**Chryseobacterium meningosepticum Neonatal Infection: a case report**

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**INTRODUCTION**

Bacterial meningitis is one of the most important causes of morbidity and mortality in neonates. The most common organisms causing neonatal meningitis were *Streptococcus agalactiae*, *Escherichia coli* K1, and other gram-negative bacilli including *Klebsiella*, *Enterobacter*, *Citrobacter* and *Serratia* species. Empirical antibiotics therapies for neonatal meningitis were ampicillin and an aminoglycoside. Alternatively, a third-generation cephalosporin can also be used for high risk newborns. Newborns are especially vulnerable to infection. Their cellular and humoral immunities are immature.¹ Early diagnosis of neonatal meningitis is a challenge for pediatricians. Young infants may not display features of the disease. Possible clinical findings of meningitis may include lethargy, high fever, neck stiffness, bulging fontanel, seizures, or hypothermia. Therefore, CSF analysis through lumbar puncture is the only way to confirm the diagnosis. Ideally, primary clinical assessment should provide clues of the disease and to determine if LP is required.² Even with treatment of bacterial meningitis associated with septic shock, outcome may be unfavorable. Developing cerebral vessels appear to be fragile to pathological conditions, and may contribute to later neurological diseases. Long-term neurological sequelae, including deafness, blindness, cerebral palsy, seizures, hydrocephalus or cognitive impairment, occurred in approximately 25 to

**Abstract**

*Chryseobacteria* has been described as an etiological agent of meningitis, sepsis, bacteremia, and pneumonia. This organism is highly pathogenic in immunocompromised individuals and neonates. Its multi-drug resistant nature caused optimal drug selections for the patient very difficult.

We report here a male neonate with bacteremia and meningitis caused by *Chryseobacterium meningosepticum*. The organism was multi-drug resistant. When the baby came to our hospital, he presented with fever, poor activity, slightly bulging of anterior fontanel, and leukocytosis in the cerebral spinal fluid (CSF). *Chryseobacterium meningosepticum* was isolated from both CSF and blood samples. In addition, Cosackie B6 virus was isolated from the nasopharyngeal swab as well. The patient was successfully treated with three-combined antibiotics, including ciprofloxacin, vancomycin, and flomoxef. There was no neurological sequela at the 1-year follow-up. This case give us an important information that *Chryseobacterium meningosepticum* infection should be taken into consideration when a newborn infant has symptoms of meningitis, and appropriate antibiotics treatment is important for optimizing patient’s outcome. (J Pediatr Resp Dis 2014;10:59-62)

**Key words: neonatal infection, chryseobacterium meningosepticum, meningitis, sepsis**
50% of survivors. Disease-related fatality rate ranges from 8 to 30% worldwide.\textsuperscript{1,3}

\textit{Chryseobacterium} has been described as the etiological agent of meningitis, sepsis, bacteremia, pneumonia. It is highly pathogenic for the immunocompromised individuals including premature and term neonates. Although \textit{Chryseobacterium} infection is not commonly seen in neonates, severe sepsis and meningitis may occur in infected subjects. This kind of bacteria is usually multi-drug resistant which usually makes the choice of antibiotics a challenge. Alertness in diagnosis, proper management and optimal antibiotics administration are very important to treat these infected cases. We reported here a successful experience in treating a newborn infant who was suffered from \textit{Chryseobacterium}-infected sepsis and meningitis.

\section*{CASE REPORT}

A male infant was born to a 35-year-old mother by Cesarean section with a gestational age of 37 weeks. The mother’s prenatal screening tests were unremarkable except the cervical culture grew group B streptococcus, and she received an adequate prenatal antibiotics prophylaxis for group B streptococcus before delivery. At birth, the baby weighted 3500g and the Apgar score at 1 minute was 10 and at 5 minutes was 10. When he was 3 days old, he was discharged from our hospital and brought to a postpartum nursing care unit for further care.

Fever with a body temperature of 39.4 °C and yellowish skin color were noted when he was 7 days old, so he was brought to our pediatric clinic for help. He appeared ill and lethargic. Other than decreased activity, he had no respiratory or gastrointestinal symptom. On physical examination, his anterior fontanel was slightly bulging, the breath sounds were clear, and the response to painful stimuli was active. Under the impression of sepsis with meningitis, he was admitted to the neonatal intensive care unit.

His laboratory test showed leukocytosis with neutrophil predominant (white blood cell count: 17600/uL, segmented neutrophils: 74.4%, lymphocytes: 15.6%). The C-reactive protein (CRP = 0.23 mg/dL), electrolytes, and serum bilirubin were within normal limits initially. Urine routine revealed no pyuria. Lumbar puncture was performed and the cerebral spinal fluid (CSF) examination showed marked leukocytosis (WBC: 660/uL, RBC:10/uL, total protein: 143.6 mg/dL, glucose: 53 mg/dL). The initial CSF gram stain showed few neutrophils and no microorganisms. \textit{S. pneumoniae}, \textit{N. meningitidis}, \textit{H. influenza B}, and \textit{S. agalactiae} antigen of the CSF were all negative. Empirical antibiotics of ampicillin and cefotaxime were started after the lumbar puncture. During his hospital course, his anterior fontanel became more bulging and tense. The CRP elevated to be 5.53 mg/dL within 24 hours, and Gram-negative bacilli were found in the initial blood culture 24 hours later (Figure 1). The CSF culture grew \textit{Chryseobacterium meningosepticum} susceptible to amikacin and flomoxef. Antibiotics were switched to amikacin and vancomycin based on microbiological sensitivities and the suggestions of pediatric infection specialist. Blood culture also reported to have \textit{Chryseobacterium meningosepticum}, but with a different sensitivity. The one that grew in the CSF was susceptible to ciprofloxacin, but it was resistant to amikacin. He continued to be febrile 48 hours later, and a second lumbar puncture was performed with results of leukocytosis, elevated protein and decreased glucose (CSF: WBC 263/uL, RBC 307/uL, total protein 293.4 mg/dL, and glucose 29 mg/dL).

