Lactation and Breast Feeding
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Basic Breast Structure.

The breasts include the mammary glands, overlying skin and associated connective tissue – they are accessories to reproduction in women and are rudimentary in men. The mammary glands are modified sweat glands (which do not usually develop in men), and lie anterior to the pectoralis major and pectoralis minor muscles. They are separated from these muscles by just the pectoral fascia(1).

Lymphatic drainage is mainly into the axillary nodes and parasternal nodes which are common sites of breast carcinoma metastases, and as some of the medial breast drains lymph to the opposite breast this can be an explanation as to why breast carcinoma can be bilateral.

The blood supply to the breast is from several sources – the internal mammary arteries, the lateral thoracic arteries, the thoracoacromial arteries and the posterior intercostal arteries(2). Innervation is by the 4^{th} 5^{th} and 6^{th} intercostal nerves.

In women who are not lactating, the breast consists of mainly fat, whereas in lactating women the breast is predominantly glandular tissue(1). There are several suspensory ligaments of the breast (also known as Cooper's ligaments) which connect the pectoral fascia to the overlying skin of the breast. This can be of clinical significance as in certain breast carcinomas the added weight of the tumour can pull on the ligaments and cause a visible pitting of the overlying skin referred to as skin tethering.

The functional units of the breast are the acini, also known as the alveoli(3) which are lined by epithelium and myoepithelium. The acini are arranged like a bunch of grapes – many acini connect to one duct which opens out directly onto the nipple. There are traditionally thought to be around 15-20 lactiferous ducts which each open independently onto the nipple(1), although several studies have suggested a greater variability in the number(4). Towards the opening, each duct has a dilation called the lactiferous sinus which is also an area that is being questioned – a study in 2005 by Ramsay et al investigated the female breast by ultrasound and suggested that they may not be present at all(4). On the exterior of the breast surrounding the nipple is a pigmented area of skin which commonly darkens permanently during a woman's first pregnancy(5). This area is referred to as the areola and it contains modified sebaceous glands called Montgomery's glands for lubrication during breast feeding.

Lactation Physiology.

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The term lactation refers to the production of milk (an apocrine secretion) in the female breast(5). It is dependent on high concentrations of the hormone prolactin from lactotropes in the anterior pituitary gland(6). There is a significant increase in the number of lactotropes during pregnancy, so much so that the anterior pituitary almost doubles in size(5). During pregnancy high levels of progesterone and oestrogens make the acini of the breast resistant to prolactin even though levels are steadily rising. After birth, there is a sudden decline in the sex steroids progesterone and oestrogen and lactation can begin. Prolactin is no longer inhibited and is released in a pulsatile fashion 7-20 times every 24 hours(7), the majority of which is released when the woman is asleep. The act of the infant suckling on the breast maintains levels of prolactin, therefore allowing lactation to continue(6) (see figure 1). When the nipple is stimulated this also inhibits dopamine release which is another hormone which usually suppresses prolactin(7).

