

50 PUBERTY OF A GIRL

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(Definition)

CARRY

Every girl, of age 12-14, begins to find anxiety about her body changes which on for a few years. She would be especially be frightened by her first vaginal bleeding (menstrual flow 經血), which occurs periodically afterwards, if no one tells her the truth and necessity of these bleedings.

Since or a time before (1) the first menstrual flow, the child-girl (女孩) enter into another stage of life, her puberty. During puberty, she undergoes physiological, psychological as well as body changes which take place gradually and characterise her to be a young girl, different from a gentleman. (2) This changing period lasts for a few years, but the length of time is not constant for every girl. The word "puberty" is applied to mean this period which takes the girl into the adult stage. She is then matured. (成熟)

(A General View at the Changes)

A) Body Changes : It is the development of the female secondary sex characterist. This includes :

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- I) Slowly enlargement of the breast(mammae) by the deposition of fat mainly, and a well as the increase of mammary glands(乳腺) & other related tissues, e.g. connective tissues. (Mammary glands secrete milk for the new born baby)
 - II) The growth of the pelvis to a stage that could bear baby(roundening and broadening of the pelvis)
 - III) The distribution of fat in the female body giving it the characteristic curve.
 - IV) The rapid increase of height which slows down after puberty.
 - V) The growth of axillary and pubic hair.
 - VI) The voice becomes sharp generally.

The female internal and external reproductive organs, at this stage, begin to enlarge showing that they turn into an active stage after about ten years dormancy. They can function now. Psychologically the girl matures mentally and acts as a woman should act (womanhood)

Before going into the processes which activate the female reproductive organs and make them functionable, let's discuss the female reproductive system first. This could help us understand the fundamental physiology (reproduction) of the female.

(The Female Reproductive Organs)

The system contains 2 groups of organs, the internal & external. The internal organs consists : (Fig. I)

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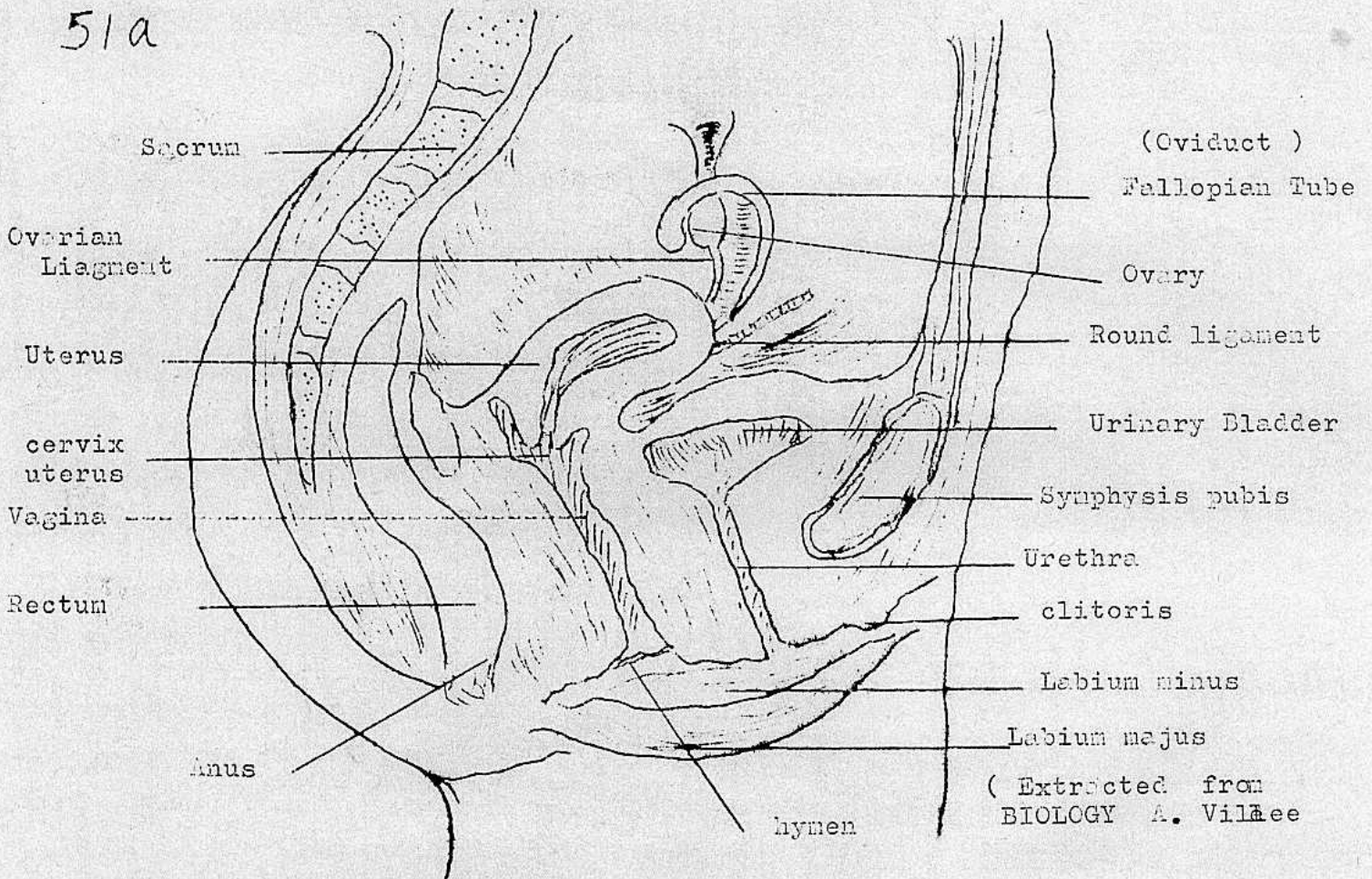


