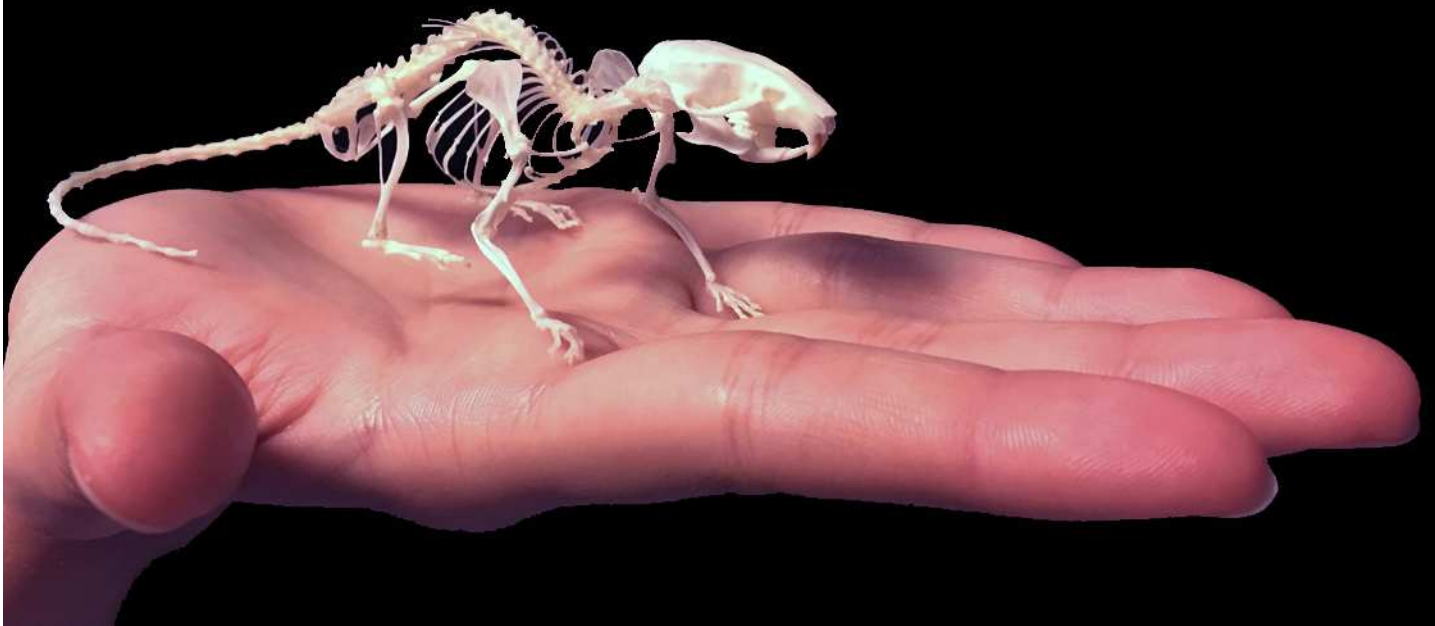


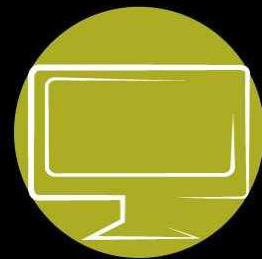


# Summer Course

## Module I



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



**BARCELONA, July 15<sup>th</sup> – 26<sup>th</sup> 2019**

**PATHBIO** ([www.pathbio.org](http://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 online teaching material for mouse embryology and anatomy, mouse pathology, and for mouse imaging.

In July 15<sup>th</sup>-26<sup>th</sup>, 2019, the first course on **Mouse Embryology, Anatomy, Histology, and anatomical basis of Imaging** will take place in the Veterinary School at the Universitat Autònoma de Barcelona ([www.uab.cat](http://www.uab.cat)). 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.

The course teaching pretends to be a “hands on” process, and lectures will be followed by practical sessions in which participants will dissect specifically the different organs of the mouse body and will work with bone specimens, radiographs, and images from TEM, micro-CT and MRI. For histological teaching digital slides will be used.

