



• PROJECT:

This project addresses one of the major issues currently affecting cattle breeding: how climate change affects the health and performance of dairy cows.

The project is based on a systems biology approach, using omics sciences (metabolomics and transcriptomics) to investigate the molecular basis of HS tolerance in dairy cattle. Samples are collected under different field conditions, comparing Brown Swiss and Holstein breeds raised on the same farm. Exosomes obtained from blood and milk are characterized to identify several potential biomarkers. The biological function of exosomes is subsequently validated in ex vivo and in vitro studies, with the aim of evaluating the effects on tissues that play a key role in the efficiency and welfare of dairy ruminants (mammary gland, intestine, immune cells).

Results of the studies will be integrated and analyzed to identify significant associations of markers with HS responses with already known clinical, physiological and production indicators. As the project addresses a topic with a high impact on livestock production and sustainability, the project aims to involve all stakeholders (farmers, livestock associations, animal science associations, companies trading in agricultural cooling systems, dairy companies...) for effective and rapid transfer of scientific knowledge to the field application phase.

• KEYWORDS:

Climate change, Heat stress, Environmental aspects of animal husbandry, Adaptation, Dairy cattle, Animal welfare.

• OBJECTIVES:

The project analyzes how climate change affects the health and performance of dairy animals. It aims to study: 1) physiological responses to heat stress in two cattle breeds (Holstein Friesian and Brown Swiss) 2) gain knowledge on the role of exosomes, their microRNA (miRNA) content and metabolites in modifying tissue functions during heat stress (HS) 3) identify miRNAs and biological markers in biological fluids for early and effective detection of HS condition in dairy cattle.

• WORK PACKAGES:

- **WP1.** The impact of heat stress on lactating Holstein Friesian and Brown Swiss breeds.
- **WP2.** Blood and milk exosomes isolation and characterization.
- **WP3.** Validation of OMIC results on samples collected during *in vivo* studies.
- **WP4.** *In vitro* evaluation of EXO activities.
- **WP5.** Coordination of the project and overall management.
- **WP6.** Dissemination and communication.

• EXPECTED RESULTS:

The expected results of this project will impact the livestock production field. Dairy livestock plays a major role in human food production, converting non-human edible plant material to high-quality products such as milk. The knowledge generated within the project will be useful for dairy livestock farmers to adopt management strategies, including breeding and nutritional strategies, to help with heat stress, improve animal health and contribute to the sustainability and competitiveness of the agro-food sectors.