

Chitosan Modified Halloysite Nanomaterials for Efficient and Effective Vaccine Delivery in Farmed Fish

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Abstract : Nanotechnology has been recognized as an important tool for modern agriculture and has the potential to overcome some of the pressing challenges faced by aquaculture industry. A strategy for optimizing nanotechnology-based therapeutic delivery platform for immunizing farmed fish was developed. Accordingly, a compositional library of nanomaterials of natural chemistry (Halloysite (clay), Chitosan, Hydroxyapatite, Mesoporous Silica and a composite material of clay-chitosan) was screened for their toxicity and efficiency in delivering model antigens in cellular and zebrafish embryo models using high throughput screening platforms. Through multi-parametric optimization, chitosan modified halloysite (clay) nanomaterial was identified as an optimal vaccine delivery platform. Further, studies conducted in juvenile seabass showed the potential of clay-chitosan in delivering outer membrane protein of *Tenacibaculum maritimum*- TIMA (pathogenic bacteria) and its efficiency in eliciting immune responses in fish. In short, as exemplified by this work, the strategy of using compositional nanomaterial libraries and their biological profiling using high-throughput screening platform could fasten the discovery process of nanomaterials with potential applications in food and agriculture.

Keywords : nanotechnology, fish-vaccine, drug-delivery, halloysite-chitosan

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