

Preventing Neonatal Legionellosis-The Environmental Surveillance Approach

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Neonatal and Pediatric Legionellosis

Legionellosis is thought to be a very uncommon cause of pneumonia in children and even more in neonates [1]. Despite this, they have been documented cases of legionnaire's disease in pediatric patients. The majority of them were hospital-acquired and the source of infection in most cases was hospital's tap water [1,2]. In children legionellosis, the most common symptoms are fever and cough and the most common findings are tachypnoea, hypoxia and abnormal lung examination [1]. Especially neonates, due to their underdeveloped immune defenses, as well as the intensive medical treatments they may receive, represent another population that could be at particularly high risk for *Legionella* infection [1].

The Environmental Approach-The Strategy in Greece

Routine monitoring of hospitals tap water and especially neonatal, obstetric and pediatric units remains a controversial matter. CDC recommendations are focused on environmental monitoring, only after recognized cases of Legionnaires disease, or in transplant units [3]. In Greece there is no specific legislation for *Legionella* spp. But the Hellenic Ministry of Health has instituted guidelines for the prevention and control of Legionnaires' disease, based on European Working Group for Legionella Infections (EWGLI) recommendations [4]. Based on these hospitals and health care facilities, proceed in routine water samplings at least twice a year as it was described before [5-8].

Review of the Literature

A review of the medical literature by Greenberg et al. identified 76 cases of *Legionella* infection in children, 78% of whom had an underlying condition such as malignancy [1]. Shachor-Meyouhas et al., report that 7/13 (54%) of neonatal who contracted legionellosis survived [9].

Only a few sporadic and one outbreak of hospital-acquired neonatal legionellosis have been reported in literature. The majority of them were linked to contaminated water. Levy and Rubin, had previous reviewed 9 cases of hospital-acquired neonatal legionellosis [2]. Six of the infants had a fatal outcome (55% mortality). An environmental link was found at 5 cases, in 4 cases with the hospital water system and in 1 case with a humidifier and an incubator.

Greenberg et al., had review another 3 cases of hospital-acquired neonatal legionellosis with an environmental link to the hospital [1]. Another 2 cases of neonatal *Legionella* infection are associated with contaminated hospital water in Taiwan. In this report, *Legionella* isolates from neonates and from water dispensers were found indistinguishable [10]. A large outbreak has been reported in a

neonatal unit of a private hospital in Cyprus, linked to hospital tap water. Eleven cases were reported and three deaths [11]. Shachor-Meyouhas et al describe an 11-day-old neonate who contracted Legionnaires' disease, as it was rinsed in a hospitals' sink [9].

The Antibiotic Approach-In vivo and In vitro

Macrolides, rifampicin and flouroquinolones are the treatment of choice for legionellosis. The selection of these categories is mainly based on clinical experience [12]. The antibiotic erythromycin is the historically drug of choice for the treatment of legionellosis [13]. However, the latest years the use of fluoroquinolones is increasing because they seem to be superior in inhibiting intracellular growth of *Legionella* spp. both *in vitro* and in animal models [14,15]. It was found that strain resistance in fluoroquinolones with *in vitro* selection can be acquired with an 8-fold increase in MIC after three passages [16]. Susceptibility testing, as a routine procedure for *Legionella* strains clinical or environmental, is not commonly used. As there is no specific regulation on susceptibility testing and *Legionella* spp. has particular nutritional requirements, various methods have been used to determine MIC values: E-test, broth dilution, agar dilution, *in vivo* animals' models and *in vitro* cell cultures [14-18].

Based on findings, most clinical *Legionella* isolates are not resistant to these antibiotics, despite the fact that many studies showed in patients' failure of treatment [17,19,20]. Despite this, as legionellosis is acquired from water samples, susceptibility testing of environmental isolates could recognize if an antibiotic-resistant strain has colonized the water distribution system and thus increase the risk of infection [21-23]. The presence of environmental *Legionella pneumophila* strains that are less susceptible in antibiotics could probably increase the risk of a failed antibiotic treatment in patients with legionellosis, especially those who are in high risk groups such as neonates and infants [24].

Conclusion

Legionnaires' disease is thought to be rare in children, a fact that leads to a delay in diagnosis and to the appropriate antimicrobial therapy. As it happens in most cases of legionellosis in adults, in neonates the incidence can also be underestimated. The main reason for this is the difficulty in isolation of *Legionella* bacteria from clinical samples. In addition, in children clinical symptoms of legionellosis can vary a lot [2]. As this infection can only be transmitted through environmental sources, the main preventing strategy includes proactive environmental surveillance. In addition, this can be combined with antibiotic susceptibility surveillance in high risk areas, such as neonatal and obstetric sink taps in order to prevent the mainly lethal neonatal legionellosis.

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