

## DATOS GENERALES

<b>Curso académico</b>	Curso 2024/2025
<b>Tipo de curso</b>	Máster de Formación Permanente
<b>Número de créditos</b>	60,00 Créditos ECTS
<b>Matrícula</b>	6.700 euros (importe precio público)
<b>Requisitos de acceso</b>	<p>Applicants are required to hold at least a Bachelor's Degree in a clinical or scientific field related to reproductive or clinical embryology. The acceptance process, in addition to the standard graduate studies application procedure, is contingent upon the University of Valencia's approval and the supervision of the Course Director.</p> <p>The general access requirements vary according to the type of program:</p> <p>* For UV-specific master's degree:</p> <ul style="list-style-type: none"> <li>- Possession of a Spanish or foreign university degree enabling access to official postgraduate programs.</li> <li>- Students in the process of completing up to 10% of a university degree are eligible, with the condition that the degree is finalized before the conclusion of the postgraduate course.</li> </ul> <p>*For Specialist Diploma:</p> <ul style="list-style-type: none"> <li>- A Spanish or foreign university degree granting access to official postgraduate programs.</li> <li>- Students with pending completion of up to 10% of a university degree can apply, with the requirement to finish the degree before the postgraduate course concludes.</li> <li>- Experienced professionals in the field are welcome.</li> </ul> <p>*For Expert Diploma:</p> <ul style="list-style-type: none"> <li>- A Spanish or foreign university degree granting access to official postgraduate programs.</li> <li>- Students with less than 10% remaining to complete their degree may be conditionally accepted, with the stipulation to obtain the title in the same academic year.</li> <li>- Experienced professionals in the field are encouraged to apply.</li> </ul> <p>*For Certificate:</p> <ul style="list-style-type: none"> <li>- Ability to access the University.</li> <li>- Experienced professionals in the field are eligible to apply.</li> </ul>
<b>Modalidad</b>	On-line
<b>Lugar de impartición</b>	UV Virtual Classroom
<b>Horario</b>	Online
<b>Dirección</b>	
<b>Organizador</b>	Facultat de Medicina i Odontologia
<b>Dirección</b>	<p>José Bellver Pradas          Profesor/a Titular de Universidad. Departament de Pediatria, Obstetrícia i Ginecologia. Universitat de València          Nicolás Garrido Puchalt          Director de Fundación Instituto Valenciano de Infertilidad - FIVI</p>
<b>Plazos</b>	
<b>Preinscripción al curso</b>	Hasta 27/10/24
<b>Fecha inicio</b>	Noviembre 24
<b>Fecha fin</b>	Abril 26
<b>Más información</b>	
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## PROGRAMA

[Human Reproduction Physiology](#)

- 1.1 Anatomy of the female reproductive organs.
- 1.2 Steroid and protein hormones of the reproductive axis
- 1.3 Ovarian rejuvenation
- 1.4 Uterine Factor and Implantation
- 1.5 Neuroendocrinology of the female reproductive system.
- 1.6 The menstrual cycle compared to other mammals
- 1.7 Endocrinology of the testicle and the effect of aging on the male reproductive system
- 1.8 Effect of age on the male reproductive system
- 1.9 Analysis of biochemical and ultrasound indicators for the control of the menstrual cycle. Hormonal action on the genital tract
- 1.10 Other endocrine axes and obesity (GH-IGF, thyroid, adrenal, etc.)
- 1.11 Effect of aging on the female reproductive system
- 1.12 The polycystic ovary

### Oogenesis, Spermatogenesis and their Deficiencies

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- 2.1 Gametogenesis: Biological relevance of meiosis.
- 2.2 Oogenesis; From oogonia to MII oocyte. Oogenesis stages
- 2.3 Oogenesis: Folliculogenesis
- 2.4 Ovulation induction
- 2.5 The testicle and the spermatogenesis
- 2.6 Markers of sperm quality
- 2.7 Factors affecting sperm quality
- 2.8 Markers of oocyte quality
- 2.9 Oocyte quality improvement
- 2.10 Oocyte in vitro maturation
- 2.11 In vitro gamete derivation from human embryonic stem cells
- 2.12 COVID-19 in Assisted Reproduction

### Fertilization, embryo development and techniques to obtain in vivo produced embryos

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- 3.1 Gamete transport
- 3.2 Gamete maturation
- 3.3 Fertilization in Humans
- 3.4 Gamete immunology
- 3.5 Fertilization: The role of the glycocalyx in fertilization
- 3.6 Fertilization: Oocyte molecular changes in response to the fertilizing sperm
- 3.7 Fertilization: Fertilization genomics
- 3.8 Uniparental Inheritance: Centrioles
- 3.9 Uniparental inheritance: Mitochondria
- 3.10 Fertilization abnormalities. Monopronuclear and Trippronuclear Zygotes
- 3.11 Fertilization correction mechanisms
- 3.12 Preimplantation embryo development
- 3.13 Blastomeric fate: polarization
- 3.14 Differentiations of cell lineages I
- 3.15 Differentiations of cell lineages II
- 3.16 Gastrulation
- 3.17 Transcriptomics of the preimplantation embryo development I
- 3.18 Transcriptomics of the preimplantation embryo development I
- 3.19 Morphological and functional embryology