Fig. I The Human female Reproductive System.

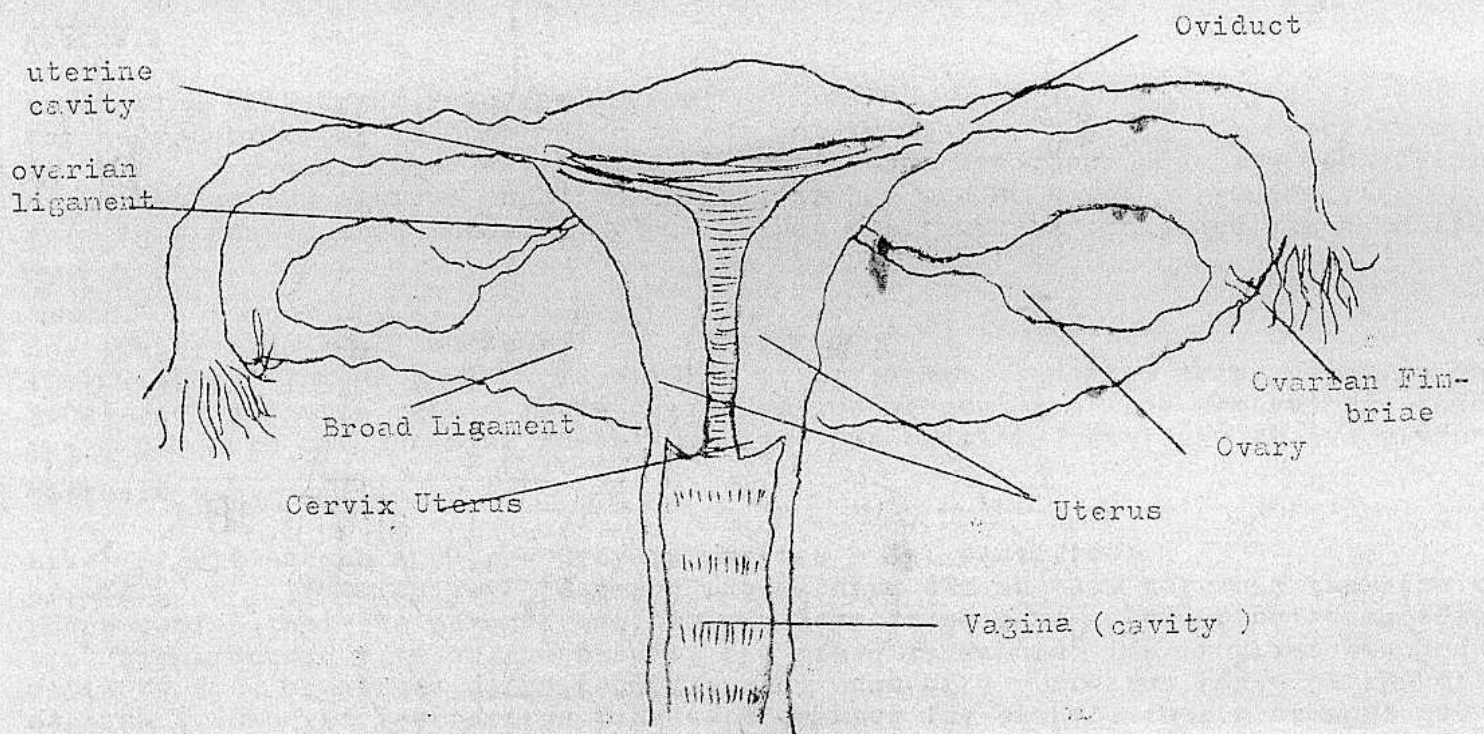


Fig. showing the arrangement of reproductive organs in the female body. The central part is a sectional view.

Fig. extracted & modified from Textbook of Physiology & Biochemistry
Function of the Human Body.

- a.) 2 egg-producing ovaries, one on each side, (卵巢)
- b.) 2 uterine tubes (oviducts 輸卵管),
- c.) the uterus (子宮) - the unitation of the oviducts,
- d.) the vagina which leads to the outside. (陰道),

Ovaries :

The ovaries are 2 egg-producing organs kept on the dorsal wall of the abdominal cavity by ligaments. The ovarian ligaments connect the ovaries to the uterus. Each ovary is also attached to the funnel-shaped ends of the uterine tubes by the ovarian fimbriae and lies at the back of the broad ligaments. The fimbriae are long threads coming from the oviduct endings and well lined by a layer of ciliated epithelium (纖毛表皮), which help to catch the matured egg or ovum released from the ovaries. (This occurs when the girl is matured - ovulation.)

Oviducts

The 2 oviducts are muscular tubes, one from one ovary, which leads to the uterus. In fact, they unite to form a large cavity at the middle, i.e. the uterus. The inner lining of the lumen (腔) is a layer of ciliated epithelium which helps to convey the released ovum (egg).

Uterus :-

This is a pear-shaped muscular organ and has a triangular flattened lumen continued with that of the uterine tubes (oviducts). It has mucous membrane (endometrium 內膜) and ciliated epithelial lining. Glands are found here and responsible for some secretion. It terminates at the cervix uterus (子宮頸) which is a muscular ring projecting into the vagina.

Vagina :

