians
	Ken C. Richardson
P 1C.15. (137)	Course and Branching Pattern of Selected Thoracic and Lumbar Spinal Nerves in the Domestic Cat
	Nicole Röhrmann, Dora Bernigau, <u>Sven Otto</u> and Christoph K.W. Mülling
P 1C.16. (146)	Immunohistochemical Characterisation of Spinal Ganglia Neurons Supplying the Hip Joint Capsule in
	The Sheep
	Waldemar Sienkiewicz, Agnieszka Dudek, Aleksander Chrószcz, Maciej Janeczek and Jerzy Kaleczyc
P 1C.17. (158)	Immunoreactivity to calcium-binding proteins in the hippocampus of the chinchilla
	<u>Radosław Szalak,</u> Jadwiga Jaworska-Adamu and Marcin B. Arciszewski
P 1C.18. (168)	Distribution of Mast Cells in Porcine Lumbar Spinal Ganglia
	Angel P. Vodenicharov, Ivaylo S. Stefanov, Nikolai S. Tsandev and Genadi N. Kostadinov
P 1C.19. (178)	The Distribution of Metastin-Like Immunoreactive Nerve Structures Occurring in the Spinal Cord of the
	Domestic Pig (Sus scrofa)
	wichal Zalecki, waldemar Sienklewicz, Agnieszka Dudek and Jerzy Kaleczyc

D. Anatomy Teaching	1
P 1D.1. (15)	Po"t"casts for Teaching Veterinary Anatomy
	Dora Bernigau, Sebastian Schmalz, <u>Jule K. Michler</u> and Christoph K.W. Mülling
P 1D.2. (31)	The Good, the Bad and the Ugly Face of Anatomy
	Carmen B. Crivii
P 1D.3. (51)	Comparative Study Regarding the Methods of Obtaining the Bones of the Autopodium in Pigs (<i>Sus scrofa domestica</i>)
P 1D / (67)	Ioana Dufnitru, Bianca Matosz, Cristian O. Martonos, Daima Csibi, Calin Nut, Fiorin Silagni and Aurei Damian
P ID.4. (62)	some experiences on Anatomy innovative Education
	Juncar Gorizatez-soriano, Pilar Marin Garcia, Ana Garcia-Moreno, Pilar Marunez-sainz and Kosario Marun-Oru
P ID.5. (71)	Anatomy Just a paraclinical subject? - A Reachout educational activity
D 1D (/72)	jenny riagen Tradicio da constructione Anna en la later la constructione de la constructione de la constructione de la const
P ID.6. (72)	Yoshiharu Hashimoto, Daisuke Kondo, Saori Otsuka, Osamu Ichii, Motoki Sasaki, Nobuo Kitamura and Yasuhiro Kon
P 1D.7. (74)	Teaching Crocodilian Anatomy to Undergraduates
	Carsten Hopperdietzel, Johanna Plendl, Kenneth Richardson
P 1D.8. (92)	Can the Use of iPads Enhance Learning in the Dissection Laboratory
	Juha Laakkonen
P 1D.9. (114)	"The Back of the Dog" – an Interactive Learning Program on the Anatomy
	Kaline Pfaffendorf and Johann Maierl
P 1D.10. (120)	Three-Dimensional Visualizations Can Improve Anatomical Training – Using the Example of Canine and
	Feline Bones of the Thoracic Limb
	<u>Cordula Poulsen Nautrup</u> , Matthias Kästner, Inga Wölfel, Johanna Helmke, Ulrike Matis, Andrea Meyer- Lindenberg, Andreas Brühschwein
P 1D.11. (141)	Using Methods to Support the Learning of Veterinary Anatomy
	Inmaculada Santos, Maria José Blánquez, Pilar Martínez and Concepción Rojo
E. Clinical, Functional	and Imaging Anatomy
P 1E.1. (10)	Clinical Importance of Muscle Variation in Dogs
	<u>Ivan Ali</u> ć, Tajana Trbojević Vukičević, Martina Duras, Dražen Vnuk and Vesna Gjurčević Kantura
P 1E.2. (33)	Morphological Analysis of the Cranial Caudal Fossa (CCF) in the Dog
	<u>Norbert Czubaj,</u> Wojciech Sokołowski, Michał Skibniewski, Karolina Barszcz, Marta Kupczyńska and Michał Wąsowicz
P 1E.3. (87)	Retrograde Intravenous Regional Anaesthesia in Sheep's Limbs
	Thomas Köppen, Andrea Fiedler and <u>Johann Maierl</u>
P 1E.4. (89)	Clinical Morphology of the Transverse Ligament of the Atlas in the American Mink (Neovison vison) Marta Kupczyńska, Karolina Barszcz, <u>Norbert Czubaj</u> , Wojciech Sokołowski, Karolina Warchulska, Małgorzata Sobczak-Filiniak and Michał Wasowicz

P 1E.5. (104) Comparison between Radiographic and Ultrasonographic Measurements of Renal Size in Healthy Cats Julie Monot, Jean Sautet, Didier Concordet and Giovanni Mogicato

- P 1E.6. (110) The Knee Joint Capsule in Dogs with Patellar Luxation: Histology and Collagen Distribution Petra Peer, Hana Huenigen, Leo Brunnberg and Johanna Plendl
- P 1E.7. (150) Relation between Rostral Cranial Fossa and Basis of Cranial Cavity in Mesaticephalic Dogs Wojciech Sokołowski, Norbert Czubaj, Michał Skibniewski, Marta Kupczyńska, Karolina Barszcz and Michał Wąsowicz
- P 1E.8. (161) Ultrasonography Application in the Early Gestation Diagnosis in Cows and Buffalo Cows <u>Grigore Tomai</u>, Melania I. Crişan, Irina Irimescu, Flaviu Tuns, Aurel Damian and Iancu Morar
- P 1E.9. (171) Comparative Aspects of Liver Tumors Diagnosed Through Clinical, Imaging and Laboratory Methods in Cats and Dogs Cristina-Alice Vulpe, Elena Gavrilaş, Sorin A. Pasca, Constantin Spataru, Vasile Vulpe and Ionel Papuc
- P 1E.10. (172) Studies of Radiological Anatomy Performed with a Contrast Substance of the Digestive Tractus in Adult Quails (*Coturnix coturnix*)
 - Vasile Vulpe, Constantin Spataru and Tescovschi Teona

P 1E.11. (175)	Computed Tomography Analysis of Guinea Pig Bone: Architecture, Density and Dimensions throughout Development Agata Witkowska, Aziza Alibbai, Chloe Hughes, Jenny Price, Craig Sturrock and Catrin S. Butland
P 1E.12. (180)	Three-dimensional Model of the Skeletal and Vascular System of the Dog's Forelimb Bianka Zankó, <u>László Z. Reinitz</u> , Gábor Csontos, Tibor Kovács, Attila Arany-Tóth and Péter Sótonyi
POSTER SESSION 2: Saturday	[,] July 26, 2014, 11:15–12:45
A. Urogenital System	
P 2A 1 (67)	A Quantification Study of Terminal Arterioles to the Uterine Tube in the Sow
	Hugo A. Gutiérrez Truiillo. Elizabeth Martínez. Rafael Latorre and Octavio López Albors
P 2A.2. (68)	Pattern of Terminal Arterioles Supplying the Uterine Tube in the Sow
	Hugo A. Gutiérrez Trujillo, Elizabeth Martínez, Rafael Latorre and Octavio López Albors
P 2A.3. (106)	Morphostructural Role of Rete Ovarii in Adult Cows
	Florin Nechifor, Dan Drugociu, Carmen Solcan, Ștefan Ciornei and Petru Roșca
P 2A.4. (115)	The Distribution and Chemical Coding Of Urinary Bladder Trigone Projecting-Neurons in Prevertebral
	Ganglia of the Male Pig
	Pidsudko Zenon, Załęcki Michał, Dudek Agnieszka, Sienkiewicz Waldemar, Godlewski Janusz and Kaleczyc Jerzy
P 2A.5. (130)	Effects of Prepubertal, Pubertal and Adult Orchiopexy in Testicular Morphology and Spermatozoids in Rats
	Carina T. Ribeiro, Raquel Milhomem, Diogo B. De Souza, Bianca M. Gregório, Carla B.M. Gallo, Waldemar S. Costa,
	Francisco J.B. Sampaio, Marco A. Pereira-Sampaio
P 2A.6. (131)	Effect of Anti-oxidants on Outcomes of Testicular Torsion in Rats of Different Ages
	Carina T. Ribeiro, Raquel Milhomem, Diogo B. De Souza, Waldemar S. Costa, Francisco J. B. Sampaio and Marco
	A. Pereira-Sampaio
P 2A.7. (138)	Aspects Linked to the Presence and Distribution of Rete Ovarii in Hybrid Merino Ewe Lambs
	Vasile Rus, Ionel Radu, Flavia Ghiran, <u>Gal Adrian,</u> Lucica Geru, Viorel Miclăuș
P 2A.8. (169)	Expression of Steroidogenic Acute Regulatory Protein (STAR) and 15-Hydroxyprostaglandin
	Dehydrogenase (HPGD) in Bovine Placentomes at Parturition
	Jessica von Hof, Nele Sprekeler, Gerhard Schuler, Mariusz P. Kowalewski and Alois Boos
B. Cardiovascular System and	d Lymphoid tissue
D 2D 1 (C)	The Duanching of the Acutic Auch in the Flowings
F 2D.1 (0)	
D 7R 7 (7)	Ayun Alan, mulat Ornan and Aynan Duzler
F 20.2. (7)	(Coturnix coturnix inconica) during the Post-batching Poriod?
	Emol Alan Narin Liman and Hakan Sağısaz
P 2R 3 (12)	Mornhometry of the Coronary Ostia in the Domestic Shorthair Cat
1 20.3. (12)	Karolina Barszcz, Marta Kunczwiska, Wojciech Sokołowski, Norhert Czubaj, Michał Wasowicz, Joanna
	Kalolina balszez, marta Rapczyńska, <u>wojciech sokolowski</u> , wolben czabaj, michał wąsówicz, soanna Klaćkowska.Nawrot and Pawał Janczuk
P 2B / (17)	Anatomic Acnests Regarding the Subenicardic Branches of the Coronary Arteries of the Pig (Sus scrafa)
1 20.4. (17)	Alexandra Blendea, Nicolae Cornilă, Ioana D. Chirilean, Melania I. Crisan, Sergiu C. Bărdas, Cristian O. Martonos
	and Aurel Damian
P 2B 5 (36)	The Structural Features of Several Large Arteries in Pigs
	Aurel Damian, Viorel Miclăus, Melania I, Crisan, Irina Irimescu, Vasile Rus and Elaviu Tuns
P 2B.6. (44)	Histological Evaluation of Equine Melanoma with regard to Vascularization
	Kathrin Dietze Petra Peer, Karin Briest-Forch, Tania Fuhrmann-Selter and Johanna Plendl
P 2B 7 (45)	Age Related Echocardiographic Parameters of Clinically Healthy Rabbits
	Ömer G. Dilek and Hasan Erden
P 2B.8. (47)	Lectin- and Immunohistochemistry of Porcine Lymph Nodes
	Claudio Dolder, Michael H. Stoffel and Kathrin Kuehni-Boohenbor
P 2B.9. (85)	Do Endothelial Cells Activate Lung Cancer Cells to Form Blood Vessels?
	Sabine Kaessmeyer, Kanti Bhoola, Svetlana Baltic, Philip Thompson and Johanna Plendl
P 2B.10. (86)	Lymphatics in the Distal Forelimb of the Horse
	 Horst E. König, Jenny Hagen and Peter Böck
P 2B.11. (93)	Expression of the Z-disk protein Myozenin-2 in Angiogenic Endothelial Cells in vitro
	Elisa Lauterbach, Simone Fietz, Johanna Plendl and Mahtab Bahramsoltani

P 2B.12. (140)	Immunolocalization of Vascular Endothelial Growth Factor, Its Receptors (flk1/fms, flk1/KDR, flt4) and Vascular Endothelial Growth Inhibitor in Quail Spleen (<i>Coturnix coturnix japonica</i>) During the Post-
	Hakan Saŭsöz, Narin Liman and Emal Alan
P 2B 13 (163)	Features of the Ascending Aorta and of Its Emerging Branches in Swine
1 20.13. (100)	Flaviu Tuns, Cornel Cătoi, Ioana D. Chirilean, Florin G. Stan, Cristian C. Dezdrobitu, Cristian O. Martonos
	Laurent Ognean. Ionel Papuc and Aurel Damian
C. Musculo-skeletal System	
P 2C.1. (13)	The Morphology of the Forelimb Skeleton in Tiger (Panthera tigris)
	Cristian Belu, Gabriel Predoi, Iulian Dumitrescu, Florica Bărbuceanu, Bogdan Georgescu, Anca Șeicaru, Petronela Roșu, Ștefania Raita and Nicolae Cornilă
P 2C.2. (29)	Histological Research of the Distal Sesamoid Bone's Fibrocartilage in Draught Horses Diagnosed with
	Deep Digital Flexor Tendinopathy
	<u>Melania I. Crișan</u> , Aurel Damian, Viorel Miclăuș, Adrian Gal, Cristina L. Ștefănuț, Irina Irimescu, Cristian C. Dezdrobitu and Jean-Marie Denoix
P 2C.3. (61)	Vascular Channels in Hyaline Cartilage: Development of Channels and Removal of Matrix Degradation
	Products
	Simone Gabner, Gabriele Häusler and Peter Böck
P 2C.4. (69)	The Correlation between Morphological and Functional Parameters of the Equine Hoof
	Jenny Hagen, Daniela Mader and Willy Wuttke
P 2C.5. (70)	The influence of Hoof trimming on Bone Alignment, Pressure Force Distribution, Hoof Morphology
	and Fooung
P 2C 6 (75)	<u>Senity Hagen,</u> Daniela Mader and Willy Wollke
1 20.0. (73)	Michael Hünnler Sandra Geiger Daniela Mäder Florian Häfner Jenny Hagen
P 2C 7 (76)	The Effect of Orthopedic Horseshoe Modifications on the Bone Alignment of the Equine Foot
	Michael Hüppler. Sandra Geiger. Daniela Mäder. Florian Häfner. Jenny Hagen
P 2C.8. (98)	The Skull of the Common Viper
	Bianca Matosz, Ioana Dumitru, Cristian C. Dezdrobitu, Călin C. Pop, Alina M. Iurcuţ, Gabriel M. Borza, Carmen
	B. Crivii and Aurel Damian
P 2C.9. (100)	Development and Differentiation of the Flight Muscles of Birds
	<u>Oleg P. Melnyk,</u> Szara Tomasz and Olexii Melnyk
P 2C.10. (101)	Morphology of the Pectoral Girdle of Some Paddlefish and Sturgeons
	<u>Oleg P. Melnyk</u> , Kateryna Grom and Szara Tomasz
P 2C.11. (103)	Structural Properties of the Post-Natal Equine Deep Digital Flexor Tendon
	Kristina Minichmair, Iris Ribitsch, Florien Jenner and <u>Monika Egerbacher</u>
P 2C.12. (105)	Ossification of the Pelvic Symphysis in Ruminants
P 2C 12 (111)	Esta Narikur, Erin Erinis, Viauinin Anurianov, Minker Jaiakas and Eria Jaiv
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Abstracts

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1 - Development of a short-term canine fullthickness skin organ culture model – preliminary observations

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Introduction: Although human cultured skin models have been widely researched for either pathogenic, toxicology and skin substitute development studies, the only data available in veterinary medicine rely on Gottingen minipig skin organ culture. The aim of the present study was to establish a canine skin organ culture method for the short-term maintenance of full-thickness, adult canine skin in serum-free medium to be used in future mechanistic investigations. Success criteria included maintenance of normal morphology, keratinocyte proliferation and Mast cell's physiology.

Methods: Normal skin was obtained from a donor dog. Four-millimeter wide skin samples were placed into 6 well plates and cultured in William's E medium supplemented with antibiotics, insulin, hydrocortisone and L-glutamine at appropriate concentrations. At different time-points (day 1, 4 and 7) skin specimens were processed for paraffin embedding and 5- μ m sections were stained for morphological evaluation using H&E and Mallory staining. Mast cells degranulation was induced with compound 48/80 and evaluated on metachromatic toluidine blue staining. Cell proliferation was assessed by Ki67 immunoreactivity.

Results: General tissue architecture was maintained up to day 7. Epidermis was well preserved throughout the study. Dermis was structurally intact and showed normally blue-stained collagen bundles with the Mallory method. Ki67 immunostaining showed keratinocyte proliferation up to day 4. Hair follicles showed degenerative changes in the bulb region as from day 1. Compound 48/80 was able to induce mast cell degranulation in culture. Mast cells were clearly identified up to day 7.

Conclusions: Our preliminary data suggest that canine skin organ culture model, once standardized and optimized, could offer a new tool for studying epidermal and dermal cells within their natural 3D environment, deepening our knowledge on pathophysiological mechanisms of canine skin disorders, as well as evaluating topical formulations.

2 - Influence of dietary acetic acid supplementation on the broiler performance, intestinal histomorphology and hematology Ahsan-ul-Haq¹, N. Akram¹, Zaib-Ur-Rehman², Shahid-Ur-Rehman¹, M. Ashraf¹ and R. H. Pasha³*

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Introduction: This study was intended to investigate the effect of increasing levels of acetic acid (AA) on performance, hematology and intestinal histomorphology of broilers.

Methods: One hundred and eighty one day-old broiler chicks were purchased from local hatchery and were reared in a group for one week. After one week, one hundred twenty broiler chicks of medium weight were picked up randomly and divided into 12 experimental units (10

chicks/each). A total of 120 broilers were randomly allotted to 1 of the following 5 dietary treatments: 1) basal diet (AA0), 1 g/Kg AA (AA1), 20 g/Kg (AA2) and 30 g/Kg (AA3) acetic Acid. Experiment was conducted from 1 to 42 days under uniform management conditions, with the first week as adaptation period. Acetic acid supplementation improved weight gain (P < 0.00) and feed conversion ratio (P < 0.001). Acetic acid supplementation showed non-significant effect on feed consumption (P > 0.05).

Results: Overall acetic acid supplementation at 0.3% level improved bird's performance during 2-6 weeks of age. Data at slaughtering showed that dressing percentage exhibited non-significant effect by supplementation of AA. Supplementing AA increased the intestinal length, intestinal weight and showed significant decrease in pH of proventriculus and gizzard (P < 0.01) as level of acid increased. The best results were found under AA3. By increasing the levels of AA in broilers feed, villus height, crypt depth, villus surface area of duodenum were increased. Increasing levels of AA significantly increased the lymphocyte concentration (P < 0.01) and decreased the heterophil/lymphocyte (H/L) ratio (P < 0.01). Supplementation of acetic acid revealed non-significant effect on red blood cells, white blood cells, heterophil, packed cell volume, hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration (P > 0.05).

Conclusions: In conclusion, acetic acid supplementations in broiler feed revealed positive effects on performance, intestinal histomorphology and hematological parameter.

3 - Expression of epidermal growth factor receptors and epidermal growth factor, amphiregulin and neuregulin in bovine uteroplacental tissues during gestation *M. E. Akbalık* and M. A. Ketani*

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Introduction: Growth factors are proteins that bind to specific cell surface receptors that initiate signalling pathways and result in proliferation or differentiation of the affected cells. During gestation, epidermal growth factor receptors (ErbB1-4) and its ligands (epidermal growth factor-EGF, amphiregulin-AREG, neuregulin1-NRG1) play a significant role in differentiation, function and growth of the uterus. The aim of this study, was to determine the role of ErbB receptors and its ligands in bovine uteroplacental tissues during gestation.

Methods: The gravid uteruses of 30 Holstein cows from early gestation until near term were obtained from private

slaughterhouses operating in Diyarbakır province. Tissue samples taken from the placentomes and interplacentomal regions of the gravid uterine cornu were fixed in 10% neutral formaldehyde solution for routine histological processing and were subjected to immunohistochemical staining methods were applied on $5-\mu$ m serial sections.

Results: It was determined that immunoreactivity for ErbB receptors and the ligands were observed in trophoblasts, the cotyledonary stromal, caruncular epithelial and stromal cells, while caruncular stromal cells did not show any immune reaction for ErbB1, EGF, AREG, NRG1 and cotyledonary stromal cells for ErbB1. However, immuno-reactivity was detected for ErbB receptors and its ligands in the luminal and glandular epithelial, stromal and smooth muscle cells of the uterus. Generally, it was observed that total scores (6.49 ± 0.49 ; 4.97 ± 0.61 ; 2.75 ± 0.52) for ErbB receptors and its ligands had decreased from early to late gestation (P < 0.05).

Conclusions: Our study shows the presence of ErbB receptors and EGF, AREG and NRG1 in the mid- and late-phases of pregnancy. The results indicates that these factors may play a crucial role not only to enable cellular proliferation and differentiation in the uterus throughout gestation, but also to have a potential role in the communication between the embryo/fetus and uterus within the placenta.

4 - The expression of osteopontin in small intestine in the chukar partridge (*Alectoris chukar*, *Gray* 1830)

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Introduction: Osteopontin (OPN) which has been isolated from rat bone is a highly phosphorylated sialoprotein that is an important component of the mineralized extracellular matrix of bone and teeth. OPN was found in kidney, testis, gastrointestinal regional secretions and epithelial cells. OPN interacts with CD44 and various surface receptors containing few integrin and finally cell adhesion, migration and specific signal functions are being situmulated. Although OPN have been used in histological studies and diagnostic pathology for cancer researchs, its localizations in the intestine of chukar partridge has not yet been studied. The aim of this study was to demonstrate, the pattern of expression of OPN in different regions of the small intestine mucosa of chukar partridge. Methods: In this study the OPN localization in small intestine of 10 chukar partridge (5 male and 5 female) was examined on the level of light microscope by using immunhistochemical methods. Tissues were fixed in formol-alcohol for 18 h, dehydrated, cleared and then embedded in paraplast. Two slides were prepared from each sample, and each slide contained a minimum of three sections that were at least 100 μ m apart. Serial 5- μ m-thick sections were cut.

Results: OPN immunostaining was present only in epithelial cells of all small intestine regions. In duodenum while OPN reactivities were being observed both in cytoplasm and basal surface of epithelial cells, in jejunum and ileum both decrease in cytoplasmic staining and be seen in the apical and basal localization was remarkable.

Conclusions: The findings of the present study suggest that, for the OPN, the differences between localizations of OPN in intestine may be related to ligand localization and cellular behaviour. On the bases of literature, we thought that the functional contribution of these glycoproteins might be related to cellular barier and/or secretion.

5 - Anatomic and scanning electron microscopic studies of the tongue and lingual papillae in red fox (*Vulpes vulpes linnaeus 1758*)

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Introduction: The purpose of this study was to examine threedimensionally the dorsal lingual surface of the red fox, in order to compare the results with those previously published in other mammals.

Methods: One adult red fox which died because of traumatic causes after being brought to the clinic was evaluated in this study. Tissue samples were taken from various parts of tongue. Thereafter, the specimens were dehydrated through graded series of acetone, critical-point-dried and sputter-coated with gold-palladium before being examined under scanning electron microscope.

Results: The length of the tongue is 9–10 cm. Fungiform papillae and filiform papillae are very common in front and mid-1/3 parts of dorsal face. Whereas filiform papillae are short in front part (0.1 mm), the length of them rises towards the root of tongue (0.5 mm). Average diamaters of fungiform papillae are 0.5 mm. Papillae vallate, papillae foliata and papillae conica are seen in posterior 1/3 part of tongue. Papillae foliate are formed from 4–5 laminae in both sides of tongue and gustatory holes around 0.025 mm diamater are seen on it. There are two vallate papillae in both parts of tongue and it is sorrounded gustatory groove. Papillae conica are seen in

the root of tongue and lengths of them varies between 0.3-2.1 mm.

Conclusions: Morphological differences and variations appearing in the tongue are directly associated with dietary specializations and food type (Iwasaki S, 2002: Journal of Anatomy 201:1–13). In the study five types of lingual papillae were found on the dorsal surface of the tongue. The number and arrangement of the 4 vallate papillae, observed in the red fox, are similar to those observed in the silver fox (Jackowiak et al, 2004: Annals of Anatomy 186:179–183).

6 - The branching of the aortic arch in the flamingo

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Introduction: The aim of this study was to determine the vascular branching morphology of the aortic arch in the flamingos (*Phoenicoptures ruber*). In birds, in contrast to mammals, two brachiocephalic trunks originate from the aortic arch and give rise to the common carotid and subclavian arteries. According to literature, no studies have addressed the vascular organization of the aortic arch in the flamingo.

Methods: Two adult flamingos (*Phoenicoptures ruber*) were evaluated in this study. Red colored latex was injected into the left ventricle. The animals were dissected and photographed thereafter.

Results: The heart was located from the first to the third intercostal space in the flamingos. The two brachiocephalic trunks arose separately but adjacent to each other from the aortic arch. The left trunk was longer than the right one but the diamater of the right trunk (0.684 mm) was greater than the left one (0.601 mm). It was observed that the right and left trunks gave rise to the common carotid arteries at the distance of 1.52 and 2.03 cm on average away from their origins of the aortic arch, respectively.

Conclusions: The right and left brachiocephalic trunks arise from the aortic arch and give rise to common carotid and subclavian arteries in avian species (Baumel et al. 1993 Handbook of Avian Anatomy:Nomina Anatomica Avium, 2nd edn. Cambridge, pp 425–426; Erdogan S, 2012: Vet Med Czech 57(5):239–244; King AS, McLelland J, 1984: Birds: their structure and function, 2nd edn. Pitman, Reading, pp218–220). The subclavian and common carotid arteries supply the head, neck, cervical and pectoral region and forelimbs (Nickel R, Schummer A, Seiferle E, 1977: Anatomy of the domestic birds. Parey, Berlin, pp. 85–90). Likewise, we observed that two brachiocephalic trunks arise from the aortic arch in the flamingo and continue in short subclavian arteries on both sides.

7 - Are epidermal growth factor receptors and ligands expressed in the spleen of the Japanese quail (Coturnix coturnix iaponica) during the post-hatching period?

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Introduction: The Epidermal Growth Factor (EGF) family (ErbB1, ErbB2, ErbB3, ErbB4 receptors and their ligands such as EGF, neuregulin and amphiregulin) plays an important role in the development of several organs (Ejskjaer K, et al. 2005: Mol. Hum. Reprod. 11, 543-551). The avian spleen is a principal organ of systemic immunity and its importance in disease resistance is presumably accentuated by the scarcity of avian lymph nodes (John JL. 1994: Q. Rev. Biol. 69, 327-351). The aim of this study was to determine whether ErbB receptors and their ligands are expressed in the structural component of the quail spleen during the post-hatching period.

Methods: Five quails each, aged 1, 7, 14, 21, 28, and 60 days, were euthanized under ether anaesthesia and their spleens were fixed in a formaldehyde-alcohol solution. Following routine histological processing, strepavidin-biotinperoxidase method was used for immunohistochemical examination.

Results: EGF was not observed in any of the spleens structural components. Although, strong cytoplasmic immunoreactions for ErbB2, ErbB4 and Neuregulin were observed in ellipsoid associated cells of the quail spleen throughout the post-hatching period, amphiregulin immunostaining was weak. Furthermore, it was observed that ErbB2 immunoreactivity in ellipsoid associated cells increased after the 7th day post-hatching. ErbB1, ErbB3, ErbB4, amphiregulin and neuregulin immunoreactions were relatively similar in all components of the spleen during post-hatching period. Some cells of the peri-arterial lymphatic sheath (PALS) and peri-ellipsoidal white pulp (PWP) showed positive immunoreactivity for ErbB2, ErbB3, ErbB4, Neuregulin and Amphiregulin, but not ErbB1. ErbB2 immunoreactivity in the muscle cells of vessels was stronger than ErbB1, ErbB4, neuregulin and amphiregulin immunoreactivities.

Conclusions: Our data show that EGF is not produced by the spleen, however, ErbB1, ErbB2, ErbB3, ErbB4, amphiregulin and neuregulin are expressed by different structural components of the quail spleen during the posthatching period.

This study was approved by the Ethics Committee of Ercives University.

8 - Immunohistochemical localization of epidermal growth factor system in the lung of the Japanese quail (Coturnix coturnix japonica) during the post-hatching period E. Alan¹*, N. Liman¹ and H. Sağsöz²

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Introduction: The Epidermal Growth Factor (EGF)-system plays a major role in prenatal and postnatal lung development and in the repair of damaged airway epithelium and mucin production (Nadel JA. 2001: Respir. Res. 2, 85-89, Burgel et al., 2004: Thorax 59, 992-996). It comprises four receptors, ErbB1, ErbB2, ErbB3, ErbB4 and ligands such EGF, neuregulin and amphiregulin. The function and localizations of EGFRs and its ligands, however, has not yet been established in post hatch development of lung in birds. The purpose of this study is to determine the possible changes in the localization of the four EGF receptors and three ligands in quail lungs from the first day of hatching until the 125th after hatching, using immunohistochemical methods.

Methods: Five quails each (total 30 quails), aged 1, 5, 10, 15, 30, and 125 days, were sacrified under ether anaesthesia following fixation in alcoholic-formalin and embedding in paraffin processing, strepavidin-biotin-peroxidase method was used for immunohistochemical examination. This study was approved by the Ethics Committee of Ercives University.

Results: The nuclear and cytoplasmic immunoreactions for EGFRs and ligands in the air capillaries, atria, parabronchi, secondary bronchi of quail lung were relatively similar throughout the post-hatching period. Neuregulin and ErbB4 cytoplasmic stainings in the epithelium of atria, parabronchi and secondary bronchi were stronger than nuclear staining. ErbB2 immunoreactivity was strong in the muscle cells of atria, secondary bronchi and blood vessels; however immunoreactivities for other receptors and ligands were weak. ErbB1 was very strong especially in the goblet cells of epithelium of the secondary bronchi. The macrophages in the interstitial tissue of the parabronchial walls displayed positive immunoreaction for Amphiregulin, Neuregulin and ErbB4.

Conclusions: Our data, which showed the presence of EGFRs and ligands in the structural component of quail lung during the post-hatching period, support the hypothesis that the member of EGF-system play an important role in post-hatch lung development in quails.

9 - About the inguinal gland during gestation and after parturition: a glance towards prolactin, estradiol and progesterone receptors

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Introduction: In the ewe, the inguinal gland (IG) smelling product, in combination with vocal and tactile stimuli, seems to activate udder-seeking behavior. Lambs are reactive to IG odour and can discriminate between the scent of its own mothers' IG from others. We have demonstrated that estradiol receptors (Er α and β) and progesterone receptor (*P4R*) genes mRNA transcription occurs within the IG. Nevertheless, the expression of putative related genes to nursing functions and their signalling pathways during different estrous cycle phases are still unknown. The goal of this work was to evaluate mRNA level of prolactin receptor (PRLR) and expression of Er(α and β) and *P4R* in sheep IG during pregnancy and after parturition.

Methods: IG from 12 adult cyclic ewes were collected at pregnancy (n = 6) and after parturition (10–15 days, n = 6) and Er (α and β) and *P4R* expression were quantified by flow cytometric analysis (FACScanTM). Qualitative PCR was performed in order to assess *PLR receptor* gene transcription in the IG, LSConfocal performed, and Data analysed by ANOVA.

Results: An increase in the expression of Er (α and β) and *P4R* in the IG was observed after parturition (*P* > 0.001), when compared to pregnancy, being the levels of Er β higher than the others (*P* > 0.05). The mRNA of PLR was transcribed in IG.

Conclusions: Since the IG is an integumentary appendage, and the focal point of prolactin actions is the integument, it explains the presence of PRLR in this gland. To the best of our knowledge, it was shown for the first time that mRNA of PLR was transcribed within the ewe IG, which might contribute for a better understanding of PRL action. Besides, significant modifications on the expression of P4R and Er (α and β) after parturition in the IG can be seen as a possible signaling pathway for

nursing functions and activation of udder-seeking behavior.

Experiments were monitored by competent veterinary authorities and approved by the ethical committee of the Faculty of Veterinary Medicine (Lisbon, Portugal). Several authors are holders of FELASA (Federation of European Laboratory Animal Science Associations) grade C certificate. Sheep were euthanized by official entities were collected by a veterinarian according to the directive 86/ 609/EEC.

10 - Clinical importance of muscle variation in dogs

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Introduction: Muscle variations are defined as the appearance of additional muscle bundle or belly, unusual muscle origin or termination, as well as complete absence of a muscle. Muscle variations are very interesting regarding their embryonic development, but their importance increases during some surgical procedures. The aim of this study was to describe the abundance and clinical importance of some muscle variations in the dog.

Methods: A total of 57 dogs, conserved with 4% formalin fixative solution, were dissected within a gross anatomy course at the Faculty of Veterinary Medicine University of Zagreb.

Results: Muscle variations were observed in 13 (22.8%) of 57 dogs in different body region as follows: in pectoral girdle muscles (brachiocephalicus, omotransversarius, rhomboideus capitis and serratus ventralis cervicis); in neck muscles (strenocephalicus, sternohyoideus, styl-ohyoideus and scalenus dorsalis); in the muscles of the thorax (intercostales muscles) and in hindlimb muscles (sartorius). The most of variations were observed in pectoral girdle muscles (7 dogs), followed by neck muscles (4 dogs), while variations of thorax and hindlimb muscles were observed only in one dog each.

Conclusions: Muscle variations are important during surgical procedures because they are part of the surgical field. Moreover, rhomboideus and serratus ventralis are important during forelimb amputation. Additionally, serratus ventralis muscle is crucial for intercostal thoracotomy. The sternocephalicus and sternohyoideus are important during cervical vertebrae approach and intervertebral disks repairs, while the structure of sternohyoideus

and stylohyoideus should be taken in account during cervical soft tissue approach. The sartorius muscle is implemented in repairs of traumatic caudal abdominal hernias and large inguinal hernias. Therefore, our study confirms the strong bond between basic anatomical research and clinical science.

The animals were handled in accordance with the Croatian Animal Protection Act (2006), and the study protocol was approved by the Ethics Committee of the Faculty of Veterinary Medicine.

11 - Quantitative analysis of the relative abundance changes observed in Type I, III and V collagen after suspensory ligament injuries in horses

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Introduction: The equine suspensory ligament (SL) injuries are an important cause of lameness in horses. Quantification of the relative abundance of the constitutive collagen types is essential to investigate the differences between normal and injured tissues. The aim of this original study was to precisely determine the different collagen ratios both in injured and normal SL. This approach is a rational step towards understanding the intimate mechanisms of SL repair and regeneration at the molecular and histological levels.

Methods: Five Warmblood horses with visible signs of injury in only one forelimb SL were selected. Specimens were obtained from the central core of lesions in damaged SLs and from the corresponding regions in other healthy SLs. Collagen types I, III and V were purified by differential salt precipitation after collagen extraction with acetic acid containing pepsin and they were examined by transmission electron microscopy. The bands corresponding to types I, III, and V collagen were assessed by densitometry after SDS-PAGE. SAS software (SAS Institute 2001) was used for all statistical analyses.

Results: Based on ultrastructural observations, purified fibers of types I, III, and V collagens have been identified. The relative proportions of type III and type V collagen

were significantly higher in the specimens from damaged tissue compared with specimens from normal tissue (P < 0.0001). These changes were concomitant with significant decrease in type I collagen in the injured tissue (P < 0.0001).

Conclusions: Our study showed that after SL injury, the relative abundance of the different collagen types is modified. These changes are the molecular hallmark of a decrease in tissue quality and mechanical properties of the ligament. It lays down the bases of subsequent researches on the tissue regeneration that may lead to the development of new treatment strategies for damaged tissues, particularly in the equine SL injuries.

12 - Morphometry of the coronary ostia in the domestic shorthair cat

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Introduction: Diagnosis and treatment of heart diseases due to changes in the coronary vascularisation need a detailed knowledge on the morphology and possible variations of the aortic valves and coronary ostia. This study was performed to clarify details on morphology and morphometry of these structures in domestic shorthair cats.

Methods: The study was performed on 52 hearts of adult domestic shorthair cats of both sexes. Pathological examination was performed before dissection of the hearts. The ascending aortas were collected from all the studied hearts by detaching them just above commissures of the aortic valves. Subsequently, a transverse cut was performed to reveal coronary ostia. Morphological and morphometrical observations were perfomed with the use of Ecleris surgical microscope with an integrated video channel and software adapted to metric analysis of images. Measurements of the opening area of the left coronary artery PACS (mm^2) , opening area of the right coronary artery P_{ACD} (mm²) and difference between them were determined. A statistical analysis of results was performed with the use of Statistica 10.0 software. The difference between the population of males and females for each of the parameters was determined by the Fisher's LSD test and the significance level was $P \leq 0.05$.

Results: In all examined specimens, the aortic valve had a tricusp structure and coronary ostia were located in the sinuses of the left and right semilunar leaflets. In the studied material it was found that the P_{ACS} (0.54–2.64 mm²) in all individuals was bigger than P_{ACD} (0.12–1.37 mm²). The average difference between the opening area of the above vessels amounted to 0.65 mm². No significant differences were noticed between the population of females and males.

Conclusions: The present study provides data useful in the diagnosis of cardiac diseases based on current angiography methods and as a basic for surgical interventions.

The tests were carried out in accordance with the Resolution No. 16/2009 of the III Regional Ethics Committee for animal testing in Warsaw.

13 - The morphology of the forelimb skeleton in tiger (*Panthera tigris*)

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Introduction: Bones from a cadaver of a male tiger (*Panthera tigris*) from Zoo Băneasa has described. We strongly believe that this study can be useful to the veterinarians from zoos, parks, and other protected areas.

Methods: After the maceration was completed, the bones were washed and dried. Bones were measured and described in accordance with Nomina Anatomica Veterinaria – 2005. The results have been compared with the existing and for the jaguar (*Panthera onca*).

Results: Scapula in *Panthera tigris* is resembling to the other big cats. Bone length measured on the dorsal edge (taking the direction of the spina scapularis) to acromion is 29.5 cm; before width at half of shaft is 15.5 cm. The ratio of these dimensions is 1.90. The ratio of the length and width of glenoid cavity is 1.35. Humerus has a 36 cm in length and 4.1 cm width at the middle of the shaft, the ratio being 8.78. Radius is 30.5 in length and 3.2 cm width at the middle of the shaft, the ratio of the length. The ratio between the length of the ulna and the olecranon height (measured from the base of coronoid process to the tuberosity of the olecranon is 3.66.

Conclusions: All studied bones have the general features presented in felines. In comparison with the jaguar, tiger's

bones are significantly longer. We consider that the differences are explained by the ability of the jaguar to climb and can be criteria of considering bones origin when necessary.

14 - Basic fibroblastic growth factor inhibits osmotic swelling of rat retinal glial (Müller) cells

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Introduction: Retinal edema is a prominent vision-threatening complication of ischemic-hypoxic and inflammatory retinal diseases. Edema is caused by vascular hyperpermeability (vasogenic edema) and/or water accumulation in retinal neurons and glial cells resulting in cellular swelling (cytotoxic edema). Normally, Müller glial cells regulate the retinal osmo- and volume homeostasis by transcellular ion and water transport and maintenance of their cell volume when neuronal activity causes a decrease in extracellular osmolarity and activated neurons display glutamate-induced swelling. However, the capability of Müller cells to regulate the retinal osmo- and volume homeostasis is impaired under pathological conditions, and they rapidly swell under hypoosmotic conditions that is not observed in cells of normal healthy retinas. Thus, osmotic Müller cell swelling may contribute to the development of retinal edema and neurodegeneration. The aim of the present study was to determine whether basic fibroblast growth factor (bFGF), a main neuroprotective factor in the retina, may inhibit the osmotic swelling of Müller cells in rat retinal slices.

Methods: Swelling of Müller cells was induced by superfusion of freshly isolated retinal slices with a hypoosmotic solution (60% osmolarity) containing barium chloride (1 mM). Pharmacological receptor blockers were used to determine the receptor types involved in the swelling-inhibitory effect of bFGF.

Results: bFGF prevented completely the osmotic swelling of Müller glial cells in retinal slices. The swelling-inhibitory action of bFGF was dose-dependent, with a half-maximal effect at ~1.1 ng/ml. The effect of bFGF was abrogated in the presence of the FGF receptor kinase inhibitor, PD173034, and the antagonist of group II metabotropic glutamate receptors, LY341495, respectively. *Conclusions:* The data suggest that the neuroprotective effect of bFGF in the retina is mediated in part by prevention of the cytotoxic swelling of retinal glial cells. The swelling-inhibitory effect of bFGF might be mediated by induction of autocrine/paracrine glial glutamate signaling.

