Certified Fertility Counselor Course-Session 6- Luteal Phase and Hormones

What is a Luteal Phase?

The luteal phase (loo-tee-uh-l) is the latter part of the menstrual cycle, and is named after the Corpus Lutuem, which means yellow body in Latin. This is the phase that most women who are trying to conceive pay close attention to. Once the mature egg departs from the follicle, the follicle immediately starts forming and eventually flattening into what's called the Corpus Luteum Cyst. The pituitary hormones Follicle Stimulating Hormone and Luteinizing Hormone cause the remaining parts of the follicle to transform. It continues to grow for a period of time after ovulation, and produces two main hormones, progesterone and estrogen. Progesterone is produced in large amounts, while estrogen is produced in smaller amounts.

A luteal phase is different for each individual. However, for that particular person without fertility complications a luteal phase will stay consistent, but could vary by a day or two every so often. Most average luteal phases are fourteen days in length. This is because the hormones produced by the Corpus Luteum also suppresses the production of the two hormones FSH and LH that the Corpus Luteum needs to maintain itself. With continued low levels of FSH and LH, the Corpus Luteum will start to decrease and slowly die. With the decreasing size of the Corpus Luteum, progesterone and estrogen also start to fall, and trigger the end of the luteal phase, starting a new menstrual cycle.

Length of a Luteal Phase

The average length of a Luteal Phase is fourteen days. This gives the conception and implantation process the time that it needs to complete the stages of a beginning pregnancy. There are times where a luteal phase for certain women is under fourteen days. The best and more accurate way in finding out how long a luteal phase is, is by using the basal body temperature method. A luteal phase with the length of twelve to sixteen days is in the normal range. A luteal phase under ten days is called a Luteal Phase Defect.

Luteal Phase Defect (LPD) and its Causes

A luteal phase defect is when the corpus luteum disintegrates or starts to die off too soon in the luteal phase. Too soon meaning before implantation of the developing embryo can implant into the uterus. If trying to conceive, this can be an issue, however most of the time it can be corrected.

Having a shorter luteal phase, such as twelve days is not a luteal phase defect, although spotting prior to a new menstrual cycle starting can be problematic with a shorter luteal phase. This is because the progesterone starts to drop too soon in the luteal phase before implantation has a chance to take place, and progesterone levels are what supports the newly implanted embryo. The endometrium also has to develop nutrients from progesterone for the developing embryo, without these, the embryo will not attach properly. When spotting does occur too soon in the luteal phase it is best to have a progesterone blood test done, known as P4. This will help determine if the corpus luteum is producing enough progesterone production to sustain a potential pregnancy.

Another cause of a luteal phase defect is early or later ovulation. Studies have shown that ovulating before day ten, or very late, after day twenty shows poor follicle development and insufficient levels of follicle stimulating hormone, and luteinizing hormone.

However, a luteal phase can be over twelve to fourteen days, and still have a luteal phase defect. Other than poor follicle development, the lining has a large role as well. After ovulation, the endometrial lining continues to grow and to change. This phase of that development is controlled by the Corpus Luteum. By about the seventh day after ovulation the endometrium should be prepared to nurture an embryo during implantation. Given the timing of when implantation takes place is largely dependent on the hormonal support that the endometrial lining receives from the corpus luteum. If the corpus luteum is not functioning correctly, the development of the endometrial lining can take place out of synch with ovulation. The lining may either be prepared too early or too late to receive the fertilized blastocyst.

Women who stop taking birth control pills may have a luteal phase defect. Sometimes this lasts a few cycles, some could take longer. Women who are breast feeding could also be at risk for a luteal phase defect, while breast feeding prolactin levels are elevated which not only can stop ovulation, but can also prevent enough progesterone from being secreted.

Athletes have a higher risk of a luteal phase defect. As many as 48 percent of women considered to be “recreational” athletes were affected by low progesterone. Unfortunately a luteal phase defect is found in up to 10 percent of women with infertility, and 35 percent who experience recurrent miscarriages.