Vagina is the largest reproductive tract and serves as a birth canal from which the baby emerges. Further it provides a path for the male sperms (精子) to enter the female body to fertilise the ovum.

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The external female genital (reproductive, sex) organs are collectively known as the vulva, which will be discussed shortly.

The opening of the vagina is enclosed by 2 double folded skins, the external hairy labia majora and the internal smooth labia minora.

At the junction of these 2 skins a pea-shaped organ small is found. It is spongy (containing spongy tissue) erectile & sensitive (provided with nerve endings). Its functions to accept or receive sexual stimuli during the intercourse and helps the female reach a state of sexual excitement. It is named clitoris.

Next to the clitoris is the urethra (尿道) and the one followed is the vagina. Before the first sexual intercourse of the female, the opening of the vagina is naturally guarded by a thin membrane called the hymen (处女膜)

(The Structure and Function of the Ovary)

The ovaries are egg-producing organs, each of dimension of 3 cm. by 1.5 cm. by 1 cm. They do not manufacture eggs during the female's puberty nor sexual life. Eggs are at one time produced by the ovaries. There are about 400,000 eggs in the ovaries when the female is still a few months old (4-5) embryo. 胎

The eggs at that time are referred to a state of dormancy. They are not matured and can not function, i.e. they cannot be fertilised (受精) As the female grows, most of the eggs degenerate (退化) and only about 400 can undergo maturation. They are released at intervals into the oviducts.

When the infant girl attains the beginning of puberty, the ovaries are stimulated by

enough amount of certain chemical agents, the hormones, from the pituitary gland (下垂體). The potential eggs begin to develop.