15 - Po"t"casts for teaching veterinary anatomy

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Introduction: Students use multimedia-supported teaching material with increasing frequency and intensity. Integration of this material with other formats is of paramount importance and improves students' learning success. The working group "VetAnaTube" at the Institute of Veterinary Anatomy in Leipzig deals with the production of various kinds of multimedial learning material. Among these especially "potcasts" are used frequently by students. Potcasts are audiovisual flash-animations of specimens of the anatomical museum (from formalin-pot to po"t"cast). The objective of the study was to evaluate whether and to which extent potcasts enhance the learning effect in veterinary anatomy in comparison to traditional media.

Methods: Two potcasts featuring the anatomy of the tongue were produced. A photograph of a specimen was combined with a descriptive text and additional information to an animation using the software Adobe Flash Professional. First and 2nd year students (n = 101) were randomly allocated to a "potcast-group" and a "textgroup". After the same time period of preparation (watching the potcast vs. reading the text) students took a written mini-exam. In addition the potcast-group was asked to fill in a feedback sheet (6 step Lickert-scale).

Results: Evaluation of the test revealed that the potcastgroups of both years achieved better results compared to the text-groups. These differences varied within the individual questions. The total results for given right answers of the 1st year students show that the potcast group (44.1% right) was up to 9.5% better than the text group (34.6% right). In comparison 2nd year students in both groups achieved higher rates of right answers (73.8–81.9%)%, with a difference of 8.1% in favor of the potcast group.

Conclusions: In our study potcasts significantly improve knowledge retention and learning success in comparison to simple text forms. They are suitable for acquiring new as well as for refreshing existing knowledge in veterinary anatomy.

16 - Probiotic effect on Broilers' liver morphology in T-2 mycotoxicosis

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Introduction: T-2 toxin is a trichothecene mycotoxin produced by some Fusarium fungi. The harmful consequences on liver activity either after short-term or prolonged administration of dietary T-2 mycotoxin (T2) were noticed. Recently, researchers have focused on the use of probiotics as potential mycotoxin adsorbents. Therefore, the aim of this study was to examine the effect of probiotic *Enterococcus faecium DSM* 7134 (probiotic) on broiler's liver morphology after T-2 my-cotoxicosis.

Methods: Eighty day-old broilers were divided in four groups: control (C); T-2 (T2); probiotic (P) and probiotic with T-2 (P+T2). T-2 toxin was given in a single dose of 0.250 mg/bird/day, for three consecutive days, starting form the fourth day. The probiotic in concentration of 3.3×10^9 cfu, was administered in drinking water in quantity of 0.2 g/l, in groups P and P+T2, from day one till the end of the experiment. All animals were given feed and water ad libitum. Twenty-four hours after the last application, the liver was fixed in buffered 10% formalin, embedded in paraffin, serially cut at 5 μ m and stained with haematoxylin and eosin.

Results: Compared to controls, the body weight of T2 group was significantly decreased by 27.26%, while the body weight of P+T2 was decreased by 19.8%, compared to P. The relative liver weight in T2 group was significantly increased by 5.30% compared to control. Histopathological analyses of T2 group showed several destructed areas with cell necrosis, the presence of mononuclear cell infiltration and fatty degeneration. Small lipid vacuoles in hepatocytes' cytoplasm were noticed in P group. Analysis of P+T2 group showed lipid infiltration with mixed big and small vacuoles as well as fewer destructed areas compared to T2 group.

Conclusions: The obtained results underline the potential benefit from the use of *Enterococcus faecium DSM* 7134 probiotic counteracting the mycotoxin effect upon liver morphology.

The experimental protocol was approved by the Local Ethical Committee in conformity with the recommendation provided in the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (ETS no. 123, Appendix A).

17 - Anatomic aspects regarding the subepicardic branches of the coronary arteries of the pig (*Sus scrofa*)

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Introduction: With reference to the known comparative anatomic data, we appreciate that the present study reveals some peculiarities regarding the coronary arteries of the pig. In this first stage of our research, we have limited our remarks to mentioning the peculiarities of the subepicardic branches of the coronary arteries.

Methods: For the purpose of highlighting some peculiarities regarding the coronary arterial system of the pig, a number of eight hearts of pig have been taken under observation. These hearts have been sampled from adult subjects, of common species, clinically assessed as healthy, which have been sacrificed by exsanguinations for economic purpose. In order to highlight the coronary arterial system, the method of injecting a coloured plastic substance in the vascular bed has been used. For documentative purposes, this paper is accompanied by original photos.

Results: Among the obvious and not described peculiarities to be reported in the consulted literature, we mention main subepicardic collaterals, intermediate ventricular collaterals of the left coronary circumflex artery and especially the aspect of the right coronary artery. It has a remarkable size, making a ramification after a short trajectory, like the left coronary artery, into a strong ventricular and circumflex atrioventricular branch. At the irrigation of the apical heart area participates the paraconal artery terminals, intermediate collateral branches of left circumflex and terminals of subsinusal branch of right coronary.

Conclusions: The ventricular terminal branch of the right coronary artery is the main irrigation vessel of the right ventricular myocardium. Atrioventricular terminal collaterals (right circumflex) represents secondary irrigation branches for the right ventricular myocardium and the right atrium.

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18 - The anatomical study of the spinal cord in chinchillas (*Chinchilla lanigera*)

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Introduction: In the recent years, the exotic animal medicine became an integral part of the veterinary medical practice, and this caused an expansion of knowledge by conducting biomedical research on exotic animals, including Chinchillas. The experimental neurobiology on this species is less studied, probably because the pathological disorders localized in the spinal cord are not so common in Chinchillas.

Methods: The study of the spinal cord was performed on ten samples collected from commercially slaughtered Chinchillas of both sexes, average age of three years and average weight of 500 g. Each spinal cord was dissected by laminectomy, and examined macroscopically both in its normal relations to its neighboring anatomical formations and after the complete detachment from the spinal canal, by cutting at the level of the occipital foramen and caudally to the *conus medullaris*.

Results: Overall, the spinal cord in Chinchillas corresponds to the general descriptions in Mammalian species. A particularity is caused by the large number of the vertebrae making up the spinal column (51 pieces) and thus impacts on the spinal canal. Similar to the general literature description, the dorso-ventral diameter of the spinal cord varies from one segment to another, being the largest in the cervico-thoracic region.

Conclusions: This data on the spinal cord in Chinchillas extends the neuroanatomy knowledge on these species and contribute to a better understanding the different structural changes in the nervous tissue of the spinal cord in comparative anatomy.

19 - Histostructural particularities of the neck of the gall bladder mucosa in sheep *I. Cazimir*, N. Cornilă, C. A. Constantinescu and O. A. Haidău*

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Introduction: The gall bladder is not a simple organ that collects bile from the liver, but is also an actively secreting organ with its own mucous cells, and its pathology in sheep determines mostly mucosal changes. In this study

we propose to point out the specific details of the epithelium and glandular formations, along with aspects of the *lamina propria*.

Methods: The pieces collected and processed using conventional histological techniques, were harvested from adult slaughtered sheep (*Ovis aries*), indigenous race Ţurcană, the white variety. Serial paraffin cross sections of the neck of the gall bladder were stained with Hematoxy-lin-Eosin, Mallory methods, and later analyzed.

Results: The mucosa of the neck of the gall bladder presents mucosal folds lined by simple columnar epithelium, typical columnar cells containing apical mucinogen granules predominate. Among them, rare, narrow epithelial cells appear to have acidophil cytoplasm and compact oval nucleus. The superficial epithelium continues with the epithelium of short crypts, where mucus-secreting tubuloalveolar glands open. Should the tubuloalveolar glands in the mucosa be considered only an extention of the crypts in lamina propria or should they be considered glandular structures due to the specificity of the cells they integrate? Transepithelial lymphocytes have been identified. In the lamina propria, periepithelially appears an obvious network of lymphatic vessels and lymphatic cell infiltration. Deep in the mucosa, in lamina propria, we have identified compound tubuloacinar glands, mucous or serous.

Conclusions: In the mucosa of the neck of the gall bladder, mucus-secreting tubuloalveolar glands are seen superficially, accompanied by lymphatic vessels and lymphatic infiltrative population. In the depth, there are compound mucous and serous tubuloacinar glands. The gall bladder in sheep should be used as a study tool of the mucogenic cells and of the mucosal acinar glands, given the diversity of the cellular mucogenic load.

20 - Histostructural investigation of the nasal cavity and infraorbitary sinus mucosa during posthatch development in Japanese quail I. Cazimir*, N. Cornilă and C. A. Constantinescu

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Introduction: The present study focuses on histological comparison of different age periods of the development of nasal cavities and infraorbital sinus mucosa in *Coturnix coturnix japonica*. This study was undertaken considering the short incubation period these birds undergo before hatching and the fact that this segment of the respiratory system is highly prone to viral diseases in *Gallinaceae*.

Methods: The biological material was represented by quails (*Coturnix coturnix japonica*) of 1, 30 and 70 days

old (the last two age groups being considered adults), originated from a healthy egg-meat poultry line. The pieces of interest were collected after slaughter and processed using conventional histological techniques, obtaining serial slides stained and analyzed.

Results: At one day old individuals, the nasal mucosa is composed of thin, smooth keratinized stratified squamous epithelium, but no significant differences were observed in adult birds, where the vestibular epithelium begins to curl, forming a series of intraepithelial columns. The respiratory epithelium is predominantly simple ciliated columnar at 1 day old individuals, only to become ciliated pseudostratified columnar with mucosal tubuloal-veolar glands in adults. *Lamina propria* has a variable vascularity and contains lymphatic cells. The nasal mucosa is continuous with the infraorbital sinus lined with bistratified squamous epithelium initially, which it becomes simple columnar in adults.

Conclusions: In the 1 day old birds the nasal mucosa has a well-defined structure similar to that of adult specimens. Abundant lymphatic cell population, organized in lymphatic nodules is seen only in adult birds. The histostructural particularities allow the nasal mucosa to cope with microbial aggression immediately after hatching.

21 - The anatomical particularities of the papillary muscles, atrioventricular cusps and tendinous chords of the sheep (Ovis Aries) heart

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Introduction: Observations made on the anatomical features of the heart in different species of domestic animals have shown the existence of both species-dependent and intraspecific, individual, particularities.

Methods: In this case, we focused on sheep. The present study underlines particularities shown by clinically healthy sheep of different ages and both sexes. We used chords from 7 females of various ages (3–6 years old) and 3 males with the age of 4 years old. The chords were obtained from the slaughterhouse. The ventricular cavities were accessed by two longitudinal incisions parallel to the paraconal groove.

Results: Examining the atrioventricular valvular system reveals the incomplete division of the cusps system and a difference of development between the cusps of the

atrioventricular orifices. There is also a difference concerning the distribution system of the tendinous chords. A great variability is seen in the papillary muscles which are simple, two-headed or dispersed. This aspect is a consequence of the developmental and distribution variability of the tendinous chords of the cusps. There is great individual variability, with regards to the placement of the muscle formations. We have found the placement of these formations on a single ventricular wall. There is also a great variability of the ventricular septomarginal trabeculae and the trabeculae carneae of the apex.

Conclusions: The observations acquired in this study can be correlated to the stages of the embryonic development of the heart. The individual particularities of the myocardial structures can be taken into account when considering physiological functional, physiopathological, semiological and clinical aspects regarding the heart. We can conclude that the heart, similar to other organic systems, shows a great morphological individual variability.

22 - Histological and ultrastructural aspects of the testis and epididymis in male pseudo hermaphrodite pigs

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Introduction: Pigs present the highest frequency (from 0.1 to 4% individuals of a population) out of the intersex condition among farm animals, with an unknown exact cause. The aim of the present work is to describe the ultrastructure of gonads in a male pseudohermaphrodite pig. In scientific literature, the ultrastructure of the endocrine cells of the testis from different aged boars was analysed in order to determine the organogenesis and function of these cells, due to their role in testosterone production. In intersex boars, such data is vague or missing, since comparative ultrastructural studies performed between normal and cryptorchid pigs are sparse.

Methods: Out of 16 cases of intersex pigs examined from different slaughtered houses, the samples for this study have been obtained from one case and routinely processed for transmission electron microscopy. The ultrastructure details were assesses using an *Jeol Jem 1010 – Electron Microscope*.

Results: The Sertoli cells rest on the basal lamina, with nucleus of different shapes, from oval to round and fringed and located at different heights as a result to the absence of germ cells. Both histological and ultramicroscopical sections (including semithin sections) have shown that the interstitial Leydig cells are highly developed at the expense of seminiferous tubules. The Leydig cells occupy about 70% of the sections area, whereas in normal boars they form only small groups of cells between the seminiferous tubules.

Conclusions: Ultrastructurally, in pseudohermahrodite pigs, it is confirmed that seminiferous tubules are composed of a single type of cell - Sertoli cells. Also the ultrastructure of the epididimys confirmes the abscence of spermatozoa, due to the lack of seminal cells from seminiferous tubules.

23 - Histostructural comparison of the pancreas of two East-European wild birds *C. A. Constantinescu*¹*, *V. Chiurciu*² and *I. Cazimir*¹

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Introduction: This study observed the pancreas differences between two species of ecological interest, that play a role as sentinel birds near human community environment. Both the pheasant (*Phasianus colchicus colchicus*) and the magpie (*Pica pica*) roughly share the same areas, and are susceptible to soil and water pollution, but have different diets.

Methods: The male adult birds were shot during the hunting season, and the anatomical structures of interest have been collected and processed using conventional histological techniques. Numerous serial sections were obtained, stained and then analyzed.

Results: In pheasant, the serous acini become elongated under the pancreatic capsule, as they are constituted of 21–27 pyramidal cells. However, in the depth of the parenchyma, the acini are spheroidal. The pancreatic islets are rare and little developed, with few very large endocrinocytes, and concentrating small endocrinocytes. In magpie, the pancreas is well vascularized, innervated, and discretely infiltrated with lymphatic cells. The acini are spheroidal and contain 6–8 cells. Among the serous acini, we observed vegetative ganglia, with stellated neurons, nerve fibers, and glial cells. The pancreatic islets are randomly distributed throughout the parenchyma and have a variable cellular composition. The endocrinocytes may

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appear dispersed among the serous acini, as grouped cells, or well-developed, compact formations.

Conclusions: In *Phasianus colchicus*, the pancreas has elongated acini, as well as predominant spheroidal ones. The largest diameter of acini is seen in pheasant, while the most numerous pancreatic islets are seen in magpies.In both avian species, there is an active lymphatic population that tends to organize as lymphatic nodules, even near the interlobar ducts.

24 - The horse in art – from prehistoric to contemporary times G. M. Constantinescu*

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This presentation is intended to be a guided tour through the fascinating world of the artistic work of painters, sculptors, and engravers who have chosen the horse as the inspiration for their art.

From ancient times the horse has had a prominent role as a symbol of power and action, as a companion to man and as a tame animal.

In the sculptures of ancient times it is often abundantly clear that the Creator was a serious judge of horse, but not until the advent of George Stubbs in the 18th century England did equestrian art acquire an anatomical foundation.

There are many directions to follow to explore the artistic side of the horse, either in paintings, in sculptures, or in engravings. The following slides will show the evolution of artistic representation of the horse.

Albeit the oldest paintings have been found in the Lascaux caves in France (30,000–10,000 B.C.), the first studies of equine anatomy have been published in 1598 by Carlo Ruini in "Dell'anatomia et dell'infirmita del cavallo", and in 1766 George Stubbs published his book of engravings "Anatomy of the Horse". His original drawings are realistic and with so much detailed account of anatomical structures, that they remain an authority to these days.

Paintings of horses starting during the Ice Age (30,000 B.C.), in Europe and central China, also sculptures and bassorelievos of horses from the Greek, Assyrian, and Etruscian art B.C., paintings and sculptures from Renaissance (14th-16th century), paintings and sculptures from the 4th century A.D. (Byzantine equestrian sculptures), 14th to 15th century (Italian equestrian sculptures), Japanese wood engraving horses (18th century), and an abundance of equestrian paintings, sculptures and bassore-

lievos in the post Renaissance era are shown accompanied by short comments.

25 - Sketching morphology: graphical interactivity in large classroom settings *P. Cornillie**

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Introduction: Unrestricted admittance for university students in Belgium has led to overcrowding, with more than 430 first-year veterinary students solely at Ghent University. To uphold quality standards and still allow (inter)active participation in large classroom settings, new teaching strategies needed to be developed, a quite challenging task for graphically oriented courses such as anatomy and embryology.

Methods: Interactive pen-tablet drawing along with a webbased BYOD polling system was introduced in morphologically oriented courses. First, tablet sketching was applied to illustrate complex (developmental) anatomy. Students were encouraged to draw along, but are also given afterwards, via the digital learning environment, the final drawings and short movies illustrating the making of these schemes afterwards. In a next step, these short videos were made available before the actual lessons, along with an interactive digital atlas of annotated pictures as an aid to study the theory described in the course notes. During classes, the theory is further exemplified using an interactive, problem-based approach which includes real-time polling and exchange of graphical material through wireless internet.

Results: Students experienced the lessons as more enjoyable, although the total amount of time invested (including preparation, processing...) had significantly increased (x 1.45). More than 50% of all students present fully participated in the digital connectivity with the teacher, whilst interactivity between students rose to almost 100%. Students possessed higher initial competences at the beginning of the practicals, and looked more confidently forward to the examinations. Despite a better outcome for some specific exam sections, global results did not significantly improve amongst the first-year students. Typically, students still struggle when asked to synthetize topics and storylines into a brief but full synopsis.

Conclusions: Even in large classroom settings, (graphical) interactivity is possible thanks to modern technologies. As with every tool, these techniques should be applied rationally to obtain the desired effect.

26 - Calcium binding proteins mediate dioxin-induced motor deficit in sheep *A.* Costagliola¹*, F. Fiorito¹, P. Mithbaokar¹, S. *Damiano² and V. Maharajan³*

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Introduction: Sheep from environmental dioxin contaminated areas show motor discoordination suggesting a pathophysiology in cerebellar function. Since Calcium binding proteins are known to play a role in the Ca2+ homeostasis in neurons and during neurotransmission, we have investigated the role of these proteins in motor deficits in dioxin exposed adult and neonate sheep. We present herein the study of the expression patterns of Calcium binding proteins, Calbindin (CB) and Parvalbumin (PV) in cerebellum of adult and neonatal sheep chronically exposed to dioxin in comparison with those in cerebellum of sheep from uncontaminated area of the Campania Region.

Methods: Sheep environmentally exposed to chronic dioxin were obtained from Acerra of Campania Region and the uncontaminated control sheep were from Chiusano S. Domenico of the same Region. Cerebella from control and dioxin-exposed adults and neonates were fixed in paraformaldehyde and processed for immunohistochemistry on paraffin sections, using polyclonal primary antibodies against PV and CB, biotin-avidin detection system using DAB as chromogen.

Results: In control animals CB and PV showed specific and different staining patterns in adult and neonatal cerebellum but those in neonates were uniformly more intense than those in adults. Both CB and PV expressions decreased in dioxin exposed cerebellum of adult and neonatal sheep in most cerebellar subpopulations of both stages. Significantly, the fibres of white matter in adult and neonate showed uniformly increased CB and PV expression in animals from dioxin contaminated area.

Conclusions: Present results confirm that CB and PV expressions are altered in majority of the cerebellar neurones in chronic environmental dioxin-exposed animals and dioxin is possibly responsible for the pathophysiology of their cerebellum. Thus modifications in the expression patterns of calcium binding proteins could be one of the mechanisms by which environmental dioxin alters the functional aspects of the cerebellar circuit inducing motor and ambulatory deficits.

Approved by the Veterinary Scientific Committee of the University of Naples Federico II (art. 3 D.LVO 116/ 92)

27 - Chronic maternal morphine alters calbindin D-28k expression pattern in neonatal mouse brain

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Introduction: Calcium-binding proteins such as calbindin (CB), parvalbumin (PV) and calretinin, widely present in the mammalian brain, are presumed to buffer elevated intracellular calcium levels associated with ischemia, epilepsy or excitation and acting as endogenous protective proteins. Our earlier study on chronic morphine effects on PV expression in developing mouse brain indicated alterations in the patterns of PV immunoreactivity (IR) in specific brain regions. Herein we have studied the influence of chronic maternal morphine on Calbindin D-28k expression in brain regions earlier observed to reveal alterations in PV-IR.

Methods: Female Swiss Mice were daily administered saline or morphine (30 or expression60 mg/kg body weight) for a period comprising 7 days before mating, during gestation and until 21 day post-partum. Their pups were sacrificed on postnatal day 18 and coronal sections of their brains were examined by histological staining of cresyl violet and for CB-immunoreactivity.

Results: Histology revealed no significant changes in the cell number of the morphine-treated neonatal forebrain. However the number of CB-positive neurons decreased remarkably in the anterior cingulate cortex, in layers II-IV of the parietal cortex I and in CA1 and CA2 regions of the hippocampus; and increased in layers V-VI of the parietal cortex I and in the subicular region.

Conclusions: These effects of morphine on calbindin-immunoreactivityin areas like the cingulate and parietal I cortices and the hippocampus of neonatal mouse confirm the key roles played by these structures in the behavioural patterns of the maternally addicted neonates, such as impaired somatosensory, cognitive, learning and memory performances. The molecular mechanisms of morphine action on CB in neonatal mouse brain are not evident, but alterations in the expression patterns of calcium binding proteins in specific regions of the developing brain might be one of the mechanisms by which addictive drugs modify the functionality of developing brain.

Approved by the Veterinary Scientific Committee of the University of Naples Federico II (art. 3 D.LVO 116/ 92)

28 - Biomechanical effects of equestrian exercise surfaces: impact on the stresses applied to the horse's locomotor system

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Introduction: Exercise surfaces are a known risk factor of injury to the equine locomotor system, especially the limbs, and it is one of the rare factors that can be theoretically controlled. However this requires to have first established the cause and effect relationship between the surface's characteristics and the stresses applied to the equine limbs' anatomical structures (bones, tendons, ligaments). The general aim of our works is to quantify these stresses in horses under real training conditions.

Methods: An original biomechanical protocol, combining dynamic and kinematic measurements, has been applied to the testing, at training speeds, of about 40 exercise surfaces, for trotters, galopers and sport horses. This protocol uses a 3D-dynamometric horseshoe (Chateau H *et al.* 2009: J. Biomech. 42, 336–340). and a triaxial accelerometer, fixed on two hooves of the horse, and two high-speed cameras (1000 Hz). All these measurements are synchronized together and with the speed of the horse, which is simultaneously recorded. A specific research program has also included the follow-up of a group of 12 trotter horses trained during 4 months, one half on a "hard" track, the other on a "comfortable" track.

Results: Several dynamic variables turned out to be linked to injury occurrence (e.g. superficial digital flexor tendinopathy, severe bone contusion of the distal IIIrd metacarpal/metatarsal bone, ...). These variables concerned the maximal vertical loading of the fore and hind limbs during stance. The impact shock (maximal vertical deceleration) and maximal braking force revealed discriminant among surfaces but mainly linked with the surface's top layer properties.

Conclusions: Thanks to this unique biomechanical protocol it is now possible to quantify the equine locomotion parameters and the stresses applied to the limbs under real training conditions. These results shed new light on the equine locomotor physiology at high speed, and perspectives for injury prevention.

29 - Histological research of the distal sesamoid bone's fibrocartilage in draught horses diagnosed with deep digital flexor tendinopathy

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Introduction: The aim of the current study was to investigate and to provide a detailed description of the histological changes of the distal sesamoid bone's (DSB) fibrocartilage in draught horses from Romania diagnosed with distal deep digital flexor tendinopathies.

Methods: A post mortem diagnosis of DDFT injuries, using ultrasound and gross anatomopathological examinations, was performed on 36 isolated thoracic limbs collected from 36 horses slaughtered for commercial purpose. The DSB presented macroscopic lesions in 8 cases. The samples were fixed in 10% neutral buffered formalin, softened in 4% phenol and dehydrated with ethylic alcohol. Goldner's Trichrome staining method was used.

Results: Most of the encountered DSB lesions in our set of cases were degenerative and chronic. The histopathological examination revealed chondrocytes clusters formation or loss of chondrocytes, fibroplasia, necrosis, vascular changes and osseous metaplasia. In the dorsal half of the DSB fibrocartilage, the fibroplasia was represented by a mature connective tissue, rows of chondrocytes and well-organized blood vessels with a mature endothelium. In the palmar half of the fibrocartilage, scattered chondrocytes were present. No inflammatory response or traumatic lesions were noted.

Conclusions: The significant changes of the DSB in this study were situated on its palmar cortex and fibrocartilage, on the gliding surface of the deep digital flexor tendon. These findings indicate that lesions of the DSB have a degenerative character, as well as those of the deep digital flexor tendon. Further studies are necessary to evaluate the clinical involvement of these lesions in training sessions of sport horses.

30 - Gross post-mortem and histological findings of deep digital flexor tendon in the equine distal limb

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Introduction: The horse is mainly use for sportive activities. It is known that the most affected anatomical entity of the podotrochlear apparatus in horses diagnosed with chronic foot pain is the deep digital flexor tendon. The aim of the current study was to investigate and to provide a detailed description of the macroscopical and microscopical changes of the equine deep digital flexor tendon (DDFT) in the distal limb.

Methods: A post mortem diagnosis of DDFT injuries, using ultrasound and gross anatomopathological examinations, was performed on 36 isolated thoracic limbs collected from 36 horses slaughtered for commercial purpose. The samples were fixed in 10% neutral buffered formalin, softened in 4% phenol and dehydrated with ethylic alcohol. Goldner's Trichrome staining method was used.

Results: Most of the encountered DDFT lesions in our set of cases were degenerative and chronic. The main lesions of DDFT which can be noticed via gross post-mortem examination were represented by: global lesions, dorsal surface fibrillations, parasagittal splits, adhesions, insertional lesions including enthesopathy or multifocal tendinitis. Histopathologically they were represented by areas of dystrophic necrosis of the tendinous fibers, reduced cell number or complete loss of tenocytes, fibroplasia and vascular proliferation associated with structural disorders of blood vessels.

Conclusions: Results from our study showed alteration and closure of the blood vessels that induced hypoxia, accompanied by scar tissue formation and loss of the normal fibrillar aspect of the tendon. They support the degenerative and necrotic etiopathogenesis of distal DDFT lesions.

31 - The good, the bad and the ugly face of anatomy

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Introduction: Historically, Anatomy has been considered the cornerstone of the medical education – the "good face"! But there is another truth that we have to take into consideration: Anatomy has been in decline in the last years – the "ugly face"! In this condition, we have to ask: 1) Do we need Anatomy in the modern curricula? Do the next generations need to know Anatomy? If the answer is "yes", the 2nd question is: How much Anatomy is enough? What is the real opinion of our students regarding Anatomy?

Methods: Students from each study year answered to a questionary regarding the Anatomy. The answers were analyzed and classified.

Results: The students from the Ist year of study are interested in learning Anatomy, thinking that "the Anatomy is very important". The students from the IInd and IIIrd years, because they just have completed the Anatomy course, they are thinking that "Anatomy is a very difficult exam to pass", but from the IVth year of study on, the students start to become more aware about the importance of Anatomy as a "key" to good medical education.

Conclusions: In the contemporary time period we have a real problem with Anatomy education and our meaning is to find the best way to balance the minimum anatomical knowledge in the huge information influx from all the biological fields and the minimum knowledge for future medical practice ... the "bad face"? It's up to us to manage all these in the interest of our students, to reconsider the position of Anatomy in the medical curriculum.

32 - Blood supply of the canine brain: a multiway approach with conventional technique, corrosion casting and cryosectioning

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Introduction: Correct anatomical visualization and interpretation are essential for clinical, research and educational activity. Neuroanatomy is one of the most

researched field during past decades. Diagnostic imaging (CT, MRI, SPECT) and neurosurgery get more importance in small animal veterinary practice, that's why knowledge of location and path of major vessels in dog's brain (including its possible variations) have high importance. This study presents a multi-way approach of the canine brain's vasculature.

Methods: Three mesocephalic dog cadavers were used for the demonstration of the major vessels. Arteries of two dogs were filled with colored silicone/polyurethane. Methacrylate was injected into the last dog's arteries through both common carotid and vertebral arteries to enhance visibility their pathways. The first polyurethane filled dog was fixed in 8% formalin-solution and was dissected 48 h post mortem: bones of neurocranium have been gradually removed to show their relationship to the vessels (eg. circulus arteriosus, a. carotis interna). Other polyurethanefilled head was embedded into polyurethane and was cryosectioned in 0.5 mm-s steps for latter reconstruction. The methacrylate-filled head was treated with potassiumhydroxide in order to remove all organic tissues.

Results: Different processes allowed demonstrating vessels in distinct ways: relationship of vasculature, bony structures and brain tissue on step by step preparations can be seen which were resulted by a systematic approach of the central nervous system. Cryosectioning could be a good basis to compare images received by the aforementioned diagnostic imaging techniques and 3D-modelling of crymacrotomised layers makes details more obvious and traceable.

Conclusions: Different techniques make it possible to gain more information about one selected anatomical region or system. Since sometimes there are distinct needs in clinical and educational field (two-dimensional vs. 3D visualization), multiple approach is a good choice for demonstration location and pathway of vessels in the central nervous system.

33 - Morphological analysis of the Cranial Caudal Fossa (CCF) in the dog

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Introduction: Base of the cranial cavity can be divided into three parts: rostral, middle and caudal cranial fossae (García-Real I et al. 2004: Veterinary Radiology and Ultrasound 45, *38–45*). Each of the following contains specific portions of the encephalon. Underdevelopment of the occipital bone which mainly forms cranial caudal fossa (CCF) may cause its overcrowding and displacement of encephalon structures towards the vertebral canal.

Methods: Morphological investigations were carried out on the skulls of 26 dogs of various age and both sexes. Dogs were of mesaticephalic. Their heads were macerated in hot water with the use of calcined soda and then anatomically preparated. Skulls were cut in half in sagittal plane. Morphometric study was performed using an electric caliper, exact to 0.01 mm. Following measurements were performed on both sides of the skull: H height of the CCF, BTODS base of the tentorium osseum (to) dorsum sellae (ds), TODS to - ds, L length of the CCF ds - basion, JB projection of the jugular foramen in saggital plane - basion, BTOB base of the to - basion, TOB to - basion. Statistical analysis of the results obtained was performed using Statistica 10.0 software (StatSoftinc.). The data were not normally distributed therefore we used non parametric methods. The significance of differences between studied groups was tested with U Mann-Whitney test of $P \leq 0.05$ using animal sex as a grouping variable.

Results: Mean value of the H was 28.47 mm. L value was characterized by strongest standard deviation of 5.47. JB value varied from minimum value of 6.16 mm to maximum of 14.65 mm. We didn't find statistically significant differences of linear measurements of CCF between individuals of both sexes.

Conclusions: There is need for further research concerning the cranial caudal fossa morphometry on larger sample with taking into account individuals morphotype.

34 - Co-expression pattern of galanin with substance P (SP) and Corticotrophin Releasing Factor (CRF) in the small intestine of wild boar (Sus Scrofa) A. Czujkowska^{1,2} and M. B. Arciszewski¹*

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Introduction: Expression patterns of galanin in gut have been studied in most laboratory and domestic mammals whereas wildlife animals have attracted relatively low attention. The aim of the present work was to immuno-histochemically evaluate whether and to what extend galanin is co-expressed with SP or CRF in wild boar small intestine. The results of the present study broaden our knowledge about the structure and functioning of ENS in wild animals.

Methods: Frozen sections of wild boar small intestine were made. Double immunohistochemical staining utilizing

antibodies raised against galanin, SP and CRF were made. The proportions of galanin-IR enteric neurons coexpressing SP and CRF were counted. The densities of galanin-IR nerve fibres were arbitrary assessed. Statistical comparisons among multiple groups were made.

Results: In myenteric ganglia of all intestinal segments neither galanin-IR myenteric neurons nor galanin-IR nerve fibres show the presence of SP. The proportions of galanin-IR/SP-IR submucous neurons found in the duodenum, jejunum and ileum were $35.3 \pm 2.6\%$, $36.6 \pm 3.5\%$ and $27.1 \pm 1.0\%$ (respectively). Different numbers of galanin-IR/SP-IR nerve fibres were detected in submucous ganglia, circular smooth muscle layer, lamina muscularis mucosae and in the core of the intestinal villi. In all segments, none of galalnin-IR myenteric/submucous neurons show the presence of CRF however CRF-IR nerve fibres closely encircled galanin-IR perikarya. None of CRF-IR nerve fibres supplying the mucosa were galanin-IR.

Conclusions: In conclusion, the obtained results revealed the expression pattern of galanin in ENS of small intestine of wild boar and emphasized the importance of galanin as enteric neuronal messenger. Co-existence of SP in galanin-IR submucous neurons suggests functional cooperation of both peptides in regulation of wild boar gut.

All the procedures involving the use of animals are in accordance with the ethical principles approved by IInd Local Ethical Committee at the University of Life Sciences Lublin, Poland.

35 - Distribution of the Interbranchial Lymphoid Tissue (ILT) in the gills of Atlantic salmon (*Salmo Salar* L.)

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Introduction: The function of the gills necessitates a profound interaction with the surroundings, making it a strategic place for localization of lymphoid tissue performing immune surveillance and first line of defence against external environment. The immunological importance of the gill was confirmed with the discovery of the ILT (Haugarvoll, E. *et al.*, 2008, J. Anat. 213, 202–9), an aggregation of intraepithelial lymphoid cells within gill epithelium at the caudal edge of interbranchial septum at the base of the gill filament (Koppang, E.O. *et al.*, 2010, J. Anat. 217:728–39). However, our work reveals that the interbranchial lymphoid tissue is not anatomically confined to the base of the filament but rather spreads out in a continuous fashion throughout the gill filament.

Methods: Juvenils and mature adults, both sampled from freshwater and representing different life stages, were chosen. The distribution of gill lymphoid tissue was analysed using different histological techniques, immunohistochemistry (CD3, CD8, MHC class II, secretory IgM and cytokeratin) and gene expression analyses using RT-qPCR (CD3 ζ , CD8 α , CD8 β , TCR α , TCR γ , total IgM and IgT).

Results: Vast amounts of T cells were discovered residing between epithelial cells stretching from the edge of the interbranchial septum along the trailing edge towards the gill tip, while clearly delineated from underlying connective tissue through a thick basement membrane. Other lymphoid markers were present in more scares amounts, indicating that this lymphoid tissue primarily consists of T cells. This was confirmed by RT-qPCR analysis.

Concusions: The lymphoid tissue in the gills of the Atlantic salmon represents some unique features unparalleled by the mucosal epithelium of higher vertebrates. Our work represents the starting point of the characterization of this tissue, which ultimately could offer a strategic and appealing target for mucosal delivered vaccines.

The experiment was approved by the Norwegian Research Animal Council (Forsøksdyrutvalget), FOTS id 5817 2013/64255-2 of date 25.04.2013.

36 - The structural features of several large arteries in pigs

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Introduction: All high caliber arteries, also known as elastic arteries, contain three components – elastic, muscular and collagen. However, the literature contains little data regarding the ratio of these components for each type of artery and how the structure changes from the elastic (large) arteries to the muscular (medium and small) ones. Considering the structure of the arterial wall, according to the type of the artery, we have investigated the particular aspects of the large arteries in pigs, a species which by definition has more fatty tissue and a particular lifestyle. *Methods:* Samples were collected immediately after slaughter, from seven crossbred pigs, aged between 2 and 12 months. They were artery segments represented by: aorta (aortic bulb, aortic arch), pulmonary trunk, brachiocephalic trunk, subclavian artery, bicarotid trunk and common carotid arteries. The collected samples were histologically processed (Goldner trichrome and Verhoeff staining).

Results: The aorta served as a prototype for the large arteries. Although the above mentioned blood vessels are all classified as elastic arteries, the ratios of the muscular and the elastic components, as well as the quantity and the lamellar arrangement of the latter, differ from one artery to the other. The elastic component represents 70% in the aorta, 50–60%, in the pulmonary trunk, in the brachiocephalic trunk and in the bicarotid trunk. Its percentage gradually decreases, so that the left and right subclavian arteries are made of 50%, 40–45%, respectively, elastic component. In the common carotid arteries, the muscular component becomes predominant, representing 60% of the structure of the media.

Conclusions: The variations of ratios of the elastic and muscular components, favouring one or the other, present in the large arteries of the pig, particularities that have not been previously described in literature.

This study was approved by the Bioethical Committee of the Faculty of Veterinary Medicine of Cluj-Napoca, Romania.

37 - Ultrastructure of the testis of the rooster

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Introduction: This ultrastructural study was realized on testes obtained from adult roosters. The studies of the testicular parenchyma showed two categories of cells: the Sertolli cells and the germ cells in different stages of evolution.

Methods: For this study of the testicular parenchyma, tissue fragments were harvested from fresh testicles, fixed in phosphate buffered saline (PBS) with 2.5 glutaraldehide and routinely processed for electron microscopy for obtaining ultrastructural results that allowed the assessment of the normal morphological pattern of the cells representing the spermatic epithelium.

Results: Above the basement membrane was the seminal epithelium consisting of Sertolli cells, and spermatogonia of the first order and second order spermatocytes. Sper-

matids were found in the upper layers and the aspect of elongated nuclei when undergoing the final phase of maturation during spermatogenesis. Under the basal membrane there are myofibroblasts, phagocytosis vesicles, bundles of fibers, Leydig cells and blood capillaries. By studying the interstitial connective tissue fibers, were revealed loose connective tissue in which there are numerous blood vessels. Occasionally, there are macrophages, mast cells and Leydig cells. The Sertoli's cells bases membrane are arranged like ring or a network.The number of Sertolli cells will determine the number of germ cells that can be supported through spermatogenesis and hence will numerically determine the extent of sperm production (Sharpe R. *et al*.Biology of Reproduction. 2003125:769–784).

Conclusions: The studies of electron microscopy ran on the roosters that were in their mating season showed that the inter-sertollian junctions were tight junctions or zonulae occludentes, not only on the sides of the Sertolli cell, like all the mammals have, but to the apex of the cell.

The experimental protocol was approved by the Local Ethical Committee.

38 - Morphological studies on visceral lymph nodes of the abdominal cavity in the rabbit *V. Danacu*, S. Raita, V. Danacu and C. Ionita*

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Introduction: The experimental research was performed on domesticated rabbit (Oryctolaguscuniculus) that suits very well for studying the anatomy by stratigraphical and regional dissections (Predoi G.*et al.* 2001-Anatomy of domestic animals, ALLMedical, Bucharest). Lymph nodes are small or large sized nodules of the lymphoid tissue and are regarded as the filters or barriers located in the course of smaller lymphatics (Sarma *et. al* - Indian J. Anim. Sci. 2004, 74: 750–751).

Methods: For this topographical study the following methods were used: stratigraphical and regional dissection, injection with contrast media and histological studies using light microscopy. A total of six adult rabbits, two males, four females were sacrificed and dissected, lymph nodes were identified also the abdominal wall was studied.

Results: The lymph nodes of the stomach were represented as of two packages of gastric lymph nodes. One package located on the small curvature of the stomach near the insertion of the lesser omentum and the second package was located between the divisions of the celiac trunk and the gastric veins. One of these lymph nodes is constant in terms of the location of the cardiac orifice.
Hepatic lymph nodes were situated around the entry of the portal vein into the liver at the hilum. Among the intestinal lymph nodes were highlighted the duodenal lymph nodes of two peritoneal sheets located at a distance of about 2 cm from the insertion of the mesentery intestine's; cranial mesenteric lymph nodes are situated near the edge of the dorsal mesentery to the posterior pole of the right kidney.

Conclusions: The rabbit's visceral lymph nodes are situated next to the organs that give them their names or in between the two peritoneal sheets that go along with blood vessels that irrigate those organs. The experimental protocol was approved by the Local Ethical Committee.

39 - Kidney healing after laparoscopic partial nephrectomy without collecting system closure in sheeps

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Introduction: Recently, it was demonstrated that the pig kidney does not develop urinoma and urinary leakage after partial nephrectomy without collecting system closure, as occur in humans. Therefore, the aim of this study was to access kidney healing in sheeps after laparoscopic partial nephrectomy without closure of the collecting system.

Methods: Eight female adult domestic sheeps were submitted to left laparoscopic partial nephrectomy, with removal of the caudal pole of the kidney. Monopolar energy was applied for hemostasis only in the parenchyma, avoiding coagulation near the collecting system, which was left opened. After 14 days, all animals were killed and the left kidney was removed, then the ureter was catheterized and an ex vivo retrograde pyelogram was performed, in order to evaluate any leakage of contrast medium.

Results: In all animals, the operated pole was completely covered by adipose and fibrous tissue, which hindered the identification of the collecting system. One kidney presented an urinoma surrounding the caudal pole. The retrograde pyelograms depicted contrast medium extravasation through the operated pole in all kidneys, even with injection under low pressure. Although the necropsy did not show any evidence of urinary leakage and the operated pole was covered by great deposition of adipose tissue and firm adherences to adjacent organs, the presence of urinoma demonstrated that the collecting system does not heal as in pigs. These observations agree with clinical data in humans, where urinary leakage and urinoma after this kind of surgery is considered a common and major complication. Therefore, we can infer that the sheep collecting system healing is similar from that of humans and quite different from pigs.

