Biomimicry in action: Using furanones to address diseases and fouling issues in marine aquaculture

Alice Motola[1], Anamarija Frankić[2]

1 Dipartimento di Scienze della Terra, Universita "La Sapienza" di Roma, Italy

2 Department of Ecology, Agronomy and Aquaculture, University of Zadar, Croatia

Presenting Author: Alice Motola (motola.1663504@studenti.uniroma1.it, + 39 328 98 132 30)

Aquaculture is the fastest growing food production sector worldwide. However, the development of this industry is limited by the outbreak of diseases, which occur on account of the abuse of antibiotics in order to keep the spreading of infections under control. This has led to the global problem of antimicrobial resistant genes, which constitutes a major threat to human and animal health, and to the natural environment. The red marine alga *Delisea pulchra* has evolved a defense mechanism to protect itself from extensive bacterial colonization, specifically by causing a disruption of the key quorum sensing (QS), bacterial cell-to-cell communication, which in turn controls the virulence factor of pathogens, through the exudation of halogenated furanones. A biomimicry solution to avoid *a priori* use of conventional antibiotics would be to produce those secondary metabolites synthetically and employ them as a potential anti-virulence therapy and anti-fouling strategy. The main advantage of this 'biomimetic' approach is that there will be none, or minimum interference with non-target organisms. Many findings confirm that the use of furanones was successful both *in-vitro* and *in-vivo* to protect fish and crustaceans from pathogens. In addition, furanones are effective when incorporated into polymers designed to prevent macrofouling by epiphytic algae, barnacles and bryozoans on sea-cages, and to prevent corrosion. In conclusion, this sustainable biomimetic approach promises a safer alternative to conventional antibiotics, providing a broad range of applications in marine fields, preventing bacteria resistance and minimizing negative impacts in marine environment.

Keywords: aquaculture, furanones, biomimicry, quorum sensing, antivirulence therapy