

NUFFIELD DEPARTMENT OF
OBSTETRICS AND GYNAECOLOGY

MSc Clinical Embryology

A one-year residential taught course



UNIVERSITY OF
OXFORD





This one-year, residential, taught MSc course aims to provide graduate students, scientists and clinicians with highly advanced theoretical and practical understanding of human reproductive biology, embryology, infertility and assisted reproductive technology (ART) along with intensive ‘hands-on’ practical training in essential laboratory skills, including the sophisticated micromanipulation techniques associated with ART. The course is administered by the Nuffield Department of Obstetrics and Gynaecology at the University of Oxford and is based, alongside the Oxford Fertility Unit, in the new, purpose-built, Institute of Reproductive Sciences.

The Oxford MSc in Clinical Embryology

Clinical embryology is a relatively young branch of reproductive science that has undergone enormous expansion over the last twenty years. Louise Brown, the world’s first ‘test tube’ baby, was born in 1978 as a result of pioneering research carried out by a team of British clinicians led by Patrick Steptoe and Robert Edwards. Since then, infertility treatment has undergone phenomenal development and become a highly specialised field involving a multitude of interventions known collectively as assisted reproductive technology (ART). Worldwide, approximately one million ART treatments are now performed each year and over five million ART babies have been born. However, a major concern is that there are too few appropriately trained clinical embryologists, both within the UK and throughout the rest of the world, to maintain this pattern of growth. In addition, the field of clinical embryology is becoming ever more closely regulated, with greater emphasis on quality assurance. Meticulous training of new personnel in theoretical knowledge and practical skills is therefore critical to future advancement and ensuring patients consistently receive the best care. In response to these concerns, the University of Oxford has developed an intensive, one-year, residential, taught MSc in Clinical Embryology. Our intention is to inspire, motivate and train a network of future leaders in clinical embryology throughout the world.

Our MSc course provides students with theoretical and practical understanding of human reproductive biology, embryology, infertility and ART. The course includes the very latest developments in ART including legislation, ethics, and quality management. Significant emphasis is placed upon continuing professional development and acquiring valuable transferable skills. To this end, our MSc course will include a considerable practical component. Students will learn skills and techniques directly relevant to ART, as well as a

range of ‘traditional’ and ‘cutting edge’ scientific techniques and procedures. A particular strength of our programme is the fact that each of our students will be individually trained in gamete manipulation/injection and embryo biopsy. For this purpose, students will use gametes and embryos acquired from a variety of mammalian (e.g. mouse, cow) and non-mammalian (e.g. zebrafish, sea urchin) organisms.

Our MSc programme will prepare students for active employment within the clinical embryology/ART sector and/or a research career in reproductive science. As the course was designed in response to identified employment needs, our graduates are likely to be highly sought after. In particular, we expect our graduates to possess sufficient knowledge and skills to allow them to make a significant contribution to the design and establishment of new *in vitro* fertilisation (IVF) units, which need to incorporate the latest techniques and conform strictly to current legislation. Every year, we also encourage exceptional graduates to apply for prestigious scholarships in order to undertake a DPhil (Oxford equivalent of a PhD) within the department.

Once enrolled on the MSc programme, you will be allocated a Departmental Mentor, who will be a senior member of the clinical, scientific or research staff. Your Mentor will provide individual support and guidance throughout the course and will meet you regularly to discuss coursework and assessment. You will also become a member of one of Oxford’s historic and prestigious colleges and be assigned a college tutor. This level of individual support is a prominent and highly acclaimed feature of the University’s environment and will provide the support necessary for you to achieve maximum benefit from your studies.

Course outline

The course runs over a period of one year, from October to September, incorporating the three University terms: Michaelmas, Hilary and Trinity. Fundamental reproductive science and laboratory methods/practical skills are taught in the first term (Michaelmas) over five discrete modules.

Applied and clinical aspects are delivered in the second term (Hilary) over a further set of five modules. Each module is delivered over a period of one to three weeks and together, the ten modules comprise the 'core content' of the course. The third term (Trinity) is extended to allow sufficient time for a high quality laboratory research project.

