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Fact Sheet 27

# The Process of Ovulation

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**In order for a pregnancy to occur there are three basic requirements – eggs have to be released from the ovary (which is called ovulation), sperm have to be put in the vagina at the right time, and a tube has to be patent (open) so that eggs and the sperm can unite.**

In the normal female the maturation and release of eggs takes place every month. Ovulation is controlled by a gland in the brain called the pituitary gland, which is the size of a cherry and is situated behind the bridge of the nose. This gland makes two hormones – the Follicle Stimulating Hormone (FSH), whose job it is to mature follicles, and Luteinising Hormone (LH), whose job is to crack the shell of the egg to release the yolk. It is called Luteinising Hormone because after ovulation the egg white and egg shell which stay behind in the ovary are known as corpus luteum or 'yellow body'. The pituitary gland, in turn, is controlled by a higher centre of the brain called the hypothalamus. The hypothalamus releases a hormone called Gonadotrophin Releasing Hormone (GnRH) which trickles down the venous channels to the pituitary. The release of GnRH is pulsated about every 90 minutes. It is the frequency, duration and the size of these pulses which determines the response from the pituitary.

As a landmark the first day of menstruation is taken as Day 1 of the menstrual cycle. Menstruation will last four to six days and during this time there is an outpouring of FSH from the pituitary. This hormone circulates in the blood and when it reaches the ovary it stimulates some undeveloped follicles to start developing. Usually a whole cluster of follicles starts to develop in the ovary, but one of them will be destined to become the 'leading follicle'. The leading follicle then suppresses its neighbours, so that in the ideal situation only one follicle matures. This system is pretty good in humans as spontaneous double ovulations are rare. When they do occur they may result in non-identical twins. The use of gonadotrophins such as in IVF counteracts the suppression by the leading follicle of its neighbours and enables a whole batch of follicles to develop.

The developing follicle in turn secretes oestradiol (E2). This circulates in the blood and affects the rest of the body. The uterus is the organ which is responsible for the laying down of the endometrium (the lining of the uterus), which is called proliferative phase. Around day 12 to 14 of the cycle when the leading follicles have matured and increased to the size of 16mm to 18mm, the uterus sends a signal back to the hypothalamus to say that it is ready. At this stage LH is secreted like a bolt of lightning and can be measured in the blood as a distinct peak. Through the rest of the cycle LH levels are quite low at basal levels.

**The rush of the LH to the ovary results in the cracking of the shell of the egg with the yolk (ovum) being released – that is ovulation.**

All going well, this yolk will find its way into the end of the fallopian tube looking for some fertile sperm. The egg white and egg shell stay behind in the ovary as the corpus luteum and also secrete hormones – some oestrogen but more significantly progesterone. The effect of the progesterone on the lining of the uterus (endometrium) is that it undergoes what is called 'secretory change'. What this means is that it becomes full of glands, which are rich in glycogen (sugar nutrient) and is very receptive to a fertilised embryo, should it arrive. Normally this occurs about day 21 of the cycle. Should the egg meet some suitable sperm and become fertilised, the early embryo secretes a hormone called Human Chorionic Gonadotrophin (hCG). The job of this hormone is to send a stimulant back to the corpus luteum in the ovary saying, "Hey buddy I am on a good thing here, stick around, keep working and keep the endometrium in place". In the absence of the ovum being fertilised and, if no hCG is secreted, the corpus luteum only has a life span of 10 to 14 days.

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After about 10 days it starts to succumb and the levels of oestrogen and progesterone both fall. In response to the falling levels of oestrogen and progesterone, the endometrium sloughs off and menstruation results. The cycle then starts all over again.

As oestrogen and progesterone circulate throughout the body they affect many organs. By studying some of these organs we can do what is called a 'bio-assay' of the cycle. For example, the cervical mucus is an excellent way to study what is going on in the cycle. After menstruation, in the absence of oestrogen, the cervical secretions are sparse. As the oestrogen level from a developing follicles rises, the cervix starts to secrete some cervical mucus. The quantity of the mucus gradually increases and also becomes more watery. Just prior to ovulation it is copious, clear and may stretch like egg white. This can easily be detected by the sensation in the vagina or on one's fingers.

Once ovulation occurs and progesterone is secreted, the mucus changes – rather than being egg whitey it becomes claggy. The rapid change from the favourable egg whitey mucus to the unfavourable claggy mucus signifies the time of ovulation.

After ovulation, the mucus remains claggy and is unfavourable to sperm penetration. Microscopic tests can also be done on the cervical mucus to determine whether ovulation has taken place. If the cervical mucus is allowed to dry on a microscope slide and then inspected down a microscope, prior to ovulation mucus will have what is called a 'ferning' appearance like the branches of a Christmas tree. After ovulation the mucus will change where it will not have such a clear Christmas tree appearance and there will be numerous white cells.

Another way that we can assess what is happening within the cycle is by a temperature chart. If one measures the basal temperature – the temperature of a woman upon waking each morning – it will be between 36.2° and 36.5°C.

After ovulation, progesterone has the effect of elevating the temperature, which rises above 36.5°C. The flat part, or sometimes even a dip, prior to the temperature rise is when ovulation would have taken place. A temperature chart is also a very useful way of finding out what is going on with the cycle, particularly if intercourse is marked on the chart. Then one can retrospectively analyse whether ovulation took place and whether intercourse was well timed.

Ovulation is also often associated with some pelvic pain. Although this suggests ovulation is taking place, it does not pinpoint ovulation. The pain can be due to the follicles stretching, the actual act of ovulation or some bleeding a day or two afterwards.

Another non-specific system which suggests ovulation is taking place is the feeling of premenstrual symptoms. These include bloating, breast tenderness, sometimes headaches and irritability. In a woman who regularly gets any of these in the second half of her cycle, the circumstantial evidence is that she is ovulating.

The way that ovulation is clinically diagnosed is to measure the progesterone levels in the second half of the cycle. This is usually measured in blood. It is also possible to use ultrasounds to watch the follicle grow and then disintegrate, but this requires multiple examinations which are both expensive and time-consuming. Another way to confirm that ovulation has taken place is to take a sample of the lining of the uterus by endometrial sampling or curettage and seeing if it has undergone the secretory change which is unique to when progesterone is secreted.

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