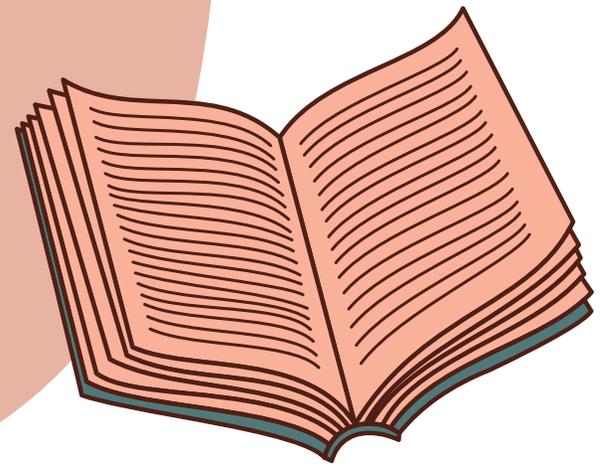


Foundations of Lactation

An introduction to concepts in sustaining lactation

Lactation Knowledge



Before we can understand what practices most benefit combo-feeding, we first have to understand what concepts drive and support lactation. Knowing how these concepts influence milk production can help guide you as you navigate what practices might be most beneficial for you.

This class covers three important components influencing milk synthesis:

- 1) Milk Storage Capacity
- 2) The Feedback Inhibitor of Lactation
- 3) The Circadian Rhythm of Prolactin

Lactation is highly individual, and relies on a number of complex mechanisms, largely regulated by reproductive hormones. This introductory class will help as you learn more about the nuance of lactation and how it applies to your individual goals and preferences.

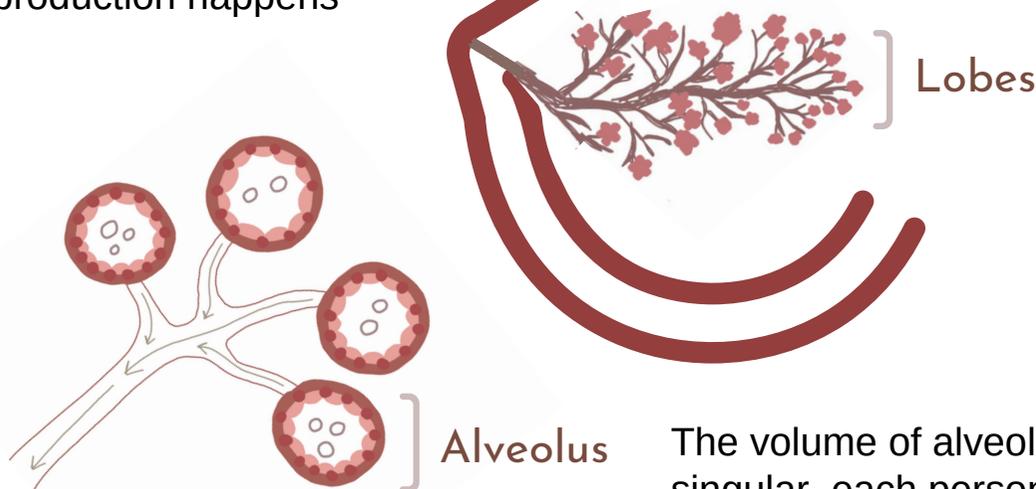
Milk Storage Capacity

Milk storage capacity is the highest volume of milk the breasts are capable of holding at any one time. For those who EBF, this capacity may be as low as 2.5-5 ounces in each breast, and is highly individual to each person.

