

1) Reproductive biology

The main research objective is the understanding of the factors involved in the differentiation of eggs and sperm, using the house mouse as a model organism. These differentiation processes are also studied when chromosomal or environmental conditions (e.g. xenobiotics) alter both gametogeneses.

We aim to identify the markers of the ovarian follicle maturation (oocytes and follicle cells), both in vivo and in a 2D or 3D culture system. A Systems Biology approach that associates high throughput methodologies (transcriptomics, genome-wide DNA-methylation, miRNA) with advanced computational approaches is used to bring out the molecular networks that identify and regulate follicle development and the acquisition of the egg's developmental competence.

As for the male gamete, our research is focused on the cellular and molecular mechanisms that alterate meiotic progression and sperm differentiation.

Our studies have also an evolutionary perspective. To this regard, both oogenesis and spermatogenesis are studied in the armadillo, pertaining to the ancient mammalian superorder of Xenarthra.

2) Stem cell biology

We aim to determine the effects of environmental pollutants (e.g., dioxin or arsenic) or physical agents (radiations) on the differentiation process from embryonic stem cells to cardiomyocytes.

Collaborations:

- Prof. J. Adjaye, Max Planck Institute for Molecular Genetics, Berlino, and Institute for Stem Cell Research and Regenerative Medicine, Medical Faculty, Heinrich Heine University, Düsseldorf, Germany.
- Prof. R. Bellazzi, Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia.
- Prof. P.L. Fassina, Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia.
- Prof. Irina Solovei, Department Biology II, Ludwig-Maximilians University, Monaco, Germania.
- Prof. R. Fernandez-Donoso, Dipartimento di Biologia, Università del Cile, Santiago, Cile.
- Prof. M.S. Merani, Centro de Investigaciones en Reproducción (CIR), Buenos Aires, Argentina.
- Prof. J Page, Departamento de Biología, Facultad de Ciencias, Universidad Autónoma de Madrid, Spagna.
- Prof. J. Searle, Department of Ecology and Evolution, Corson Hall, Cornell University, Ithaca, NY, USA.
- Prof. M. Zuccotti, Dipartimento di Scienze Biomediche, Biotechnologiche e Traslazionali, Università degli Studi di Parma, Parma, Italy.
- Prof. B Conti, Dipartimento di Chimica, Università degli Studi di Parma, Parma, Italy.
- Prof. Alexis Parada-Bustamante, l'Institute of Maternal and Child Research, School of Medicine, University of Chile, Chile
- Prof. P. Magni, Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia.

- Prof. J. Arechaga, Laboratory of Stem Cell, Development and Cancer, Department of Cell Biology & Histology, Faculty of Medicine & Dentistry, University of the Basque Country (UPV/EHU), Leioa, Vizcaya, Spain.
- Prof. E. Cebal, Laboratorio de Reproducción y Fisiopatología Materno-Embrionaria, Instituto de Fisiología, Biología Molecular y Neurociencias, Departamento de Biodiversidad y Biología Experimental, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina.

The research activity is documented by 140 publications on indexed international scientific journals or chapters in international books.