Chryseobacterium indologenes Bacteraemia: A Potential Cause of Early-onset Neonatal Sepsis in a Full-term Baby

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ABSTRACT
Chryseobacterium indologenes is considered as an emerging pathogen known to cause pneumonia, bacteremia, and meningitis in children. It has been reported previously, mainly from the Indian subcontinent, as a rare cause of early-onset neonatal infection, mostly affecting preterm infants. We report the first case in the United Kingdom in which C. indologenes was isolated from the blood culture of a term infant who was clinically suspected of having early-onset neonatal sepsis. Our case had a good outcome, but mortality has been reported in published literature. A positive neonatal blood culture of C. indologenes should not automatically be considered as a contaminant; and a joint discussion between neonatologists and microbiologists should determine the appropriate management and antibiotic regimen.

Key Words: Early-onset neonatal sepsis, Bacteremia, Chryseobacterium indologenes, Contaminant, Antibiotics.


INTRODUCTION
Early-onset neonatal sepsis (EOS) occurs in the first week of life. In the United Kingdom (UK), Group B Streptococcus (GBS) and Escherichia coli are the most common isolated causative bacteria.1 Infections with C. indologenes are reported uncommonly from children in whom it has been documented as a cause of pneumonia, bacteremia, and meningitis.2 C. indologenes as a cause of EOS has not been previously described in literature from the Western world. This article describes a case of suspected EOS in which C. indologenes was the sole bacterium isolated from the infant’s blood culture.

CASE REPORT
A Caucasian male infant, born at 41 weeks gestation with a birth weight of 3.82 kgs, was admitted to the Special Care Baby Unit (SCBU) at 12-hour of age because of respiratory distress. Risk factors for EOS were present: maternal pyrexia, GBS isolated on high vaginal swab in this pregnancy and raised maternal C-reactive protein (CRP) of 101 mg/L. On admission, the infant’s heart rate was 152 beats/min, respiratory rate 54 breaths/min, temperature 36.6°C, and oxygen saturation 93% in air.

Clinical examination revealed moderate respiratory distress with intercostal recessions and upper airway conducted noises; the rest of the examination was normal. Nasal continuous positive airway pressure (CPAP) was started and blood was taken for culture and other investigations. Chest X-ray showed normal lung fields.

A provisional diagnosis of suspected EOS was made and antibiotic treatment was started with intravenous benzyl penicillin and gentamicin. Initial investigations showed CRP of 4 mg/L, white cell count 22.1×109/L, and neutrophil count 13.1×109/L. The baby showed clinical improvement, and CPAP was stopped after a day; low-flow oxygen was administered for the next 24-hour. Intravenous fluids with 10% dextrose were given for the first 36-hour; and later, the baby was weaned to on-demand formula feeds via bottle.

The mother’s CRP increased to 190 mg/L 48-hour post-delivery, and she was treated as puerperal sepsis; her blood culture grew coagulase negative Staphylococcus aureus, which was considered to be a skin contaminant. There was no bacterial growth on urine culture.

At 40-hour, blood cultures from the baby became available and confirmed growth of C. indologenes; the organism was identified on standard culture and was susceptible to amoxicillin and cefalosporins; but resistant to gentamicin and amikacin. The baby remained well; and 48 hours after starting antibiotics, CRP values had decreased to 1 mg/L. Following microbiology advice in the light of the mother’s clinical condition and microbiological results, the baby’s antibiotics were changed to intravenous ceftaxime for further five days.

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Lumbar puncture was not performed as the baby remained clinically well. The baby was discharged home on day-8 of life and was reported to be doing well at follow-up in the clinic six weeks later.

**DISCUSSION**

*C. indologenes* (previously classified as *Flavobacterium indologenes*) is a gram-negative bacillary organism, usually found in soil and plants. Although this bacterium only rarely causes human disease, it is sometimes found in food and water sources, usually in hospitals, as a nosocomial infection. Most reported cases of infection are of adults with predisposing factors, including suppressed immunity, or indwelling catheters and other devices. It is considered to be an emerging cause of bacterial infection; and cases have been observed across the USA and in other countries.

