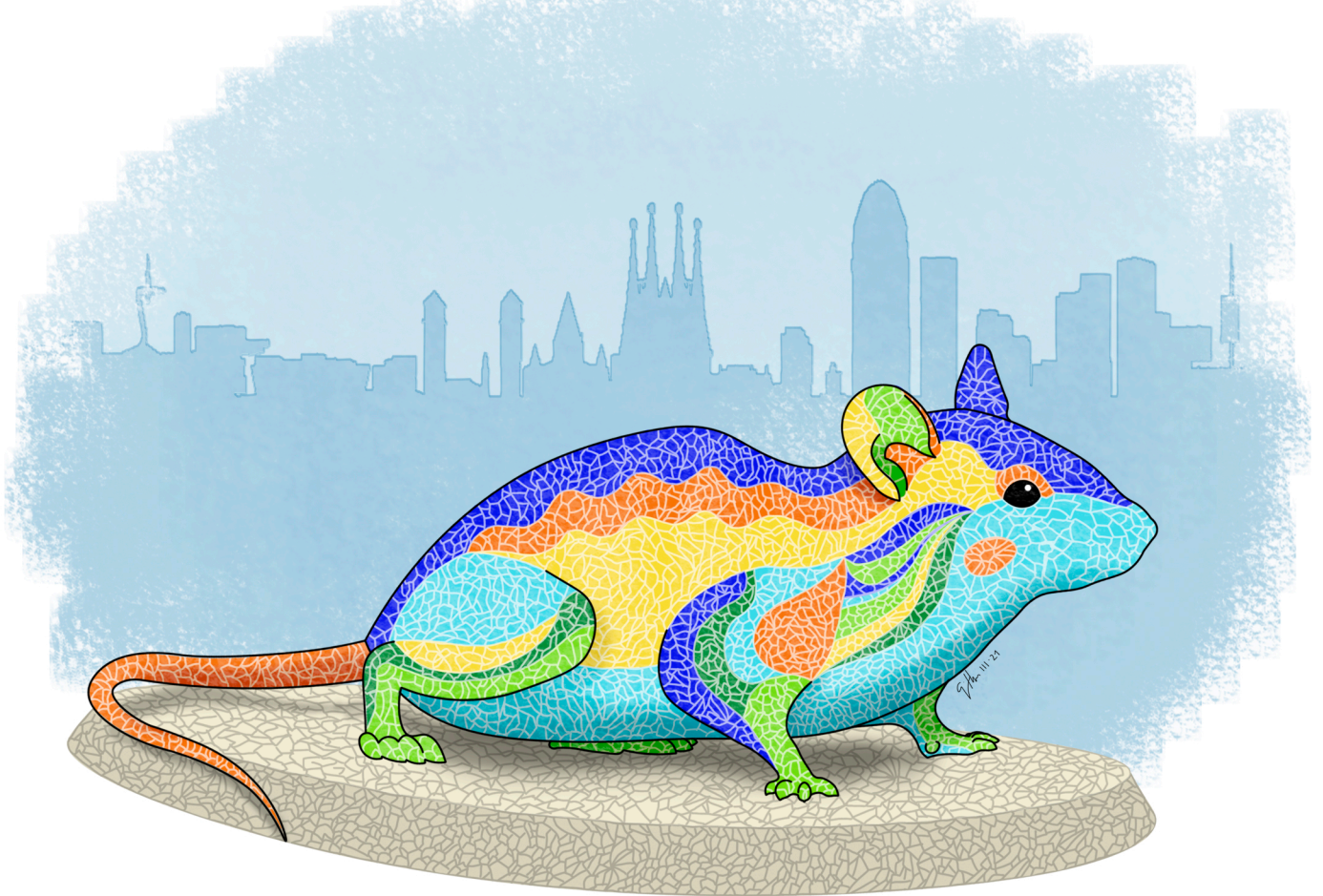




On-Line Summer Course

**Embryology, Anatomy, Histology
& the Anatomical Basis of Imaging**



July 5th to 16th, 2021

PATHBIO (www.pathbio.org) is an EU-funded ERASMUS+ Knowledge Alliance for “**Precision Pathobiology for Disease Models**”, including major European Universities, 5 European “Mouse clinics” for high-throughput phenotyping of mice, major mouse providers (Charles River, JAX, TCP), as well as associated partners worldwide (KMPC, APN, UATE, UCT). This Knowledge Alliance will provide courses and on-line teaching material for mouse embryology and anatomy, mouse pathology, and for mouse imaging.

