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Modeling phage-bacteria interactions and phage therapy as an alternative to bacterial multidrug resistance

Berge Tsanou

Deaprtment of Mathematics and Computer Science, Faculty of Sciences,
University of Dschang, Cameroon
bergetsanou@gmail.com

The World Health Organization has sounded the alarm on increasing appearance of bacterial resistance and multi-resistance to existing antibiotics which causes millions of human deaths per year. Faced with this therapeutic impasse, there is a renewed interest in the use of phages (or bacteriophages), which are harmless to humans, but bacteria-eating viruses, as a reliable alternative to combat this scourge, especially since the use of phages for therapeutic purposes or phage therapy is an ancient practice that dates back more than a century and has been successful and continues to be practiced in Eastern Europe.

During this plenary presentation, I will give a brief history of phage therapy since 1917, and emphasize a review of the literature on mathematical models of bacterium-phage interactions and phage therapy described by differential equations. I will conclude this with a detailed presentation of age-since-infection structured model, taking into account spontaneous prophage induction in the presence of lytic and temperate phages.