Popular science summary of the PhD thesis

PhD student	Valentina Laura Donati
Title of the PhD thesis	Bacteriophage-based control of *Flavobacterium psychrophilum* in rainbow trout. Studies on phage-treatment of rainbow trout at fry and eyed egg stages and effects on gut microbial communities.
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Due to the rise of antibiotics resistance and the disruptive effects of antibiotics on the host microbiota and on the environment, novel environmental-friendly approaches are of urgent need for the treatment and prevention of bacterial infections. Bacteriophages (or phages) are host-specific viruses of bacteria (they infect, lyse and kill the host bacterium releasing a new progeny to the environment). Overall, this PhD project brings new knowledge for the development of phage-based control strategies targeting the pathogenic bacterium *Flavobacterium psychrophilum* (etiological agent of rainbow trout fry syndrome (RTFS) and of Bacterial Coldwater Disease (BCWD)) that could be applied in aquaculture facilities.

This PhD thesis consists of an initial introduction of the focused research area (*F. psychrophilum*, phage therapy and the fish gut microbiota), an overview of the PhD study aims, methods, results and conclusions, and of three manuscripts. In **Manuscript I**, we investigated the potential of a two-component mix of bacteriophages in controlling *F. psychrophilum* in rainbow trout fry administered by three methods: oral (phage treated feed pellets prepared by spraying or by irreversible immobilization (Fixed Phage Ltd)), bath and injection. We demonstrated the delivery of phages to fish organs by oral administration, but we concluded that higher phage dosages than the tested ones may be needed to provide the fish an adequate protection against this bacterium. In **Manuscript II**, we focused on evaluating the effects of *F. psychrophilum* infection, of the oral administration of phages and of the antibiotic florfenicol (antibiotic in use in Denmark for the treatment of RTFS) on the gut microbiota of rainbow trout fry. Results showed a dysbiosis effect caused both by the infection and by florfenicol administration. Interestingly, phage addition altered the microbiota of the fish independently of the presence of their target bacterium. In **Manuscript III**, we focused on *F. psychrophilum* infections in rainbow trout eyed eggs and demonstrated the potential use of phages during early life stages of rainbow trout.

To conclude, this PhD study aimed to bring the development of phage therapy as an alternative approach in relation to *F. psychrophilum* infections and rainbow trout one step forward for its application in aquaculture facilities. Overall the study has generated important knowledge. However, various challenges were revealed and further studies should be focused on overcoming them.