

Does Lanolin Use Increase the Risk for Infection in Breastfeeding Women?

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Background: Use of lanolin has become a breastfeeding cultural norm, although the evidence is conflicting on its safety and efficacy. Little to no evidence is available on the relationship between lanolin and infection.

Methods: This is a feasibility study, using case-control, retrospective chart review, examining lanolin use and the development signs and symptoms of nipple or breast infection in breastfeeding mothers with nipple pain. Fungal infection versus bacterial infection was suspected according to the corresponding effective treatment.

Results: Lanolin users were suspected to have a 62% infection rate, as compared to non-lanolin users at 18%, odds ratio 7.5 (95% CI 2.4–23.4). Although not significant, fungal infection may be more frequent than bacterial infection based on effective corresponding treatment.

Conclusion: A randomized controlled trial is called for to determine if frequent lanolin use increases the risk of nipple or breast infection.

Keywords: nipple pain, lanolin, bacterial infection, fungal infection

Breastfeeding women may experience nipple and breast infections causing pain severe enough to alter the breastfeeding relationship. Nipple pain and nipple wound healing are areas of nonconsensus among medical and lactation professionals, which may result in delay of symptom relief, endangering the likelihood of continued breastfeeding (Wilson-Clay & Hoover, 2008). Moist wound healing, usually by applying lanolin after every feeding, is a common recommendation for nipple trauma (Betzold, 2005). However, the association between lanolin and infections has not been established. Does lanolin use by breastfeeding women increase the risk of infection? Does it specifically increase the risk of fungal infection? Could antibiotic use further increase this risk?

Background

Nipple Areolar Complex

The nipple and areola are self-lubricating structures. The nipple is composed of mesenchymal smooth muscle cells covered in epithelial cells and contains sebaceous and apocrine sweat glands (Lawrence & Lawrence, 2011).

Like all skin, the nipple and areola breathe and perspire. The areola is circumscribed with Montgomery glands, which secrete lubrication to protect the entire nipple-areolar complex (Lawrence & Lawrence, 2011). The nipple and areola do not require creams and lotions because these substances will reduce the amount of air circulation to the skin, and secretions from the Montgomery glands may provide the baby with a smell aiding in nipple location (Lauwers & Swisher, 2010). The lymph system of the breast drains from the

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cutaneous area through the breast to the parasternal and axillary nodes (Lawrence & Lawrence, 2011).

Infections

There are multiple causes of nipple infections and mastitis. This article will focus on two common pathogens: *Candida albicans* and *Staphylococcus aureus*. *Candida* colonizes the skin, gastrointestinal tract, and vagina; favoring warm, moist areas; and is found in the mouths of most infants (Osterman & Rahm, 2000). With a 32% average cesarean-section rate nationally (Menacker, 2010), and 10%–30% of women being Group B *Streptococcus* positive (Centers for Disease Control and Prevention, 2010), it could be calculated that approximately 30%–60% of women are receiving intravenous antibiotic therapy at the time of birth, placing them at risk for secondary fungal infections.

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Box 1. Clinical Presentation

Amy D. is a 26-year-old G1P1 breastfeeding Delilah, a 3-week-old girl. Latch had been uncomfortable, but tolerable. She presents with worsening left nipple pain. The right nipple is pain free. The left nipple is red, flaky, tender between feedings, and cracked, with red streaks extending into the breast tissue. On history, she was treated with antibiotics in labor and uses lanolin after every feeding. The lactation consultant improved latch on the left side, recommended keeping the nipple clean and dry, and referred to the OB for evaluation, where she was prescribed dicloxacillin. The symptoms subsided for 1 week and returned bilaterally with painful, red, cracked nipples.

The incidence of vulvovaginal candidiasis after exposure to antibiotics is well established (Spinillo, Capuzzo, Acciano, De Santolo, & Zara, 1999) as well as the incidence of candiduria (Weinberger, 2003).

Candida infection makes the epidermis friable; skin breakdown may occur and barrier protection is lost (Wilson-Clay & Hoover, 2008). Fetherston (1998) found that candidiasis led to infectious mastitis in most cases. Dennis, Allen, McCormick, and Renfrew (2008) explain that breakdown in the tissue integrity of the nipple or areola expose the breast to symptoms of fungal or bacterial infection, including symptoms of a *Candida* infection. Osterman and Rahm (2000) found

that women experiencing lactation mastitis were most frequently colonized with *S. aureus*. It is noteworthy that methicillin-resistant *S. aureus* (MRSA) is also known to infect the breast and cause abscesses (Wilson-Clay, 2008).

