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Immunobiological Safety Profile and Therapeutic Effectiveness of Klebsiella pneumonia Bacteriophages Using Acute and Sub-Chronic Animal Toxicity Study

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Abstract

Recently, numerous pre-clinical and clinical studies have shown their significant phage therapy efficacy against many antibiotic resistant pathogens and proved to be one of the best alternatives to the antibiotics. Bacteriophages can also be used as biocontrol agents in agriculture and petroleum industries. However, only few researchers have focused to monitor the phage-mediated acute immune reactions during phage therapy. Besides, phage safety was evaluated by determining toxicity after acute and sub-chronic oral administration of low and high dose of bacteriophages in male and female rodents. Here, in this study, we had orally administered the bacteriophages against Klebsiella pneumonia XDR strain in low (1015 PFU) and high dose (1020 PFU) quantities to rats in acute (single dose) and chronic toxicity (daily dose for 28 days) model. No significant clinical sign was observed in all the experimental groups as well as in the control animals. Besides, no significant change in feed intake and body weight was observed throughout the study period. After 28 days of phage dosing, blood was collected for estimation of hematology, biochemistry, and cytokines assay. The data suggested no alterations in the haematological profile, clinical biochemical parameters, relative organ weights, and immune biomarkers. Also, the gross pathological examinations of all the major organs were found to be normal across the treatment groups. Cytokines i.e. interlukin-1 beta (IL-1□), IL-4, IL-6, and INF-gamma were observed within normal range for rat regardless of treatment. The results suggested no acute and sub-chronic toxicity in oral administration of low (105 PFU) and high dose (107PFU) of isolated bacteriophages. Thus, in conclusion these results support the long term oral bacteriophage therapy without having any strong acute immune response.

Keywords—Bacteriophages, XDR, Viral immune mechanism, Toxicity

Professional Biography (100-150 words)

Dr. Mayank Gangwar has expertise in virology, microbiology, pharmacology, invivo, invitro activities of screening the natural products. Animal activity of various medicinal plants using diabetic wound model and ulcerative colitis, anti-inflammatory activity, analgesic and hypnotic activity in rats. In addition with pharmacology, microbiological expertise with respect to antimicrobial screening of drugs had been widely studied. I have an expertise in microbiology laboratory at molecular level. Besides that, parasitological exposure is outstanding with recent high impact publication with respect to Hydatid disease and other diseases related to cestodal infection. Besides, virology exposure, management, protocol optimizations, standardizations of molecular methods, viral RNA isolation from clinical samples, c-DNA formation and advanced real time PCR for detection of all the epidemic viral outbreaks and diagnosis has been well standardized

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