Pseudomonas aeruginosa phages to disinfect plumbing materials and surfaces in contact with drinking and thermal water : feasibility study

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Résumé

Pseudomonas aeruginosa is an opportunistic organism, especially problematic in hospital where it is responsible for almost 10 % of nosocomial infections behind *Escherichia coli* and Staphylococcus aureus. The water environment is considered as a key issue in *P. aeruginosa* colonisation of patients. Thus, many studies have attributed a major role to water network contamination in the incidence of patients' colonisation with P. aeruginosa especially in ICUs. In hospital water networks contaminations are often located in biofilm at terminal point-of-uses. Numerous infection control practitioners advocate regular cleaning, descaling and disinfecting of tap-water, sinks and U-bends to decrease cross-transmission via hospital water supplies. Thus, regular cleaning and disinfection of sinks and faucets using chlorination or thermal shock at 70∘C for 30 min are used but these treatments may damage materials and numerous reports note the difficulty of reducing colonisation in tap water.
The aim of our study is to test the potential efficiency of phages as biocontrol agent against *Pseudomonas aeruginosa* in materials in contact with water, or removable outlets used in hospital but also in thermal institute. Our first approach is based on the application of several bacteriophages suspensions on planctonic and sessile cultures of Pseudomonas aeruginosa. We also developed a model of biofilm on different materials to test efficiency of bacteriophages on monospecies biofilm. First results highlight the specificity of some phages towards environmental strains of P. aeruginosa studied. Bacterial susceptibility depends on physiological cells state (included planktonic or sessile) but also on the concentration of phages used. While phages can specifically and rapidly reduce the populations of P. aeruginosa, resistance or adaptation can be observed in bacterial populations These phenomenons must be taken into account and further investigations are needed to optimize phages infection and to formulate bacteriophages combination to improve their efficiency.

In parallel, insights are needed with regard to the legal status of bacteriophages to develop disinfection applications. Even if bacteriophages can be used as an alternative to antibioresistance in human medicine or as a prophylaxis in farms with a specific status of drugs, the use of bacteriophages as disinfection treatment of surfaces and plumbing materials in contact

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with water may be approved by the biocides regulation.

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