

The maintenance and duration of reproductive activity have a significant impact on the production profit. Therefore, understanding of the mechanisms regulating optimal functions of the reproductive organs is important. Regulation by numerous endocrine and autocrine/ paracrine factors of ovarian activity in birds is rather well known while the molecular mechanisms of ovarian processes and changes occurring in the structural architecture of the ovarian tissues, especially in the extracellular matrix (ECM) during reproductive cycle are not fully understood. Changes taking place during ovarian follicle development, ovulation and subsequent regression may occur as a result of multihormonally controlled extensive tissue remodeling. Such process requires cyclic turnover of the ECM components. Numerous studies have established that the key role in matrix turnover during remodeling of several type of tissues, including reproductive ones are matrix metalloproteinases (MMPs). Although numerous reports indicate the involvement of MMPs in remodeling and functioning of the reproductive system of mammals, information about their involvement in the reproduction of birds are scarce. Therefore, in the proposed project the establishment of the participation of selected components of metalloproteinase system in the mechanisms determining development, ovulation and regression of the chicken ovarian follicles are planned. In order to realize this objective the following items should be known: (1) expression and localization of the chosen extracellular matrix metalloproteinases (MMP-2, MMP-7, MMP-9 and MMP-13) and their tissue inhibitors (TIMP-2, TIMP-3) in the ovarian compartments of chicken during ovulatory cycle and pause in egg laying, (2) activity of metalloproteinases in the ovarian tissues during ovulatory cycle and regression of the ovary, (3) possibility of the posttranscriptional regulation of selected MMPs and TIMPs by microRNA (miRNA), and (4) participation of gonadotropins, estrogen and prolactin in regulation of expression and activity of chosen components of metalloproteinase system in the hen ovary.

Determination of expression, localization and activity of the chosen MMPs and their tissue inhibitors in the chicken ovary during the ovulatory cycle and pause in egg laying should help to clarify the mechanisms responsible for the development, ovulation and regression of ovarian follicles and for proper remodeling of the avian ovary during pause in laying. Moreover, investigation of activity and expression patterns of MMP system members in the ovary after injection with pregnant mare serum gonadotropin (PMSG), tamoxifen (estrogen receptor modulator) and prolactin may explain the relationship between gonadotropins, estrogens and prolactin, and metalloproteinases in the ovary of birds and will allow for extrapolation of results on reproductive tissues of other animals or people. Identifying the molecules of miRNAs which regulate the expression of MMP system components will be particularly innovative and will have important contribution to clarifying the molecular mechanisms responsible for the synthesis of these compounds. The results of the project will complement and extend current knowledge on the regulation of the avian ovary function. Disturbances in the functioning of the ovary directly affect the egg production. Therefore, the results obtained in the project may point to new possibility to regulate the extension of egg production period in hens, resulting in better economical profit. It should be emphasized that in recent years the ovary of chicken has been recognized as an excellent model for the study of ovarian tumors of women, and tested in the project MMPs and TIMPs are markers of some cancers and abnormalities in the functioning of the ovary of mammals, hence the results obtained from the use of the chicken ovary as a model may indicate prognostic biomarkers for the diagnosis of ovarian tumors and may be useful in development of methods used in the treatment of cancer of the reproductive system in humans. In turn, the ovarian postovulatory follicles which degenerate rapidly may be a model tissue for studying the mechanisms of regression.