A mother with *Salmonella* mastitis and a baby with *Salmonella* bacteremia

Hana Mitchell MD FRCPC Regan Ebbeson MD FRCPC
Meaghan Maclean MD Jan Hajek MD FRCPC

Case

A 5-month-old, previously healthy boy presented to a community hospital in British Columbia with 12 hours of fever, nonbloody emesis, diarrhea, and dehydration. He received intravenous fluids, blood was drawn for cultures, and he was started on empiric intravenous antibiotics before being transferred to a tertiary pediatric hospital in Vancouver.

He was born at term, received all age-appropriate immunizations, and had been meeting growth and development milestones as expected. He had been exclusively breastfed and his mother did not use a breast pump or a bottle.

The baby had a close sick contact in his mother, who experienced a sudden onset of right-sided breast pain and swelling, high fevers, chills, and emesis on the same day her infant was hospitalized. She had a previous history of lactational mastitis with her older children that had resolved on its own with symptomatic management and continued breastfeeding. She had no other relevant medical issues.

The baby lived with his family in the greater Vancouver area. Four weeks before admission, he had returned from a trip with his mother to Hong Kong and coastal Thailand, where they had attended a wedding and stayed at high-end hotel facilities. His mother recalls eating uncooked bean sprouts on several occasions in Thailand. Neither the mother, the infant, nor their known contacts had been sick during this trip.

After they returned home to Vancouver, and 24 hours before the onset of symptoms, the infant and his mother attended a barbecue. Recalling the event later, his mother noted that the cook had been handling raw pig meat while also handing out drinking glasses. No one else who attended the barbecue was ill. Neither the mother nor the child had a history of direct exposure to poultry, hedgehogs, turtles, or other animals while abroad or in Canada.

The infant's blood and stool cultures were positive for *Salmonella*. The isolate was sent to the provincial reference laboratory and confirmed to be *Salmonella enterica* serovar Stanley (*Salmonella* Stanley), susceptible to ampicillin, ceftriaxone, ciprofloxacin, and trimethoprim-sulfamethoxazole.

His mother was seen at an adult outpatient clinic and diagnosed with lactational mastitis. Breast milk culture was positive for *Salmonella* Stanley with the same antimicrobial susceptibilities. Her blood cultures were negative. Ultrasound findings of the affected breast showed no evidence of an underlying abscess.

The infant responded well to fluid resuscitation and received 10 days of intravenous ceftriaxone. Aside from transient electrolyte disturbance attributed to dehydration, he did not have any other evidence of end organ dysfunction. Given his rapid clinical improvement, no further investigations for invasive disease or underlying immunodeficiency were pursued.

His mother was initially treated for mastitis with cephalexin. She was empirically switched to ciprofloxacin, and then to ceftriaxone, owing to concerns about poor clinical response. She had obvious improvement after day 2 of ceftriaxone. Guided by antimicrobial susceptibilities, her course of treatment concluded with cefixime; she received a total of 14 days of antibiotics.

Editor's key points

- Nontyphoidal *Salmonella* is a common cause of traveler's diarrhea and a leading cause of bacteremia and meningitis in infants in tropical and low-income countries. It is a rare cause of lactational mastitis.
- Breast milk from healthy mothers naturally contains bacteria, both benign commensal bacteria—"good bacteria"—and potentially pathogenic bacteria.
- In cases of lactational mastitis, especially in mothers with recent travel to tropical regions or when there is concurrent illness in the infant, cultures of breast milk can be helpful in guiding antibiotic therapy.
- With few exceptions, mothers with lactational mastitis can safely continue to breastfeed.

Points de repère du rédacteur

- La *Salmonella* non typhique est une cause commune de la diarrhée du voyageur, et l'une des principales causes des bactériémies et des méningites chez les nourrissons vivant dans les pays tropicaux et à faible revenu. Il est rare qu'elle entraîne une mastite due à l'allaitement.
- Le lait maternel de mères en santé contient naturellement à la fois des bactéries commensales bénignes, soit de « bonnes bactéries », et des bactéries potentiellement pathogènes.
- Dans le cas d'une mastite due à l'allaitement, surtout chez les mères qui ont récemment voyagé dans des régions tropicales ou s'il y a une maladie concomitante chez le nourrisson, il peut être utile de procéder à des cultures du lait maternel pour orienter l'antibiothérapie.
- Les mères souffrant d'une mastite due à l'allaitement peuvent continuer à allaiter en toute sécurité, sauf dans quelques rares exceptions.

Throughout treatment, the infant's mother expressed and discarded milk from the right breast and continued to breastfeed from the unaffected breast. Repeat breast milk culture a week after the end of the mother's antibiotic treatment was negative. Both mother and infant made a full clinical recovery and were well at a 6-month follow-up visit.

