

1. Abnormal latch/suck dynamic

- *Suboptimal positioning.* Often cited as the most common cause of sore nipples, suboptimal positioning of the infant during a breastfeed can lead to a shallow latch and abnormal compression of the nipple between the tongue and palate.^{9–11} (II-2, III, III)
- *Disorganized or dysfunctional latch/suck:* The ability of an infant to properly latch and breastfeed is dependent, among other factors, on prematurity, oral and mandibular anatomy, muscle tone, neurological maturity, and reflux or congenital abnormalities, as well as maternal issues such as milk flow, breast/nipple size, and engorgement. Infants who are premature, have low oral tone, and reflux/aspiration or congenital anomalies that may be at risk for disorganized suckling.¹² (III) Evaluation of the infant for difficulty coordinating sucking and swallowing may be indicated.
- *Ankyloglossia* (tongue-tie), recognized in 0.02–10.7% of newborns, involves the restriction of tongue movement (projection) beyond the lower gum¹³ due to an abnormally short or thickened lingual frenulum. Poor tongue movement may lead to difficulty attaining a deep latch and is frequently associated with maternal nipple pain.^{14,15} (II-3, I) Factors such as breast fullness, milk flow, nipple size and elasticity, infant palate shape, and height affect the impact of ankyloglossia on the mother's nipples. Not all infants with ankyloglossia cause problems for the breastfeeding dyad.
- *Infant biting or jaw clenching at the breast:* Infants who bite or clench their jaws while breastfeeding may cause nipple damage and breast pain. Conditions that may lead to this behavior include clavicle fractures, torticollis, head/neck or facial trauma, mandibular asymmetry,¹⁶ oral defensiveness or aversion (e.g., infants force-fed with ridged nipples [teats]), tonic bite reflex, nasal congestion, a response to an overactive milk ejection reflex, and teething. (III)

2. Breast pump trauma/misuse

Because of the widespread use of breast pumps in many countries and the variability of consumer education, literacy, and support, there is significant potential for harm from breast pump use. In a survey in the United States, 14.6% of 1844 mothers reported injuries related to pump use.¹⁷ (II-2) Injury may be either a direct result of pump misuse or failure or an exacerbation of pre-existing nipple damage or pathology. Observing the mother while using the breast pump may clarify the cause(s) of trauma (i.e., improper flange fit, excessive high-pressure suction, or prolonged duration).

Dermatoses

Breast dermatoses such as eczematous conditions or, less commonly, psoriasis and mammary Paget's disease may be responsible for nipple and/or breast pain in lactating women. Any of these conditions may be secondarily infected with *Staphylococcus aureus*, causing impetiginous changes such as weeping, yellow crusting, and blisters.¹⁸ (III)

1. Eczematous conditions

These conditions can affect any skin, but are commonly seen on and around the areola in breastfeeding women. Attention to the distribution of skin irritation and lesions may help identify the underlying cause/trigger. Eczematous rashes vary considerably.

- *Atopic dermatitis (eczema):* This condition occurs in women with an atopic tendency and may be triggered by skin irritants and other factors such as weather and temperature change.¹⁹
- *Irritant contact dermatitis:* Common offending agents include friction, infant (oral) medications, solid foods (consumed by the infant), breast pads, laundry detergents, dryer sheets, fabric softeners, fragrances, and creams used for nipple soreness.¹⁸
- *Allergic contact dermatitis:* Common offending agents include lanolin, antibiotics (topical), chamomile, vitamins A and E, and fragrances.^{18,20} (III)

2. Psoriasis

Flares can occur during lactation sporadically (usually 4–6 weeks after the birth²¹ (III) or as a response to skin injury (koebnerization) from latch, suckling, or biting.

3. Mammary Paget's disease (Paget's disease of the nipple)

More common in postmenopausal women (60–80% of cases), but observed in younger women, this slow-growing intraductal carcinoma mimics eczema of the nipple. A unilateral, slowly advancing nipple eczema that begins on the face of the nipple is unresponsive to usual treatment, persists longer than 3 weeks, or is associated with a palpable mass should increase suspicion for Paget's disease.¹⁸ Other findings consistent with the diagnosis are ulceration, moist erythema, vesicles, and/or granular erosions.²² (II-2) Skin biopsy and referral for specialist treatment are necessary.

Infection

Although a number of studies have attempted to identify what, if any, microbe may cause persistent nipple/breast pain during lactation, the roles of bacteria and yeast remain unclear. Both *Staphylococcus sp* and *Candida* can be found on nipples and in breast milk of women with no symptoms.²³ (II-2) Additional theories suggest a role for virulence traits that make detection and elimination of potentially causative microbes extremely difficult. These include biofilm formation, consisting of bacteria alone^{24,25} (III, III animal/in vitro studies) or mixed species of *Staphylococcus sp* and *Candida*,^{26,27} (III, III animal/in vitro studies), as well as intracellular infection by small colony variants.²⁸ (III animal/in vitro studies)

1. Bacterial

- *Superficial bacterial infection in setting of skin trauma:* Infection secondary to damaged skin, especially around the nipple–areolar complex, is a common occurrence. Impetigo and cellulitis may occur alone or concurrent with an underlying dermatitis.¹⁸
- *Bacterial dysbiosis and lactiferous duct infection:* Bacterial overgrowth combined with biofilm formed by bacteria (possibly in conjunction with *Candida sp*) may lead to narrowed lactiferous ducts and inflamed