Course aims

Specific aims of the Oxford MSc in Clinical Embryology are:

- To deliver intensive teaching for students in both fundamental and applied aspects of subject areas directly related to clinical embryology such as human reproductive biology, embryology, infertility and ART.
- To provide students with dedicated theoretical and practical training in basic laboratory research skills.
- To ensure students understand and appreciate the ethical and legal issues associated with ART and the treatment of infertility.
- To provide students with intensive 'hands-on' practical training in laboratory skills and ART, particularly gamete micromanipulation, intra-cytoplasmic sperm injection (ICSI) and pre-implantation genetic diagnosis (PGD).
- To provide, in the extended third term, high quality laboratory training in research methodology that can be applied to basic or applied aspects of reproductive science/clinical embryology in the future.
- To encourage student understanding and appreciation of how current molecular technologies (such as the human genome sequencing project, embryonic stem cells, cloning, nuclear transfer and reprogramming) might relate to the future treatment of infertility and the ethical/legal issues involved.
- To understand how business management skills and quality management procedures are vital in the ART clinic.
- To provide training in professional development and transferable skills.
- To build a network of potential leaders in clinical embryology for the future.



Course structure



Term 1 (Michaelmas), October to December

The first term is planned to ensure that students gain core knowledge in the fundamental principles of reproductive science and the application of essential laboratory techniques. Course material is presented in the form of five modules:

- Essential Cellular and Molecular Biology
- Laboratory Methods and Practical Skills
- The Mammalian Reproductive System
- Fertilisation and Early Embryogenesis
- Embryonic Development and Pregnancy

During the term, students will be expected to write two essays, sit a practical skills assessment and write up the results of practical classes. At the end of the term, students will sit a qualifying examination (online multiple choice format). Students are required to pass this exam to proceed with the remainder of the course.

Term 2 (Hilary), January to March

The second term aims to provide students with advanced theoretical and practical knowledge of infertility and ART. Material is presented in the form of five further modules:

- Infertility
- Assisted Reproductive Technology (ART)
- Assisted Conception: Skills and Techniques
- Micromanipulation in ART
- Infertility and ART: Developments and Current Issues

During the second term, students will be expected to write up the results of their practical classes and undertake a library-based extended essay. During this term, students will learn micromanipulation/injection/biopsy techniques using a variety of animal models.

Students will sit an examination (short essay format) at the beginning of the third term, allowing time over Easter for revision. The examination will be based upon the modules presented during the second term.

During the second term, students will choose a laboratory research project to begin in the third term. Projects are predominantly provided within the Institute of Reproductive Sciences and the Nuffield Department of Obstetrics and Gynaecology (John Radcliffe Hospital). Additional projects may be available in several collaborating University departments.

Term 3 (Trinity+), April to September

The extended third term is predominantly devoted to a laboratory research project which is expected to involve approximately four months of experimental work. Results are to be written up and submitted as a dissertation of no more than 10,000 words. Students will present the results of their research project to a departmental audience by way of a short talk and will prepare a poster presentation which will form the basis of a short oral examination.

Practical skills

Our MSc course places significant emphasis on practical skills and techniques, particularly those relevant to clinical embryology and reproductive science. Students will learn a wide array of 'hands on' practical techniques, these include:

