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DEPARTMENT: HUMAN NUTRITION AN DIETETICS

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 COURSE: ENDOCRINE PHYSIOLOGY

PHYSIOLOGY OF GESTATION AND LACTATION IN PREGNANT WOMEN

 SOLUTION

 **OVERVIEW**

 The physiology of lactation is a process which begins to take effect before the initial latch of a new born infant. Lactation deals with the secretion and yielding of milk by females after giving birth. The milk is produced by the mammary glands, which are contained within the breasts. It requires the breast to change in composition, size, and shape during each stage of female development. Development includes puberty, pregnancy, and lactation. These stages are influenced by physiologic changes that are crucial to successful breastfeeding. The changes that occur in a woman's body during pregnancy may be compared to a revolution. The foetus imposes unique demands on maternal physiology, which undergoes profound changes during pregnancy. A considerable number of adjustments take place in most of the maternal organ systems. Such changes are needed to promote foetal growth and prepare the woman's body for delivery and lactation. Growth of the foetus and enlargement of the maternal body causes weight gain, this increase is due to the conceptus (i.e., placenta, fetus, and amniotic fluid) and maternal components (e.g., uterus, breasts, blood volume, protein, fat storage, and extracellular fluid).

 **PREPARATION FOR LACTATION AND MILK PRODUCTION**

During the fifth or sixth month of pregnancy, the breasts are ready to produce milk. Galactopoiesis is the maintenance of milk production. This stage requires prolactin and oxytocin. During the fifh month of pregnancy, the woman’s breasts enter into the lactogenesis I stage. This is when the breasts make colostrum, a thick, sometimes yellowish fluid. It is at this stage that high levels of progesterone inhibit most milk production. At birth, prolactin levels remain high, while the delivery of the placenta results in a sudden drop in progesterone, estrogen, and human placental lactogen levels. Prolactin is a polypeptide hormone synthesized by lactotrophic cells in the anterior pituitary and is structurally similar to growth hormone and placental lactogen. Prolactin stimulates mammary gland ductal growth and epithelial cell proliferation and induces milk protein synthesis. Emptying of the breast by the infant's suckling is thought to be the most important factor. Prolactin concentration increases rapidly with suckling of the nipple which stimulates nerve endings located there.

Oxytocin is involved in the milk ejection or letdown reflex. The tactile stimulation of the nipple-areolar complex by suckling leads to afferent signals to the hypothalamus that trigger release of oxytocin. This results in contraction of the myoepithelial cells, forcing milk into the ducts from the alveolar lumens and out through the nipple. Oxytocin also has a psychological effect, which includes inducing a state of calm, and reducing stress. It may also enhance feelings of affection between mother and child, an important factor in bonding.

 This abrupt withdrawal of progesterone in the presence of high prolactin levels stimulates the copious milk production of the lactogenesis II stage.

When the breast is stimulated, prolactin levels in the blood rise and peak in about 45 minutes, then return to the pre-breastfeeding state about three hours later. The release of prolactin triggers the cells in the alveoli to make milk. **Organ Systems Involved**

The Normal lactation involves the female breast, anterior lobe of the pituitary, and the posterior lobe of the pituitary. Their functions are described below:

The decision to breastfeed or to provide breast milk is a decision that every mother must make. Breast milk provides ideal nutrition for infants with vitamins, proteins, and fats that are more easily digested than formula. Breast milk also contains antibodies from the mother that help babies fight off viruses and bacteria. Other anti-infective factors it provides include immunoglobulin, white blood cells, whey protein, and oligosaccharides. It also lowers the baby's risk of asthma, allergies, ear infections, respiratory illnesses, bouts of diarrhoea, and the risk of diabetes and obesity.

 Therefore, Lactation is maintained by regular removal of milk and stimulation of the nipple, which triggers prolactin release from the anterior pituitary gland and oxytocin from the posterior pituitary gland.

