

## Clinical Cases and Brief Reports

# Neonatal Group B Streptococcal Infection Related to Breast Milk

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### ABSTRACT

Group B streptococcus is currently the most common cause of sepsis and meningitis in newborns. How should mothers whose breast milk cultures show growth of this microorganism be managed regarding breastfeeding? This case study discusses the possible transfer of group B streptococcus to a preterm infant from mother's milk. It also describes the process that was taken to preserve the breastfeeding experience while the infant was treated. The questions provoked during this investigation prompted the authors to revise procedures in their special care nursery for dealing with infants and mothers presenting with signs of infection. In this case, providing treatment for the mother and infant and withholding breast milk from the infant until cultures were negative, while supporting the mother's milk supply, made it possible for this mother to continue to breastfeed.

### INTRODUCTION

**G**ROUP B STREPTOCOCCUS is currently the most common cause of sepsis and meningitis in newborns. Group B streptococcus is also a frequent cause of newborn pneumonia. According to The Centers for Disease Control and Prevention (CDC), approximately one of every 100 to 200 infants whose mothers carry group B streptococcus develops signs and symptoms of group B streptococcal disease. Seventy-five percent (75%) of cases of group B streptococcal disease among newborns occur in the first week of life (early-onset disease) and most of these appear within hours after delivery. Premature infants are more susceptible to group B

streptococcal infection than full-term infants.<sup>1</sup> Group B streptococcal disease also may develop in infants 1 week to several months after birth (late-onset disease). Only about 50% of late-onset group B streptococcal disease cases among newborns come from a mother who is a group B streptococcus carrier; the source of infection for the others with late-onset disease is unknown.<sup>1</sup> Late-onset disease is very rare, but may be acquired from various sources, including nosocomial, community, and maternal contact. Maternal milk has been suggested as a source, but this has not been proved by molecular microbiology.<sup>2</sup> The CDC recommends universal prenatal screening for vaginal and rectal colonization of all pregnant women at 35

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to 37 weeks' gestation.<sup>1</sup> A study by Kubin et al. has reported the group B streptococcal breast milk carriage rate to be 3.5% in 1132 samples from healthy lactating women.<sup>3</sup>

### CASE REPORT

The mother is a 32-year-old married white, gravida 2, para 1. The mother's first pregnancy was uncomplicated. Group B streptococcus status was unknown during both pregnancies. This was a twin pregnancy. Twin B had polyhydramnios, which was treated with amniocentesis as an outpatient 10 days prior to delivery, resulting in fluid drainage of 1000 mL. The patient was admitted to the hospital at 31 and 3/7 weeks gestation, because of spontaneous rupture of membranes with clear fluid. Twin A was a known fetal demise identified 1 day prior to delivery; twin B had polyhydramnios and transverse lie. The infants were delivered by primary Cesarean section. The stillborn Twin A had an autopsy report of "macerated fetus weighing 1600 g." The cause of death was attributed to torsion of the umbilical cord at the attachment to the fetus with focal disruption and constriction. No evidence of infection was noted. Twin B had nuchal cord and was delivered within the membranes. The gestational age by modified Ballard score was 31 weeks LGA. Apgar scores were 9 at 1 minute and 9 at 5 minutes. The weight was 1883 g and the cord length was 60 cm. Cefoxitin sodium 2 g was given to the mother before delivery. Three more doses of cefoxitin 2 g every 6 hours were given to the mother during the postpartum stay and then discontinued. The mother started pumping milk for her infant on day 1 and continued to pump with an electric breast pump after discharge. Procedures for collection and storage of expressed breast milk in the hospital setting were followed as recommended by The Human Milk Banking Association of North America's 1993 guidelines.<sup>4</sup>

Twin B was admitted to the special care nursery. Intravenous therapy was started, a blood culture was drawn, and ampicillin 180 mg every 12 hours and gentamicin 4.5 mg every 18 hours were given intravenously (IV). Gentamicin peak and trough blood levels were

within normal limits. The blood culture report showed no bacterial growth by 48 hours and the antibiotics were discontinued.

The mother's colostrum was fed to the infant by indwelling nasogastric feeding tube on day 1, and formula or breast milk was given every 3 hours as a bolus feeding through day 4. On day 5, as the mother's supply increased, breast milk was given exclusively via indwelling nasogastric tube every 3 hours, advancing to 35 mL every 3 hours by day 10. On day 8, human milk fortifier was added to the breast milk to obtain 22 calories per ounce.