Lanolin

Lanolin is produced by extracting sebaceous gland secretions from the wool of sheep. Various brands of lanolin nipple cream are sold at retailers and dispensed by healthcare personnel for breastfeeding mothers as a treatment for sore and cracked nipples. The use of lanolin as a nipple treatment has been normalized by retail marketing and healthcare providers. In a breastfeeding handout by the American College of Obstetricians and Gynecologists (ACOG, 2011), women are instructed to “apply 100% pure lanolin to your nipples after feeding” to “keep breasts healthy.”

The Food and Drug Administration (FDA) has not approved lanolin cream specifically for use on nipples, specifies that it is not for oral use and has not tested if it is fully absorbed into skin (Department of Health and Human Services, 2003). Purified lanolin products are marketed to breastfeeding mothers’ claim to “soothe and protect mom’s sore, cracked nipples,” and state their product is “completely safe for baby” (Lansinoh Laboratories, 2013).

Literature Review

Evidence regarding the effectiveness of lanolin is inconsistent. Studies that examine the relationship between lanolin use and breast infection as the main variable were not found. Studies on lanolin that incidentally measure infection report inconsistent findings. Some report more infections in lanolin groups, others in hydrogel, placebo, or expressed-breast-milk groups.

Dodd and Chalmers (2003) compared hydrogel dressings to lanolin, using 86 patient participants from two hospitals in separate locations within the U.S. They found eight incidences of mastitis and candidiasis, all from the lanolin group, with no infections in the group using hydrogel dressings. Although the eight incidences of infection were considered within normal limits, because nipple damage often leads to infection, the statistical analysis suggested that lanolin use was correlated with breast infection.

Brent, Rudy, Redd, Rudy, and Roth (1998) found the opposite. They compared hydrogel dressings to lanolin plus breast shells, measuring healing and pain. The lanolin-plus-breast-shells group had better results. However, patients with breast infections were excluded from the study, which was ended early because of a high rate of infections in the experimental group.

Melli et al. (2007) conducted a randomized controlled trial treating primiparous breastfeeding women’s nipples with peppermint oil gel, lanolin ointment, and placebo gels to prevent nipple damage and also concluded that nipple damage was best prevented using peppermint-oil-gel treatment and was more likely to occur among women using lanolin or placebo gel, although there was no statistical significance between the lanolin and peppermint groups. Infection was seen in the placebo group only.

A study by Abou-Dakn, Fluhr, Gensch, and Wockel (2011) showed that lanolin was more effective than expressed breast milk in reducing nipple pain and promoting tissue healing. Bacterial cultures were taken at enrollment, which grew physiologic skin flora and were not significantly different between the two groups.

There were cases of mastitis in the expressed-breast-milk group but not the lanolin group. However, no statistical analysis is given.

Dennis, Schottle, Hodnett, and McQueen (2012) evaluated the effectiveness of “All Purpose Nipple Ointment” (APNO) versus lanolin on damaged nipples. They found lanolin to be superior to APNO using a double-blind randomized controlled trial. Both mastitis and nipple Candida symptoms were measured at 12 weeks by self-report. Mastitis was reported in 4.1% of the APNO group and 2.7% of the lanolin group. Candida symptoms were reported in 8.1% of the APNO group and 11.0% of the lanolin group. This difference was not statistically significant.

Method

Sample

This is a feasibility study, using chart review to examine lanolin use and the development of signs and symptoms of nipple or breast infections in breastfeeding mothers with nipple pain. Fungal infection versus bacterial infection was suspected according to the corresponding effective treatment. A retrospective case-control study was

done using 131 charts, spanning a 2-year period, from the private lactation consulting practice of an International Board Certified Lactation Consultant (IBCLC). Confidence intervals were calculated using Epi Info.

Participants whose charts were included in the sample had already signed an optional consent allowing their anonymous clinical information to be used for research. Permission to perform the chart review was granted by the Dignity Health Sacramento-Sierra Regional IRB. All participants were adult, breastfeeding mothers, living within a 50-mile radius of Sacramento, California, between 2010 and 2012.

