Course: Frontiers in Molecular Biology
AA 2016-2017
Aula Buzzati-Traverso

"Model systems in molecular biology research:

from basic processes to human diseases"

Organizers:
Prof. Sergio Comincini and Prof. Elena Giulotto, Dipartimento di Biologia e Biotecnologie, Università di Pavia; Dr. Ennio Prosperi and Dr. A. Ivana Scovassi, Istituto di Genetica Molecolare CNR, Pavia.

The fundamental biological processes have been conserved during evolution; this is the reason why information on basic molecular mechanisms has been obtained from studies on a few model organisms. In the last decades, animal models were produced in which specific genome alterations were introduced to mimic human genetic diseases. The aim of the course is to provide a wide view on the main model systems used nowadays for studying molecular pathways and human disease.

Wednesday May 24, 2017
14:30 - 16:30
Prof. GIORDANO LIBERI
Istituto di Genetic Molecolare del CNR, Pavia
Title: "The budding yeast model system to study human diseases"
The budding yeast Saccharomyces cerevisiae is a powerful model organism for studying a variety of cellular processes relevant to all eukaryotes, including humans. Contrary to humans that are made of billions of cells, yeast is a unicellular organism and is therefore easier to study and handle. I will review the basic aspects of the yeast's life cycle, the central features of the S. cerevisiae genome, the most common experimental tools and yeast techniques, including those that can be used to explore the molecular mechanisms of human diseases.

Thursday May 25, 2017
14:30 - 16:30
Prof. SILVIA GARAGNA
Università degli Studi di Pavia
Title: "Embryonic stem cells as a platform to study the alteration of cardiomyocyte differentiation"
The seminar focuses on the derivation of embryonic stem cell lines and their use for understating the alterations of the differentiation process into cardiomyocytes in the presence of Arsenic trioxide (a xenobiotic and a drug for cancer treatment).

Friday May 26, 2017
14:30 - 16:30
Prof. MARIANGELA BONIZZONI
Università degli Studi di Pavia
Title: "*Drosophila melanogaster* as a model system"
The common fruit fly, Drosophila melanogaster, is a powerful system for studying human diseases for a number of reasons, mainly: 1) nearly 75% of human diseases-causing genes are believed to have a functional homolog in the fly; 2) flies are easily maintained and have short generation times; 3) powerful genetic manipulations and screening tools are available for D. melanogaster. This seminar will explore the fly characteristics that make it an ideal model system for human diseases, with a focus on neurodegenerative diseases.

Monday May 29, 2017
14:30 - 16:30
Prof. FREDDIE PARTRIDGE
University College London
Title: "*Caenorhabditis elegans*, an invertebrate animal model for investigating human disease and screening for novel candidate therapeutics"
C. elegans is of particular interest as its complete cell lineage is known and it is the only organism for which a complete nervous system wiring diagram is available. Its short life cycle and transparent nature are further advantages. It was the first complex organism to have its genome sequenced. Transgenic lines and mutants provide models of human nervous system and neuromuscular disorders. Genetic screens and genome-scale RNAi studies can help identify new targets and pathways of therapeutic interest. Library-scale chemical screening combined with automated behavioural phenotyping can help uncover new 'hit' chemotypes which can then be explored further as candidate lead therapeutic compounds.

Tuesday May 30, 2017
14:30 - 16:30
Prof. VINCENZO COSTANZO
IFOM, Milano
Title: "Using *Xenopus laevis* cell free extract to study DNA metabolism"
The frog Xenopus laevis is an invaluable model organism to study basic cell and molecular biology, and to model human diseases. Xenopus eggs provide an abundant source for high-throughput biochemical studies using in vitro cell-free system that can reproduce basic biological processes. In this lecture, I will show how this model system is useful to study DNA metabolism, and in particular to analyze cell cycle events such as chromatin formation, centromere organization, nuclear assembly, DNA replication and DNA damage checkpoint activation.

Wednesday May 31, 2017
14:30 - 16:30
Prof. TOSSO LEEB
University of Bern
Title: "Personal genomics in domestic animals"
Due to their special population structure purebred dogs with their closed populations and a limited amount of inbreeding are an excellent model system to perform forward genetics and to unravel the causative genetic variants for heritable traits in

spontaneous mutants. Many of the spontaneous mutants can serve as animal models for human hereditary diseases. During my lecture, I will review the state of the art in positional cloning (linkage analysis, GWAS) and illustrate the potential and limitations of whole genome sequencing using selected examples from canine veterinary genetics.

Monday June 5, 2017
14:30 - 16:30
Prof. ANTONELLA FORLINO
Università degli Studi di Pavia
Title: "Zebrafish: a powerful tool to study heritable diseases"
The teleost zebrafish was mainly used in the past to investigate vertebrate development thanks to its external fertilization, rapid generation time and embryos transparency. Lately the zebrafish genome has been sequenced and more recently correspondences have been found with human diseases, including skeletal disorders. My lecture will focus on the power of zebrafish model for the understanding of heritable diseases and on its use for drug screening approaches.

Tuesday June 6, 2017
14:30 - 16:30
Prof. ROBERTO CHIESA
Istituto Mario Negri, Milano
Title: "Animal models for prion disease studies"
Prion diseases are very complex pathologies, where unconventional infectious agents have an interplay with the host's genome and proteome. In this seminar, different mice models will be described in their genetic and molecular architecture to mimic these complex diseases, with the particular emphasis on human prion scenario. These models are also key determinants to sustain the still debated "prion-hypothesis".