Teaching Guide				
Identifying Data				2019/20
Subject (*)	Stem Cells and Cell Therapy		Code	610441009
Study programme	Mestrado Universitario en Bioloxía Molecular , Celular e Xenética			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias Biomédicas, Medicina e FisioterapiaDepartamento profesorado másterFisioterapia, Medicina e Ciencias Biomédicas			
Coordinador	Arufe Gonda, María del Carmen	E-mail	maria.arufe@udc.es	
Lecturers	Arufe Gonda, María del Carmen Blanco García, Francisco Javier Doménech García, María Nieves Rendal Vazquez, Maria Esther Silva Magalhães, Joana Cristina	E-mail	maria.arufe@udc.es f.blanco1@udc.es esther.rendal.vazquez1@udc.es joana.magalhaes@udc.es	
Web				
General description	Subject´s coordinador :María del Carmen Arufe Gonda maria.arufe@udc.es Teachers from INIBIC: Dr. Fco. Javier Blanco García (fblagar@sergas.es) Dra. Nieves Domenech García (nieves.domenech.garcia@sergas.es) Dra. Mª Esther Rendal Vázquez			

Study programme competences	
Code	Study programme competences
A1	Skills of using usual techniques and instruments in the cellular, biological and molecular research: that are able to use techniques and instruments as well as understanding potentials of their uses and applications.
A2	Skills of working in a sure way in the laboratories knowing operation handbooks and actions to avoid incidents of risk.
A6	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.
A7	Skills of knowing and analyzing specific cellular systems as stem cells, nerve cells, cells of the immune system, or other cells related to several pathologies.
A8	Skills of having an integrated view of the previously acquired knowledge about Molecular and Cellular Biology and Genetics, with an interdisciplinary approach and experimental work.
B1	Analysis skills to understand biological problems in connection with the Molecular and Cellular Biology and Genetics.
B3	Skills of management of the information: that are able to gather and to understand relevant information and results, obtaining conclusions and to prepare reasoned reports on scientific and biotechnological questions
B4	Organization and work planning skills: that are able to manage the use of the time as well as available resources and to organize the work in the laboratory.
B8	Critical reasoning skills and ethical commitment with the society: sensitivity in front of bioethical problems and to the ones related to the natural resource conservation
C1	Adequate oral and written expression in the official languages.
C6	Acquiring skills for healthy lifestyles, and healthy habits and routines.
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.

Learning outcomes	
Learning outcomes	Study programme competences

The study of cellular techniques	AR1 AR2 AR6 AR7 AR8	BR1 BR3 BR4 BR8	CC1 CC6 CC8

Contents	
Topic	**Sub-topic**
Introduction	Culture area for cell therapy. Stem cells and therapy basic cell. Embryonic stem cells and therapeutic cloning.
Search cell sources for cell therapy	Obtaining mesenchymal stem cells from umbilical strome. Cell therapy in cartilage recovery. Cell therapy in myocardial recovery. Culture of ocular limbal cells to repair
Tissue Engineering	Transplantation of tissue-engineered skin produced. Scaffolds and Biopolymers in tissue engineering.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A1 A2 B1 B3 B4 C6 C8	12	30	42
Laboratory practice	B4 B8 C1 C6 C8	7	0	7
Seminar	C6 C8	1	7	8
Objective test	A6 A7 A8 C1 C6	1	17	18
Personalized attention		0	0	0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	Lecture participatory, encouraging the exchange of views, debate and answer questions from students.
Laboratory practice	They unfold techniques currently used in biomedical research, complementing the knowledge imparted in the keynote session.
Seminar	Invitation some scientist to show us her most recent research.
Objective test	Multiple choice exam in which each question consists of 4 claims of which only one is correct.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech Laboratory practice	Being a small group of students, it is possible to resolve doubts and individualized monitoring during the learning process itself. In particular, the master class is participatory, encouraging the exchange of opinions, debate and answer questions. The students in labs are supervised at all times by teachers and, if necessary, by the research group in which the student integrates. Students with part-time dedication or waiver of presence should contact the teachers of the subject in the early going to establish a schedule of activities to acquire and evaluate in a complementary way the competences.

