

Research Project entitled: „The role of adipokines in viability and functional differentiation of bovine mammary epithelial cells”

The mammary gland is an exocrine gland characteristic only for mammals (class mammalia). The complete functional development of the gland occurs postnatally in females, with enhancement of the process occurring during puberty and terminal differentiation possible only at the time of pregnancy followed by lactation. Fully developed mammary gland comprises two main types of tissue: parenchyma - responsible for milk secretion during lactation and stroma, which has structural functions. The parenchyma is composed of a dense network of ducts that terminate in secretory alveoli during lactation, and these structures are formed by mammary epithelial cells. The stroma contains different types of cells: adipocytes (fat cells), fibroblasts, immune cells, vascular endothelial cells as well as extracellular matrix. Currently, it is well established that aside from the structural properties, the mammary stroma is tightly involved in coordination of the mammary epithelium development, forming specific microenvironment of the gland, which is rich in biologically active compounds that stimulate the epithelium. Moreover, this microenvironment enables a direct contact between the cells of the parenchymal and stromal tissues. Adipocytes seem to play a special role within the stroma, because these cells are capable of synthesizing and secreting molecules that show the activity of hormones (leptin, adiponectin), cytokines (interleukins, e.g. IL-6) and chemokines (chemerin), collectively known as adipokines. Increasing number of data indicate that adipokines may play a substantial role in development of the mammary epithelium. However, the majority of published scientific studies describes results regarding interactions between the mammary epithelial cells and stromal adipocytes in mouse or human mammary glands. Considering the differences in the structure of the mammary gland and the course of its morphogenesis between the ruminants and rodents, or humans, it is not possible to directly interpolate these results for other mammalian species, especially the dairy cattle in which case the mammary gland is intensively exploited for milk production. **Due to a relatively small number of studies regarding the contribution of the mammary stromal cells in the development of the mammary epithelium in cattle, the aim of the present research project is to determine the role of leptin, adiponectin and chemerin in regulation of viability and functional differentiation of bovine mammary epithelial cells.**

The studies will be conducted using an *in vitro* cell culture model of primary bovine mammary epithelial cells isolated directly from cow udders, as well as on established BME-UV1 cell line. These cells will be treated with culture media supplemented with leptin, adiponectin or chemerin in order to determine the influence of the adipokines on the ability of bovine mammary epithelial cells to: proliferate, form acinar structure (resembling the alveoli found within the mammary gland), produce milk proteins, as well as to induce apoptotic cell death. All of these processes play a major role in the development of the glandular epithelium. The studies will be performed using modern molecular techniques and methods (real time PCR, Western-blot, immunofluorescent staining, confocal microscopy, flow cytometry). Results obtained will allow for better understanding of the function of specific adipokines in relation to the physiological development of the bovine mammary epithelium. These studies may broaden the knowledge about the paracrine interactions between the glandular stroma and parenchyma, which may substantially regulate the activity of the mammary gland. In the case of the dairy cattle the knowledge obtained may help in introducing new solutions for cattle farming and milk production in the future.