Conclusions: Our findings clearly demonstrated that the sheep kidney is a good experimental model for research on which collecting system healing is an important aspect to be considered.

The work was formally approved by the Ethical Committee of the Fluminense Federal University.

40 - Dissections without formalin: the experience of the anatomy department in alfort

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Introduction: Formalin is often used in anatomy in order to preserve cadavers from putrefaction. Discovered during the 1860s, it has been widely used in histology and anatomy. In France, since January 1st 2007, activities involving exposure to formaldehyde have been added to the list of processes considered as carcinogenic. This induces the obligation to consider all the ways to prevent exposure or reduce the exposure to the lowest level. After a rather long study, the decision was taken to proceed with the substitution of formaldehyde in the teaching of macroscopic anatomy.

Methods: To ensure cadaver preservation, a technique using a 40% solution of zinc chloride $(ZnCl_2)$ was developed. After death, blood is evacuated from the cadaver by injecting cold water in the common carotid artery. After this, an infusion of zinc chloride is passively injected, using gravity.

Results: The muscles of cadavers injected with this solution become clearer; muscles and joints remain quite flexible; nerves are white and fairly resistant; veins are filled with solid coagulated blood; arteries are empty but can be injected with latex after flushing them with cold water, this remaining difficult. lymph nodes merge with surrounding muscles. Cadavers support rather well hot temperatures. The method was tested on a large number of dogs, cats, horses, ruminants and pigs.

Conclusions: Before the end of the XIXth century, fluids containing Hg^{2+} , Cu^{2+} and Zn^{2+} were currently used to preserve bodies. This technique is easy to apply, has no toxicity for the humans, preserves the flexibility of the cadaver and allows a quite easy dissection. $ZnCl_2$ is irritating and the use of light protective equipment (gloves and glasses) is recommended. It has no fixation capacity for histology.

41 - The third interosseus muscle: from anatomical to imaging and clinical features *J.-M. Denoix*^{1,2}*

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Injuries of the suspensory ligament (third interosseus muscle, TIOM) involving either thoracic or pelvic limbs are frequent in sport and race horses and, especially for proximal injuries, can be career threatening. Recent improvements in imaging techniques and corrective shoeing have led to increase interest in the anatomy and functional anatomy of the TIOM.

The proximal TIOM of the thoracic limb is divided in two lobes. Each lobe is made of several tissues having a specific distribution: the tendinous component is mainly dorsal; a palmar fasciculus of fat incorporates striated muscle fibres, vessels and nerves. This architecture is well documented with new imaging techniques such as ultrasonography and magnetic resonance imaging. Distribution of these tissue components is different in the pelvic TIOM, having a more oval or round cross section.

Innervation of the TIOM is well known but diagnostic techniques for obtaining the most sensitive and specific information using troncular nerve analgesia are still debated. In situ injection into a lesion is more specific but may lack of sensitivity for the enthesis. Blocking the deep branch of the palmar ramus of the ulnar nerve (thoracic limb) or the deep ramus of the lateral plantar nerve (pelvic limb) is more sensitive but less specific because of potential diffusion on the corresponding commun digital nerve.Clinical manifestations at gaits during the stance phase differ according to the type of lesion. In horses presenting an enthesopathy a reduced extension of the fetlock can be observed because of the pain. On the other hand, especially at the walk a decrease suspension of the fetlock can be seen with failure and lengthening of the TIOM. The rational corrective shoeing of these conditions consists in increasing fetlock support by stimulating tension of the deep digital flexion tendon using a corrective shoe presenting reduced support under the heels.

42 - Indirect radiographic lymphography and ultrasonography of the lymphatic vascular system of the caudal mammary gland in the domestic cat

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Introduction: This study aims to map the lymphatic vascular system of the caudal mammary gland in clinically healthy cats. Investigating the lymphatic system of the mammary glands offers clinicians and especially surgeons the various possibilities of mammary lymphatic drainage. Deviation from the pattern of drainage might indicate a cancerous pathology since the lymphatic system is the main way for tumor metastasis.

Methods: In order to perform the morphological research of the caudal abdominal mammary gland we have used indirect lymphography with contrast medium Optiray 350 and three echographic methods: B mode, Doppler and ultrasonography with contrast medium. The indirect lymphography with contrast medium was applied on 11 clinically healthy cats and the ultrasonographic method was performed on 10 subjects.

Results: The lymphatic drainage of the caudal abdominal mammary gland is exclusively caudal. This aspect was proven by the indirect lymphography with contrast medium on all 11 cases. The first lymphatic relay is represented by the caudal epigastric lymph node, and due to the inter-nodal connections, the efferent lymphatic vessel of the caudal epigastric lymph node becomes afferent to the mammary lymph node. The ultrasonographic assessment has underlined similar results in all of the examined lymph nodes: an ovoid or elongated shape, with an isoechogenic or slightly hypoechogenic parenchyma, as compared to the hilum of the lymph node, which is hyperechogenic. The capsule surrounding the parenchyma presented smooth borders in all of the examined subjects. Our results indicate that all examined subjects presented healthy lymph nodes.

Conclusions: The lymphography underlines the lymphatic vessels and lymph nodes that drain the lymph from the mammary gland, and the ultrasonography helps imaging

the topography, size, number, shape, echostructure and vascularization of the lymph nodes. The methods used in this study complement each other and therefore they are applicable in the clinic for feline pacients.

This study was approved by the Bioethical Board of the Faculty of Veterinary Medicine of Cluj-Napoca, Romania

43 - In vitro angiogenesis of equine macrovascular endothelial cells

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Introduction: Equine blood vessels are very susceptible to chemical or mechanical manipulation with endothelial cells (ECS) as the site of damage. However, few studies have been carried out on the development of these. Objective of this study was to establish equine endothelial cells in cell culture and to characterize individual stages of in vitro angiogenesis.

Methods: Samples were taken from the carotid artery and jugular vein of euthanized horses. After enzymatic isolation from the respective vessel, the cells were incubated in a selective primary medium containing fetal bovine serum (FBS). Phenotypic identification was accomplished by morphology and positive staining to von Willebrand factor. A batch of frozen cells was thawed and disseminated on different medium, i.e., FBS and fetal horse serum (FHS), conditioned or unconditioned.

Results: ECS from both carotid arteries and jugular veins displayed good growth in selective primary medium. Growth of cells proceeded from initial cluster formation to semi-confluence followed by a confluent homogenous monolayer with a characteristic cobble stone pattern. Subsequently, ECS showed sprouting, linear arrangement and distinctive network formation. Prior to detachment of the monolayer, ECS displayed a three-dimensional configuration. Initially, cells grew more slowly on medium supplied with FHS than FBS. Growth of ECS from jugular veins which had been used for intravenous application in the course of euthanasia was delayed. Cells obtained from one horse with inflammatory processes on both hind legs stopped growing after 7 days.

Conclusions: Different stages of in vitro angiogenesis, which were established for microvascular bovine and human ECS earlier, could be confirmed for macrovascular equine ECS. This study showed that equine ECS are suitable for in vitro angiogenesis assays.

44 - Histological evaluation of equine melanoma with regard to vascularization

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Introduction: Melanoma represents the most frequent skin tumor in horses. Even though epidemiological and clinical pathological features have been examined in detail and immunological and molecular biological studies of equine melanoma have been carried out, its pathological mechanism remains unclear. In humans, neovascularization of melanoma corresponds to prognosis, and vascular mimicry has been described for different types of melanoma. Objective of this study was to investigate the vascularization of equine melanoma in detail.

Methods: Samples of equine melanoma from the oral cavity, abdomen, and perineal region of an 18 year old grey mare were obtained after the animal had been euthanized. The samples were fixed in 4% formalin, embedded in paraffin, and 5- μ m sections were cut. These were bleached with 0,5% potassium hydroxide containing 3% peroxide. Immuno-histological staining was performed using anti-S100 (Sigma), known as marker for melanocytes. In addition, keratinocytes were immuno-labelled with anti-pan-cytokeratin (Dako).

Results: The outer region of the melanoma was negative for S-100 staining but positive for the keratinocyte marker. Towards the inner region, positive staining for S-100 was recognized, which was more obvious after bleaching. Occasionally blood vessel-like tubular structures were found containing endothelial cells within their walls. Erythrocytes in the lumen were not observed in the material examined here.

Conclusions: Unbleached slides may display false negative staining of S-100 due to superimposition of melanocytes and keratinocytes in the outer region of the melanoma. Keratinocytes are found in all of the outer part of the melanoma representing a capsular region. This corroborates the fact that, unlike human malignant melanoma, grey horse melanomas are encapsulated and most often not invasive. Results also show involvement of melanocytes in tubular structures indicating vascular mimicry.

Equine material used in this study was taken from a horse cadaver that was used for teaching purposes at the Institute for Veterinary Anatomy, Freie Universität Berlin. The horse was euthanized at the Institute for Anatomy under veterinary control in accordance with all relevant local animal welfare laws, guidelines, and policies.

45 - Age related echocardiographic parameters of clinically healthy rabbits *Ö. G. Dilek*¹* and *H. Erden*²

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Introduction: Echocardiography has become one of the most important diagnostic tools in veterinary cardiology (Al-Haidar *et al.*Research In Veterinary Science. 2013, 95, 255–260). New Zealand rabbits tend to reach sexual maturity at around 6 months. The development of the New Zealand rabbit is completed by the end of 9 months. The aim of this study is to evaluate the effect of age, body weight and sex on echocardiographic measurements.

Methods: In this study, twenty four New Zealand rabbits were used. Twelve rabbits were 6 months old (6 male, 6 female) and twelve rabbits were 9 months old (6 male, 6 female). Physical examination, thoracic auscultation, capillary refill time, dehydration and complete blood count measures were performed. Clinically healthy rabbits were lightly anesthetized with midazolam. Interventricular septum thickness at the end of diastole (IVSTd), left ventricle internal diameter at the end of diastole (LVIDd), left ventricle posterior wall at the end of diastole (LVPWd), interventricular septum thickness at the end of systole (IVSTs), left ventricle internal diameter at the end of systole (LVIDs), left ventricle posterior wall thickness at the end of systole (LVPWs), ejection fraction (%EF) and fractional shortening (%FS) parameters were evaluated using the Teicholz method. Summary statistics were determined and Mann-Whitney U was used to test the effect of age, body weight and sex onto the variables evaluated.

Results: All echocardiographic parameters tested were significantly increased influenced by age and body weight, whereas gender may not have any effect on all parameters. Systolic functions may increase with ageing and body weight in rabbits.

Conclusions: This study shows that echocardiographic parameters increase in growing rabbits.

This study approved by the Animal Ethics Committee of Mehmet Akif Ersoy University.

46 - The qualitative and quantitative assessment of the renal echogenicity at the clinically healthy New Zealand rabbits

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Introduction: Ultrasonography lacks specificity with regard to diseases of the renal parenchyma (Platt JF *et al.* 1988: Am J Roentgenol. 151, *317–319*). The relationship between renal cortical echogenicity and parenchymal disease has been demonstrated in people. Increased renal cortical echogenicity in both dogs and humans is, in general, abnormal, but many diseases may be responsible (Moghazi S, *et al.* 2005: Kidney International. 67, *1515– 1520*). The aim of this study is to qualitatively and quantitatively examine the echogenicity of the renal cortex in healthy New Zealand Rabbits.

Methods: Twenty four clinically normal and with no history of renal disease New Zealand Rabbits (9 months of age) were used. The each rabbit was investigated by complete blood count, serum biochemical analysis and renal biopsy. Renal ultrasonography was performed with a 6.5 MHz frequency microconvex probe. Ultrasound machine settings were kept constant during the study. The images were analyzed by Image J (Version 1.45). Mean and standard deviation of data were calculated using SPSS 18.0 software.

Results: The renal cortex was qualitatively assessed as isoechoic (21/24), hyperechoic (3/24). Quantitatively, mean histogram value of the renal cortex 60.1 ± 1.67 , (range, 53.65-62.56).

Conclusions: Clinically, it is the subjective assessment of echogenicity that is used to make decisions (Ivancıc M, Mai W, 2008: Veterinary Radiology & Ultrasound. 49, 368–373). But the plentiful amount of fat vacuoles in the tubular epithelium of the renal cortex can affect qualitative echogenicity in normal kidney (Yeager AE, Anderson WI, 1989: American Journal of Veterinary Research.50, 860–863). Our results indicate that analysis of digitized renal cortical ultrasonographic images from rabbits using the histogram technique can be used to quantitatively determine echogenicity.

This study approved by the Animal Ethics Committee of Mehmet Akif Ersoy University.

47 - Lectin- and immunohistochemistry of porcine lymph nodes

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Introduction: Porcine lymph nodes are typically characterized as being inverted in comparison to most other mammals. In an effort to further substantiate the architectural hallmarks of porcine lymph nodes, the distribution of blood vessels, lymphatic vessels and high endothelial venules (HEV) as well as the zonation of T- and B-lymphocytes were assessed in paraffin sections. The aim of this study was to identify suitable markers in order to accomplish a 3D-reconstruction of the porcine lymph node by optical projection tomography (OPT).

Material and Methods: Small mesenteric and tracheal lymph nodes were collected from healthy pigs after slaughter, fixed in paraformaldehyde or immediately frozen. Paraffin sections or methanol-fixed cryosections were used for immunohistochemistry or lectin histochemistry.

Results: Vessels: Tomato lectin (TL) highlighted all the blood vessels including the HEV, which were also stained with anti-MECA-79. A monoclonal anti-LYVE-1 failed to reveal lymph vessels in porcine tissue. Datura stramonium lectin preferentially labelled endothelial cells of lymphatic sinusoids but also showed some cross-reactivity with TL-positive blood vessels. Lectins from Griffonia simplicifolia-I, Hippeastrum and Ulex europaeus failed to stain any cells or structures. T-lymphocytes: Anti-CD3 revealed numerous cells in the paracortex and single cells in the lymphonoduli on paraffin sections. In contrast, staining of cells in the paracortex with anti-CD4 and anti-CD8a was successful in methanol-fixed cryosections only. B-lymphocytes: Wheat germ lectin (WGA) yielded a signal in lymphonoduli on paraffin sections, which was congruent with B220-positive cells in methanol fixed cryosections.

Conclusions: The present study demonstrates that TL and Meca-79 are suitable markers for blood vessels and HEV's in porcine lymph nodes, respectively. B-cell areas were clearly labelled with WGA, and T-cell areas were reliably revealed with anti-CD3. In order to identify lymphatic vessels, further studies will make use of polyclonal antibodies against LYVE-1 or podoplanin.

48 - Distribution and chemical coding of the rat diaphragm-projecting neurons located within the stellate ganglia

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Introduction: The aim of this complementary study was to investigate the distribution and chemical coding of diaphragm-projecting neurons located within stellate ganglia (SG) in the rat in order to understand the fiber-composition of the autonomic supply.

Methods: Combined retrograde tracing and double labelling immunohistochemistry were applied [Dudek and Sienkiewicz 2010: Veterinarni Medicina, 55, (5): 242–252, Dudek *et al.*, 2011: PJVSci. 14 (2): 199-205).

Results: FB-positive (FB+) neurons were found within SG and the mean numbers were 687.5 ± 110.8 and 492.8 \pm 69.22, respectively. The neurons were round- or oval-shaped with a longitudinal axis of approximately 27 μ m and a short axis of approximately 15 μ m. They were distributed unevenly and formed large district clusters found within the caudal region of the ganglia, while in the other regions single labelled neurons were scattered evenly. Immunohistochemistry revealed that 97% FB+ neurons were adrenergic in nature [dopamine-betahydroxylase- positive $(D\beta H+)$]. They were surrounded by very dense networks of cholinergic, VACHT+ (vesicular acethylcholine transporter- immunoreactive) nerve fibers. The retrogradelly labelled neurons displayed also immunoreactivities to neuropeptide Y (NPY; approximately 55%) or Met-Enkephaline (MetEnk; 10%). No galanin (Gal)- and cholinergic-immunoreactive labelled neuronal somata were found. However, single Gal- or Met-Enkimmunoreactive nerve fibers were observed in the vinicity of these nerve cells.

Conclusions: Most of the labeled neurons were adrenergic, probably visceromotoric. Other neurons could have afferent function. Further investigations are needed to characterize these neurons in distinct reflex chains.

All the experiments were approved by Local Ethics Committee for Experiments on Animals in Olsztyn.

49 - Distribution of diaphragm-projecting autonomic neurons in the rat – preliminary data

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Introduction: The aim of the study was to establish the distribution of the autonomic neurons supplying the diaphragm in the rat.

Methods: Retrograde tracing method utilizing neuronal tracer Fast blue (FB) was applied to reveal the distribution of the autonomic neurons innervating the diaphragm in the rat (Dudek and Sienkiewicz 2010: Veterinarni Medicina, 55 (5): 242–252). The left and right stellate ganglia (SG), as well sympathetic chain ganglia (SCHG),

cervical cranial ganglia (CCG) and coeliac and cranial mesentheric ganglia (CSMG) were collected.

Results: FB-positive (FB+) neurons were found within SG, SCHG, CCG and within CSMG. The largest population (51.8%) of FB+ neurons was observed within CSMG (4266 n/a). The mean number 1123 of FB+ nerve cells, which constituted 13.63% of all labeled neurons was found within the ipsilateral CCG. The population of FB+ neurons observed within contralateral CCG comprised 991.5 n/a - which constituted 12.04% of all labelled cells. 687.5 n/a (8.34%) and 492.8 n/a (5.98%) of all FB+ neurons were found in ipsi- and contralateral SG, respectively. Mean number of the labeled nerve cell bodies - located within ipsilateral SCHG was 363 while that within the contralateral SCHG was 311, which constituted 3.77% and 4.4% of all labelled nerve cells, respectively.

Conclusions: Most of the neurons were found in the CSMG, what speaks for the main fiber supply from and to the solar plexus.

All the experiments were approved by Local Ethics Committee for Experiments on Animals in Olsztyn.

50 - Distribution of primary sensory neurons innervating the belly and tendon of the gastrocnemius muscle in the rat – preliminary data

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Introduction: The aim of the study was to establish the distribution of primary sensory neurons supplying the belly and tendon of the gastrocnemius muscle in the rat. *Methods:* Retrograde tracing method utilizing neuronal tracers Fast blue (FB) and DiI was applied. Individual animals were injected with 4 μ l of DiI into the belly of the left GM and with 2 μ l of the FB into its tendon. After one week survival period they were deeply anesthetized and transcardially perfused with 4% buffered paraformaldehyde and ipsi- and contralateral lumbar and sacral dorsal root ganglia (DRG) were collected. The preparation and cutting of the tissues as well as counting of traced (FB+,DiI+) somata were previously described (Dudek and Sienkiewicz 2010: Veterinarni Medicina, 55, (5): 242–252).

Results: The study revealed the presence of three populations of primary sensory neurons supplying the structures investigated. FB+ sensory nerve cells supplying the gas-

trocnemius muscle tendon accounted for 31.73% of all labeled neurons while DiI+ perikarya supplying the gastrocnemius muscle belly accounted for 64.87% of all labelled perikarya. Double-labelled (FB/DiI+) neurons, thus projecting to both the tendon and muscle belly accounted for 4.82% of all labeled sensory neurons. Neuronal somata supplying the gastrocnemius muscle tendon or belly and those supplying both structures were round or oval in shape with the round nucleus located in the cell center. Mean diameters of FB+, DiI+ and FB/DiI+ perikarya were 27.78, 28.37 and 23.13 µm, respectively. Conclusions: The study revealed the existence of three population of sensory neurons contributing to the innervation of the belly and tendon of the GM. The smallest but still prominent population comprises neurons with divergent projections to both structures investigated. This finding, reported for first time, suggest the occurrence of a complex, peripheral neural circuit involved in the innervations of the mammalian GM.

All the experiments performed on animals, presented in this abstract were approved by Local Ethics Committee for Experiments on Animals in Olsztyn.

51 - Comparative study regarding the methods of obtaining the bones of the autopodium in pigs (Sus Scrofa Domestica) *I. Dumitru*, B. Matosz, C. O. Martonoş, D. Csibi, C. Nut, F. Silaghi and A. Damian*

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Introduction: Nowadays a big concern in biology and medicine in general is to avoid the decomposition of certain tissues from cadavers, in order to obtain pure and integral tissues. Conservation through boiling is a technique used especially for obtaining skeletal specimens, and involves removing the soft tissue from the bones. Then, the bones are boiled for various periods of time, depending on their origin. The purpose of this study was to comparatively evaluate the efficiency of the boiling technique for obtaining anatomical specimens in mammals, with the technique of pressurized receptacles.

Methods: After the soft tissue has been removed, four pig feet have been submitted to a process using pressurized heat resistant receptacles, normal, heat resistant receptacles, heat source, water, commercially available detergent, NaCl and a silicon gun. The specimens were put in the receptacles, covered with water and left on the heat source to boil.

Results: In case of the specimens boiled under pressure, tissue separation occurred after 2 h compared to 2 h and 30 min in case of the classic technique, which make using pressurized receptacles advantageous from a work time point of view.

Conclusions: For degreasing, the usage of NaCl crystals has proven to be more efficient that the commercially available detergent.

52 - Silicone plastination of the laboratory rat with cold temperature technique: can plastinated specimens be effectual for teaching laboratory animal anatomy? O. Ekim¹*, B. Ekim², M. Ayavalı¹ and C. Bakıcı¹

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Introduction: Silicone plastination in cold temperature has main steps as is known. To obtain a purposive plastinated specimen, these steps have to be handled meticulously and alterations of the factors such as preservation time or chemical concentration should also be monitored regularly. The aim of this study was to indicate and optimize the parameters such as temperature, time, and concentration and demonstrate how a real-like plastinated specimen could reduce the number of animals which are currently being used to demonstrate the anatomical structures in laboratory animal handling courses.

Methods: The whole body cadavers of the 4 Wistar albino rats were plastinated. After dissection procedure, samples were processed to the dehydration, defatting, impregnation, and gas curing-hardening stages respectively. The indicated parameters the specimens exposed such as temperature, time and concentration were recorded regularly in each step.

Results: Two times of acetone bath was effectual in dehydration process. Impregnation stage was carried on for 8 days. Afterwards samples waited for chain reaction process another 8 days before gas curing- hardening stage. Specimens were cured for 7 days and then put in preservation bags for 15 days because the chain extension reaction was probably carrying on.

Conclusions: fter preservation period the silicone specimens were elastic but durable enough to use as for educational purposes. There was no changing on the normal posture and position of the organs. However there were slight volumetric alterations on the hollow organs, elaborated plastinated specimens could be used as education materials in the courses and anatomy lessons. It was considered that this kind of plastinated specimens could provide us to reduce the number of animals euthanized for courses.

Ethical Approval: Gazi University Local Ethical Comitee of Animal Experiments.

53 - *Bmp2* regulates chicken *Ebf3* gene expression in pharyngeal arches, cranial sensory Ganglia and Placodes

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Introduction: Despite the importance of the Early B-cell Factor 3 (*Ebf3*) gene in neurogenesis and neural differentiation, a thorough examination of its expression in the pharyngeal arches (PAs), cranial sensory ganglia (CSG) and placodes has not been reported yet. Recently, we have described *cEbf* expression in somites and feather buds and found their expression is regulated by *Bmp* (*bone morphogenetic protein*) and *Shh* (*sonic hedgehog*). It is possible that these two molecules can also regulate *cEbf3* expression in PAs, CSG and placodes.

Methods: The spatiotemporal expression profile of *Ebf3* in chicken embryos (n = 60) from HH8 to HH24 was determined by *in situ* hybridization technique. Gain (ectopic expression of either SHH or BMP2) and loss (either by SHH inhibitor, cyclopamine, or BMP inhibitor, Noggin) of function experiments were carried out to assess whether this expression can be regulated by BMP and/or SHH.

Results: cEbf3 gene was expressed in the same prospective areas of migratory and the post-migratory cranial neural crest cells (crNCCs) occupying the PAs, and in trigeminal and vestibular ganglia as well as in olfactory placodes, and otic vesicle. Implantation of cells expressing Noggin, into the pre-migratory crNCCs led to complete down-regulation of *cEbf3* in PAs and trigeminal ganglia. Implantation of 100 μ g/ml BMP2-coated Affigel bead in the pharyngeal region resulted in up-regulation of *cEbf3* around the bead. Cyclopamine treatment up-regulated *cEbf3* expression only in the second PA and this expression was down-regulated after application of 1 μ g/ μ l SHH-loaded bead in the second PA.

Conclusions: The expression of *cEbf3* in crNCCs occupying the PAs, in the neural crest-derived trigeminal ganglia, but not the placodal-derived vestibular ganglia is mainly regulated by *Bmp2*. All experimental procedures approved by Animal Care and Welfare Committee of Kafrelsheikh University, Egypt and were in accordance with National Institutes of Health guidelines on animal care.

54 - Architectonics of nervous apparatus of fibrous formations in cattle acropodia *V. Enciu**

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Introduction: The knowledge of innervation and local topography of fibrous formations of acropodia in cattle plays an important role in the normal functioning of the locomotor apparatus, and also in the pathology associated with. Detailed knowledge of all morphofunctional aspects of the nerves destinated to the fibrous formations may contribute in great parts to the choice and application of an adequate and effective treatment.

Methods: The current study was performed on 16 acropodia coming from healthy cattle, collected at Chisinau slaughterhouse. The nerves were isolated by usual dissection technique. A binocular magnifying glass MBI-9 was used for detailed macroscopic examination followed by histological processing (Schiff reactive staining for fibrous formations and silver staining for the nerves) and interpretation.

Results: The intraorganic ramifications of the nerves, independently of their provenience, are establishing intra and intersystem connections, creating two interconnected nervous network: a superficial and a deep one. These networks are located in all stratums of articular capsules and periosteum. The nervous network of fibrous formations of acropodia is formed by trunks, fascicules and nervous terminations which have an nest aspect. The superficial and deep nervous networks of the fibrous formations of accropodia present morphological and functional connections and they are considered as components of a unitary nervous complex. The highest concentration of nervous terminations of different structure was noted in the places of insertion of capsules, articular ligaments and muscular tendons.

Conclusions: The nervous apparatus of acropodal fibrous formations in cattle has a special importance for the regional trophic processes, ensuring the growth and the adaptation of local locomotor apparatus. The knowledge of innervation sources and their topography facilitate the understanding of mechanism of locomotor apparatus in normal and pathological conditions. The obtained results

are also important for planning surgical interventions of the accropodia in the cattle.

55 - Functional anatomy of the syrinx of the chukar partridge (Galliformes: *Alectoris Chukar*) as a model for phonation research *S. Erdoğan*¹*, *H. Sağsöz*² and *F. Paulsen*³

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Introduction: The phonation process is influenced by the material characteristics of the participating structures, ranging from molecular to macroscopic dimensions. Good animal models for phonation research are still lacking. Due to easy availability and relatively simple structure, the syrinx of birds might serve as a good animal model for humans. Our aim was therefore to determine morphologic features of the syrinx and obtain insights into its mucus layer characteristics.

Methods: Syrinx was analyzed using anatomical, histochemical and immunohistochemical methods and conclusions were drawn on use of the syrinx as a model for phonation research by comparing the epithelium and its mucus characteristics to human laryngeal secretions. Ten partridges were analyzed.

Results: The syrinx was formed by the last two tracheal cartilages and first eight bronchial cartilages. The tracheal and bronchial epithelia and pessulus of the syrinx were lined by pseudo-stratified columnar epithelium in which goblet cells and intraepithelial glands were localized. Alveolar glands were observed in the lamina propria on both sides of the pessulus. Collagen fibers were distributed in the lamina propria of all parts of the syringeal mucosa. Elastic fibers in the medial and lateral membranes of the syrinx showed pronounced dispersal and were thicker than in other areas. All glandular epithelial cells and goblet cells were positive for neutral and acidic mucins and carboxylated mucins were dominant in particular. Epithelium and glands revealed positive reactivity with antibodies to the mucins MUC1, MUC2 and MUC5AC. Of these, MUC2 and MUC5AC were dominant.

Conclusions: We can state that the syrinx of partridge can serve as a good *ex vivo* model for phonation research because the partridge has an epithelial and mucus lining, that is similar to human laryngeal mucosa and mucus. The specimens were treated in accordance with the guide-lines of the local Ethical Board of Dicle University.

56 - Anatomical and scanning electron microscopic studies of the tongue and lingual papillae in the chital (*Axis axis*, Erxleben 1777)

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Introduction: The lingual mucosa of animals is equipped with a highly differentiated papillary system that has mechanical and gustatory functions. To our knowledge, detailed morphological features of the chital tongue have not been studied before. In this research, our aim is to comparatively study the gross anatomical features of the tongue and scanning electron microscopic morphologies and topographical distribution of the lingual papillae that localize on all of the lingual surfaces.

Methods: Tongues of five deer were used. Animals were obtained from "Estancia Presidencial Parque Anchorena", Colonia, Uruguay, and the specimens were handled and treated according to the local Ethical Board guidelines of University of the Republic, Uruguay. Organs were observed macroscopically and examined under a stereomicroscope and scanning electron microscope to determine their general anatomical characteristics and structures of lingual papillae.

Results: Cone-shaped filiform papilla was composed of one larger main papilla and two smaller secondary papillae, which emerged from bottom of main papilla. Rounded fungiform papillae were randomly distributed on the lingual body and torus, and some fungiform papillae were surrounded by evident groove. The lenticular papillae on the lateral and rostral side of the torus were smaller in length compared with ones localized on central region of the torus. Eleven to fourteen circumvallate papillae were situated on each caudolateral side of the torus. The circumvallate papillae were surrounded by a prominent gustatory groove and there were no annular pads surrounding the groove.

Conclusions: The present study submits the similarities in the morphology of the tongue of the chital with wild deer species, such as the goitered gazelle, roan antelope and some domestic ruminants such as goat. It is thought that this research will provide morphological contributions for deer species as there are not sufficient and detailed sources on species-specific morphology in researches on Cervidae family.

57 - The equine sternum revisited: analysis by clinical and micro computed tomography C. Eydt¹, E. Engelke¹*, C. Schröck², F. Geburek³, K. Rohn⁴, C. Staszyk² and C. Pfarrer¹

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Introduction: In horses, the sternum provides an excellent source for bone marrow. Thus, its anatomy came into the focus of veterinary clinicians. However, the anatomical literature gives heterogeneous information regarding its structure and the number of sternebrae differing between 5 and 6 plus the manubrium sterni.

Methods: Sterna were collected from 19 horses aged 2 to 28 years, euthanized for clinical reasons, and clinical computed tomography (cCT) as well as micro computed tomography (μ CT) were performed. The dimensions of each bone were determined and correlations with the age and weight of the horses were analysed.

Results: Around each bone, a thin (< 1 mm) bone lamina established a clear border between bony and cartilaginous sternal parts. The interior consisted of a periphery with woven radiodense tissue, and a centre showing large radiolucent lacunae between loosely arranged radiodense trabeculae. According to this structure, the caudal bony element of the equine sternum consisted of two sternebrae, although they were fused in all examined sterna. The shape of the bones changed from lentiform with flattened lateral sides (manubrium sterni, sternebrae 1, 2) over spherical (sternebrae 3, 4) to lentiform flattened dorsoventrally (sternebrae 5, 6). Sternebrae 2 to 4 showed the largest volume. The dimensions of the sternal bones were positively correlated with the age of the horses.

Conclusions: The equine sternum consists of seven bones, until now termed manubrium sterni and sternebrae 1 to 6. However, recent clinical studies described seven sternebrae, omitting the term manubrium sterni. This discrepancy may lead to fatal mispuncture of the thoracic cavity while trying to aspirate sternal bone marrow. To ensure a safe sternal puncture we therefore suggest 1) to use the spherical sternebrae for puncture, and 2) to apply the already established clinical nomenclature (numbering the sternal bones from sternebra 1–7).

58 - Neurotrophic effect of a decenoic acid derivative on PC12 cells

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Introduction: Low molecular size compounds with neurotrophin-like effect on the nervous system are a promising therapeutic approach for treatment of neurodegenerative disorders. This study was conducted to investigate the effect of (E)-2-(diethylamino) ethyl dec-2- enoate [E2] derived from decenoic acid on the PC12 cells to find if it has a neurotrophin-like action on PC12 cells and the possibility of using it as a therapeutic tool for certain neurological disorders.

Methods: The *in vitro* effect of E2 on PC12 cells was investigated using Western blotting with aid of tissue culture technique.

Results: E2 potentiated nerve growth factor (NGF)induced neurite outgrowth in PC12 cells in a dose dependent manner. The maximum number of cells bearing neurites appeared at higher concentration ($37.5 \ \mu g/$ ml) of E2. In addition, E2 up-regulated phosphorylation of MAPK/ERK 1/2 after 30 min of incubation and significantly increased the phosphorylated CREB but only with high concentration of E2. However, addition of E2 did not change the expression level of the phosphorylated AKT or neurofilament-M after 24 hours of incubation.

Conclusions: Our results showed that the decanoic acid derivative, E2, potentiates the NGF-induced neurite outgrowth mainly through the activation of MAPK/ERK 1/2 pathway. Thus, perhaps the combined use of E2 and other neurotrophic micromolecules that promote neurite outgrowth and regulate AKT phosphorylation could provide an alternative therapy for maintaining the health of the central nervous system.

59 - Basic principles of neocortex expansion during evolution - a cell biological analysis of neural stem and progenitor cells *S. A. Fietz** and *J. Seeger*

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Introduction: Neocortex expansion is a hallmark of brain evolution. A major cause of this expansion is the increase

in the number of self-renewing neural progenitors during embryogenesis. In rodents, two progenitor subtypes can be distinguished: apical progenitors (APs) of the ventricular zone and basal progenitors (BPs) of the subventricular zone (SVZ). Importantly, the human SVZ harbours a neural progenitor cell type - the basal radial glia cell (bRGC). This cell type maintains features of APs that, in contrast to rodent BPs, enable it to self-renew. Intriguingly, bRGCs also exist in other mammals including marmoset, but only in lower abundance. This led to the hypothesis that a high abundance of bRGCs provides a basis for mammalian neocortex expansion. However, if and to what extent bRGCs are also present in the developing neocortex of other mammals, specifically of domesticated species, remains unknown. Therefore this study aims to characterize the neural progenitors in the developing neocortex of mammals exhibiting various degrees of cortical expansion.

Methods: Embryonic and fetal neocortex of selected mammalian species was collected from distinct developmental stages spanning from early mid-gestation to end-gestation. Neural progenitor cell subpopulations were analyzed by immunofluorescence for established molecular makers. *Results:* Similar to human, the SVZ in the developing neocortex of all species investigated in this study was found to be massively expanded. Moreover, a major proportion of the SVZ progenitors in these species seems to be of the bRGC type.

Conclusions: This is the first study demonstrating that bRBCs are present in the developing neocortex of a broad range of domesticated mammalian species. Its precise abundance during corticogenesis is currently being investigated. This work will shed light on the mechanisms underlying neocortex expansion during evolution and will introduce novel model organisms to the research fields of neural stem cells, human brain disorders and cortex development.

All animal experiments were performed in accordance with German animal welfare legislation and were approved by the Landesdirektion Sachsen.

60 - Histomorphological study of the harderian gland in the Canadian ostrich (*Struthio camelus*)

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Introduction: In mammals, birds, rodents, amphibians and reptiles the Harderian gland (HG) is an exocrine gland

with a secretion of varying character. Although during the recent years, there have been presented numerous publications about histological, histochemical and ultrastructural studies of the Harderian glands in many avian species, detailed information on the morphology of the HG in the ostrich is incomplete.

Methods: The heads of ten healthy adult ostrich obtained from slaughterhouses constituted the materials of the study. The Harderian gland was dissected out and all of the gross morphometrical parameters including length, width and thickness as well as weight of left and right glands were recorded. Tissue sections were stained using haematoxylin eosin, Masson trichrome, periodic acid Schiff and Alcian blue (pH 2.5) techniques.

Results: In the ostrich, the HG is an orbital organ located ventromedially around the posterior part of the eyeball. It has an oval flatted shape, light pink color with an irregular outline and is pointed in the dorsal extremity. The mean registered length of the HG is 35.30 ± 2.48 and 35.55 \pm 3.58 mm and the mean width is 15.30 \pm 1.20 and 15.65 ± 1.18 mm, in left and right sides, respectively.

Conclusions: The results of histological analysis of the HG in the Canadian ostrich show that the gland is tubuloalveolar and covered by a capsule which divides the organ into lobes and lobules. Also this organ has a single duct. Its product is mucous and the secretion mode is apocrine. Histochemical staining revealed that all epithelial cells of both glandular units and ducts contain both neutral and acidic mucins. There is no significant difference between length, thickness, weight and width of the left and right HG.

Approval for this study was gained from the animal care and ethics committee of the Ferdowsi University of Mashhad

61 - Vascular channels in hyaline cartilage: development of channels and removal of matrix degradation products S. Gabner¹*, G. Häusler² and P. Böck¹

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Introduction: Vascular channels (VCs) into cartilage models of bone develop at the beginning of indirect ossification. The channels are directed to the ossification center, a cluster of hypertrophic chondrocytes and calcified matrix. We studied ingrowing VCs before the channels reached the ossification center (before calcified matrix is corroded and removed).

Methods: Cartilage models of rostral bone from 1 to 6 days old piglets were fixed in formalin and routinely processed for histological examination.

Results: VCs develop from circumscribed connective tissue protrusions into cartilage matrix ("perichondrial papillae", PPs (Schaffer J., 1930: Die Stützgewebe. Handbuch der mikroskopischen Anatomie des Menschen II/2, 1-390. Berlin: Julius Springer)). Papillary stroma contains numerous fibroblasts and sinusoidal blood vessels with membranes. discontinuous basement Extravascular monocytes and macrophages expressing MAC387 marker protein are remarkably rare. Multinucleated giant cells (chondroclasts) are missing. Fibroblasts in PPs or in penetrating VCs synthesize collagens I and III, matrix is rich in hyaluronan and sulfated gylcosaminoglycans. Cartilage matrix becomes corroded at the tips of PPs or VCs but not along the sides of ingrowing VCs. Corroded matrix shows reduced basophilia, alcianophilia (pH = 2.5), and metachromasia. Reduced staining intensities mark a "preresorptive layer" (Lee E.R. et al., 2001: Dev Dyn 222, 52-70) where matrix is removed and VCs penetrate further. Cartilage matrix is not broken down to single molecules. Sulfated macromolecular fragments are identified within sinusoids of VCs and within larger veins outside the perichondrium. Intravascular matrix constituents are not found in all VCs at a given time point.

Conclusions: Matrix material in the lumen of associated vessels characterizes actively ingrowing VCs. VCs do not penetrate simultaneously (PPs are seen together with deeply penetrating VCs; removal of matrix constituents is not seen in all VCs). Ingrowth of individual VCs must be governed by locally produced substances and/or locally expressed receptors.

62 - Some experiences on anatomy innovative education

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Introduction: The subject Anatomy of Exotic Animals was implemented in the Veterinary School of the University Complutense in 1999, for the first time in a Veterinary School in Spain. By that time, concerns about Bologna Principles and innovation in Veterinary Education started in our University.

Methods: The "Anatomy of Exotic Animals", as well as other disciplines, was used to train teachers and students for the new time to come, as we had to change from a teacher-centred education to a student-centred education. The so-called "Projects on Innovative Education" are one of the methods to promote the implementation of new teaching practices in superior education. Due to these projects, teachers are able to develop new teaching tools, to make the adaptation to Bologna easier and faster. For the first time, we started to have a more applied (less academic and more professional) approach. Anatomy evolved from being a traditional subject, too theoretical and sometimes even tedious, towards a practical and directly applicable matter in the daily activities of a veterinarian.

Results: Our results show that Anatomy can be used as the basis for other applied sciences as Radiology, Pathology, Surgery or Internal Medicine. By doing that, it is possible to give the knowledge of a basic science a practical sense. This principle was especially true in three Projects on Innovative Education. The last one is UNICOMEX which is a virtual resource to facilitate the study of exotics (anatomy and clinics). Its entire content is in Spanish and English, to make UNICOMEX a real useful tool.

Conclusions: Projects on Innovative Education are useful tools to change from a teacher-centred education to a student-centred education. In the case of Anatomy, we show that it can have a practical sense, as it is the basis for other applied sciences.

63 - Trabecular microarchitecture at birth, escape from the Wolf(f)

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Introduction: Bone is a dynamic tissue adapting to loading according to Wolff's law. During growth however, adaptation solely based on loading, might not meet the requirements necessary to resist the increasing external forces. The most dramatic change in loading occurs immediately after birth in precocial neonates, as they should follow their herd within an hour after birth. Other species experience a more gradual start after birth, so the development of their skeletal system is expected to be slower. In this study we investigated and compared the skeletal system's degree of development at birth of both types species. *Methods:* Subject of investigation: talus. Animals: full term, still-born piglets (5), calves (5), puppy (1), elephant calf (1) and foals (5). Method of research: Micro CT imaging. Calculated parameters: Bone volume, trabecular number, trabecular thickness and anisotropy.

