

Abstract

The phenotype-linked fertility hypothesis predicts that both, male carotenoid-based sexual ornamentation and their spermatozoa are phenotypically plastic and may be co-affected by the environment. One of the factors affecting their phenotype may be oxidative stress and the ability of organism to eliminate its effect. Oxidative stress may reduce sperm quality because sperm lack the ability to repair DNA, but it can also affect spermatogenesis itself. However, some substances may function as antioxidants, and thus eliminate effect of reactive oxygen species (oxidative stress) in the body. In this study, adult zebra finch males (*Taeniopygia guttata*) originating from the domesticated and recently wild-derived populations were exposed to the diquat (D), which enhances the oxidative stress, and carotenoid lutein (L), which could have an antioxidant function. Experimental design had factorial character 2x2 with a control (group L, D, LD, control). Neither oxidative stress, carotenoids, nor their interactions affected sperm morphology or velocity and it also did not increase abnormal sperm proportion in the ejaculate. However, the differences were observed at the molecular level, where by inducing the oxidative stress, the sperm had reduced signal intensity of acetylated α -tubulin in the sperm tails. Reduced rate of acetylation could be a sign of structural damage of the sperm tails. However, when a combination of diquat and lutein was used, the ratio between sperm with a weaker and stronger signal was equalized. Morphometric analysis of the testes also revealed significant changes. Oxidative stress caused the reduction of the mean diameter of seminiferous tubules and it increased the height of seminiferous epithelium. The reduction of the mean diameter of seminiferous tubules was also observed in the combination of the lutein and diquate-treated group. However, the increase in the height of the seminiferous epithelium did not occur in this group, and lutein was able to prevent this pathological condition. This work thus confirms the negative influence of oxidative stress on sperm and on spermatogenesis in zebra finch males. It also demonstrates the importance of carotenoids for maintaining redox homeostasis and their partial antioxidant effect under oxidative stress conditions.

Key words: sperm, spermatogenesis, oxidative stress, carotenoids, α -tubulin acetylation, zebra finch