Commentary

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Injection of Ozone Nano bubbles into Water Reduces Bacterial Load

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Description

Injection of ozone nanobubbles into water reduces bacterial load, improves dissolved oxygen, and modulates the fish innate immune system. Little is known about the effect that nanobubble treatment has on the concentration of viruses in water. This study, investigated the disinfection impact of oxygen and ozone nanobubbles on an Aeromonas hydrophila-specific phage, pAh6.2TG, a virus lab model. After 5-, 10- and 15-min treatments with NB-O2, the concentration of phage remained the same, while the same treatment with NB-O3 eradicated 99.99% to 100% of the phage in the water. Since this phage has been shown to control bacterial infections in fish, we further investigated whether NB-O2 improved the adherence of the phage to the body surface of the fish and phage penetration into fish internal organs, specifically the liver. Nile tilapia, Oreochromis niloticus were used as experimental fish in this study. The results indicated that the number of phages adhered to the skin mucus and gills in NB-O2 treatment group was 1.07 to 15.0 times higher than in the untreated control group without gas nanobubbles.

Integrated Multitrophic Aquaculture Is Widely Used To Reduce the Environmental Pressure

The phage uptake into fish liver after NB-O2 treatment increased 1.29 to 4.75 fold compared to untreated control. These findings suggested a plausible application of NB-O2 treatment for improving efficacy of phage therapy in aquaculture. On the other hand, NB-O3 application may be useful for disinfection of harmful viruses in culture water, but the application would need to be omitted during phage treatment. This study provides preliminary information on potential applications of nanobubble technology in aquaculture to reduce viral load in the water. Aquaculture is an important protein source in many countries, including China. Integrated Multitrophic Aquaculture is widely used to reduce the environmental pressure of aquaculture and to increase profits. However, effects of IMTA on host immune and metabolic responses, the dynamics of bacterial communities, and Antibiotic Resistance Genes (ARGs) are relatively understudied. In this study, the IMTA mariculture systems with different combinations of the hybrid grouper, the whiteleg shrimp Litopenaeus vannamei, and the alga Gracilaria bailinae were constructed to evaluate the effects of different culture systems on the aquatic environment and cultured species during the initial stage of aquaculture. Results showed that G. bailinae could effectively remove inorganic nutrients accumulated in water, which in turn significantly promoted growth and enhanced non-specific immunity and glycolipid metabolism in the hybrid grouper. Although ARGs were present throughout the culture process, the relative abundance of ARGs in three of the four culture systems decreased with culture time. This was especially the case in the monoculture and the fish-algal IMTA systems, indicating that these aquaculture systems had a scavenging effect on ARGs in the environment. Correlation and network analyses indicated that ARGs were not significantly correlated with environmental factors but were closely related to bacterial communities. Approximately 25 bacterial groups of Bacteroidetes and Proteobacteria were significantly correlated with ARGs, including aminoglycoside, beta-lactamase, chloramphenicol, and multidrug resistance genes. Moreover, tnpA-07, a transposase gene, indirectly affected ARGs through its interaction with Acteroidetes and Proteobacteria. This study provides insights into further optimizing culture methods and controlling the spread and ecological risk of ARGs in IMTA systems. China is one of the largest producers and consumers of antibiotics, and China is a larger producer of livestock farming and aquaculture in the world. The livestock farming and aquaculture industry is a major area of antibiotic misuse, which has caused serious antibiotic residues and environment pollution. The antibiotic residues exceeding the standard may lead to antibiotic resistances in animals or human bodies, which poses a threat to human health. In this context, this study tries to systematically review the current situation of antibiotic misuse in livestock and aquaculture in China, and put forward corresponding regulatiory measures for the central government. Based on the status quo of livestock farming and aquaculture in China, this study reviewed antibiotic misuse in livestock farming and aquaculture and antibiotic resistance in China, introduced China's current policies on antibiotic regulation and the gap between China and developed countries, and analyzed the implications of current regulatory policies on animal health and productivity. At last, we put forward suggestions for the future antibiotic regulation, including strictly implementing the relevant laws and regulations, formulating specific supporting measures, encouraging the research and development of antibiotic substitutes, introducing advanced technologies for

supervision and regulation, strengthening the publicity of science popularization and enhancing the public's awareness of the rational use of antibiotics.

The Antibiotic Residues Exceeding the Standard May Lead To Antibiotic Resistances

If these policy recommendations can be implemented, they will significantly promote the regulation of antibiotic abuse. While highly successful in terms of profitable seafood production, salmon Salmo salar aquaculture may also be a source of potential negative environmental externalities. In an attempt to address these challenges through supporting the development of new technology, the Norwegian government has introduced a new class of aquaculture licenses labeled as development licenses. As a result, new technological solutions were proposed to reduce negative externalities through expansion to open ocean areas not yet used for aquaculture and reduced emissions from inshore production systems. This paper presents an analysis of the technological concepts proposed in applications for development licenses. The applications for development licenses provide a unique perspective on what technological directions existing marine aquaculture companies envisage that marine aquaculture may take in the future. The analysis indicates that units will become larger and stronger, as well as being specially designed to suit a variety of environments, creating a more heterogeneous industry. Large offshore structures such as semi-submersible platforms and other strong, rigid structures with permeable enclosures have been particularly successful in this application process, receiving relatively many development licenses. In sheltered fjord areas, many concepts involving closed enclosures have been suggested and awarded licenses. In this paper, we critically analyze how sustainability is considered in aquaculture policies and strategies using the Nordic countries as a case. The strong versus weak sustainability concepts are used to define and clarify what sustainability aspects are central to each state. To illustrate these concepts further, we draw on and modify four mainstream environmental discourses defined by John Dryzek and apply them to the strong and weak sustainability dichotomy to help categorize how environmental sustainability is portrayed in Nordic aquaculture policies and strategies. Subsequently we apply the characteristics of the concepts to aquaculture and sustainability in the Nordic countries. This allows us to identify each state's depiction of sustainable aquaculture, compare these to one another and assess where the Nordic states position themselves regarding sustainability and aquaculture. Our findings show that the policies emphasize technological advancements, intensification, and economic growth, which correlates with weak sustainability. Environmental sustainability receives a significant role in the documents too but does not seem to trump increased intensification or profitability. All policies are heavily focused on fed aquaculture and in order to reduce negative impacts from aquaculture there is a need to incorporate key elements of strong sustainability in policies, including measures to reduce impacts from pollution and the spread of pathogens, use of high-grade food resources and energy consumption. This to transform the industry to sustainability rather than just making it less unsustainable.