

Master Course 2015-2016 - UAM
BMM11 module: Genetically Modified Animals: Strategies and applications
Masters UAM of Molecular Biomedicine
21 September-30 October 2015 (Monday to Friday)
15:00-16:30 h
School of Medicine, UAM
Aula 7

Coordinators:

Lluís Montoliu (CNB-CSIC)

Tel. 915854844

montoliu@cnb.csic.es

Sagrario Ortega (CNIO-ISCI)

Tel. 917328000

sortega@cni.es

Miguel Manzanares (CNIC-ISCI)

Tel. 914531200

mmanzanares@cnic.es

Laura Formentini (CBMSO-UAM)

Tel. 911964648

lformentini@cbm.csic.es

Invited faculties:

Juan Bernal

CNIC

Paola Bovolenta

CBMSO-CSIC/UAM

Marcos Malumbres

CNIO

Francisco J. Martínez Mojica

Universidad de Alicante

All lectures will be delivered in English

BMM11 PROGRAM – MASTER UAM COURSE 2015/2016

Monday, 21 September 2015

Introduction to BMM11 module: evaluation criteria (15 min)

Coordinators: Lluís Montoliu, CNB-CSIC; Miguel Manzanares, CNIC; Sagrario Ortega, CNIO; Laura Formentini, UAM

Transgenic animals I

Lluís Montoliu, CNB-CSIC

Tuesday, 22 September 2015

Transgenic animals II

Lluís Montoliu, CNB-CSIC

Wednesday, 23 September 2015

Transgenic animals III

Lluís Montoliu, CNB-CSIC

Thursday, 24 September 2015

Use of mice in biomedicine: history, genetics

Miguel Manzanares, CNIC

Friday, 25 September 2015

Student's presentation/discussion of selected papers (SEMINAR 1)

Lluís Montoliu, CNB-CSIC

Miguel Manzanares, CNIC

Monday, 28 September 2015

Mouse biology and developmental biology I

Miguel Manzanares, CNIC

Tuesday, 29 September 2015

Mouse biology and developmental biology II

Miguel Manzanares, CNIC

Wednesday, 30 September 2015

Mouse biology and developmental biology III

Miguel Manzanares, CNIC

Thursday, 1 October 2015

ES cells and knockout mice I

Sagrario Ortega, CNIO

Friday, 2 October 2015

Student's presentation/discussion of selected papers (SEMINAR 2)

Miguel Manzanares, CNIC

Sagrario Ortega, CNIO

BMM11 PROGRAM – MASTER UAM COURSE 2015/2016

Monday, 5 October 2015

ES cells and knockout mice II
Sagrario Ortega, CNIO

Tuesday, 6 October 2015

ES cells and knockout mice III
Sagrario Ortega, CNIO

Wednesday, 7 October 2015

iPS cells, haploid ES cells, human ES cells
Sagrario Ortega, CNIO

Thursday, 8 October 2015

Genome Editors I: ZFNs and TALENs
Lluís Montoliu, CNB-CSIC

Friday, 9 October 2015

Student's presentation/discussion of selected papers (SEMINAR 3)
Sagrario Ortega, CNIO
Lluís Montoliu, CNB-CSIC

Monday, 12 October 2015

National Fest

Tuesday, 13 October 2015

Invited seminar (CRISPR)
Genome Editors II: The origin of the CRISPR-Cas systems
Francisco J. Martínez Mojica, Universidad de Alicante

Wednesday, 14 October 2015

Genome Editors III: CRISPR-Cas9 applications for genome editing
Lluís Montoliu, CNB-CSIC

Thursday, 15 October 2015

Student's presentation/discussion of selected papers (SEMINAR 4)
Sagrario Ortega, CNIO
Lluís Montoliu, CNB-CSIC

Friday, 16 October 2015

Fest of School of Medicine

BMM11 PROGRAM – MASTER UAM COURSE 2015/2016

Monday, 19 October 2015

Mouse functional genomic analysis. Bioinformatic Tools, examples
Lluís Montoliu, CNB-CSIC

Tuesday, 20 October 2015

Videos on transgenic mice, ES cells and knockout mice
Lluís Montoliu, CNB-CSIC

Wednesday, 21 October 2015

Animal models for studying mitochondrial-related diseases I
Laura Formentini, CBMSO-UAM

Thursday, 22 October 2015

Animal models for studying mitochondrial-related diseases II
Laura Formentini, CBMSO-UAM

Friday, 23 October 2015

Student's presentation/discussion of selected papers (SEMINAR 5)

Laura Formentini, UAM
Miguel Manzanares, CNIC

Monday, 26 October 2015

Invited seminar (pig animal model)
Advances in animal transgenesis: new tools for a new era
Juan Bernal, CNIC