The foetal Ovary (胎兒期子宮)

Each ovary is enclosed by a layer of cubical cells, the germinal epithelium. During the female's foetal life, groups of cells grow into the ovary substances from the germinal epithelium. They multiply and one of them enlarges forming the primitive ovum. Lastly each egg becomes covered with a layer of cells, the membrana granulosa, and such a structure (one egg enclosed in a single layer of membrane - the membrana granulosa) is called a Primordial Follicle. The spherical follicles together with the connective tissues & blood vessels compose the ovary substances. Most of the follicles degenerate, but many remain unchanged until puberty to develop. Since puberty, a limited number of follicles matures in succession (陸續成熟) so that various developing stages of follicles may be seen in the ovary. Their development is controlled and achieved by hormones.

Ovulation

Towards the end of a menstrual cycle (menstrual bleeding or menstruation represents the end of a menstrual cycle), one follicle begins to grow and mature. It grows rapidly. The ovum enlarges and gradually becomes enclosed in a membrane (zona pellucida). The single layer of membrana granulosa multiplies to form many layers of cells and a kind of liquid is seen in these cells, as droplets. The droplets then coalesce to form a liquid cavity. The increase of internal pressure of the follicle due to the increasing adding of follicular fluid causes the follicle to migrate towards the surface. Lastly the matured follicle ruptures and the yellow ovum with about 3000 surrounding cells are

released. The ovum is caught by the fimbriae into the uterine tubes. The process is called ovulation. It occurs in the 15th day of the menstrual cycle.

54 Corpus Luteum (yellow body ^{黄、白、体})

After the rupture of the follicle, the latter clots immediately as blood leaks into it from the surrounding related blood vessels. The resulted structure is called the corpus luteum. The remained cells then multiply and large yellow pointed epithelial cells are formed. The related tissues and cells gradually grow into the clot and lastly replace it. Thus the corpus luteum is formed in the 9th day after the rupture. If the ovum in the uterine tube is fertilised, the corpus luteum will remain for several months secreting the necessary hormones for pregnancy. It will degenerate when the next menstrual cycle begins if no fertilisation occurs.

(The Menstrual Cycle)

Since a girl's puberty, her uterine lining (endometrium) begins characteristic periodic changes under the influence of hormones. This cyclical development, named the menstrual cycle, is completed in every 28 days and ended in the menstrual bleeding (menstruation) which may last for 4-6 days.

The beginning of the cycle is the first day of bleeding.

Menstruation (the menstrual bleeding) (1st - 4 or 5 sts.)

The superficial (surface) layers of endometrium, which have actively developed into thicker layers, begin to degenerate & are discharged with an amount of blood. After menstruation, the thickness of endometrium decreases to 1 mm. and is the thinnest among other periods.

The endometrium casting (脱落) process is slow and not done at one time, otherwise a sudden large flow of blood would occur. At the intervals of about 1-15 min., the blood-flow into the vagina takes place in tiny spurts (点滴). In a few days time, the endometrium will be casted away.

The content of menstrual flow contains blood, mucus (secreted by the glands) wound-out tissues and at first a large number of leucocytes (white blood cells) (Sometimes it contains the unfertilised ovum). The content does not clot though there is blood. It is suggested that an anticoagulant substance (抗凝剂) or a blood-liquified sub-

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stance-enzyme- (An enzyme is an organic substance (compound) which achieves a reaction that will not take place if the enzyme is absent. A blood-liquified enzyme is an enzyme that liquifies clotted blood) may be present. At that time, the corpus luteum in the ovary has completed its degeneration and become a scar(). Another follicle begins to mature rapidly.

Proliferative Stage (5th - 14th day)

After the completion of menstruation, the thin remaining endometrium(1-2 mm. thick) begins to regenerate again. Glands are actively formed and grow. At the end of 14th day, the endometrium's thickness increases to 3-4 mm. The follicle in the ovary matures completely and the ovum is released in about 15th day. Thus ovulation is finished.

Premenstrual Stage (15th - 28th day)

While the corpus luteum in the ovary is forming, the endometrium continues to grow and the glands changes to a convoluted appearance & show secretory activity. These changes are important in respect to future implantation of the fertilised ovum if fertilisation does occur. (An fertilised ovum will invade the thickened uterine lining-endometrium- and here it grows to a baby in about 10 X months.) When fertilisation is completed(if occurs), the endometrium is about 6-7 mm. thick containing large amount of blood and other related tissues. If the ovum is not fertilised, the endometrium begins to degenerate again and menstrual flow takes place. The corpus luteum, before the first day of bleeding, begins to degenerate.

