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Keynote Lecture
Phage therapy: myth or reality?
L. Debarbieux* (Paris, FR)

Phage Therapy was proposed as a therapeutic treatment against bacterial infections almost a century ago by Felix d'Herelle, about 10 years before the discovery of penicillin. Despite a rapid world diffusion of this therapy, the lack of scientific knowledge on bacteriophages/bacteria relationships and the discovery of antibiotics precipitated its abandon except, mainly, in East European countries. While antibiotics became a routine therapy in the second half of the last century, the scientific knowledge on bacteriophages led to the birth of molecular biology. Today the increasingly public health problems caused by antibiotic-resistant bacteria are a major driving force in the renewed interest in phage therapy. Together with the re-discovery that bacteriophages were used to treat bacterial infections in humans for years in some East European countries, recent works performed with animal models highlight the potential of the use of bacteriophages in medicine. In the past few years, we have shown using mice that bacteriophages can be used to treat acute lung infections caused by Pseudomonas aeruginosa. This work, performed on two different P. aeruginosa strains with two different bacteriophages, was later extended to the demonstration that bacteriophages could also be used to prevent and protect mice from lethal lung infection up to 4 days. These investigations led us to the identification of two new groups of bacteriophages. More recently we investigated the relationships between bacteriophages and the intestinal flora. We first showed that bacteriophages were able to infect bacteria growing on biofilms formed in vitro and ex vivo. Second, using a mouse model colonized with an enteroaggregative O104:H4 Escherichia coli strain, we demonstrated that bacteriophages can replicate continuously over several weeks. Upon addition of an initial high dose of bacteriophages we could show that the ileal concentration of the E. coli strain was strongly reduced. However, this strain could not be totally cleared from the gut. In the light of these two examples, phage therapy is getting closer to reality and does not anymore resemble to a myth, even if numerous questions have still not yet found answers. Debarbieux et al., J Infect Dis. 2010 201(7):1096-1104. Morello et al., PLoS One. 2011 Feb 15;6(2):e16963. Maura et al., Environ. Microbiol. 2011 in press.