Tuesday, 27 October 2015

Invited seminar (zebrafish/medaka animal model)
Vertebrate animal models to study eye development
Paola Bovolenta, CBMSO-CSIC/UAM

Wednesday, 28 October 2015

Invited seminar (mouse animal model)
Mouse models in cell cycle research
Marcos Malumbres, CNIO

Thursday, 29 October 2015

Student's presentation/discussion of selected papers (SEMINAR 6)

Sagrario Ortega, CNIO
Laura Formentini, UAM

Friday, 30 October 2015

Final Exam (60 min), Correction and discussion afterwards (30 min)

Sagrario Ortega, CNIO
Lluís Montoliu, CNB-CSIC
Laura Formentini, UAM
Miguel Manzanares, CNIC

BMM11 Module, Evaluation Criteria Course 2015-2016

Participation (3 points, 30%): Students, in groups of 2-4 persons, will present and discuss a selected scientific article, in English, to the rest of the classroom (25 min). Three papers will be presented each seminar day. Presenting students should engage the rest of students in the class to actively participate in the discussions. Their contribution to the discussions will also be accounted for the evaluation of the group presenting each article.

Written report (3 points, 30%): Each student will receive a gene and will have to prepare a written short report (**4 pages max**, in English) on **existing animals models** using this gene or its mutations and their relevance and contribution to the understanding of the associated diseases or physiological role of the protein/RNA in the organism. This written report will have to be ready and uploaded at the “UAM Biociencias-Master” web server through the moodle application, **by November 15, 2015**.

Exam (4 points, 40%): The exam (60 min) will be prepared as a test of **30 questions** with 5 possible answers (only 1 will be correct). Wrong answers will not decrease the final mark. The correct answer for each and every question will be provided and discussed at the end of the exam (30 min).

PAPERS (publications) to be discussed and presented by students at SEMINARS

Paper 1:

<http://www.ncbi.nlm.nih.gov/pubmed/26283726>

Whole-Body In Vivo Monitoring of Inflammatory Diseases Exploiting Human Interleukin 6-Luciferase Transgenic Mice. Hayashi M, Takai J, Yu L, Motohashi H, Moriguchi T, Yamamoto M. *Mol Cell Biol*. 2015 Oct 15;35(20):3590-601.

Paper 2:

<http://www.ncbi.nlm.nih.gov/pubmed/25825735>

Islet 1 specifies the identity of hypothalamic melanocortin neurons and is critical for normal food intake and adiposity in adulthood. Nasif S, de Souza FS, González LE, Yamashita M, Orquera DP, Low MJ, Rubinstein M. *Proc Natl Acad Sci U S A*. 2015 Apr 14;112(15):E1861-70.

Paper 3:

<http://www.ncbi.nlm.nih.gov/pubmed/24408435>

Single-cell RNA-seq reveals dynamic, random monoallelic gene expression in mammalian cells. Deng Q, Ramsköld D, Reinis B, Sandberg R. *Science*. 2014 Jan 10;343(6167):193-6.

Paper 4:

<http://www.ncbi.nlm.nih.gov/pubmed/26168398>

Genetic compensation induced by deleterious mutations but not gene knockdowns. Rossi A, Kontarakis Z, Gerri C, Nolte H, Hölper S, Krüger M, Stainier DY. *Nature*. 2015 Aug 13;524(7564):230-3.

Paper 5:

<http://www.ncbi.nlm.nih.gov/pubmed/25903628>

A new heart for a new head in vertebrate cardiopharyngeal evolution. Diogo R, Kelly RG, Christiaen L, Levine M, Ziermann JM, Molnar JL, Noden DM, Tzahor E. *Nature*. 2015 Apr 23;520(7548):466-73.

Paper 6:

<http://www.ncbi.nlm.nih.gov/pubmed/25371360>

Symmetry breaking, germ layer specification and axial organisation in aggregates of mouse embryonic stem cells. van den Brink SC, Baillie-Johnson P, Balayo T, Hadjantonakis AK, Nowotschin S, Turner DA, Martinez Arias A. *Development*. 2014 Nov;141(22):4231-42.

Paper 7:

<http://www.ncbi.nlm.nih.gov/pubmed/20418860>

Aberrant silencing of imprinted genes on chromosome 12qF1 in mouse induced pluripotent stem cells. Stadtfeld M, Apostolou E, Akutsu H, Fukuda A, Follett P, Natesan S, Kono T, Shioda T, Hochedlinger K. *Nature*. 2010 May 13;465(7295):175-81.