There is not fee for this course. Participants have to organize travel and accommodation themselves and cover the corresponding expenses. Interested participants should apply with CV and letter of motivation to [jesus.ruberte@uab.es](mailto:jesus.ruberte@uab.es). Deadline for applications is May 31<sup>st</sup>, 2019. Accepted participants will be informed middle of June



Co-funded by the  
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## Monday, July 15<sup>th</sup>

- 12:30-13** Welcome address and introductory remarks  
**J. Ruberte and G. Gracia**
- 13-14** General concepts in morphological mouse phenotyping.  
Directional terms and planes of the mouse body  
**J. Ruberte**
- 14-15:30** Introduction to mouse development: segmentation,  
gastrulation, the embryonic period, and the fetal period  
**H. Jacobs**
- Coffee break**
- 16-17** Development of extraembryonic lineages  
**O. Wendling**
- 17-17:30** Morphology of the placenta. Interpretation of virtual  
slides  
**A. Carretero**
- 17:30-18:30** Determining the window of lethality of mutant mice  
*in utero*  
**O. Wendling**

## Tuesday, July 16<sup>th</sup>

- 9-10** Collection and fixation of mouse embryos and placentas  
**O. Wendling**
- 10-11** Models in Placental Biology Research  
**M. Climent**
- 11-12** Bone Ontogeny. Skeletal Nomenclature, bone  
architecture and types of bone. Strain, gender and age  
differences  
**J. Ruberte**



**12-13** Bone histology, immunohistochemistry and ultrastructure. Interpretation of virtual slides  
**J. Ruberte**

**Lunch**

**14-16** Skeleton of thoracic limb: scapula, clavicle, humerus, ulna, carpal, metacarpal, and digital bones. Identification of main anatomical features in isolated bones, X-ray and microCT images  
**L. Mendes-Jorge**

**Coffee break**

**16:30-18:30** Skeleton of pelvic limb: coxal, femur, tibia, fibula, tarsal, and metatarsal bones. Hip and knee joints. Identification of main anatomical features in isolated bones, X-ray and microCT images  
**M. Navarro**

**Wednesday, July 17<sup>th</sup>**

**9-11** Skeleton of the head: skull and mandible. Identification of main anatomical features in isolated bones, X-ray and microCT images  
**A. Carretero**

**11-13** Skeleton of the trunk: vertebral column, ribs and sternum. Identification of main anatomical features in isolated bones, X-ray and microCT images  
**V. Nacher**

**Lunch**



**14-15** Molecular Imaging Techniques in GEMM with bone diseases

**F. Mulero**

**15-16** Arthrology: shoulder, elbow, hip, and stifle joints. Interpretation of virtual slides

**M. Navarro**

**Coffee break**

**16:30-17** Myology: types of muscles, histology, histochemistry, immunohistochemistry and ultrastructure

**M. Navarro**

**17-18** Myology of limbs

**H. Jacobs**

### Thursday, July 18<sup>th</sup>

**9-10** Anatomy of peripheral nervous system

**H. Jacobs**

**10-11** Nerve histology and ultrastructure: the facial nerve axotomy model

**B. Almolda**

**11-12:30** Dissection of main muscular groups and peripheral nerves

**M. Navarro and H. Jacobs**

**12:30-13:30** Mouse models to study muscle diseases

**A. Serrano**

**Lunch**

**14:30-16** Anatomical basis of cardiovascular development

**J. Ruberte**



**16-17** Heart: topography, structure and vascularization  
**J. Ruberte**

**Coffee break**

**17:30-18:30** Animal models to study cardiac diseases: physiological and pathological interventions  
**A. Planavila**

**Friday, July 19<sup>th</sup>**

**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** Histology of thymus and spleen: pathological findings of The lymphoid and hematopoietic system  
**J. Calzada-Wack**

**12-13:30** Topography and histology of lymphatic nodes. Demonstration of lymphatic nodes and thoracic duct by Evan's blue injection and lipid ingesta  
**J. Ruberte**