Results: The tali of the puppy were still cartilaginous, whereas the tali of the calves and foals were almost completely ossified. The tali of the last two were most adapted to loading, although the strategies differed. Foals had the highest bone volume (BV) (about 45% versus 30%), whereas the calves showed more anisotropy in comparison to the foals (up to 1.55 versus 1.40). In piglets the tali had a BV of about 45%, but a less organized microarchitecture (anisotropy 1.25) than foals and calves. The elephant calf's joints were partly ossified and these parts had a BV of 35%.

Conclusions: This study shows that major differences exist between the listed animals in bone volume and trabecular microarchitecture at birth. More knowledge about the exact regulatory mechanisms explaining these differences could be helpful in understanding the aetiology of developmental bone and joint diseases like osteochondrosis. Finally it can also be used in choosing the correct species as a model for growth, development or disease.

64 - Scanning electron microscopy study on the lingual and buccal papillae of the alpaca (*Vicugna Pacos*)

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Introduction: Although alpaca's tongue was characterized also by others, there were not three-dimensional studies in this field. The aim of this research was SEM examination of lingual and buccal papillae.

Methods: The study was conducted on three tongues from female alpacas obtained post-mortem from the Wroclaw Zoological Garden. The preparations were observed with using of EVO LS 15 Zeiss scanning electron microscope.

Results: The filiform, conical lingual papillae and two type of conical buccal papillae were isolated as mechanical papillae. Fungiform and circumvallate papillae as gustatory papillae were found only on the lingual but not buccal surface. The filiform papillae were most numerous and their apical shape was specified as primary papillae

with secondary papillae or pseudopapillae on the lateral part. The superficial part of these papillae was gradually rough. The small conical papillae have a pointed top with slightly folded structure, while the biggest conical papillae were bunoform. The fungiform papillae were round in their shape with various numbers of gustatory pores. The surface of fungiform papillae were slightly folded. Only six circumvallate papillae were seen, with different amount of pseudopapillae. They were circular in shape with papillary groove and an annulary pad outside. The shape of their pseudopapillae was circular or oval. The openings of gustatory pores on the dorsal surface of the circumvallate papillae were not as abundant as on the surface of the fungiform papillae. Some of the buccal papillae were similar to the small-conical lingual papillae and others buccal papillae were rather bunoform in their shape. The surface of buccal bunoform papillae was folded with small bun-shape pseudopapillae.

Conclusions: The morphology of tongue and cheeks in alpaca classificate this animal between browsers and grazers. The filiform papillae are similar to these present in others Camelidae. Absence of foliate papillae is typical for most of Ruminants.

65 - Anatomical study of cerebral hypoxia in normal canine brain: comparison between mesaticephalic and brachycephalic dogs *E.* Griffeuille¹*, *F.* Ruiz¹, *J.* Sautet¹ and *G.* Mogicato^{1,2}

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Introduction: Brachycephalic breeds such as Boston terriers, Boxers and French bulldogs are predisposed to develop spontaneous gliomas that resemble the human disease (Stoica G. *et al.*, 2011: Veterinary Pathology. 48, 266–275). Furthermore, the malignant transformation of neural stem cells can be explained by changes of their microenvironment, such as hypoxia (Doetsch F. *et al.*, 1999: Cell. 97, 703–716). However, it appears that the airway obstructive syndrom common in Brachycephalic dogs creates a chronical hypoxic state (Hoareau G.L. *et al.*, 2012: J Vet Intern Med. 26, 897–904) which could affect the cerebral oxygenation status. The aim of the present study was to highlight anatomical differences of the cerebral oxygenation status between mesaticephalic and brachycephalic dogs.

Methods: After euthanasia, transversal anatomical sections were perfomed in 6 normal mesaticephalic (Beagle) and 6

normal brachycephalic (different breeds) dog brains. Previous studies have shown that the hypercapnia due to the chronical hypoxic state leads to an increased cerebrospinal fluid (CSF) production (Portnoy H.D. *et al.*, 1981: Neurosurgery. 9, *14–27*), and thus an increase of the ventricles volume. That's why cerebral and ventricles areas were measured in each section using the Visiolab 2000 software (BIOCOM, Les Ullis, France). Total cerebral and ventricles volumes were estimated from these areas. Then different ratios between measured areas and between estimated volumes were calculated to compare normal brachycephalic and mesaticephalic canine brains.

Results: In some transversal anatomical sections, there was significant difference for the ratio (ventricles / cerebral areas) between brachycephalic and mesaticephalic canine brain. Also ratio (ventricles / cerebral volumes) is significantly higher for brachycephalic dogs.

Conclusions: These first results show an anatomical difference between brachycephalic and mesocephalic canine brain related to the cerebral oxygenation status. Even though our results need to be confirmed in a large population. Moreover histological and imaging studies will be perfomed using hypoxia markers and Magnetic Resonance Spectroscopic Imaging (MRSI).

The Ethical Committee "Comité d'Ethique Science et Santé Animales - Toulouse – France" evaluated this abstract.

66 - Fractal analysis – a complementary **method for species identification?** *A. I. Gudea*¹*, *A. Ştefan*², *C. O. Martonoş*¹, *C. C. Dezdrobitu*¹ and *F. G. Stan*¹

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Introduction: Identification of species on the basis of bone morphology is a common challenge for anatomists. Starting form macroscopical features, followed by osteometric methods and then micromorphological assessment, all these methods are used nowadays in species identification. The present study presents a new approach, the fractal analysis of the histological digital images and the possible utility and usefullness of this method as a complementary one, in case of three highly related species- sheep (Ovis aries), goat (Capra hircus) and roe deer (Capreolus capreolus).

Methods: Osteons of the femur, tibia, metatarsal bones were analyzed with ImageJ FracLac plug-in and

box-counting method. The cropped Regions of Interest (ROI) of 500px/500px were computed for Fractal Dimension and Lacunarity. The data analysis has been performed with specialized statistical software. Bonferoni tests and one-way ANOVA were the POST-HOC statistical tests used for pair comparisons. The tests were performed both interspecifically and intraspecifically.

Results: The comparative statistical data obtained from fractal analisys and lacunarity prove to be much relevant when compared to the comparative merphometrical data. The Fractal Dimension was able to make a quite clear distinction between most of the bone samples and in the same time Lacunarity came with complementary discriminatory values. As far as interspecific aspects are concerned, only the pair Capreollus capreollus vs Capra hircus in respect of tibia seem to be alike. Intraspecifically, the tibia and femur samples of Capreollus capreollus showed very close values (fractal dimensions and lacunarity).

Conclusions: The utility of the Fractal Analysis, as an analytical tool alongside the morphological assessment shows a promising potential for differentiating bone type between species and/or within a species. Further in-depth studies are needed to establish a clear pattern-map, with practical application in the specific morphological identification of bone fragments.

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67 - A quantification study of terminal arterioles to the uterine tube in the sow *H. A. Gutiérrez Trujillo*^{1,2}*, *E. Martínez*¹, *R. Latorre*¹ and *O. López Albors*¹

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Introduction: Until now quantitative information of potential changes in the vascular supply to the uterine tube of the sow is very limited. In this work, the density of terminal arterioles (DA) was used as a macroscopic estimator of the vascular supply to the uterine tube in relation with the portion of the organ -isthmus vs ampulla- and the phase of the sexual cycle.

Methods: Reproductive tracts of 75 "Large White" sows were sampled from the slaughterhouse. The samples were allocated into three different functional phases follicular (F), early luteal (L1) and late luteal (L2), according to the macroscopic morphology of the ovaries. Latex injections of the ovarian and uterine arteries were carried out and

the DA quantified as the number of afferent arterioles per centimetre of isthmus and ampulla. SPSS 19.0 software was used for the statistics, with a descriptive analysis and Mann-Whitney test for a significance level of 95%.

Results: A detailed visualization of the branching pattern of tubaric branches arising from the ovarian and uterine arteries showed that the terminal arterioles reach the wall of the uterine tube in groups of 3–5 vessels. DA values between the isthmus and ampulla were significantly different (16.05 \pm 5.28 and 12.28 \pm 4.78, respectively P < 0.0001), but no differences were observed according to the phase of the sexual cycle ($F = 13.53 \pm 5.27$, L1 = 13.56 \pm 4.98 and L2 = 13.14 \pm 5.44, P = 0.68).

Conclusions: The uterine tube of the adult sow has a higher blood supply in the isthmus than in the ampulla which might be related with their different functionality. The lack of changes in DA throughout the sexual cycle demonstrates that the macroscopic vascular supply to this organ is not directly influenced by the levels of sex hormones in the sow.

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68 - Pattern of terminal arterioles supplying the uterine tube in the sow

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Introduction: Until now the vascular pattern of the uterine tube in the sow has been mainly referred to the main branches arising from the ovarian and uterine arteries. However, a detailed description of the terminal arterioles directly supplying the tubal portions is lacking and could help to understand differences in function based on blood supply.

Methods: Reproductive tracts of 10 "Large White" sows were sampled from the slaughterhouse. The ovarian and uterine arteries were injected with either coloured latex or Araldit[®] resin. Vascular dissections and casts displaying the vessels supplying the uterine tube were photographed at macroscopical and submacroscopical levels.

Results: The vascular casts and latex injections displayed the arterial network to the uterine tube with great detail of representation. In no case a unique branch to the uterine tube was observed to arise from the ovarian artery. Terminal arterioles commonly arise from vascular arcades which run closely and in parallel to the mesosalpingeal and antimesosalpingeal borders. In the mesosalpingeal border the arcades result from anastomosis of branches directly coming from the ovarian and uterine arteries, or from profuse anastomosis existing between them. For the antimesosalpingeal border a single vessel crosses over the ampuloisthmic union so as to bifurcate in cranial and caudal branches which give rise to the terminal arterioles. With the exception of the infundibulum where the arterioles spread in an irregular pattern, terminal arterioles reach the isthmus and ampulla in a pattern resembling

the vasa recta of the small intestine. *Conclusions:* A precise knowledge of the distribution of terminal arterioles supplying different portions of the uterine tube in the sow has been obtained. The existence of a simple vessel supplying the arterioles at the antimesosalpingeal border is described by first time.

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69 - The correlation between morphological and functional parameters of the equine hoof

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Introduction: Various morphological and functional parameters of the hoof are used as reference for trimming or shoeing, aiming to prepare a balanced hoof. The purpose of this study was to examine the correlation between morphometrical parameters, toe bone alignment, centre of force (CoF), pressure force distribution and footing to create objective data supporting the practical work of farriers.

Methods: 70 barefoot, regularly trimmed horses underwent radiological (Gierth X-Ray international[®], Metron XP) and kinetic (Tekscan [®]) examination. The pressure measurements were carried out while standing and walking in a straight line on concrete. Moreover 14 morphometrical parameters of the hoof capsule were collected.

Results: No correlation of morphometric parameters and the CoF could be observed. A significant correlation between wall angles and pressure force distribution is visible while there is no strong correlation with the footing. Moreover the alignment of the bones does not interact with kinetic parameters. No association between the mediolateral position of the distal phalanx and the side wall angles was observed. Only 17 left hooves and 32 right hooves showed a distal phalanx that was almost parallel to the ground in the mediolateral projection (dorsoplamar 2 horses). *Conclusions:* The position of the CoF is not only influenced by the hoof conformation but rather by the upper body structure which should be considered for trimming. The shape of the hoof capsule is an indicator for judging the effecting pressure forces to influence the load distribution by trimming. Moreover the load in the main stance phase seems to change the hoof morphology more than the impact during the initial contact. Therefore a plane footing would not be the solution to create a balanced hoof in any case. Judging the mediolateral alignment of the distal phalanx by examining the hoof capsule is not a valuable orientation for trimming.

70 - The influence of hoof trimming on bone alignment, pressure force distribution, hoof morphology and footing

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Introduction: The assessment of hoof trimming often depends on subjective judgment because of a lack of objective data on biomechanical effects on the equine hoof. The purpose of this study were to collect scientifically sound data about the influence of various hoof trimming methods on static and dynamic parameters as an objective basis for practical work and expert discussions.

Methods: Three groups of 23 barefoot sound horses (n = 69) were trimmed at regular intervals over ten months using methods based on different concepts (pastern axis theory, self-maintaining, F-Balance). Morphological and kinetic data (Tekscan [®]) of the forelimbs were obtained directly prior and after every trimming. A radiological examination (Gierth X-Ray international [®]) was carried out at the first and last trimming session and x-rays were analysed with Metron XP afterwards.

Results: The mediolateral position of the coffin bone is not affected while the changes in the palmar angle were influenced by the trimming method. The influence on the alignment of the upper bones is not predictable from the load's impact during the radiological examination. Moreover there are several minor changes of morphometrical parameters observable during the ten months. The effect on the location of the center of force is not predictable while the pressure force distribution and the loaded area are significantly influenced by trimming. To change the footing of the horse an individualized trimming is necessary.

Conclusions: Static evaluation of the toe bone alignment is an unreliable parameter as a reference for hoof trimming or for judging the work of a farrier. More important is

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the influence on functional parameters like the pressure force distribution and the footing in the context of the individual body conformation of the horse. It takes at least one growth period to change morphometric parameters of the hoof capsule.

71 - Anatomy just a paraclinical subject? - a reachout educational activity J. Hagen*

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Introduction: Anatomy is one of the oldest and most fundamental disciplines for students in medical and biological sciences. It is generally taught as a foundation for the following clinical qualification. Nevertheless anatomy is strongly correlated with clinical and practical activities outside universities.

Methods: Our research group "Equine locomotor system and hoof orthopaedics" focuses on clinical studies about hoof trimming and shoeing. Therefore a close international collaboration with farriers, horseshoeing schools and associated industry has developed. In order to provide the scientific results to professionals a free E-lecture platform was established in cooperation with "Werkman Horseshoes" (www.werkmanhorseshoes.com). Moreover the group supported the "Flying Anvil Foundation (FAF)". Their goal it is to improve the knowledge of farriers in regions where needs are greatest. In its first institute (Rajasthan, India) anatomy, biomechanics and practical skills of hoof trimming were taught in lectures and practical courses by Jenny Hagen as one of the volunteers in April 2014.

Results: Since February 2014 the Werkman Hoofcare Acadamy is becoming a link between craftsmen who wish to enhance their skills and research. Intensely focused on acquiring (new) knowledge in order to improve farriery and hoof care this E-learning platform is used around the world and increased the exchange between farriers and other professionals. Moreover the FAF-Farriery Institute trained a group of 12 farriers over one year they graduated with certificates, further groups are underway. Conclusions: Anatomy can't be limited to a paraclinical discipline. It is a foundational discipline connected to every profession working with living beings. Outside universities there is great interest and demand for sound anatomical knowledge in order to improve the respective practice skils. No other person can provide these skills better than an anatomist - therefore we should share our multifaceted knowledge wherever we can.

72 - Teaching veterinary anatomy in the Inter-University School of Veterinary Medicine, Hokkaido in Japan

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Introduction: Teaching veterinary anatomy in the currently established Japanese Inter-University school of veterinary medicine has been in the process of upgrading its teaching contents to meet International Epizootic Office's (IEO) Recommendations – "Day 1 graduates" by applying eLearning system, multimedia programs, and the portal system, which provide proper anatomical teaching materials with preclinical and clinical class students, having an essential aim to prepare the evaluation activity of European Association of Establishments for Veterinary Education (EAEVE).

Methods: To Realize improved teaching veterinary anatomy that meets current international standard of veterinary medicine, publications of full sized Japanese edition of anatomy textbook of mammals and birds (König/Liebich), multimedia program of the Anatomia Canis (Sotonyi, Jpn./Eng. eds.) have been published. In addition, standardized minimum-sized textbooks (Anatomy, Histology, and Embryology) have also been published based on our new "Veterinary Model Core Curriculum" prepared for our "Veterinary Common Achievement Tests ("Computer Based Testing" (vetCBT) & "Objective Structured Clinical Examination" (vetOSCE) which evaluate minimum knowledge and clinical skills of individual students carrying out at the end of 4th yearclass before entering clinical classes.

Results: The textbooks are formatted both in paper and in digitalized texts with valuable pictures and illustrations, and the contents of the digitalized texts and eLearning materials are easily accessible and viewed on a tablet PC or a smart phone through our portal site with the Internet web browsers. These teaching tools for veterinary anatomy have been common to use for gross anatomy in addition to the histological laboratory sessions.

Conclusions: The teaching tools have created a new teaching style providing more detailed information on the topographical and cross-sectional anatomy of the animal bodies for preclinical course students before entering their clinical experiences. Information of the upgrading process is available at the following website (in Japanese): http:// plaza.umin.ac.jp/~vetedu/index.html

73 - Ultrastructural evaluation of nerves proximal to the ramus communicans of the equine thoracic limb after transection of the ramus

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Introduction: The ramus communicans serves as a neural communication between the medial and lateral palmar nerves in the distal portion of the metacarpus of horses. Fiber type and pathway of sensory impulses through the palmar nerves should be understood to avoid errors when interpreting the results of diagnostic anesthesia of these nerves performed to localize the site of pain causing lameness.

Methods: A 1-cm section of the ramus communicans of both metacarpi of 2 anesthetized ponies were excised through a 2-cm longitudinal, cutaneous incision created over the palmar aspect of each metacarpus. After euthanizing the ponies 2 months after surgery, samples of palmar nerves, proximal and distal to the ramus, and samples from the distal ulnar and median nerves were harvested (just proximal to termination) and examined with an electron microscopic for axonal change.

Results: All nerves examined demonstrated changes characteristic of axonal degeneration, indicating that all of these sampled nerves (medial and lateral palmar, ulnar and median) contribute to the ramus communicans. Various stages of Wallerian degeneration were observed. Ruptured mitochondria and mitochondrial cristae, vacuoles and multilayered vesicles of various sizes were observed in the axoplasm. Light axoplasm containing vacuoles and ruptured mitochondria was observed in swollen axons. Most sections contained islands of myelinated profiles and multilayered vesicles. Cytoplasm of neurolemmocytes (Schwann cells) contained ruptured mitochondria, vacuoles and vesicles. The inner part of the myelin sheath was separated by vacuoles and spaces indicating that the nerves were demyelinating. Continuity of the myelin sheath was often lacking.

Conclusions: These changes indicate that all of the sampled nerves contribute to the fibers of the ramus communicans.

This study was approved by University Institutional Animal Care and Use Committee.

74 - Teaching crocodilian anatomy to undergraduates

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Introduction: Undergraduate veterinary training has seen major shifts in emphasis over recent decades. This has been due to not only the increasing depth of knowledge within the profession but also the expansion into newer areas of endeavour, wildlife in particular. These changes are most notably in the more affluent countries such as much of Europe and North America where there has been a marked increase in the personal ownership of exotic pets of which reptiles are a significant component. Many veterinary curricula have embraced these changing demands with the introduction of training in basic anatomy and histology of reptiles, fish, amphibians and birds. Methods: The Institute of Veterinary Anatomy at the Freie Universitaet in Berlin, has adapted to these demands by introducing a compulsory undergraduate course to study the functional morphological characteristics of these groups of animals including crocodilians. This involves gross anatomical studies of skeletal and plastinated specimens as well as histological specimens prepared by our institute. The characteristics of the crocodilian musculoskeletal, nervous, digestive, cardiovascular, respiratory, urinary and reproductive systems are each covered in depth. Details of sense organs, skin, haematology, as well as radiography are also explored.

Results: To some extent our teaching has been hampered by the paucity of specimens and literature covering the anatomy and histology of crocodilians. Overall students not only enjoy this aspect of their undergraduate training but also seek to learn more. Many of our students gain experience with live crocodilians held in veterinary clinical institutions as well as by excursions to zoological institutes.

Conclusions: Even though we have been limited by little 'hands on' teaching material, our students have embraced our endeavours positively and welcomed the opportunity to explore the quite different anatomies of the non-domestic species that many students wish to work with in their future workplaces.

75 - The effect of orthopedic horseshoe modifications on the pressure force distribution and the footing

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Introduction: There are various modifications of orthopedic horseshoes, all to influence the biomechanics of the hoof. Still, there are few scientific studies objectively assessing these influences. The purpose of this study was to examine the effect of various orthopedic horseshoes on pressure force distribution, footing and gait pattern in comparison to non-shoed hooves and standard horseshoes.

Methods: Twenty-five horses were shoed with different horseshoe modifications (ten shoes) and various standard horseshoes (four shoes). Kinetic data was collected using the TekScan[®] -System. Sensors were positioned between hoof and shoe as well as shoe and ground. The horses were examined walking a straight line on four different types of ground. Six to seven steady strides were averaged for analysis with the Hoof-System[®].

Results: The pressure force distribution changes depending on the ground's condition, the modified shoes' surface and the differences in toe alignment due to the modification's shape. By changing the shoe surface regional ground penetration can be influenced. Therefore the ground reaction forces increase due to the reduced sinkin and are transmitted to the corresponding part of the hoof capsule. The footing is mainly influenced by modifications that partially alter the hoof height.

Conclusions: Orthopedic horseshoes are often used with the intention to influence the strain on tendons, ligaments and joints by changing the toe bone alignment. Little consideration is given to the impact on the hoof capsule. In addition, the footing influenced by modification of the leaver arm and the height interacts with these structures. Relieve on one part always causes higher load in the opposite region. The optimal choice of a horseshoe should also take the ground conditions into account because they significantly influence the effects the shoe modifications have on biomechanical function and structure of the hoof.

76 - The effect of orthopedic horseshoe modifications on the bone alignment of the equine foot

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Introduction: Orthopedic horseshoes are mainly used to prevent certain hoof disorders or are part of a therapeutic strategy. The aim of this study was to evaluate the changes in the equine bone alignment of the foot caused by different shoe modifications. Established methods of x-ray imaging of the equine distal limb were used in hooves with different orthopedic horseshoes under different ground conditions.

Methods: 25 horses shoed with different orthopedic horseshoes were examined radiologically (0°, 90°) (Gierth X-Ray international [®]). To ensure reproducible pictures, each hoof was marked to center the x-ray beam (Cauldron 1997 and Kummer 2004 et al.) For subsequent analysis (Metron Hoof[®]), the examined foot was placed on a podoblock equipped with a wooden block or a soft pad simulating hard or soft ground.

Results: Significant changes in the bone alignment caused by a modified horseshoe surface could be seen on soft ground. Modifications which offer increased palmar/plantar support (eggbar, heartbar shoes) show reduced sink-in of this area resulting in a steeper alignment of the coffin bone. Also a wider toe or branch of the horseshoe leads to a changed position of the distal phalanx following the same mechanism. Wedges affect the bone alignment on every ground. However, the conformation of the first and second phalanges and the joint space symmetry not only depend on the coffin bone position but rather on the ground properties and load.

Conclusions: Depending on the bone alignment of the equine foot the load on tendons, ligaments and entire joints can either be reduced or enhanced. The angle of the distal phalanx always affects the surrounding structures and can be used to foretell alterations of the load whereas the strain on structures connected to the first and second phalanxs' position is influenced by numerous additional parameters and therefore harder to predict.

77 - Immunohistochemical localization of glucose transporters in ostriches gastrointestinal tract

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Introduction: Glucose transporters, integral membrane proteins, play a pivotal role in the transfer of glucose across epithelial cell layers that separate distinct compartments in organism. Up to now there is little information about the localization of glucose transporters in birds gastrointestinal tract. As carbohydrates are the main energy source of food it is very important for veterinary science to gain more knowledge about transport of sugars in gastrointestinal tract. The aim of the present study was to detect the facilitated-diffusion glucose transporter family members GLUT-1, GLUT-2 and GLUT-5 in different parts of ostriches gastrointestinal tract: superficial gland zone of proventriculus, duodenum and the terminal zone of ileum.

Methods: Material from three parts of gastrointestinal tract was collected from six 30 days old ostriches. Specimens were fixed with 10% formalin, embedded in paraffin, sections 7 μ m thick were cut followed by immunohistochemical staining. Polyclonal rabbit antibodies GLUT-1, GLUT-2 and GLUT-5 served as primary antibodies. Immunohistochemical staining was carried out according to the manufacturers guidelines (IHC kit, Abcam, UK).

Results: Stronger positive staining for GLUT-1 was detected in ostriches superficial gland zone of proventriculus and in epithelial cells of the terminal zone of ileum; epithelial cells of duodenum were stained weaker. Besides proventriculus, brush border membranes of small intestine were stained positively for GLUT-2. GLUT-5 (the fasciliated glucose/fructose transporter) was detected in the epithelial cells of proventriculus, in the brush border of enterocytes as well as in the Goblet cells in the small intstine. Compared to GLUT-2 the terminal zone of ileum was more intensively stained by GLUT-5.

Conclusions: The present investigation provided information concerning the localization of GLUT-1, GLUT-2 and GLUT-5 in ostriches gastrointestinal tract, which is a prerequisite for transpithelial transport of sugars.

The Ethical Committee of Latvian University of Agriculture has evaluated the abstract.

78 - Multimodalities approach in teaching veterinary anatomy: proposed strategies *N. Inpanbutr**

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Introduction: Historically, anatomy has been a cornerstone in veterinary medical education. However, there are many challenges facing anatomy education including reduced time, shortage of qualified anatomists, and changes in student learning behavior. The irrefutable press for changes in teaching approach based heavily from changes in student-learning behavior. Students are active learners who are digitally savvy, visual-computer–based oriented, able to multitask, network and collaborate. Moreover, information growth and availability is continuously accelerating. Taken together, it is necessary to re-think our teaching methods for digital generations. It is a fact that students learn better when the learning process is more attuned to their style. Therefore, as educators, we must bear this in mind when we design and deliver content.

Methods: Based on current circumstances, as well as my own research and observations from students, I propose the following modalities for teaching anatomy: 1) Divided students into smaller groups and exposethem to different modules concurrently, 2) Provide longitudinal learning curriculum, where anatomy is revisited throughout the curriculum until students reach the clinical year, 3) Integrate and emphasize clinically oriented, cases-based lectures, 4) Conduct dissection laboratories by alternating groups that centered around clinical cases, 5) Supplement dissection laborites with prosections, plastinated modules and all probable learning resources, 6) Implement a Wiki program, and 7) Provide a comprehensive anatomy learning resource center or library that includes interactive modules, X-ray, CT,MRI, ultrasound images, and tools which promote learning.

Results: These implementations provide various forms of learning resources deem to be suitable, more attuned to the students' different learning style. In addition, these implementations should help in retention, less dissection time, enhance clinically oriented learning skills, providing opportunities for team building, collaborative learning, and developing critical-thinking skills.

Conclusions: These implementations should be compatible to the digital generation learning style, therefore, improving the overall learning experience.

79 - Radiosensitization effects of curcumin and calcitriol on canine transitional cell carcinoma *in vitro*

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Introduction: Transitional cell carcinoma (TCC) is an aggressive malignancy that presents a therapeutic problem in dogs because the disease is often very advanced at the time of clinical presentation. Curcumin, a component of turmeric, has been shown to have anti-inflammatory, pro-apoptotic, and growth inhibitory properties in cancer cell lines. Previous work in our laboratory has shown enhanced radiosensitivity of TCC when pretreated with $1,25(OH)_2D_3$ (calcitriol) at clinically relevant doses. Ionizing radiation (IR) is a well-established therapy in the treatment of many malignancies. However, its therapeutic application in the lower urinary tract for the treatment of TCC is limited due to side effects. In this study, curcumin and calcitriol were evaluated to determine if they would enhance the effects of IR on TCC.

Methods: Canine TCC cells were treated with calcitriol at 10^{-7} M and curcumin at 10, 20, 30 μ M for 24 hours before irradiation by 6MV X-rays at doses ranging from 2 to 10 Gy. Cells were then incubated for 72 and 96 hours. Proliferation was assessed using the CyQuant assay and Vitamin D receptor (VDR) production by western blot assay.

Results: Curcumin at 10 μ M was cytoprotective, 20 μ M was mildly inhibitory, while 30 μ M showed significant inhibition. Calcitriol had variable effects at the 10⁻⁷ M dose, however concentrations $<10^{-7}$ M were cytoprotective. IR doses of 8 or 10 Gy showed marked cell death as compared to 6 Gy or lower. VDR expression increased compared to controls in IR-treated cells at 20 μ M of curcumin.

Conclusions: Preliminary data demonstrated that pretreated cells with 10 μ M curcumin, and $<10^{-7}$ M calcitriol exhibited cytoprotective, enhancing radiosensitivity effects in TCC exposing to IR. Future *in vivo* study could leading to the use of calcitriol and curcumin to enhance efficacy of radiation in canine TCC patients.

80 - Preliminary results of a macroscopical and histological study of the medulla oblongata in chinchillas (Chinchilla lanigera) *I. Irimescu*¹*, *P. F. Bolfă*^{2,3}, *R. Vidrighinescu*², *M. I. Crisan*¹, *C. C. Dezdrobitu*¹ and *A. Damian*¹

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Introduction: Chinchillas (*Chinchilla lanigera*) have been used in neurology research, but the literature lacks a detailed description of its central nervous system (CNS). The question arises if the extensively mapped CNS of the taxonomically related rat (*Rattus norvegicus*) is a precise enough guide for chinchillas. Hypothesizing that both species present the same general neural structures, we have analyzed the medulla oblongata in chinchillas, comparing it to previous descriptions.

Methods: Ten encephalons were sampled from commercially slaughtered adult chinchillas of both sexes. 5 samples were macroscopically examined. 5 samples were serially cut and stained (modified Luxol-Cresyl protocol). The structure of the medulla oblongata was assessed and compared to descriptions of the rat's.

Results: The external aspect of the medulla oblongata in chinchillas is similar to the rat's, but several elements tend to be more prominent (ventral pyramids, trapezoid bodies, dorsal vestibular areas), while the rhomboid fossa is narrower. The coronal profile of the medulla oblongata is proportionally narrower in chinchillas. The internal structure of this segment conforms to the general white and grey matter arrangement but the external particularities reflect various internal topographical modifications (ex.: more prominent medial vestibular nuclei, spinal trigeminal tracts and nuclei with a higher position in the anterior half, etc.).

Conclusions: Overall similarities recommend medulla oblongata neuroanatomic maps of the rat as a relevant general guide for the chinchilla. However, the particularities of this brain component in chinchillas indicate that precise neurosurgical experimental models of this species require accurate mapping of the chinchilla's medulla oblongata.

81 - Preliminary results of a macroscopical study of the cerebral hemispheres in chinchillas (*Chinchilla lanigera*)

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Introduction: The neuroanatomy of rodents is very important for the elaboration of valid research models in most of the branches of human neurologic research. The cerebral hemispheres of the chinchilla (*Chinchilla lanigera*), as a laboratory animal, have not yet been fully described. Our study undertook the task of their macroscopical assessment, based on literature descriptions available for related species.

Methods: Five encephalons were sampled from commercially slaughtered adult chinchillas of both sexes. Each telencephalon was isolated, fixated in formalin and macroscopically examined. The surface features of the cerebral hemispheres were assessed and compared to literature descriptions in rats and in rabbits.

Results: The surface of the cerebral hemispheres in the chinchilla shares the lissencephalic characteristics of rodents and rabbits. A ventral view of the brain reveals a well developed rhinencephalon similar to the rat's, proportionally shorter than the rabbit's, yet retaining a similarly narrow shape. The pyriform lobes have a particular globular shape. The dorsal view of the cortex shows the oral halves of the hemispheres significantly contracted, generating a triangular shape (as in rabbits). The general frame of the hemispheres is however more compact, the ventral profile is less curved (as in rats).

Conclusions: The lissencephalic cerebral hemispheres of the chinchilla present many features related to those of the rat, but also share similar traits with the rabbit's. This may suggest internal topographic differences from the rodent telencephalon, potentially important for neurologic experimental models, underlining the need for further studies.

82 - Angioarchitecture of the Pig urinary bladder

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Introduction: The 3-D organization of the blood vessels on vascular corrosion cast (VCC) of urinary bladder was described mainly in small laboratory animals, cat, dog and in man. The purpose of present study was an evaluation of the arrangement of vascular networks in the urinary wall with special attention on adaptations to changes in the size of the organ.

Methods: The LM and SEM observations were made on histological slides and vascular corrosion casts of 10 urinary bladders taken from slaughtered animals. The VCC were obtained by injection of low viscosity Mercox resin. The observations of vascular networks were documented in a SEM 435 VP.

Results: The histological structure of wall of the urinary bladder consists of mucosa, muscle layer and serosa with a well developed subserosal tissue. The differences in density of collagen bundles in mucosal folds and in an area near a smooth muscle layer was observed. In the wall of the urinary bladder we distinguished subserosal and mucosal vascular networks. The superficial arteries and veins of the subserosal plexus run in vascular pairs or as triads and form small branches for local capillary networks. The small arterioles of the subserosal vascular network pierce the muscular layer and reach the lower part of lamina propria mucosae, where they give off branches in similar intervals running to mucosal folds. Subepithelially, terminal arterioles, dense capillary networks, and collecting venules were observed. The characteristic feature was a lack of capillaries in places of transfer of forces between muscle layer and mucosal folds. During changes of the urinary bladder volume, blood vessels show a sinusoid or a twisted pattern. Conclusions: LM and SEM observations of vascular corrosion cast showed special organization of blood vessel networks functionally adapted to changes in size of urinary gallbladder.

83 - Correlated macro-and microscopical studies on tongue and lingual papillae in the Tunisian donkey (*Equus asinus*)

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Introduction: The aim of the study was to determine the types and locations of the lingual papillae in the female and male domestic donkey.

Methods: The macroscopic observations were carried out on 16 female tongues and 11 males tongues of the slaughtered Tunisian donkey. The three age groups were determined: 0–1.5, 2–5, 6–10 years. LM, SEM and metric measurements were conducted.

Results: The tongue of the Tunisian donkey is elongated and consists of the apex, body, torus linguae and the root of tongue. It was found no sexual dimorphism of the donkey tongue. The length of the tongue increases in age groups from 20 cm to 26 cm. The width of the torus linguae in the individual age groups are also increase from 4.8 cm to 6.0 cm. On the dorsal surface of the tongue there are filiform, fungiform, foliate and vallate papillae. The filiform papillae cover the entire surface of the tongue up to area of the vallate papillae. The fungiform papillae are scattered between the filiform papillae and also present on the lateral surface. Interesting observation in the donkey tongue is the reduction of the number of fungiform papillae from 85 to 60. The foliate papillae are located on the lateral surface of the posterior part of torus linguae and consist of about 7-8 leaves in each age groups. The vallate papillae are located on the posterior part of the torus linguae and in each age groups vary between 2 and 5, but predominantly there are three vallate papillae.

Conclusions: The anatomy of the tongue in Tunisian donkey resembles the tongue in horse. The special-specific features are the lack of cartilage of dorsum of tongue (*cartilago dorsi linguae*) and also the variable number of vallate papillae.

84 - Morphometric examination of the equine adult and foal lungs

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Introduction: To understand the mechanisms of age-specific equine diseases such as *Rhodococcus equi* infection, we must first quantify with stereology baseline normal structures such as the parenchymal density, ductal airspace, and endothelial surface area, which influence immune responses (Hsia et al., 2010: Am. J. Resp. Crit. Care Med. 181, 394–418). We tested a hypothesis that the foal lung will have a less structurally differentiated lung composition in comparison to the adult horse.

Methods: We adapted and applied stereological methods to the lungs from healthy adult horses (n = 4) and 1 day (n = 5) and 30 day (n = 5) old foals. The left lung was fixed *in situ* followed by immersion fixation before applying unbiased sampling. The tissue samples were fixed in plastic blocks for stereological evaluation.

Results: The lung had median parenchymal density (alveolar airspace, ductal airspace and tissue) of 81.0% in 1 day

old foals, 84.4% in 30 day old foals, and 93.7% in adult lungs. The median volume density of alveolar airspace/ lung was 45.9% in 1 day old, 55.5% in 30 day, and 66.9% in adult horse lungs. The age didn't influence the ductal airspace and alveolar tissue volume density. The median alveolar surface area (m²) increased with age, from about 205.3, 258.2 and 629.9 m² in 1 day old foals, 30 day old foals, and adults, respectively. While the median alveolar surface density decreased with age, the mean linear intercept increased with age. Although alveolar surface area was consistently greater than endothelial surface area (m²) within each lung, the ratio between alveolar and endothelial surface density remains unchanged with age. The median endothelium surface area was 106.2 m² in 1 day, 147.5 m² in 30 day and 430 m² in adult lungs. Conclusions: The data suggested that the foal lung at birth is functionally developed while post-natal lung development and re-modelling are a result of alveolar expansion paralleled with angiogenesis.

The animal experiments were approved by the University of Saskatchewan's Committee on Animal Care and Assurance.

85 - Do endothelial cells activate lung cancer cells to form blood vessels?

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Introduction: The formation of blood vessels is initiated by vasculogenesis and angiogenesis. However, novel angiogenesis-independent pathways have been observed in the blood supply of certain tumours such as vasculogenic mimicry, mosaic vessel formation, vascular co-option and intra-tumour embryonic-like vasculogenesis. As lung cancer is the leading cause of cancer worldwide, the aim of the current study was to develop an in vitro model to investigate the interactions between lung endothelial and lung carcinoma cells.

Methods: Microvascular human lung endothelial cells and squamous or adenocarcinoma lung cancer cells were incubated and examined by phase contrast microscopy and by immunocytochemistry in mono- and co-cultures. Morphology of cells labelled with the endothelial marker anti-CD31and of lung cancer tissue was monitored.

Results: Lung tumour cells and endothelial cells interacted morphologically via cellular extensions. In co-cultures

endothelial cells surrounded squamous tumour cells; also tumour cells incorporated into vascular structures. Groups of adenocarcinoma cells became strongly positive for CD31 and bridged over endothelial cell clusters. Histology supported in vitro findings.

Conclusions: When co-cultured with lung endothelial cells, lung carcinoma cells form vascular structures or incorporate into blood vessels.

The study was approved by the Human Research Ethics Committee of Sir Charles Gairdner Hospital Nedlands Western Australia, Australia.

86 - Lymphatics in the distal forelimb of the horse

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Introduction: Lymphatic vessels are categorized into initial lymphatics (INIT), collecting lymphatics (COLL), and conduit lymphatics (CON). Discontinuous endothelial lining of INIT allows interstitial fluid to enter or leave the lumen freely. COLL begin with the first valve. Endothelial lining is continuous and lymph flow is directed. COLL converge and form CON which drain lymph from a particular region towards the afferent lymph node.

Methods: Skin biopsies and connective tissue along the medial palmar and medial palmar digital arteries were studied (forelimbs of 5 horses). Paraffin sections from formalin fixed material were routinely stained for collagen and elastic fibers, IHC (smooth muscle actin, vimentin, desmin) showed myofibroblasts and smooth muscle cells.

Results: INIT start as continuation of interstitial clefts between collagen fibers, which become lined with endothelium. The flat vessels miss a structured wall, endothelial basement membranes are discontinuous. Numerous lymphatic anchoring filaments connect endothelial cells to the elastic fiber system of surrounding connective tissue. COLL possess valves, endothelial lining is continuous. The endothelium is wrapped with delicate collagen fibers but there is no clearly defined or stratified vascular wall. The number of anchoring filaments is reduced. Sporadic smooth muscle cells and/or myofibroblasts are seen next to the endothelium. However, these cells are not organized into bundles. CON are characterized by a vascular wall that mainly consists of collagen fibers. Contractile cells are quite sparse and scattered over the wall region. The wall of CON is indistinctly separated from its surroundings; a layer of small blood vessels indicates a border region.

Conclusions: Isolated contractile cells cannot significantly contribute to the maintenance of lymph flow. We propose that any deformation of surrounding connective tissue, in particular during movement of joints, causes alternating pressure and relief of pressure on lymphatics. The performance of lymphatic valves transforms exerted pressure into directed lymph flow.

87 - Retrograde intravenous regional anaesthesia in sheep's limbs *T. Köppen¹, A. Fiedler² and J. Maierl¹**

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Introduction: The animal welfare being an issue with increasing significance in farm animals it is important for the practitioner to know about methods allowing for a painless procedure during surgical treatment. In ruminants local anaesthesia in combination with sedation is the method of choice in order to guarantee painlessness as surgical procedures under general anaesthesia are problematic in these species. The retrograde intravenous regional anaesthesia (RIRA) is the preferred method in the limbs. While plenty of information is available on RIRA in cattle, hardly any information can be found concerning the sheep. It was the objective of this study to give an exact instruction on the RIRA in sheep.

Methods: An animal experiment on RIRA was performed on front and hind limbs of 15 (10 experimental animals tested twice and 5 control animals) sheep of the race "Weißes Bergschaf". Anaesthesia has been performed analogous to the approach described in cattle.