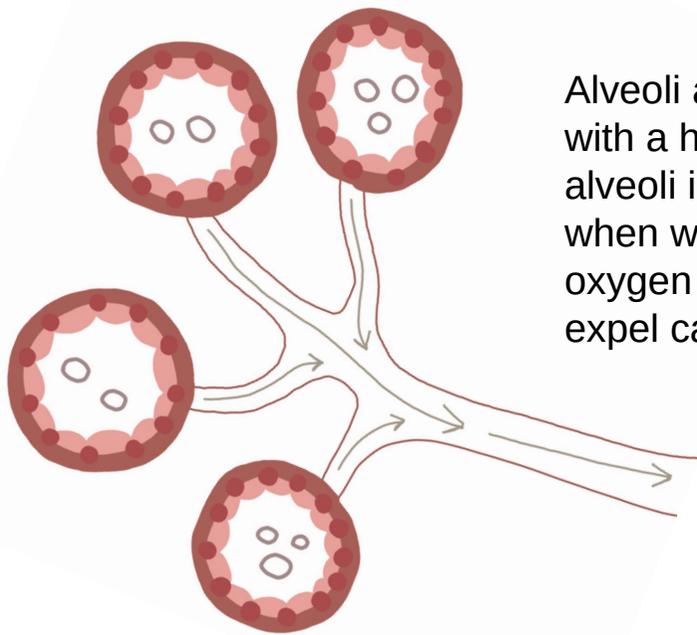
Capacity cannot be altered outside of puberty and pregnancy

Milk storage capacity is dictated by the volume of glandular tissue in the breasts, also called **lobes**.

These lobes are comprised of clusters of tiny cells called **alveoli**, which is where milk production happens



The volume of alveoli, or **alveolus** for singular, each person has in their breasts is unique to their own biology.



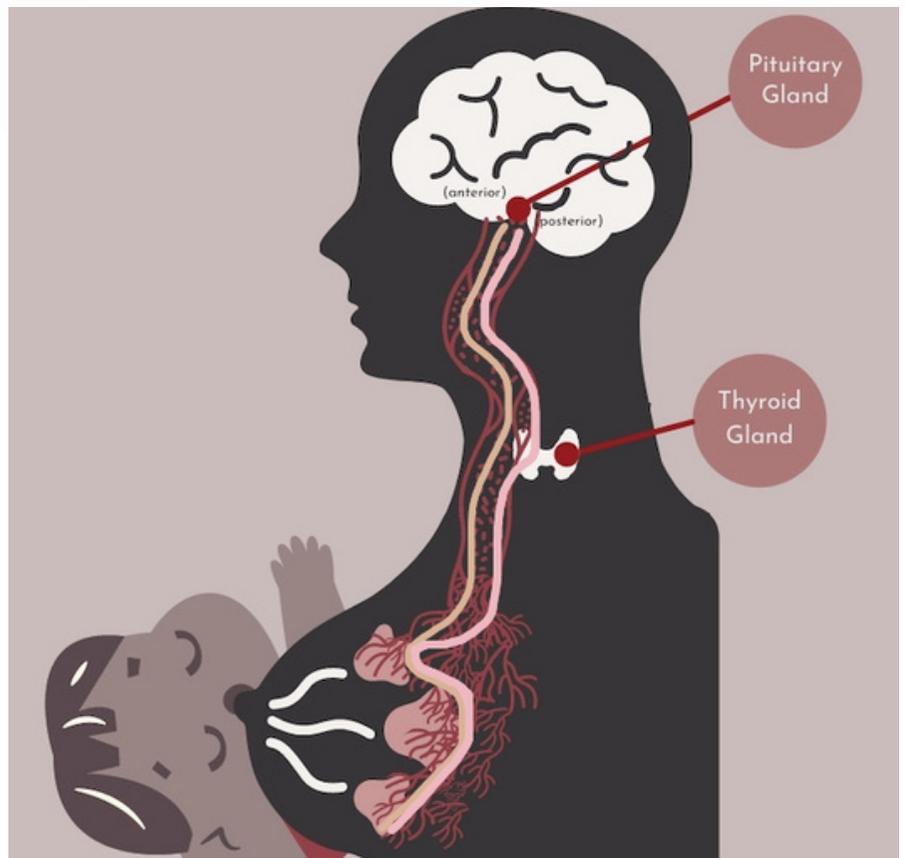
Alveoli are a type of cell. They're tiny, round sacs with a hollow interior, like a balloon. We have alveoli inside our lungs that enable breathing—when we inhale the alveoli expand and take in oxygen and when we exhale they shrink and expel carbon dioxide.

