

66017 - Master's Dissertation

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	537 - Master's in Molecular and Cellular Biology
ECTS	30.0
Course	1
Period	Annual
Subject Type	Master Final Project
Module	---

1. Basic info

1.1. Recommendations to take this course

This course, Master dissertation or Master Final Project (FMP) will consist in the development, under the supervision of a researcher involved in the Master (Tutor), of an experimental research project in which the student will put into practice and extend the knowledge and skills he/she has acquired so far.

The FMP will be carried out in one of the research groups affiliated to the postgraduate program (see section 5.5. for a list of participating research groups and publications and section 5.3 (program) for some examples of recent FMP topics).

The web page of the Science School (<http://ciencias.unizar.es>) will inform of the dates and procedures for both the election and presentation and defense of the FMP. It is highly recommended to visit the web page of the Biochemistry and Molecular Biology department (bioquimica.unizar.es) to get information on the groups, research lines and possible tutors of FMP in order to make a choice.

The FMP can be performed preferentially throughout the whole academic year with an average weekly dedication of around 10 h but, upon agreement, it can also be developed in a semester with an average weekly dedication of 20 h.

At the end of the Master, the student will have to prepare a written report of its FMP, that will be presented and defended orally in front of a three-member committee. The committee will evaluate both the structure and contents of the written report as well as the student communication capacity and mastering of the project's research field.

Both the FMP written report, as well as the oral defense can be performed in English or in Spanish.

1.2. Activities and key dates for the course

Each student will organize the required activities according to the project director (Tutor) guidelines.

The web page of the Science School (<http://ciencias.unizar.es>) will inform of the dates and procedures for both the

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election and presentation and defense of the FMP. It is highly recommended to visit the web page of the Biochemistry and Molecular Biology department (bioquimica.unizar.es) to get information on the groups, research lines and possible tutors of FMP in order to make a choice.

(See details at: <https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15>)

2. Initiation

2.1. Learning outcomes that define the subject

The main objectives of the FMP are:

- To enable students to acquire and practise the basic skills required to conduct experimental work in the laboratory in the fields of Molecular and Cellular Biology.

- To teach the students how to analyze and interpret the experimental data obtained and take decisions for the development of a given project.

- To ensure students acquire the knowledge and ability they will need to identify problems, and find practical and creative solutions, as well as to apply them in a research or professional context in the fields of Molecular and Cellular Biology.

- To develop their ability to present scientific work in a clear and concise manner, orally and in writing, both to the specialist as well as to a general audience, understanding the ethical and social implications involved.

2.2. Introduction

3. Context and competences

3.1. Goals

The main objectives of the FMP are:

- To enable students to acquire and practise the basic skills required to conduct experimental work in the laboratory in the fields of Molecular and Cellular Biology.

- To teach the students how to analyze and interpret the experimental data obtained and take decisions for the development of a given project.

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- To ensure students acquire the knowledge and ability they will need to identify problems, and find practical and creative solutions, as well as to apply them in a research or professional context in the fields of Molecular and Cellular Biology.

- To develop their ability to present scientific work in a clear and concise manner, orally and in writing, both to the specialist as well as to a general audience, understanding the ethical and social implications involved.

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

The student will have to prepare a written report of its FMP, that will be presented and defended orally in front of a three-member committee. The committee will evaluate both the structure and contents of the written report as well as the student communication capacity and mastering of the project's research field. A written report by the project tutor or the student general performance will also be considered for the final vote.

Both the FMP written report, as well as the oral defense can be performed in English.

The evaluation committee will consider (**See details at:**
<https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15>) :

1. **Written FMP memory** (60% of final vote). A 40-60 page written report containing the following sections: Title, Introduction, Hypothesis and Objectives, Methodology, Results, Discussion, Conclusions and Bibliography.

2. **Oral presentation and defense** (30% of final vote). A public presentation of the work during around 15 minutes followed by a discussion with the committee members of around 15 minutes.

3. **Project tutor report on the student's general performance** (10% of final vote).

The FMP will be evaluated in any of the official periods established by the Sciences School. The written memory will be presented typically around 8 school days before the day established for the oral defense.

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The precise dates for the FMP defense and the composition of the evaluation committee will be published in the School web page and in the Biochemistry Department boards. Typically the defense periods will be in July (1st -15th) and September (15th -30th).

5. Activities and resources

5.1. General methodological presentation

This course is intended to develop and apply the theoretical knowledge accumulated by the student during the previous period. The main objectives of the FMP are to enable students to acquire and practise the basic skills required to conduct experimental work in the fields of Molecular and Cellular Biology, to analyze and interpret the experimental data obtained and to develop their ability to present scientific work in a clear and concise manner both to the specialist as well as to a general audience.