In the morning of the tenth day postpartum, the mother complained of not feeling well with a sore left breast, especially under her arm. The obstetrician examined the mother and found no mastitis at that time. The mother stated she had slept through the night the previous night and had gone 6 hours without pumping. The mother and infant had done first skin-to-skin holding on day 10 but had not yet directly breastfed. All feedings were by nasogastric tube with fortified breast milk at this point. Comfort measures were discussed with the mother and she was informed to call her obstetrician if symptoms did not improve in 24 hours. That evening, the infant developed numerous episodes of apnea and bradycardia, and was noted to be lethargic and inactive. A blood culture and spinal tap were done. The infant was made NPO and antibiotic therapy was started. Initial antibiotic therapy for the infant was ampicillin 190 mg IV every 12 hours, gentamicin 4.5 mg IV every 18 hours, and vancomycin 27 mg IV every 18 hours. The infant's blood culture was positive for group B streptococci. A spinal tap was negative for bacterial growth. The infant had one dose of ampicillin and two doses of gentamicin and vancomycin; these antibiotics were discontinued after the culture and sensitivity were obtained. Penicillin G potassium 50,000 units IV every 8 hours was started. This dose was given for five doses, and then the penicillin G potassium was increased to 200,000 units every 6 hours for 8 more days. The infant was treated with penicillin for a total of 10 days.

The morning after the infant developed apnea and bradycardia, the mother returned to her obstetrician. She related that she had a tem-

perature of 103°F. Cephalixin 500 mg twice per day orally for 7 days was prescribed for mother at this time. The obstetrician ordered a computed tomography scan of the abdomen to rule out an abdominal abscess. Contrast material was given; thus, the mother continued to empty her breasts by pump and discarded the milk for 24 hours as recommended by the radiologist. Red area on outer upper left breast was noted. The mother reported that the volume of milk was decreased on the left side. The mother completed 7 days of antibiotic therapy.

Feedings were restarted at 12 days of age by nasogastric tube, while mother and infant were on antibiotics. The infant went to breast at 17 days of age and was nursing well twice a day with a breast shield at the 24th and 25th days of age, with the rest of the feedings given by nasogastric tube with expressed breast milk. Antibiotics were discontinued for the infant on the 20th day of age after 10 days of treatment.

On day 25, the infant had apnea and bradycardia again. A complete blood count, blood culture, and spinal tap were done and the infant was placed on nasal variable positive airway pressure (NVPAP). Antibiotic therapy was restarted, using vancomycin 20 mg IV every 8 hours, ampicillin 208 mg IV every 8 hours, and gentamicin 5 mg IV every 18 hours for 14 days. The blood culture was again positive for group B streptococci and the spinal fluid was again negative for bacterial growth.

Because the infant became ill for a second time, a clean-catch breast milk sample was obtained from the mother 2 days later; also a culture of breast milk from a frozen pumped sample from the 10th day of age was obtained. The clean-catch procedure involved washing the breast first with soap and water, rinsing with water, and drying the breast with a clean washcloth. First sprays of milk were discarded and a sterile bottle was used to collect the specimen. The mother was asymptomatic for infection in the breast at the time the infant developed the second infection. The infant was fed breast milk until the result of the culture was obtained. The breast milk culture from the frozen milk sample on the 10th day of age showed heavy growth of group B streptococci and the second sample 2 days after the second infant infection showed light growth of group B streptococci.

On day 29, the infant was switched to formula feedings. The infant was transferred to a level III neonatal intensive care unit for peripherally inserted central catheter on day 30 and then transported back to the level II nursery on day 32.

With both cultures of breast milk positive for group B streptococcus, the mother was put on a second course of oral cephalixin 500 mg twice daily for 7 days. Breast milk was pumped and discarded. Breast milk was cultured and was negative for group B streptococcus on the last day of mother's antibiotic treatment. The culture was again negative for group B streptococcus 2 days after the antibiotics were discontinued and the next culture of breast milk 1 week later also was negative for group B streptococcus. However, the mother's milk was now positive for methicillin-resistant *Staphylococcus aureus*. All cultures of milk were collected by the clean-catch procedure using new sterile pump equipment each time. The mother was again asymptomatic for any infection. Consultations were obtained from an adult infectious disease physician and a pediatric infectious disease physician as the mother continued to pump and discard milk to maintain supply. After treatment of infant and mother for this organism and negative breast milk cultures, the pediatric infectious disease physician gave the mother permission to start breastfeeding again 28 days after initial positive methicillin-resistant *Staphylococcus aureus* culture. The infant was now 11 weeks old. As reported by the mother, after several attempts to breastfeed with difficult latch, the infant did go back to the breast well. The infant continued to nurse at 1 year.