Abnormally low cholesterol levels can result in low to no progesterone production at all. All hormones including progesterone need cholesterol in order to be produced by the body. Those who are underweight can be at risk due to low cholesterol and body fat levels.

Misfiring of the follicle can also happen and turns into a luteal phase defect. This happens because the developing follicle matures as it should, but fails to release an egg, thus resulting in the corpus luteum partially developing, and turning into a Follicular cyst. Yet at the same time it is releasing very small amounts of progesterone. When this happens, a period may be very light or even not at all, premenstrual symptoms may be more pronounced, and one may experience even hot flashes.

Summing it up: Three Main Causes to Luteal Phase Defect

There are three main causes to a luteal phase defect.

1. Poor follicular production occurs in the first half of the cycle (Follicular phase). Many women do not produce a normal level of FSH, or the ovaries do not respond strongly to the FSH, leading to inadequate follicle development. Since the follicle ultimately becomes the corpus luteum, poor follicle formation leads to poor corpus luteum quality. Resulting in the poor corpus luteum producing inadequate progesterone, causing the uterine lining to be adequately prepared for implantation of the embryo. Progesterone levels may drop early and menstruation will arrive sooner than expected.

2. Premature failure of the corpus luteum can occur even when the initial quality of the follicle/corpus luteum is adequate. In some women the corpus luteum sometimes does not persist as long as it should. In this case initial progesterone levels at about five to seven days past ovulation will be low, even if they are adequate, the levels drop precipitously soon after, leading to the early onset of a menstrual period.

3. Failure of the uterine lining to respond can occur even in the presence of adequate follicle development and a corpus luteum that persists for the appropriate length of time. In this condition the uterine lining does not respond to normal levels of progesterone. Therefore if the embryo tries to implant the uterine lining will not be adequately prepared and implantation will likely fail.

The Corpus Luteum

The corpus luteum which in Latin is “yellow body” is a endocrine structure that involves in the production of high levels of progesterone and moderate levels of estrogen and inhibin A. It's colored due to the concentrating carotenoids from the diet and secretes a moderate amount of estrogen to inhibit further release of the GnRH hormone (gonadotropin releasing hormone) and secretion of Luteinizing hormone, and FSH (follicle-stimulating hormone).

The corpus luteum develops from the follicle during the luteal phase. The follicle forms a corpus hemorrhagicum before it becomes the corpus luteum. Hemorrhagicum refers to the visible collection of blood after the rupture of the follicle that secretes progesterone. The corpus luteum remains in the ovary.

Minor bleeding from the follicle into the abdominal cavity may cause irritation and lower cramping pain. The granulosa and theca cells of the follicle lining promptly begin to proliferate, and the clotted blood is rapidly replaced with yellowish lipid rich luteal cells.

Corpus luteum cells develop from the follicular cells surrounding the ovarian follicle. The follicular cells luteinize into small luteal cells, and follicular granulosa cells luteinize into large luteal cells forming the corpus luteum. The hormone progesterone is synthesized from cholesterol by both the large and small luteal cells upon luteal maturation. Cholesterol complexes bind to receptors on the plasma membrane of luteal cells and are internalized. Cholesterol is released and stored within the cells as cholesterol ester. Large luteal cells produce more progesterone due to uninhibited/basal levels within the cell. Small luteal cells have LH receptors that regulate within the cell.

The development of the corpus luteum is accompanied by an increase in the level of a steroidogenic enzyme that converts cholesterol to pregnenolone in the mitochondria. Pregnenolone is then converted to progesterone that is secreted out of the cell and into the blood stream. Growth of the corpus luteum depends on its developing an adequate blood supply.

The corpus luteum is typically very large relative to the size of the ovary, the size ranges from under 2cm to 5cm in diameter.