**Lunch**

**14:30-15:30** Histology of skin, hair and nail  
**J. Sundberg**

**15:30-16:30** Mouse models to study skin diseases  
**J. Sundberg**



**Monday, July 22<sup>nd</sup>**

- 9-10** Anatomical basis of gastropulmonar development  
**A. Carretero**
- 10-12** Respiratory apparatus: nasal cavities, larynx, trachea and lungs. Anatomy and Imaging. Interpretation of virtual slides  
**M. Navarro and R. Bernardini**
- 12-13** Mouse models of respiratory allergy  
**F. de Mora**
- Lunch**
- 14-15** Histopathology of mouse models to study pulmonary diseases  
**N. Prats**
- 15-16** Dissection of the thorax  
**M. Navarro and R. Bernardini**
- Coffee break**
- 16:30-17:30** Oral cavity, pharynx, esophagus, and stomach. Interpretation of virtual slides  
**V. Nacher**
- 17:30-18:30** Imaging teeth. Mouse models to study tooth diseases  
**J. Prochazka**



## Tuesday, July 23<sup>rd</sup>

- 9-10** Intestine and liver. Interpretation of virtual slides  
**L. d'Angelo**
- 10-11** Mouse models to study gastrointestinal diseases  
**M. Jimenez**
- 11-12** Animal models to study human chronic liver disease:  
an update  
**J. Gracia-Sancho**
- 11-13** Anatomical basis of urogenital development  
**M. Mark**
- Lunch**
- 14-15** Urinary organs. Anatomy, histology, and imaging.  
Interpretation of virtual slides  
**P. de Girolamo**
- 15-16** Male and female genital organs. Anatomy, histology, and  
imaging. Interpretation of virtual slides  
**A. Carretero**
- Coffee break**
- 16:30-17:30** Modelling mammalian sperm function: is this possible?  
**J. E. Rodriguez**

## Wednesday, July 24<sup>th</sup>

- 9-11** 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  
**F. Villarroya**

**Lunch**

**14-15** Pancreas. Anatomy, histology and imaging  
**V. Nacher**

**15-16** Mouse models to study diabetes  
**V. Jiménez**

**Coffee break**

**16:30-17:30** Thyroid, parathyroid and adrenal glands  
**V. Nacher**

### **Thursday, July 25<sup>th</sup>**

**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

**14-15** Diencephalon, hypothalamus, and hypophysis. Anatomy and imaging

**J. Ruberte**

**15-16** Telencephalon

**L. Puellas**

## Coffee break

**16:30-17:30** Correction of the cerebellar pathology in mouse models of Megaloencephalic Leukoencephalopathy with subcortical Cysts (MLC)

**A. Sanchez**

**17:30-18:30** Cranial nerves. Encephalic ventricles and brain vascularization

**J. Ruberte**

## Friday, July 26<sup>th</sup>

**9-10:30** Dissection of the central nervous system. Interpretation of brain sections

**J. Sautet and J. Ruberte**

**10:30-11:30** Vestibulocochlear organ. Anatomy and imaging

**M. Navarro**

**11:30-12:30** Mouse models to study deafness

**I. Valera-Nieto**

**12:30-13:30** Eye and related structures: Anatomy and imaging

**J. Ruberte**

## Lunch

**14:30-15:30** Retinal Vascularization. *In vivo* fluorescent angiography and scanning confocal microscopy analysis

**J. Ruberte**

**15:30-16:30** Mouse models to study eye diseases

**J. Ruberte**











**16:30-17** Course Evaluation

**CONCLUDING REMARKS**

**List of speakers**

SPEAKER	INSTITUTION
Almolda, Beatriz	
Bernardini, Roberta	
Bosch, Assumpció	
Calzada-Wack, Julia	
Carretero, Ana	
Climent, María	
d'Angelo, Livia	
de Girolamo, Paolo	

de Mora, Fernando	 Universitat Autònoma de Barcelona
Gracia-Sancho, Jordi	
Jacobs, Hugues	
Jiménez, Marcel	 Universitat Autònoma de Barcelona
Jiménez, Verónica	 Center of animal biothecology and gene therapy
Mark, Manuel	
Mendes-Jorge, Luisa	
Serrano, Antonio	 Universitat Pompeu Fabra Barcelona
Mulero, Francisca	 Centro Nacional de Investigaciones Oncológicas
Nacher, Víctor	 Universitat Autònoma de Barcelona
Navarro, Marc	 Universitat Autònoma de Barcelona
Planavila, Anna	
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	
Rodriguez, Juan Enrique	
Rozman, Jan	
Ruberte, Jesús	
Sánchez, Angela	
Sautet, Jean	
Serrano, Antonio	
Sundberg, John	
Varela-Nieto, Isabel	
Villarroya, Francesc	
Wendling, Olivia	

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