Early-Onset Neonatal Sepsis with Extended Spectrum Beta-Lactamase Producing *Escherichia Coli* in Infants Born to South and South East Asian Immigrants: A Case Series

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Extended-spectrum β-lactamases (ESBL) are plasmid encoded enzymes produced by Enterobacteriaceae and induce bacterial resistance by hydrolyzing β-lactam antibiotics.1,2 ESBL-producing Enterobacteriaceae represent a major worldwide threat and contribute to morbidity and mortality among newborn infants, especially in other parts of the world with a pooled prevalence of 11%.3 In the U.S., early onset sepsis (EOS) in neonates with ESBL organisms is rare. We present three cases of EOS with ESBL *Escherichia coli* sepsis in infants born to families from South and Southeast Asia to inform the practitioner community about this emerging threat. Infants with suspected sepsis, whose mother is from Asia or Southeast Asia, should be suspected of having an infection with an ESBL-producing organism, and practitioners should strongly consider adding a carbapenem to their usual initial antibiotic regimen.

Case Series

**Case 1**

A 34-week expected gestational age (EGA) male was born to a 32 years/o Pakistani mother via spontaneous vaginal delivery, with rupture of membranes 12 hours before delivery. Pregnancy was complicated by gestational diabetes and severe pre-eclampsia. The mother received two doses of betamethasone and magnesium sulfate. Apgar scores were 6 and 8 at 1 and 5 minutes, respectively. The infant initially did well and was transferred to a step down unit on day 2. No antibiotics were administered during the initial Neonatal Intensive Care Unit (NICU) stay. At 62 hours of age, skin mottling, lethargy, abdominal distension, delayed capillary refill hypotension, and oliguria developed. A sepsis evaluation was initiated and ampicillin, gentamicin, and acyclovir were begun. Respiratory failure led to intubation and mechanical ventilation. Laboratory results revealed elevated C reactive protein (89.9 mg/L), leukopenia (1,004/μL), neutropenia (100/μL), and thrombocytopenia (71,000/μL), and severe metabolic acidosis with lactic acid of 16 mmol/L. Multiple doses of sodium bicarbonate (NaHCO3) and fluid resuscitation did not improve the acidosis. The infant developed shock refractory to fluid boluses and vasopressors. Blood culture grew gram-negative rods within 7 hours of draw, and cefepime was added for extended gram-negative coverage. Cerebrospinal fluid (CSF) results revealed gram-negative meningitis. The infant developed pulmonary hemorrhage from disseminated intravascular coagulation (DIC) within 24 hours of presentation and continued to receive multiple blood products without improvement. He rapidly deteriorated despite vigorous resuscitative efforts and died. Blood and CSF cultures grew ESBL *E. coli*. 

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**Case 2**
A 35-week EGA male twin 2 was born to a 26 years/o Vietnamese mother after an uncomplicated pregnancy. Maternal Group B Streptococcus (GBS) status was unknown, and mother received two doses of ampicillin prior to delivery. Mother had no signs of chorioamnionitis. The well-appearing infant was admitted to the well-baby nursery. At 60 hours, he developed hypothermia and new onset apnea. Rectal temperature was 94°F, and poor perfusion, and decreased activity were present. A sepsis evaluation was initiated and ampicillin, gentamicin, and ceftazidime were started. The infant was intubated with worsening respiratory status and persistent apnea. Pulmonary hemorrhage was noted during intubation. Chest X-ray showed near total opacification of the right lung. The baby was placed on conventional ventilation and multiple doses of endotracheal epinephrine were given without improvement. Multiple blood products were given for DIC. Blood gases showed a severe mixed acidosis. He deteriorated rapidly and died 4 hours after onset of symptoms. Blood culture grew ESBL E. coli.

**Case 3**
A 30-week EGA male infant was born to a 35 years/o Indian mother via spontaneous vaginal delivery. Pregnancy was complicated by gestational diabetes and prolonged rupture of membrane (48 hours). Maternal GBS status was unknown. She received four doses of ampicillin prior to delivery. There were no signs of chorioamnionitis; however, she developed a fever of 101.7°F on postpartum day 1 and was diagnosed with endometritis. Apgar scores were 7 and 8 at 1 and 5 minutes, respectively, and the infant was transferred to the NICU on room air. At 3 hours of age, he developed respiratory distress requiring continuous positive airway pressure (CPAP), which was escalated to conventional and then high frequency ventilation within the next 12 hours. Chest films showed generalized granular infiltration. Amoxicillin, gentamicin, and ceftazidime were started. His status deteriorated with compensated septic shock, tachycardia, and lactic acidosis (11.6 mmol/L). DIC was present with pulmonary hemorrhage, thrombocytopenia, and coagulopathy. He received multiple normal saline boluses and blood products. Dopamine was added for hypotension. Blood culture grew gram-negative rods within 12 hours. Due to his ethnicity, meropenem was added due to high suspicion for ESBL organisms. Blood culture grew gram-negative rods within 12 hours. He received multiple normal saline boluses and blood products. Dopamine was added for hypotension. Blood culture grew gram-negative rods within 12 hours. Philadelphia chromosome was negative. His status deteriorated with compensated septic shock, tachycardia, and lactic acidosis (11.6 mmol/L). DIC was present with pulmonary hemorrhage, thrombocytopenia, and coagulopathy. He received multiple normal saline boluses and blood products. Dopamine was added for hypotension. Blood culture grew gram-negative rods within 12 hours. Due to his ethnicity, high suspicion for ESBL organisms. Multiple blood products were given for DIC. Blood gases showed a severe mixed acidosis. He deteriorated rapidly and died 4 hours after onset of symptoms. Blood culture grew ESBL E. coli.

**Discussion**
ESBLs induce bacterial resistance by hydrolyzing penicillins, first, second, and third generation cephalosporins and aztreonam, but not cephamycins or carbapenems. β-lactamase inhib-
References