Results: After congestion of the digital venous system by applying a tourniquet the V. digitalis palmaris communis II or the V. digitalis propria IV abaxialis were used in the front limb, while the V. digitalis dorsalis communis III was preferably used in the hind limb. An average of 4 ml local anaesthetic (procaine hydrochloride 2%) was injected having released the blood from the congested veins. The onset of analgesia occurred about 3–4 min after injection. After removal of the tourniquet sensitivity returned within an average period of 4 min. No problems in terms of inflammations or thrombosis were observed.

Conclusions: The RIRA is a little more difficult in the sheep compared to cattle. With some practice the RIRA is a reliable and an easy to apply method to produce analgesia of the digits.

This experiment has been evaluated and approved by the Ethical Committee of the Government of Upper Bavaria.

88 - Effect of dietary net energy content on intestinal morphology and cell proliferation in immunocastrated pigs in comparison to entire males

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Introduction: Immunocastration (IC) represents an alternative to the surgical castration. Studies dealing with the effect of IC focus mostly on growth performance, boar taint elimination and physiological and morphological changes of reproductive organs. Recently published metaanalysis (Batorek *et al.*, 2012: Animal 6, 1330–1338) showed that IC improves fattening results. However after the effective immunisation pigs considerably raise feed intake, which diminishes fattening performance of IC pigs compared to entire males (EM). In this case measures such as restricted feed or energy intake could be applied; the later can be achieved with energetic dilution. The present study aimed to evaluate the effect of IC and diet on pig intestinal morphology.

Methods: The study was conducted on 24 pigs (6 EM and 3×6 IC) allocated within litter to four treatment groups. Experiment lasted from the age of 84 days until 172 days when pigs were slaughtered. IC received feed differing in net energy (NE) content: high NE diet (HNE): 11.6 MJ/ kg DM, middle NE diet (MNE): 11.1 MJ/kg DM and low NE diet (LNE): 10.5 MJ/kg DM) while EM received HNE diet. Differences in NE of feed were achieved by dietary fibre addition (Batorek et al., 2013: Book of Abstracts of the 64th Annual Meeting of the European Federation of Animal Science, Nantes, France, 560). Duodenum, jejunum, ileum, caecum, colon ascendens and colon descendens were sampled and stained with HE and PCNA antibodies. Intestinal villi and mucosa depth were measured and cell proliferation estimated by counting PCNA positive cells.

Results: Neither IC nor diet effects were observed on duodenum and caecum. In comparison to HNE, pigs on LNE diet exhibited accompanied by increased villous height in jejunum (32%) and ileum (5%) and increased crypt depth in ileum (10%), colon ascendens (24%) and colon descendens (21%). Increased cell proliferation was observed at the same sites.

Conclusions: Intestinal morphology was altered by the diet indicating that higher dietary fibre stimulates cell proliferation, and increases villi size and crypt depth.

Experiment was performed in INRA Saint-Gilles facilities, France in accordance with French laws on animal experimentation (agreement of E. Labussière: no 35–110).

89 - Clinical Morphology of the transverse ligament of the atlas in the american mink (*Neovison vison*)

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Introduction: The available literature provides no entries with descriptions of morphology and histology of the transverse ligament of the atlas in American mink. These issues were more fully studied in research concerning other representatives of Carnivores including domestic dog and cat. The initial own observations are a completing material in comparative anatomy.

Methods: The study was performed on 10 corpses of adult American minks. According to the law in force in Poland, tests on tissues obtained *post-mortem* do not require an approval of the Ethics Committee. The atlantooccipital and atlantoaxial joints were thoroughly dissected, with particular attention paid to the transverse ligament of the atlas. The studied ligament was shown by excising the dorsal arch of the atlas and removing the spinal cord and the covering membrane. The dissected ligaments from all specimens were taken for histopathological analysis. Following standard paraffin embedding, serial sections, 2 μ m thick, were stained with standard hematoxylin and eosin, with Van Gieson to visualise colagen fibers, with orcein for elastin fibers.

Results: The transverse atlantal ligament in American mink stretches between the walls of the vertebral foramen on the internal surface of the atlas. The ligament crosses the vertebral foramen and directly covers the dens of the axis. In the transverse ligament of the atlas thick bundles of collagen fibres coursing parallel to each other were observed along its whole length. At the attachment ends

numerous chondrocytes lay in isogenic groups or individually, between the collagen bundles.

Conclusions: The transverse ligament of atlas is one of many elements composing the craniocervical junction (CCJ). Disorders in stability of this junction may be the cause of the intravitally observed neurological symptoms.

90 - Macroscopic findings in a multiple congenital anomalies from a newborn Simmental calf

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Introduction: Multiple congenital anomalies with mostly unknown causes, structural or functional abnormalities seen in one component often leading to malformations in other systems, are observed in most cases together (Islam *et al.*, 2011: Korean J. Vet. Res. 51, 63–67). They result from multiple complex causes including genetic factors and environmental teratogenic agents. In this case, a set of congenital anomalies were described in a newborn (1 day old) female Simmental calf presented with complaints of atresia ani and open lesion on the sacral area. The mother with no previous similar history was impregnated by natural breeding, had its 10th pregnancy, and received no drug during pregnancy. A palpation per rectum for early pregnancy diagnosis was reportedly performed on the 35th gestation day.

Methods: The animal died during the diagnostic process in the Animal Research and Application Center, Faculty of Veterinary Medicine at Mustafa Kemal University, Turkey. Radiography and necropsy were applied to determine outcomes of the anomalies in the organs of affected systems.

Results: The major macroscopic anomalies revealed atresia ani, spina bifida, hyperextension on the extremities, renal fusion (horseshoe kidney), perosomus elumbis (sacral vertebral agenesis), internal hydrocephalus, and rectovaginal fistula indicating a cloacal membrane defect.

Conclusions: Such multiple congenital defects are thought to be of interesting to be reported. Yet, palpation per rectum reported in this case for early pregnancy diagnosis needs to be highlighted since possible malpractice may be among the causes of congenital anomalies even though literature (Romano and Fahning, 2013: J. Am. Vet. Med. Assoc. 243, 1462–1467; Pereira *et al.*, 2013: J. Dairy Sci. 96, 7630–7639) indicates that rectal palpation for pregnancy diagnosis has not increased pregnancy loss in dairy cattle.

91 - Histological investigation of the eyes in certain marine fish species – preliminary research

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Introduction: Detailed knowledge of the eye's anatomy and histology of each fish species is a basic prerequisite for understanding the physiology of vision as well as the pathological changes. The life conditions and a great taxonomic diversity are continuously leaving significant traces in all fish's organs and senses, especially on the eye. *Methods:* Research was carried out on six fish species *Mullus barbatus, Diplodus annularis, Diplodus vulgaris, Spicara smaris, Gobius geniporus* and *Chelidonichthys lastoviza* originating from different coastal areas of the Adriatic Sea. Five fish were sampled from each species. For the purpose of micro – morphological study, one eye from each fish was fixed in 10% buffered formaldehyde solution and stained with HE, Mallory and PAS.

Results: Although the fish eye has the basic elements similar to terrestrial vertebrates, micro – morphological differences were found in each one of the components. Equally, the eye structures differed significantly between the investigated species, especially the retina of *Diplodus annularis*.

Conclusions: The wide habitat range of fish species, differences in their living conditions as well as numerous adaptations to the life conditions, make the generalization of these aspects difficult in fish species.

The fish were handled in accordance with the Croatian Animal Protection Act (2006), and the study protocol was approved by the Ethics Committee of the Faculty of Veterinary Medicine of Zagreb.

92 - Can the use of iPads enhance learning in the dissection laboratory *J. Laakkonen**

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Introduction: Dissection is an important part of veterinary anatomy teaching curriculum, and it is difficult to entirely replace it with morphological or virtual models. Mobile devices, such as smart phones, ipads, laptops and

their applications may, however, be implemented as part of dissection to enhance the learning process. The aim of this study was to gain information on the usefulness of iPads as learning aids during the dissection sessions.

Methods: First – year veterinary students' (N = 69) experience the use of iPads as learning aids during dissections were studied during a 2-week course on the circulatory and nervous systems of pet and production animals. One iPad mini containing e-versions of one anatomical textbook and one anatomical atlas were available for each working group consisting of five or six students. Paper versions of the anatomy books and atlases were also available for students to use during dissections. Two or three anatomy teachers were present at all times during the course to supervise, and help the students if needed. On the last day of the course, students' experiences on the use of iPads were collected by a questionnaire and interviews of ten randomly selected students.

Results: Students used iPads primarily for taking notes and accessing the e-books. Students also downloaded lectures and figures from electronic platforms of previous anatomy courses to complement and customize their learning material. Students felt that the e-books would have been more useful if they had included virtual models and exercises.

Conclusions: iPads not only provide an alternative to heavy textbooks, but they also present possibilities for new learning approaches to cadaver dissections. The availability of e-books increased the use of books to solve dissection problems without help from teachers. Some students did not gain any significant learning benefits from the use of iPads.

93 - Expression of the Z-disk protein myozenin-2 in angiogenic endothelial cells *in vitro*

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Introduction: Angiogenesis research is frequently performed in *in vitro* models based on microvascular endothelial cells. These cells can be isolated using specific markers which are expressed by all endothelial cells independent of their angiogenic potential. Until now no specific and reliable marker for the identification of angiogenic endothelial cells in particular has been established and consequently false negative results may occur

in angiogenesis tests. Therefore, the aim of this study was to investigate the presence of endothelial proteins only and exclusively expressed by angiogenic endothelial cells.

Methods: Human microvascular primary endothelial cultures (purchased from Lonza Biosciences, Verviers, Belgium) from different individuals and organs were investigated over a time period of 30 days. By staging the angiogenic cascade both angiogenic and non-angiogenic endothelial cultures were identified. The protein expression profiles of these endothelial cell cultures were investigated and compared by two-dimensional gel electrophoresis. Protein spots exclusively appearing in the angiogenic or non-angiogenic cultures were picked and sequenced by mass spectrometry.

Results: Seven proteins were found to be exclusively expressed in the angiogenic cultures. Six of these proteins are characteristically upregulated in all activated cells including endothelial cells. One prominent candidate protein identified was Myozenin-2 (MYOZ2). Until now MYOZ2 has been described as a Z-disk protein exclusive to striated muscles and specific to cardiac and slow-skeletal muscle fibers.

Conclusions: This is the first study demonstrating that MYOZ2 is expressed by endothelial cells. As MYOZ2 was detected exclusively in the angiogenic endothelial cultures, it could emerge as a marker for angiogenic potential. MYOZ2 expression and its cellular localization in angiogenic endothelial cells are currently investigated by immunocytochemistry and results will be reported.

94 - Anatomic variations in the lumbosacral disc and arthropathies in lumbosacral and sacroiliac joints of barrel racing quarter horses, evaluated by transrectal ultrasonography

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Introduction: With the escalating popularity of barrel racing shows there has been an increasing demand for athletic performance evaluation. This modality imposes a strong stress on pelvic joints and on segments of the vertebral column responsible for transmission of propulsive forces. The goal of this survey was to observe the incidence of diseases associated with the equine lumbosacral and sacroiliac segments resulting from this type of exercise.

Methods: The current study was performed on 40 Quarter Horses, with ages ranging from 3 to 22 years, coming from stables from different locations in São Paulo State, Brazil. All subjects had a history of poor performance, non-related to lameness. Animals were restrained in stocks and they were evaluated by a transrectal ultrasound exam, using a transrectal linear probe. The ventral aspect of the lumbosacral disc and the left and right lumbosacral intertranverse joints and sacroiliac joints, were examined.

Results: From the 40 lumbosacral discs evaluated, six presented anatomic variations (15%) and 34 had normal presentation (85%). From the 80 lumbosacral intertransverse joints examined 32 displayed signs of arthropathy (40%), 17 being located on the left side (21.25%) and 15 on the right side (18.75%). As for the sacroiliac joints, 19 presented signs of arthropathies (23.75%), nine of them being on the left side (11.25%) and 10 on the right side (12.5%).

Conclusions: This study demonstrated a significant occurrence of lumbosacral intertransverse and sacroiliac joint arthropathies in Quarter Horses engaged in barrel racing. Unfortunately, there are no similar studies reporting on occurrence of these arthropathies, which would allow comparison of data.

95 - Oxygen glucose deprivation: it's impact on cell viability of bovine claw keratinocytes *in vitro*

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Introduction: The prevention and treatment of laminitis in cattle is still an unsolved problem. Insufficient blood supply resulting in ischemic alteration of the claw epidermis seems to be involved in the pathomechanism of laminitis. Thus, recent research focuses on the investigation of the cellular and molecular biology of the claw building tissues. For this purpose, an *in vitro* ischemia model such as the preferred oxygen-glucose deprivation (OGD) represents a promising approach.

Methods: To establish the *in vitro* ischemia model, the keratinocytes were exposed to oxygen-glucose deprivation over 24, 48 and 72 h followed by reperfusion for 24 h. Subsequently, measurement of cell viability was performed by LDH (lactatedehydrogenase) and MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) cell viability assays. Furthermore, the effect of hypoxia and glucose deprivation on keratinocyte viability was assessed separately. To demonstrate an altered protein

expression after OGD, marker of terminal differentiation were detected by western blot.

Results: The highest LDH release caused by cellular lysis was detected after 24 h exposure to OGD followed by a decrease of LDH activity. Cell viability measured by MTT assay showed a high decrease after 24 h which turned to an increase of cell viability after 72 h. Exposure of keratinocytes to hypoxia and glucose deprivation showed a greater effect of oxygen deficiency on cell viability.

Conclusions: Results show that OGD exposure induces loss of cell viability followed by a time-dependent regeneration of cells combined with a slight increase of cell viability. The obtained results reflect the cellular mechanisms proceeding in keratinocytes during laminitis and demonstrate the recovery potential of stressed cells.

96 - Changes of histomorphometric parameters of the ostrich stomach in postnatal ontogenesis

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Introduction: Depths of the superficial proventricular glands and thickness of the ventriculus submucosa characterize development dynamics of histological stomach structure in postnatal ontogenesis. The stomach structure of the ostrich is specific and development of the stomach part is unequal. Therefore the goal was to find out the development of superficial proventricular glands depth and submucosa thickness of the ventriculus of ostriches in postnatal ontogenesis.

Methods: In the research 18 ostriches at 120 (n = 4), 180 (n = 4), 240 (n = 4), 365 (n = 6) days of age were used. Tissue samples from each ostrich (n = 4) were collected in the slaughterhouse from the superficial and deep proventriculus glands of the proventriculus wall and from the ventriculus side and pyloric gland region wall. The superficial proventricular glands depth (μm) was determined in 36 samples with 30 measurements each. The submucosa layer thickness (μm) of the ventriculus was determined in 36 samples with 30 measurements each. The data were processed by SPSS 20.0.

Results: Depth of the superficial proventricular glands increased with the ostrich age (P < 0.05). In all age groups depth of the superficial proventricular glands of the superficial proventricular gland region was greater (395.9 ± 16.51–592.2 ± 29.45) than in the deep proventricular glandular region (347.1 ± 22.29–553.6 ± 66.65). In the deep proventricular glandular region the depth of the superficial proventricular glands increased signifi-

cantly (P < 0.05) from 240 until 365 days of age. The thickness of the ventriculus submucosa increased (370.2 ± 53.99–488.7 ± 72.49) in all age groups with rapidly increasing from 180 until 240 days of age. In all age groups of the ventriculus pyloric gland region it was from 223.0 ± 52.80 to 390.5 ± 22.41.

Conclusions: Depth of the superficial proventricular glands increase faster from 240 until 365 days of age. The submucosa thickness in the ventriculus pyloric gland region has decreased and occasionally disappeared, which can be explained by the transition of the small intestine.

97 - Anatomical studies regarding the trajectory and distribution of the femoral artery in chinchillas (*Chinchila lanigera*)

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Introduction: The morphological investigations on the circulatory system in chinchillas require a special attention. The purpose of this study was to detail the anatomical description of the trajectory and distribution of the femoral artery as well of the supplied territories by its branches.

Methods: Following the injection of the revealing substance, the stratigraphical and regional dissection was performed in seven individuals. The femoral artery and its collateral branches were identified and described.

Results: In chinchillas, the femoral artery is a direct continuation of the external iliac artery at the level of the femoral ring. The branches of the femoral artery are represented by two proximally situated arteries, as follows: the lateral femoral circumphlex artery that is distributed in the region of the hip and proximal thigh. The other artery is superficial branch wich supplies the skin in the inguinal region and the medialwith cutaneous inguinal and medial thigh distribution in proximal direction tigh. Another branch is represented by the saphenous artery that sends off cutaneous and deep muscular branches as well as a fine descending branch for the area of the knee joint. From the adductor's ring, the femoral artery continues as the popliteal artery, giving off branches for the muscles of the crus area and a short branch for the knee joint. At the level of the popliteal fossa, the popliteal artery terminates with the cranial and caudal tibial arteries, that send fine branches for the distal third of the crus and the area of the paw.

Conclusions: The femoral artery in chinchillas presents some particular aspects. The differences and similarities (the noticeable absence of the deep femoral artery-constantly present in other rodents) makes the anatomical investigation a necessary tool in order to combine the clinical aspects with the functional ones.

All the procedures of the present study were made in accordance with the regulations of the Committee for Bioethics of the Faculty of Veterinary Medicine Cluj-Napoca, Romania.

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98 - The skull of the common viper B. Matosz^{1,*}, I. Dumitru¹, C. C. Dezdrobitu¹, C. C. Pop¹, A. M. Iurcuţ¹, G. M. Borza², C. B. Crivii³ and A. Damian¹

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Introduction: The Common Viper (*Vipera berus*) is the most prevalent species of viper in our country. It is found both in mountainous areas, and in the hills. The Viper is a venomous snake; however, it attacks only if provoked, as a last resort of its defense. Usually, it prefers to run and hide when in the vicinity of a human, which explains why they are so rarely spotted. Taking into consideration the fact that there are limited data regarding the normal morphology of the cranium of the Common Viper, our study is intended to initiate a detailed assessment of its characteristics.

Methods: The research has been conducted in the laboratory of Comparative Anatomy, Faculty of Veterinary Medicine of Cluj-Napoca, by examining five Common Viper skulls. The bony samples have been obtained by maceration with warm water at 40°C, for 3 days. The skulls were disassembled bone by bone in order to facilitate the study.

Results: The results indicate the absence of the temporal arch and of the interorbital septum, as well as the lack of the middle ear cavity. We have also noted the absence of the intermandibular symphysis. Moreover, the joint between the quadrate bone, the inferior maxillary bone and the palatomaxillary arch presents excellent mobility. Common Vipers present a strong ossification of the

majority of the osseous pieces that compose the cranium, a very mobile mandible that is longer than the skull and an incomplete ossification of the nasal bones.

Conclusions: Despite the lack of the middle ear cavity, the spatial orientation of the Common Viper is remarkable. The mandible has a very high mobility not only due to the insertion of the quadrate bone in the temporo-mandibular articulation, but also because of the manner of the articular gearing system.

99 - Expression of parvalbumin and calbindin D28k in the claustrum and endopiriform nucleus of chinchilla

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Introduction: Claustrum (Cl) and endopiriform nucleus (EN) are telencephalic structures present in almost all mammals however their exact function(s) remain still unknown. Parvalbumin and calbindin-D28k are calciumbinding proteins (CaBP) widely present in central nervous system (CNS) and regulating many important cellular processes like intracellular concentration of calcium, release of neurotransmitters and synaptic conductivity. The expression patterns of CaBP have been studied in CNS of most of laboratory rodents. Recently, chinchilla has been added to a list of species used in biomedical research. The aim of the present study was to immuno-histochemically determine the distribution patterns of parvalbumin and calbindin-D28k in chinchilla's Cl and EN.

Methods: Formalin-fixed, paraffin-embedded chinchilla's brains were cut into sections. The sections were immunohistochemically stained with antibodies raised against parvalbumin or calbindin-D28k according to peroxidaseantiperoxidase (PAP) method. Diaminobenzidine (DAB) was used as a chromogene. Stained slides were subjected to histomorphometric analysis.

Results: The distinct expression patterns of parvalabumin and calbindin-D28k in chinchilla's Cl and EN were found. Parvalbumin-immunoreactive (ir) neurons were numerous in Cl, whereas parvalbumin-ir cell bodies were occasionally detected in EN. Reversely, calbindin-ir nervous cells were commonly found in EN, while in Cl they were relatively scarce. Morphometric analysis reveal that, similarly to other species, in Cl and EN of chinchilla parvalbumin- and calbindin-expressing cells can be categorized into several distinct morphological subtypes, including small, medium and large multipolar cells, bipolar cells and cells triangular in shape. *Conclusions:* The described distribution patterns and cellular localization of studied proteins in Cl and EN of chinchilla closely resemble those previously described in other mammals. Further studies are necessary to elucidate whether parvalbumin-ir and calbindin-ir neurons coexpress other neuropeptides.

All the procedures involving the use of animals are in accordance with the ethical principles approved by IInd Local Ethical Committee at the University of Life Sciences Lublin, Poland.

100 - Development and differentiation of the flight muscles of birds

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Introduction: The muscular system of birds is still not completely explored. The aim of the research was to establish the degree of development, differentiation and transformation of basic "flight muscles" (the pectoralis muscle and the supracoracoideus muscle) in different taxonomic groups.

Methods: The research was carried out on the cadavers of different taxonomic groups of birds which died by natural cause. A standard anatomical dissection of muscles was carried out on cadavers of 50 birds of different species, which were fixed in 10% formalin solution.

Results: The most developed muscle of birds (except *Palaeognathae*) is the pectoralis muscle. The supracoracoideus muscle is significantly less developed. The function of the pectoralis muscle is to lower the wing and that of supracoracoideus muscle is lifting the wing; the mass of the pectoralis muscle is 15–40 times more than the supracoracoideus muscle. Thus, lowering the wing requires more effort than lifting it during flight. We found that in some birds (*Gaviiformes, Podicipediformes*) the pectoralis muscle is clearly differentiated into two portions – superficial and deep, which have different orientation of muscle fibers (dorsoventral and caudoventral, respectively).

Conclusions: (1) A significant development of the pectoralis muscle in birds is caused by providing an antigravitational action during the flight or fast underwater swimming and rowing functions of wings (*Sphenisciformes*). (2) The presence of two pectoral muscles – superficial and deep – in certain birds (*Gaviiformes*, *Podicipediformes*) testifies that they provide not only an antigravitational action during the flight, but also multiple functions during the underwater swimming.

101 - Morphology of the pectoral girdle of some paddlefish and sturgeons O. P. Melnyk^{1,}*, K. Grom¹ and S. Tomasz²

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Introduction: The anatomy of different species of fish is still not completely studied. The purpose of the research was to carry out comparative morphological analysis of the pectoral girdles of sturgeons and paddlefish.

Methods: The research material was the pectoral girdle of some representatives of the order Acipenseriformes, namely Russian sturgeon (*Acipenser gueldenstaedtii*) and American paddlefish (*Polyodon spatula*). A standard anatomical dissection of muscles was carried out on cadavers of 10 fish of each species. The muscles were weighed and described (in particular their attachments, direction of the fibers and connective tissue structures).

Results: The skeleton of the pectoral girdle of investigated Acipenseriformes is divided into primary (cartilaginous) and secondary (osseous) parts. The osseous part is composed of *cleithrum, supracleithrum, postcleithrum* and *clavicula*. Acipenseriformes are the only representatives of bony fish which have a clavicle. However, it is not analog to the clavicle of higher vertebrates. The muscles of the pectoral fins of investigated Acipenseriformes have a very low level of differentiation. They are divided into only dorsal (*adductor*) and ventral (*abductor*) muscle bulks. Dorsal muscles are more developed in Russian sturgeon and ventral muscles in American paddlefish. And this is because pectoral fins of Russian sturgeon are less motile than pectoral fins of American paddlefish. So, more power is required for moving down (to adduct) the pectoral fins.

Conclusions: The development of pectoral fins muscles of examined species is not the same. In our opinion, it is caused by the peculiarities of the body's stabilization during swimming.

102 - Isolation of cells with melanocytic properties from the equine hair follicle *J. K. Michler*^{1,2,*}, *H. Plaue*², *V. Savkovic*² and *C. K. W. Mülling*¹

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Introduction: As a non-invasive source for regenerative therapies compared to other methods for harvesting stem

cells, hair follicles possess a proven putative developmental potential in humans. In the horse, they offer almost unexplored possibilities. The objectives of this study were to translate the isolation and cultivation of human hair follicle stem cells by establishing a corresponding equine hair follicle model. Within this ongoing attempt, the study focuses on the isolation of melanocytic progenitor cells.

Methods: For cell isolation, skin samples were obtained from the frontal region of adult horses (protocol numbers T66/13 and T96/13). The primary isolation of hair follicles was performed under a preparation microscope followed by a two-phase cultivation. The cultivation included the outgrowth of cells on transwells with an air liquid interface under hypoxic conditions (5%0₂) and an adherent culture. For this purpose, a DLM melanocyte medium was used. The adherent culture was carried out for a better cell monitoring and harvesting cells for the characterization by immunocytochemistry and RT-PCR.

Results: After 4–6 weeks, the outgrown cells were almost confluent on the transwells. At this point of time, the transfer to the adherent culture was carried out. A melanocytic growth pattern could be observed after subcultivation. By immunofluorescent characterization of cells, the most important lineage marker, tyrosinase, proved to be positive as well.

Conclusions: Techniques described for the cultivation of human hair follicle stem cells can be applied to equine hair follicles as the source of cells. Migratory and proliferating potential proven in the resident cells of human follicles exists in horse hair follicles as well. With the presented approach, it is possible to harvest cells with melanocytic potential from equine hair follicles. The findings from this study characterize the equine hair follicle as an interesting cell source for further research on autologous regenerative therapies.

103 - Structural properties of the post-natal equine deep digital flexor tendon

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Introduction: Tendinopathy is one of the most frequent musculoskeletal disorders in horses with the superficial and deep digital flexor tendon at high risk for suffering injury. In order to develop new strategies for therapy

leading to tendon regeneration, knowledge about the normal tendon tissue structure is essential for judging the outcome of any intervention. This morphological study stands in the broader context of investigating fetal, neonatal and adult tendons in order to analyze their regenerative potential.

Methods: The DDFT of nine horses from age 2 days to 23 years were used for this study. Breeds were Arabs, Warmblood, Island and Welsh ponies and Haflinger. Samples of the DDFT were fixed in 2% glutaraldehyde and embedded in EPON resin. Ultrathin sections were cut and the composition of collagen fibrils were evaluated by measuring the fibril diameter and the number of fibers per nm².

Results: The ultrastructural analysis showed circular fibril profiles. Fibril diameters ranged from 10.89 to 339.57 nm over all ages investigated. There was an increase in fibril diameter mean from birth to 5 years of age (119–174 nm) with the exception of a 4-year old Arab horse (90 nm) and a decrease in older horses (23 y–65 nm). We found a tendency to smaller as well as larger fibrils with increasing age (2d: min 35.64 nm, max 269.28 nm; 23 y: min 10.89 nm, max 279.18 nm). The number of fibrils per area varied from 19 to 223, with a mean of 45 in the neonatal and a mean of 119 in the oldest animal.

Conclusions: This study provides basic data of the structural changes that occur during tendon development. Differences seen were not only age related but also influenced by the horse breed. This has to be taken into account when evaluating morphological changes of tendons in horses.

104 - Comparison between radiographic and ultrasonographic measurements of renal size in healthy cats

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Introduction: The urinary organs are some of the most frequently disease organs in cats including kidney disease. In veterinary medicine, the most commonly primarily applied and available imaging technics are the radiography and the ultrasonography. Many diseases can, in fact, be diagnosed on the basis of radiographs and ultrasonography. In addition of the renal shape, position and

outline, the size is an important parameter in the assessment of renal disease. The aims of this study were to determine if the two imaging techniques (radiography and ultrasonography) are equally reliable concerning the measurements of renal size and to study the effects of bodyweight, age, sex and neutering on these measurements.

Methods: Length and height of right and left kidney were measured on 120 healthy cats on an abdominal radiography and a renal ultrasonography. For each cat, eight measurements were performed. The owner's consent for each cat was obtained before its enrolment in the study. For the statistical analysis, considering the ultrasonography as the gold standard, a test of Bland Altman was used to compare the reliability of the two imaging techniques for the different renal measurements. Finally a general linear model was used to analyse the effect of bodyweight, age, sex and neutering of the cat on the radiographic and ultrasonographic renal measurements.

Results: For the same renal measurement, our results revealed that radiography tends to magnify the renal size. Concerning the effects of bodyweight, age, sex and neutering, the different renal measurements were correlated with bodyweight ($P < 10^{-6}$) and sex ($P < 10^{-5}$) but not with age and neutering for the two techniques.

Conclusions: The present study shows that radiography is not a very reliable technique to determine the real size of the kidney. Moreover, in the evaluation of feline kidney size, weight and sex of the animal also have to be taken into account.

The Ethical Committee "Comité d'Ethique Science et Santé Animales – Toulouse – France" evaluated this abstract.

105 - Ossification of the pelvic symphysis in ruminants

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Introduction: From the perspective of calving, ossification of the pelvic symphysis is an important issue. The reports in literature on the order of ossification of the pelvic symphysis are questionable. The aim of this paper is to present the pelvic symphysis in the European elk (*Alces alces*) and in bovine breeds.

Methods: The poster shows the difference of pelvis in the elk, Estonian Holstein Breed (EHF) and Estonian Native Breed (EN) cattle. The pelves have been cleaned and submitted to a biological maceration, then measured and analysed by X-ray.

Results: In 14-month-old bovine pelves (6) are a slightly ossified centres on the ischial arch. In 5-year-old EHF bulls (3) the ischiadic symphysis and the caudal branch of the pubes are ossified. In aged EHF (12) and EN (14) cows the pelvic symphysis between the caudal pubic branches is partly cartilaginous. In 5.5-year-old and older elk cows (15) the ischial bones can partially fuse. Ossification continues between the cranial pubic rami and between the ischial rami, but cartilaginous tissue is not yet ossified between the caudal pubic rami.

Conclusions: In female animals, ossification of the pelvic symphysis begins in the ischial symphysis, followed by the cranial branches and finally by the caudal branches of the pubes. In cows, slower ossification of the cranial and middle sections of the pelvic symphysis enables widening-the space between the ischial spines during calving. In bulls, ossification begins in the ischial symphysis, continues between the caudal branches of the pubis. Thus the process, as reported in literature, that in ruminants the direction of ossification in the pelvic symphysis, is not valid for the studied species. The ossification centres, located in the ischial symphysis, form the new structure –the interischial bone.

106 - Morphostructural role of rete ovarii in adult cows

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Introduction: Rate ovarii, frequently described as a vestigial structure, is formed of cells and tubules organized in three areas: extraovarian, intraovarian and connective region (Odend'hal S. Et al. 1986: Anat Rec 216: 40–43). Rete ovarii was described in several species, including the woman, but its presence in the postnatal ovary is a debated topic (Clement P.B. 2001: Anatomy and histology of the ovary. In: Kurman RJ, editor. Blaustein's pathology of the female genital tract. New York7 Springer-Verlag; *p.* 649–73; Khan M.S. et al. 1999: Ki-67,J Clin Pathol, 52, 517–520). Rete ovarii seems to have an important role in populating ovarian cortex with specific granulosa cells (Woolnough E. et al. 2000. Pathol. 32:77–83). *Methods:* Histological investigations were preceded by collecting fragments of ovary, from 10 clinically healthy cows, aged between 8 and 10 years, of Holstein breed. The samples were fixed in formalin 10%, and included in paraffin, obtaining sections of 5 μ m that were subsequently stained. Following staining methods were used: H.E.A., P.A.S. and immunohistochemistry Ki-67. Stained sections were examined in order to establish the histological structure, while IHC with Ki-67 was used for estimation of cell proliferation rate.

Results: In four of the cows (aged 8–9 years), rete ovarii was observed in the medulla of the ovarium. The rete epithelium is cubic, sometimes columnar and frequently layered. The cells are small, with a high nucleus/cytoplasma ratio, stained PAS positive and attached to the basement membrane, intercellular junctions being absent. In the lumen of the rete can be observed cells, cellular debris and PAS-positive material. Under the epithelium, attached to basal membrane are noticed numerous reticulin fibers and an amorphous layer of PAS-positive glycosaminoglycans. In two cows (10 years old), rete ovarii presented atrophy, was reduced in dimensions and surrounded by conjunctive tissue formed of collagen fibers and fibroblasts.

Conclusions: Ki-67 marker of cell proliferation was negative in rete ovarii region, but has positively marked the nuclei of follicular cells from ovarian cortex. The absence of Ki-67 bookmark in rete ovarii sugests the low rate multiplication of the cells and probably the absence of follicular cells population in ovarian cortex.

107 - Comparative anatomy of the podocyte: a scanning electron microscopic studies on the kidneys of rat (*Rattus norvegicus*) and blind mole rat (*Spalax leucodon*) *i. H. Nur^{1,*}*, *A.* Yoldas², *A.* Alan¹ and *A.* Akcay³

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Introduction: Blind mole rats perform the heavy work of digging their subterranean burrows in Turkey under highly hypoxic conditions. Contrary most rodents, they can carry out high levels of metabolic rate under these conditions, although their metabolic rate at low work rates is depressed.In this study, renal podocyte were investigated and compared both types.

Methods: The renal podocytes of blind mole rat and rat kidneys were examined by using scanning electron microscopic.

Results: There were not statistically significant differences in the length, the width and the thickness of both species' kidneys (P > 0.05). Furthermore, between both species when comparing the diameter of the glomerulus were not statistically significant differences. When compared Bowman's capsule diameters and Bowman slits of blind mole rat and the rat was measured to be larger. The mean length of Pedicel spacing (Filtration slits) of blind mole rat and rat were found to be $0.049 \pm 0.003 \ \mu\text{m}$ and $0.073 \pm 0.004 \ \mu\text{m}$ respectively. The podocyte pedicels were uniform needle-like shapes and, its length was ranging from 0.88 to $1.02 \ \mu\text{m}$, interdigitated with those of adjoining cells along the entire length of the cell margins in both species examined.

Conclusions: The features of design of the renal podocyte were seen to be alike in both species. However, in Blind mole rats anastomosis or bridge formation between two adjacent processes was often observed in the primary, secondary and tertiary process levels pedicel processes in some places are connected by a small bridge with each other. In blind mole rat connection between pedicel spacing was more often seen than in the rat.

The Ethics Committee of the Adana Veterinary Institute approved all experiments.

108 - The morphological features and characteristic activity stages of the cellular and acellular formations from goat milk *L.* Ognean^{1,*}, *V.* Chiurciu², C. Chiurciu², A. Arion¹,

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Introduction: Goat milk investigations imply the use of standard cytology tests for cow milk, although its cytological configuration is dominated by atypical cells, cellular debris and enucleated cells.

Methods: The main objective of this study was to investigate the typical/atypical components of the colostrum and milk cellular populations from a group of Carpathian goats (n = 30). The cytological preparations were performed, using the Squash technique (using milk sediment, Dia-Quick-Panoptic staining) and fresh specimen (using Toluidine staining), which were subjected to quantitative microscopic examinations (milk cytogram) and qualitative tests (cyto-morphological analyses and activity stages related tests).

Results: For the quantitative examinations, the stains from colostrum and milk revealed an increased frequency of macrophages (57.65% and 30.63%) and epithelial cells

(8.12% and 7.12%) compared to the known values for cow. An important proportion was represented by the PMN leukocytes (23.78% and 47.9% respectively), represented almost exclusively by neutrophils (92%); a decreasing proportion of lymphocytes being observed (10.45%) and 22.24%). The high frequency (+++) of cellular debris and atypical structures was another characteristic of the goat milk cytogram. The quality examinations outlined a high level of heterogeneity for macrophages, the active/ hyperactive cells being the dominant cell types in milk (34.68/24.10%) and especially colostrum (38.96/33.28%), indicating an increase of the mammary glands' selfdefense, at the beginning of lactation. The atypical cells were represented by nucleated structures in an advanced state of necrobiosis/apoptosis. The evaluation of the cell viability, based on the ratio of necrosis/apoptosis, indicated a fast rhythm of ageing for neutrophils. Occasionally, metaplastic macrophages transformed in colostral bodies or lipophages, could be encountered. In the fresh specimens, the small fat spherules were predominant, thus ensuring a high digestibility of milk.

Conclusions: This study brings important contribution in clarifying the cytological standards and morpho-functional criteria for evaluating the health and conformity of goat milk.

109 - A novel pressure-constant *ex vivo* model of the equine larynx

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Introduction: Functional electric stimulation (FES) is a frequently used method in human medicine. Over the past 4 years, it has been established in veterinary research for treating recurrent laryngeal neuropathy (RLN) in horses. The measurement of the three dimensional (3D) distribution of the electric field can optimize the outcome of FES. Therefore, Martini et al. used a constant flow *ex vivo* model of the equine larynx (Martini et al., 2012: Biomed Tech. *57*, *870–873*). Focus of this study is to establish a novel pressure-constant *ex vivo* model of the equine larynx. This model is the essential prerequisite for reliable measurement of the 3D electrical field distribution.

Methods: Horses were euthanized in consent with the national council's guidelines of animal care (protocol numbers: T66/13, T96/13). Following euthanasia, the larynx was isolated within 10–15 min and stored in an acrylic glass tub filled with prewarmed Tyrode solution (37°C). Subsequently, the larynx was connected to a

closed pressure-constant perfusion system via both cranial thyroid arteries and the vitality of the organ was confirmed. In order to determine the degree of tissue edema, histological tissue samples from one of the laryngeal muscles were taken.

Results: The pressure-constant perfused *ex vivo* larynx showed functional myogenic autoregulation as a sign for organ vitality. Macroscopically, the larynx showed no signs of tissue swelling. The histological examination of the muscle samples obtained after the perfusion showed mild signs of interstitial swelling in contrast to the samples taken before the perfusion.

Conclusions: By using a pressure-constant setup, the described tissue swelling effects could be reduced. Furthermore, this *ex vivo* model of the equine larynx could be used as a reliable platform for additional studies on the optimization of FES for the treatment of RLN.

110 - The knee joint capsule in dogs with patellar luxation: histology and collagen distribution

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Introduction: Pathological distribution of collagens is known to cause various phenotypic abnormalities of connective tissue such as laxity of joints that may lead to patellar luxation (Halper, J., 2014: Adv Exp Med Biol. 802, 231–40). Objective of this study was to characterize histologically the layers of the joint capsule and its collagen composition in knee joints of dogs with or without congenital patellar luxation.

Methods: Histological staining methods were used and characterization of six relevant collagen types (I, III, IV, V, VI, X) by immunohistochemistry was performed in samples of the knee joint capsule of dogs with patellar luxation. Dogs with cruciate ligament rupture and femur fracture were examined as controls. Morphometric analysis was done using Nikon NIS[®] elements software.

Results: Results showed that the stratum fibrosum of the joint capsule in dogs with patellar luxation is thinner than those of dogs with cruciate ligament rupture and femur fracture. Furthermore a characteristic localization and distribution of the different collagens in the knee joint capsules was detected. The quantitative ratio of collagen types varies between the capsular strata and patient groups.

Conclusions: Changes in histo-morphological characteristics and collagen distribution of the canine knee joint may be responsible for laxity of joint and subsequent patellar luxation.

111 - Immunohistochemical classification of skeletal muscle fibers in the lambs

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Introduction: The classification of skeletal muscle fibers in mammals is based on the myosin heavy chain (MHC) isoform expression as well as the activities of myofibril mATPase and some other metabolic enzymes. In most animals the skeletal muscle types are classified. In sheep, the skeletal muscle fibers types are still not fully clarified mainly due to the lack of correspondence between the myofiber classification systems that are usually used for myofiber identification. In this work we present immuno-histochemical classification based on the MHC-antigen composition as well the myofibril mATPase activity on ovine skeletal muscle fibers.

Methods: The serial muscle tissue cryosections from longissimus thoracis and psoas major muscles were investigated. The 70 muscle samples were taken from 35 lambs (mean age of 3 months) from breed "pramenka" with 10.93 kg of average weight. The identification of skeletal muscle fiber types was performed with mATPase enzymehistochemical methods as well the immunohistochemical reactions of muscle fibers with a panel of eight monoclonal antibodies specific for the different slow and fast MHC isoforms.

Results: In the ovine skeletal muscle fibers, three different MHC isoforms are expressed: one slow myosin heavy chain (MHC-I) and two fast myosin heavy chains (MHC-Ila; MHC-Ilx). The ovine muscle fibers are classified as: pure muscle fibers (type I, type IIA and type IIX) with one single MHC isoform expression and hybrid muscle fibers (type I/IIA and type IIA/X) with simultaneous expression of two different MHC isoforms. The proportional distribution of skeletal muscle types, in both investigated muscles, increased in the following order: IIX > IIA > I > IIA/X > I/IIA.