If conception and implantation occur and are successful, the corpus luteum then supplies the embryo with progesterone sustaining the new pregnancy until the placenta starts producing

progesterone around eight to twelve weeks or pregnancy. To which at that time, the corpus luteum will then dissolve. If there is no conception, the corpus luteum (now corpus albicans) begins to degenerate about four days before the next new cycle.

Progesterone Hormone

Progesterone is in small amounts during the follicular phase of the menstrual cycle at a level of 0.9ng/mL, however during the luteal phase the large amounts secreted by the corpus luteum cause ovarian secretion to increase about 20 fold. The increase of progesterone is what causes the basal body temperature to remain high.

Progesterone is important to a number of body functions. During times of stress or chronic conditions of chronic adrenal hyper-stimulation, progesterone is capable of being converted into the stress hormone cortisol. This explains why women tend to feel tired and sometimes in pain, because their cholesterol is high. Her body will create more cholesterol to help handle all the stress and inflammation in the body by being a precursor for the body's natural cortisone.

When someone goes through chronic stress or sever long term stress, the hypothalamus will at first trigger an over production of the adrenal hormones (especially cortisol and DHEA), this eventually leads to adrenal weakness, a state in which the exhausted adrenals cannot respond adequately. Most are fatigued, crave carbohydrates, and salty foods if this happens.

The function of the liver also affects the secretion of progesterone. If the liver is congested, it will not function as it should and will not metabolize and eliminate hormones. Sometimes constipation is a sign of this.

Progesterone is also known as P4, and is a steroid hormone belonging to a class of hormones known as progestogens. Progesterone signals the sperm to move towards the egg as it moves through the fallopian tubes for fertilization. This hormone also prepares the endometrium to its secretory stage to prepare for implantation. While these changes are happening, progesterone also affects the vaginal cervical mucus making it thick and impenetrable to sperm.

It's hard to say who's at risk for inadequate progesterone deficiency. Progesterone deficiency can be associated with the faulty secretion of FSH, LH, or even prolactin and is often linked to endometriosis. Symptoms of inadequate progesterone would include lumpy breasts, anxiety, irritability, fatigue but unable to sleep, unexplained weight gain (bloating), headaches, bleeding between periods, and loss of libido. Most of these symptoms contribute to premenstrual syndrome (PMS).

As already stated if the liver is not working optimally, this can lead up to a build-up of estrogen because it cannot metabolize or eliminate hormones, this is what causes Premenstrual Syndrome. The build-up now of estrogen causes the liver to function more badly, leading to more buildup of estrogen. One of the ways that the liver detoxifies estrogen is by binding glucoronic acid to the estrogen and leading it out of the body. But bad intestinal bacteria make an enzyme that breaks the bond between the glucoronic acid and the estrogen, setting the estrogen free to be reabsorbed by the body, leading to an increased amount of estrogen and

Premenstrual Syndrome

Increased estrogen levels (and lower progesterone) reduce the body's endorphins, which leads to mood swings and an increase of premenstrual cramping. Increased levels of estrogen also inhibits the body's serotonin, basically the brains built in antidepressant, leading to depression with premenstrual syndrome. However, increased levels of estrogen also reduce the action of vitamin B6, this vitamin is crucial to proper hormone balance and to the manufacture of serotonin. Along with depression, mood swings, cramping, and breast tenderness, an increased level of estrogen also increases aldosterone levels, which lead to water retention (bloating) and increased prolactin levels- leading eventually to breast pain.

Symptoms - PMS, Progesterone or Pregnancy?

When trying to conceive, or even when avoiding conception, some women will start to question their symptoms during the luteal phase. Every woman knows the symptoms of pregnancy and for decades nausea, breast tenderness, prominent veins on the breasts, fatigue, increased appetite, and frequent urination have all been the most common symptoms experienced during the luteal phase. Does it always mean conception and implantation was successful, no. It just simply means that the two hormones estrogen and progesterone are indeed fluctuating at different amounts during the luteal phase.

