

Insight from Molecular, Pathological, and Immunohistochemical Studies on Cellular and Humoral Mechanisms Responsible for Vaccine-Induced Protection of Rainbow Trout against *Yersinia ruckeri* - DTU Orbit (09/11/2017)

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The immunological mechanisms associated with protection of vaccinated rainbow trout, *Oncorhynchus mykiss*, against enteric redmouth disease (ERM), caused by *Yersinia ruckeri*, were previously elucidated by the use of gene expression methodology and immunochemical methods. That approach pointed indirectly to both humoral and cellular elements being involved in protection. The present study correlates the level of protection in rainbow trout to cellular reactions in spleen and head kidney and visualizes the processes by applying histopathological, immunohistochemical, and in situ hybridization techniques. It was shown that these cellular reactions, which were more prominent in spleen than in head kidney, were associated with the expression of immune-related genes, suggesting a Th2-like response. *Y. ruckeri*, as shown by in situ hybridization (ISH), was eliminated within a few days in vaccinated fish, whereas nonprotected fish still harbored bacteria for a week after infection. Vaccinated fish reestablished normal organ structure within a few days, whereas nonprotected fish showed abnormalities up to 1 month postinfection. Protection in the early phase of infection was mainly associated with the expression of genes encoding innate factors (complement factors, lysozyme, and acute phase proteins), but in the later phase of infection, increased expression of adaptive immune genes dominated. The histological approach used has shown that the cellular changes correlated with protection of vaccinated fish. They comprised transformation of resident cells into macrophage-like cells and increased occurrence of CD8 α and IgM cells, suggesting these cells as main players in protection. Future studies should investigate the causality between these factors and protection.

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