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Rearing in captivity affects fish spermatogenesis through changes in germ cell proliferation and apoptosis

Rosa Zupa
University of Bari Aldo Moro, Italy

Spermatogonial proliferation and loss of germ cells via apoptosis are critical processes during fish spermatogenesis. The correct balance between spermatogonial self-renewal and differentiation towards meiosis determines the eventual sperm output. Moreover, apoptosis, a form of programmed cell death, plays a role in maintaining a correct Sertoli/germ cells ratio, limiting germ cell population and preventing maturation of aberrant germ cells. These processes are controlled by pituitary gonadotrophins-follicle-stimulating hormone (FSH) and luteinizing hormone (LH) - whose release is stimulated by gonadotropin-releasing hormone (GnRH). Most male fish reared in captivity display reproductive dysfunctions which are supposed to be caused by an insufficient pituitary stimulation by GnRH, and the consequent inadequate gonadotropin release, as a result of the combination of captivity-induced stress and lack of adequate natural spawning conditions. The effects of rearing in captivity on large pelagic fish (Atlantic bluefin tuna *Thunnus thynnus*; greater amberjack *Seriola dumerili*) germ cell proliferation and apoptosis are herein argued. In captive-reared Atlantic bluefin tuna, a delay of spermatogonial proliferation and an increase of germ cells apoptosis (Fig. 1) were associated to low 11-ketotestorone (11-KT) levels. In captive-reared greater amberjack, a high level of germ cell apoptosis at the beginning of the breeding phase was observed, along with a progressive decrease of germ cell proliferation during the reproductive season. Both in Atlantic bluefin tuna and greater amberjack, the observed gametogenesis dysfunctions eventually resulted in low quality sperm production and, in Atlantic bluefin tuna, they were alleviated by the administration of a GnRH agonist (GnRHa). Proper rearing practices, including handling procedures that minimize stress, along with hormonal therapies, are recommended to ameliorate spermatogenesis dysfunctions.

Biography

Rosa Zupa is a Biologist whose research activity is focused on teleost reproductive biology. In particular, she studies the effect of confinement in captivity on gametogenesis in teleost species candidate to aquaculture. She has worked on Atlantic bluefin tuna domestication within the EU project SELFDOTT and the Apulian regional project ALLOTUNA. Currently, she is participating to the EU project DIVERSIFY on aquaculture species diversification. Her expertise includes analysis of germ cell proliferation and apoptosis.

rosa.zupa@uniba.it

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