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Editorial

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Bacteriophage Therapy as a Future Preventive and Curative Approach Against Bacterial Infections in Aquaculture

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One of the major causes of economic losses in aquaculture worldwide is bacterial infectious diseases. Antibiotics have been commonly used for prophylaxis and treatment of such diseases because many of them are cost effective, readily available and able to kill a wide variety of bacterial pathogens. However, antibiotics have some adverse effects such as:

1. They are notorious for producing side effects that are proven to be more difficult to manage than the ailments they are meant to cure.
2. They destroy friendly bacteria along with disease causing bacteria.
3. Abuses of antibiotics can lead to their ineffectiveness and development of antibiotic resistant bacteria. Tetracycline is a classic example of how antibiotics become ineffective in killing some bacteria when they are abused.

Recently, the use of antibiotics to control diseases in aquaculture has raised a major concern on their safety to environment, farmers and consumers. In many countries, several antibiotics have been prohibited to be used in aquaculture. Many of them tend to be banned in the near future. Therefore, finding safer strategies to control diseases in aquaculture has become an issue of interest worldwide. Among them, bacteriophage therapy is one of the promising strategies.

Bacteriophage therapy is the therapeutic and prophylactic use of lytic bacteriophages to treat pathogenic bacterial infections. An important benefit of bacteriophage therapy is derived from the observation that bacteriophages are much more specific than most antibiotics that are in clinical use. Theoretically, bacteriophage therapy is harmless to the eukaryotic host undergoing therapy, and it should not affect the beneficial normal flora of the host. Bacteriophage therapy also has few, if any, side effects, as opposed to drugs, and does not stress the liver. Since bacteriophages are self-replicating in their target bacterial cell, a single, small dose is theoretically efficacious. On the other hand, this specificity may also be disadvantageous because a specific bacteriophage will only kill a bacterium if it is a match to the specific subspecies. Thus, bacteriophage mixtures (bacteriophage cocktails) may be applied to improve the chances of success, or clinical samples can be taken and an appropriate bacteriophage identified and grown [1]. Bacteriophages are currently being used therapeutically to treat bacterial infections that do not respond to conventional antibiotics. Moreover, they are reported to be especially successful where bacteria have constructed a biofilm composed of a polysaccharide matrix that antibiotics cannot penetrate.

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Currently, many bacteriophages have been reported to be virulent to fish pathogenic bacteria including *Lactococcuc garvieae* [2], *Pseudomonas plecoglossicida* [3] and *Streptococcus agalactiae* [4]. Furthermore, several bacteriophage cocktails have been proposed to be able to control bacterial infections in fish, for example, a bacteriophage cocktail containing φSt2 and φGrn1. This bacteriophage cocktail was demonstrated to inactivate *Vibrio alginolyticus*, a fish pathogenic bacterium [5]. The above mentioned evidences emphasize that a large number of bacteriophages that can control bacterial infections in aquaculture have already been discovered and this number tends to increase in the future. These suggested that bacteriophage therapy will play a major role in prevention and treatment of bacterial infections in aquaculture in the future.

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