Advance

SHARING SKILLS AND KNOWLEDGE

UKRI Medical Research Council

Course Brochure

Spring/Summer 2022

Contents

What is Advance?

Advance is a state-of-the-art scientific training centre dedicated to training and skills transfer within the life sciences. Located at MRC Harwell, Advance offers a mixture of practical and theoretical courses in laboratory animal science and genetics to the research community worldwide.

The centre is purpose built to deliver high-quality scientific training. The centre brings together some of the country's experts in laboratory animal science to provide engaging training courses in mouse genetics, genome editing, pathology and laboratory skills. Our goal is to address the vital need to develop skills in life sciences by expanding training and education opportunities for researchers and technicians. We aim to deliver quality training courses that develop the expertise that scientists can offer in a competitive global research industry, whilst maintaining a strong emphasis on animal welfare.

As a wide-reaching knowledge and research base, we aim to develop links with external training providers, including academic organisations, societies and commercial companies, to support, collaborate and produce bespoke training courses. Advance also offers unique facilities, including laboratory space equipped to support *in vivo* techniques alongside seminar rooms and modern meeting spaces for workshops and training courses.

Welcome

We are delighted to be opening the doors to the new Advance training centre on the Harwell Science Campus in Oxfordshire. MRC Harwell has a rich history in genetic research and in training the next generation of scientists and technicians, so establishing a centre dedicated to developing skills and providing high-quality training is the natural next step in our journey.

From the early planning stages, it was essential for us that Advance would focus strongly on practical training, supported by classroom-led teaching and engaging interactive workshops. Incorporated into the design of the building are two fully equipped laboratories that provide the ideal environment for hands-on collaborative learning. Our highly experienced trainers aim to provide specialised and comprehensive training in all aspects of laboratory science as well as specialist training in mouse genetics.

The Advance centre is particularly keen to forge new partnerships with other organisations, both on campus and further afield, who may wish to use the facilities and resources we have on offer for their own training or educational purposes. It is an exciting time for the Mary Lyon Centre at MRC Harwell and Advance will be an integral part in developing a cooperative and dynamic future.

Sara Wells
Director of the Mary Lyon Centre at MRC Harwell

Genetics

Genetically altered mice remain one of the most commonly used animals in biomedical research and disease. As technology and science advance so does the complexity of animal models for genetic research. Understanding the background of mouse genetics, including allele crosses and the development of breeding strategies, is vital to advance medical research through the use of *in vivo* models.

Our genetics courses provide complete training, from an introduction to DNA and disease, through to an understanding of more advanced mouse genetics. Each course is designed to develop the knowledge and skills required by researchers and technicians to maintain high levels of expertise in this rapidly changing field.

Our genetics training includes the following courses:

- DNA to Disease: Genetics for Beginners - **1 day course**
- Introduction to Genetically Altered Mice - **2 day course**
- Advanced Mouse Genetics - **2 day course**
- Conditional Transgenics - **2 day course**

DNA to Disease: Genetics for Beginners

Monday 6th June, 2022

£250

View Course Calendar

Who is this for?

- Animal Technicians
- Technical Staff
- Those who are new to genetics

What is a gene? What is DNA? How do these make proteins? What goes wrong and causes disease in the human body? This course provides a comprehensive introduction into genetics, covering the genetic code and how this leads to protein formation, as well as how errors in DNA can lead to disease.

After this course, you will be able to:

- Understand the concept of DNA and how genetic traits are inherited from one generation to the next
- Understand what genes are and how they code for different proteins
- Understand the role of different proteins in making different cell types
- Understand some of the processes by which genetic disease can occur

