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Editorial

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Nanoengineering the Phage for Pathogen Detection

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Editorial

Waterborne bacterial infections are a big public health problem around the world, claiming many lives and placing a tremendous financial strain on governments. To prevent the spread of bacterial pathogens and disease outbreaks, rapid and precise pathogen identification, as well as adequate water quality monitoring, is critical. Bacteriophages, or phage's, are the most common and widespread biological organisms on our planet. These bacterial viruses can be found in any corner of the biosphere and have a high degree of specificity when it comes to their host bacteria. Phage's may be used as bio-probes to not only detect a pathogen of interest but also to distinguish between viable and non-viable bacteria and to detect their host in situations where conventional lab cultures fail this can be done by nanoengineering their physical structure these can use to detect the pathogens in the water and another microorganism which is harmful to the water body and when consumed can affect human body too. Phage are promising candidates for pathogen detection applications due to their stability in harsh environments and relative ease of mass processing. However phage based biosensors has taken a long time to make it to the market. We address the current status of phage based biosensors or bioassays for the detection of waterborne bacterial pathogens, as well as important design parameters for bacteriophage based detection platforms, in this thorough analysis. We also go over the advantages and disadvantages of using phage based detection methods in water and wastewater samples, as well as the potential prospects for bacteriophages as an important tool in environmental nanoengineering. Phage's bind to the host cell and inject genetic material into bacteria. What happens after that decides whether bacteriophages are lysogenic or lytic. The lytic cycle involves disrupting a host's cell to release progeny phage's from infected bacteria. Amurins which are proteins that inhibit peptidoglycan synthesis allows for lysis. The viral genome integrates into the chromosome of bacteria during the lysogenic period and remains latent replicating for generations. A prophage is a bacterium that has viral genetic material integrated into its chromosomal DNA. The appearance of stressors, such as chemicals, UV radiation, or DNA damage to the host may cause the cycle to switch from lysogenic to lytic. Only a few filamentous phage's have been found to produce progeny virions indefinitely without killing the host. Bacteriophages are non-toxic to eukaryotes because the virion's structural elements cannot bind to eukaryotic cells. Phage contamination of bacteria-based biotechnological systems on the other hand, makes them rivals. Due to delays in processing and manufacturing, poor product quality material contamination, and ultimately complete production loss phage outbreaks may result in significant economic losses. Physical or Chemical agents are used to deactivate bacteriophages but more flexible effective and user friendly methods are required. Nanotechnology holds out the prospect of providing a solution. The gold nanoparticles tested were successful against the phages T1, T4, and T7. The observed decrease in titers ranged from 2 logs after 5 hours at 50 degrees Celsius to 5 logs after 24 hours. For successful phage deactivation a combination of negatively charged and hydrophobic capping ligands was necessary.

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