DNA vaccination against viral haemorrhagic septicaemia (VHS) in rainbow trout: size, dose, route of injection and duration of protection—early protection correlates with Mx expression

Rainbow trout of different sizes (10 and 100 g) were injected intramuscularly (i.m.) or intraperitoneally (i.p.) with different doses (range 10 ng-10 µg) of a viral haemorrhagic septicaemia (VHS)-DNA vaccine (pcDNA3vhsG). As controls, fish were injected with the pcDNA3 plasmid alone, or with inactivated VHS virus. Fish were challenged at different times post-vaccination (p.v.) to assess protection. At certain times p.v., serum samples were analysed for neutralising antibody and liver tissue was analysed for Mx mRNA expression. A DNA dose of 0.5 µg injected by the i.m. route induced protection in fish of all sizes in challenges performed either 1 or 4 weeks p.v. This dose also conferred effective protection up to 9 months p.v. in fish >100 g. With lower doses of DNA (0.1 and 0.01 µg) and challenge at 4 weeks p.v., 10 g fish were partially protected but protection was not observed in 100 g fish. Vaccination by the i.p. route induced no or lower levels of protection compared with the i.m. route. Fish vaccinated with 0.5 µg DNA i.m. had no detectable serum neutralising antibody (NAb) at 4 weeks p.v. (with the exception of a single 10 g fish) but antibody was detected at 8 weeks and 6 months p.v. but not at 9 months p.v. However, cohorts of these fish showed effective protection at all timepoints. Lack of detectable levels of NAb (at 9 weeks p.v.) despite partial protection in challenge at 4 weeks p.v. was also observed with 0.01 µg doses of DNA i.m. NAb was detected in sera of fish at 8 weeks after vaccination with 0.1 µg i.m. but not in fish vaccinated with doses of 0.01-0.5 µg i.p. Early protection (1 week p.v.) correlated with elevated Mx gene expression.

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