Conclusions: According to the results, five types of skeletal muscle fibers could be identified in both investigated ovine skeletal muscles. This classification is performed with high sensitive immuno-enzyme-histochemical

reactions adequate for ovine MHC antigen structure and contractile properties (mATPase) of individual skeletal muscle fibers.

112 - Veterinary anatomical series for iPad': an evolutionary learning concept J. Perkins, R. McGhie and P. Noble*

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Introduction: A recent study supports the role of eBook technology in modern anatomy curriculum as a useful adjunct to traditional methods (Stirling A *et al.*, 2014: Anat Sci Educ 7, 19–27). In that context, the project focus is the construction of an anatomical eBook series that supplements other delivery methods such as lectures and dissections. The objective is to accommodate diverse learning styles enabling students to have a better comprehension of anatomy for clinical practice.

Methods: Using dissections of bovine, equine and canine specimens, photos and movies of myology and osteology were designed with iMovie and PhotoshopCS6. An Apple iPad eBook was then developed using custom programming.

Results: Users are able to navigate content through an interactive 'table of contents'. Search capabilities are accessed through an alphabetical 'index'. Each anatomical structure includes a detailed page with the precise location within the body, as well as subsequent views to aid the user to better understand the 3d visualization. Videos of dissections are also included. Tap gestures will expose a toolbar which is used to navigate to a flash card deck. Finally the program is able to support user additions, including custom notes. This is accomplished with a finger swipe, across included text. This results in a pop-up menu that gives users the option to add highlights, notes or copy and paste information within their addition.

Conclusions: This program coupled with the iPad's dynamic and interactive feature sets allows students to utilize the provided content quickly and efficiently. The evolutionary platform features allow users to add updates and customizations to their edition as desired. Due to the nature of the ever changing Veterinary Medical field, this design, along with the ability to access downloadable updates, offers an advantageous approach to anatomical learning. Additional information: http://m.youtube.com/watch?v=-M_zGfRA9w8.

113 - Practical aspects of the corrosion casting technique

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Introduction: Correct anatomical visualization and interpretation of the vascular system is a big challenge in the research, clinical work and education. The new 3D reconstruction methods of diagnostic imaging (vascular reconstructions) give us a non-destructive method (Lafayette et al., 2009 : Tissue engineering. 15, 729–738, Mondy WL. Et al. 2013 : Microscopy and microanalysis. 19, 1416– 1427) but it has its limits. Corrosion casting is a widely used method for demonstrating the different vessels (Bugge, 1963: Acta Anat. 54, 177–192; Noestelthaller *et al.*, 2007: Anat. Histol. Embryol. 36, 33–37; Tompsett. D.H., 1956: Anatomical Techniques). The authors present the possibilities of this technique.

Material and methods: Corrosion casts from different organs and body regions of domestic mammal and bird cadavers were made using Tensol No.70, Biodur E20, Acrifix 190 and Acrifix 1900. The resins were modified in viscosity and color for achieving the desired results. Macerations were tested using: hydrochloride acid, potassium-hydroxide and modified enzymatic maceration for the conservation of the bones.

Results: By selecting the right material (i.e. Tensol No.70, Acrifix 190 and 1900 for the macrocorrosion casts, Biodur E20 for the microcorrosion casts), viscosity (low, middle and high), color and maceration procedure we were able to demonstrate the vasculature in a wide range of diameter. We produced micro- and macrocorrosion casts of different organs and body regions.

Conclusions: With the current diagnostic imaging methods (CT and MR) it's hard to reproduce the finer branches of the vessels for large organs or body regions, which could play a major role in clinical research. Corrosion casting can help us to complement the reconstruction of the vascular system by selecting the right technique, material (McMullan *et al.*, 2004: Microvascular research 67, *215–217*) and maceration method.

114 - "The back of the dog" – an interactive learning program on the anatomy *K. Pfaffendorf and J. Maierl**

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Introduction: First year veterinary students have to memorize a lot of anatomic facts. Commonly veterinary textbooks are used to learn veterinary anatomy. But many veterinary textbooks are based on a comparative concept dealing with all species of domestic mammals. Consequently, on the one hand, detailed information on individual species and illustrations are given only sparsely. On the other hand textbooks dealing with a single species only often are too comprehensive for students to learn from them. In this situation e-learning can offer valuable assistance. It was the objective of this study to provide students of veterinary medicine with complementary learning material to help them prepare for examinations. *Methods:* The program is based on HTML, Cascading Stylesheets (CSS) and JavaScript.

Results: The program is divided into five chapters: bones, joints, muscles, blood vessels and nerves. Each of the chapters is subdivided into further sections. Numerous photographic or schematic figures of the skeleton, corrosion casts of articular cavities, and muscular as well as topographic specimens help to illustrate the architecture of the canine back. The most important aspects of each chapter are summarized in tabulated exercises for reviewing the subject matter. In each chapter there is a self-evaluation giving feedback at the end of each test. An interactive index allows for direct navigation to the respective chapter.

Conclusions: Next to students of veterinary medicine this program can be of interest to graduate students and veterinarians as a reference work of anatomical knowledge. As a standardized programming language, HTML is independent of hardware and software environments. Thus the program works with most internet browsers and operating systems, as long as the programmer considers the standards defined by the World Wide Web Consortiums (W3C).

115 - The distribution and chemical coding of urinary bladder trigone projecting-neurons in prevertebral ganglia of the male pig

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¹Faculty of Veterinary Medicine, Department of Animal Anatomy, University of Warmia and Mazury in Olsztyn, Oczapowskiego Street 13, 10-719 Olsztyn, Poland ²Department of Human Histology and Embryology, Faculty of Medical Science, University of Warmia and Mazury in Olsztyn, Warszawska Street 30, 10-082 Olsztyn, Poland *Introduction:* Combined retrograde tracing and doublelabelling immunofluorescence were used to investigate the distribution and chemical coding of neurons in some prevertebral ganglia (PRVG) supplying the urinary bladder trigone (UBT) in the juvenile male pig (n = 4, 12 kg of body weight).

Methods: Retrograde fluorescent tracer Fast Blue (FB; total volume of 40 μ l) was injected into the wall of both the left and the right side of the bladder trigone during laparatomy performed under pentobarbital anesthesia. All the pigs were deeply anesthetized and transcardially perfused with 4% buffered paraformaldehyde. PRVG (testicular ganglion – TG, aorticorenal ganglion – ARG) were collected and processed for double-labelling immunofluorescence method. The cryostat sections were examined under a Zeiss LSM 710 confocal microscope equipped with adequate filter blocks.

Results: The UBT-projecting neurons (PN) were distributed in both TG and ARG. The most of the neurons were found in the right ganglia, mostly in the right TG. Immunohistochemistry disclosed that the vast majority of UBT-PN were noradrenergic (tyrosine hydroxylase- and/or dopamine beta hydroxylase-positive). Many noradrenergic neurons contained also immunoreactivity to neuropeptide Y, somatostatin or galanin. Most of the UBT-PN were supplied with varicose nerve fibres exhibiting immunoreactivity to vesicular acethylcholine transporter, Metenkephalin, calcitonin gene related peptide, nitric oxide synthase or substance P.

Conclusions: This study has revealed a relatively large population of differently coded PRVG neurons projecting to the porcine urinary bladder. As judged from their neuro-chemical organization these nerve cells constitute an important element of the complex neuro-endocrine system involved in the regulation of the porcine urogenital organ function.

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116 - Expression of calcium binding proteins in the dog claustrum

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Introduction: The latin word "claustrum", that means hidden place, indicates a long, band-like grey matter structure situated in the ventrolateral telencephalon of the
mammalian brains. Its morphology, chemoarchitecture, physiology, phylogenesis and ontogenesis are still a matter of debate. There is a general consensus that the claustrum is reciprocally connected with the cerebral cortex, this finding suggests a role in the multisensory integration for the generation of conscious percepts. Calbindin-28 kD (CB), parvalbumin (PV), and calretinin (CR) belong to the EF-hand family of calcium binding proteins (CBPs). The immunohistochemical distribution of the CBPs is an excellent tool to reveal compartments of nervous structures, most notably in the thalamus and in the brainstem. While no data are present for the dog, CBPs did not demonstrate specific compartments in the claustrum of previously investigated species. Therefore, the present study analyses the localization and the morphology of neurons expressing PV, CB and CR in the dog claustrum. Methods: A mouse anti-CB (cat. C9848, Sigma-Aldrich, St. Louis, MO, USA) a mouse anti-CR and mouse anti-PV (cat. 6B3 and cat. 235, Swant, Bellinzona, Switzerland) were used in FFPE archival claustrum samples coming from three adult dogs of different age and breeds euthanized for reasons unrelated to psychiatric or neurological disorders. Indirect immunohistochemistry was performed using the peroxidase method.

Results: Immunoreactivity for PV and CR was observed in the neuronal somata and processes distributed throughout the anterior-posterior extent of the dog claustrum. Both CR and PV immunolabeled neurons were mostly localized in the central and ventral region of the claustrum. We did not detect CB immunostaining.

Conclusions: CBP immunolocalization reveals no functional segregation or structural heterogeneity of the dog claustrum. Possible explanation for the lack of CB immunostaining include potential loss of signal due either to post-mortem changes or specific factors influencing its presence in the canine claustrum.

117 - Gastroesophageal mucosal layer junction disposition – anti-reflux factor *N. C. Popovici*^{1,}*, *D. Blidaru*¹ and *I. Chirilean*²

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Introduction: Gastroesophageal reflux and gastroesophageal reflux disease are two distinct entities. The pathogenesis of gastroesophageal reflux is not yet fully elucidated. Generally, formulated theories to explain the reflux were focused on structural, anatomical changes, of region involved. The purpose of this study is to highlight the role of the gastroesophageal junction mucosa disposition in the anti-reflux mechanism.

Materials and methods: The mucosal layer of the transition zone between the esophagus and the stomach was studied in the distal esophagus segment, collected with the upper third of the stomach. The study was applied to 60 adult human subjects, and to compare, on 12 pieces of three different representative animals species (carnivorous, ruminant, pseudo ruminant).

Results: In human, the mucous plies in the lower esophagus are well represented. They have a longitudinal direction, being approximately parallel to each other. Their number varies from 6 to 9. In the cross section, their appearance is cone-trunk or semi-elliptical. By opening all studied esophagus, practiced by opening the anterior wall in longitudinal axis, the existence of mucosal in the form of turned swallow nests was detected. 93.4% cases demonstrated the plies-valves aspect. In the transverse section of the epidiaphragmatic esophagus appears the classic look in "Z-line". In animals mucosal formations with a certain role in the closure mechanism of the distal esophagus were revealed. They are present in animals that do not have gastric reflux (ex. In horse) and are absent in animals with physiological gastroesophageal reflux (ruminants).

Conclusions: The study revealed in human variants of junction mucosa, valve formations and mucosal sinuses, with certain role of closing lower esophagus, aspect unreported in literature. In animals a direct proportional relationship between the presence of clear mucosal formations, as locking mechanism and the absence of the reflux phenomenon is seen.

118 - The Pituitary-Adrenocortical Axis in Rats after Long-Term Exposure to Moderate Heat

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Introduction: The exposure to high ambient temperature as a physical stressor affects the activity of pituitary-adrenocortical axis. In regions with moderate continental climate all living organisms are chronicaly exposed to elevated ambient temperature during summer months. Having in mind the ambiguous literature data concerning the absence of changes or a decrease of ACTH and corticosterone concentrations after heat exposure, the aim of this study was to examine the stereological and hormone secreting characteristics of the pituitary-adrenocortical axis in rats during long-term exposure to moderate heat.

Material and methods: Adult male Wistar rats were divided in three experimental groups (n = 7/group): 21, 30 and 60 days of continuous exposure to $35 \pm 1^{\circ}$ C. The control group (n = 7) was kept at $20 \pm 2^{\circ}$ C. After the sacrifice, pituitary glands were fixed in Bouin's solution, embedded in paraplast, serially cut and pituitary corticotrophs were identified by peroxidase-antiperoxidase immunohistochemical procedure using hACTH antisera and swine anti-rabbit IgG antibodies. For the stereological analyses, the multipurpose test system M₄₂ was used. Blood ACTH and corticosterone concentrations were measured by radioimmunoassay (ACTH-IMMULITE kit) and corticosterone ELISA test.

Results: Compared to the control group, body weight in all experimental groups (21, 30 and 60 days) was decreased (P < 0.05) by 22.6%, 24.5% and 37.6%, respectively. The significant decrease (P < 0.05) of the cellular volume (by 13.4%, 8.6% and 14.2%), as well as the volume density (by 26.6%, 13.3% and 26.7%) of the pitutiary corticotrophs was registered after 21, 30 and 60 days of exposure, respectively, in comparison with the controls. Blood ACTH concentration was decreased (P < 0.05) after 30 days exposure by 36.0%, while corticosterone concentration was decreased (P < 0.05) by 29.1%, 21.1% and 24.4% after 21, 30 and 60 days, respectively.

Conclusions: Decreased blood hormone concentrations and stereological parameters of pituitary corticotrophs suggest that the prolonged moderate heat exposure causes inhibitory effects on the pituitary-adrenocortical axis.

The experimental protocol was approved by the Local Ethical Committee in conformity with the recommendation provided in the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (ETS no. 123, Appendix A).

119 - Interactive three-dimensional real-time modeling of the feline heart, a new application not only for the anatomical training

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¹Anatomy, Histology and Embryology, Department of Veterinary Science, Ludwig-Maximilans-University, Munich, Germany ²EAH-Consulting, Aachen, Germany *Introduction:* A good understanding of the macroscopic anatomy of the heart is an important subject of the anatomical curriculum and essential for the interpretation of clinical imaging techniques, such as echocardiography and conventional thoracic radiography. But external and internal structures of the heart are complex and impose high demands on three-dimensional (3D) visual thinking. Until now some digital 3D cardiac models have been developed in human medicine. The authors are not aware of a comprehensive, interactive, and animated tool in veterinary medicine, including cats. Aim of the current project was to create an anatomically and physiologically accurate, interactive, and immersive, digital 3D real-time model of the feline heart.

Methods: Two different applications were created, an app for tablets and smartphones, and a multimedia teaching program for computers, each for different operating systems. The digital heart model was built using anatomical specimens, latex casts and sequential photographs. The cardiac animation was created on the basis of normal echocardiographies.

Results: The 3D real-time model shows in detail the external and internal cardiac structures while simulating systolic and diastolic movements. The heart can be freely moved, rotated, or tilted, as well as digitally sliced to allow the comparison with echocardiographic planes. In addition, the user can 'travel' through the inner heart. Each anatomical structure can be temporarily highlighted and Latin anatomical terms, as well as English, German, or Spanish legends can be displayed. Scientific text sections explain all relevant anatomical structures and physiological processes with respect to their clinical relevance. The digital 3D model provides the basis for 3D prints of the whole and sectioned feline heart during systole and diastole.

Conclusions: The interactive 3D real-time modeling of the feline heart is intended to improve not only the functional anatomical training but also the interpretation of radiographs and echocardiographies.

120 - Three-Dimensional Visualizations Can Improve Anatomical Training – Using the Example of Canine and Feline Bones of the Thoracic Limb

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¹Anatomy, Histology and Embryology, Department of Veterinary Science, Ludwig-Maximilans-University, Munich, Germany ²Clinic of Small Animal Surgery and Reproduction, Centre of Clinical Veterinary Medicine, Ludwig-Maximilans-University, Munich, Germany *Introduction:* Virtual three-dimensional (3D) skeletons of humans and various animals have been available for 20 years. Conventional digital 3D reconstructions exist for adult long-legged dogs and adult cats. Aim of the current project was to create virtual 3D bones of cats, long-legged and chondrodystrophic dogs, thereby comparing the skeletons of adult animals with growing bones. Different methods of 3D visualization should be used and discussed.

Methods: The skeletons were three dimensionally reconstructed by using computed tomographies (CT's) of isolated bones and intact legs, and photographs from separated bones. Skeletons of adult and growing animals were considered, including cats, long- and short-legged dogs. For appropriate visualizations DICOM reading, volume rendering, surface rendering, object editing, and labelling were performed, and depth images and videos were produced, each with corresponding software programs.

Results: After volume or surface rendering, relevant anatomical structures were highlighted and marked with English legends or Latin and German anatomical terms. In videos or animated presentations, the virtual 3D bones can be inspected from different perspectives during movement, thereby enhancing the anatomical understanding. Stereophotographs of the bones were created to increase the 3D effect. Differences between adolescent and adult bones as well as between long-legged and chondrodystrophic bones are easily recognized with 3D visualization. Using surface rendered CT's, gray scale depth map pictures were digitally created, being the basis of autostereograms, which represent a playful anatomical teaching tool. Surface rendered, virtual bones can be printed with common 3D printers.

Conclusions: The animated and labeled, virtual 3D bones represent scientific anatomical presentations, whereas the stereograms and autostereograms are intended to contribute to the joy of learning. In summary the manifold opportunities of digital 3D visualization may support and improve the conventional self-study in anatomy, including bookwork and examination of specimen.

121 - A morphometrical study of metapodial bones in karagouniko sheep (*Ovis aries*, L. 1758) and hellenic goat (*Capra hircus*, L. 1758)

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¹Laboratory of Anatomy, Histology & Embryology, Faculty of Veterinary Medicine, University of Thessaly, Karditsa, Greece ²Clinic of Farm Animals, Faculty of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece *Introduction:* The morphometry of the metapodial bones is an important tool for identifying fossil bones and studying the pedal function and the evolutionary history of animals. The objective of the present study was to provide some metrical data and to evaluate the morphometrical characteristics of the metapodial bones of Karagouniko sheep and Hellenic goat that are related with some functional and clinical aspects.

Methods: The distal extremities of the limbs from 30 Karagouniko ewes and 30 Hellenic goats were collected from a slaughterhouse and immediately identified (fore-hind limb) and grouped according the animal. Consequently, the metapodials were skinned, macerated, cleaned and dried. A total of 17 linear measurements were performed at each bone with the aid of caliper. Also some ratios and the metapodial (metacarpal and metatarsal) indexes were calculated. Paired samples *t*-test was run to identify the significance of the differences between the metacarpal and metatarsal indexes in each animal species and independent samples t-test was used for the comparison of the metapodial indexes between sheep and goats.

Results: The metacarpal index in sheep was 67.61% (95% C.I.: 66.73–68.49%) and the metatarsal 66.15% (95% C.I.: 61.77–64.02%). In goats, the metacarpal index was 57.20% (95% C.I.: 56.25–59.59%) and the metacarpal index 57.56% (95% C.I.: 56.19–58.92%). The metapodial index was significantly different between the front and hind leg in sheep (P < 0.05) but not in goats (P > 0.05). The metacarpal and metatarsal indexes were significantly different among sheep and goats (P < 0.05).

Conclusions: The differences in morphometrical data evaluated suggest that the metapodial bones of Karagouniko sheep and Hellenic goat are possibly related with biomechanical particularities which characterize their locomotory diversity. Also, these data help to assess and compare small ruminant osteology during various scientific procedures.

122 - Comparison of two methods for the measurement of medial and lateral metapodial bones in karagouniko sheep (*Ovis aries*, L. 1758) and hellenic goat (*Capra hircus*, L. 1758)

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Introduction: Metapodial length measurement with a caliper has some difficulties in sheep and goats arising from the special anatomy of their articular surfaces. So, it

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is possibly better to use a two-dimensional method for the evaluation of metapodial lengths. The objective of this study was to compare the measurements obtained in metapodial bones in sheep and goats with a caliper with those obtained by a two-dimensional digital method.

Methods: The distal extremities of 30 ewes and 30 goats collected from a slaughterhouse were identified (fore-hind limb) and grouped according the animal. The metapodials were skinned, macerated, cleaned and dried. Their lateral and medial length was measured with the aid of caliper; then each bone was scanned and the same lengths were digitally measured using GIMP 2.0 (GNU Image Manipulation Program) software. The same individual (T.C) made all measurements with both methods. Paired samples *t*-test was run to identify the significance of the differences between the bone lengths obtained by the two methods. Passing and Bablok regression analysis was run to evaluate the agreement between the two methods and the precision and accuracy of the measurements was tested using the concordance correlation coefficient.

Results: The length of all bones measured with a caliper was significantly higher compared to those measured with the digital method (P < 0.05). The precision and the accuracy (which represents a bias correction factor) were over 98% for all bones in sheep and goats. In goats, the lateral length of both metacarpals and metatarsals were significantly higher than medial length (P < 0.05), whereas in sheep the lateral length was significantly higher compared to medial one only in metatarsal bones (P < 0.05).

Conclusions: The two-dimensional digital method is sufficiently accurate to measure the lengths of metapodial bones in sheep and goats: however, the lengths are underestimated in comparison with caliper.

123 - Kinematic locomotion analysis of the hind limbs in ruminants

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Introduction: Acceleration values and image analyses of the lower leg are strongly related to the position of the leg in terms of, gait types, and welfare. The objective of this study was to perform kinematic locomotion analysis of the hind limbs in cows and sheep using imaging techniques and accelerometers, interpreting the values of the hind limbs. With detection of different acceleration values correlated with results of imaging techniques possibilities of measuring early stage of laminitis.

Methods: The accelerometer was attached on the lateral side of the metatarsal region on the left hind leg of six sheep, set for measuring the acceleration of the three axes. In cows, non-contact infrared thermography was performed on thirty cows with thermal camera; determining temperature difference of the coronary band FLIR thermografic camera were used at the distance between 1.5 and 2 m. The value (was set to 0.95 according the object ability to absorb and emit infrared radiation.

Results: In standing position the acceleration of the vertical axis was in range 0.8 and 1 g. The acceleration of the lateral axis during lying was ≈ 1 or -1 g. The frequencies of values of axis and sum vector showed differences in the category 0–1 g for walking *x*-axis, 65.56 ± 8.37 and sum vector, 37.74 ± 5.92 and running 22.24 ± 4.86 ; 4.91 ± 3.03 ; in the category 3–4 g were: walking 3.39 ± 1.5 ; 4.97 ± 2.15 and running 19.65 ± 4.05 ; 30.09 ± 2.19 . The imaging techniques on cows showed differences of the skin temperature with claw disorders. Elevated temperature was detected of the solear surface and coronary band in cows with laminitis. Impaired circulation of the laminar corium with the appearance of discoloration and double sole compared with non-lame cows results with increased temperature.

Conclusions: The acceleration values could be used for kinematic analysis of locomotion, whereas combined with the imaging techniques are tools for early detection of laminitis.

124 - Histological researches concerning the pancreas in struthio camelus

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Introduction: According to the Handbook of Avian Anatomy: Nomina Anatomica Avium (Baumel et al., 1993), the pancreas of the birds is considered to have four lobes: ventral, dorsal, third and splenic; with three ducts: ventral, dorsal and third, as described in chicken and quail.

Methods: For this study, pancreatic samples were collected from five ostrich carcasses of both sexes (two females and three males) and aged between 6 months and 3 years, from slaughter house Suraki, Giurgiu. The tissue samples were immersed in solution of formalin 10%, were embedded in paraffin and the tissue sections of 5–6 microns were stained with Haematoxylin Eosin for general observations, Gomori's method for reticulum, Masson's trichrome method for pancreatic islet cells and Bensley's method for zymogens' substance.

Results: Macroscopically, the pancreas gland can be described as a pale pink and surrounded by adipose tissue. The pancreas is bordered by a thin capsule, which detaches septa partitioning pancreatic lobules. Conjunctive capsule of the pancreas contains elastic and collagen connective fibers. A serous acinus consists of a number of serous cells 4–7 and noticed that intraacinar lumen is almost unnoticeable. As in other bird species, the endocrine function of this organ is satisfied Langerthans pancreatic islets, located among the serous acini, the stains made stating that they are made of rare clumps of cells round, oval and irregular and are surrounded by connective tissue and are well vascularized.

Conclusions: The pancreatic secretory unit consists of a acin and a intercalary duct. Canalicular system of the pancreas is the channel intercalary and intralobular ducts, very difficult to distinguish on the ostrich, continued through interlobular ducts. Interlobular ducts channels are continued interlobular followed by sewers. By Gomori's method we found the arrangement of reticulin fibers bounding acinar parenchyma by connective tissue septa fine.

125 - Morphological studies on the liver in *Struthio camelus*

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Introduction: The ostrich has become, in the last period of time in our country quite appreciated for high meat protein value and low cholesterol level. Scientific papers in the field that deals with the macroscopic and microscopic structure of ostrich liver are rare compared with poultry and other ratites.

Methods: For this study were collected liver samples from five ostrich of both sexes (two females and three males) and aged between 6 months and 3 years. Macroscopic investigations had the way study dissection and the microscopic fixation in 10% formalin, were embedded in paraffin wax, were applied specific histological technique and then all sections were examined with histological techniques (H&E, Gomori, Masson's trichrome).

Results: This paper presents the macro and microscopic structure observed in the ostrich liver, as in other birds, the liver is a gland that has a status of amficrina gland, with a thick consistency, color from brown to purple – dark from the point of view anatomically consists of two main lobes or four secondary situations right upper quadrant. By application of histological techniques Gomori, we pointed distribution of reticular fibers in the liver parenchyma, pointing out the particular arrangement of hepatocytes, organized with the help of this network of connective fibers reticulin.

Conclusions: The liver is composed of two lobes, with the left one divided. Different from other ratites, the ostrich hasn't got a gall bladder. It is important to note that compared with poultry, in the liver of ostrich hepatic cords are arranged radially, both around the central vein, as well as around the port area. Parenchyma shows irregular septa and consists of cords of hepatocytes radiating arranged around the central vein. Among the hepatic cords, we revealed the presence of numerous capillary sinusoids, noting that the vasculature on the ostrich liver are very well developed.

126 - Ultrastructural characterization of *Diclidophora luscae* and comparison of the metric variables in different methodologies applied to species characterization *P. Ramos*¹, *F. Rosa*², *M.-M. Oliveira*¹, *A. Grade*¹ and *G. Alexandre-Pires*³,*

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Introduction: Diclidophora (Monogenea) members exhibit high specificity to commercial valuable fish. *D. luscae* was recently reported in the Northeast Atlantic of Portuguese coast and infects the second and third gill arches of *Trisopterus luscus* (pouting) where important lesions occur due to hematophagy. Our aim was to compare the ultrastructural and metric variables of the parasite obtained from fresh and frozen hosts and on the sequential staining procedures in order to clarify cross-infections.

Methods: Specimens from fresh pouting were collected (n = 15) and from gill frozen fish (n = 15), fixed in 70% ethanol, stained with alcoholic carmine and mounted in Canada Balsam. Body extensibility of fresh specimens was obtained by relaxing in 10% salted water at 5°C during 12 h and of preserved ones by means of slide pressure.

Body length (BL), body width at level of the origin of haptor (BW), distance to gonopore (DG), first clamp length (FCL), first clamp width (FCW), pre-ovary length (POL) and post-ovary length (PTOL) were measured. Robustness of the estimates was obtained since all samples were bootstrapped, using the SPSS statistics software. Results: Surface topography of the parasite revealed by scanning electron microscopy appears rough as microvilli-like structures are present. The presence of few small nodules in the anterior jaw of the clamps and the ovarium located in the anterior haptor region were noticed. Specimens were identified as D. luscae, although smaller than those reported in other studies. A decrease in all parameters was noticed from fresh to stained specimens. The analysis of data pointed out to a strong correlation between fixed/pressed and stained specimens in BL, BW, DG and POL (P < 0.01) and between defrozen and fixed/ pressed in BL and POL (P < 0.01).

Conclusions: Attention should be drawn to methodological procedures in case of using morphology to study cross-infection.

127 - The microvascular systems of the porcine vocal folds: age related differences *H. Reinhard, A. Lang* and H. Gasse*

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Introduction: Interstitial fluids influence the viscoelastic properties of the vocal fold's lamina propria. Accordingly, structures which facilitate inflow and outflow of such fluids impact on phonation. For this reason, the local distributions of blood capillaries, lymph capillaries, and lymphatic precollectors were studied in the cranial and caudal vocal folds (CraF, CauF) of minipigs.

Methods: Cross sections of Bouin-fixated, paraffin-embedded vocal folds of 'young' (2–3 months, n = 6), 'adult' (11–27 months, n = 12), and 'old' (4–7 years, n = 6) female minipigs* were alternately treated with polyclonal anti-von-Willebrand-Factor or polyclonal anti-Smooth-Muscle-Actin in order to distinguish lymphatic and blood microvessels. By means of this method, characteristic Zones and Rows were identified, and age-related differences in the microvessels' local distributions were assessed.

Results: The microvascular networks were relatively dense in the 'young' minipigs, but wider in the 'adult' animals. This was found in all layers of the lamina propria of CraF and of CauF. The differences between 'adult' and 'old' specimens were complex: In both folds, arterioles and venoles were arranged more densely in the 'old' specimens than in the 'adult' ones, while the density of capillary arrangement was the same in both age groups. The age-related changes in the distribution of initial lymphatics were inconsistent: Initial lymphatics were located mainly in the superficial layer, but with very heterogeneous arrangements, i.e. sometimes the distances between profiles were smaller, sometimes wider. In the deeper layers of the lamina propria, initial lymphatics occurred only sporadically.

Conclusions: Similar amounts of microvascular profiles were located in an area which was relatively small in the 'young', but larger in the 'adult' specimens. We, therefore, conclude that the 'development' and 'maturation' of the microvascular system was completed prior to the completion of growth of the folds, while changes from 'adult' to 'old' reflect the process of 'ageing' (accompanied by decreased size of the folds).

No experiments were performed on living animals. The Guidelines 86/609/EEC were observed.

128 - Volumetric measurements of the canine cerebrospinal fluid using magnetic resonance imaging (MRI)

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Introduction: The cerebrospinal fluid (CSF) volume has a significant clinical importance in case of various interventions and syndromes in dogs, such as myelography or hydrocephalus. However, only estimations (Oppelt W.W. *et al.*1964: Am. J. Physiol., 206. p. 247) and uncertain post mortem measurements (Nigge, H.K., 1944: D. T. W. U. T. Rdsch. 50, 26–29) are described in the literature. The aim of this study was to determine the relationship between CSF volume and bodyweight in dogs.

Methods: Twelve healthy, male mongrel dogs (dolichocephalic and mesocephalic) age between 3 and 5 years and bodyweight 7.5–35.0 kg were examined with MRI using a sequence designed for CSF detection. The CSF was segmented and its volume was measured using 3D Slicer software.

Results: In the extracranial compartment 20.21–44.06 ml CSF was measured (cervical region: 41.01% \pm 3.3%; thoracic region: 35.93 \pm 2.1%; lumbosacral region:

23.06 ± 1.9%); the total CSF volume of the ventricles were 0.97–2.94 ml (lateral ventricles: 62.12 ± 11.7%; third ventricle: 17.58 ± 4.9%; aqueductus mesencephali: 4.85 ± 1.6%; fourth ventricle: 15.45 ± 6.6%). The following correlation was found between the bodyweight in kilograms (BW) and the extracranial CSF volume in ml (V_{EC} CSF) (P = 0.0002; $r^2 = 0.74$): V_{EC} CSF = BW*0.93 + 11.8.

Conclusions: The current dosage methods for the interventions related to the subarachnoid space are based on a hypothetical lineal relationship between the CSF volume and the bodyweight. Our results indicate that these dosage methods might have to be revised to V_{EC} CSF = BW*0.93 + 11.8. By measuring the CSF volume of a patient and comparing it to our results, diagnosis of hydrocephalus or syringomyelia can be supported.

The research was approved by the Institutional Animal Care and Use Committee, Faculty of Veterinary Science, Szent István University.

129 - Biomechanical properties of the equine digital tendons and the medius interosseous muscle

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Introduction: The knowledge of the biomechanical properties of the equine digital tendons, the accessory ligament of the deep digital flexor tendon (AL) and the medius interosseous muscle (MIM) is of high importance to understand their functional anatomy and pathology. There are only a few data available which are not fully comparable because the test design is not standardized.

Methods: Biomechanical testing was performed on the common extensor digital tendon (CEDT); the deep digital flexor tendon (DDFT), the superficial digital flexor tendon (SDFT), the AL, and the MIM of 25 adult horses from the slaughterhouse. Measured were the maximum load capacity, the tensile strength, the tensile load, the compressive strength, and the module of elasticity in different traction and gliding regions of these tendons and the AL.

Results: There are quit different biomechanical properties not only between different tendons but also between different regions of a tendon. The gliding regions of the deep and superficial digital flexor tendons have the highest load capacity, whereas the tensile strength of these regions is significant lower compared to their traction regions. Especially the CEDT has a very high tensile strength. The lowest tensile strength was found in the AL and the MIM, whereas these structures were significant higher elastic than the tendons. A very high compressive strength was found in the gliding regions of the DDFT. *Conclusions:* In adaptation to their very different functions the tested tendons and the AL have very different and region specific biomechanical properties. For example the CEDT primarily has to transfer the force of the common extensor muscle; therefore it has a very high tensile strength and a low elasticity. In contrast the SDFT has to store energy like a coil spring therefore it has a high elasticity and a low tensile strength in comparison to the DDFT.

130 - Effects of prepubertal, pubertal and adult orchiopexy in testicular morphology and spermatozoids in rats

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Introduction: Testicular damage has been related to orchiopexy for testicular torsion treatment. However, the long-term impact of orchiopexy when used in different ages is not known. The objective of the present study is to assess the effects of transparenchymal suturing in prepubertal, pubertal and adult rats.

Methods: Prepubertal (4 weeks old, n = 10), pubertal (6 weeks old, n = 10) and adult (9 weeks old, n = 10) male rats were used. Under anesthesia, the right testicle was sutured in anatomical position, penetrating the tunica albuginea and (as little as possible) the parenchyma. The left testicles remained untouched and were considered as controls. The animals were killed at 14 weeks old, and spermatozoids were collected from epididymal tail and evaluated for concentration, motility and viability. Several morphometric parameters were assessed: volumetric density and absolute volume of the different testicular structures (tunica propria, seminiferous epithelium, tubular lumen, seminiferous tubule, vessels and the intertubular compartment), seminiferous tubules diameter, seminiferous epithelium height and total tubular length. Means were compared by Student-t-test, considering P < 0.05 as significant.

Results: Spermatozoid concentration and motility were equivalent in samples collected from right (sutured) and left (control) organs both in prepubertal, pubertal and adult groups. Viability of spermatozoid, as verified by the hypo-osmotic test, was also not different for pubertal and

adult groups. However, in prepubertal animals, viability was 35% reduced in samples obtained from right organs, in comparison to controls (P = 0.002). For all the histomorphometrical parameters analyzed in the study, the right sutured testicle was statistically similar to controls. This was observed in prepubertal, pubertal and adult operated animals.

Conclusions: Testicular transparenchymal suturing, used for orchiopexy, did not promote testicular or spermatozoid production damage in pubertal or adult operated rats. However, for prepubertal animals, the viability of spermatozoids is reduced, even after 10 weeks of orchiopexy.

The work was formally approved by the Ethical Committee of the Biological Institute of the State University of Rio de Janeiro.

131 - Effect of anti-oxidants on outcomes of testicular torsion in rats of different ages

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Introduction: To assess reproductive and testicular function of adult rats submitted to testicular torsion (TT) before, during and after puberty, with or without resveratrol or arginine treatment.

Methods: Age matched rats were assigned into one of the following groups: Sham (simulated surgery without TT), TT (submitted to 720° TT for 4 h), RES (submitted to TT with resveratrol treatment) and ARG (submitted to TT with arginine treatment). At 12 weeks old, all rats were allowed to mate females for obtaining the reproductive function analysis. The males were killed at 14 weeks when spermatozoids were collected from epididymal tail and evaluated for concentration, motility and viability. Samples from testes were collected for morphological analysis.

Results: The reproductive function was not altered by testicular torsion but antioxidants improved potency. Concerning the spermatozoid analysis, the twisted testicle samples were inferior for all parameters in relation to sham and contra-lateral samples. Resveratrol and arginine were not able to improving the spermatozoid parameters in the twisted testis; however the contra-lateral samples were improved by both drugs. Seminiferous epithelium of animals submitted to TT during puberty were the least affected. Both anti-oxidants prevented (partially or totally) some morphological parameters affected by TT. The animals submitted to TT before puberty were the mostly protected by the treatments.

Conclusions: Testicular morphology is less affected in animals submitted to TT during puberty. The treatment with anti-oxidants improves contra-lateral testicles and some fertility parameters. Both anti-oxidants also ameliorate testicular morphology after TT. Prepubertal animals were the most benefited after both anti-oxidants treatment.

The work was formally approved by the Ethical Committee of the Biological Institute of the State University of Rio de Janeiro.

132 - Dorsal integumentary glands in crocodilians *K.* C. Richardson*

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Introduction: The dorsal integumentary glands reported in the Nile crocodile and the American alligator (Reese, AM, 1921: Journal of Morphology, 35: 581–611) were believed to maintain the skin similarly to mammalian sebaceous glands. This study examines their structure in embryonic and young Saltwater crocodiles *Crocodylus porosus* and Australian Freshwater crocodiles *Crocodylus johnstoni*.

Methods: Crocodilian eggs were incubated and at selected intervals sample eggs were opened and embryos killed using intraperitoneal barbiturate. The glandular structures were dissected and tissues processed routinely.

Results: Dorsal integumentary glands first appeared at day 23 as masses of polyhedral cells within the dermis at 11 and 1 o'clock on the embryo's dorsum. By day 37 they formed a basal germinative layer of tall cells surrounding a core of large cells each with a small nucleus and many cytoplasmic acidophilic vesicles. In the final trimester luminal cell nuclei were pycnotic, membranes disrupted and secretory bodies had coalesced. Glandular ducts open onto the dorsal skin surface between the first and second scale rows. In hatchlings, dorsal integumentary glands lie in the hypodermis on each side of the dorsal midline from the cervical to lumbar regions in both C. porosus (19 pairs) and C. johnstoni (24 pairs). These were soft and yellow averaging 2×1 mm in C. porosus and 1×0.6 mm in C. johnstoni. In older animals they were smaller consisting of irregular rings of keratin-like material surrounding a central dried amorphous matrix. Conclusions: This study confirms the presence of dorsal integumentary glands in Saltwater and Australian freshwater crocodiles. The role of these glands possibly being functional for only the early period of their life is unclear. It is probable that the glands produce pheromones and may function in hatchlings as a form of communication between siblings and/or the very young and their mother.

This study was conducted with the full approval of the Charles Darwin University Animal Ethics Committee.

133 - Porcine intestinal mast cells – fixation, histochemistry and quantification

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Introduction: Mast cells (MCs) are frequently positioned at epithelial barriers, maintaining crucial functions in mucosal surveillance. A variety of mediators is stored intracellularly in granules and can be rapidly released upon stimulation. Fixation and staining techniques are critical factors influencing the histochemical visualization of MCs. Formalin fixation restricts staining of porcine mucosal MCs while other fixatives have been described as suitable (Rieger *et al.*, 2013: Eur J Histochem 57, *e21*). Objective of this study was to determine a reliable histochemical method for counting porcine intestinal MCs. Fixations, which allow subsequent immunohistochemistry, were also evaluated. Tissue shrinkage was measured to compare results of the different methods.

Methods: Samples were taken in a feeding trial including twenty conventionally kept German Landrace piglets. Sections from jejunum and colon were fixed in Carnoy, lead acetate, lead nitrate, Zamboni and Zinc-salt-fixation (ZSF). They were paraffin embedded and stained with polychromatic methylene blue, alcian blue or toluidine blue. Tissue area was measured in each processing step, calculating tissue shrinkage.

Results: ZSF, Carnoy and the lead salt fixations preserved metachromasia of porcine MCs. Zamboni did not. Polychromatic methylene blue was the optimal staining agent also suitable for automatic counting. Shrinkage ranged from 19% to 57%. Jejunum and colon required individual shrinkage factors. Subsequent immunohistochemistry with several antibodies potentially detecting mast cells showed only unsatisfying results in porcine tissues with the employed methods.

Conclusions: Different fixatives fundamentally influence tissue shrinkage. Data gained with different fixation methods are not directly comparable and quantification results have to be adjusted. Polychromatic methylene blue is excellent for the differentiation and automatic quantification of porcine intestinal MCs. ZSF preserves metachrom-

asia and may be suitable for histochemical and immunohistochemical methods.

Animal experimentation approved by 'Landesamt für Gesundheit und Soziales, Berlin' (LaGeSo Reg. Nr. 0347/ 09).

134 - Immunohistochemical detection of *Salmonella* in tissues of experimentally infected pigs

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Introduction: Salmonellae are a prevalent source for foodborne infections caused by consumption of contaminated pork. Salmonella Typhimurium is a main pathogen compromising porcine and human health as well as food safety (Kreuzer et al., 2014: Vet. Immunol. Immunopathol (in press)). Salmonella infects epithelial cells of the small and large intestine and may cross this barrier, invading the lamina propria and disseminate rapidly through efferent lymph in mesenteric lymph nodes and through the blood stream (Velge et al., 2012: Microbiologyopen 1, 243–258). The objective of this study was to develop a proper histochemical approach for detection of salmonellae in tissues from pigs experimentally infected with Salmonella Typhimurium.

