Studies on embryonic development in reptiles - why? Reptiles are one of the most ecologically and evolutionarily remarkable groups of living organisms, having successfully colonized most of the planet, including the oceans and some of the harshest and more environmentally unstable ecosystems on earth. Although (non-avian) reptiles are the second most species-rich group of amniotes after birds, current knowledge regarding their development in comparison with other vertebrates is very poor because reptiles are difficult to capture, to manipulate and to maintain alive under laboratory conditions. Why? Because, reptilian embryonic development begins while the eggs are still in the female genital tract, so at the time of oviposition, embryos are at an advanced stage of embryogenesis. Due to the lack of existing structural, ultrastructural, immunocytochemical and molecular analyses of the developing reptilian organs, only some hypotheses regarding the differentiation of these structure have been put forth, leading to certain generalizations being made about the evolutionary development of this organ in vertebrate species in general. Therefore, the literature contains many question marks that would be worth filling out with the content.

Lizards are one of the most diverse groups of Squamates, therefore the key issue, and the crux of this project, is to answer the following question: how does the pancreas, and to be exact its mysterious endocrine part, of lizards develop? Pancreas is a glandular organ in the digestive system and endocrine system of all vertebrate species. It serves as two glands in one: a digestive exocrine gland and a hormone-producing endocrine gland. The exocrine part of this organ, synthesizes pancreatic juice containing digestive enzymes that break down the proteins, lipids, carbohydrates, and nucleic acids in food and assist digestion and absorption of nutrients in the small intestine. The endocrine part of pancreas produces several important hormones, including insulin, glucagon, somatostatin, pancreatic polypeptide and ghrelin – hunger hormone which circulate in the blood. Why pancreas of lizards? Because its morphology in adult lizards within the lower evolutionary species shows very primitive features and this type of pancreas is considered to be a kind of "prototype" of the pancreas in the Squamates. Representatives of three main groups of lizards were selected for research: brown anole (Iguania), leopard gecko, mourning gecko (Gekkota) and sand lizard (Lacertoidea) representing a different evolutionary positions. All research using the sand lizard, which are under strict species protection, will be conducted with the permission of the Regional Directorate for Environmental Protection in Katowice.

In this project the structural, ultrastructural, and immunocytochemical studies, and 3D reconstructions will be performed which allow: 1. Identification of the number of the pancreatic buds and degree of their fusion; 2. Temporal and spatial evaluation of transcription factors expression during lizard's pancreas morphogenesis.; 3. Determination of the mechanisms of the pancreatic islet formation and identification of the endocrine cells arrangement within islets; 4. The endocrine cell type identification, sequence of their appearance, characteristic and co-localization of the endocrine granules in these cells; 5. Determination of the process of the lumen of the pancreatic ducts and acini differentiation; 6. Three-dimensional reconstructions of the shape of the gland, its localization in relation to the surrounding organs and its connections with them at the subsequent developmental stages and 7. Evaluation of the developmental sequences during lizard's pancreas differentiation in the light of discordance between morphological and molecular phylogenies of Squamata.

Although interest in the reptile biology in the world is still growing, the team that has planned the research is the only one in Poland and one of the few in the world team that comprehensively deals with the development processes of embryonic reptiles. We are convinced that the many years of experience and research passion of the team members will make that the results of the planned research will allow learning the processes occurring during lizard's pancreas development.

Studying of the differentiation of reptilian pancreas will provide basic research knowledge from the discipline of developmental biology and results of these studies will constitute a unique source of information on the reptilian pancreas morphogenesis. The studies will contribute to a better understanding of the mechanisms of the reptilian pancreas differentiation and will fill the gaps in academic handbooks of development biology and evolution of vertebrates. No doubt, they will supplement the knowledge of vertebrate pancreas differentiation. The investigations of the pancreatic development of species belonging to three different clades will make possible to determine whether the phylogenetic position of a given group of lizards has an influence on the way of the pancreas differentiate. Moreover, the obtained results will complement the matrix of features that in the future may become the basis for inference about the relationship of the species studied.