

Holy Water Associated Pulmonary Infection with a Multiresistant *Acinetobacter Baumannii* in an 11-Year-Old Child

Weihwasser-assoziierte pulmonale Infektion mit multiresistentem *Acinetobacter baumannii*

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Key words

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- multiresistant acinetobacter
- holy water
- transmission

Schlüsselwörter

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Bibliography

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Background

Acinetobacter species have become an important source of nosocomial infection as they have developed resistance to a wide range of antimicrobials ultimately causing closure of intensive care units due to *Acinetobacter* contamination [8]. This may dramatically affect both individual health and medical expenses. Infections by *Acinetobacter* species had for a long time been thought to be a significant problem particularly in adult intensive care units [4]. However, in recent years endemic infections with *Acinetobacter* species have been reported also in pediatric patients [1,5]. We report the transmission of a multiresistant *Acinetobacter baumannii* by the dissembling use of holy water.

Patient presentation

A formerly healthy and bright 11 year old boy from Russia with febrile infection-related epilepsy syndrome was admitted to our pediatric intensive care unit (PICU). For 3 months various anticonvulsive therapy regimens had been carried out without success to stop cerebral convulsions. Due to the nature of disease and therapy (e.g. thiopental sodium therapy for more than ten days) nasotracheal intubation and mechanical ventilation was required. A few days after his arrival in our PICU the boy developed severe bilateral pulmonary infection. Lung compliance was extremely reduced requiring intensified mechanical ventilatory support with peak inspiratory pressures up to 30Torr (40mbar, 3.9hPa). The chest x-ray showed bilateral extensive patchy infiltrates suggesting severe pneumonia (○ Fig. 1). Microbiological examination of the patient's tracheal secretion, catheter urine and skin smear from the orifice of his percutaneous gastrojejunal feeding tube yielded a multiresistant *Acinetobacter baumannii* exclusively sensitive to Poly-

myxins (Colistin, Polymyxin B). In blood and stool no pathogen was found.

Personal communication with colleagues from the referring hospital revealed the fact that the boy had previously been treated for severe pulmonary infection caused by multiresistant *Acinetobacter baumannii*. The pathogen had the same microbiological susceptibility as the one isolated in our PICU. And we learned that extended spectrum beta-lactamase (ESBL)-*Acinetobacter* is only infrequently found in Russian hospitals. Thus the source of infection remained unclear. Microbiological examinations obtained from the patient's parents and the patient's PICU room proved to be negative.

One day our medical staff observed the patient's mother sprinkling her son with water from a plastic bottle (○ Fig. 2).

We learned that this water was holy water and that the boy had been receiving this water on a regular base for several months in hospitals in Moscow by sprinkles on his skin, into his mouth, and by application via the feeding tube. All the time it had been the same holy water from exclusively this one bottle. Microbiological examination of this holy water showed the multiresistant *Acinetobacter baumannii* strain that had been isolated from the patient before.

The bottle of holy water contained a mixture of holy water obtained from 7 different churches in Moscow (collected by the parents) and water from the Jordan river.

Larger quantities of water from the 7 different churches and from the Jordan river were stored separately by the parents. Further microbiological investigations revealed the same multiresistant *Acinetobacter baumannii* in the water from the Jordan river but not in the water from the 7 churches.

The patient was treated with Colistin (Polymyxin E) intravenously and by inhalation. The intravenous application caused intermittent decline in lung compliance that returned to normal as soon

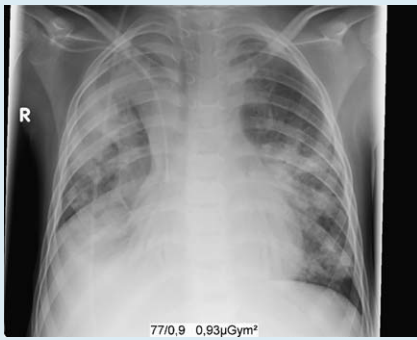


Fig. 1 Chest radiograph displaying severe pneumonia with extensive bilateral patchy infiltrates.



Fig. 2 The family's plastic bottle containing holy water. The boy had been repeatedly contaminated with this water for several months in hospital.

as the intravenous route was discontinued. The administration of holy water to the child was stopped. Subsequently, there was a restitutio ad integrum with respect to the pulmonary indisposition so that the lung compliance and with that the peak inspiratory pressures were normalized and oxygen concentration could be reduced to 21%.

Discussion

Acinetobacter species are nonfastidious, hydrophilic, aerobic, nonfermenting, immotile, gram-negative coccobacilli. They are ubiquitous in the environment and commonly found in soil and fresh water. They easily grow at 30° Celsius or higher and have a large repertoire of antimicrobial resistance mechanisms [8]. Multiresistant *Acinetobacter baumannii* is a dreaded microbe especially in intensive care units [4]. In adults the principle site of *Acinetobacter*-infection is the respiratory tract. In children, infections with *Acinetobacter* species usually manifest as bacteremia or meningitis [4]. Infections with *Acinetobacter* are usually hospital-acquired. Some strains are tolerant of soap which explains why they can be found on the hands of medical personnel. The bacterium is also present on the surface of equipment and furniture in hospitals, probably contaminated and transmitted via the hands of staff. Nevertheless, a significant number of community-acquired infections with *Acinetobacter baumannii* have been reported in tropical countries probably due to the predominant warm humid climate in these regions [4]. Reviewing the literature we found 2 case reports with holy water-associated infections: burned patients were sprinkled with holy water and subsequently developed severe wound infection and septicemia. In one case holy water was found to be the source of *Pseudomonas aeruginosa* infection [3]. In the other case report holy water contained *Acinetobacter baumannii*. The latter patient – like ours – also required mechanical ventilation. He did not only suffer from wound infection but also from severe pneumonia with *Acinetobacter baumannii* [12].

Holy water appears to be a substantial reservoir for pathogenic bacteria. Various pathogens were found in holy water from temples in Southern Thailand [11]. Holy water fountains in Spain also turned out to contain pathogenic bacteria [7]. Holy water from churches in Ireland was found to be a reservoir for coliforms, staphylococcus, yeasts, and molds [10].

One reason for the contamination of holy water might be human skin transmission and misuse of the water [7]. Moreover, aquatic environments serve as an important reservoir for mesophilic and nonfastidious bacteria in general: multiresistant *Pseudomonas* was reported to be isolated from water reservoirs and cooling systems in Spain [2]. Being faced with various substances like faecal and industrial contamination pathogens can easily develop multidrug resistance.

According to our microbiological results the source of the multiresistant *Acinetobacter baumannii* was probably the water of the Jordan river. This might well be possible as the Jordan river is a warm surface water which serves as an ideal nutrient for bacteria like *Acinetobacter*. Moreover, the plastic bottle in which the holy water was stored served as ideal reservoir [6].

Conclusion

Contamination of holy water with *Acinetobacter baumannii* may cause severe pulmonary (and non-pulmonary) infections difficult to treat even when using intravenous Colistin that by itself may induce pulmonary fibrosis and renal failure [9]. Even though not frequently reported holy water can be a microbiological reservoir for multiresistant bacteria. We should take into account cultural and religious habits when searching for a possible source of infection. Hygiene guidelines should clearly prohibit any use of holy water and other uncontrolled water sources in hospitals and other healthcare institutions.

Conflict of interest: The authors have no conflict of interest to disclose.

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