Methods: The samples were obtained from a probiotic feeding trial where piglets of the German Landrace were challenged intragastrically with *Salmonella enterica* serovar Typhimurium DT104 ($1.4-2.1 \times 1010$ CFU). Piglets from each group were sacrificed 2 and 28 days post infection. Tissue samples (jejunum, ileum, colon, ileocecal mesenteric lymph nodes, tonsil) were fixed in Zambonis fixative and paraffin embedded. Different immunohistochemical staining protocols with a monoclonal mouseanti-*Salmonella* Typhimurium antibody were evaluated.

Results: Salmonella was detected in varying amounts in the tissues. Brown iron-containing pigments in the lymph nodes interfered with the identification of *Salmonella* if DAB was used as a staining reagent. Detergents like Triton X-100 or Saponin enhanced the quantity of the reaction products enormously.

Conclusions: Immunohistochemistry is a powerful diagnostic tool for the *in situ* demonstration of salmonellae. It is advisable not to use a detection system with brown staining for bacteria in an experimental setup involving intestinal damage including hemorrhage. The use of detergents seems to be necessary for the proper immunohistochemical detection of salmonellae.

Experimental approval has been given by the local authority (Landesamt für Gesundheit und Soziales, Berlin ID: G0348/09).

135 - Expression of prostaglandin synthesizing enzymes in the ovary of birds *D. Rodler* and F. Sinowatz*

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Introduction: Cyclooxygenase is the rate limiting enzyme in the production of prostaglandins (PGs). In bird it exists in two isoforms, cyclooxygenase 1 (COX-1) cyclooxygenase 2 (COX-2). Downstream enzymes, like PGE synthase, convert PGH2 to a family of PGs, each member of which exerts a range of physiologic effects through Gprotein coupled receptors. Despite evidence implicating that cyclooxygenases and PGs are critical factors in female reproduction in birds, little is known about COX expression in the avian ovary.

Methods: In the present study we investigated the expression of COX-1 and COX-2 in the ovary of the quail (*Coturnix japonica*) and the ostrich (*Struthio camelus*) using immunocytochemistry (avidin-biotin-complex method) and transmission electron microscopy.

Results: Our results demonstrate prostaglandin synthesizing enzymes are differentially expressed in these two species of birds. In the quail, antibodies to COX-1 distsinctly stained the smooth muscle cells of the stroma, whereas COX-2 shows a distinct immunostaining in the thecal glands and the ovarian surface epithelium. In the ostrich COX-1 immunostaining was similar to the quail, but for COX-2 a completely different expression pattern was observed: the follicle cells of primordial follicles ((90– 100 μ m in diameter) showed weak immunostaining for COX-2, whereas the pseudostratified columnar granulosa cell layer in late previtellogenic follicles (150–400 μ m in diameter) was distinctly immunopositive for this enzyme. In larger follicles, immunostaining for COX-2 was significantly reduced.

Conclusions: The expression pattern of COX-1 and COX-2 is different in each avian species studied so far. These results do not support the hypothesis that prostaglandins play a major role in ovulation in birds.

136 - Impact on cell metabolism of dog hepatocytes when exposed to *Leishmania infantum*

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Introduction: Canine leishmaniosis is a zoonotic disease caused by *Leishmania infantum*, a protozoa parasite transmitted by sand flies. The liver is a preferential target organ for the parasite and possesses effector mechanisms that can contribute to direct elimination of *Leishmania* in a not yet defined way. Metabolic alterations can impact the outcome of the infection and treatment. This work aims to assess the effect of *L. infantum* on the metabolic activity of dog hepatocytes.

Methods: Liver samples from healthy stray dogs captured and euthanized by official entities were collected by a veterinarian according to the directive 86/609/EEC. The parasite tropism to hepatocytes was assessed in fluorescent and scanning electron microscopy. To investigate how the presence of L. infantum modulates the function of hepatocytes, urea production was quantified and activities of hepatic cytochrome P450, the most important enzymes involved in biotransformation, phase I alkoxyresorufin-Odealkylases (EROD, MROD, BROD, and PROD) and phase II UDP-glucuronosyltransferase, were assessed. Also a leishmanicidal compound was added to parasite exposed hepatocytes and the previous described metabolic parameters quantified. The results were statistically analyzed using Mann-Whitney U test for related samples (P < 0.05).

Results: Leishmania infantum is attracted to hepatocytes but do not penetrate the cells. EROD, MROD, BROD, and PROD activity are altered by the exposition to the parasite and by the addition of an antileishmanial drug. An increase in urea production was also observed, indicating a stress response of active hepatocytes. Results suggest that exposition to parasite influences the metabolic activity of hepatocytes.

Conclusions: Although the parasite does not enter the cells, hepatocytes seem to sense the presence of *L. infantum*, reacting with a stress response by increasing levels of urea production and changing the normal activity of CYPs. These mechanisms may alter the susceptibility of the liver to *L. infantum* infection, influencing disease outcome.

This work was partially supported by the Portuguese Foundation for Science and Technology (FCT) and European Union (FEDER) through project PTDC/CVT/ 113121/2009. Armanda Rodrigues holds PhD scholarship SFRH/BD/73386/2010 from FCT.

Experiments were monitored by competent veterinary authorities and approved by the ethical committee of the Faculty of Veterinary Medicine (Lisbon, Portugal). Several authors are holders of FELASA (Federation of European Laboratory Animal Science Associations) grade C certificate.

137 - Course and branching pattern of selected thoracic and lumbar spinal nerves in the domestic cat

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Introduction: Exact knowledge about the cutaneous innervation in dogs and cats is of great importance for veterinarians practising complementary medicine, namely acupuncture, neural therapy or osteopathy. Literature about the detailed branching pattern of spinal nerves in cats is scarce. The aim of this study was a detailed dissection and description of the innervation pattern of the dorsal branches of the spinal nerves in cats with special reference to the cutaneous nerves.

Methods: A mesoscopic dissection of the thoracic and lumbar standard position was carried out in 13 European Shorthair cats of different sex and age. After formalin fixation, computertomographic images were taken for morphometric assessment of the vertebral column. The dissection was carried out in four layers on both body sides. In each layer, the course of individual nerves was described, documented by digital photography and the distances between the nerves were measured.

Results: In most animals, the distribution of nerves and branching pattern were bilaterally symmetric. The number of nerves along the lumbar spine decreased in caudal direction. For example, the spinal nerve of the first lumbar vertebra supplied the skin areas between the lumbar vertebras 2 and 4. The distances between the individual nerves increased in caudal direction. This data correspond with findings in dogs, where a caudal shift of at least one vertebral length has been described.

Conclusions: The results of this ongoing study show that the dorsal branches of spinal nerves in cats are regularly distributed. In contrast to findings in dogs, there are subtly different interindividual variations of nerve course and branching in cats. This might have benefits for therapeutic methods. With the data presented here, we provide a solid anatomical foundation for treatments used in complementary medicine such as acupuncture.

138 - Aspects linked to the presence and distribution of rete ovarii in hybrid merino ewe lambs

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Introduction: Rete ovarii represents a remnant from the foetal period, present in the ovarian medulla. It appears as a network of ducts or tubes and sometimes as cell nests. The frequency of this vestigial structure in hybrid Merino ewe lambs is followed in this study.

Material and Methods: Animals taken into study were 12 hybrid merino ewe lambs, 0–6 months old, from the Lower Danube area, deceased from various causes. Ovaries were collected during necropsy, fixed with formalin, included in paraffin, sectioned at a 5- μ m thickness and stained with Goldner's trichrome.

Results: Rete ovarii was histologically identified in four out of the 12 ewe lambs taken into study (33%). Among them, only a 2 months old ewe lamb presented rete ovarii in the medullas of the two ovaries. In a 3 months old ewe lamb, it was identified in the right ovary, and in a 5 months old ewe lamb, in the left ovary. In a single 2, 5 months old ewe lamb, rete ovarii was observed in both the medulla and the hilum area of the right ovary.

Conclusions: The intercepted aspects sustain the fact that rete ovarii persists only in some of the hybrid merino ewe lambs, in either right or left ovary and sparsely in both ovaries. In most of the cases, it is present in the ovarian medulla and and can sometimes extend at the hilum area.

139 - Expression of vascular endothelial growth factor, its receptors and vascular endothelial growth inhibitor in lungs of Japanese quail (*Coturnix coturnix japonica*) during the post-hatching period

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¹Department of Histology and Embryology, Faculty of Veterinary Medicine, Dicle University, Diyarbakir, Turkey ²Department of Histology and Embryology, Faculty of Veterinary Medicine, Erciyes University, Kayseri, Turkey Introduction: Vascular endothelial growth factor (VEGF) and its receptors VEGFR1-Flt1, VEGFR2-KDR/Flk1 and VEGFR3/Flt4 play an important role in vasculogenesis and physiological angiogenesis. The lung actions of VEGF are overarching since they affect lung development and structural maintenance of the adult lung. To determine the expression pattern of VEGF and its receptors in the lung, we analyzed levels of VEGF, VEGFR1-Flt1, VEG-FR2-KDR/Flk1 and VEGFR3/Flt4 and Vascular endothelial growth inhibitör (VEGI) in lung of quail during posthatching period.

Methods: Thirty Japanese quails were obtained from the Safiye Çikrikçioglu Vocational College, Erciyes University (Kayseri). Five quails each, aged 1, 5, 10, 15, 30, and 125 days, were sacrified under ether anaesthesia and their lungs were quickly removed for immunohistochemical analysis. The tissues were fixed in 10%neutral formalin solution for 24 h at room temperature.

Results: Immunohistochemical studies revealed the presence of cytoplasmic and membrane staining for VEGI, VEGF and its receptors were observed in bronchi, atria and air capillaries as well as blood vessels in the lung throughout the post-hatching period. Immunoreactivity for Flt1/fms and Flk1/KDR in the bronchi, atria and air capillaries were stronger than those of VEGF, VEGI and flt4, particularly from hatching to the 15th days posthatching. Besides, immunoreactivity for VEGF in the atria and air capillaries was strong on the 30th and 125th days of post-hatching period. However, VEGI immunoreaction was relatively similar in the all parts of the lung during post-hatching period.

Conclusions: We conclude that post-hatching period may be precisely regulated by the combined functions like growth and vasculogenesis/angiogenesis of VEGF family members, angiogenic VEGF and VEGF receptors, and the angiogenesis inhibitor VEGI in the guail lung,.

This study was approved by the Ethics Committee of Erciyes University.

140 - Immunolocalization of vascular endothelial growth factor, its receptors (flk1/ fms, flk1/KDR, flt4) and vascular endothelial growth inhibitor in quail spleen (*Coturnix coturnix japonica*) during the post-hatching period

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Introduction: The formation of blood vessels allows the growth and functioning of organs and the vascular endothelial growth factor (VEGF) and its receptors have been implicated as key players in this process. The spleen is an immunologic organ with a very rich vascular supply. In the present study, the question of whether VEGF, its receptors (flt1/fms, flk1/KDR and flt4) and vascular endothelial growth inhibitor (VEGI) are expressed in the vascular system and lymphoid tissue of quail spleen during the post-hatching period was investigated using immunocytochemistry.

Methods: Thirty quails were obtained from the Safiye Çikrikçioglu Vocational College, Erciyes University (Kayseri). Five quails each, aged 1, 7, 14, 21, 28, and 60 days, were sacrificed by means of ether anaesthesia and their spleens were quickly removed for immunohistochemical analysis.

Results: Both, a membrane and cytoplasmic pattern of staining for VEGI, VEGF and its receptors were observed in some cell types of peri-ellipsoidal white pulp (PWP) and periarterial lymphoid sheath (PALS), endothelial cells of penicillar capillaries (Pc) and central arteries (CA) as well as venous sinuses (S) of red pulp in the spleen throughout the post-hatching period. Flt1/fms and Flk1/KDR immunoreactivities in the Pc and CA and S were stronger than those of VEGF, VEGI and flt4, particularly from hatching to the 21th days post-hatching. Besides, VEGI immunoreactivity in the Pc, some cell types of PWP,PALS and in S were strong on days 1, 7, and 14, but negative on days 21, 28 and 60 of the post-hatching period. However, VEGF and Flt4 immunoreactivities were weak in all components of the spleen during post-hatching period.

Conclusions: Our findings show that the localizations of VEGF, flt1/fms, flk1/KDR, flt4 and VEGI in structural components of quail spleen are altered during the days of the post-hatching period.

This study was approved by the Ethics Committee of Erciyes University.

141 - Using methods to support the learning of veterinary anatomy

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Introduction: In order to a better adaptation to the European Higher Education Area, the objective of the present

work is to develop a useful tool for personal studying focused on self-learning, as an alternative to the traditional education. We present a positive experience on learning veterinary anatomy using theoretical and practical notebooks.

Methods: Students will receive a theoretical and practical notebook that includes a summary of the topics explained in the theoretical classes, and many original images with application forms to identify the different anatomical structures. In the practical class, students, divided into groups of four to five people, will have to prove that they have achieved the skills. So that, they will answer the questions raised by the teacher about each anatomical part. Thereafter, students must complete the notebook and give it to the teacher for correction within a month. The right evaluation of both, practice session and notebook, replace the exam. This activity is voluntary.

Results: An 87.1% (115/132) of the students performed the activity. The average score of the group for this activity was 9.6. A comparison with the traditional learning was also made: a 12.9% attended the traditional exam, achieving an average score of 7.3. Statistically significant difference (P < 0.005) between both methods: theoretical-practical notebook/traditional method was found.

Conclusions: The results of our study show that the use of this type of theoretical and practical notebooks and evaluation systems helps to improve the academic performance of students, compared to the traditional teaching methods.

142 - Morphological research on microglia in the canine cognitive dysfunction syndrome *F. Schmidt*^{1,}*, *A. Stolzing*² and *J. Seeger*¹

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Introduction: Dogs develop an age-associated cognitive dysfunction syndrome with several aspects resembling Alzheimer's disease. Neuropathological alterations include accumulation of amyloid- β -peptides and hyperphosphorylated tau protein. It was the aim of this study to investigate if deposits of misfolded protein cause senescence of canine microglial cells.

Methods: Twenty four dogs were euthanized for medical reasons and their brains examined. The dogs were 2–19 years old (trial no. DEC 2011.III.08.091) and divided into the categories of small (\leq 10 kg), medium (11–25 kg) and large dogs (>25 kg). Brains were dissected from the skull and fixed in 4% paraformaldehyde. Afterwards the

hippocampal formation, the frontal and entorhinal cortex were isolated, vitrificated in 30% sucrose solution and frozen to -80° C. 40 μ m thick sections were made and subsequently stained by immunohistology in order to detect deposits of A β and hyperphosphorylated tau, respectively. Antibodies against Iba1 and human HLA-DR antigen (TAL.1B5) as well as the Filament Tracer of Imaris software were used to analyze microglial morphology and activation status. Stereological analysis methods served for the quantification of A β deposits and microglia.

Results: Within the examined brain regions a progressive increase in $A\beta$ depositions was observed from 9 years on. Especially in the brains of small dogs more plaques were deposited than in medium and large dogs. Hyperphosphorylated tau protein was present in the hippocampal formations of three dogs. Accompanied by increasing age and an associated protein pathology, altered microglial morphology was detected. Alongside with ramified microglia, activated cells were identified in the examined brain regions. Several microglia showed signs of senescence and were present in the brains of dogs with severe $A\beta$ and tau pathology.

Conclusions: This study showed that tau and $A\beta$ pathology can cause senescence of canine microglial cells. A compound between the severity of protein pathology and the presence of dystrophic microglia was observed.

143 - Effect of hydrostatic pressure on collagen and aggrecan expression by articular chondrocytes in vitro J. Schneevoigt, J. Seeger* and M. Bahramsoltani

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Introduction: After any kind of lesions, the articular hyaline cartilage is replaced by fibrocartilage. However, the extracellular matrix of fibrocartilage consists of a high concentration of collagen fibers, particularly collagen type I, and a low content of proteoglycans like aggrecan. This composition does not match the requirements of the articular pressure load. Until now, there is no successful method to produce a cartilage *in vitro* fitting a composition of fibers and proteoglycans as present in hyaline cartilage. The aim of this study was to determine whether the application of hydrostatic pressure might have a beneficial influence on the expression of extracellular matrix components by chondrocytes *in vitro*, in accordance with the hyaline cartilage.

Methods: Human articular chondrocytes were cultivated in vitro without the application of hydrostatic pressure

for 7 days. Afterwards, they were transferred to a bioreactor system applying a hydrostatic pressure of 5 and 10 bar for 24 h. Subsequently, the expression of aggrecan, collagen type I, and collagen type II was investigated and quantified using RT-qPCR. Chondrocytes cultivated exclusively without the application of hydrostatic pressure served as controls.

Results: The application of 5 bar hydrostatic pressure led to a 0.2 fold decrease of the expression of collagen type I and II and a 2.3 fold increase of aggrecan expression compared to the unloaded controls. A pressure load of 10 bar led to a 0.8 fold decrease of the expression of collagen type I and II and showed a 1.7 fold increase of aggrecan expression.

Conclusions: Results show that the application of hydrostatic pressure – particularly 5 bar for 24 h – to chondrocytes *in vitro* positively influences the synthesis of an extracellular matrix towards its composition in hyaline cartilage.

144 - Vascularization of the equine stifle joint with special focus on the menisci *H. Schöpper**

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Introduction: Information on vascularization pattern of the equine stifle joint is needed as (1) arthroscopy and endoscopic surgery techniques are increasingly performed and may potentially harm vessels, and (2) *ex vivo* models of menisci need nutrient supply that mimic the *in vivo* situation. The vascularization of the equine stifle joint is provided by a vascular network receiving blood from the descending genicular artery and branches of the popliteal artery, both deriving from the femoral artery. However, literature on exact branching of the popliteal artery and blood supply of the menisci in horses is still incomplete.

Methods: Colored latex was injected in arteries of nine pelvic limbs of six equine cadavers and allowed to harden for at least 48 h. Subsequently surrounding tissue was removed and occurrence, variation and approximate diameter of vessels supplying the stifle joint were recorded – with special focus on meniscal supply. Furthermore, additional meniscus samples were processed histologically for evaluation of internal vascularization pattern.

Results: Next to the descending genicular artery, 13 branches of the popliteal artery can be described in the horse that feed the vascular network of the stifle joint. While the proximal genicular arteries are considerably smaller than 1 mm, the middle genicular artery and distal

genicular arteries show a larger lumen. Next to these well-known branches of the popliteal artery a multitude of regularly occurring branches to joint structures can be described. With focus on the menisci a vascularization map was created showing blood supply to these intraarticular structures.

Conclusions: Seemingly, there was only a partial description on the blood supply of the equine stifle joint so far that could be expanded now. In addition, the map of meniscal supply is potentially of great importance to both clinicians in preparation of best-suited incisions for arthroscopy as well as for researchers designing new experiments on menisci.

145 - Stunning of water buffaloes in Swiss abattoirs

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Introduction: In 1996, the first water buffaloes were imported from Rumania to Switzerland for milk production. At slaughter, it became apparent, however, that conventional captive bolt guns used for stunning cattle are ineffective in water buffaloes. The aim of this study was to provide information about the water buffalo's forehead and frontal sinus in comparison to cattle, to assess the extent of brain lesions resulting from different stunning methods and to provide a scientific basis for the development of a stunning procedure being adequate for water buffaloes.

Methods: Thirty three heads of slaughtered water buffaloes and eight heads of slaughtered cattle were examined via post mortem diagnostic imaging (computed tomography and magnetic resonance imaging). The anatomy of the heads as well as the brain lesions resulting from stunning were examined in detail, taking into account sex and age differences. In parallel, a questionnaire was distributed to Swiss abattoirs slaughtering water buffaloes in order to gather all stunning methods currently being used. Forehead plates and sagittally bisected heads of stunned animals were reshot with the devices used, thus allowing loss of energy and behavior of the bullets to be assessed.

Results: The water buffalo's sinus is substantially deeper as compared to cattle. Being aware of the ineffectiveness

of the conventional bolt guns, Swiss butchers use specifically designed bolt guns or free projectiles to stun the animals.

Conclusions: Although being effective in most cases, handguns and free projectiles bear the risk of misuse and occupational hazards by through and through shots. The results of this study provide a scientific basis for the development of optimal devices and contact points for stunning water buffaloes in Swiss abattoirs taking into account animal welfare, technical feasibility, reliability and occupational safety. Improved stunning devices and procedures are currently being investigated further.

146 - Immunohistochemical characterisation of spinal ganglia neurons supplying the hip joint capsule in the sheep

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Introduction: Until now the localisation of primary sensory neurons supplying the hip joint capsule has been investigated in the rat, rabbit and sheep but except rat no data regarding their chemical coding is available. The present contribution is the first attempt to reveal immunohistochemical features of sensory neurons innervating the hip joint capsule in the sheep.

Methods: The study was carried out on five sexually $(3 \[Gamma]\]$ and $2 \[Gamma]\]$ mature sheep, weighing 30 kg each. All sheep were deeply anesthetized and injected with 20 μ l of 5% water suspension of a retrograde tracer-Fast blue (FB) into the lateral side of the right hip joint capsule. After a survival period of 5 weeks, the animals were reanesthetized, and transcardially perfused with 4% buffered paraformaldehyde. The spinal ganglia were collected and prepared for further investigations. Sections containing FB+ neurons were processed for double-immunofluorescence method using antisera against CGRP, SP, NPY, NOS, VIP, Leu-ENK, Met-ENK, Gal, VACHT and PA-CAP. The preparations were examined under a confocal laser microscope (LSM 700, Zeiss).

Results: FB+ neurons were found within ipsilateral spinal ganglia and were gathered in upper third of the ganglion. They stained for CGRP–($80.73\% \pm 7.968\%$), SP–($56.37\% \pm 4.842\%$), PACAP– ($52.93\% \pm 2.933\%$), Gal–($50.63\% \pm 19.73\%$) and also for NPY–($34.63\% \pm 6.72$ 7%), NOS–($37.77\% \pm 9.678\%$), VIP–($28.73\% \pm 4.764$ %), Leu-Enk–($27.13\% \pm 14.59\%$) and VACHT– (16.6

7% \pm 9.613). No FB+ Met-Enk-positive neurons were determined.

Conclusions: This study has revealed, the chemical coding of neurons in the spinal ganglia supplying the ovine hip joint capsule. In previous work authors investigated only presence of CGRP in cells supplying hip joint capsule, and found that about 30% of these cells are CGRPimmunoreactive, while in sheep the number of these cells is almost three times higher, which indicates the existence of deep interspecies differences. Functional significance of our findings should be elucidated in further physiological experiments.

All the experiments performed on animals presented in this abstract were approved by the Local Ethics Committee for Experiments on Animals in Olsztyn, Poland. Supported by grant: N N308 593240

147 - Gross anatomy as the foundation of integrated veterinary biomedical curriculum *B. Singh**

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Introduction: The curriculum reform is usually accompanied by reduced times allocated to the teaching of anatomy.

Methods: During the recent review and revision of the veterinary medical curriculum at the University of Saskatchewan, we successfully pursued the argument to integrate the teaching of veterinary biomedical disciplines around the teaching of gross anatomy. The dissection of dog in a regional format is used to teach the comparative anatomy of other veterinary species, and to coordinate and integrate the teaching of histology, embryology, biochemistry and physiology. At the end of teaching of a particular region, we do integrative clinical case studies in groups of 7–8 students (three sessions of 90 min each) to integrate the information from anatomy, physiology and biochemistry. At the end each case study, the whole class is brought together for a wrap-up session.

Results: Through this approach we were able to integrate 650 h of veterinary biomedical teaching with anatomy as the foundation. The students were surveyed on their integrative learning in the first year and followed for another 3 years. The data show that students are retaining biomedical sciences in a more integrated manner and are able to use the information to solve clinical problems. The numerical data will be presented at the congress.

Conclusions: Integration of basic sciences with gross anatomy as the foundation and linkage to clinical scenarios appear to promote integrative learning of the veterinary medical matter.

148 - Prospects of a humane veterinary anatomy: opportunities and problems *F. Sinowatz*, D. Rodler and R. Kenngott*

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Introduction: Teaching veterinary anatomy, histology and embryology deserves further investment to provide students with ethical and effective methods for the acquisition of the necessary anatomical skills.

Methods: In this lecture we review tools and approaches for teaching anatomy, that can be used to in teaching veterinary anatomy that ensure a humane treatment of animals.

Results: The use of ethically sourced cadavers is standard practice in human anatomy. The ethical sourcing of animal cadavers is potentially much easier in veterinary anatomy compared to human medicine. The most important sources are private veterinary clinics and veterinary teaching hospitals. In special donation programmes clients of the clinics agree to donate the cadaver of their companion animal after its natural death. The important issue concerning the preservation and storage of the cadavers is shortly addressed. Important approaches to reduce the number of animals used for anatomical teaching involve the use of models, phantoms and simulators and, increasingly important the use of multimedia-computer simulations, including virtual reality. Selected examples of these teaching methods are given. It will be critically discussed, how these methods may be incorporated into the curriculum.

Conclusions: Teaching veterinary anatomy using multimedia techniques, including virtual reality and the use of ethically sourced animal cadavers will provide ethical and effective methods for teaching veterinary anatomy, histology and embryology.

149 - Histology of the northern elephant seal (*Mirounga angustirostris*) eye

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Introduction: Northern elephant seals (NES) are the deepest diving pinnipeds, reaching depths of 1600 m (Delong et al., 1991: Mar. Mammal. Sci. 7, 369–384), zone of absolute darkness. The purpose of this study was to histologically assess their eyes, determine ganglion cell distribution and to describe adaptations to vision in darkness.

Methods: Tissue samples were collected from the NES and fixed in 10% neutral buffered formalin. Eyes were processed using standardized histological techniques. Intact eyes were used for preparation of retinal wholemounts. Ganglion cell densities were estimated with well-established stereological techniques, using the optical fractionator module of Stereoinvestigator 10.

Results: NES have relatively large, nearly spherical eyes. The iris has well developed pupillary constrictor and dilator muscles; however, the ciliary muscle is poorly developed. The well-developed, cellular tapetum lucidum can be up to 50 cells thick at the eye's fundus. The pigmented epithelium is almost completely devoid of pigments. The photoreceptor layer is predominantly composed of rods. Often, the photoreceptor and outer nuclear layers are folded. The periphery of retina is sparsely populated with ganglion cells, averaging less than 100 cells per mm²; whereas, in the dorsolateral and ventromedial quadrants there are two distinct dense zones of up to 450 cells per mm².

Conclusions: The vascular tunic in NES carries well-developed dilator and constrictor pupillary muscles, as described in other phocids (Jamieson et al., 1972: In: Funct. Anat. Mar. Mamm. Edited by Harrison RJ: Academic Press, London, 2, 245-261; Mass et al., 2007: Anat. Rec. 290, 701-715, Welsch et al., 2001: J. Morphol. 248, 165-174). The thick cellular tapetum lucidum extends throughout the whole vitreous surface of the eyeball, as observed in Weddell seal (Welsch et al., 2001: J. Morphol. 248, 165-174). The retina is characterized by extremely low density of ganglion cells. Other seal species report significantly higher numbers of ganglion cells (Welsch et al., 2001: J. Morphol. 248, 165-174; Mass., 2009: Dokl. Biol. Sci. 429, 575-578). Retinal folding was often observed. This folding was also described in Sperm whale (Mann., 1946: Biologica. 4, 23-71), Harbor seal (Jamieson et al., 1971: Can. J. Zool. 49, 19-23) and Megachiroptean bats (Fejer et al., 2001: Act. Biol. Hung. 52, 17-27). Careful anatomical and histological evaluation of the NES eye revealed a set of traits consistent with scotopic vision adapted eye.

We did not use live animals for this project. We used cadavers of animals which died naturally, since this is a

protected species. For this we had approvals from Western University of Health Sciences, Instructional Animal Care and Use Committee and National Oceanic and Atmospheric Administration.

150 - Relation between rostral cranial fossa and basis of cranial cavity in mesaticephalic dogs

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Introduction: Hydrocephalus is described more often in brachycephalic than dolichocephalic breed of dogs. Cerebrospinal fluid (CSF) travels with olfactory nerves through cribriform plate (CP) to nasal cavity where it is absorbed by lymphatic vessels. Olfactory nerves originate from rhinencephalon which is located in rostral cranial fossa (Evans, H. E., De Lahunta, A., 2013: Millers Anatomy of the Dog, Elsevier Health Sciences). There is possibility that disturbances in CSF absorption in this region may induce hydrocephalus (Rammling M. et al., 2008: Cerebrospinal Fluid Res. 5, 15).

Methods: Morphological investigations were carried out on the skulls of mesaticephalic dogs (n = 30) of various age and both sexes divided into three groups depending on skull index (SI): M1 (n = 16) with SI: 50–57, M2 (n = 6) with SI: 57.01–64, M3 (n = 7) with SI: 64.01–71. Skulls were cut in a sagittal plane. Morphometric study was performed using an electric caliper, exact to 0.01 mm. Following measurements were performed in sagittal plane of the skull: lrcf (length of rostral cranial fossa) the most rostral aspect of cp – caudal edge of *sulcus chiasmatis* (sch), bcc (base of the cranial cavity) cp – basion (b). lrcf/bcc index were calculated.

Results: Mean values of lrcf/bbc indexes for each group were: M1 = 0.481, M2 = 0.462, M3 = 0.449. lrcf/bcc index varied from minimum value of 0.449 to maximum of 0.546 in group M1, from 0.416 to 0.496 in group M2, from 0.402 to 0.501 in group M3.

Conclusions: In mesaticephalic dogs individuals with higher SI index length of rostral cranial fossa has tendency to shortening in regard to basis of cranial cavity. There is need for further research concerning relation between rostral cranial fossa and basis of cranial cavity on larger sample of dolichocephalics, mesaticephalics and brachycephalics.

151 - The morpho-functional peculiarities of the antebrachio-carpo-metacarpal and tibio-tarso-metatarsal joints of brown bears *C. Spataru*¹, *M. Spataru*¹, * and *V. Vulpe*²

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Introduction: The brown bear is a mammal that has mostly four-legged movements, sometimes biped, plantigrade support, but at the same time it is a good climber. Methods: By dissection of five brown bear corpses, the studies have revealed the aspects of the joints angles, surfaces and ligament structures in correlation with habitat condition adapted to moving on land and by climbing. Results: The studies on the antebrachio-carpal-metacarpal and tibio-tarso-metatarsal joints show the morpho-functional peculiarities of these joints as a result of plantigrade support. In the case of antebrachio-carpometacarpal joint, the angle of the joint in extension is about 90 degrees as a result of touching the ground with the entire autopodium. The collateral ligaments are in the shape of two short beams on each row of the bones. The tibio-tarso-metatarsal joint makes an angle of about 90 degrees both in the two-legged and four-legged support. A strong long plantar ligament inserted on the caudal edge of the calcaneus and the fifth metatarsus opposes excessive flexion. The complex tibio-tarso-metatarsal joint performs only flexion and extension movements because the tibio-talar joint is a trochlearthrosis.

Conclusions: The absence of the collateral ligaments of the heel correlated with the distal talus surface being head-shaped and the proximal scaphoid articular cavity allow the lateral and medial movements, required during the climbing.

152 - Peculiarities of falcons' temporomandibular joint and muscles that are acting in prehension

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Introduction: Peregrine falcon belongs to the Falconidae family, has a short beak, curved upper valve over the lower valve. It feeds with small animals they hunt while flying.

Methods: To study the muscles that are acting in prehension three specimens of falcon obtained by shooting were used. By stratigraphic dissection of the head muscles and jaw joints one's follows the presence and appearance of ligament structures that occur in joint movement and strengthen the action of the muscles acting on the lower valve.

Results: The articular condyle of the mandible is lowered to the dorsal edge of it, the supraangular process is reduced and the angular caudal process is rounded with an oblique trochlea, medially oriented. The squamousmandibular ligament appears as a long beam inserted into the aboral orbital process and mandible, under the articular condyle. We found the presence of the lateral quadratum-mandibular ligament that crosses the squamoso-mandibular ligament. It is inserted on the os quatratum and on the ventral edge of the mandible. The caudal quadrato-mandibular ligament appears as a long beam, pearly white, which passes through trochleea of the angular process to insert on the medial angle of it. The articulo-oticum ligament appears as a short and strong fascicles inserted on the medial angle of the angular process. The occipitomandibular muscle is a flat muscle which is inserted on the two crests of the angular process. The masseter muscle is developed, triangularly as aspect and it extends from the temporal bone, under jugal bone, to the dorso-lateral edge of the mandible, near the commissure of the valve.

Conclusions: The lateral quadratum-mandibular and squamo-mandibular ligaments consolidate the joint limiting the lateral movements of the mandible and allow a slight mobility across the jugal bone. The posterior quadratum-mandibular ligament, opposes joint dislocation.

153 - Ultrastructure properties of jejunal vili of pigs fed with the supplement from button mushroom *Agaricus bisporus*

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Introduction: In order to justify investigation of alternative strategies, avoiding antibiotic growth promoters, for the control and prevention of enteric infection in farm animals in intensive farming (VIP project: 17/11/2012) in

this study we examined the effect of supplement of *Agaricus bisporus* on the ultrastructure of jejunal villi in pigs under controlled farm conditions.

Methods: A total of 14 crossbred pigs (Swedish Landrace \times Yorkshire), females and castrates, uniform body weight of about 7 kg, at the age of 28–56 days were used in this experiment. The dietary groups were controlled, one group was fed on basal diet and the other group on diets containing 1% dry supplement of *Agaricus bisporus* from the commercial cultivation of GEA Ltd. Zagreb. 28th day of the experiment, two pigs from each group were euthanised in accordance with the 'Directive for the Protection of Vertebrate Animals used for Experimental and Other Purposes' (86/609/EEC) and jejunal tissue were obtained. Ultrastructure of jejunal villi were visualized by electron microscope type SEM Tescan Mira3 FEG (Center for Forensic Investigations, Research and Expertise 'Ivan Vučetić', Zagreb, Croatia).

Results: Control group of animals, fed with the basal diet showed villous damage with subtotal or total villous atrophy, chronic inflammatory cell infiltration in tha lamina propria, and scattered granulomas without necrosis. There was no visible damage in jejunal villi of animal fed with supplement of *Agaricus bisporus*.

Conclusions: Results of this research indicated protective effects of *Agaricus bisporus* on intestinal vili and provides useful information to allow the design of future experiments aimed at potential role of *Agaricus bisporus* in modeling prevention of enteric infections.

This research was approved by Ethical Commitee of Faculty of Veterinary Medicine, University of Zagreb.

154 - Role of grey scale ultrasound, ceus and elastography in primary lymph node assessment of mammary gland neoplasia in carnivores

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Introduction: In humans, after cardiovascular diseases, cancer has a primordial role in morbidity. In animals, particularly carnivores, cancer's favorite location is the mammary gland (Stan F., 2009: Bulletin UASVM, Veterinary Medicine, 66 (1), *114–120*; Stan et al., 2010: Anato-

mia Histologia Embryologia *39*, *2870*). Most mammary gland neoplasia metastasize through the lymphatic system, therefore primary lymph node status and its evaluation is an essential requirement in staging and subsequent therapeutic attitude (Stan F. and Badea R., 2012: Bulletin UA-SVM, Veterinary Medicine, 69 (1–2) *220–226*).

Methods: Grey scale ultrasound, Contrast Enhanced Ultrasound (CEUS) and elastography were used to assess primary lymph nodes in fourteen subjects with mammary gland tumors and in nine clinically healthy subjects. Histological examinations of primary lymph nodes were performed in all cases. Before excision, the primary lymph nodes identification was performed by injecting coloring solution, peritumoral in subjects with mammary gland tumor, and in mammary gland parenchyma in healthy subjects.

Results: Lymph nodes heterogenicity and irregular appearance of lymph nodes capsule were statistically significant for metastatic lymph nodes. CEUS showed the presence of necrotic areas inside the metastatic lymph nodes, without contrast media uptake in the late phase in these areas. Elastography showed areas of higher stiffness (blue areas) in metastatic lymph nodes, corresponding to malignant lesions. Histological examinations certify the presence of metastatic infiltration in the lymph nodes as described above.

Conclusions: Compared with conventional ultrasound techniques, CEUS and elastography showed a high specificity in the evaluation of metastatic lymph nodes. These techniques provide valuable information in differentiating benign from metastatic lymph nodes and have a great importance in early identification of lymphatic metastatic dissemination.

The Institutional Bioethics Committee of University of Agricultural Science and Veterinary Medicine in accordance to Directive 2010/63/EU of the European Parliament and of the Council on the protection of animals used for scientific purposes approved the study.

155 - Anatomical differences and similarities of liver and hepatic ligaments in rabbits and guinea pigs

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Introduction: Rabbits and guinea pigs are widespread as pets and as an experimental model, both in human and veterinary medicine. This aspect requires a detailed knowledge of the anatomy of Lagomorphs and Rodents

species (Stan F., 2013: AgroLife Scientific Journal 2 (2), 73–78; Stan *et al.*, 2013: Bulletin UASVM Veterinary Medicine, Cluj Napoca. Veterinary Medicine, Book of abstracts, 2, 102). The aim of this study is to describe the anatomical differences and similarities of a major component of digestive system – the liver.

Methods: Two groups, consisting of ten adult rabbits and ten adult guinea pigs, clinically healthy, with various weights were used. Following dissection, using anatomical techniques, the topography, hepatic ligaments and external configuration of liver were documented.

Results: In both species, the liver appeared divided by an obvious cleft in two territories: right and left. Guinea pigs have six hepatic lobes: right lateral, right medial, quadrate, left medial, left lateral and caudate, while rabbits presented five lobes, the right lobe being not clearly divided. The caudate lobe was subdivided into caudate and papillary process. In both species, on the caudate lobe the right kidney imprint was noted. In rabbit, the quadrate lobe was less developed compared with guinea pigs. In guinea pigs, the ventral segment of gallbladder exceeds the ventral edge of the liver. The falciform ligament is incomplete in rabbits. Both right and left hepatic ligaments were present in guinea pigs, while in rabbits this feature was noted in two subjects. The hepatorenal ligament in rabbit had a long parietal insertion. The lesser omentum has the same insertion in both species.

Conclusions: Relevant differences exist in anatomical liver conformation and connection structures in rabbit and guinea pigs. These anatomical differences are important and useful in clinical application.

The Institutional Bioethics Committee of University of Agricultural Science and Veterinary Medicine in accordance to Directive 2010/63/EU of the European Parliament and of the Council on the protection of animals used for scientific purposes approved the study.

156 - Mast cells distribution in the intramural part of normal porcine *Ductus Choledochus* and *Papilla Duodeni Major I. S. Stefanov*^{1,}*, *A. P. Vodenicharov*¹, *N. S.*

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Introduction: In recent years, newly identified roles of mast cells or individual mast cell products, such as proteases and IL-10, in host defense, cardiovascular disease

and tumor biology, and in settings in which mast cells have anti-inflammatory or immunosuppressive functions have been discussed (Galli et al., 2008:. Nat. Rev.Immunol. 8, 478-486). Berberine sulphate has been used to stain rat and swine tissues to distinguish between mucosal mast cells and connective tissue mast cells because it forms a strong fluorescent complex with heparin proteoglycan (Forsberg et al., 1999: Nature 400, 773-776; Humphries et al., 1999: Nature 400, 769-772; Xu, L et al., 1993: Histochemical Journal, 25, 516-522). Since cytochemical peculiarities of mast cells in porcine Ductus choledochus and Papilla duodeni major of domestic swine are not established, we aimed to estimate their distribution and as well as to identify the heparin in order to elucidate their role in the physiological and pathological processes in this organs.

Material and Methods: A histochemical study of mast cells in the intramural part of the *Ductus choledochus* and *Papilla duodeni major* was performed in six male and six female pigs at the age of 6 months. Tissue samples were collected at the slaughterhouse and fixed in Carnoy's fixative 30 min after dead of pigs. Serial sections were stained with toluidine blue. For comparative purposes, other sections were stained with berberine sulfate.

Results: Mast cells density in different layers of the studied organs was determined after estimating their number per 1 mm². The statistical analysis of data was done by the Student's *t*-test. Their number was higher in propria than musculature. It was established that 75% of all toluidine blue stained mast cells contain heparin.

Conclusions: The data obtained allowed to suggest that mast cells in *Ductus choledochus* and *Papilla duodeni major* are probably involved not only in local homeostasis maintenance, but they are also important for the smooth muscle relaxation or contraction in these organs.