Paper 8:

<http://www.ncbi.nlm.nih.gov/pubmed/24412312>

Genetic exploration of the exit from self-renewal using haploid embryonic stem cells. Leeb M, Dietmann S, Paramor M, Niwa H, Smith A. *Cell Stem Cell*. 2014 Mar 6;14(3):385-93.

Paper 9:

<http://www.ncbi.nlm.nih.gov/pubmed/25733580>

Correction of the sickle cell disease mutation in human hematopoietic stem/progenitor cells. Hoban MD, Cost GJ, Mendel MC, Romero Z, Kaufman ML, Joglekar AV, Ho M, Lumaquin D, Gray D, Lill GR, Cooper AR, Urbinati F, Senadheera S, Zhu A, Liu PQ, Paschon DE, Zhang L, Rebar EJ, Wilber A, Wang X, Gregory PD, Holmes MC, Reik A, Hollis RP, Kohn DB. *Blood*. 2015 Apr 23;125(17):2597-604.

Paper 10:

<http://www.ncbi.nlm.nih.gov/pubmed/24572354>

Mouse liver repopulation with hepatocytes generated from human fibroblasts. Zhu S, Rezvani M, Harbell J, Mattis AN, Wolfe AR, Benet LZ, Willenbring H, Ding S. *Nature*. 2014 Apr 3;508(7494):93-7.

Paper 11:

<http://www.ncbi.nlm.nih.gov/pubmed/26167643>

Unraveling CRISPR-Cas9 genome engineering parameters via a library-on-library approach. Chari R, Mali P, Moosburner M, Church GM. *Nat Methods*. 2015 Sep;12(9):823-6.

Paper 12:

<http://www.ncbi.nlm.nih.gov/pubmed/25908821>

Genome editing. The mutagenic chain reaction: a method for converting heterozygous to homozygous mutations. Gantz VM, Bier E. *Science*. 2015 Apr 24;348(6233):442-4.

Paper 13:

<http://www.ncbi.nlm.nih.gov/pubmed/11751691>

Manipulating mitochondrial DNA heteroplasmy by a mitochondrially targeted restriction endonuclease. Srivastava S, Moraes CT. *Hum Mol Genet*. 2001 Dec 15;10(26):3093-9.

Paper 14:

<http://www.ncbi.nlm.nih.gov/pubmed/24567072>

Mitochondrially targeted ZFNs for selective degradation of pathogenic mitochondrial genomes bearing large-scale deletions or point mutations. Gammage PA, Rorbach J, Vincent AI, Rebar EJ, Minczuk M. *EMBO Mol Med*. 2014 Apr;6(4):458-66.

Paper 15:

<http://www.ncbi.nlm.nih.gov/pubmed/25959774>

Disruptions of topological chromatin domains cause pathogenic rewiring of gene-enhancer interactions. Lupiáñez DG, Kraft K, Heinrich V, Krawitz P, Brancati F, Klopocki E, Horn D, Kayserili H, Opitz JM, Laxova R, Santos-Simarro F, Gilbert-Dussardier B, Wittler L, Borschiwer M, Haas SA, Osterwalder M, Franke M, Timmermann B, Hecht J, Spielmann M, Visel A, Mundlos S. *Cell*. 2015 May 21;161(5):1012-25.

Paper 16:

<http://www.ncbi.nlm.nih.gov/pubmed/22172720>

β -catenin signaling controls metastasis in Braf-activated Pten-deficient melanomas. Damsky WE, Curley DP, Santhanakrishnan M, Rosenbaum LE, Platt JT, Gould Rothberg BE, Taketo MM, Dankort D, Rimm DL, McMahon M, Bosenberg M. Cancer Cell. 2011 Dec 13;20(6):741-54.

Paper 17:

<http://www.ncbi.nlm.nih.gov/pubmed/22855427>

Lineage tracing reveals Lgr5+ stem cell activity in mouse intestinal adenomas. Schepers AG, Snippert HJ, Stange DE, van den Born M, van Es JH, van de Wetering M, Clevers H. Science. 2012 Aug 10;337(6095):730-5.

Paper 18:

<http://www.ncbi.nlm.nih.gov/pubmed/25216638>

In vivo RNAi screening identifies a mechanism of sorafenib resistance in liver cancer. Rudalska R, Dauch D, Longerich T, McJunkin K, Wuestefeld T, Kang TW, Hohmeyer A, Pesic M, Leibold J, von Thun A, Schirmacher P, Zuber J, Weiss KH, Powers S, Malek NP, Eilers M, Sipos B, Lowe SW, Geffers R, Laufer S, Zender L. Nat Med. 2014 Oct;20(10):1138-46. d