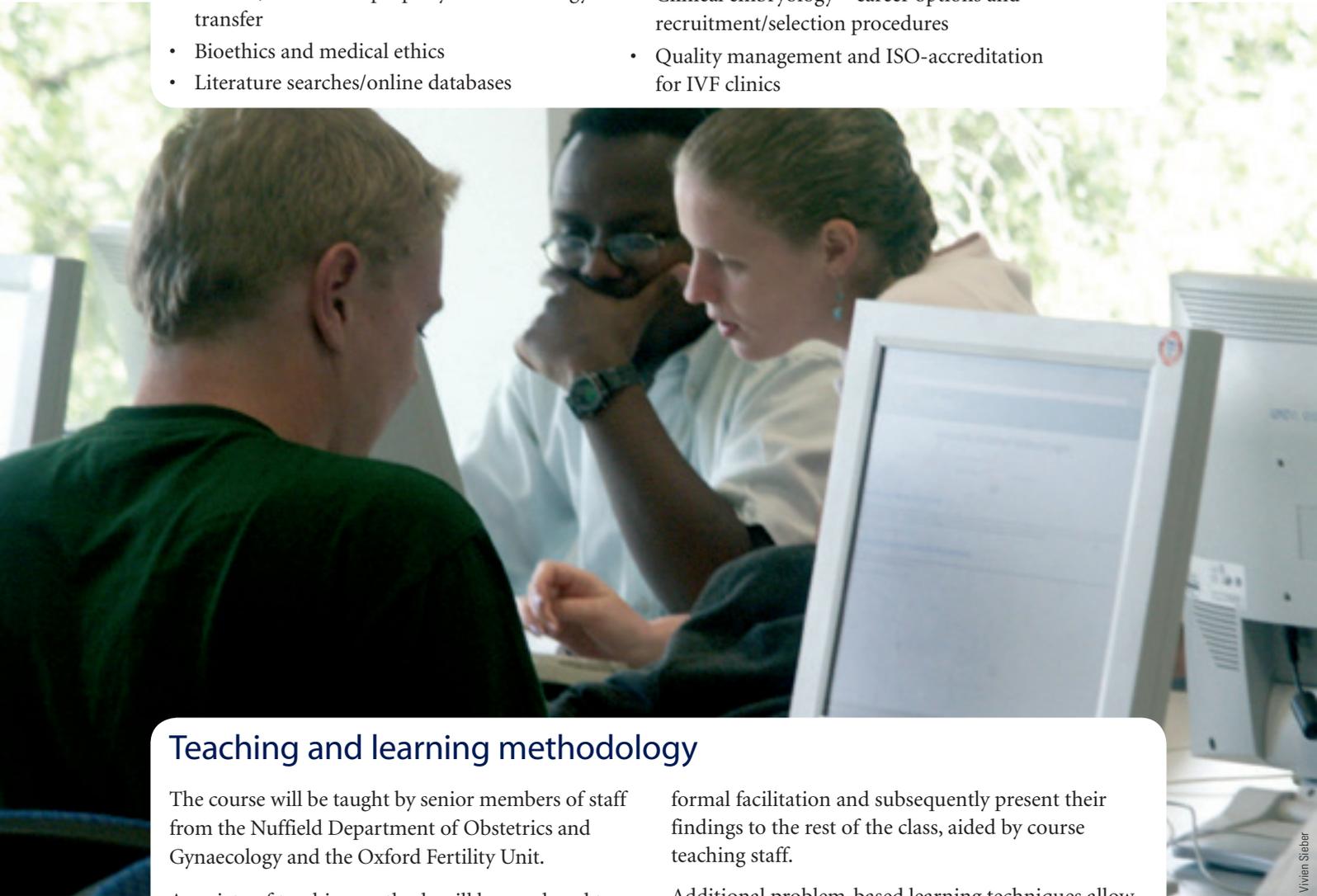
- Safety, liquid handling, aseptic techniques, waste management
- Preparation of media and buffers
- DNA extraction and Polymerase Chain Reaction for gene isolation
- Agarose gel electrophoresis and recombinant DNA technology
- Immunocytochemistry/Immunohistochemistry
- Reproductive anatomy
- Sperm counting and morphological analysis
- Oocyte and embryo grading
- Cryopreservation of gametes and embryos
- Vitrification protocols
- *In vitro* maturation of oocytes
- Micromanipulation of gametes in model organisms
- Intra-cytoplasmic sperm injection in model organisms
- Sperm DNA fragmentation analysis
- Embryo biopsy techniques
- Single cell PCR analysis
- Pre-implantation genetic diagnosis (PGD)
- Bioinformatics
- Computer assisted sperm analysis
- Laser-assisted embryo biopsy
- Array comparative genome hybridisation (aCGH)
- Oral and written presentation skills
- Statistics, experimental design, interpretation and analysis

Emphasis is placed directly on our students acquiring 'hands on' experience, facilitated by experienced scientific and clinical instructors. Our teaching laboratory has been purposefully designed to provide a stimulating learning environment and features interactive whiteboard technology to enhance student learning. The course staff were awarded a Teaching Development Grant by the Higher Education Academy (UK) in order to promote and enhance the use of interactive technology in the 'wet' laboratory.