157 - Quantitative analysis of gold nanoparticle uptake by neural cells in culture A. Stojiljkovic*, K. Kühni-Boghenbor, V. Gaschen and M. H. Stoffel

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Introduction: By definition, nanoparticles range from 1 to 100 nm in diameter irrespective of the material they consist of. Their use in various fields of biology and medicine has dramatically increased over the last years as they hold many promises in cosmetics, microsurgery and drug delivery (Lévy R. *et al.*, 2010: Nano Reviews 1, *1–18*). However, due to their often unpredictable behaviour and obscure metabolism, they may represent serious hazards

to living organisms (Gehr P. *et al.*, 2011: Compr. Physiol. 1, *1159–1174*). The goal of the present study, therefore, was to investigate the internalization of specifically designed colloidal gold nanoparticles by different cells in culture. Epipolarization and high content analysis were used to provide extensive quantitative data on particle uptake.

Methods: N9 microglial cells and SH-SY5Y neural cells were exposed to various concentrations of native and specifically coated colloidal gold particles of different sizes (15, 40 and 80 nm) for 2 h (Frens G., 1973: Nat. Phys. Sci. 105, 20–22). After fixation of the cells, gold particles were visualized directly by epipolarization after silver enhancement. Data acquisition, segmentation and statistical analysis were performed with the InCell Analyzer 2000 (General Electrics). Intracellular localization was assessed by transmission electron microscopy.

Results: Readiness to take up nanoparticles was significantly higher in N9 than in SH-SY5Y cells. Irrespective of the cell type, uptake of gold nanoparticles was strongly affected by size, electric charge and protein coating.

Conclusions: High content analysis is a powerful tool to quantitatively assess the uptake of nanoparticles in cell culture. Gold particles can be visualized and analyzed quantitatively by epipolarization. Thus, the approach presented herewith provides a unique and elegant key to assessing the impact of size, charge and any protein coating on *in-vitro* uptake of nanoparticles.

158 - Immunoreactivity to calcium-binding proteins in the hippocampus of the chinchilla *R. Szalak*, J. Jaworska-Adamu and M. B. Arciszewski*

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Introduction: The hippocampus plays an important role in memory shaping, formation of addiction and in the pathogenesis of many diseases of the central nervous system (CNS). At the central level, several factors are thought to regulate these processes also by binding to Ca^{2+} . The expression patterns calcium-binding proteins (CaBP) have been studies in CNS of most of laboratory rodents. Recently, chinchilla has been recognized as species useful in biomedical research. In the present study we hypothesize that CaBP may be present in the hippocampus.of chinchilla.

Methods: Formalin-fixed, paraffin-embedded mature chinchilla brains were cut into 10- μ m sections. Sections were immunohistochemically stained with antibodies raised against parvalbumin(PV), calbindin-D28k (CB) or calretinin (CR) employing the peroxidase-antiperoxidase (PAP) method. Stained slides were subjected to histomorphometric analysis.

Results: Immunoreactivity to PV, CB and CR was incidentally seen in neurons of CA1, CA2, CA3 fields as well as in dentate gyrus (DG) of the hippocampus. In CA4 field moderate numbers of CR-immunoreactive neurons were observed. Few neurons showing intense immunoreactivity to PV were found in the hippocampus and DG. Neurons with intense immunoreactivity to CB and CR were found in CA2 field. Neurons showing moderately intense immunoreactivity to CB and CR were observed in few neurons of CA1 and CA3 fields as well as in DG.

Conclusions: The present study revealed relatively moderate expression of PV, CB and CR in neurons of the hippocampus and DG in chinchilla. The obtained results suggests that CaBP in chinchilla hippocampus may play a similar role(s) to those previously described in other species. To further explore this, studies determining the chemical code of CaBP-expressing neurons are necessary.

All the procedures involving the use of animals are in accordance with the ethical principles approved by IInd Local Ethical Committee at the University of Life Sciences Lublin, Poland.

159 - First osteometric study of sheep skulls (*Ovis aries*, L. 1758): Ouled Djellal breed (Algeria)

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Introduction: The native Algerian sheep breed (Ouled Djellal) has been very little studied and this study aims to achieve for the first time an osteomorphometric approach of skull bones.

Methods: Thirty sheep skulls were used. For each animal, age and sex were recorded. The entire head was collected at the slaughter house and prepared at the anatomy laboratory of Constantine. Each skull was measured (24 linear measurements) and four indexes were calculated. For the

dorsal part of the skull (respectively the mandible), 7 (1) measurements of width, 7 (3) of length and 2 (4) of height were performed. The sexual dimorphism was analysed and the skull values were compared with other sheep breeds. These preliminary results are based on a sample of 15 males and 15 females (<1 to >8 years old): all are older than 6 months (considered to have reached their adult size).

Results: Sexual dimorphism is much more relevant on height (8% more in males than in females) and width (5.5% more in males than in females) measurements (and on the indexes calculated with these parameters) than on the length (2% more in males than in females) of the skull. Comparing the Ouled Djellal skulls to a previous study on 10 recent breeds (Guintard C. and Fouché S., 2008: Rev. Méd. Vét. 159, 603-617), with CB19 = f (CL10), we can conclude that this breed is located into the variability of the 'rustic breeds' group.

Conclusions: The variability and correlation among variables were analysed and provide reference data for zooarchaeology. These data allowed us to reveal the most relevant measurements that can be used to study skulls in Sheep. The main purpose of this tool is to compare unknown populations, such as fossil ones, to present sheep breeds, in order to increase our knowledge of domesticated sheep history, from its origins to the present day.

160 - Morphological aspects of the masculinization process in chickens

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Introduction: The sexual dimorphism in chickens refers to the differences between the hen and rooster regarding the secondary sex characteristics. In the present study, three chickens presenting male characteristics were used. The aim was to describe the changes that occur in the masculinization process and correlate them with the morphology of the genital tract and with the endocrine status. *Methods:* The chickens were selected and studied firstly based on their behavior and gross anatomy, afterwards, blood samples were taken for the determination of oestrogen and testosteron levels. For the morphology of the genitalia both gross anatomy and histological aspects were researched. The samples for histology were cut at 5 μ m and stained HE and PAS. Results: All three cases showed behavior changes, overgrowth of the comb, chin and spurs, colorful plumage, which are secondary sexual characters specific for males. Macroscopically, in the female genitalia, the first chicken presented a tumor; the second an ovarian congestion and cyst of the right Müller duct reminiscences; and the third an ovotestis and left oviduct with normal morphology. The ovotestis consists of an ovarian part on the outside and the testicular area on the inside. The ovarian structure presents few primary and secondary follicles, some in necrobiosis. The testicular structure presents seminiferous tubules with Sertoli cells and spermatic immature cells that have a pycnotic nucleus - sign that they will not develop further into spermatozoa. Between the seminiferous tubules there are Leydig glands. The oviduct of this chicken presents a normal histological structure. The testosterone level is five times higher than average and the oestradiol levels are lower or normal.

Conclusions: In chicken, the masculinization phenomenon is correlated with the inhibition of ovarian function that can be caused by different factors.

The research has been approved by the ethical committee of the FVM, Iaşi.

161 - Ultrasonography application in the early gestation diagnosis in cows and buffalo cows

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Introduction: Ultrasonography is a medical imaging technique based on ultrasound echo application. It is a morphological method, based on the good correlation between the ultrasonographic and anatomical aspects, providing important data on parenchimatous viscerae pathology. It is a non-invasive procedure that offers complex diagnostics data for the clinician. This study assessed the early diagnosis of gestation in the cow and buffalo cow and also obtained ultrasonographic images regarding the gestant uterus topography, the aspect of the uterine wall and of the caruncles during gestation, the presence of foetal liquids and of foetal vital signs.

Methods: Multiple ultrasound examinations have been performed on cows and buffalow cows of various ages, both at the Faculty of Veterinary Medicine of Cluj-Napoca, and on the field, in the Suciu de Sus commune,

Maramureş county. The animals were restrained, their rectal ampula was emptyed. The ultrasound examinations were performed using the transrectal approach with a lubricated probe, by scanning the uterus and the ovaries. Results: At 30 days of gestation, the bovine and buffalo foetus presents the outline of the adult animal: the cepahlic vesicle, the foetal neck, and the burgeons of the members - the somites, become visible and also the ombilical cord. At 45 days of gestation several foetal components become visible: the foetal skeleton, several viscerae, the heart and the heart beat, and the vertebral canal as well. Conclusions: The earliest interval for a precise ultrasound gestation diagnosis in cattle and buffalo is at 27-35 days from the of the mount. At 40-50 days of gestation, the clinical transrectal examination in cattle and buffalo retains a high error risk (approx. 43%). The use of the ultrasound diagnosis in this interval is thus extremely useful.

162 - Histological and histochemical studies on the lacrimal gland of the Bilgorajska geese

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Introduction: Bilgorajska geese are placed on the World Watch List for Domestic Animal Diversity (FAO, UNEP). The secretion of the lacrimal gland is part of the water layer of the corneal film. Therefore, knowledge of the structure of the gland is important in veterinary ophthalmology.

Methods: The study was conducted on 13 adult females of Bilgorajska goose. This material was obtained as a result of natural death of birds. Morphometric measurements of lacrimal gland were performed using an electronic caliper. Tissue sections stained with H&E, Azan, PAS, AB pH 2.5, AF and HDI. The preparations were examined using Zeiss Axio Scope A1 light.

Results: The lacrimal gland was located in the dorsolateral angle of the orbit, between the lateral straight and dorsal straight muscles, close to the pyramidal third eyelid muscle and the tendon of pyramidal muscle. The mean size (length × width × thickness with SD) of the LG was 5.3 $(\pm 3.3) \times 4.4 \ (\pm 3.1) \times 1.9 \ (\pm 0.5)$ mm. The LG pos-

sessed one excretory duct, which entered the conjunctival space beneath the lower eyelid. The lacrimal gland of Bilgorajska geese had a tubulo-acinar structure of a mucous nature. The acini were composed of tall conical cells, which encompass a small lumen and are surrounded by myoepithelial cells with eosinophilic granular and vacuolated cytoplasm. The excretory duct was lined with the basal layer of cuboidal cells. Histochemical studies of the secretory cells, showed the presence of mucoprotein, neutral mucopolysaccharides, sulfated acid mucopolysaccharides and carboxylated acid mucopolysaccharides. We have not identified any goblet cells.

Conclusions: The LG morphology, histology and histochemistry differ significantly not only between vertebrates' classes, but also between particular species within each class. Therefore, further investigations can bring interesting results that will contribute to our knowledge of the LG morphology and function.

163 - Features of the ascending aorta and of its emerging branches in swine

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Introduction: Following a compared literature study regarding the ascending aortic segment and the aortic arch made in humans and in swine, besides underlining the numerous differences between these two species, we noted that there are many intraspecific differences in humans, referring to the number and topography of the emerging aortic branches. Taking into consideration the many existing similarities of the cardiovascular system between these species, our investigations focused on the incidence and the manner in which these particularities can be found in pigs.

Methods: The research was performed on eight crossbreed adult pigs, weighting between 70 and 100 kg, from different breeders. To highlight any features found in the ascending segment of the aorta and in the aortic arch, we isolated the related arteries, then injected them with colored latex, to better highlight the blood vessels. After the injection, the dissected pieces were kept for 48 h in a 2% formaldehyde solution, for fixation, and after that the dissection was completed. *Results:* The research group has shown no intraspecific differences in the ascending aorta and in the aortic arch. The encountered particularities are characteristic to this species and refer to the presence of an aortic bulb with a caliber similar to that of the aortic arch and well-developed sigmoid valves. Also, the left subclavian artery is better developed than the right one. After emitting the right subclavian artery, the brachiocephalic trunk is continued by a short bicarotid segment.

Conclusions: The initial aorta segment presented only features characteristic to the studied species. It was confirmed that the ascending aorta is missing as an individual segment and the aortic arch is very well represented. The common carotid arteries are less developed compared to the subclavian arteries.

This study was approved by the Bioethical Committee of the Faculty of Veterinary Medicine of Cluj-Napoca, Romania.

164 - Anatomical description and ultrasonographic identification of the venous pulmonary circulation in horses

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Introduction: In humans, pulmonary venous circulation has been thoroughly studied because of its importance in relation to atrial fibrillation and mitral valve dysfunction. Despite the clinical importance of these conditions in horses, the pulmonary venous circulation has hardly been investigated. The aim of our study was to describe the drainage of the different parts of both lungs through the pulmonary vein ostia into the left atrium and to use these data to identify these structures on echocardiography in healthy horses.

Methods: By anatomical dissection and silicone casting of twelve equine cardiopulmonary packages, the branching pattern of the pulmonary veins and the position of the pulmonary vein ostia were visualized and described. In four horses, echocardiography was performed from a left and right parasternal view to demonstrate the pulmonary vein ostia *in vivo*.

Results: In general, four pulmonary vein ostia can be found in horses, two of which drain the caudal parts of either lung and open dorsocaudally in the left atrium. The first ostium drains the cranial and middle parts of the left caudal lung lobe and the second drains the caudal

part of both caudal lung lobes. The cranial border of the third antrum, draining the cranial parts of the right lung, merges with the interatrial septum, which can be used as a useful reference point during echocardiography. The antrum of the fourth and most cranial ostium collects blood from the left cranial lung lobe and extends at the left side of the pulmonary trunk in craniodorsal direction. Echocardiography allowed clear visualization of the second, third and fourth ostium. Visualization of the first ostium requires further validation.

Conclusions: The anatomical study of the equine pulmonary veins allowed to describe the pulmonary venous drainage into the left atrium. The different pulmonary venous ostia and antra could be identified on echocardiography.

165 - Micro-architecture of ovine tonsils

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Introduction: Tonsils play an important role in induction of immunity. However, not all of their working mechanisms are fully unravelled. The mechanisms by which antigens are transported through the reticulated epithelium, nor their further processing are precisely known. In contrast, lymph nodes have a known and well-investigated functional micro-architecture, with antigens being transported through conduits in the reticular network depending on their molecular weight, while immunological cells and substances are guided via the very same network. Bearing in mind the importance of tonsils as the first line of defence, the present study aims to investigate their functional organisation and micro-architecture enabling and enhancing the induction of immunity.

Methods: All studies were performed on ovine tonsils due to the anatomical similarity with their human counterpart. Palatine and pharyngeal tonsils were obtained from freshly slaughtered sheep. Multiple techniques were combined, including immunohistochemistry, double immunofluorescence, general histological stainings and scanning electron microscopy.

Results: Tonsils appeared to be constructed in a similar way to lymph nodes, both possessing a reticular network built up from collagen-I fibres, along with collagen-IV and laminin, while the reticulin staining showed the presence of collagen-III. These fibres divided the parenchyma in four different micro-environments: the subepithelial, interfollicular, basal and B-cell associated network. Blood and lymph vessels were surrounded by reticulin, connecting

them to the reticular network present throughout the parenchyma. High endothelial venules were most abundant underneath B-cell follicles and close to lymph vessels.

Conclusions: The ovine tonsillar subepithelial architecture is comparable to that of the lymph node parenchyma and is therefore possibly capable of functioning in the same way, along with its function as connective supporting tissue. Application of additional markers and functional studies could provide further insight in the functional morphology of tonsils.

166 - Additional anatomical markers for ageing roe deer in the field

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Introduction: The standard ageing technique in roe deer focuses on different teeth characteristics, nasal septum ossification and sometimes additional markers such as antler pedicle morphometry. However, these methods often lead to ambiguous results or are too circuitous to be performed in the field. The present study aims to find additional and readily accessible markers for roe deer ageing in wildlife management.

Methods: Growth plates were investigated in sixty skulls, ten vertebral columns and leg bones of thirty roe deer of various age. Mandibular teeth were used to estimate the age range. Additionally, two reference animals of known age were examined. Growth plates were defined as being (wide) open, closing, closed or disappeared.

Results: Most of the growth plates close in the first or second year, providing no further help in determining the age of elder deer. Nearly all cranial sutures either closed within the first year or remained visible in all specimens. The intersphenoidal synchondrosis closed at variable age, but always before the age of five, the first closure being observed in the second year. All vertebral growth plates closed early and before 2 years of age. In the appendicular skeleton, nearly all growth plates began to close in the second year. At the age of two, all growth plates in the front legs had closed except for the distal ulnar ones. In the hind legs, the growth plates of the tibial tuberosities closed last, beyond 16 months of age. All growth plates in the legs were closed at the age of four.

Conclusions: Examination of the growth plates in roe deer could be helpful in age determination. Some growth plates in the legs close between 16 months and 4 years of age. However, more research needs to be conducted on marked deer of known age to validate these data.

167 - Anatomic, ultrasonographic and magnetic resonance study of the canine elbow joint

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Introduction: Ultrasonographic (US; Lamb and Wong, 2005: Vet. Radiol. Ultrasound Ultrasound 46, 319–325) and Magnetic resonance imaging (MRI; Baeumlin, et al., 2010: Vet. Surg. 39, 566–73) studies of the canine elbow joint have been previously reported. The purpose of this study was to assess the canine elbow joint soft tissue using US and MRI and correlate the images with plastinated anatomical sections obtained on the same planes used in the imaging protocols.

Methods: Anatomical study: transparent anatomical sections (2 mm thick) were obtained from 10 forelimbs frozen at -70° C obtained from five German Shepherd-crossed breed dog cadavers; sections were preserved using the E12 plastination technique. Ultrasonographic study: 10 elbow joints from five live German Shepherd-crossed breed dogs were ultrasonographically evaluated using an 18 MHz linear array. Magnetic resonance study: six elbows from three German Shepherd-crossed breed dog cadavers were evaluated using T1 and T2 techniques. Correlations between ultrasonographic, MR and anatomic images were made.

Results: Assessed structures during US and MRI include the biceps brachii muscle, the medial humeral epicondyle, the insertion tendons of brachialis and biceps brachii muscles, the medial collateral ligament and the medial coronoid process. There was a good correlation between the diagnostic imaging techniques results and the anatomical sections.

Conclusions: Soft tissue structure visualization corresponded to that obtained in previous studies; however in this study a better ultrasonographic resolution of structures was observed. In particular, the attachment of the tendons of biceps brachii and brachialis muscles attachment on the ulna was described in this study, which has not been reported in previous publications. Plastinated anatomic sections allowed a better interpretation of US and MRI images of the canine elbow joint.

168 - Distribution of mast cells in porcine lumbar spinal ganglia

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Introduction: Mast cells are characterized by a large complement of secretory granules which store a wide variety of mediators, including biogenic amines, neuropeptides, cytokines, sulfated proteoglycans and neutral proteases (Johnson and Krenger, 1992: Res., 17, 939-951; Silver et al., 1996: Trends Neurosci, 19, 25-31; Galli et al., 2005: Nat. Immunol., 6, 135-142). When released in the central nervous system, mast cell secretory products can alter the function of neural (Khalil et al., 2004: In Keystone Symposium on Mast Cells in Physiology, Host Defense and Disease: Beyond IgE. Taos, New Mexico. p. 57) and vascular elements (Esposito., et al., 2001: Brain Res., 888, 117-127). The aim of the current study was to establish the localization and density of mast cells in porcine spinal ganglia. Mast cells granules contain different neurotransmitters that may play an important role in nociceptive transmission.

Methods: Localization and density of mast cells in the lumbar spinal ganglia was carried out in 12 pigs (six males and six females) aged 6 months. Animals were slaughtered for meat consumption in a slaughterhouse according to Bulgarian laws. Whole ganglia were obtained from the pigs on the slaughterhouse and then fixed in Carnoy's fixative, 30 min after animals dead. Serial sections of 6 μ m were stained with toluidine blue. Other sections were stained with 0.02% aqueous solution of berberine sulfate.

Results: Mast cells localization and density in the ganglia were established after estimating the number of these cells per ganglion. Mast cells were observed predominantly in the ganglion capsule near the blood vessels. Some of the studied cells were localized in the vicinity of satellite cells and near the perikarion of neurons. The statistical analysis of data was performed using the Student's *t*-test. It was found out that 67% of toluidine blue stained cells contain heparin.

Conclusions: Our results proved the presence of mast cells in normal porcine ganglia and suggest a possible role of these cells in modulation of neurons function. The presence of mast cells near the blood vessels is most probably related with increasing microvascular permeability and therefore their influence on the pathological processes at this location.

169 - Expression of steroidogenic acute regulatory protein (STAR) and 15hydroxyprostaglandin dehydrogenase (HPGD) in bovine placentomes at parturition J. von Hof¹, N. Sprekeler¹, G. Schuler², M. P. Kowalewski¹ and A. Boos¹.*

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Introduction: The steroidogenic acute regulatory (STAR) protein is the rate-limiting factor in the synthesis of steroids and 15-hydroxyprostaglandin dehydrogenase (HPGD) an enzyme metabolizing prostaglandins; both are important players regulating endocrine events during late pregnancy. In the bovine placenta HPGD expression and activity are stimulated by progesterone and downregulated by progesterone-receptor blockers and glucocorticoids. Only limited information is available on the expression patterns of these factors, and their role in the signal cascade leading to parturition is virtually unknown. Methods: Aim of this study was to characterize STAR and HPGD expression in bovine placentomes during late gestation (D272, n = 3), at normal term (NT, n = 5) and after induction of parturition on day 270 using the prostaglandin F2 α analog cloprostenol (PG, n = 3; induction of luteolysis), the progesterone-receptor antagonist aglepristone (AP, n = 3; withdrawal of placental and luteal progesterone effects) and the glucocorticoid dexamethasone (GC, n = 4; mimicking prepartal increase in fetal cortisol). Expression of STAR and HPGD mRNA was investigated by real-time PCR, at the protein level immunohistochemistry was applied.

Results: STAR mRNA was found in all samples with significantly lower expression in AP cows (P < 0.001) and D272 cows (P < 0.01) compared to NT, PG and GC cows. STAR protein was restricted to uninucleate trophoblast cells. Placentomes of AP cows (P < 0.001) and GC cows (P < 0.01) showed significantly lower HPGD mRNA expression compared to D272, NT and PG cows. HPGD protein was detected in uterine epithelial and uninucleate trophoblast cells.

Conclusions: Results indicate that in placentomes of prepartal cattle STAR is up-regulated at normal term and at GC or PG induced parturition and thus possibly stimulating estrogen synthesis. HPGD expression is downregulated by AP and GC, which can be related to the increased prostaglandin release during luteolysis and their role in myometrial contractility.

The animal experiments were approved by the local ethical committees on the use of animals for research purposes (Regierungspraesidium Giessen, No. V54-19c-

20-15(I) Gi 18/14-No. 41/2007; LAVES, 33.9-42502-04-09/1634; Ethical Committee of Uludag University of Veterinary Medicine, No. 401/1510-26.03.2007). The support of Dr. G. Özalp and Prof. C. Pfarrer is gratefully acknowledged.

170 - Combining sheet plastinates and anatomical photography *C. von Horst**

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Introduction: Sheet plastinates provide specific insights into the anatomy. In addition the details and functional aspects recognizable in a real anatomical plastinate are more authentic and fascinating than pictures in books or on the screen. This is particularly important if the anatomy shall also be presented in nature museums, secondary schools, etc. (von Horst, C. and Henry, R.W., 2012: BJVM 15, Suppl.1, *50*). On the other hand the use of pictures has obvious advantages. The goal of this study was to find ways how real sheet plastinates and pictures thereof can be combined with synergistic effects.

Methods: Sheet plastinates of various animal species were prepared using the patented Tissue Tracing Technique (TTT), Selective Impregnation (SI) and regular flat chamber sheet plastination. Overview and detail pictures were taken from finished sheet plastinates. The pictures were edited and labelled if necessary. Prints were produced in various sizes, on different materials and presented in combination with real sheet plastinates, acrylic embedded prints and screen presentations.

Results: Enlarged overview prints and labelled detail views of plastinates can highlight specific aspects and provide a better understanding of the anatomy than plastinates alone. A combination of a real sheet plastinate with high resolution detail images of the same specimen allows the user to track back any visible detail and given information to the real specimen.

Conclusions: Combining the authenticity and fascination of a real sheet plastinate with labelled detail views and enlarged pictures produces a strong synergistic effect. People tend to verify the information provided in the pictures immediately by looking at the real specimen. The effect is much higher if the specimen shown in the pictures and presented in reality is identical and clearly recognizable.

171 - Comparative aspects of liver tumors diagnosed through clinical, imaging and laboratory methods in cats and dogs *C.-A. Vulpe^{1,*}*, *E. Gavrilas²*, *S. A. Pasca³*, *C.*

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Introduction: In dogs or cats, the radiographical examination of the liver is a basic part of the imaging examination of the abdomen as a whole. It is performed directly, to appreciate the shape and the size of the liver, the relations with the neighboring organs or the presence of suspicious bodies. The aim of this study is to prove the correlation between an initial radiographic examination and other imaging techniques and to make a comparison between types of liver tumours in dogs and cats. (Barbara, 2008: 33rd World Small Animal Veterinary, Congress, Dublin, Ireland, 508–509; Larson, 2012: In Thrall Textbook of Veterinary Diagnostic Radiology, Saunders Elsevier, 679–694; Meuten, 2002: 4th Edition Iowa State Press, 483–508; Nyland *et al.*, 2002: Ed 2, Philadelphia, Saunders, 93–27).

Methods: Six dogs and five cats were clinically examined. The criteria these specific cases were selected was the presence of suspiciously tumoural bodies inside the abdomen. The special techniques used for further investigating the cases were: the radiographic and the ultrasound examination and the ultrasound-guided fine needle aspirate. The last technique that was used was the necropsy. All six dogs presented suspicious bodies inside the abdomen. All five cats had suspicious bodies inside the abdomen, but four also had mammary tumours.

Results: The dogs were found to have liver tumours of three types and the cats were proven to have liver tumours of two types. The clinical and imaging results were corroborated with the ones from the laboratory and have all led to this diagnosis.

Conclusions: The examined dogs presented: an adenocarcinoma in three of the six studied cases, a carcinoma in two of the dogs and a cholangiocarcinoma in a single case. In the case of the cats, four out of five presented various evolutionary stages of a lymphosarcoma, while one single case was diagnosed as an adenocarcinoma. The studies are preliminary and will be continued in some specific PhD theses.

172 - Studies of radiological anatomy performed with a contrast substance of the digestive tractus in adult quails (*Coturnix coturnix*)

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Introduction: The experiments aimed to radiologically explore the digestive tractus in the Quail (Coturnix coturnix), using a contrast substance. The radiological results were supplemented by the necropsic examination that pointed out various macroscopic aspects of the digestive tractus (Aptekmann *et al.*, 2001: Anat Histol Embryol., 30 (5), 277–280; Baraldi *et al.*, 2010: Pakistan Journal of Zoology, 42, 6; Hena *et al.*, 2012: Scientific Journal of Veterinary Advances, 1(2), 57–64). This is the first time that the radiological examination using a barium sulphate solution has been applied in quails.

Methods: Five quails of 45 days of age were anesthesised using ketamine (2 mg/100 g/live weight, intramuscular). The radiological technique consisted of X-raying with and without the contrast. Lateral and dorsal-ventral positions were used. The second method consisted of necropsic examination, particularly macroscopic investigation.

Results: Usually, the esophagus is a difficult part to identify radiologically, due to its' accelerated transit. The integrity of the crop along with possible perforations were identifiable. The small intestine and the large intestine were easy to identify by X-rays performed 10–15 min after the oral administration of the contrast substance.

Conclusions: The studies prove the fact that the oral administration of a solution of barium sulphate rapidly crosses the area of the true stomach and of the gizzard; this area is thus radiologically marked in a dull manner, which is why multiple administrations are necessary. The necropsic examination completes the information resulted from X-rays and verifies the data concerning the peristalsis and the relative standstill of the contrast substance in the various digestive segments.

This study was approved by the Committee of Ethics and Deontology of the faculty.

173 - Application of X-ray microtomography for comparative embryology in teaching and science

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Introduction: The preparation of serial sections from embryos for electron microscopy is laborious and destroys the valuable sample which is problematic in particular in species where embryos are not easy to obtain. Especially for teaching purposes, the demonstration of a whole embryo in fine resolution is a useful tool for comparative embryology. Therefore, a method that enables both isotropic 3D imaging and the depiction of cellular and subcellular structures using light and transmission electron microscopy (TEM) is desirable.

Methods: We applied X-ray microtomography (microCT) for imaging horse embryos that were fixed and embedded following standard procedures for TEM. Before scanning, sharp edges were removed from the resin block to avoid artifacts in the tomographic reconstruction. Samples were scanned using an XRadia MicroXCT-200 at voxel resolutions of approximately 4 μ m. Reconstructed volumes were visualized using the 3d software package Amira 5.3

Results: The microCT scanning procedure results in high contrast 3D images. Image contrast is a result of high X-ray density of osmium compared to low x-ray density of the epoxy resin. In Amira 5.3, volume visualizations and virtual sections in every desired plane allow to understand the position and orientation of even small structures within the embryo. Subsequently to microCT examination, serial semithin and ultrathin sections can be prepared in a clearly defined sectioning plane. Images of the semithin and ultrathin sections can then be integrated into the 3D volume. As a major advantage of this technique, fine structure details can be depicted in their original position and orientation within the sample.

Conclusions: MicroCT imaging is suitable to produce quantitative, high-resolution images of animal embryos and fetuses without destroying the specimens. Moreover, standard procedures as applied for TEM are suitable to obtain satisfying image contrast. This technical application is useful in comparative developmental studies in teaching and science.

174 - The prepollex of elephants

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Introduction: The prepollex of elephants supports the foot cushion on its caudomedial side. By some authors, the prepollex is regarded as a sesamoid structure which may ossify later in life (Hutchinson *et al.*, 2011: Science 334, 1699–1703). It is described to form a very mobile articulation with the first metacarpal bone and that muscles insert on it. Due to our previous experiences (Weissengruber *et al.*, 2006: J. Anat. 209, 781–792) we doubted these findings. It is unclear whether the prepollex is completely cartilagineous as described before and which type of cartilage it contains.

Methods: We dissected five juvenile African elephants that were shot as part of the regular elephant culling programme in the Krüger National Park (South Africa) and one over 40 years old female Asian elephant that died naturally in Austria. From one African and the Asian elephant, tissue samples representing the complete prepollex and the connection between prepollex and metacarpal bone were collected, fixed in buffered formalin and processed histologically.

Results: In both African and Asian elephants, the prepollex was a slightly flexible rod connected syndesmotically to the first metacarpal bone. A synovia-filled joint cavity could not be detected. In the young African elephant, the complete prepollex consisted of hyaline cartilage surrounded by thick perichondrium. In the prepollex of the adult Asian elephant, an array of various connective tissues, hyaline and fibrous cartilage and bone tissue could be found. No muscles or tendons inserted on the prepollex.

Conclusions: Bone tissue in the elephant prepollex may be classified as metaplastic tissue developing possibly due to the load on this weight bearing ray. Since the prepollex has no close relation to muscles or tendons and does not function as a hypomochlion, is not a sesamoid bone.

Supported by the University of Pretoria, Onderstepoort, South Africa.

175 - Computed tomography analysis of guinea pig bone: architecture, density and dimensions throughout development *A. Witkowska¹, A. Alibhai¹, C. Hughes¹, J. Price¹*,

C. Sturrock² and C. S. Rutland^{1,}*

¹School of Veterinary Medicine and Science, University of Nottingham, Nottingham, UK ²School of Biosciences, University of Nottingham, Nottingham, UK *Introduction:* The domestic guinea pig, *Cavia aperea f. porcellus*, belongs to the *Caviidae* family of rodents. It is an important source of food (17 000 tonnes from Peru alone/annum), kept as pets and used in medical research (Terril *et al.*, 1998, The Laboratory Guinea Pig, CRC PressINC). Puberty occurs at ~6 weeks in sows and 9– 10 weeks in boars, adult weight is achieved at 8– 12 months and life expectancy is ~5–6 years. Our aim was to map bone density, structure and dimensions across developmental stages.

Methods: Guinea pigs (n = 23) that had died of natural causes were collected and the bones manually extracted and cleaned. Micro Computed tomography (Micro CT) was undertaken of the left and right humerus, femur and scapula to ascertain bone density and manual and automated bone dimensions. Statistical analysis between groups was carried out using.

Results: Our data mapped a number of dimensions, and the densities (average and across the bone) of the scapula, femur, and humerus in guinea pigs aged 0–1 month, 1–3 months, 3–6 months, 0.5–1 year and 1–4 years. Bone dimension growth rates and densities differed between the ages, and the three bone types differed between each other in growth rates and density increase. The Micro CT and imaging software technology showed very distinct differences between the relative densities across the structure of the bones.

Conclusions: Our data showed the density, bone structure and measurements of guinea pig bones from birth to 4 years. Understanding the anatomy using Micro CT can help inform our clinical colleagues of potential fracture points and growth rates of different bones. This technology can be utilised to advance research into nutrients, disorders and drug development in the guinea pig and other species.

Ethical permission obtained under The University of Nottingham in accordance with the British Home Office laws.

176 - Changes in expression of serotonin in the small intestine of red kidney bean (*Phaseolus vulgaris*) lectin-stimulated suckling piglets

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Introduction: More than 90% of the total body content of serotonin is located in mucosa of the gastrointestinal tract, and enterochromaffin cells (EC) are its main source. In farm animals, lectins have been recognized as

promising nutritional stimulant In this study we hypothesize that lectin may evoke changes in the numbers and chemical code of EC in the small intestine of suckling piglets. The results of the present study improve our understanding of mechanism of action of lectins.

Methods: Frozen sections of the small intestine samples from control and experimental animals were cut. Double immunohistochemical (IHC) staining utilizing antibodies raised against serotonin, somatostatin (SOM) and corticotropin releasing-factor CRF were made. In each segment of the small intestine, populations of EC were counted and statistically compared. The proportions of EC co-expressing (or not) SOM and CRF were also counted and compared.

Results: After the lectin treatment the increased numbers of EC were noted in the duodenum of experimental animals. Lectin stimulation did not change the proportions of EC in the jejunum and ileum. In the duodenal epithelium of the lectin-stimulated piglets the vast majority of serotonin-immunoreactive (IR) EC were distributed at the base of crypts. After the lectin administration in all portions of the small intestine the proportions of serotonin-IR/SOM-IR EC were statistically similar. No upregulation of CRF was found in duodenal, jejunal and ileal EC of lectin-treated animals.

Conclusions: In conclusion, lectin administration resulted in increased number of serotonin-producing EC in the duodenum (but not jejunum and ileum) of suckling piglets. The results of present study suggest that red kidney bean lectins may be efficient factors influencing serotonin-dependent gut maturation processes.

All the procedures involving the use of animals are in accordance with the ethical principles approved by IInd Local Ethical Committee at the University of Life Sciences Lublin, Poland.

177 - Histological Investigation of Jackal (*Canis aureus*) Stomach

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Introduction: The jackal is a carnivore belonging to the Canidae family. As a wild animal it feeds on meat, but also vegetable and herbal food. The anatomical gastrointestinal tract structure is similar to that of the domestic dog, but there are few studies of its histological structure. The aim of the current study is to investigate the microscopic anatomy of the jackal stomach wall and to compare its canine structure with another carnivorous – domestic dog and cat, respectively.

Methods: The stomachs of two male jackals (Canis aureus), obtained by hunting, were investigated by conventional histological methods.

Results: The results show that the mucous membrane of the jackal stomach wall contains the typical tubular glands in the anatomical regions of the stomach and a chief, parietal and mucous exocrinocytic cells are present. In carnivores just below the base of the propria glands a layer stratum compactum is presented, according histological nomenclature. But no signs of collagen belt formation were observed in jackal stomach mucosa in contrast of feline stomach. The mucosal lamina muscularis is welldeveloped and smooth muscle cells bundles interrupted by thick connective tissue streaks are established. In layer tela submucosa, which is relatively thick, well developed network of arterial and venous vessels is observed. The muscle layer of the wall is proportionally developed and an autonomic intramural nervous plexus - plexus myentericus, is found. The serosa is morphologically presented as visceral peritoneum.

Conclusions: The histological structure of the jackal stomach wall shows the typical structure like the simple glandular stomach but no stratum compactum is present in mucosal lamina propria. We also observed in other dog gastrointestinal investigations that the stratum compactum is also missing. This fact supports the hypothesis that the mucosal layer stratum compactum is not developed in carnivores belonging to Canidae family.

178 - The distribution of metastin-like immunoreactive nerve structures occurring in the spinal cord of the domestic pig (*Sus scrofa*)

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Introduction: The current knowledge on metastin, a natural ligand for GPR54 receptor, mainly concerns its involvement in neuroendocrine regulation of reproduction. However, occasional contributions reporting the localization of metastin in various areas of the nervous system suggest its engagement in other autonomic and sensory functions. The present experiment was designed to examine the occurrence of metastin-like immunoreactive nerve structures within the selected segments (cervical, thoracic, lumbar and sacral) of the porcine spinal cord. *Methods:* The experiment was performed on three immature gilts (body weight 20 kg). The animals were deeply anesthetized and perfused with 4% solution of paraformaldehyde. The spinal cords were collected and further processed according to the protocol. Transverse frozen sections of selected spinal segments (cervical, thoracic, lumbar, sacral) were cut with a cryostat. Then standard immunocytochemical staining procedure with primary (rabbit polyclonal anti-Kiss1) and secondary (AlexaFluor555 anti-rabbit) antibodies was applied. The slides were finally analyzed and photographed under confocal laser microscope (Zeiss LSM-700).

Results: Nerve fibers expressing metastin immunoreactivity were observed within the gray matter of all the studied sections, while occasional immunoreactive perikarya were found at some spinal segments near the region of lamina X. These perikarya were mostly oval in shape and the immunoprecipitate appeared in the characteristic granular pattern. Two main categories of the immunopositive nerve fibers could be distinguished: a) fine, varicose fibers observed in the highest concentrations within the lamina I and II of the dorsal horn b) thick bundles of varicose fibers localized mainly within the intermediate grey matter (lamina VII, VIII) and lamina X.

Conclusions: The present morphological results revealed for the first time details concerning spatial distribution of metastin immunoreactive nerve structures in the porcine spinal cord. The data obtained could suggest the involvement of metastin in autonomic and sensory functions regulation.

Approved by Local Ethical Committee in Olsztyn.

179 - Intrinsic gastric nerve projections supplying the pyloric sphincter in the domestic pig (*Sus scrofa*) – preliminary studies *M. Zalecki**

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Introduction: The pylorus is one of the most important portions of the gastrointestinal tract. Its dysfunction results in many health problems in humans and animals. The pig is an animal of a great economic value and its significance as an animal model in biomedical research increases systematically. Our previous studies precisely described sources of origin of extrinsic pyloric nerves, while there is complete lack of data concerning intrinsic pathways involved in porcine pylorus innervation. Therefore, the aim of the present study was to explore the extension of the distribution of intrinsic gastric neurons projecting to the pyloric sphincter in the pig.

Methods: The experiment was performed on two gilts. Using the retrograde neuronal tracing technique (20 μ l of Fast Blue injected into the muscular layer of the pyloric sphincter) the gastric neurons supplying pyloric sphincter were labeled. Week after injections, consecutive microscopic transverse cross-sections of the stomach wall, taken in specified intervals (starting from the sphincter) were analyzed. In order to correctly analyze the extension of distribution of fluorescent neurons in the animals studied (regardless of the varying dimensions of the individual stomachs) the data were presented as percentages.

Results: All the traced neurons were found exclusively in the myenteric plexus. The neurons occupied a distance which amounted to $47.25 \pm 0.75\%$ of the whole stomach length from the site of injection (which is equivalent of the length of 6.97 ± 0.11 cm). The number of cells systematically decreased towards cardia – in sections proximal to the pyloric orifice neurons gathered in groups up to seven cells, while in the farthest sections only occasional FB-positive perikarya were encountered.

Conclusions: Data obtained revealed details concerning intrinsic descending pathways projecting to the porcine pyloric sphincter, which confirms the complexity of sphincteric muscles innervation.

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180 - Three-dimensional model of the skeletal and vascular system of the dog's forelimb

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Introduction: Traditionally 2D images are used primary for anatomy teaching and demonstrating, although it is often hard for the students to understand the overall 3D structure through a drawing or photo. The purpose of this study is to represent the realistic position of the vessels according to the bones in the dog's forelimb using images gained through Computer Tomography and 3D Laser Scanner.

Methods: Three dimensional data of each bone of the forelimb were gained using a 3D Laser Scanner. The skeleton used did not show any pathological sign, and matched the anatomical descriptions. The data was imported into 3DS Max where the models were combined, thus creating the three-dimensional structure of the dog's forelimb. To create high quality CT images, a contrast material was injected into the left a. axillaris of a dog specimen. We used the 'Treshold', 'Wand' and 'Paint' tools in the 'Editor' module of 3D Slicer to separate the arteries so these could be exported into 3DS Max as a 3D model. The model of the skeleton and the vascular system was combined with each other.

Results: A Complete three-dimensional model of the bone structure with the significant arteries of the dog's fore-limb was created. Pictures and animations of these structures can easily be rendered for anatomical demonstrations.

Conclusions: Different artificial modeling techniques have been used to obtain anatomical models, but by now we possess the technology to create real-based 3D models of the body. Results of the study can be valuable in educational and demonstrational scenarios. Further research is needed to extend the model with nervous and muscular system.