Introduction to Genetically Altered Mice

Monday 7th–Tuesday 8th February, 2022
or Monday 4th–Tuesday 5th April, 2022

£500

View Course Calendar

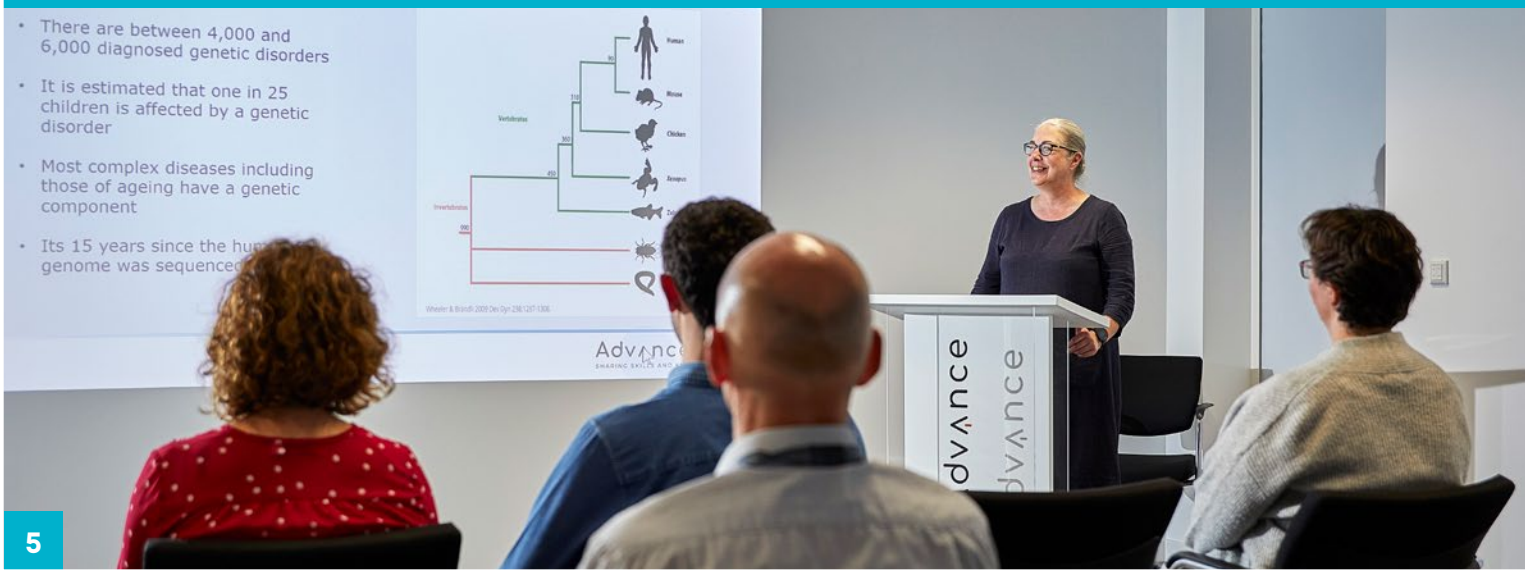
Who is this for?

- Animal Technicians
- Early Career Researchers
- PhD Students

This course introduces animal technicians and researchers to the background of mouse genetics and will cover topics such as Mendelian gene inheritance and genetic crosses, as well as aspects of more complex genetics intended to inform breeding strategies in establishing new genetically altered lines.

After the course, you will be able to:

- Understand Mendelian gene inheritance
- Predict the outcomes of genetic crosses
- Have a working knowledge of the genetic background of mouse strains
- Understand how to maintain the genetic integrity of inbred lines
- Plan breeding schemes with consideration of the minimum number of animals required
- Perform multiple allele inheritance calculations
- Understand how genetically altered lines can be established using modern transgenic technologies



Advanced Mouse Genetics

Monday 16th–Tuesday 17th May, 2022

£500 View Course Calendar

Who is this for?

- Colony Managers
- Researchers
- PhD Students

This course explores more complex genetic topics, including multiple-allele crosses, complex disease models and will inform breeding strategies and experimental design rather than give a complete guide to the molecular biology. Our team of experienced trainers will support you to examine how different modification lead to different breeding strategies, the importance of genetic consistency and integrity, different modes of inheritance and troubleshooting issues of reproducibility.

After the course you will be able to:

- Understand the foundations of mouse genetics and its use in biomedical research
- Have a working knowledge of different genetic background of mouse strains
- Understand how to maintain the genetic integrity of inbred lines
- Predict the outcomes of genetic crosses involving multiple alleles
- Perform multiple-allele inheritance calculations
- Understand the fundamentals of different methods that give rise to Genetically Altered mice strains
- Understand how Genetically Altered lines can be established using modern transgenic technologies
- Troubleshoot breeding and colony maintenance issues
- Nomenclature and access to international mouse resources