### Sterility

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- 4.1 Effect of aging on the female reproductive tract
- 4.2 Recurrent miscarriage
- 4.3 Sterility
- 4.4 Endometriosis
- 4.5 Uterine and tubal sterility
- 4.6 Artificial insemination
- 4.7 In vitro fertilization
- 4.8 Ovarian and endometrial manipulation
- 4.9 Fertility preservation for oncological and non-oncological reasons
- 4.10 Egg Donation
- 4.11 Ovarian Hyperstimulation Syndrome: Physiopathology, Prevention and Management
- 4.12 Critical analysis of egg donation
- 4.13 Medical treatment of endometriosis: New perspectives
- 4.14 Fundamentals of ultrasound imaging in patients with infertility problems
- 4.15 Health of children conceived by assisted reproduction techniques
- 4.16 ART biosurveillance system. SIRHA assisted human reproduction information system
- 4.17 The importance of the luteal phase in assisted reproduction

### Basic Research in Assisted Reproduction

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- 5.1 Basic research in Human Reproduction
- 5.2 Isolation techniques and study of nucleic acids.
- 5.3 Isolation and protein study techniques. Protein Identification
- 5.4 Morphological location Immunohistochemistry Confocal and electronic microscopy. Applications in Reproductive Medicine
- 5.5 Cell culture. Human endometrial stromal and epithelial cell culture.
- 5.6 In vivo studies on animal models. Model for endometriosis studies

- 5.7 Omics as a non-invasive diagnostic tool
- 5.8 Massive sequencing applied to reproductive medicine
- 5.9 Mitochondrial DNA, the energy of the preimplantation embryo
- 5.10 Introduction to statistics I
- 5.11 Introduction to statistics II
- 5.12 Introduction to statistics III
- 5.13 Introduction to research and Good Clinical Practices
- 5.14 Developing a research project
- 5.15 Functions and responsibilities of the participants in a clinical trial
- 5.16 Drug development process
- 5.17 Classification of research projects
- 5.18 Use of research results: publication of results
- 5.19 How to write a manuscript
- 5.20 Ethics within publications

#### Basic Techniques in Assisted Reproduction

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- 6.1 Structure of an assisted reproduction unit
- 6.2 History of assisted reproduction techniques
- 6.3 Low complexity procedures: artificial insemination and sperm freezing
- 6.4 Gamete donation
- 6.5 Diagnostic procedures in the clinical analysis laboratory
- 6.6 High complexity procedures
- 6.7 Applied molecular biology techniques
- 6.8 Research in Assisted Reproduction
- 6.9 Risk management
- 6.10 Treatment of sanitary waste
- 6.11 ISO Management System and Quality Management
- 6.12 Artificial intelligence in Assisted Reproduction

#### The Andrology Laboratory

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- 7.1 The testicle and spermatogenesis
- 7.2 Basic semen analysis. Spermogram Special situations and additional tests
- 7.3 Sperm preparation techniques for homologous artificial insemination, indications and outcomes
- 7.4 Oxidative Stress and its effect on gametes and embryos
- 7.5 Sperm freezing techniques
- 7.6 Selection, control and use of sperm donors
- 7.7 Management and control of the Sperm Bank
- 7.8 Sperm washing in seropositive males for HIV, hepatitis B and hepatitis C
- 7.9 Flow cytometry: cell sorting, applications on sperm and sperm separation
- 7.10 Sperm DNA fragmentation and male fertility
- 7.11 Methods for an objective selection of competent sperm
- 7.12 Microarrays technology in sperm diagnosis
- 7.13 Other molecular markers of sperm quality
- 7.14 Automated Semen Analysis I
- 7.15 Automated Semen Analysis II; ISAS

#### In Vitro Fertilization Laboratory

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- 8.1 The clinical embryology laboratory: a cleanroom
- 8.2 Getting to know laboratory environment
- 8.3 Environmental contamination and the In Vitro Fertilization laboratory
- 8.4 The in vitro fertilization (IVF) laboratory: Structure, equipment and maintenance
- 8.5 Oocyte retrieval, capacitation and sperm retrieval protocols. Conventional insemination
- 8.6 Sperm selection for ICSI
- 8.7 Use of testicular sperm in In Vitro Fertilization
- 8.8 Micromanipulation techniques, assisted fertilization: SUZI, PZD, ICSI and associated techniques
- 8.9 Evaluation of fertilization. Pronuclear Score and Reproductive Outcomes
- 8.10 Oocyte dysmorphisms and clinical repercussion
- 8.11 Standard Embryo Culture: Selection Criteria for Embryos for Transfer and Freezing
- 8.12 Embryo transfer
- 8.13 Cryopreservation of oocytes and embryos
- 8.14 The role of the IVF laboratory in preserving fertility
- 8.15 Rescue of immature oocytes in In Vitro Fertilization
- 8.16 Quality management of a clinical embryology laboratory
- 8.17 Key performance indicators in IVF
- 8.18 Traceability in the IVF laboratory