In July 5th-16th, 2021, the third course on **Mouse Embryology, Anatomy, Histology, and Anatomical Basis of Imaging** will take place **ON-LINE**. The aim is to provide graduate, master, PhD and postdoc students with basic and expert knowledge to phenotype morphologically mouse models of human diseases. At this course, expert mouse embryologists, anatomists, pathologists and researchers from Europe and the US will give lectures and discuss with the participants different aspects of mouse morphological phenotyping, including examples of mouse models for the major human diseases.

Hands on teaching is a very important phase for learning morphological sciences. However, due to COVID-19 pandemic a “classical” presential dissection room teaching is not possible. During this course lectures will be followed by on-line dissections of the different regions and organs of the mouse body. Recorded videos and preprint material will be available for participants to improve the on-line learning experience. Furthermore, radiographs, images from TEM, micro-CT, and MRI, as well as, digital slides will be used for teaching during the course.

The technological platform to set the on-line course will be TEAMS (Microsoft). The local organizers will host the sessions and will lead the discussions.

There is no fee for this course. Interested participants should apply with CV and letter of motivation to jesus.ruberte@uab.es. Deadline for applications is June 15th, 2021. Accepted participants will be informed by the end of June.

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Monday, July 5th

- 9-10** Welcome address and introductory remarks
J. Ruberte and G. Gràcia
- 10-11** Animal transgenesis: from the classics to the CRISPR genome editing
A. Pujol
- 11-12** Overview of mouse genetic nomenclature
J. Sundberg
- 12-13** 3R's principles for ethical use of mice: replacement, reduction and refinement
B. Pintado

Lunch break

- 14-15** *In vivo* phenotyping of laboratory mouse
K. Svenson
- 15-16** Phenotyping and research reproducibility
C. Brayton
- 16-17** Histology of skin, hair and nail
J. Sundberg
- 17-18** Mouse models to study skin diseases
J. Sundberg

Tuesday, July 6th

- 9-10** General concepts in morphological mouse phenotyping. Directional terms and planes of the mouse body
J. Ruberte
- 10-11** Introduction to mouse development: segmentation, gastrulation, the embryonic period, and the foetal period
H. Jacobs

11-12 Development of extraembryonic lineages. The placenta
O. Wendling

12-13 Determining the window of lethality of mutant mice
in utero
O. Wendling

Lunch break

14-15 Collection and fixation of mouse embryos and placentas
O. Wendling

15-16:30 Bone Ontogeny. Skeletal Nomenclature. Bone histology, immunohistochemistry and ultrastructure. Strain, gender and age differences
J. Ruberte

16:30-18:30 Skeleton of thoracic limb: scapula, clavicle, humerus, ulna, carpal, metacarpal, and digital bones. On-line identification of main anatomical features in isolated bones, X-ray and microCT images
L. Mendes-Jorge

Wednesday, July 7th

9-11 Skeleton of pelvic limb: coxal, femur, tibia, fibula, tarsal, and metatarsal bones. On-line Identification of main anatomical features in isolated bones, X-ray and microCT images
M. Navarro

11-13 Skeleton of the head: skull and mandible. On-line identification of main anatomical features in isolated bones, X-ray and microCT images
J. Ruberte