Table 1. Development of Nipple or Breast Infection Symptoms

Groups	Infection	No Infection
Lanolin	17	10
Non-lanolin	7	31

Antifungal treatments included *Nystatin*, *Monistat*, *Diflucan*, gentian violet, and probiotics. Clients being treated for suspected fungal infections treated their baby as well. Antibiotics included *dicloxacillin*, *cefazolin*, and

other prescription antibiotics. Nipple hygiene included hand washing, rinsing the nipples after feeding sessions, discontinuing topical treatments, and air drying the nipples. Nipple hygiene sometimes involved using coconut oil in place of lanolin, only if the client insisted she needed a topical moisturizer to tolerate breastfeeding.

Results

Of the sample of 131 client charts, 4 were excluded from the study because of insufficient follow-up data, 2 were excluded for plugged ducts, and 1 was excluded for an allergic reaction to lanolin, making the final sample size 124. The participants were socioeconomically homogeneous but racially diverse. The population was stratified by nipple pain. Thirty-eight mothers with nipple pain did not use lanolin, and 27 did use lanolin. In the non-lanolin group, 18% (n 5 7) developed signs of a nipple or breast infection. In the lanolin group, 62% (n 5 17) developed signs of a nipple or breast infection. Odds ratio 5 7.5 (95% CI 5 2.4–23.4; see Table 1).

All 17 clients in the lanolin group who developed signs and symptoms of infection were advised to discontinue lanolin. Of the 17, 47% (n = 8) resolved with antifungals, 35%

Data Collection

Four main data points were extracted: (a) nipple pain or trauma, (b) lanolin use, (c) development of signs and symptoms of nipple or breast infection, and (d) resolution of these symptoms with antifungals, antibiotics, or nipple hygiene. Nipple pain and trauma were noted by self-report or clinician assessment. Lanolin use was noted if used daily or more frequently. Infection was suspected by the presence of the following symptoms: nipple and areolar erythema with severe pain (burning, stabbing, between feedings), and/or severe breast pain with a fever and malaise. Plugged ducts that resolved mechanically were not suspected to be an infection.

Conclusion

Our preliminary data suggest that lanolin use may increase the risk for infection. Fungal infection was suspected to be the most frequent pathogen. This study

antibiotics, and 17% (n = 3) resolved with nipple hygiene.

One-way ANOVA was not significant (see Table 2).

Table 2. Resolution of Nipple or Breast Infection Symptom in the Lanolin Group

Resolved With	Lanolin Group
Antifungals	8
Combination of antifungals and antibiotics	6
Nipple hygiene	3

Clinical Lactation, 5(1), 2014
(n = 6) resolved with a combination of antifungals and

Discussion

The IBCLC should provide evidence-based guidance. The evidence at this time is conflicting and not sufficient to determine if lanolin use is related to infection. Although some clinicians believe that wound healing may be hastened with lanolin, the wound itself is an entry point for pathogens. The authors hypothesized that lanolin and moist-wound healing may be providing an environment ideal for bacterial and fungal growth. Research is needed to evaluate this relationship and to examine causation. The potential for infection must be ruled out prior to making lanolin standard practice.

Although our sample was too small to show significance, many of the participants had symptoms of fungal infection. Research is needed to determine if lanolin applied to nipples, coated with a baby's oral flora, becomes a growth medium for *Candida*. Clinicians treating women for nipple and breast infections should obtain a history of intrapartum antibiotic use. Altered flora from antibiotics, plus a history of frequent lanolin use, should trigger an assessment for nipple or ductal candidiasis.

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is limited by the small convenience sample. Also, we were unable to control for hand hygiene; because lanolin is applied with the fingers, this is an important confounder. This data shows the feasibility of a larger randomized controlled trial to determine the relationship between lanolin use and infection. Women would be enrolled prenatally and assigned to a group at birth. One group would be assigned to lanolin use after each feeding, a second group assigned to no topical treatments, and both followed for development of infection. The groups should be stratified by broken skin, peripartum exposure to antibiotics, and type of infection. Standardized instructions, such as hand hygiene and standardized lactation support, should be given to both groups. The results of such a study would greatly benefit the evidence base for lactation consultants.

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