#### Sex Determination Techniques

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- 9.1 Importance of preconception and preimplantation sexing in animals
- 9.2 Analysis of the sperm DNA content: bases of the X/Y separation
- 9.3 Legislation on sex determination
- 9.4 Molecular and Cellular Bases of sex
- 9.5 Sexual differentiation in mammals
- 9.6 Sex determination and differentiation in humans and associated alterations
- 9.7 Advantages of sexual reproduction

- 9.8 Clinical relevance of preception and preimplantation sex selection in humans
- 9.9 Alternative sexing methods
- 9.10 Variations in the sex ratio. Effect of external factors
- 9.11 Sex Reassignment and Assisted Reproduction
- 9.12 Assisted Reproduction in patients with sexual disorders

#### In Vitro production of embryo. Embryo culture.

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- 10.1 Cell culture
- 10.2 Culture media
- 10.3 Types of prolonged culture
- 10.4 How to obtain blastocyst stage embryos
- 10.5 Application of coculture to research. History
- 10.6 Application of coculture to research. New technologies
- 10.7 Embryo development: From fertilization to blastocyst
- 10.8 Correlation between morphology and aneuploidies: from gamete to blastocyst
- 10.9 The blastocyst: types and morphology

#### Cryobiology. Preservation of maternal and paternal inheritance. Embryo preservation

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- 11.1 Biophysical Principles of Cell Cryopreservation
- 11.2 Cryoprotectants: Permeable Agents; Non-Permeable Agents
- 11.3 Cryopreservation Methods: Slow Freezing
- 11.4 Cryopreservation Methods: Vitrification
- 11.5 Oocyte Cryopreservation. History. Main Factors Affecting the Cryopreservation of the Female Gamete
- 11.6 Vitrification of Oocytes and Embryos in Assisted Reproduction
- 11.7 Cryo-room: Equipment and Requirements
- 11.8 Cryopreservation Laboratory: Equipment and transfer of samples
- 11.9 Maintenance of Storage Tanks and Transport Containers
- 11.10 Cryo-management
- 11.11 Factors Affecting the Oocyte Vitrification Program
- 11.12 Subcellular Effects of Vitrification I: Oxidative Stress
- 11.13 Subcellular Effects of Vitrification II: Epigenetics
- 11.14 Ovarian Tissue Cryopreservation

#### Embryo Quality Improvement

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- 12.1 Embryo health: morphological indicators of embryo quality
- 12.2 Embryo health: introduction to non-morphological indicators of embryo quality
- 12.3 Embryo health: introduction to non-morphological indicators of embryo quality. Respirometry
- 12.4 Factors affecting embryo quality. Intrinsic factors: infertility causes
- 12.5 Factors affecting embryo quality. Intrinsic factors: effect of the spermatozoon
- 12.6 Factors affecting embryo quality. Intrinsic factors: effect of the oocyte
- 12.7 Factors affecting embryo quality. Intrinsic factors: effect of progesterone on oocyte quality
- 12.8 Factors affecting embryo quality. Extrinsic factors: response to ovarian stimulation
- 12.9 Factors affecting embryo quality. Extrinsic factors: types of ex vivo culture
- 12.10 Factors affecting embryo quality. Extrinsic factors: effect of humidity during culture on embryo quality
- 12.11 Factors affecting embryo quality. Extrinsic factors: effect of oxygen tension on embryo quality and livebirth rate
- 12.12 Factors affecting the outcomes of vitrified blastocysts. How to improve survival rate and clinical outcome
- 12.13 Strategies to improve embryo quality: Cytoplasm transfer
- 12.14 Strategies to improve embryo quality: Nuclear transfer
- 12.15 Mitochondrial content during the preimplantation development and its relationship with embryo quality.
- 12.16 Strategies to improve embryo quality: Assisted hatching and fragment removal

