

## Summary for electronic version

Every organism experiences the effects of stress in its day to day life. Stress can be defined as any disturbance of the organism's homeostasis. The internal or external stimulus that causes stress is called the stressor. Usually, the organism is well equipped to adapt to the stress. It has the mechanisms, generally referred to as the stress response, to restore its disturbed homeostasis. However, severe and chronic stress may exceed the ability to adapt and this may then lead to suppression of growth, the immune response or the reproductive performance. In fish, as in higher vertebrates, stress adaptation has been shown to be related to an activation of the hypothalamic-pituitary-interrenal (HPI) axis. In teleost fish, cortisol is the main glucocorticoid produced by the interrenals under influence of stress. Cortisol plays a key role in the restoration of homeostasis and is frequently indicated to be the major factor mediating the suppressive effect of stress on the reproductive performance.

This thesis addresses the effect of stress adaptation on the pubertal development. Puberty is the developmental process by which the animal acquires the capacity to reproduce. In males, the period of pubertal development may be defined as the time span that starts with the beginning of spermatogonial multiplication until the appearance of the first flagellated spermatozoa. The onset and regulation of puberty is determined by functional development of the brain-pituitary-gonad (BPG) axis. Stress effects have been reported to affect all levels of the BPG-axis. However, the precise mechanisms via which the stress response has its adverse effects on reproduction are still unknown.

The present study is an attempt to find more answers to solve this intriguing question. Firstly, we investigated the effects of repeated temperature stress on the pubertal development (Chapter 2). Since cortisol has been shown to play a key role in the homeostatic adaptation during or after stress, we focussed in chapter 3 on the effects of cortisol on the pubertal development. In the same chapter we also paid attention to the question at which level the BPG-axis is affected by cortisol. Since our results indicate that all levels of the BPG-axis were affected by cortisol, we studied the cortisol effects on the pituitary and

the testis in more detail (chapter 4 and in chapter 5) and tried to answer the question whether cortisol has its effects, directly or indirectly on the different components of the BPG-axis. Based on these studies we hypothesized that the cortisol-induced suppression of pubertal development is mediated by effects on the androgen production. In the following chapter, chapter 6, we therefore intensified our research on the testis, focussing on the steroid synthesis. Finally, in chapter 7, we investigated the role of the androgens, which possibly play a key role in the cortisol-induced suppression of pubertal development, by combined cortisol treatment and steroid replacement therapy.

Keywords: Stress, cortisol, reproduction, puberty, pituitary, testis, spermatogenesis, steroidogenesis, testosterone, feedback