Use of bacteriophages in the treatment of extensively drug-resistant *Pseudomonas aeruginosa* septicemia in a patient with acute kidney injury – a case report

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A 62-year-old man was hospitalized for severe abdominal sepsis with disseminated intravascular coagulation, secondary to a diaphragmatic hernia with bowel strangulation. The patient had a prolonged hospital course complicated by gangrene, resulting in the amputation of the lower limbs and two fingers and the development of large necrotic pressure sores on the back. Three months later, the patient was transferred to the burn wound center of the Queen Astrid military hospital for surgical management of the pressure sores. Wound cultures on admission revealed MRSA, MDR *P. aeruginosa*, *E. cloacae*, *Klebsiella pneumoniae* and *Candida albicans* colonisation. The patient developed septicemia with extensively drug-resistant (XDR), colistin-only-sensitive, *P. aeruginosa*.

Intravenous (IV) colistin and sulfamethoxazole/trimethoprim combination therapy was started. Ten days later, the patient developed acute kidney injury, probably caused by drug-induced acute interstitial nephritis. The patient was in a coma and antibiotic therapy was stopped. Unfortunately, XDR *P. aeruginosa* septicemia re-emerged with positive hemocultures for three consecutive days. Upon expert advice and informed consent from the patient's family, IV and topical bacteriophage therapy were initiated under the umbrella of Art. 37 of the Declaration of Helsinki. Fifty ml of purified bacteriophage cocktail BFC1 (Merabishvili *et al.* 2009), containing two active *P. aeruginosa* bacteriophages in sodium chloride 0,9% at a concentration of 10^7 plaque forming units (PFU) per ml were administered as a 6h IV infusion for 10 days. Wounds were washed with bicarbonate buffer and irrigated with 50 ml BFC1 every 8h for 10 days.

Immediately, blood cultures turned negative, CRP levels dropped and the fever disappeared. Kidney function recovered after a few days. Hemodialysis was avoided and no clinical abnormalities related to the application of bacteriophages were observed. This is, as far as we know, the first documented report of intravenous bacteriophage monotherapy against *P. aeruginosa* septicemia in humans.

Figure 1. Timeline showing relevant clinical parameters and treatments. Dotted lines mark the upper threshold values. CRP C-reactive protein.

Figure 2. Large pressure sores in the sacral and spinal back areas. Situation on 17 November 2016.