3. 遺伝子編集による大西洋サケの不妊化

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Introduction

Atlantic salmon is a major aquaculture species in Norway with more than 1.2 million tons produced every year. However, further increase in production is currently hampered due to sustainability concerns including disease problems and genetic introgression from farmed escapees to wild salmon populations. The latter issue may be solved by using sterile salmon in the sea cages. One way to produce sterile salmon is through triploidization. However, triploid salmon are generally more sensitive to suboptimal rearing conditions, which may lead to several welfare problems. Therefore, alternative sterilization methods are being explored. The innovation of the highly efficient and potent CRISPR/Cas9 methodology allows gene editing of specific DNA sequences in any organism, thus for the first time permitting the editing of traits, including sterility, beneficial for sustainable aquaculture.

Results

Using CRISPR/Cas9 we have produced a sterile salmon by targeting a gene that is essential for primordial germ cell survival and further gametogenesis.¹ Furthermore, this germ cell-free (GCF) salmon does not enter puberty,² which is associated with reduced welfare and growth.³ Preliminary data suggest that GCF salmon have a similar growth rate and welfare compared to wild type salmon. We are currently exploring a method to mass-produce GCF salmon, as well as additional target genes for possible sterility treatments.

Discussion

If we succeed in establishing a way to mass-produce 100% sterile salmon that will not enter puberty, this model will have significant commercial potential because it may solve the problem with genetic introgression from farmed escapees to wild populations of salmon, as well as issues with precocious maturation.

References