## DISCUSSION

At the time of the second infection of the infant, breast milk was suspected as the etiology. Group B streptococci were present in light growth in the breast milk even though the mother was asymptomatic for infection at this time. Group B streptococci also were found in large growth in the frozen milk pumped at the time of the infant's first infection when the mother was symptomatic for mastitis. This led

the authors to consider whether the infant's first infection was a result of transfer of group B streptococcus from the breast milk and not simply late-onset group B streptococcal disease as was first thought.<sup>5-7</sup> Review of the literature showed that the authors were not the first to encounter an infant GBS infection related to breastfeeding (Table 1).<sup>2,5-8,12,13,17-19</sup> The authors' review of these cases shows that 76% of the infants presented with symptoms before 1 month of age: All were less than 48 days old. All reported cases were positive for GBS in the breast milk. The majority of patients who described outcomes discontinued breastfeeding. Of the cases reported, there was one death at 4 days of age.

Further questions were considered. How did the mother get the group B streptococcal mastitis? A possible explanation for GBS mastitis has been described as a continuous circular process, as with coagulase-positive staphylococci. Infection of the breast follows colonization of the infant during the first days of life and with negative pressure created by suckling, organisms are aspirated into the mammary ducts. The bacteria then could multiply in the breast milk and be returned in increased numbers and result in disease in the infant.<sup>8</sup> For this infant, the GBS status of the mother was unknown as she was only 31 3/7 weeks gestation, the mother received antibiotics prior to delivery, the initial infant blood culture was negative, and the infant had not actually breast fed prior to the symptoms of mastitis. The mother and infant had done skin-to-skin holding the morning prior to the infant becoming symptomatic. One possible explanation why this particular infant and mother were infected with this pathogen was that a more virulent strain of group B streptococcus had developed with the use of prophylactic antibiotics in labor. As reported by researchers in *The Journal of Clinical Investigation*,<sup>9</sup> highly virulent strains of group B streptococcus produce a surface-localized protease that promotes the group B streptococcus survival by acting as an antiphagocytic factor. Further study of this topic may be of interest as widespread use of antibiotic prophylaxis in labor for positive GBS prenatal cultures continues. Other factors considered included the possibility that early

introduction of formula and human milk fortifier can alter the intestinal tract and make the infant more susceptible to infection.<sup>10</sup> A study by Chan<sup>11</sup> found that certain human milk fortifiers might affect the antibacterial actions of preterm human milk by the addition of iron, which appears to abolish human milk antimicrobial activity. As reported by Chan, preterm milk has higher levels of lactoferrin than term milk from the second to the 12th week postpartum. When iron is added to human milk either directly or by a fortifier containing iron, it may saturate lactoferrin, thereby decreasing its antibacterial action.<sup>11</sup> Formula was added to the infant's diet through day 4 until mother's supply was adequate and added fortifier on day 8.

As this case was studied further, the authors considered how to lessen or prevent this from happening again. There were many factors to consider. Perhaps closer surveillance of breast milk should be used, especially for preterm infants whose mothers' group B streptococcus status is unknown or positive. As suggested by Kotiw et al.,<sup>2</sup> an infant may be reinfected with or without mastitis, as the microbial concentration increases in the milk. When there are clinical signs of mastitis or clinical signs of illness in the infant, breast milk and infant's blood should be cultured using a DNA testing process such as restrictive length polymorphism (RFLP) when possible to document possible transmission from mother to infant, and breast milk be withheld until a culture result is available and, if positive, until adequate therapy is achieved.<sup>6,12</sup> Also, a vital step in the pathogenesis of GBS infant disease as discussed by Atkins included persistent mucosal colonization. They recommended that if a breastfed infant has recurrent GBS disease, consideration should be given to concomitant treatment of the mother and infant with rifampin.<sup>13</sup> In addition, there is a risk of having false-negative prenatal GBS vaginal screening results as discussed in the literature. As presented by Welch and Aldridge,<sup>14</sup> the standard culture-based GBS screening method can have up to a 50% false-negative culture result from women colonized with GBS if the broth enrichment step is skipped and a direct agar plating approach is used.