(The Hormonal Integration of the Sexual Function)

HORMONE - It is a chemical(organic) messenger which is secreted by ductless glands & conveyed by blood stream to their effectors. It affects chemically the function of an organ or tissue and acts as a regulator.

In fact, the regeneration and degeneration of the endometrium, the development of the follicles and corpus luteum etc... are also controlled and regulated by hormones. Since puberty, the pituitary body begins to secrete an enough amount of certain hormones which bring about directly and indirectly all the changes stated.

THE FOLLOWING IS CHIEFLY TAKEN FROM : Essentials of Human Reproduction, R.C.Wabnitz Chapter One - Hormones & Reproduction

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a) The FSH - Follicle-Stimulating Hormone

Function -- 1) Growth of ovarian follicle.

2) Maturation of the granulosa cells by causing them to divide and secrete the follicular fluid.

3) Further development of the follicular structure, e.g. the theca interna, cells investing the follicular cavity.

b) The LH - Luteinizing Hormone

or ICSH - Interstitial Cell Stimulating Hormone

acts on organs which has been already been acted by FSH.

Function : 1) Maturation of the ovarian follicle,

2) Secretion of estrogens (hormones) by the theca interna,

3) Ovulation,

4) Formation of the corpus luteum,

c) The LTH - Luteotropic Hormone or Lactogenic Hormone

Function -- 1) The secretion of another hormone from the corpus luteum, the progesterone,

2) Stimulation of the mammary glands, after the action of many other necessary hormones, to secrete milk after the birth of the baby.

The pituitary hormones act on other tissues or organs and indirectly give rise to the secretion of many other sexual hormones. The following are the chief :

a) Estrogens, the 17- β -estradiol (Biology A. Villee)

It is the female primary sex hormone secreted by the theca interna of the maturing follicle.

Function -- 1) Cause the uterine endometrium to grow,

2) Development of the secondary sex characteristics, e.g. the changing of voice quality, the broadening of the pelvis, The growth of the external & internal reproductive organs,

3) Control of the menstrual cycle.

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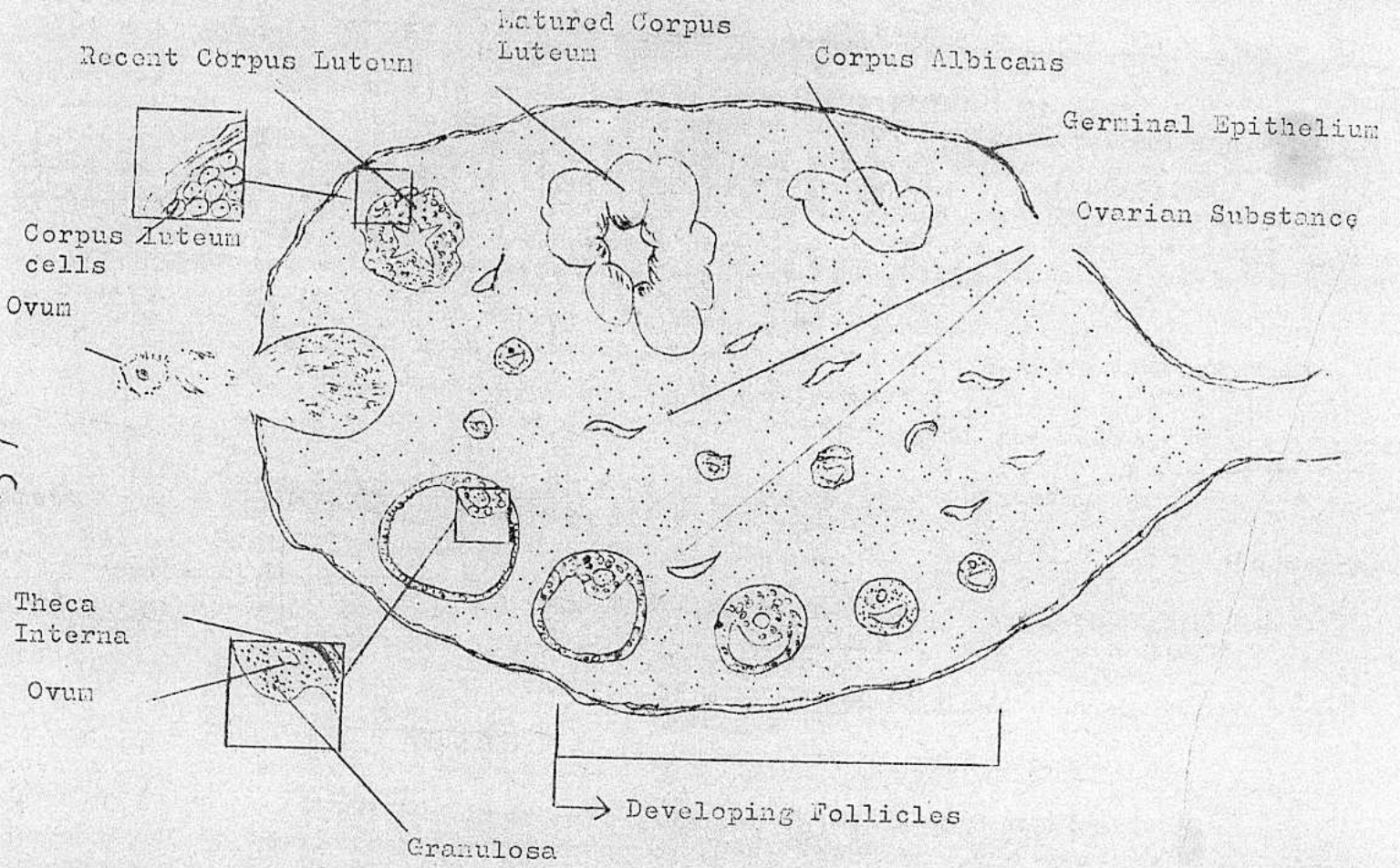