Assessment

Methodologies	Competencies	Description	Qualification
Guest lecture / keynote speech	A1 A2 B1 B3 B4 C6 C8	Attendance and participation	15
Objective test	A6 A7 A8 C1 C6	Questions about the theory and methodology used in the class.	40
Seminar	C6 C8	Reading and discussion commented.This activity will be assessed the acquisition of skills A18, B1, B3, B4, B8.	15
Laboratory practice	B4 B8 C1 C6 C8	Attendance and participation. This activity will be assessed the acquisition of skills A3, A4, A6, A9, A10	30

Assessment comments
Students with part-time dedication or waiver attendance may choose to be evaluated in a final exam if they do not qualify for continuous evaluation.

Sources of information	
Basic	

Complementary	1 Lawrence, R. C. et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheum 58, 26-35, doi:10.1002/art.23176 (2008). 2 Arufe, M. C., De la Fuente, A., Fuentes-Boquete, I., De Toro, F. J. & Blanco, F. J. Differentiation of synovial CD-105(+) human mesenchymal stem cells into chondrocyte-like cells through spheroid formation. J Cell Biochem 108, 145-155, doi:10.1002/jcb.22238 (2009). 3 Csaki, C., Matis, U., Mobasheri, A., Ye, H. & Shakibaei, M. Chondrogenesis, osteogenesis and adipogenesis of canine mesenchymal stem cells: a biochemical, morphological and ultrastructural study. Histochem Cell Biol 128, 507-520, doi:10.1007/s00418-007-0337-z (2007). 4 Carlson, C. S., Loeser, R. F., Purser, C. B., Gardin, J. F. & Jerome, C. P. Osteoarthritis in cynomolgus macaques. III: Effects of age, gender, and subchondral bone thickness on the severity of disease. J Bone Miner Res 11, 1209-1217 (1996). 5 Olson, E. J., Lindgren, B. R. & Carlson, C. S. Effects of long-term estrogen replacement therapy on the prevalence and area of periarticular tibial osteophytes in surgically postmenopausal cynomolgus monkeys. Bone 41, 282-289, doi:S8756-3282(07)00355-9 [pii] 10.1016/j.bone.2007.04.175 (2007). 6 Ham, K. D., Loeser, R. F., Lindgren, B. R. & Carlson, C. S. Effects of long-term estrogen replacement therapy on osteoarthritis severity in cynomolgus monkeys. Arthritis Rheum 46, 1956-1964, doi:10.1002/art.10406 (2002). 7 Tang, C. H. et al. Bone-derived SDF-1 stimulates IL-6 release via CXCR4, ERK and NF-kappaB pathways and promotes osteoclastogenesis in human oral cancer cells. Carcinogenesis 29, 1483-1492, doi:bgn045 [pii] 10.1093/carcin/bgn045 (2008). 8 Mateos, J. et al. Lamin A deregulation in human mesenchymal stem cells promotes an impairment in their chondrogenic potential and imbalance in their response to oxidative stress. Stem Cell Res 11, 1137-1148, doi:10.1016/j.scr.2013.07.004 (2013). 9 Ramallal, M. et al. Xeno-implantation of pig chondrocytes into rabbit to treat localized articular cartilage defects: an animal model. Wound Repair Regen 12, 337-345, doi:10.1111/j.1067-1927.2004.012309.x WRR12309 [pii] (2004). 10 Liechty, K. W. et al. Human mesenchymal stem cells engraft and demonstrate site-specific differentiation after in utero transplantation in sheep. Nat Med 6, 1282-1286, doi:10.1038/81395 (2000). 