For these purposes, the FMP will be carried out in one of the research groups affiliated to the postgraduate program under the supervision of a Tutor/s. The FMP can be performed either throughout the whole academic year with an average weekly dedication of around 10 h (preferred) or in a semester with an average weekly dedication of 20 h.

At the end of the Master, the student will have to prepare a written report of its FMP, that will be presented and defended orally in front of a three-member committee. The committee will evaluate both the structure and contents of the written report as well as the student communication capacity and mastering of the project's research field.

Both the FMP written report, as well as the oral defense can be performed in English or in Spanish.

(See details at: <https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15>)

5.2. Learning activities

The main learning activities of this course are:

1. The tutor will propose a specific scientific problem to the student (an hypothesis that has to be checked). The student should learn the background around the problem to be solved through the study of the corresponding publications, thesis or previous studies related to it. The student should try to answer questions such as: What is known about this problem? What similar problems have been solved and how?
2. The Tutor of the FMP will guide the student to design the experiments required to solve the problem. They will plan together the steps to cover and the schedule to develop.
3. The student will learn and apply the experimental methods required to obtain the results that will help to answer the problem.

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4. The student will learn to analyze and interpret the results, and to discuss them and plan new experiments with the help of the tutor.
5. The student will learn to prepare a scientific memory with the following sections: Title, Introduction, Hypothesis and Objectives, Methodology, Results, Discussion, Conclusions and Bibliography. For this purpose the tutor will supervise and help the student.
6. The student will prepare an oral presentation of the work developed according to the time and content guidelines.

The web page of the Science School (<http://ciencias.unizar.es>) will inform of the dates and procedures for both the election and presentation and defense of the FMP. It is highly recommended to visit the web page of the Biochemistry and Molecular Biology department (bioquimica.unizar.es) to get information on the groups, research lines and possible tutors of FMP in order to make a choice.

5.3.Program

There is not a specific program for this course. Each student will organize the required activities according to the project director guidelines.

Examples of recent FMP topics:

- "**Prokaryotic** FAD synthetases (FADS): a potential pharmacologic target in therapy. Analysis of structure-function relationships and inhibitor design". (**Directors:** Dr. Milagros Medina and Dr. Ana Serrano , **BM CBD and BiFi**)
- "Tumor stem cell activation effects of Granzyme A induced inflammation in colorectal carcinoma". (**Director:** Julian Pardo, **IACS**)
- "Development and validation of a an immunochemical test for the diagnosis of invasive aspergillosis" . (**Director:** Julian Pardo, **IACS**)
- "Multifunctional nanoparticles for transport and selective delivery of anti-hepatitis C (VHC) drugs" (**Director:** Olga Abian, **BiFi**)

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- "Identification and characterization of new ionic channel modulators for the treatment of neurological and cardiovascular diseases". (**Director:** Ralf Kohler, UIT-IACS)
- "Functional analysis of polymorphisms in promoters involved in lipid metabolism". (**Directors:** Miguel Pocoví e Isabel de Castro **BMCBD and IACS**)
- "Melatonin effect on the ovine reproductive system" (**Directors:** Adriana Casao Gascón and Rosaura Perez Pe , **BMCBD** Veterinary School)
- "Functional effects of directed mutations in human Apoptosis Inducing Factor (hAIF)". (**Directors:** Dr. Patricia Ferreira and Dr. Raquel Moreno-Loshuertos , **BMCBD and BiFi**)
- "Search for pharmacological chaperones to rescue MeCP2 mutations involved in Rett syndrome". (**Directors:** Dr. Adrián Velázquez Campoy and Dr. Olga Alban, BiFi-IACS)
- "In vitro antitumoral effects of BH3-mimetic compounds combined with the proteosomal inhibitor Carfilzomib and with PARP-1 inhibitor Olaparib". (**Director:** Isabel Marzo, **BMCBD**)
- "Role of mtDNA genetic polymorphisms in Parkinson's disease". (**Directors** : Julio Montoya and Eduardo Ruiz-Pesini, **BMCBD**)

5.4.Planning and scheduling

The list of available FMP with a title, and the contact address of the tutor(s) will be published according to the School guidelines and the Department and the Master coordinator will inform the enrolled students. (See details at: <https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15>)

Each student will organize the required activities according to the project director (Tutor) guidelines considering the other courses of the Master and the 30 ECTS assigned to the FMP.