Professional development

Significant emphasis will be placed on professional development and the acquisition of transferable skills. Our MSc students will receive regular professional development seminars and workshops delivered by internal and external staff. Areas covered include:

- Information technology
- Business and management skills
- Laboratory safety/health and safety in a clinical environment
- Patents, intellectual property and technology transfer
- Bioethics and medical ethics
- Literature searches/online databases
- Data protection
- Experimental design, interpretation and analysis
- Getting research published
- Clinical embryology – career options and recruitment/selection procedures
- Quality management and ISO-accreditation for IVF clinics



Teaching and learning methodology

The course will be taught by senior members of staff from the Nuffield Department of Obstetrics and Gynaecology and the Oxford Fertility Unit.

A variety of teaching methods will be employed to enhance and optimise student learning, e.g. class lectures, group tutorials, laboratory practical classes, and in-house demonstrations by visiting companies. Students will also receive regular lectures from many visiting scientists who are world experts in their field. Our course places special emphasis on the development of practical laboratory skills, especially those that are applicable to ART and the routine duties of a clinical embryologist. The course staff won an OxTalent Award in 2013 for their innovative use of interactive white board technology in the wet laboratory.

Self-directed learning strategies allow students to study topics of interest on an individual basis without

formal facilitation and subsequently present their findings to the rest of the class, aided by course teaching staff.

Additional problem-based learning techniques allow the class to analyse and research a given problem collectively. In these cases, the group will be led by a student. Findings are subsequently presented and discussed with course teaching staff.

Students will also gain significant benefit from watching and discussing live clinical procedures occurring within the Oxford Fertility Unit laboratories located within the Institute of Reproductive Sciences.

In 2012, the course won a 'Major Educator Award' in the University of Oxford's Teaching Excellence Scheme, for an exceptional contribution to postgraduate education in the medical sciences.

Student resources

Mentors

Each student will be allocated a departmental mentor for the duration of their MSc programme. Mentors are members of senior academic, clinical or research staff. Students will meet regularly with their mentor to discuss progress. The mentor will read and appraise first drafts of essays and laboratory reports, ensure that essays are marked and discussed, and will be available to offer help and advice throughout the course. The mentor will additionally provide one-on-one feedback to the students.



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IT resources

Our MSc students are provided with dedicated office space and teaching facilities within the new Institute of Reproductive Sciences. The student office is equipped with a variety of IT equipment including personal computers, printer and scanner. Computers are connected to the University network and possess all the necessary software required by the MSc course in terms of word processing, presentation preparation and data analysis. Photocopying facilities are also available.

The MSc in Clinical Embryology utilises the University's virtual learning environment and web-based support network, WebLearn (www.weblearn.ox.ac.uk/portal). This electronic facility allows students to access lecture overheads, support material and other learning resources directly from the internet. WebLearn also provides an excellent means of providing course teaching staff with valuable feedback at regular intervals throughout the course.

Libraries

The University of Oxford has one of the best library collections in the world. Our students can access all the required academic journals and textbooks needed for the course via the library service (www.bodleian.ox.ac.uk).



www.envirofoto.com

Laboratory equipment

The dedicated MSc teaching facility within the Institute of Reproductive Sciences is equipped with the very latest laboratory equipment, as well as several sophisticated micromanipulation workstations. A sufficient number of equipment set-ups are provided to ensure that each student is guaranteed to have hands-on practical experience in all the laboratory sessions.

The Nuffield Department of Obstetrics and Gynaecology is well equipped with the latest equipment for molecular and cell biology projects. Specialised equipment is also available for microscopy and hormone assay/endocrine studies.



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The Oxford Fertility Unit

The research activities of the University Department have been enormously enhanced as a result of a close partnership with the Oxford Fertility Unit, a fertility treatment centre founded in 1985. The Unit also has close links with the John Radcliffe Hospital. The Unit's mission is 'to provide efficient and cost-effective fertility treatment in a caring and professional environment, and to foster research and development in the field of reproductive medicine'. The Unit offers a wide range of treatments including intra-uterine insemination, *in vitro* fertilisation, intracytoplasmic

sperm injection, surgical sperm extraction, donor insemination, IVF with donor sperm/egg, sperm and embryo storage, oocyte *in vitro* maturation (IVM) and pre-implantation genetic diagnosis. The Unit held its '2,000th baby' party in 2000 and was awarded ISO-9001 certification in 2004. In 2007, the Unit achieved the UK's first IVM pregnancy. The Unit is situated in new purpose-built premises, the Institute of Reproductive Sciences, with dedicated teaching and research facilities. For more information, visit the Unit's website:

www.oxfordfertilityunit.com

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The Nuffield Department of Obstetrics and Gynaecology