Lunch break

- 14-16** Skeleton of the trunk: vertebral column, ribs and sternum. On-line identification of main anatomical features in isolated bones, X-ray and microCT images
V. Nacher
- 16-17** Molecular Imaging Techniques in GEMM with bone diseases
F. Mulero
- 17-18** Arthrology: shoulder, elbow, hip, and stifle joints. Myology: types of muscles, histology, histochemistry, immunohistochemistry and ultrastructure
M. Navarro
- 18-19** Myology of limbs
H. Jacobs

Thursday, July 8th

- 9-10** Anatomy and histology of limb nerves
H. Jacobs
- 10-12** On-line dissection of main muscular groups and peripheral nerves
H. Jacobs and M. Navarro
- 12-13** Mouse models to study muscle diseases
A. Serrano

Lunch break

- 14-15** Anatomical basis of cardiovascular development
J. Ruberte
- 15-16** Heart: topography, structure and vascularization
J. Ruberte

16-17 Animal models to study cardiac diseases: physiological and pathological interventions

A. Planavila

17-18 Blood: cellular morphology and clinical analysis

E. José-Cunilleras

Friday, July 9th

9-10 Localization, disposition and topography of main vessel trunks. Identification by X-ray angiography, CT and MRI

M. Navarro

10-11 Structure of blood and lymphatic vessels. Components of the vascular wall

J. Ruberte

11-12 Mouse models to study the lymphatic system

S. Ortega

12-13 Topography and histology of lymphatic nodes.

J. Ruberte and G. Gràcia

Lunch break

14-15 On-line demonstration of lymphatic nodes and thoracic duct by Evan's blue injection and lipid ingesta

J. Ruberte and G. Gràcia

15-16 Histology of thymus and spleen: pathological findings of the lymphoid and hematopoietic system

J. Calzada-Wack

16-17 Students tutoring. Questions and answers. Students autoevaluation

Monday, July 12th

- 10-11** Anatomical basis of gastropulmonar development
J. Ruberte
- 11-12** Respiratory apparatus: nasal cavities, larynx, trachea and lungs. Anatomy and Imaging
M. Navarro
- 12-13** Histopathology of mouse models to study pulmonary diseases
N. Prats

Lunch break

- 14-15** On-line dissection of the thorax
M. Navarro and R. Bernardini
- 15-16** Oral cavity, pharynx, esophagus, and stomach. Anatomy and Imaging
V. Nacher
- 16-17** Imaging teeth. Mouse models to study tooth diseases
J. Prochazka

Tuesday, July 13th

- 9-10** Intestine and liver. Anatomy and Imaging
L. d'Angelo
- 10-11** Mouse models to study intestinal visceral sensitivity
V. Martinez
- 11-12** Animal models to study human chronic liver disease: an update
A. Fernandez
- 12-13** Anatomical basis of urogenital development
M. Mark

Lunch break

- 14-15** Urinary organs. Anatomy, histology, and imaging
L. d'Angelo
- 15-16** Male and female genital organs. Anatomy, histology, and imaging
A. Carretero
- 16-17** Modelling mammalian sperm function: is this possible?
J. E. Rodríguez

Wednesday, July 14th

- 9-11** On-line dissection of male and female abdominal and pelvic cavities
A. Carretero and L. Mendes-Jorge
- 11-12** The fat organ. Morphology, physiology and imaging
J. Rozman
- 12-13** Mouse models to study obesity
M. Peyrou

Lunch break

- 14-15** Pancreas. Anatomy, histology and imaging
V. Nacher
- 15-16** Mouse models to study diabetes
A. Casellas
- 16-17** Thyroid, parathyroid and adrenal glands
V. Nacher