The alveoli inside the breasts function in a similar way but rely on **hormonal mechanisms** and cellular signaling to engage:

The mammary alveoli have **receptors** for prolactin and oxytocin that enable communication in the body.

When the **prolactin** receptors are signaled, more milk is made

When the **oxytocin** receptors are signaled, the alveoli contract and release the milk.



When the nipples are stimulated or milk is being drained from the breasts, a signal is sent to the brain's pituitary gland to release more prolactin and communicate with the alveoli's prolactin receptors to make more milk.

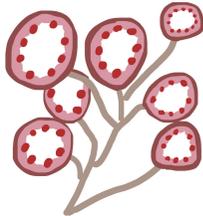
Milk storage capacity is dictated by the number of alveoli in the breasts.

Feedback Inhibitor of Lactation

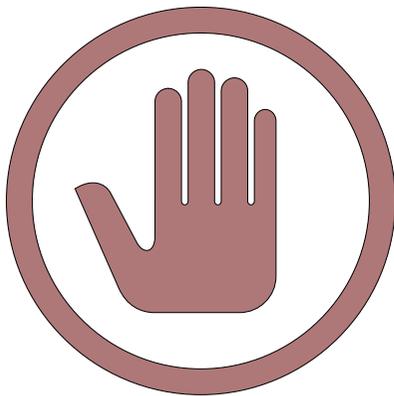
Though milk storage capacity dictates the highest volume of milk the alveoli can possibly hold at once, this isn't reflective of the volume of milk produced throughout daily breast draining.

Maximum storage capacity is only reached when the alveoli are engorged.

When we have a high volume of alveoli, our milk storage capacity is large



A small storage capacity means less volume of milk can be held in the breasts at once



As the alveoli fill with milk, milk production slows the closer in proximity it fills to its unique storage capacity. This is the result of a protein in breastmilk called the **Feedback Inhibitor of Lactation (FIL)**.

This protein acts as a protection mechanism: if milk production continued endlessly, our alveoli would rupture.

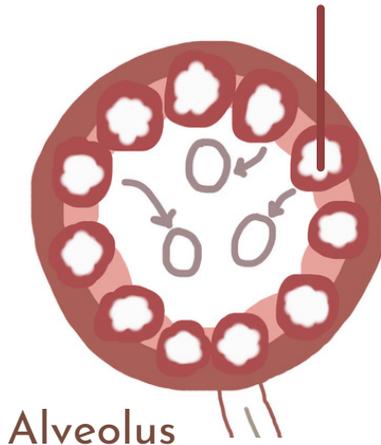
The function of FIL is to calibrate milk production to decrease the speed of milk synthesis or overall milk production if the alveoli are experiencing engorgement. It's also the mechanism responsible for the cessation of milk production (weaning).

↑ FIL in milk = ↓ lower levels of prolactin

When the breasts are drained, FIL levels are extremely low. As the alveoli are filling, FIL is also increasing in concentration. High levels of FIL create a blockade for prolactin communication with the alveoli; it's a stop sign for prolactin and milk production. The effects of FIL are temporary if high FIL concentration isn't happening regularly. In recurrent episodes of high FIL, prolactin receptors will be signaled to turn off.

This is how secondary low milk supply happens.

Prolactin sites (lactocytes)



Recurring elevated levels of FIL:

Prolactin receptor sites start to shut-down if not in use

With decrease in receptor sites, decreased prolactin and prolactin receptors lower milk production

To avoid the impacts of FIL and maximize milk production to your unique capacity, it means managing frequent breast draining to avoid close proximity to your milk storage capacity.