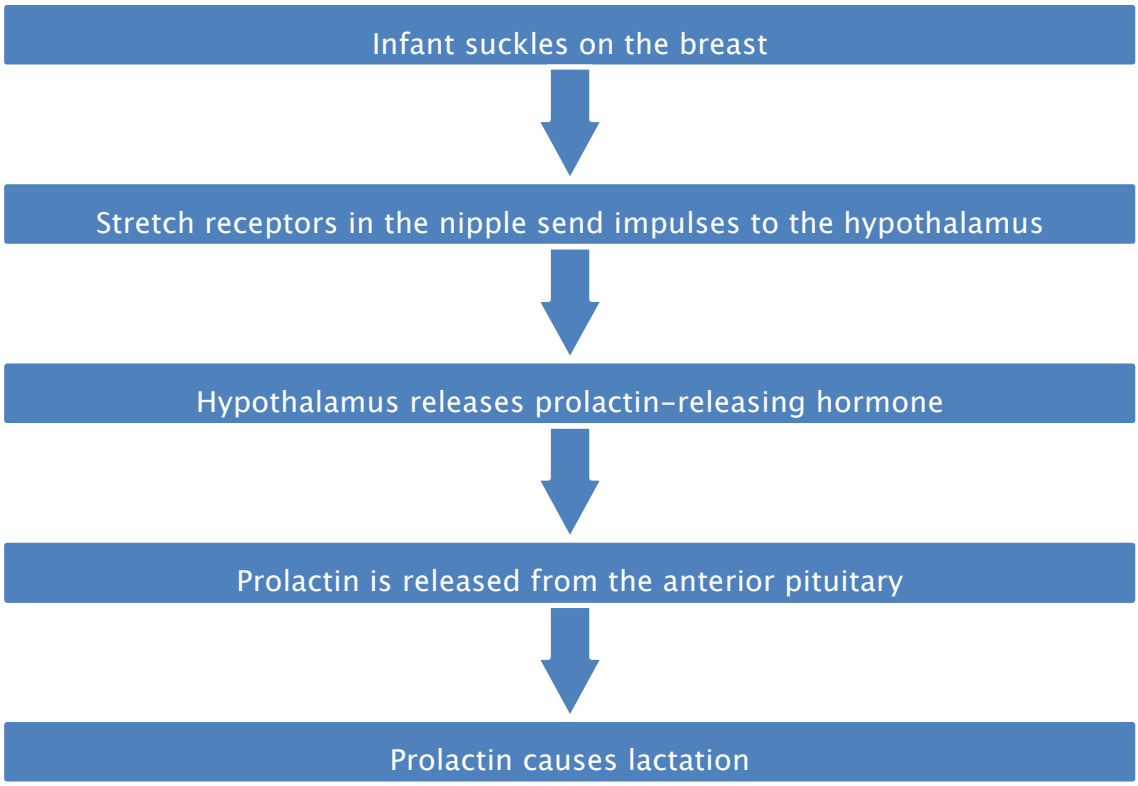

Figure 1 – Flow chart showing the effect of infant sucking on lactation.

There are two stages of lactogenesis(3). Stage one occurs by mid-pregnancy – the mammary gland differentiates so that it has the potential to secrete milk and women often experience a few drops of milk on the nipple during the second and third trimester. Breast size usually increases during lactogenesis stage 1 as the alveoli differentiate into secretory cells for milk production. Stage two occurs at

delivery when the placenta (the source of progesterone) is removed meaning that milk secretion is no longer inhibited.

Breast Feeding.

Milk production is mainly controlled by prolactin, whereas milk ejection is aided by the hormone oxytocin. When the infant suckles, the hypothalamus also causes the posterior pituitary to release oxytocin which is carried in the bloodstream and causes the myopeithelium lining the ducts to contract, therefore releasing the milk. This mechanism is often referred to as the milk let-down reflex(5).

Oxytocin release can be inhibited by catecholamines which means that stress, fear and anxiety can prevent milk ejection even if the breasts are full(5). The reflex can also be conditioned over time, so that even the sound of the baby's cry can trigger the ejection of milk which could cause an unwanted leakage. It is also common for both breasts to lactate at the same time when the baby is only suckling on one.

Breast feeding seems to be a very different experience between women, for example women describe the sensation of breast feeding very differently – some women find it painful whereas others cannot feel much at all. There is also a significant psychological impact associated with breast feeding that should be noted – it has been suggested that breast feeding helps mother and baby bond, and new mothers commonly get a sense of failure when having problems with breast feeding.

Advantages of Breast Feeding.

It is commonly stated that "breast is best" – the NHS supports this by stating that:

- Breast milk protects the baby
- It is always at the correct temperature
- It is available wherever and whenever the baby needs it
- It's the cheapest option
- It gives a woman a great sense of achievement
- It also provides health benefits to the mother(8)

It is true that breast milk offers a certain degree of protection to the baby that formulas cannot – the newborn is provided with 0.25-0.5g of IgA antibodies per day which helps to protect the mucosal membranes(9). At birth, babies are deficient in IgA therefore it can be explained why breast-fed babies tend to have lower rates

of infection than those who are not. It is also stated by Cancer Research UK that although the reasons are not fully understood, breast feeding decreases the mother's risk of developing breast cancer in the future(10).

The Composition of Breast Milk.

The composition of breast milk varies between women, and also varies throughout the day. It is high in cholesterol and lactose, and also contains variable amounts of oligosaccharides, protein, fat, and certain minerals and vitamins. There is usually about 800ml of milk produced per day in a woman feeding one baby, and the energy content of the milk is around 27kJ/L. In the first few days after giving birth, however, the mother produces a substance called colostrum which is different – about 100ml/day is produced and it is much higher in IgA, phospholipids and cholesterol but is much lower in lactose than mature milk(5). The baby generally loses weight in the first week, which is reflected in the NHS baby weight charts – measurements of infants' weight starts from day seven(11). In the second week, the milk turns from colostrum to mature milk – this substance is known as transitional milk. In women who have given birth prematurely, this process is much slower and it has been suggested that this reflects the infant's digestive abilities. There is, however, a lack of vitamin D in breast milk, meaning that it is important for infants to get frequent exposure to the sun(5).

Breastfeeding uses around 500 calories per day so can help the mother to lose weight after giving birth. It also acts as a form of contraception due to the hormonal changes involved, although this is not reliable. After a woman stops breast feeding, the mammary gland involutes and returns to its pre-pregnancy state by undergoing cell death and remodelling (the secretory epithelium dies and is replaced by adipocytes)(12). This process is referred to as postlactational involution, whereas lobular involution is a separate process by which the breast epithelial tissue is lost due to ageing(13). After the mammary glands have undergone postlactational involution, they cannot secrete milk unless the female becomes pregnant again, therefore marking the end of lactation.

Mothers who have intrauterine deaths or those who do not wish to lactate can be given bromocriptine or cabergoline to suppress lactation.

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