Fig. Showing the development of follicles & corpus luteum.
Fig. Extracted & modified from Textbook of Biochemistry & Physiology
Applied Physiology

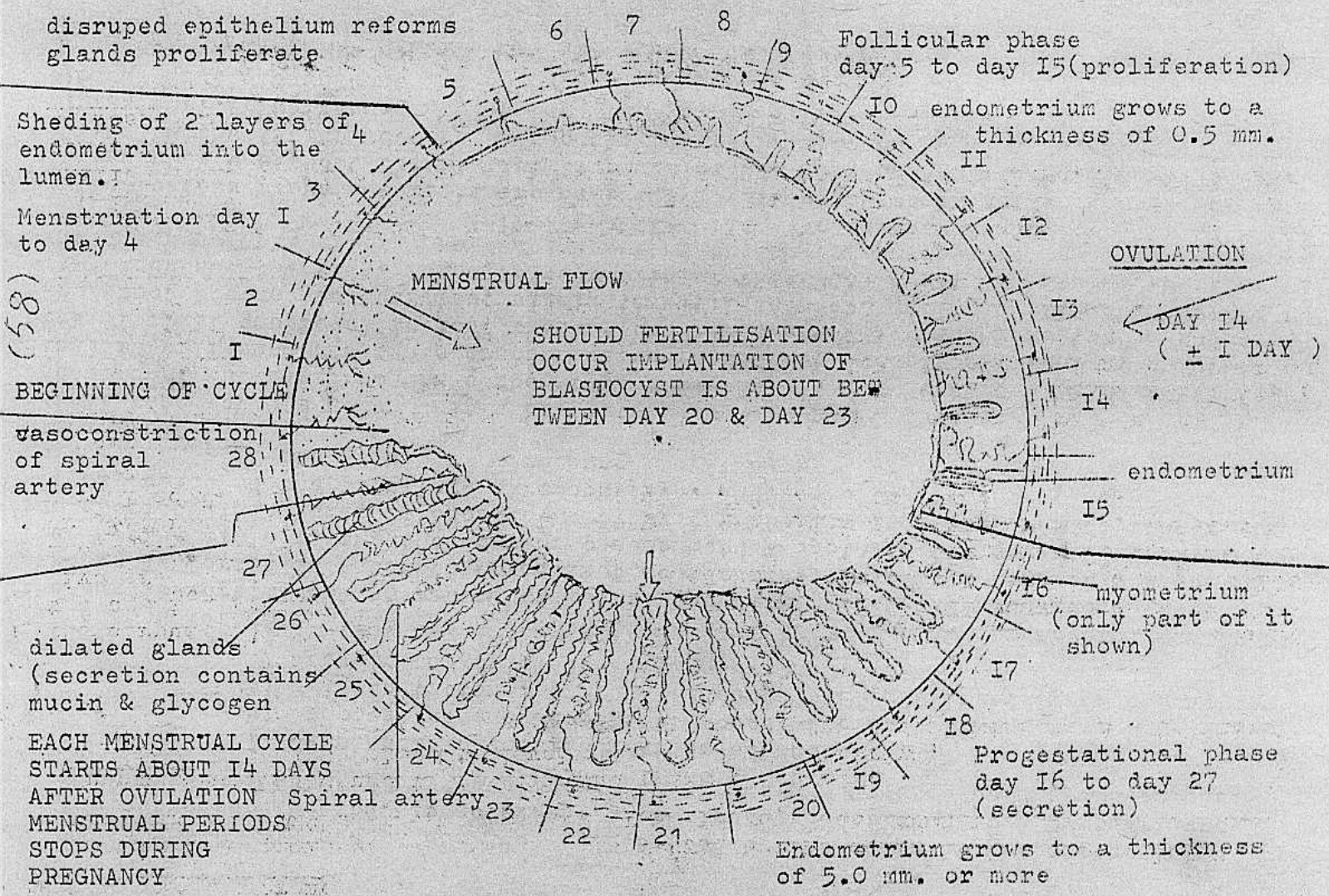


FIG. 4 : DIAGRAM OF THE CHANGES IN THE ENDOMETRIUM DURING A 28 day MENSTRUAL CYCLE
 Figure extracted from An Atlas of Histology W.H.Freeman & Brain Bracegirdle

b) The Progesterone

It is the female second sex hormone secreted by the cells of the corpus luteum by the action of the LH. It acts on organs already been acted upon by estrogens.

- Function :
- 1) Cause the endometrium glands to secrete,
 - 2) Complete the development of endometrium,
 - 3) Prepare the endometrium to accept the fertilised ovum. (function - implantation)
 - 4) Prevent any follicle from maturation.

The corpus luteum remains and continues to secrete progesterone for several months if the egg is fertilised and implanted in the endometrium. It will regress & cease to give progesterone in the 28th day of the menstrual cycle if the ovum is not fertilised. The uterine lining then degenerates as losing the maintenance (維持) factor, the progesterone. Another follicle in the ovary then begins to mature rapidly under the normal action of the pituitary hormones (i.e. FSH, LH & others)

Conclusion

Recent research has shown that these pituitary hormones & ovarian hormones act on one another. When a hormone's concentration in the blood reaches a limited level (e.g. high) it will suppress the secretion of the hormone which gives rise to the