The Nuffield Department of Obstetrics and Gynaecology is one of the largest academic clinical departments for obstetrics and gynaecology in the UK. The Women's Centre (John Radcliffe Hospital, Oxford), in which the Department is located, is responsible for the care of over 7,000 pregnant women and over 7,500 new gynaecology patients per year. The hospital is a tertiary referral centre for obstetric medicine, pre-natal diagnosis, endometriosis, reproductive medicine, IVF, urogynaecology and gynaecological oncology.

The Department enjoys and benefits from an unusually strong combination of clinical practice and basic science to inform its research, teaching and clinical expertise. The Department is one of twenty which make up the University of Oxford Medical Sciences Division. There are 20 members of academic staff based in the Department along with approximately 120 other staff, including research support staff, clerical and technical staff, and clinically qualified staff involved in research. There are also a number of visiting researchers from many parts of the world. The average annual expenditure of the Department is approximately £7 million, of which over 60% comes from outside sources. The Department

has responsibility for teaching obstetrics and gynaecology to clinical students and provision of teaching to undergraduate pre-clinical students. The teaching involves both academic non-clinical and clinical staff, as well as National Health Service (NHS) staff. At any time there are approximately 24 clinical medical students in the Department.

The Department encompasses multi-disciplinary research across a wide range of important issues in human reproduction and applied basic science. This ranges from genetic studies, the dissection of molecular, biochemical and cellular mechanisms underlying normal and aberrant reproductive tissue function, through clinical studies in women's health and pregnancy, to epidemiological research. Collaborations exist with the School's Institutes, the University's Science Departments and with researchers outside Oxford, in the UK and abroad.

For more detailed information about the Department, including up-to-date research announcements and recent publications, please visit the Departmental website:
www.obs-gyn.ox.ac.uk

Further information

For further information about the MSc in Clinical Embryology, visit: www.obs-gyn.ox.ac.uk/MSc

For further details about the University of Oxford, visit: www.ox.ac.uk

For information regarding the Oxford University Student Union, visit: www.ousu.org

Oxford City Council's website, www.oxford.gov.uk, provides detailed information regarding the city of Oxford, housing, transport and other services

For further information regarding tourism and the city of Oxford, visit:

www.oxfordmail.co.uk and

www.oxfordcity.co.uk

Admissions

Applicants must have a minimum 2:1 degree (or equivalent for non-UK students) in a clinical or scientific subject related to the field of clinical embryology. Aside from the normal graduate studies application procedure (see www.ox.ac.uk/admissions/postgraduate_courses/apply/), applicants are asked to submit a short essay (no more than 500 words) describing why they wish to study for the MSc and how they think our programme might influence their future career. Overseas students will be expected to demonstrate TOEFL or IELTS scores in line with University stipulations (higher level; www.ox.ac.uk/admissions/postgraduate_courses/apply/application_guide/ag_1_basics.html#aenglish_language_requirements).

For further specifics and the application procedure, please refer to the University Graduate Studies Prospectus (www.admin.ox.ac.uk/postgraduate/).

Fees

For information about course fees, please refer to our website, www.obs-gyn.ox.ac.uk/MSc.



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The new Institute of Reproductive Sciences

Applications

The application procedure for the MSc in Clinical Embryology is described in the Graduate Studies Prospectus, see

www.ox.ac.uk/admissions/postgraduate_courses/apply/.

Further details can be obtained from:

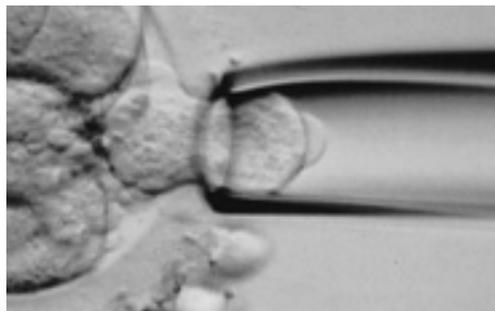
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