


# Infant With Invasive Nontyphoidal Salmonellosis and Mastitis

Global Pediatric Health  
 January–December 2015: 1–2  
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 DOI: 10.1177/2333794X15591568  
 gph.sagepub.com  


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## Introduction

Mastitis in early infancy is uncommon.<sup>1</sup> Mastitis cases in full-term neonates and nonlactational mastitis in older children have been reported, with *Staphylococcus aureus* being the most common pathogen, but concurrent bacteremia or meningitis is rare.<sup>1–3</sup> Gram-negative enteric bacteria as pathogens have been uncommonly reported, and mastitis due to *Salmonella typhi*<sup>3</sup> and nontyphoidal *Salmonella* (NTS) is rare.<sup>4</sup> Empiric management of mastitis and breast abscess in infancy according to the available literature includes parenteral and oral antibiotics with antistaphylococcal activity and surgical interventions such as aspiration and/or incision and drainage in the presence of abscesses.<sup>1,2</sup> Here, we report the case of a previously well 7-week-old infant girl with invasive NTS infection and mastitis confirmed by respective cultures.

## Case Report

A 7-week-old female of Chinese ethnicity with no significant medical history was admitted to our hospital after 1 day of fever with 2 episodes of vomiting and reduced feeding. She was noted to have a right breast furuncle. There was no travel or relevant contact history, and there were no family members with diarrhea. The infant was fed with expressed breast milk and did not consume raw food or unpasteurized milk. Insufficient bottle hygiene, whereby the bottle was rinsed only with hot water between expressed milk feeds, was reported.

Her C-reactive protein (11.6 mg/dL) and white blood cell count ( $16.48 \times 10^9/L$ ) were slightly elevated. An ultrasound investigation showed a  $0.5 \times 0.5$  cm abscess in the retroareolar region. An aerobic blood culture done before initiating parenteral antibiotics (ampicillin and cloxacillin) revealed a Group C *Salmonella* that was susceptible to ampicillin, ceftriaxone, and trimethoprim–sulfamethoxazole. Incision and drainage of the right

breast abscess was done on day 2 of admission, and the abscess culture also revealed Group C *Salmonella* with the same sensitivity pattern. Both isolates were typed to be *Salmonella* Mbandaka by the Singapore National Public Health Laboratory. A lumbar puncture was not performed, as her parents did not consent to the procedure. Her urine culture was negative. Breast milk cultures were not done. All other investigations were unremarkable.

Her fever lysed on day 2 of admission. A repeat blood culture on day 3 of admission was negative. The antibiotic regimen was changed to ceftriaxone on day 4 for clearance of possible biliary carriage of NTS and for ease of intramuscular administration in view of poor venous access. The infant developed mild diarrhea (5 episodes of loose stools) on day 6 of admission. However, stool cultures were not done, as she was otherwise well. She was discharged well on day 9 after admission and completed 2 weeks of ceftriaxone followed by 1 week of oral trimethoprim–sulfamethoxazole.

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## Discussion

This case adds to the limited literature on pathogens and clinical management of infants with mastitis and breast abscess. Klar et al<sup>4</sup> previously reported a 15-month-old infant with Group C *Salmonella* mastitis, with the pathogen identified in stool and nipple discharge cultures. Although systemic manifestations of NTS are rare, our patient had both positive blood and abscess cultures with matching isolates. Unlike the infant with Group C *Salmonella* mastitis reported by Klar et al,<sup>4</sup> who had a preceding prolonged viral infection, our patient was previously well. NTS bacteremia can occur in otherwise healthy children concurrent with diarrhea, but focal complications are uncommon.

Several other cases of neonatal NTS infection associated with maternal mastitis and breastfeeding as well as expressed breast milk have been reported in the literature,<sup>5</sup> although neonatal mastitis was not a feature in these cases. It has been hypothesized that breast milk can be a source of infection through colonization of the mammary gland by way of migration of macrophages containing pathogens from the maternal gastrointestinal tract.<sup>5</sup> In our case, we were unable to determine if maternal breast milk was a source of infection. However, there was no significant maternal history of infection. Our case implies that a collection of blood cultures and a search for gastrointestinal pathogens should be conducted, in addition to cultures from the infected breast, when an infant with mastitis also presents with fever and gastrointestinal symptoms, such as diarrhea or emesis. In such cases, the empiric addition of an antibiotic with activity against Gram-negative bacteria, such as ceftriaxone, may be warranted, in addition to coverage for the most common pathogen, *Staphylococcus aureus*.

The length of antibiotic treatment in cases of mastitis varied from 7 to 14 days in one review, with incision and drainage performed in cases that had abscess formation.<sup>2</sup> A longer duration of antibiotic therapy was prescribed for our patient in view of the presence of both invasive NTS and breast abscess, and also because a lumbar

puncture to exclude meningitis could not be performed. The infant responded well to surgical intervention and antibiotics. This suggests that infant mastitis with abscess can be adequately treated with surgical intervention together with appropriate antibiotics guided by available cultures and susceptibility test results. A longer duration of antibiotic therapy may be necessary in cases where meningitis cannot be excluded.

## Author Contributions

SXFV contributed to the design, analysis and interpretation of data and drafted the manuscript. NJHA, TKC, TNWS, MM and CCY contributed to the analysis and interpretation of data and critically revised the manuscript. TNWH contributed to the conception, design, analysis and interpretation of data and critically revised the manuscript.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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