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### **Probiotic bacteria as disease control agents in marine fish larval rearing**

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#### **Abstract:**

Aquaculture has for decades been one of the fastest growing protein producing sectors and an important source of high quality protein for the growing world population. One of the constraints is bacterial diseases. Tremendous progress in disease control has been made using vaccination programs, however, antibiotics are being used against some agents and at some life stages, such as the larval stages where the immune system is not matured. Use of antibiotics is to be limited due to the alarming development and spread of antibiotic resistance in pathogenic bacteria and one alternative is the use of beneficial bacteria, so-called probiotics. Several species of marine bacteria belonging to the *Roseobacter* group produce antibacterial compounds that antagonize fish pathogenic bacteria. The primary compound, tropodithietic acid, acts as a so-called antiporter, and target bacteria do not develop resistance against the compound. The roseobacters are part of the normal microbiota of marine systems and here we describe how roseobacters can inhibit fish pathogenic vibrios in several live feed systems (algae, *Artemia*, rotifers, copepods) used in marine larvi-culture. Also, roseobacters can reduce mortality in cod and turbot larvae challenged with pathogenic *Vibrio*, and they are thus promising disease control alternatives to antibiotics in marine larviculture.

#### **Short Bios:**

Lone Gram received her MSc in 1985 and her PhD in 1989 from the Royal Veterinary and Agricultural University in Copenhagen. She has worked on fish technology projects in African and spent research visits at University of New South Wales and at Harvard Medical School. Her research the last 20 years has focused on bacterial interactions and the use of bacteria for beneficial biotechnological purposes. She has since 2000 been a professor in bacteriology, currently at the Technical University of Denmark. She received the Villum Annual Award in 2016 and has since January 2018 been leading a center of excellence on microbial secondary metabolites. Lone has published more than 220 scientific papers that are cited more than 10,000 times.