The FMP will be evaluated in any of the official periods established by the Sciences School. The written memory will be presented typically around 8 school days before the day established for the oral defense.

The precise dates for the FMP defense and the composition of the evaluation committee will be published in the School web page and in the Biochemistry Department boards. Typically the defense periods will be in July (1st -15th) and September (15th -30th).

5.5. Bibliography and recommended resources

The Tutor will provide the specific bibliography of each project that will be updated by the student.

- **Biochemistry and Molecular and Cellular Biology Department (BMCBD) research groups:**

[Apoptosis, Immunity and Cancer](#)

[Structural Biology](#)

[Mitochondrial Biogenesis and Pathology](#)

[Biology and Biotechnology of Reproduction](#)

[Genetics of lipid metabolism disorders](#)

[Mediterranean Diet and Atherosclerosis](#)

- Members of the Department are also involved in the Institutes of [Biocomputation and Physics of Complex Systems \(BiFi\)](#) , of [Nanoscience of Aragon \(INA\)](#) , the [Aragones Institute of Health Sciences \(IACS\)](#) and the [Environmental Sciences Institute](#) . Moreover, some research groups are also involved in the Centros de Investigación Biomédica en Red (CIBER) of [Rare Diseases \(CIBERER\)](#) and [Obesity and Nutrition Physopathology \(CIBERObn\)](#) .

Groups from **other Departments/Institutes** participating in the Master Program:

[Mycobacterial genetics group](#) (Dpt. of Microbiology)

[LAGENBIO research group](#) (Dpt. of Anatomy, Embriology and Animal Genetics)

[Computational and Structural Biology group](#) (CSIC-Aula Dei)

[Ionic channels research group](#) (UIT-Miguel Servet University Hospital)

List of selected recent publications (BMCBD groups):

1.- Human NK cells activated by EBV + lymphoblastoid cells overcome anti-apoptotic mechanisms of drug resistance in haematological cancer cells. Sánchez-Martínez D, Azaceta G, Muntasell A, et al. Oncoimmunology. 2015 Jan

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9;4(3):e991613. eCollection 2015 Mar.

2.- [MHC-I modulation due to changes in tumor cell metabolism regulates tumor sensitivity to CTL and NK cells.](#) Catalán E, Charni S, Jaime P, et al. Oncoimmunology. 2015 Feb 3;4(1):e985924. eCollection 2015 Jan.

3.- [Two death pathways induced by sorafenib in myeloma cells: Puma-mediated apoptosis and necroptosis.](#) Ramírez-Labrada A, López-Royuela N, Jarauta V, et al. Clin Transl Oncol. 2015 Feb;17(2):121-32. doi: 10.1007/s12094-014-1201-y. Epub 2014 Jul 19.

4.- [Granulysin induces apoptotic cell death and cleavage of the autophagy regulator Atg5 in human hematological tumors.](#) Aporta A, Catalán E, Galán-Malo P, et al. Biochem Pharmacol. 2014 Feb 1;87(3):410-23. doi: 10.1016/j.bcp.2013.11.004. Epub 2013 Nov 22.

5.- [Liposomes decorated with Apo2L/TRAIL overcome chemoresistance of human hematologic tumor cells.](#) De Miguel D, Basáñez G, Sánchez D, et al. Mol Pharm. 2013 Mar 4;10(3):893-904. doi: 10.1021/mp300258c. Epub 2013 Feb 6.

6.- [Key Residues Regulating the Reductase Activity of the Human Mitochondrial Apoptosis Inducing Factor.](#) Villanueva R, Ferreira P, Marcuello C, et al. Biochemistry. 2015 Aug 25;54(33):5175-84. doi: 10.1021/acs.biochem.5b00696. Epub 2015 Aug 13.

7.- [Aromatic stacking interactions govern catalysis in aryl-alcohol oxidase.](#) Ferreira P, Hernández-Ortega A, Lucas F, et al. FEBS J. 2015 Aug;282(16):3091-106. doi: 10.1111/febs.13221. Epub 2015 Feb 23.

8.- [Structural insights into the coenzyme mediated monomer-dimer transition of the pro-apoptotic apoptosis inducing factor.](#) Ferreira P, Villanueva R, Martínez-Júlvez M, et al. Biochemistry. 2014 Jul 1;53(25):4204-15. doi: 10.1021/bi500343r. Epub 2014 Jun 20.

9.- [Electron transferases.](#) Ferreira P, Martínez-Júlvez M, Medina M. Methods Mol Biol. 2014;1146:79-94. doi: 10.1007/978-1-4939-0452-5_5. Review.