Conditional Transgenics

Monday 14th–Tuesday 15th February, 2022

£600

View Course Calendar

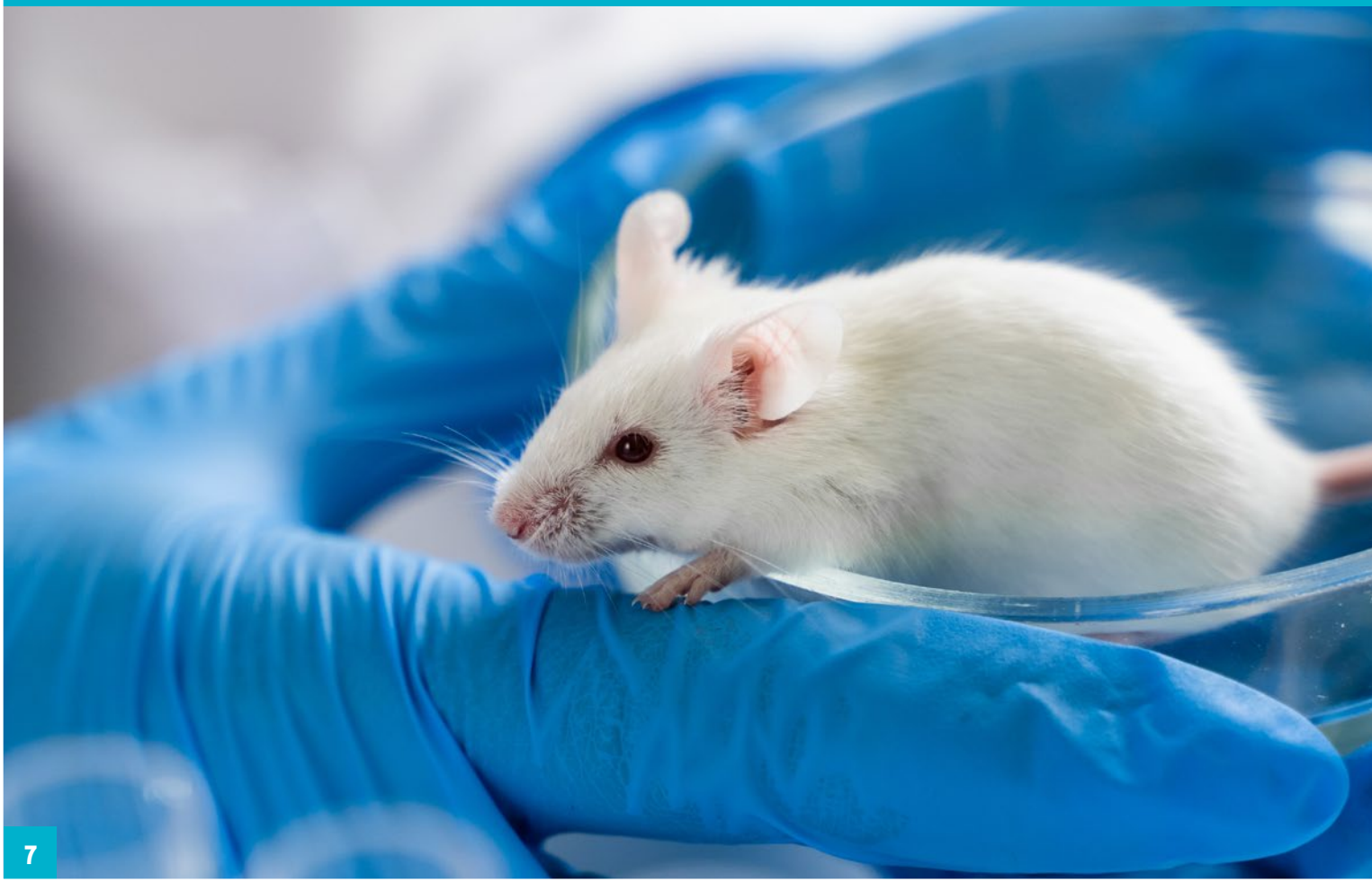
Who is this for?

- Animal Facility Managers
- Researchers with a previous knowledge of advanced mouse genetics
- PhD Students

Transgenic mice are an important resource to understand gene function, regulation and expression. This course is designed to introduce the principles behind conditional genetic modifications, experimental design and analysis.

After the course you will be able to:

- Understand the basic principles of conditional mutagenesis
- Identify the advantages and challenges of these systems
- Plan for restricting the expression of a transgene
- Analyse recombinase (Cre) expression



Practical Transgenic Technologies

Over the last decade, the use of nucleases and more recently the highly efficient CRISPR-Cas9 has allowed gene targeting to be carried out directly into embryos and the rapid production of genetically altered (GA) mice, an essential tool in biomedical research.

