

A new insight into testis development of the zebra finch (*Taeniopygia guttata*)

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Zebra finches have emerged as a widely used avian species in research. Nevertheless, the gonadal development of these birds has remained largely unexplored. The objective of this study was to elucidate the early formation of gonadal ridges in zebra finches, the process of sexual differentiation in the gonads, and the subsequent development of testicular structure. Eggs were collected on the day they were laid and incubated at 37.5 °C and 70% humidity. Embryos dissected from eggs were staged according to the Hamburger-Hamilton stages. We employed the histological staining according to Dubreuill's modifications, and compared it with immunofluorescence.

We observed a notable asymmetry in gonadal development, with the left gonadal ridge consistently larger than the right, even before the settlement of primordial germ cells (PGCs). Following the settlement of PGCs, the left gonadal ridge displayed a significantly higher number of PGCs compared to the right, further accentuating the asymmetry. The left gonadal ridge lacked a distinct division into cortex and medulla due to the abundance of germ cells.

The right differentiated testis contained testis cords and a thin surface epithelium. In some individuals left testis demonstrated a hermaphroditic structure, featuring testis cords and an extensive cortex resembling the cortex found in ovaries. Additionally, a number of mature males exhibited abnormalities in the structure of the left testis and impaired spermatogenesis, including atypical spermatid clusters or a complete absence of spermatozoa.

This study provides insight into the distinct development of testes in zebra finches, characterized by a high number of germ cells and significant cortical growth in the left testis. Understanding the molecular mechanisms underlying the development and maintenance of this hermaphroditic structure could provide valuable insights into the evolutionary adaptations of zebra finches and possibly other avian species.