10.- [The prokaryotic FAD synthetase family: a potential drug target.](#) Serrano A, Ferreira P, Martínez-Júlvez M, Medina M. Curr Pharm Des. 2013;19(14):2637-48.

11.- [The Pkn22 Ser/Thr kinase in Nostoc PCC 7120: role of FurA and NtcA regulators and transcript profiling under nitrogen starvation and oxidative stress.](#) Yingping F, Lemeille S, González A, et al. BMC Genomics. 2015 Jul 29;16:557. doi: 10.1186/s12864-015-1703-1.

12.- [Mesoscopic model and free energy landscape for protein-DNA binding sites: analysis of cyanobacterial promoters.](#) Tapia-Rojo R, Mazo JJ, Hernández JA, et al. PLoS Comput Biol. 2014 Oct 2;10(10):e1003835. doi: 10.1371/journal.pcbi.1003835. eCollection 2014 Oct.

13.- [Zur \(FurB\) is a key factor in the control of the oxidative stress response in Anabaena sp. PCC 7120.](#)

Sein-Echaluce VC, González A, Napolitano M, et al. Environ Microbiol. 2015 Jun;17(6):2006-17. doi: 10.1111/1462-2920.12628. Epub 2014 Oct 22.

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- 14.- [The FUR \(ferric uptake regulator\) superfamily: diversity and versatility of key transcriptional regulators.](#) Fillat MF. Arch Biochem Biophys. 2014 Mar 15;546:41-52. doi: 10.1016/j.abb.2014.01.029. Epub 2014 Feb 7.
- 15.- [The FurA regulon in Anabaena sp. PCC 7120: in silico prediction and experimental validation of novel target genes.](#) González A, Angarica VE, Sancho J, Fillat MF. Nucleic Acids Res. 2014 Apr;42(8):4833-46. doi: 10.1093/nar/gku123. Epub 2014 Feb 6.
- 16.- [Intradomain Confinement of Disulfides in the Folding of Two Consecutive Modules of the LDL Receptor.](#) Martínez-Oliván J, Fraga H, Arias-Moreno X, Ventura S, Sancho J. PLoS One. 2015 Jul 13;10(7):e0132141. doi: 10.1371/journal.pone.0132141. eCollection 2015.
- 17.- [Rational stabilization of complex proteins: a divide and combine approach.](#) Lamazares E, Clemente I, Bueno M, et al. Sci Rep. 2015 Mar 16;5:9129. doi: 10.1038/srep09129.
- 18.- [Increased glycolipid storage produced by the inheritance of a complex intronic haplotype in the α-galactosidase A \(GLA\) gene.](#) Gervas-Arruga J, Cebolla JJ, Irun P, et al. BMC Genet. 2015 Sep 3;16(1):109. doi: 10.1186/s12863-015-0267-z.
- 19.- [Glycated Hemoglobin, Fasting Insulin and the Metabolic Syndrome in Males. Cross-Sectional Analyses of the Aragon Workers' Health Study Baseline.](#) Saravia G, Civeira F, Hurtado-Roca Y, et al. PLoS One. 2015 Aug 4;10(8):e0132244. doi: 10.1371/journal.pone.0132244. eCollection 2015.
- 20.- [The influence of genetic variability and proinflammatory status on the development of bone disease in patients with Gaucher disease.](#) Gervas-Arruga J, Cebolla JJ, de Blas I, et al. PLoS One. 2015 May 15;10(5):e0126153. doi: 10.1371/journal.pone.0126153. eCollection 2015.
- 21.- [Mitochondrial DNA copy number differentiates the Leber's hereditary optic neuropathy affected individuals from the unaffected mutation carriers.](#) Bianco A, Martínez-Romero I, Bisceglia L, et al. Brain. 2015 Jul 23. pii: awv216. [Epub ahead of print]
- 22.- [Decrease of oxidative phosphorylation system function in severe septic patients.](#) Lorente L, Martín MM, López-Gallardo E, et al. J Crit Care. 2015 Jun 10. pii: S0883-9441(15)00340-8. doi: 10.1016/j.jcrc.2015.05.031. [Epub ahead of print]
- 23.- [Side Effects of Culture Media Antibiotics on Cell Differentiation.](#) Llobet L, Montoya J, López-Gallardo E, Ruiz-Pesini E. Tissue Eng Part C Methods. 2015 Jul 8. [Epub ahead of print]
- 24.- [Severe encephalopathy associated to pyruvate dehydrogenase mutations and unbalanced coenzyme Q 10 content.](#) Asencio C, Rodríguez-Hernandez MA, Briones P, et al. Eur J Hum Genet. 2015 May 27. doi: 10.1038/ejhg.2015.112. [Epub ahead of print]
- 25.- [An MRPS12 mutation modifies aminoglycoside sensitivity caused by 12S rRNA mutations.](#) Emperador S, Pacheu-Grau D, Bayona-Bafaluy MP, et al. Front Genet. 2015 Jan 14;5:469. doi: 10.3389/fgene.2014.00469. eCollection 2014.
- 26.- [New Insights into the Phylogeny and Gene Context Analysis of Binder of Sperm Proteins \(BSPs\).](#) Serrano E, Martínez AB, Arruga D, et al. PLoS One. 2015 Sep 2;10(9):e0137008. doi: 10.1371/journal.pone.0137008. eCollection