Discussion

We describe a case of systemic illness and bacteremia in a 5-month-old exclusively breastfed term infant associated with acute nontyphoidal *Salmonella* mastitis in his mother. The infection was likely acquired as a result of international travel to a tropical country. The case highlights that various bacteria can be found in breast milk and can be associated with mastitis, including nontyphoidal *Salmonella,* which can cause invasive disease in an infant.

The mother's consent was obtained for publishing the case. She also read the manuscript before submission. In preparing this case report we performed a literature search using PubMed and the MeSH terms *mastitis* and *Salmonella*. We also reviewed references in key articles identified through PubMed.

Nontyphoidal* Salmonella *infections. Nontyphoidal *Salmonella* infection can be acquired through contaminated food and water or contact with animals, in particular reptiles such as turtles, and amphibians. The incubation period is short, with gastrointestinal disease usually manifesting within several hours to days. Asymptomatic carriage and shedding in the stool can persist for months. Nontyphoidal *Salmonella* can cause severe disease in young infants and is a leading cause of bacteremia and meningitis in infants in tropical and low-income countries.[1]

Salmonella enterica serovar Stanley is endemic in Southeast Asia, where pigs are a common reservoir. It has also been reported in overseas travelers returning from the region.[2] As far as we are aware, this is the first reported case of *Salmonella* Stanley causing both bacteremia in an exclusively breastfed infant and maternal mastitis.

Nontyphoidal *Salmonella* bacteremia and meningitis in breastfed infants has been reported in association with maternal mastitis in 2 previous case reports, one owing to *Salmonella enterica* serovar Agona[3] and another owing to *Salmonella enterica* serovar Poona.[2] In both cases, the pathogen was isolated from the infant's blood and cerebrospinal fluid as well as from maternal breast milk. *Salmonella enterica* serovar Senftenberg[4] and *Salmonella enterica* serovar Typhimurium DT104[5] have been isolated from breast milk of asymptomatic women after their infants developed invasive disease.

Lactational mastitis. Bacteria are naturally found in breast milk and may be helpful for infant immunity and well-being.[6] Lactational mastitis, an inflammatory condition of the breast, is associated with blockage of the mammary ducts, as well as with an alteration of the normal bacterial microbiome and increased growth of potentially pathogenic bacteria.[7] *Staphylococcus aureus* is most commonly associated with mastitis, followed by b-hemolytic streptococcal species, *Escherichia coli,* and other coliforms and skin flora.[6,7]

Lactational mastitis is common and affects approximately 30% of breastfeeding women.[7] Mild cases can be managed symptomatically and by encouraging mothers to completely express milk. In more severe cases, or those lasting more than 12 to 24 hours, antibiotics targeting *S aureus* are recommended.

As well as bacteria, breast milk contains antibodies and has many immunologically beneficial properties, so that even in cases of mastitis with increased growth of potentially pathogenic bacteria such as *S aureus,* continuing to breastfeed is generally recommended.[8] In tropical and low-income countries with high rates of nontyphoidal *Salmonella* infection, breastfeeding decreases the risk of salmonellosis in infancy through specific immunologic components that are present in breast milk and by minimizing exposure to infant formula that can become contaminated during preparation.[9]

Conclusion

Questions about the risks of breastfeeding arise when maternal breast milk is a potential source of the infant's infection. Women with newly diagnosed tuberculous mastitis or untreated HIV or other systemic viral infections are generally advised to avoid breastfeeding. However, for acute bacterial mastitis, most professional bodies recommend that women continue to breastfeed; the overall benefits generally outweigh the risks to the infant.[8]

Going back in time, if we had known that this mother's breast milk was colonized with *Salmonella,* we might have been proactive and provided antibiotics to eradicate the bacteria in the hopes of preventing infection in the infant. However, *Salmonella* bacteria were only discovered in her breast milk after the infant was already found to be sick and had already been started on effective antibiotics. At that stage, the benefits of continuing to breastfeed were believed to outweigh any potential risks.

Breast milk cultures are not routinely recommended with lactational mastitis[8] but might be helpful in guiding antibiotic therapy and potentially reducing the risk of invasive disease in infants. This is particularly helpful in patients whose symptoms do not respond to empiric antibiotics directed against *S aureus,* if their child is also ill, or if there is a history of recent travel to tropical and resource-limited countries with a high prevalence of nontyphoidal *Salmonella* infections.

Dr Hana Mitchell is a pediatric infectious disease specialist at BC Children's Hospital in Vancouver and Clinical Assistant Professor of Medicine at the University of British Columbia in Vancouver. **Dr Regan Ebbeson** is a consultant pediatrician at BC Children's Hospital and Clinical Assistant Professor of Medicine at the University of British Columbia. **Dr Meaghan Maclean** is a pediatric resident at the Stollery Hospital and the University of Alberta in

Edmonton. **Dr Jan Hajek** is an infectious diseases specialist at Vancouver General Hospital and Clinical Assistant Professor of Medicine at the University of British Columbia.

Competing interests
None declared

Correspondence
Dr Jan Hajek; e-mail **janjhajek@gmail.com**

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