former's secretion. If the level is low, the latter will be secreted in a greater amount so that the former hormone is secreted, alternatively. Thus both are in a balance. Further we have discussed the chief hormones concerning the sexual function.

To the readers : This essay introduces the main development during puberty of a girl and includes various materials from various books. Some are extracted & most are simplified by the setter. Errors that could exist are reduced to minimum, if still present, please write to me.

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Any questions is welcome

編者地址如上，歡迎來信討論

Reference & Further readings With no particular order

- 'Biology 5th edition Claude A. Villee 1967 443-444 469-470
Essentials of Human Reproduction, Robert C. Wabnitz Chapter One
Samson Wright's Applied Physiology 11th Ed. 1965 487-490
Textbook of Physiology & Biochemistry 6th Ed. G.H. Bell 1965 1017-1019 Chapter 5
School Certificate Biology 1966 Ed. H.C. Hung Chapter 55
Anatomy & Physiology for Nurses 7ed. 1964 K.F. Armstrong 348-362

女性生理與病態 范存恆譯 1958 二版

本文介紹女孩在進入成人階段期中的生理發展，旨在令一般讀者對發育有一定量的認識。文中內容取裁自多方面，故不能於每段後註明出處，希為見諒。

(1) Infact the puberty begins a time before the first menstruation. But many people think that the first menstruation is the beginning of puberty.

(2) An infant girl & boy do not differ much in spite of their different hair style clothes. Their physiology & body shapes are quite the same. When they grow up, the physiology & others will have great differences.