UMR1313

Animal Genetics and Integrative Biology (GABI)
Mammary Gland and Lactation Team

GaLac

Leader
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Overall Activity
The GaLac team's main objective is to improve our understanding of the factors that influence the mother-offspring continuum via milk and to decipher the molecular mechanisms involved.

Outstanding Results
- An obesogenic diet has a deleterious long-term effect on the mammary gland.
- The presence of microRNA in milk is correlated with their expression in the mammary gland.

Member of the **University Paris-Saclay**

Member of the **doctoral school**: **SDSV** (Structure and Dynamics of Living Systems)

Member of **SAPS** (Sciences Animales Paris-Saclay)

Scientific Questions

We study the mammary gland, which plays a key role in milk production and composition. The study of milk provides information on the modifications of the mammary gland function and allows the identification of factors that may be responsible for phenotypic variations in young animals. Improving our understanding of the molecular mechanisms that underlie the development of the mammary gland and milk production allows us to identify levers for a better control of these. Toward these aims, we study more particularly, the environmental and genetic effects on these functions.

Objects of study:
- Model species: mice, rabbits.
- Livestock species: rabbits, cattle, goats, sheep.

Scale of analyses:
- **Whole animal, over several generations**: effects of various factors on lactation physiology and offspring growth.
- **Organs**: development of the mammary gland.
- **Cells**: differentiation of mammary epithelial cells.
- **Molecules**: mammary gland proteomes, transcriptomes and miRNomes, milk composition (proteins, lipids, fine phenotyping of the major milk proteins by LC-MS, miRNomes by high-throughput sequencing).

1 – Studies on the mother:
- **Health**: effects of mammary gland infections on lactation (by following epigenetic markers that occur during inflammation along successive lactations, study of the *SOCS-2* gene mutation associated with mastitis predisposition).
- **Feeds**: effects of feed restrictions (study of mammary gland microRNA expression variation, identification of markers).
- **Genetic variations**: detection of associations between mammary gland microRNA, genetic variants and milk QTL in ruminants (cattle, goats, sheep).
- **Key genes**: their role in the development of the mammary gland and lactation (*SOCS-2*, Lpl, miR-30b, *Rspo1*).

2 – Studies on the mother-offspring continuum:
- **Foods**: effect of foods on the mother and her offspring.
- **Programming**: determination of critical periods (puberty, gestation and lactation) that have an effect on the future of the offspring.

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Research Tools:
- Fine phenotyping methods of the protein fraction of milk: profiling of the major lactoproteins combined with liquid chromatography coupled with mass spectrometry (LC-MS).
- Development and access to an interactive database for all ruminant microRNA available in the literature: RumimiR

(http://rumimir.sigenae.org/).

Partnerships:
- INRAE : UMR PEGASE, Herbivores, GenPhySE and Breed.
- National: Toulouse and Alfort Veterinary Schools.
- International: University of Tizi-Ouzou, Algeria. University of Davis, California, USA.
- Private: Actalia, CCPA, Hypharm
- Breeding sector Idele

3 – Studies on milk:

- **Environment and genetic variations**: effects on milk composition (analysis of modifications due to age, parity, health, foods, breed, selection), and on milk lipolysis.
- **Foods**: detection of xenomiR in milk.
- **Role of extracellular vesicles** present in milk and the mother-offspring continuum.

Expertise: Functional genomics, Physiology, Epigenetics.

Recent publications: All our publications are accessible at: https://www6.jouy.inrae.fr/gabi

Le Guillou S, et al. (2019) Defects of the endoplasmic reticulum and changes to lipid droplet size in mammary epithelial cells due to miR-30b-5p overexpression are correlated to a reduction in Atlastin 2 expression. BBRC 291:30393-6.

Hue-Beauvais C, et al. (2019) Impact of exposure to diesel exhaust during pregnancy on mammary gland development and milk composition in the rabbit. PLoS One 14:e0212132.

Ryskaliyeva A., et al. (2018) Combining different proteomic approaches to resolve complexity of the milk protein fraction of dromedary, Bactrian camels and hybrids, from different regions of Kazakhstan. PLoS One 10:e0197026.

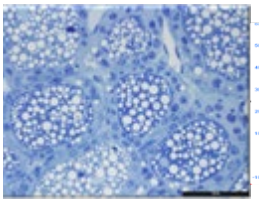
Hue-Beauvais C, et al. (2017) Diet-induced modifications to milk composition have long-term effects on offspring growth in rabbits. J Anim Sci. 95:761-770.

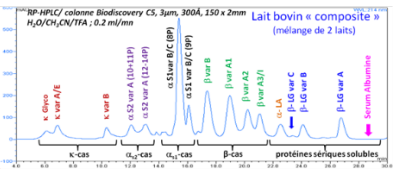
Mobuchon L., et al. (2017) Sunflower oil supplementation affects the expression of miR-20a-5p and miR-142-5p in the lactating bovine mammary gland. PLoS One. 12:e0185511.

Chadi S., et al. (2016) Phenotypic and molecular alterations in the mammary tissue of R-spondin1 knockout mice during pregnancy. PLoS One 9:e0162566.

Valentino S.A., et al. (2016) Maternal exposure to diluted diesel engine exhaust alters placental function and induces intergenerational effects in rabbits. Part Fibre Toxicol. 13:39.

Henry C. et al. (2015) Phosphoproteomics of the goat Milk Fat Globule Membrane: new insights into lipid droplet secretion from the mammary epithelial cell. Proteomics 15:2307-17.





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