

Medicine for Managers

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The Miracle of Conception – 1. The Ovum

I still marvel at the mechanism that results in the creation of a fertilised egg. It is a curious mixture of the anatomical, the biochemical and the immunological – “the entity formed by the union of a male sperm and a female ovum” with emotion, passion and mechanical coming together to form new life.

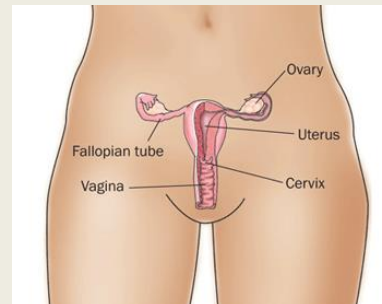
Just consider – the female manufactures an egg which is released from the ovary once a month. It wanders around in the abdominal cavity until it finds a tube down which it travels for several days.

Around the same time a male deposits thirty to forty million sperm into the vagina of the female by a mechanism which is quite remarkable in itself. The sperm find their way through the cervix and to the lower end of the tube down which the ovum is travelling.

The sperm avoid obstacles such as the immune defence mechanism of the female (which by rights should identify the sperm as ‘foreign’ and destroy them). A successful sperm meets the ovum in the tube and unites to form a fertilised embryo.

The newly created cell starts to divide and travels to the uterus where the process of implantation starts. Just amazing!

So, in more detail, the eggs (or ova) are manufactured in two ovaries which are present in the abdominal cavity.



They are oval structures about 4 cm x 3 cm x 2 centimetres in diameter and located on either side of the uterus. It is estimated that a female child has in excess of one million eggs in the ovaries, about 350-450 of which will be released during the reproductive years.

The remainder will either die off or fail to mature. In women with normal ovaries egg release may alternate but, if one ovary is diseased or dysfunctional, the other ovary if healthy would continue to release an egg on a monthly basis.

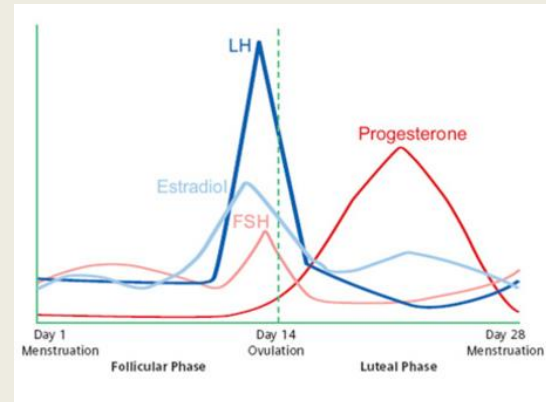
In the United Kingdom the average age of menarche (the start of cyclical reproductive function) is between about 13 and 14 years.

The ovaries are complex structures. Apart from the production of ova, they secrete hormones. The release of oestrogen results in the development of the secondary sex characteristics at puberty (including enlargement of breasts, development of axillary and pubic hair, change of body shape and widening of the hips).

They also release progesterone which is required for the preparation of the uterus for pregnancy and the preparation of the breasts (mammary glands) for milk production.

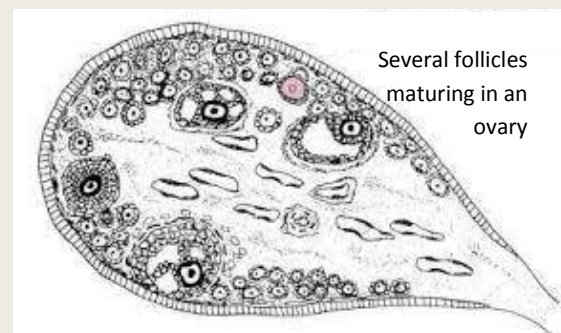
After puberty, the female has an efficient mechanism for producing an ovum each month.

Although in some women the mechanism fails because of hormonal problems, anatomical complications or disease, in general the system works well. It is a complicated process but simply explained it operates as follows:



In essence the release of an egg and the subsequent preparation of the uterus for implantation following fertilisation depend on four hormones. Two of them are produced in the anterior pituitary gland and the other two in the ovary.

In an average 28-day menstrual cycle, the uterine bleeding occurs during the first 3-5 days. In the first half of the cycle **follicle stimulating hormone (FSH)** from the pituitary gland stimulates the development of follicles in the ovary. Follicles are spherical collections of cells containing a single ovum at their centre.



Another pituitary hormone, **luteinising hormone (LH)**, which is produced at low level throughout the cycle, dramatically rises in output for a period of 24-48 hours

and stimulates the maturation and release of the ovum and plays a key part in the conversion of the remaining follicular cells into a structure called the **corpus luteum**.

During the development, maturation and release of the ovum in the first half (follicular) of the cycle, **oestrogen** (oestradiol) produced in the ovary is causing the lining of the uterus (endometrium) to thicken, the vaginal wall to thicken and vaginal lubrication to increase.

Following release of the ovum (ovulation) much will be happening. The corpus luteum will start producing **progesterone** in increasing amounts. The progesterone will act directly on the uterus to prepare it for pregnancy.

The uterine lining will continue to thicken and vaginal and mucous changes will occur. The ovum will find its way from the ovary to the **Fallopian tube**. It will be drawn in by the frond-like projections or **fimbriae** which surround the opening.

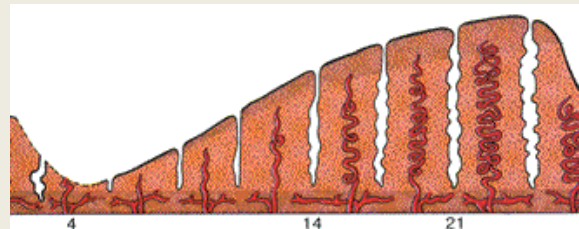


Assuming that sexual intercourse has occurred at an appropriate time somewhere around the middle of the cycle, sperm will rush to reach the ovum which occurs within the Fallopian tube. The fertilised egg will then continue down the tube and will reach the uterine cavity where

it can implant. The average ovum survives for about 24 hours after release and, if unfertilised, will die.

If pregnancy does not occur then, in a woman with a 28-day cycle, the progesterone levels will fall at around day 24-26.

The loss of support for the developing endometrium will result in a shutting down of the blood vessels in the uterus resulting in the thickened part of the endometrium dying and being shed after 2-4 days at the approaching menstrual period.



The diagram shows the endometrium at its thinnest at around day 4-5. It then develops under the influence of oestrogen and progesterone to about day 24-26.

If pregnancy has not occurred the additional uterine thickening dies and is shed with menstruation.

The process occurs on a monthly basis (or according to the 'normal' cycle of the woman until she reaches the point where cyclical activity ceases (the menopause or climacteric) which usually occurs at around the age of 52.

So, the female conceives, the ovum travels to the uterus and implants. For her nine-months of change, excitement, anxiety and,

probably, unwanted symptoms ensue. For the man, insemination has been completed and he may or may not be so involved. In part 2, I shall look at conception from the male perspective.

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