Development of Novel Anti-Fouling Paints for Aquaculture Applications. In vitro biological evaluation.

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Abstract

Biofouling is an extensively studied natural phenomenon that occurs in all immersed underwater surfaces including ships, drilling stations, water inlets and aquaculture equipment such as cages, net and ropes. It is defined as the consecutive accumulation of organic molecules, microorganisms, plants and animals leading initially in biofilm formation and finally in attachment of larger aquatic organisms. But why is biofouling a problem? Regarding ships, the resulting increase in weight and surface roughness affects speed and maneuverability and can lead up to a 40% rise in fuel consumption. In marine aquaculture, biofouling causes cage deformation and net occlusion that restricts water and oxygen exchange leading to accumulation of toxic metabolic products and, in turn, increased level of fish stress, disease vulnerability and lower immunity (Amara et al., 2018). The economic impact is remarkable. Oil, gas and shipping industries spend approximately 5.7 billion US$ annually to prevent marine biofouling. A variety of antifouling methods have been implemented to combat biofouling (Fitridge et al., 2012).

The goal of our research is to develop novel, biocompatible, biocide-free and environmentally friendly water based anti-fouling paints. Aquaculture equipment should be coated with anti-fouling agents before immersing in seawater to prevent or significantly delay biofouling. Our approach includes the development of hybrid paints based on dendritic polymer / silica nanoparticles and/or inorganic nanotubes. Our team is focused on physicochemical characterization and biological evaluation of these nanocomposite paints. Initially, DLS and FT-IR experiments were performed and subsequently, IC50 values and *in vitro* cytotoxicity were evaluated using different human cell lines.

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