Effects of soluble immunostimulants on mucosal immune responses in rainbow trout immersion-vaccinated against Yersinia ruckeri

Immersion vaccination of rainbow trout against Yersinia ruckeri infection is an established method to prevent enteric red mouth disease (ERM) but the effect is inferior to injection vaccination and the duration of protection is limited to less than six months. Adjuvants in vaccines may in general elevate the immune response and the present work elucidates how ERM immersion vaccination of trout in combination with exposure to soluble adjuvants, Montanide™ IMS 1312 VG PR and β-glucan, affects immune reactions. The former adjuvant, when used alone, induced a slightly increased protection (not statistically significant) whereas β-glucan did not increase protection. Adjuvant-treated and non-exposed groups showed elevated plasma lysozyme activity after challenge with Y. ruckeri. Specific antibody production was not positively affected by combining adjuvant and vaccine. Overall expression of immune genes tested was generally manifold higher in gills compared to skin. Only genes encoding SAA and IL-17C1 were expressed at a higher level in gills compared to skin. Dynamic differences between the gill and skin compartments were also recorded for genes encoding cytokines (TNF-α, IL-1β, IL-6, IL-10, IL-12, IL-17A/F2, IL-17C1, IL-17C2, IL-22), immunoglobulins (IgM, IgD, IgT), cell markers (CD8α, TCR-β) and acute phase reactants (SAA, lysozyme). These genes were upregulated 24h post-vaccination in fish gills exposed to both vaccine-adjuvant combinations when compared to fish exposed to vaccine alone. After a few weeks no vaccine induced reaction was seen and after challenge with bacteria mainly unvaccinated fish responded. Adjuvants used in combination with immersion vaccine clearly influences immune reactions and may improve duration and protection but further potency tests should be performed.