The organism is an extremely uncommon bacterial pathogen to be isolated from neonatal blood cultures. Of all positive neonatal blood cultures in EONS from our centre over the last 20 years [2000 – 2019], *C. indologenes* has been identified only on this occasion [Source: local microbiology database]. A large-scale retrospective study involving 30 UK neonatal units describing the analysis of prospectively collected infection surveillance network data from 2005 to 2014 identified in addition to GBS and *E. coli*, other organisms causing EONS as: *Staphylococcus aureus*, *Listeria monocytogenes*, *Enterococcus*, *Enterobacteriaceae*, and *Streptococcus pneumoniae*, and no case of *C. indologenes* infection was reported.

In our case, EONS was clinically suspected, and *C. indologenes* identified in the blood culture was the sole bacterial isolate from microbiological samples obtained from the baby. We believe that this is the first such case documented in the UK.

A detailed literature search through Medline, PubMed and Google Scholar search identified only four cases of EONS, caused by *C. indologenes*. All the cases were reported from the Indian subcontinent; the initial inflammatory markers were reported to be within normal limits and similar clinical findings were evident as with our case. All cases received prolonged courses of antibiotics. Table I shows details of the cases of EONS caused by *C. indologenes*.

Some authors have considered *C. indologenes* as a sampling contaminant rather than a true pathogenic organism. This rare bacterium is known to survive in chlorinated waters. In the hospital environment, they exist in water systems and wet surfaces which may serve as potential reservoirs of infection to vulnerable patients such as premature neonates or those with congenital heart diseases or with indwelling catheters in situ. The possibility of environmental contamination of the blood sample was considered in our case; however as there were strong maternal risk factors for EONS and there was unexplained respiratory distress at presentation at 12-hour of age, the infant was treated as a case of *C. indologenes* bacteraemia, possibly occurring via vertical transmission from the mother. In our unit, tap water samples are routinely tested for bacterial content, and only *Pseudomonas spp.* have ever been recovered, and never *C. indologenes*.

With this knowledge, the advice from our local Microbiology and Infection Control Departments was that the organism isolated from the baby’s blood culture should not be regarded as an environmental contaminant, but should be treated as the potential pathogenic cause of the baby’s symptoms.

It is important that an isolate of *C. indologenes* in a neonatal blood culture is not automatically dismissed as a contaminant, but a decision is taken through joint discussion between clinicians and microbiologists about the significance of the infection and possible management of the case. Early diagnosis and appropriate antimicrobial treatment, based on local epidemiology/confirmation of antibiotic susceptibilities, remains the best therapeutic approach for the potentially infected neonate.

**PATIENT’S CONSENT:**
Inform consent has been obtained from the parents to publish the data concerning this case.

**CONFLICT OF INTEREST:**
The authors declared no conflict of interest.

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Country</th>
<th>Gestation/gender</th>
<th>Day of presentation</th>
<th>Antibiotics used/changed to</th>
<th>Type of infection/ final outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudharani (2011)</td>
<td>India</td>
<td>36 weeks/ not mentioned</td>
<td>Day 1</td>
<td>Cefotaxime &amp; amikacin/ Changed to Cefoperazone &amp; sulbactum</td>
<td>Bacteraemia/ Survived</td>
</tr>
<tr>
<td>Eshwara et al. (2013)</td>
<td>India</td>
<td>Term / female</td>
<td>Day 6</td>
<td>Piperacillin-tazobactam &amp; amikacin</td>
<td>Bacteraemia and meningitis/ Survived</td>
</tr>
<tr>
<td>Mehta and Pathak (2018)</td>
<td>India</td>
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<td>Day 1</td>
<td>Meropenem &amp; amikacin; changed to Cefoparazone &amp; sulbactum</td>
<td>Bacteraemia/ Survived</td>
</tr>
<tr>
<td>Mirza et al. (2019)</td>
<td>Pakistan</td>
<td>32 weeks / male</td>
<td>Day 1</td>
<td>Cefotaxime; changed to Piperacillin- tazobactam</td>
<td>Bacteraemia/ Died on day 4 of life</td>
</tr>
<tr>
<td>Our case</td>
<td>United Kingdom</td>
<td>Term / male</td>
<td>Day 1</td>
<td>Benzyl penicillin &amp; gentamicin; changed to Cefotaxime</td>
<td>Bacteraemia/ Survived</td>
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</table>
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AUTHORS’ CONTRIBUTION:
SPP: Manuscript preparation and revision, literature search, submission and correspondence.
PAH: Concept, manuscript editing, and provided expert opinion.

REFERENCES