With a range of techniques available for introducing CRISPR-Cas9 into the developing embryo, in addition to the use of cryopreservation to securely archive scientifically relevant mouse models, our Advance courses offer researchers the opportunity to develop their knowledge of genome editing and the importance of mouse strain preservation and protection.

Our Advance transgenic technology courses, led by experts in the field, are designed to teach and develop the necessary skills to keep up with current techniques when producing and archiving GA mouse lines.

Our transgenic technology training includes the following courses:

- Mouse Embryo and Spermatozoa Cryopreservation - **4 day course**
- Microinjection and Electroporation - **4 day course**

Mouse Embryo and Sperm Cryopreservation

Monday 28th–Thursday 31st March, 2022

£1,400 View Course Calendar

Who is this for?

- Researchers
- Senior Animal Technicians
- PhD Students

Cryopreservation allows long-term storage of embryos and sperm, providing a convenient way to preserve, protect and transport mouse strains used in biomedical research. Archiving scientifically relevant mouse lines also adheres to good animal welfare practices by removing the need for continued animal breeding and is integral to any comprehensive colony management programme.

Running bi-annually since 2004 and regularly updated, this course provides practical experience in mouse embryo and spermatozoa freezing techniques routinely used at MRC Harwell and a simple, robust *in vitro* fertilisation procedure. The course will also cover the basic laboratory skills required when working in an assisted reproductive biology environment, such as pipetting, weighing, microscope use and embryo handling.

Following this course, you will have:

- Practical experience of sperm harvesting and freezing/thawing
- A clear understanding of how to set up an *in vitro* fertilisation session using both frozen and freshly harvested sperm
- Practical experience of oocyte and embryo harvesting for *in vitro* fertilisation and embryo freezing, respectively
- Practical experience of embryo cryopreservation/thawing using a simple vitrification method
- An understanding of surgical embryo transfer, including some practical experience of pre-operative aseptic techniques and sub-cuticular suturing
- Practical experience of non-surgical embryo transfer techniques
- An understanding of the current methods used for handling and shipping samples and managing a cryo-archive, as well as an overview of blastocyst genotyping

Microinjection and Electroporation

Monday 21st–Thursday 24th March, 2022

£1,400 View Course Calendar

Who is this for?

- Researchers
- Senior Animal Technicians
- PhD Students

The Microinjection and Electoporation course provides one-to-one tailored and hands-on training in embryo harvesting, set-up and operation of microinjection rigs, pronuclear and cytoplasmic microinjection, and the process of electroporation to introduce CRISPR-Cas9 reagents to embryos.

In addition, this course offers a demonstration of surgical embryo transfer and the opportunity to meet and discuss your specific requirements with experts in IVF technology, CRISPR-Cas9 design and mouse colony management.

Following this course, you will have:

- Experience of harvesting and sorting 1-cell and 2-cell embryos
- An understanding of the use of cryopreserved and IVF embryos in gene delivery
- Practical training in pronuclear and cytoplasmic injection of CRISPR-Cas9 reagent into the embryo (1-cell and 2-cell embryos)
- Practical training in electroporation of embryos
- An understanding of the principles of colony management, IVF and cryopreservation

Laboratory Courses

The provision of training in basic laboratory skills is central to the delivery of high quality research. Improving these practical skills is necessary to ensure standardised practice, maintain reproducibility and guarantee accurate and robust science. The Advance laboratory courses deliver training according to industry best practices, to provide the knowledge and practical understanding to achieve and maintain these skills.

Our laboratory training includes the following courses:

- Practical Laboratory Skills - **1 day course**
- Practical Microscopy - **1 day course**
- Pipetting Skills - **1 day course**

Practical Laboratory Skills

Wednesday 19th January, 2022 or Thursday 17th February, 2022 or Wednesday 2nd March, 2022 or Wednesday 6th April, 2022

£400 View Course Calendar

Who is this for?

- Research Staff
- Technical Staff and students new to the laboratory environment
- Experienced personnel looking to refresh their skills

Having the knowledge and confidence to work safely in the laboratory is an essential skill for all staff working in laboratories. This course will cover basic theoretical and practical laboratory skills, including preparation of Control of Substances Hazardous to Health (COSHH) risk assessments, good laboratory practice, use of fume hoods/biosafety cabinets, centrifuges and other laboratory equipment, pipetting skills, use of balances and preparation of reagents and solutions.

