AquaCrispr

Optimalization of the CRISPR/CAS9 knock-in technology and application in salmon and trout

PROJECT FACTSHEET

JOINT CALL COFASP – ERA-MBT

DECEMBER 2016

ABSTRACT

Recent biotechnological innovations currently allow the development of new approaches to apply genetic engineering to non-model organisms, including economically important salmonid species. This has been mediated by the introduction of the highly efficient CRISPR-Cas9 methodology, which allows mutating specific DNA sequences in any organism, thus permitting genetic studies on key traits for aquaculture. In recent years several studies have revealed that single SNPs in the genomes of salmonids can explain important traits such as time of maturity and disease resistance. Based on these findings further studies need to aim at elucidating how single nucleotide exchanges can alter important traits for aquaculture such as growth, reproduction and disease resistance. Hence, there is a need to develop technologies that can precisely alter single nucleotides in the genome. This can be obtained by knock in- by a combination of gene editing and homology-directed repair as previously done in zebrafish. So far knock out by gene editing has been established in both rainbow trout and Atlantic salmon. Both species of fish have a long generation time, therefore it will be necessary to perform double allelic knock in by homologous recombination already in the F0, which is challenging considering current low efficiencies of homologous recombination. We have successfully established a methodology using pigmentation as a tracer for double allelic mutations in Atlantic salmon, this methodology can be further explored for knocking in traits. The project will therefore focus on establishing an efficient knock in technology in salmon and rainbow trout. This will be done in combination with exploring the technology further in zebrafish and medaka as efficiency is still low in this species and also since testing out technologies is much faster in these model fish species with their short generation time and fast development. By doing so, we will focus our technology development on genes essential for pigmentation, sex determination, reproduction and egg quality since our groups have been exploring these fields for a long time and results produced can in addition to providing technological improvements explain mechanisms behind some key biological features in fish and other species.
More information can be found on the COFASP website.

Sector:

- Aquaculture

Topic:

- Genome based approach to genetic improvement of aquaculture species

Total costs*:
€ 1.719.200

Funding granted*:
€ 894.100

Duration:
3 years (2017-2019)

** Exact amount may change after completion of national contracts*

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