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2015.

27.- [Effect of seminal plasma proteins on the motile sperm subpopulations in ram ejaculates.](#) Luna C, Yeste M, Rivera Del Alamo MM, et al. *Reprod Fertil Dev.* 2015 Aug 24. doi: 10.1071/RD15231. [Epub ahead of print]

28.- [Intracellular calcium movements of boar spermatozoa during 'in vitro' capacitation and subsequent acrosome exocytosis follow a multiple-storage place, extracellular calcium-dependent model.](#) Yeste M, Fernández-Novell JM, Ramió-Lluch L, et al. *Andrology.* 2015 Jul;3(4):729-47. doi: 10.1111/andr.12054. Epub 2015 Jun 20.

29.- [Cleaved PARP-1, an Apoptotic Marker, can be Detected in Ram Spermatozoa.](#) Casao A, Mata-Campuzano M, Ordás L, et al. *Reprod Domest Anim.* 2015 Aug;50(4):688-91. doi: 10.1111/rda.12549. Epub 2015 Jun 2.

30.- [New evidence of melatonin receptor contribution to ram sperm functionality.](#) Gonzalez-Arto M, Luna C, Pérez-Pé R, et al. *Reprod Fertil Dev.* 2014 Dec 17. doi: 10.1071/RD14302. [Epub ahead of print]

31.- [PON1 and Mediterranean Diet.](#) Lou-Bonafonte JM, Gabás-Rivera C, Navarro MA, Osada J. *Nutrients.* 2015 May 27;7(6):4068-92. doi: 10.3390/nu7064068. Review.

32.- [Cloning and expression of hepatic synaptotagmin 1 in mouse.](#) Sancho-Knapik S, Guillén N, Osada J. *Gene.* 2015 May 15;562(2):236-43. doi: 10.1016/j.gene.2015.02.074. Epub 2015 Feb 28.

33.- [Involvement of intracellular signaling in the IL-1β: inhibitory effect on fructose intestinal absorption.](#) Rodríguez-Yoldi MJ, Gascón S, Barranquero C, García-Barrios A, Osada J. *J Cell Physiol.* 2015 Apr;230(4):896-902. doi: 10.1002/jcp.24820.

34.- [Dietary squalene increases high density lipoprotein-cholesterol and paraoxonase 1 and decreases oxidative stress in mice.](#) Gabás-Rivera C, Barranquero C, Martínez-Beamonte R, et al. *PLoS One.* 2014 Aug 12;9(8):e104224. doi: 10.1371/journal.pone.0104224. eCollection 2014.

35.- [Role of Δ1-pyrroline-5-carboxylate dehydrogenase supports mitochondrial metabolism and host-cell invasion of Trypanosoma cruzi.](#) Mantilla BS, Paes LS, Pral EM, et al. *J Biol Chem.* 2015 Mar 20;290(12):7767-90. doi: 10.1074/jbc.M114.574525. Epub 2015 Jan 26.

36.- [ROS-triggered phosphorylation of complex II by Fgr kinase regulates cellular adaptation to fuel use.](#)

Acín-Pérez R, Carrascoso I, Baixauli F, et al. *Cell Metab.* 2014 Jun 3;19(6):1020-33. doi: 10.1016/j.cmet.2014.04.015. Epub 2014 May 22.

37.- [Mitochondrial cristae shape determines respiratory chain supercomplexes assembly and respiratory efficiency.](#) Cogliati S, Frezza C, Soriano ME, et al. *Cell.* 2013 Sep 26;155(1):160-71. doi: 10.1016/j.cell.2013.08.032. Epub 2013 Sep 19.

38.- [Supercomplex assembly determines electron flux in the mitochondrial electron transport chain.](#) Lapuente-Brun E, Moreno-Loshuertos R, et al. *Science.* 2013 Jun 28;340(6140):1567-70. doi: 10.1126/science.1230381.

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