After the course you will be able to:

- Prepare and understand the purpose of COSHH risk assessment (RA) forms
- Understand the importance of good laboratory practice, including choosing appropriate personal protective equipment (PPE) and maintaining accurate laboratory records
- Correctly use fume hoods, biosafety cabinets, centrifuges and other general laboratory equipment
- Choose the correct pipette for your task and perform common techniques
- Set up and use balances correctly
- Prepare reagents and solutions
- Adjust the pH of solutions

Practical Microscopy

Wednesday 26th January, 2022 or Thursday 3rd March, 2022

£300

View Course Calendar

Who is this for?

- Research Staff
- Technical Staff and students new to the laboratory environment
- Experienced personnel looking to refresh their skills

Proper microscope use is important for any researcher; using a microscope correctly prevents eyestrain, saves time and avoids the presence of artefacts in the final image. Our course will cover the background and development of the microscope and aims to develop researchers' practice in microscopy.

After the course, you will be able to:

- Set up a brightfield microscope for Köhler illumination
- Understand how a microscope forms an image
- Know when to use fluorescence and confocal microscopes

Pipetting Skills

Wednesday 2nd February, 2022 or Wednesday 16th March, 2022

£200 View Course Calendar

Who is this for?

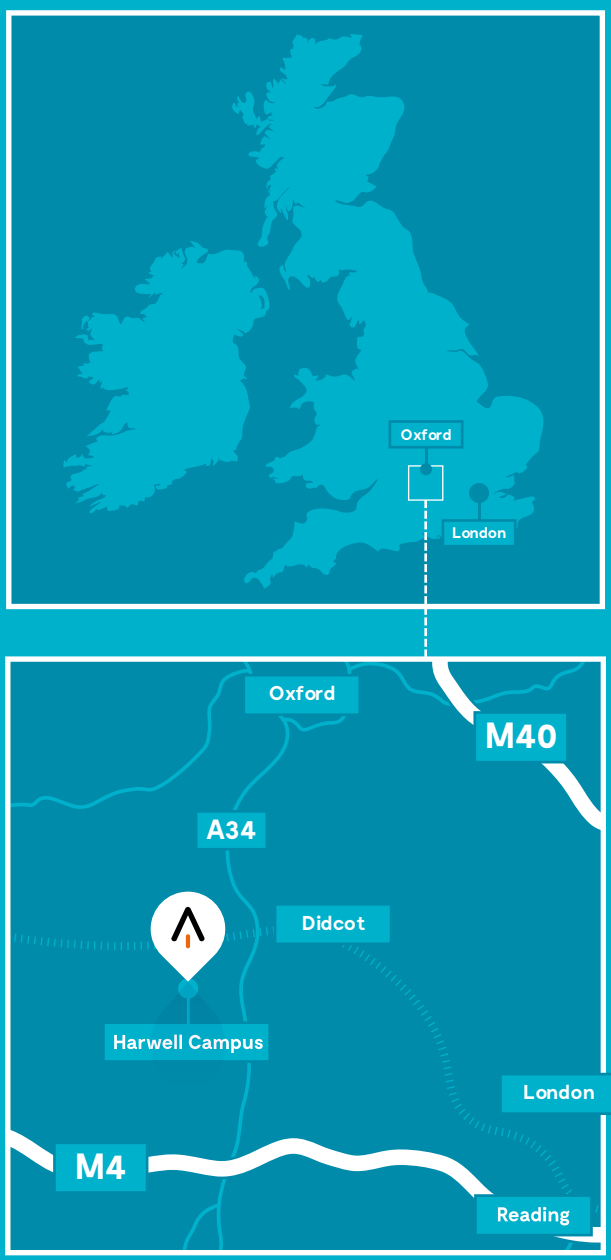
- Research Staff
- Technical Staff and students new to the laboratory environment
- Experienced personnel looking to refresh their skills

Correct pipetting technique is an essential skill for anyone working in a laboratory, to ensure reliable and reproducible results. This course is designed to teach best practice in pipetting techniques to enhance researchers' skills, quality and consistency in order to deliver accurate and precise results.

After the course you will be able to:

- Choose the correct pipette for your task and perform common techniques
- Identify the factors that can affect accuracy and precision of pipetting
- Recognise the ergonomic considerations to minimise health and safety issues

Where to find us



Advance at MRC Harwell
Harwell Campus
Oxfordshire
OX11 0RD
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How do I book a course?

Book online or get in touch with the Advance team via one of the contact points below to find the course that's right for you.

www.har.mrc.ac.uk/training

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