11 MacDonald, D. J. et al. Persistence of marrow stromal cells implanted into acutely infarcted myocardium: observations in a xenotransplant model. J Thorac Cardiovasc Surg 130, 1114-1121, doi:S0022-5223(05)00975-X [pii] 10.1016/j.jtcvs.2005.04.033 (2005). 12 Grinnemo, K. H. et al. Xenoreactivity and engraftment of human mesenchymal stem cells transplanted into infarcted rat myocardium. J Thorac Cardiovasc Surg 127, 1293-1300, doi:10.1016/j.jtcvs.2003.07.037 S0022522303015137 [pii] (2004). 13 Chen, F. H. & Tuan, R. S. Mesenchymal stem cells in arthritic diseases. Arthritis Res Ther 10, 223, doi:ar2514 [pii] 10.1186/ar2514 (2008).14 Hunziker, E. B. Articular cartilage repair: basic science and clinical progress. A review of the current status and prospects. Osteoarthritis Cartilage 10, 432-463, doi:10.1053/joca.2002.0801 S1063458402908010 [pii] (2002). 15 Koch, T. G. & Betts, D. H. Stem cell therapy for joint problems using the horse as a clinically relevant animal model. Expert Opin Biol Ther 7, 1621-1626, doi:10.1517/14712598.7.11.1621 (2007). 16 Arufe, M. C., De la Fuente, A., Fuentes-Boquete, I., De Toro, F. J. & Blanco, F. J. Differentiation of synovial CD-105(+) human mesenchymal stem cells into chondrocyte-like cells through spheroid formation. J Cell Biochem, doi:10.1002/jcb.22238 (2009). 17 Karlsson, C., Thornemo, M., Henriksson, H. B. & Lindahl, A. Identification of a stem cell niche in the zone of Ranvier within the knee joint. J Anat, doi:JOA1115 [pii] 10.1111/j.1469-7580.2009.01115.x (2009). 18 Grogan, S. P., Miyaki, S., Asahara, H., D'Lima, D. D. & Lotz, M. K. Mesenchymal progenitor cell markers in human articular cartilage: normal distribution and changes in osteoarthritis. Arthritis Res Ther 11, R85, doi:ar2719 [pii] 10.1186/ar2719 (2009). 19 Isakova, I. A., Baker, K., Dufour, J., Gaupp, D. & Phinney, D. G. Preclinical evaluation of adult stem cell engraftment and toxicity in the CNS of rhesus macaques. Mol Ther 13, 1173-1184, doi:S1525-0016(06)00012-8 [pii] 10.1016/j.ymthe.2005.12.014 (2006). 20 Mundy, G. R. Metastasis to bone: causes, consequences and therapeutic opportunities. Nat Rev Cancer 2, 584-593, doi:10.1038/nrc867 nrc867 [pii] (2002). 21 Taichman, R. S. et al. Use of the stromal cell-derived factor-1/CXCR4 pathway in prostate cancer metastasis to bone. Cancer Res 62, 1832-1837 (2002). 22 Heng, B. C. et al. Trans-Catheter Injection Induced Changes in Human Bone Marrow-Derived Mesenchymal Stem Cells. Cell Transplant, doi:ct2093heng [pii] 10.3727/096368909X12483162197006 (2009).1 Lawrence, R. C. et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheum 58, 26-35, doi:10.1002/art.23176 (2008). 2 Arufe, M. C., De la Fuente, A., Fuentes-Boquete, I., De Toro, F. J. & Blanco, F. J. Differentiation of synovial CD-105(+) human mesenchymal stem cells into chondrocyte-like cells through spheroid formation. J Cell Biochem 108, 145-155, doi:10.1002/jcb.22238 (2009). 3 Csaki, C., Matis, U., Mobasheri, A., Ye, H. & Shakibaei, M. Chondrogenesis, osteogenesis and adipogenesis of canine mesenchymal stem cells: a biochemical, morphological