Thursday, July 15th

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| 9-10 | Basic developmental concepts and general morphology of the central nervous system
L. Puellas |
| 10-11 | Spinal cord and rhombencephalon. Anatomy and imaging
J. Ruberte |
| 11-12 | Survival of motoneurons and preservation of neuromuscular junctions, two hallmarks of amyotrophic lateral sclerosis treatment
A. Bosch |
| 12-13 | Cerebellum and mesencephalon. Anatomy and imaging
J. Ruberte |
| Lunch break | |
| 14-16 | Diencephalon, hypothalamus, and telencephalon
L. Puellas |
| 16-16.30 | Hypophysis and pineal gland. Anatomy, histology and ultrastructure
J. Ruberte |
| 16.30-17.30 | Correction of the cerebellar pathology in mouse models of Megaloencephalic Leukoencephalopathy with subcortical Cysts (MLC)
A. Bosch |
| 17.30-18.30 | Cranial nerves. Encephalic ventricles and brain vascularization
J. Ruberte |

Friday, July 16th

9-10 On-line dissection of the central nervous system
J. Ruberte and J. Pampalona

10-11 Vestibulocochlear organ. Anatomy and imaging
M. Navarro

11-12 Mouse models to study deafness
S. Murillo

12-13 Eye and related structures: Anatomy and imaging
J. Ruberte

Lunch break

14-15 Retinal Vascularization. *In vivo* fluorescent angiography and scanning confocal microscopy analysis
J. Ruberte

15-16 Mouse models of allergy
F. de Mora

16-17 Mouse models of human cancer.
F. J. Benavides

17-18 Eye morphological and physiological phenotyping. On-line dissection of the eye.
A. Bonet













18-18.30 Course Evaluation

CONCLUDING REMARKS

List of speakers

SPEAKER	INSTITUTION
Benavides, Fernando José	THE UNIVERSITY OF TEXAS MD Anderson Cancer Center
Bernardini, Roberta	Università di Roma  Tor Vergata
Bosch, Assumpció	 INc Institut de Neurociències
Bonet, Aina	UAB Universitat Autònoma de Barcelona
Brayton, Cory	 JOHNS HOPKINS UNIVERSITY
Calzada-Wack, Julia	 GMC German Mouse Clinic
Carretero, Ana	UAB Universitat Autònoma de Barcelona
Casellas, Alba	<i>ciberdem isciiii</i>
d'Angelo, Livia	 UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
de Mora, Fernando	UAB Universitat Autònoma de Barcelona
Fernandez, Anabel	IDIBAPS ^B
Gràcia, Guillem	UAB Universitat Autònoma de Barcelona

Jacobs, Hugues	
José Cunilleras, Eduard	 Universitat Autònoma de Barcelona
Mark, Manuel	
Martinez, Vicente	 Universitat Autònoma de Barcelona
Mendes-Jorge, Luísa	 UNIVERSIDADE DE LISBOA
Mulero, Francisca	 Centro Nacional de Investigaciones Oncológicas
Murillo, Silvia	
Nacher, Víctor	 Universitat Autònoma de Barcelona
Navarro, Marc	 Universitat Autònoma de Barcelona
Ortega, Sagrario	 Centro Nacional de Investigaciones Oncológicas
Pampalona, Judit	 Universitat Autònoma de Barcelona
Peyrou, Marion	 UNIVERSITAT DE BARCELONA
Planavila, Anna	 UNIVERSITAT DE BARCELONA
Pintado, Belén	 CENTRO NACIONAL DE BIOFENOCLOGIA  CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

Prats, Neus	 INSTITUTE FOR RESEARCH IN BIOMEDICINE
Prochazka, Jan	 Czech Centre for Phenogenomics <small>hosted by the Institute of Molecular Genetics of the ASCR, v.v.i.</small>
Puelles, Luis	
Pujol, Anna	 Universitat Autònoma de Barcelona
Rodríguez, Juan Enrique	 Universitat Autònoma de Barcelona
Rozman, Jan	 Czech Centre for Phenogenomics <small>hosted by the Institute of Molecular Genetics of the ASCR, v.v.i.</small>
Ruberte, Jesús	 Universitat Autònoma de Barcelona
Serrano, Antonio	 Universitat Pompeu Fabra Barcelona
Sundberg, John	 The Jackson Laboratory  VANDERBILT UNIVERSITY
Svenson, Karen	 The Jackson Laboratory
Wendling, Olivia	

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