TABLE 1. GROUP B STREPTOCOCCAL DISEASE: A REVIEW OF THE LITERATURE

Reports in literature	Cesarean	Gestational age	Gender	Age onset of infant symptoms	Age at recurrent infection	Mastitis	Blood culture pos. GBS infant	CSF culture pos. GBS infant	Other pos. GBS cultures infant	EBM culture pos. GBS mother	DNA ID	Infant antibiotics	Maternal antibiotics	Outcomes
Kenny, JF 1977 <sup>8</sup>	NS	NS	M <sub>1</sub>	1 h	6 wk	Yes	Yes 1st Yes 2nd	No 1st Yes 2nd	No No	Yes	No	10 d 1st 26 d 2nd	Yes	NS
Schreiner, RL 1977 <sup>18</sup>	No NS	Term Term	NS <sub>1</sub> F <sub>1</sub>	11 d 1 mo	None None	Yes No	NS NS	Yes Yes	No	Yes Yes	No	14 d NS	Yes NS	NS NS
O'Donovan, P 1985 <sup>19</sup>	No	27 wk	F <sub>2</sub>	13 d	37 d	NS	No 1st No 2nd	No 1st No 2nd	Yes—stool 1st Yes—stool 2nd	Yes—1st Yes—2nd	No	10 d 1st 10 d 2nd	NS	Breastfeeding discontinued, Normal @ D/C on d 70
	No	27 wk	F <sub>2</sub>	13 d	37 d	NS	No 1st No 2nd	No 1st No 2nd	Yes—stool 1st Yes—stool 2nd	Yes—1st Yes—2nd	No	10 d 1st 10 d 2nd	NS	Breastfeeding discontinued, Normal @ D/C
Rench, MA <sup>17</sup>	No	40 wk	M <sub>1</sub>	12 d		Yes @ 7 d	No	No	Yes—urine & breast fluid Yes—throat & rectum	Yes	No	10 d	17 d	Breastfeeding discontinued after recurrence of maternal symptoms 2 d after first 7 d of treatment, abscess drained and recovery uneventful. Infant only had mastitis symptoms which cleared after 24 h of antibiotics.
Bingen, E 1992 <sup>12</sup>	NS NS NS NS NS	NS NS NS NS NS	NS NS NS NS NS	9 d 6 d 5 d 19 d 11 d	None None None None None	Yes Yes Yes Yes Yes	NS NS NS NS NS	NS NS Yes Yes NS	Yes—urine Yes—throat Yes—urine No Yes—articular pus	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	NS NS NS NS NS	NS NS NS NS NS	
Atkins, J 1998 <sup>13</sup>	Yes	27 wk	F <sub>1</sub>	48 d	75 d and 4 mo	No	Yes 1st Yes 2nd Yes 3rd	No NS NS		NS—1st Yes—2nd NS—3rd	Yes	14 d 1st 21 d 2nd Yes 3rd	No	After mother and infant were treated with rifampin for 7 d, GBS was not recovered from breast milk or from mucosal sites of either infant or mother and the infant remained well for 1 y.
Olver, W 2007	Yes Yes Yes	26 wk 26 wk 26 wk	F <sub>3</sub> F <sub>3</sub> F <sub>3</sub>	12 d 35 d 33 d	63 d None None	No	Yes 1st Yes 2nd Yes	No 1st NS Yes No 1st	No No No	Yes @ d 68	No	7 d 1st 14 d 2nd 14 d 10 d	7 d	Repeated cultures of breast milk were all negative after treatment; breast milk feeding was not reintroduced for other reasons; triplets remained well and were discharged at 3 mo of age.
Dinger, J 2002 <sup>5</sup>	No	39 wk	F <sub>1</sub>	12 d	No	No	Yes	No after 26 h of antibiotics	Yes—gastric juice	Yes	No	19 d	10 d	Infant developed hydrocephalus and infant survived with severe neurologic handicaps. The breast milk cultures were negative after treatment but breastfeeding was not reintroduced for other reasons.

