

Outbreak of *Sphingomonas paucimobilis* Septicemia in a Neonatal Intensive Care Unit

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We describe an outbreak of *Sphingomonas paucimobilis* in 13 newborn infants with septicemia and septic shock. Fifteen available isolates were obtained from patients and distilled water. Pulsed-field gel electrophoresis showed that there was a cross-transmission of *S. paucimobilis* in eleven patients but these types were not the same the isolate obtained from the distilled water. The outbreak was terminated by taking appropriate control measures for infection and change of source of distilled water.

Key words: Neonate, Outbreak, Sepsis, *Sphingomonas paucimobilis*, Turkey.

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S *phingomonas paucimobilis* is an aerobic, weakly oxidase-positive, catalase-positive, motile, glucose non-fermenting and gram-negative rod. This microorganism has been isolated from the hospital water systems, mechanical ventilators, soil, and different clinical specimens [1]. *S. paucimobilis* can cause nosocomial and community-acquired infections [1,2]. Although nosocomial outbreaks of *S. paucimobilis* bacteremia have been reported in pediatric wards [3], it has rarely been reported in neonatal intensive care unit (NICU) [4]. We report an outbreak of septicemia caused by *S. paucimobilis* in 13 neonates in a NICU.

METHODS

Medical charts of all the newborns having a blood culture positive for *S. paucimobilis* were reviewed for the following factors: birthweight; gestational age; delivery type; gender; postnatal age at time of admission to the NICU; sepsis related death; exposure to antimicrobial agents; receiving total parental nutrition (TPN); histamine 2-blockers and

steroids; staying in incubator; invasive and procedures such as mechanical ventilation, central catheterization and operation. Newborns with *S. paucimobilis* infection were included if they had spent at least 48 hours in NICU before their positive cultures and fulfilled the criteria for having sepsis and septic shock [5].

Cultures were obtained from the hands of healthcare workers and environment of NICU to identify the source. All the isolates were analyzed by pulsed-field gel electrophoresis (PFGE) using XbaI endonuclease. PFGE patterns were compared according to the criteria established by Tenover, *et al.* [6].

To determine the potential risk factors for *S. paucimobilis* septicemia, a matched case-control study was performed by comparing each case of *S. paucimobilis* to two uninfected controls and one case of extended-spectrum beta-lactamase-producing *Klebsiella pneumoniae* blood stream infection. Controls were infants who (a) were hospitalized in the NICU during the same period and their cultures

negative for epidemic strain, (b) had been in the NICU for at least 48 hours during the outbreak, and (c) had a primary diagnosis that was similar of the infants with *S. paucimobilis* infections. We compared *S. paucimobilis* infections with *K. pneumoniae* infection, because *K. pneumoniae* is the most common GNR causative agent for nosocomial sepsis in our unit.

RESULTS

Fifteen isolates of *S. paucimobilis* were identified between October 7, 2008 and November 15, 2008. Two of them (13.3%) were isolated from the distilled water, and 13 (86.7%) from the blood sample of the newborn babies. Twelve neonates had sepsis and one premature newborn had septic shock.

Patients with *S. paucimobilis* infections had a longer stay in incubator ($P=0.0001$), were receiving TPN ($P=0.002$), received mechanical ventilation ($P=0.006$), and had more number of days with indwelling central line ($P=0.035$) than controls.

Patients with *S. paucimobilis* infection had longer stay in incubator than patients with *K. pneumoniae* infection ($P<0.036$).

We detected three major PFGE patterns (A-C) out of the 15 isolates tested. Nine of the thirteen patients' isolates (pattern A) were indistinguishable by PFGE while the two differed by two bands (pattern A1). One other patient's isolates were considered epidemiologically unrelated to the outbreak (pattern B). Two patterns (pattern C) were shared by the isolates from distilled water. One patient's blood isolate had identical antibiotype as outbreak isolates was not available for PFGE testing. Molecular typing proved that there was a cross-transmission of *S. paucimobilis* in eleven patients, but these types were not the same the isolates from the distilled water. Healthcare worker hand cultures were negative for this organism. *S. paucimobilis* strains of the one dead patient were type A in PFGE pattern. She died due to septic shock. No further cases were found during a 20-month period.

TABLE I CHARACTERISTICS AND POTENTIAL RISK FACTORS IN CULTURE POSITIVE AND UNINFECTED CONTROLS

Characteristic	Culture positive for		Controls (n=26)
	<i>S. paucimobilis</i> (n=13)	<i>K. pneumoniae</i> (n=13)	
Birthweight (g)	2172±1003	2303±1112	2302±658
Gestational age (wks)	33.7±4.9	34.6±4.4	34.1±2.5
Preterm labor, n (%)	7 (54)	7 (54)	21 (81)
Males, n	8	9	17
Vaginal delivery, n (%)	5 (38)	6 (46)	9 (35)
Prolonged rupture of membranes, n (%)	3 (23)	2 (15)	1 (4)
Day of life positive culture	32.8±30.4	25.2±17.7	-
Duration of receiving antibiotics* (d)	9.9±8.7	8.9±5.6	-
Central venous catheter, n (%)	5 (38)	8 (62) ^a	3 (12) ^b
Duration of stay in incubator (d)	32.8±30.4 ^c	11.8±11.5 ^d	5.8±10.5 ^e
Exposure to postnatal steroids	3 (23)	3 (23)	2 (8)
Duration of indwelling central line* (d)	5.5±8.7 ^f	6.2±6.1 ^g	0.8±2.2 ^h
Duration of mechanical ventilation (d)	15.6±23.9 ^y	6.5±10.4 ⁱ	0.5±1.7 ^j
Surgery, n (%)	2 (15)	1 (8)	1 (4)
Duration of TPN (d)	18.8±26.4 ^k	14.8±11.2 ^l	2.4±5.7 ^m
Treatment with H ₂ -blockers, n (%)	6 (46)	10 (77) ⁿ	5 (19) ^o
Death, n (%)	1 (8)	4 (31) ^ö	0 (0) ^p

* Prior to onset of infection; $P<0.05$: c-d, y-j, i-j; $P<0.005$: a-b, f-h, g-h, k-m, l-m, ö-p; $P<0.001$: c-e, n-o.

WHAT THIS STUDY ADDS?

- *S. paucimobilis* can cause sepsis and septic shock in newborns, and outbreaks in NICU.

DISCUSSION

We report an outbreak caused by *S. paucimobilis* during a 6-week period in a neonatal intensive care unit. Various infections caused by *S. paucimobilis* include bacteremia, septic shock, osteomyelitis, septic arthritis, endophthalmitis, myositis, peritonitis, intravascular catheter-related bacteremia, biliary tract infection, wound infection, urinary tract infection, ventilator-associated pneumonia, pyoderma, neutropenic fever and gastrointestinal infection have been reported previously [2,3,7-12]. In this study, we observed nosocomial sepsis in twelve patients and septic shock in one patient. All neonates with positive blood culture for *S. paucimobilis* infections had clinical sepsis. Thus, growing of these micro-organisms in the blood cultures were not accepted as contaminant.

Distilled water is used for the humidifying of incubators and mechanical ventilators. It can be hypothesized that this bacterium from distilled water may be a major source for *S. paucimobilis* outbreaks. But *S. paucimobilis* types obtained from distilled water were different from the types obtained from patients. Major limitation of this study is source of the outbreak is not certain. The outbreak was terminated within 3 months by intensified infection-control measures.

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