The life of all organisms on the Earth, the unicellular and multicellular ones, plants and animals, is closely connected with the planet's rotary and revolution, which result in consecutive alternations of day and night phases, and seasons. The necessity to prepare to the cyclical changes in external conditions (i.e. day and night, summer and winter) makes all organisms build the inner biological clock that influences numerous, if not all, physiological and pathological processes. More and more proofs gained during research conducted on birds and mammals indicate that the life against inner biological clock is connected with development of numerous diseases, even though the influence of the circadian clock on organism's functioning seems to be really subtle and the initial symptoms connected with disturbances in the rhythm by outer or inner factors seem to be mild. The role of biological rhythms and the significance of research concerning this subject are emphasized by the fact that in 2017 the Nobel Prize in Physiology or Medicine was awarded for the explanation of bases for the functioning of the biological clock. The prize was given to Jeffrey C. Hall, Michael Rosbash and Michael W. Young who discovered so called clock genes in a fruit fly.

The key role in the biological clock in vertebrates is played by the pineal organ, which produces and releases of melatonin (an indolic compound) in a diurnal rhythm. The level of melatonin secretion is high during at night and low during day. The pineals of fish and amphibians are photoreceptor organs equipped with a circadian oscillator and largely autonomous in generation and regulation of melatonin rhythm. In contrast, the mammalian pineal gland produces melatonin according to the rhythm of impulses coming from the suprachiasmatic nucleus of the brain in mammals. The pineal organ of birds combines features of this organ in lower vertebrates, as it is capable of receiving light stimuli and it has an endogenic rhythm generator, and in mammals because its activity is controlled by the suprachiasmatic nucleus. These features make the avian pineal organ a perfect model for research on the biological clock. Furthermore, it should be emphasized that numerous research demonstrated the essential role of a pineal gland and its main hormone, melatonin, in physiology and pathology of birds. The results of the recent research conducted on chicken embryos have showed an important role of melatonin in the processes of early organogenesis – in formation of eyes and heart.

The present knowledge on the embryonic development of the avian pineal gland is mainly a result of research conducted on chickens' embryos and, to a smaller degree, Japanese quail's embryos. The research on other species has been scarcely conducted. The pineal glands of domestic birds differ much in the histological structure and ultrastructure, the content and daily profiles of indolic compounds (related to melatonin synthesis), and the role of particular mechanisms in the regulation of melatonin secretion. Significant interspecies differences indicate the necessity to conduct comparative research, including the studies on the pineal organ development during the embryonic life.

The project purpose is to investigate the embryonic development of the pineal gland in the domestic goose. The planned studies are comprehensive and they include morphological, biochemical and functional aspects of development. In addition to the period of embryonic life, the research will also concern changes occurring in the organ during the first two weeks after hatching out. It will enable the authors to compare the structure and physiology of the pineal gland during the embryonic period and the early stage of post-hatching development.

The morphological aspects of development will be studied on the organ and tissue levels with the use of light microscopy as well as on the cellular and subcellular levels with the use of electron microscopy. The methods of three-dimensional reconstruction will be also employed. The studies on development of the pineal metabolic pathways will be performed by determination of the content of 11 indolic compounds related to melatonin synthesis (including this hormone) in the embryos and chick as well as the level of norepinephrine, their precursors and metabolites. These analyzed will be performed by modern and highly sensitive laboratory methods. The research on the regulation of melatonin secretion will be conducted *in vitro*, using a special system where the isolated pineal organs survive for more than 10 days. With this culture, it will be possible to determine when the pineal starts to be photosensitive and when it starts to generate the rhythm of its diurnal activity.

A vast part of the studies, which are planned in the project, concerns the aspects of the pineal development that had not been investigated in birds (or even in vertebrates) before or which results had not been published in available sources. The results obtained in the project will be ones of the first data on the development of metabolic pathways of melatonin synthesis-related indoles in the vertebrate pineal organs. The levels of catecholamines, their precursors and metabolites will be measured for the first time in the embryonic avian pineal organ. The obtained results should help to answer the question "does the statement, which is often repeated in the literature, that birds' embryonic pineal organ, as opposed to mammals' embryonic pineal gland, displays essential secretory activity, is justified?". This statement is not sufficiently supported in the literature and there are reasons the suspect the secretory activity of the avian pineal organ is very low during the embryonic life and increases dramatically after hatching.