If a woman is trying to conceive, these symptoms will lead her to believe that she is pregnant, even if her fertilized blastocyst hasn't implanted yet. Progesterone increases rapidly after ovulation as the corpus luteum develops. Each ovulatory cycle is going to be different, since the body produces hormones at a different rate constantly.

One ovulatory cycle may consist of a different sized follicle development than the last, so more symptoms of premenstrual during the luteal phase will be more prominent. The follicle development is going to rely on the hormones GnRH, LH, and FSH. With every ovulatory cycle being different in follicle and hormone development, this is going to make each luteal phase seem different than the last, especially when new symptoms arrive.

Once implantation does occur, the progesterone nearly doubles what it was prior to ovulation. Causing more prominent symptoms, by this time the hormone human chorionic gonadotropin has made its way through the blood stream. The luteinizing hormone and human chorionic gonadotripin hormone are structurally similar. HCG comes from a portion of embryonic fetal tissue called chorion, a part which eventually forms into the placenta.

The chorion is one of the membranes that is formed by extraembryonic mesoderm and the two layers of trophoblast and surrounds the embryo and other membranes. The chorionic villi emerge from the chorion, invade the endometrium, and then allow the transfer of nutrients from the maternal blood to fetal blood. This all starts to form immediately from when implantation takes place.

Once the body recognizes that implantation has occurred, progesterone and estrogen immediately rise. Causing an increase of now what's known as early pregnancy symptoms. This is because the human chorionic gonadotripin hormone is now keeping the corpus luteum alive and functioning. The HCG hormone then gets passed into the urine. About this time a blood serum or at home pregnancy test will be positive.

HCG Hormone

Human chorionic gonadotripin hormone is a protein hormone that develops in the very early stages of pregnancy. This hormone actually begins to decrease when the placenta has fully developed enough to become the major producer of the two hormones progesterone and estrogen.

The amount of the HCG hormone produced and secreted by the trophoblast layer increases until it reaches at about eight weeks of pregnancy, then starts to decrease in amount reaching a low around sixteen weeks.

The production of this hormone is what keeps the corpus luteum functioning and alive, producing its hormones progesterone and estrogen, with progesterone being the main hormone production. In very early stages of pregnancy, it is often thought that the human chorionic gonadotripin hormone and the high production of progesterone is what creates morning sickness and nausea.

The placenta isn't fully developed until the first trimester, however starts to develop from the trophoblast layer of the fertilized egg (blastocyst).

CERTIFIED FERTILITY COUNSELOR COURSE - SESSION 6– QUESTION & ANSWERS

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Please be sure to fill out the information above, complete the test and e-mail it back to us at myeggandme@amandabears.com. We will grade your question & answer session and will let you know if we have any questions or concerns.

1. What is the Luteal phase?
2. What main hormone is produced during the luteal phase?
3. What is the average length of the luteal phase?
4. The Luteal phase differs between each women, but is consistent in length. T/F
5. What is a luteal phase defect?
6. What are the three causes of a luteal phase defect?
7. Can a luteal phase defect have an adequate length in a luteal phase? If so why?
8. Who's at risk for a luteal phase defect?
9. What's a Corpus luteum?
10. How is a Corpus Luteum formed?
11. What's the role of the corpus luteum?
12. If no conception occurs, what happens to the corpus luteum?
13. What is progesterone, and where does it come from?
14. What is progesterone known as?
15. How does the liver work with progesterone?
16. If progesterone and estrogen is imbalanced, what happens?
17. What is adrenal weakness, and how does this effect progesterone production?
18. What causes PMS?
19. What is chorion?
20. When does the hormone HCG get produced?
21. The production of HCG decreases around sixteen weeks of pregnancy. T/F
22. How is the placenta formed?
23. When is the placenta fully developed?
24. What does “Yellow Body” mean?