
Mass Production of Sterile Fish Using FSH Receptor Knockout and Germ Cell Transplantation

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Résumé

Sterilizing fish by knocking out genes essential for gametogenesis can effectively prevent escaped fish from mating with wild populations as well as safeguard against unauthorized seed production. However, as sterile fish produce no eggs or sperm, their mass production is challenging. In this study, we generated sterile fish by knocking out the follicle-stimulating hormone receptor (*fshr*) gene (which plays a crucial role in gametogenesis), and we evaluated the use of germ cell transplantation for mass production. The *fshr* gene is expressed in gonadal somatic cells, where it regulates germ cell proliferation and differentiation upon receiving FSH signals. Because germ cells lack FSH receptors, we hypothesized that germ cells isolated from *fshr*-knockout fish can function normally if gonadal somatic cells can receive FSH signals. To test this, we transplanted germ cells from homozygous *fshr*-knockout rainbow trout into sterile *dnd*-knockout recipients that completely lack endogenous germ cells. The resulting recipient fish initiated gametogenesis from the transplanted donor germ cells, with some males producing sperm at one year of age. Genome analysis of the sperm confirmed that it was derived from donor cells with the *fshr* knockout. These findings suggest that combining *fshr* knockout with germ cell transplantation is a promising approach for the mass production of sterile fish. We are currently maintaining female recipients of the *fshr* knockout and planning to produce only sterile offspring by mating male and female recipients.

Mots-Clés: fish reproduction genome editing germ, cell

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