Use of bacteriophages and their lysins as alternative treatments against multidrug resistant Acinetobacter baumannii strains

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Background

- Acinetobacter baumannii is a gram-negative bacterium member of the normal microbiota in humans, which in some situations is able to produce opportunistic infections (1).
- This bacteria is one of the most problematic nosocomial pathogens in hospitals worldwide due to its high rate of acquisition of resistance to antibiotics (2).
- Currently, there has been a set of lines of research to find new treatments in order to provide an alternative to conventional treatments with antibiotics.

Phage therapy

Use of phage therapy to treat bacterial infections is based on the administration of bacteriophages to the patient in order to eliminate the pathogen that causes the disease (3, 4).

Lysins

Phage lysins are enzymes capable of lysing the cell from within during the late phase of the viral lytic cycle, allowing the release of virions (5).

Limitations

- Immunogenicity of lysins
- Toxicity associated to bacterial lysis
- Exogenously effective application only in gram-positive

Limitations

- Combination of antibiotics and lysins
- Synergistic use of two lysins
- Phage lysis engineering: chimaeric lysins and artilyses

_strategies_to_solve_

- N-terminal
- C-terminal
- CD
- CBD

Examples of treatments against multidrug resistant A. baumannii strains

**Phage therapy with bacteriophages Acibel004 and Acibel007**

- Phage isolation, purification and propagation
- Establishing the A. baumannii phage collection strains
- Host range study of phages
- Frequency of occurrence of phage-resistant bacterial cells
- Phage isolation, purification and propagation

**Phage activity**

- Both phages were able to propagate in approximately half of the tested A. baumannii strains but 2 strains showed complete resistance to both phages.
- The newly isolated phages can serve as potential candidates for phage cocktails.

**Results of the study**

Concluding remarks

- Bacteriophage and lysins are treatments with therapeutic potential against multidrug resistant bacteria.
- Studies have shown different strategies to overcome disadvantages of both methods, a consideration to keep in mind as well as an incentive to apply these treatments.
- Nevertheless, alternative treatments have not been accepted to use in humans, mainly because of lack of a specific regulatory framework and the requirement of in vivo assays.
- Studies in phage therapy against A. baumannii has been focused primarily on in vitro assays, whereas phage lysins have been tested in animal model assays with successful results.
- Future research should be concentrated on clinical trials in animal models and humans in order to show the efficacy and safety of these treatments.

Bibliography