#### Multiplication of embryos and gametes

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- Pluripotency and totipotency basic concepts
- Telomeric protection and pluripotentiality
- Embryonic stem cell
- Collection of embryonic stem cells in the blastocyst
- 13.1 Functional genomics and transcriptional signature of blastomeres, Inner Cell Mass (ICM) and Trophectoderm (TE). In vivo and in vitro transcriptomic pluripotency profiling (stem cells)
- 13.2 Establishment and Culture of embryonic and trophoblastic stem cells
- 13.3 Technical aspects of the nuclear transplant
- 13.4 Dynamics of nuclear reprogramming
- 13.4 Use of polar bodies in nuclear transplantation
- 13.5 Technical aspects of transplantation for meiotic use
- 13.6 Blastomeric splitting as a cloning method without reprogramming
- 13.7 Primordial germ cells in the adult ovary
- 13.8 Obtaining oocytes in vitro
- 13.9 Testicular stem cells
- 13.10 Obtaining spermatozoa in vitro
- 13.11 Model embryos: present and future

#### Preimplantation Genetic Testing Laboratory

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- 14.1 Introduction to genetics and medical genomics
- 14.2 Meiosis, oogenesis and spermatogenesis
- 14.3 Post-fertilization mitotic divisions, and embryonic mosaicism

- 14.4 Embryo biopsy: update
- 14.5 PGT for monogenic disorders and carrier screening
- 14.6 PGT for chromosome abnormalities and chromosome rearrangements
- 14.7 The PGT-A controversy
- 14.8 Future directions for the molecular assessment and diagnosis of embryos
- 14.9 Genetic counseling in the infertile / sterile couple
- 14.10 Reproductive Genomics: basics, consortia, databases and genomic datasets
- 14.11 Techniques for genomic analysis: preliminary, exploratory and functional
- 14.12 Techniques for systems genomic analysis: network modelling
- 14.13 Genomic tools of computational prediction and clinical application
- 14.14 Genetic diagnosis of endometrial factor: controversies
- 14.15 Analysis of genome variants: prioritization of clinical biomarkers and gene panels in diagnosis
- 14.16 Systems Reproduction Medicine: the big data era

#### Stem Cells

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- 15.1 Stem cells. Therapeutic possibilities. Regenerative Medicine
- 15.2 Pluripotent Stem Cells: types and general aspects
- 15.3 New Technologies in Reproductive Medicine: Organoids and Microfluidics
- 15.4 Multipotent Cells: Umbilical Cord
- 15.5 Perinatal stem cells: umbilical cord tissue
- 15.6 Gamete generation from stem cells: reprogramming and transdifferentiation
- 15.7 Adult Stem Cells in Human Testicles
- 15.8 Adult stem cells in Myometrium and Fibroids
- 15.9 Adult Stem Cells in the Human Endometrium
- 15.10 Fertility Preservation
- 15.11 Ovarian Rejuvenation and Stem Cells: Applications and Future Perspectives
- 15.12 Uterus Transplantation

#### Legal and ethical considerations of Assisted Human Reproduction

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- 16.1 Initial Concepts
- 16.2 Law 14/2006 on Assisted Reproduction Techniques
- 16.3 Europe
- 16.4 Wider Worlds

#### Master's Final Project

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Elaboration of the Master's Degree Final Project.

## PROFESORADO

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## OBJETIVOS

Las salidas profesionales que tiene el curso son:

The postgraduate program equips students with essential training to seamlessly transition into assisted human reproduction laboratories and research centers within the field. While the most common professional path for graduates leads to roles as clinical embryologists or specialists in human reproduction laboratories, the opportunities extend beyond these roles. Graduates may find employment in research, scientific endeavors, or even engage in commercial activities within the field. The program opens doors to a diverse range of career possibilities in these dynamic circumstances.

This master's program is designed to instill in students a profound understanding of fertility mechanisms, the causes of infertility, and the techniques employed in assisted reproduction. Additionally, it emphasizes research techniques applicable to diverse situations in the study and treatment of human infertility.

Over 50 experts, hailing from the renowned Valencian Institute of Infertility (IVIRMA), contribute to this program. Drawing upon their extensive clinical, teaching, and research experience of over 25 years, and with a backdrop of more than 50,000 annual assisted reproduction treatments, these experts share their knowledge to provide students with the most current and valuable teaching materials. The program caters to recent graduates with biomedical degrees as well as professionals in the field seeking to update their knowledge. The goal is to empower these individuals to offer the best possible service to their patients.

The postgraduate curriculum delivers essential training for students to seamlessly integrate into assisted human reproduction laboratories and research centers within the field.

## METODOLOGÍA

1. Theoretical Lecture: Comprehensive material explanation through virtual attendance.
2. Case Studies: Acquisition of knowledge through the analysis of real or simulated cases.
3. Problem-Solving Techniques: Application and implementation of prior knowledge to self-upgrade content in the field.
4. Project-Centric Knowledge: Development of projects applying acquired competences, including the authoring of bibliographic research papers contributing to comprehensive training.

The program includes tutoring initiatives for personalized attention, aimed at resolving queries and facilitating significant learning in acquired competences. Professors function as academic guides, fostering autonomous learning among students.