The antibiotics were changed to a combination of vancomycin, flomoxef, and ciprofloxacin under the recommendation of pediatric infection specialist. Then, fever subsided gradually and the general condition of the infant improved. A further drug sensitivity also proved that this bacteria was sensitive to vancomycin. In addition, Coxsackie B6 virus was also isolated from the infant’s nasopharynx, but the viral cultures from CSF and anal swabs were negative. The blood and CSF culture both revealed sterile after the combination use of vancomycin, flomoxef, and ciprofloxacin for 72 hours.

After a 14-day course of ciprofloxacin and 21-day course of vancomycin and flomoxef, the patient was discharged without any neurological complication. Furthermore, no neurologic deficit was found at 1-year follow up.

\section*{DISCUSSION}

\textit{Elizabethkingia meningosepticum}, previously considered a member of the genus \textit{Chryseobacterium},

\textit{Chryseobacterium meningosepticum} infection
is a non-fastidious oxidase-positive, gram-negative aerobic bacillus that does not ferment glucose. In 1959, it was first described by King. He isolated 6 serotypes (A to F), with type C being responsible for most of the cases of meningitis. It is ubiquitous in the environment, including soil, plants, foodstuffs, and water sources. The organism can survive in chlorine-treated municipal water supplies, and has become a potential reservoir of infections in the hospital environment. It often colonizes in sink basins and taps. Contaminated medical devices involving fluids as infection sources had been documented.4,5 It was known to cause a variety of clinic conditions including meningitis, sepsis, bacteremia, and pneumonia. The organism is highly pathogenic in the immunocompromised individuals, and premature babies. Neonatal infections often occur as an outbreak in the contaminated environment, especially in the neonatal intensive care unit.5,7,8 Recent studies indicate that this species is highly heterogeneous and composed of many subgroups. Subgroups within E. meningosepticum may differ in their pathogenicity and antibiotic susceptibility. Choosing an optimal antibiotic to treat the infected infant is usually difficult due to the multidrug-resistant nature of this organism.9 This organism possesses two different types of β-lactamases, extended-spectrum β-lactamases (ESBL) and metallo-β-lactamases (MBL). The isolated organism on sensitivity test revealed variable minimal inhibitory concentrations (MIC) by the antimicrobial agents. Some isolated organism was susceptible to levofloxacin, ciprofloxacin, tigecycline, piperacillin-tazobactam, and trimethoprim-sulfamethoxazole. But all of them were resistant to colistin, vancomycin, and aminoglycosides. Thus, the optimal choices of antimicrobial therapy should be based on susceptibility tests.5,10

In this presented case, the Chryseobacterium meningosepticum was isolated from both blood and CSF specimens with different susceptibilities, and Coxsackie virus B6 was also isolated from the patient’s nasopharyngeal swab sample. Thus, this infant was a case of combined bacteria and viral infections. Most importantly, the isolated Chryseobacterium meningosepticum had different antibiotics sensitivities from different samples. The one from CSF was susceptible to vancomycin, flomoxef, cefotoxin, amikacin, and tigecycline, but the one from blood was susceptible to vancomycin, ciprofloxacin, moxifloxacin, and trimethoprim-sulfamethoxazole. Finally, this patient was successfully treated with three-
combined antibiotics, including vancomycin, flomoxef, and ciprofloxacin.

Infants with bacterial meningitis, common complications were seizure, hydrocephalus, subdural empyema, and hearing impairment.\footnote{Lin MC, Chiu NC, Chi H, Ho CS, Huang FY. Evolving trends of neonatal and childhood bacterial meningitis in northern Taiwan. J Microbiol Immunol Infect 2013 Nov. doi:10.1016/j.jmii.2013.08.012. In press.} Our case had no seizure or any other neurological symptom, and brain sonogram revealed neither hydrocephalus nor subdural empyema. Long-term follow up for evaluation of hearing impairment is still needed. We strongly believe that to avoid obvious complications, early diagnosis and appropriate antibiotic therapy based on microbiological sensitivities is important. A previous study revealed the interval between suspected sepsis and organism isolation was between 8 to 11 days.\footnote{Hoque SN, Graham J, Kaufmann ME, Tabaqchali S. Chryseobacterium (Flavobacterium) meningosepticum outbreak associated with colonization of water taps in a neonatal intensive care unit. J Hosp Infect 2001;47:188-192.} In our case, the interval was 3 days. There was no outbreak of the species at the postpartum care center or our neonatal intensive care unit during his hospital course.

The main source of Chryseobacterium meningosepticum was colonization in susceptible individuals and medical devices. This case emphasizes of early suspicion, early diagnosis, and appropriate antibiotic therapy are essential in reducing the morbidity and mortality of Chryseobacterium meningosepticum infection. Infection control is crucial to prevent the outbreak in any infant care center.

**CONCLUSION**

Chryseobacterium meningosepticum infection should be taken into consideration in neonatal meningitis. Alertness in the diagnosis and appropriate antibiotics treatment based on drug sensitivity test are the keys for optimizing patient’s outcome.

**REFERENCES**