and ultrastructural study. Histochem Cell Biol 128, 507-520, doi:10.1007/s00418-007-0337-z (2007). 4 Carlson, C. S., Loeser, R. F., Purser, C. B., Gardin, J. F. & Jerome, C. P. Osteoarthritis in cynomolgus macaques. III: Effects of age, gender, and subchondral bone thickness on the severity of disease. J Bone Miner Res 11, 1209-1217 (1996). 5 Olson, E. J., Lindgren, B. R. & Carlson, C. S. Effects of long-term estrogen replacement therapy on the prevalence and area of periarticular tibial osteophytes in surgically postmenopausal cynomolgus monkeys. Bone 41, 282-289, doi:S8756-3282(07)00355-9 [pii] 10.1016/j.bone.2007.04.175 (2007). 6 Ham, K. D., Loeser, R. F., Lindgren, B. R. & Carlson, C. S. Effects of long-term estrogen replacement therapy on osteoarthritis severity in cynomolgus monkeys. Arthritis Rheum 46, 1956-1964, doi:10.1002/art.10406 (2002). 7 Tang, C. H. et al. Bone-derived SDF-1 stimulates IL-6 release via CXCR4, ERK and NF-kappaB pathways and promotes osteoclastogenesis in human oral cancer cells. Carcinogenesis 29, 1483-1492, doi:bgn045 [pii] 10.1093/carcin/bgn045 (2008). 8 Mateos, J. et al. Lamin A deregulation in human mesenchymal stem cells promotes an impairment in their chondrogenic potential and imbalance in their response to oxidative stress. Stem Cell Res 11, 1137-1148, doi:10.1016/j.scr.2013.07.004 (2013). 9 Ramallal, M. et al. Xeno-implantation of pig chondrocytes into rabbit to treat localized articular cartilage defects: an animal model. Wound Repair Regen 12, 337-345, doi:10.1111/j.1067-1927.2004.012309.x WRR12309 [pii] (2004). 10 Liechty, K. W. et al. Human mesenchymal stem cells engraft and demonstrate site-specific differentiation after in utero transplantation in sheep. Nat Med 6, 1282-1286, doi:10.1038/81395 (2000). 11 MacDonald, D. J. et al. Persistence of marrow stromal cells implanted into acutely infarcted myocardium: observations in a xenotransplant model. J Thorac Cardiovasc Surg 130, 1114-1121, doi:S0022-5223(05)00975-X [pii] 10.1016/j.jtcvs.2005.04.033 (2005). 12 Grinnemo, K. H. et al. Xenoreactivity and engraftment of human mesenchymal stem cells transplanted into infarcted rat myocardium. J Thorac Cardiovasc Surg 127, 1293-1300, doi:10.1016/j.jtcvs.2003.07.037 S0022522303015137 [pii] (2004). 13 Chen, F. H. & Tuan, R. S. Mesenchymal stem cells in arthritic diseases. Arthritis Res Ther 10, 223, doi:ar2514 [pii] 10.1186/ar2514 (2008).14 Hunziker, E. B. Articular cartilage repair: basic science and clinical progress. A review of the current status and prospects. Osteoarthritis Cartilage 10, 432-463, doi:10.1053/joca.2002.0801 S1063458402908010 [pii] (2002). 15 Koch, T. G. & Betts, D. H. Stem cell therapy for joint problems using the horse as a clinically relevant animal model. Expert Opin Biol Ther 7, 1621-1626, doi:10.1517/14712598.7.11.1621 (2007). 16 Arufe, M. C., De la Fuente, A., Fuentes-Boquete, I., De Toro, F. J. & Blanco, F. J. Differentiation of synovial CD-105(+) human mesenchymal stem cells into chondrocyte-like cells through spheroid formation. J Cell Biochem, doi:10.1002/jcb.22238 (2009). 17 Karlsson, C., Thornemo, M., Henriksson, H. B. & Lindahl, A. Identification of a stem cell niche in the zone of Ranvier within the knee joint. J Anat, doi:JOA1115 [pii] 10.1111/j.1469-7580.2009.01115.x (2009). 18 Grogan, S. P., Miyaki, S., Asahara, H., D'Lima, D. D. & Lotz, M. K. Mesenchymal progenitor cell markers in human articular cartilage: normal distribution and changes in osteoarthritis. Arthritis Res Ther 11, R85, doi:ar2719 [pii] 10.1186/ar2719 (2009). 19 Isakova, I. A., Baker, K., Dufour, J., Gaupp, D. & Phinney, D. G. Preclinical evaluation of adult stem cell engraftment and toxicity in the CNS of rhesus macaques. Mol Ther 13, 1173-1184, doi:S1525-0016(06)00012-8 [pii] 10.1016/j.ymthe.2005.12.014 (2006). 20 Mundy, G. R. Metastasis to bone: causes, consequences and therapeutic opportunities. Nat Rev Cancer 2, 584-593, doi:10.1038/nrc867 nrc867 [pii] (2002). 21 Taichman, R. S. et al. Use of the stromal cell-derived factor-1/CXCR4 pathway in prostate cancer metastasis to bone. Cancer Res 62, 1832-1837 (2002). 22 Heng, B. C. et al. Trans-Catheter Injection Induced Changes in Human Bone Marrow-Derived Mesenchymal Stem Cells. Cell Transplant, doi:ct2093heng [pii] 10.3727/096368909X12483162197006 (2009).

Recommendations
Subjects that it is recommended to have taken before
Cellular Techniques/610441001
Subjects that are recommended to be taken simultaneously
Molecular Techniques/610441002
Subjects that continue the syllabus
Advanced Cellular Biology/610441003
Other comments
Para axudar a conseguir una contorna inmediata sustentable e cumprir o obxectivo estratéxico 9 do I Plan de Sustentabilidade Medio-ambiental Green Campus FCS, todos os traballos documentais que se realicen nesta materia serán entregados a través de Moodle, en formato dixital, sen necesidade de imprimilos. De realizarse en papel: - Non se empregarán plásticos. - Realizaranse impresións a dobre cara. - Empregarase papel reciclado. - Evitarase imprimir borradores.