

**Course unit name : MOUSE MODELS IN CANCER RESEARCH**

**1.- General information**

Code	303021	Plan		ECTS	3
Type	OPTIONAL	Course	2021/2022	Periodicity	1 <sup>st</sup> Semester
Department	Cancer Research Institute				
Virtual Platform	Platform:	CICLOUD			
	URL de Acces:	<a href="http://cicloud.dep.usal.es/index.php/s/Gp0vghR305Y6glo/authenticate">http://cicloud.dep.usal.es/index.php/s/Gp0vghR305Y6glo/authenticate</a>			

**Faculty**

Coordinator	Dr. Manuel A. Sánchez Martín	Grupo / s	
Department	Medicine		
Area	Medicine		
Center	Faculty of Medicine, Medicine Department.		
Office	Lab. Transgenic, Basement -3, CIC.		
Tutorials	16.00-18.00		
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Profesor	Dra. Sandra Muntión Olave		
Área de investigación	Unidad de Terapia Celular, Servicio de Hematología		
Centro	Hospital Universitario de Salamanca. IBSAL		
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Horario de tutorías	16.00-18.00		
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## 2.- The course in the context of the Master's Program

Formative block to which the subject belongs

Second block (out of five) of master program organization.

Aim of the subject

Professional profile.

## 3.- Previous recommendations

## 4.- Aims of the subject

- Acquire knowledge about the use of mouse models genetically modified for the cancer in vivo study.
- Acquire detailed knowledge about current genetic manipulation techniques used to generate transgenic, "knock-out" and "knock-in" mice.
- Acquire practical skills in mouse genome manipulation techniques and reproductive management.

## 5.- Contents

### LESSONS:

#### **Topic 1: The human genome complexity. Mouse models as a tool for studying the human disease.**

Lesson 1. Human variability. The Human Genome Project, 1000 Genomes Project, 1K and 100K Genome Projects. The Cancer Genome Atlas, The Cancer Genome Project and The International Cancer Genome Consortium.

Lesson 2. Animal models in cancer. The Fancy mouse: history of the laboratory mouse. Outbred strains and inbred strains. Genetic standardization of the mouse. Quantitative trait locus.

Lesson 3. Immunodeficient mice strains. Xenografts assays in cancer research. Carcinogenesis in the mouse.

#### **Topic 2: Making human cancers in mice: classical models**

Lesson 4. Manipulating the mouse embryo. Classical transgenic mice and human cancer. Conditional transgenic mice and human cancer.

Lesson 5. Transgenesis by transposition. Generation of transgenic mice with lentiviral vectors.  
Lesson 6. Gene targeting in embryonic stem cells. Generation of chimeras. Knock-out mice and embryo lethality. Knock-in mice. Knock-out/in mice mouse models and human cancer.

### Topic 3: Making human cancers in mice: new approaches

Lesson 7. Cre and Flp recombinases. Cre/Flp conditional mouse models to turn-off tumor suppressor genes. Cre/Flp conditional mouse models to turn-on oncogenes.  
Lesson 8. Gene Trap approaches. Gene Trap consortiums and mouse models in cancer.  
Lesson 9. Zin-finger nucleases and TALEN nucleases: mouse models. CRISPR history.  
Lesson 10. CRISPR-Cas9 System. Genome editing with CRISPR technology.  
Lesson 11. CRISPR-Cas reagents and protocols. Mouse models created by CRISPR technology in cancer research.

#### LABORATORY WORK

##### One group per week (3-4 students)

1. Colony management.
1. Generation of mouse models by pronuclear injection.
2. Cryopreservation of lines
3. Delivering CRISPR reagents: in vitro approaches
4. Analysis of CRISPR edited cells

## 6.- Skills to acquire

#### General skills

Development of laboratory skills based on genetic concepts and recombinant DNA technology to generate mouse models as a tools for human cancer research.

#### Especific skills

Manipulating the cell and the mouse embryo by genome editing nucleases: CRISPR approaches.

#### Transversal skills

Promotion of scientific discussions regarding cancer.

Development of skills to disseminate information of scientific topics.

## 7.- Teaching methodology

A. 10 master classes (2h each one) divided in 3 topics:

- Human genome complexity and mouse models as a research tool. Inbred and outbred mouse strains.
- Modeling Human Cancer in the Lab Mouse I: classical techniques for generating genetically modified and mutant mice.
- Modeling Human Cancer in the Lab Mouse I: genome editing nucleases and conditional mouse models.

B. Lab work: from Monday to Friday (6 h at day) at the Transgenic Facility of the University of Salamanca. Small groups (3-4 people).

C. Scientific seminars.

### 8.- Distribution of teaching methodologies

	Horas dirigidas por el profesor		Horas de trabajo autónomo	HORAS TOTALES
	Horas presenciales.	Horas no presenciales.		
Sesiones magistrales	22			22
Prácticas	- En aula			
	- En el laboratorio	30		30
	- En aula de informática			
	- De campo			
	- De visualización (visu)			
Seminarios	4		8	12
Exposiciones y debates				
Tutorías	2			2
Actividades de seguimiento online				
Preparación de trabajos				
Otras actividades (detallar)				
Exámenes	1		8	9
<b>TOTAL</b>	<b>59</b>		<b>16</b>	<b>75</b>

### 9.- Facilities

Books
Other bibliographical, electronic references or any other type of resource
1. Manipulating the mouse embryo. A laboratory manual. Third edition. CSHL Press.

## 10.- Evaluation

### General remarks

The student must must attend at least 80% of the master classes and seminars.  
Practises attendance is mandatory to be evaluated.

### Evaluation Methods

Written final exam: test type, 50 multi-answer questions. 50% of the final grade.  
A continous follow up of the capacities during the sessions and theoretical classes attendance and participation. 25% of the final grade.  
Continuous evaluation of the lab practices will be evaluated. . 25% of the final grade

### Evaluation tools

Writing examen  
Kahoot  
PPT for semminars  
Participation in other semiars sessions and practises.

### Recommendations for the evaluation

### Recommendations for the recovery.