The normal development of the female breast is the foundation for mammogenesis, lactogenesis, and lactation. Clinicians who possess an understanding of the physiology of lactation will have the tools necessary to educate their patients to maximize chances of successful breastfeeding.

**NUTRITIONAL REQUIREMENTS FOR LACTATION**

The physiology of pregnancy prepares a woman's body to lactate and breastfeed. Preparation for breastfeeding begins during prenatal care and includes evaluation for nutritional risk factors.

A**.**CaloricNeeds

B**.**Components

C. Vitamins and Minerals

D. Substances to Avoid

Low levels of alcohol intake (one or two drinks per day) may not affect breast milk production, but breast milk levels of alcohol are similar to maternal serum concentrations. Caffeine also is expressed in breast milk. Two to three cups of coffee per day do not appear to affect infants, but more than three cups of coffee per day may result in an irritable awake infant.

**PHYSIOLOGY OF A NORMAL PREGNANT WOMAN**

A woman will produce more oestrogen during one pregnancy than throughout her entire life when not pregnant. During pregnancy, oestrogen promotes maternal blood flow within the uterus and the placenta. The uterus

After conception, the uterus provides a nutritive and protective environment in which the fetus will grow and develop. It increases from the size of a small pear in its non-pregnant state to accommodate a full-term baby at 40 weeks of gestation. The tissues from which the uterus is made continue to grow for the first 20 weeks, and it increases in weight from about 50 to 1,000 gm (grams). After this time, it doesn’t get any heavier, but it stretches to accommodate the growing baby, placenta and amniotic fluid. By the time the pregnancy has reached full term, the uterus will have increased to about five times its normal size:

In height (top to bottom) from 7.5 to 30 cm, In width (side to side) from 5 to 23 cm, In depth (front to back) from 2.5 to 20 cm.

At 12 weeks’ gestation (near the end of the first *trimester*, i.e. three-month period), the **fundus** (upper margin of the body of the uterus) may be palpated (felt) through the abdomen above the pubic bone (symphysis pubis). The size of the uterus usually reaches its peak at about 36 weeks’ gestation .

The cervix remains 2.5 cm long throughout pregnancy. In late pregnancy, softening of the cervix occurs in response to increasing painless contractions of its muscular walls. The vagina also becomes more elastic towards the end of pregnancy. A pregnant woman’s entire posture changes as the baby gets bigger. Her abdomen transforms from flat or concave to very convex increasing the curvature of her back. The weight of the fetus, the enlarged uterus, the placenta and the amniotic fluid together with the increasing curvature of her back, puts a large strain on the woman’s bones and muscles. As a result, many pregnant women get back pain. Too much standing in one place or leaning forward can cause back pain, and so can hard physical work. Most kinds of back pain are normal in pregnancy, but it can also be a warning sign of a kidney infection. Pregnant women may be at greater risk of sprains and strains because the ligaments are looser, and because their posture has chang. During pregnancy, the amount of air moved in and out of the lungs increases due to two factors which are each breath contains a larger volume of air and the rate of breathing (breaths per minute) increases slightly.

During pregnancy, many women find they get short of breath. This is because the growing baby crowds the mother’s lungs and she has less room to breathe. But if a woman is also weak and tired, or if she is short of breath all of the time, she should be checked for signs of sickness, heart problems, anaemia or poor diet. Needing to urinate often is normal, especially in the first and last months of pregnancy, because the growing uterus presses against the bladder. At night, the bladder fills more quickly as fluid that collected in the legs during the day is re-absorbed. Changes in the woman’s hormones, and mechanical stretching of her growing abdomen and breasts, can cause stretch marks in the skin of these areas during pregnancy. Other skin changes may include brown pigmentation and increased sweating. In the second trimester, the breasts begin to produce colostrum — a yellowish secretion that thickens as pregnancy progresses. It is rich in proteins and maternal antibodies, and should always be fed to newborn babies.

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