Sexual differentiation of the gonads, including ovaries and testis, is one of the most important processes for the individual's sexual development. Despite some differences occurring among various groups of living organisms, the development of gonads in most vertebrates follows a general pattern of organ structure formation. However, there are different ways of determining sex among vertebrates. In most vertebrates, sex is genetically determined. However, in some vertebrates, environmental factors such as temperature play a role in sex determination. Sexually undifferentiated gonads consist of a cortex located peripherally and a medulla located centrally. Germline cells are mainly found in the cortex but also in the medulla of sexually undifferentiated gonads, at the earliest stage of development. During the process of sexual differentiation of the gonads, distinctive features emerge that allow the differentiation between ovaries and testes. The processes that determine the differentiation of gonads into ovaries or testes have been well understood to date especially in mice. Changes in the structure of ovaries and testes during their development are also well understood. The genes involved in the process of sex determination are known. In reptiles, sex hormones are responsible for the formation of sexual characteristics, including the sex of the gonads, and thus for the sexual differentiation of these organs. However, the precise influence of hormones and environmental factors on sex determination in squamate reptiles has not been determined.

My previous studies conducted on reptilian species, from the order of squamate reptiles, have shown that the earliest manifestation of ovarian differentiation is an increase in the number of cortex cells and inhibition of gonadal medulla development. An important enzyme involved in gonad differentiation into the ovary is aromatase. Aromatase converts androgens into estrogens and directs the development of undifferentiated gonads into ovaries. However, the first manifestation of testicular differentiation is the thinning of the cortex (a decrease in the number of its cells) and the growth of the medulla (an increase in the number of cells). Expression of the *SOX9* gene is an early manifestation of directing the undifferentiated gonad into the testis. Given that the first manifestation of gonadal sexual differentiation involves changes in the number of cells in the cortex and medulla, it can be hypothesized that sex determination genes regulate the proliferation (increase in numbers) and apoptosis (cell death) of somatic and germline cells in specific parts of the gonads (cortex or medulla) depending on the genetic sex. Squamate reptiles are vertebrates in which sex determination is still poorly understood. Furthermore, there is a variety of sex determination systems among squamate reptiles. The sex-specific effects of hormones and temperature on gonad development in reptiles have not been studied. This project aims to investigate the influence of hormones and egg incubation temperature on the development of gonads in squamates, and thus their sexual differentiation. Proliferation and apoptosis of developing gonadal cells in manipulated reptile species will be studied. The planned research in this project will contribute to understanding the mechanisms underlying the sexual differentiation of gonads, which is important for sexual development, in species with different sex determination systems.