(continued)



TABLE 1. GROUP B STREPTOCOCCAL DISEASE: A REVIEW OF THE LITERATURE (CONT'D)

Reports in literature	Cesarean	Gestational age	Gender	Age onset of infant symptoms	Age at recurrent infection	Mastitis	Blood culture pos. GBS infant	CSF culture pos. GBS infant	Other pos. GBS cultures infant	EBM culture pos. GBS mother	DNA ID	Infant antibiotics	Maternal antibiotics	Outcomes
Kotiw, M 2003 <sup>2</sup>	Yes	Term	M <sub>1</sub>	20 d	38 d	Yes 2nd	Yes 1st Yes 2nd	NS NS	Yes—oral swab 2nd	Yes	Yes	14 d 1st 22 d 2nd	NS	Mother and infant received 4 d rifampicin after discharge. Infant found to be normal at 2 mo and cultures of mouth and anal swabs negative. Mother's vaginal and anal swab cultures remained positive. Did not specify if breastfeeding continued or not.
	Yes	32 wk	M <sub>2</sub>	5 wk/7 d	None	Yes	Yes	NS	None	Yes	Yes	Yes	NS	Breastfeeding discontinued and complete recovery with treatment
	Yes	32 wk	M <sub>2</sub>	5 wk/5 d	None	Yes	Yes	NS	None	Yes	Yes	4 d	NS	Death @ 4 d
	Yes	33 wk	F <sub>2</sub>	6 d	None	No	Yes	Yes	None	Yes	Yes	Yes	NS	Developmentally delayed and severe seizure disorder @ 12 mo
Arias-Camison, J <sup>6</sup>	Yes	33 wk	F <sub>2</sub>	No illness	None	No	NS	NS	None	Yes	Yes	NS	NS	Breastfeeding discontinued and infant remained well
	Yes	NS	M <sub>3</sub>	10 d	None	Yes 8 d	Yes	Yes	None	Yes	No	NS	Yes	NS
	Yes	NS	M <sub>3</sub>	No illness	None	Yes 8 d	No	NS	NS	Yes	No	NS	Yes	Asymptomatic and surveillance cultures negative
	Yes	NS	M <sub>3</sub>	No illness	None	Yes 8 d	No	NS	NS	Yes	No	NS	Yes	Asymptomatic and surveillance cultures negative

NS = Not specified.

M = Male.

F = Female.

1 = Singleton.

2 = Twin.

3 = Triplet.

## CONCLUSION

After review of the literature, a prudent plan was developed that could be implemented in the authors' setting. First, they checked with the director of the laboratories to insure that the recommended collection procedures were being followed in their laboratories and alerted the obstetricians to make sure that their laboratories also followed the CDC guidelines for collection of prenatal screening cultures.<sup>1</sup> This step hopefully will decrease false-negative prenatal GBS results. Simple measures of reviewing with a mother proper hygiene for milk expression at home and in the hospital and upgrading the written pumping information to emphasize proper hygiene are easily implemented.<sup>15</sup> When an infant in the special care nursery becomes clinically ill while the mother is breastfeeding, culture the mother's milk to be sure a pathogen is not present. Until the cultures are negative consider withholding mother's milk feedings. Also, as suggested by Arias-Camison,<sup>6</sup> the authors observe mothers of infants in the special care nursery very closely for signs of mastitis. This is always important, especially when the group B streptococcus status of the mother is unknown or positive. If signs of mastitis or plugged ducts do occur, holding breast milk feedings and culturing freshly pumped milk (also frozen, if available), while observing the infant closely for signs of infection, is a prudent course of action. The authors also place informational cards next to the expressed breast milk storage freezer or refrigerator listing the signs of infection and mastitis and asking mothers to notify their infant's nurse if they have any sign of infection or mastitis. Also, although human milk fortifiers are commonly used, some may affect the antimicrobial actions of human milk. Limiting the use of formula and increasing the use of banked human milk for breastfed infants until mothers' milk is available is the next goal. When signs of infection occur in an infant and/or signs of mastitis occur in a mother, the authors plan to culture the breast milk, and withhold mother's milk from the infant while providing banked milk until cultures are negative for potential pathogens. Simultaneously, antibiotic treatment will be provided for the

mother when indicated,<sup>16</sup> the infant will be observed for infection and treated as needed, and the mother's milk supply will be supported with pumping to provide the opportunity for the mother to continue to breastfeed while the best treatment and care for the infant are provided.

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