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Synthetic bacteriophage programmed as an alternative to chemical antimicrobials against multidrug-resistant bacteria

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Abstract

The crisis of chemical antimicrobials resistance has emerged as a major threat to public health that requires novel control strategies. The decline in the effectiveness of chemical antimicrobials has generated renewed interest in the development of lytic bacteriophage as control agents of pathogenic bacteria [1]. However, translational development of natural phage has been hindered mainly by the difficulty of accessing bacterial hosts within biofilms, the rapid emergence of resistant bacteria to a single phage, and above all, by the narrow host specificity of phage compared to chemical antibiotics. Moreover, phages exhibit some other limitations that require the design of strategies to avoid or eliminate these less favourable features. Synthetic biology is driving significant advances in this area, having been successfully utilized to enhance the therapeutic potential of bacteriophages, modulating phage host range [2], reducing phage toxicity and immunogenicity [3], enhancing phage survival after administration [4], improving phage activity against biofilms [5], and enhancing bacterial killing when combined with antibiotics [6]. One of the most amazing and important application of synthetic biology is the development of novel and efficient bacteriophages for the treatment of a large number of lifethreatening infectious diseases. This investigation could have an impact in the near future on human, animal health, crop protection and wellbeing through providing an alternative to chemical antimicrobials for treating bacterial infections. Learning objectives. The overall goal of this scientific research proposal is to "isolate natural phages with broad host ranges and then, using advanced synthetic biology tools to create bacteriophage with desirable attributes, such as greater depth of kill, ability to overcome phage resistance, depolymerase activity against biofilms, lack of other characteristics such as carrying virulence genes and the ability to form lysogen".

Key words: synthetic biology, antibacterial agents, chemical antibiotics

Biography

Luis Lightbourn has a bachelor´s degree in Chemestryand PhD in Molecular Biology graduated Summa Cum Laude. Dr Lightbourn's research interests are primarily in the areas of nanotechnology, chemincal and biological sciences with emphasis on the health and crop production. Moreover, his research aims at understanding nanoscale phenomena and he is interested in investigating natural nanomaterials, manufactured nanomaterials and their interactions, behaviours and risks. Dr Lightbourn's research is also engaged with "environmentally-friendly" applications of nanotechnology viral as an alternative to chemical antimicrobials against multidrug-resistant bacteria. He has published widely in the field, with more than 20 publications, and has edited 3 books.