**FIL
controls
sustaining
lactation**



To avoid elevated FIL shutting down prolactin receptor sites, you can make adjustments to spacing slowly. This allows for gradual calibration that has a lower-risk of impacting prolactin receptor sites.

Circadian Rhythm of Prolactin



Milk storage capacity helps inform what frequency of feeding is beneficial to limit elevated FIL, but there are certain times in a 24-hour period where the body is more vulnerable to experiencing these high-FIL impacts.

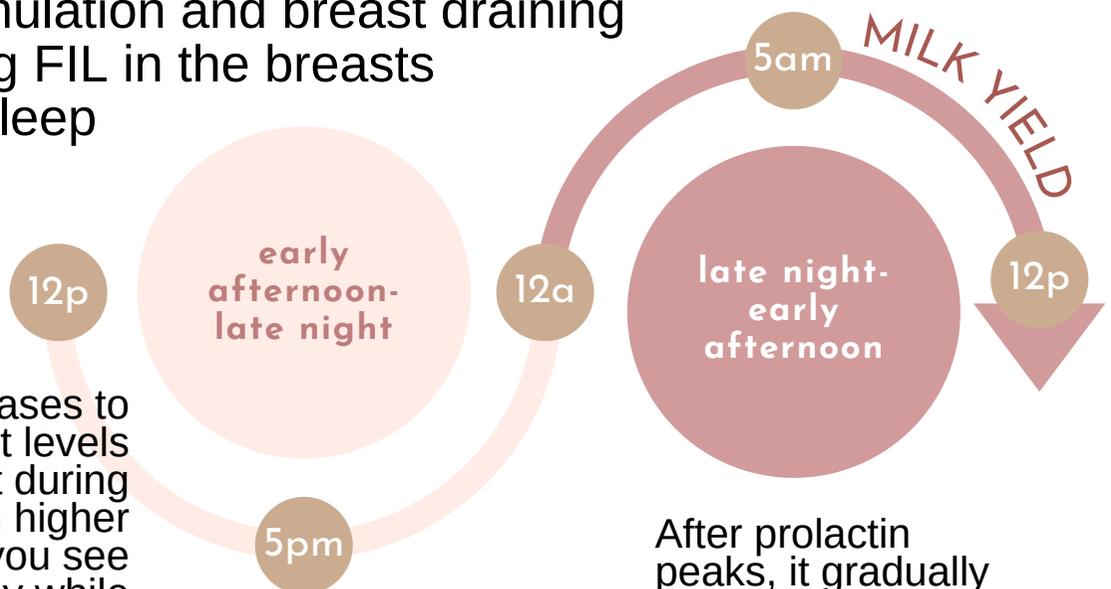
Milk production is also influenced by the **Circadian Rhythm of Prolactin**, and its influence on milk production.

During lactation, baseline prolactin in the body is higher. That baseline is increased in three different ways:

1. Nipple stimulation and breast draining
2. Decreasing FIL in the breasts
3. Maternal sleep

Prolactin variations mean milk volumes change throughout the day.

Prolactin increases to its highest levels overnight during sleep, even higher than levels you see during the day while frequently draining the breasts.



After prolactin peaks, it gradually decreases until rising again the following night.

How do we apply this to combo-feeding?



Applying Concepts

When we have an idea of milk storage capacity and the spacing windows between breast draining that sustain our supply, we can combo-feed in a way that supports and promotes lactation.

Making transitions slowly helps limit impact to our prolactin receptors.

For some, breast draining to support supply may outline draining the breasts every 2ish hours throughout the day and night



but if consistent and frequent breast draining feels like a barrier to continuing lactation, understanding when these drainings are most impactful is beneficial.

Takeaways to consider:

The most vulnerable windows of FIL impact are when your prolactin and milk yield are highest: from about 2a-10a

It's not uncommon to supplement more when your prolactin and milk yield are lowest: from about 4p-10p

Your lactation and milk production are unique to you, and finding the practices that feel most manageable for you is a huge factor in sustaining lactation.