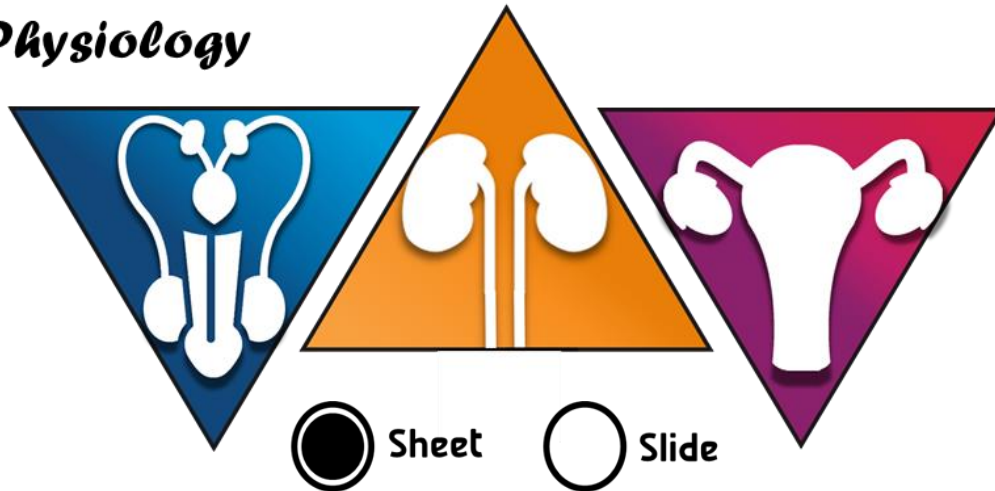




Urogenital system

Physiology



Number:

- 2nd Online Lecture

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Fetal life

The Fetal nervous and immune systems develop slowly .however, the Fetal endocrine system plays a vital role in Fetal growth , development and homeostasis .

Fetal hormones perform the same functions **as in the adult** but they subserve **unique processes such as sexual differentiation and initiation of labour .**

The **Fetal adrenal glands are unique** in both structure and function . at month 4 of gestation ,they are **larger than the kidneys .**

The Fetal zone of the fetal adrenal cortex produces large amounts of **DHEAS** (DeHydroEpiAndrosterone-sulfate) and provides **androgenic precursors for estrogen synthesis by the placenta .**

The definitive zone of the fetal adrenal cortex produces **cortisol** which has multiple functions during Fetal life including :

- the promotion of pancreas and lung maturation
- the induction of liver enzymes
- the promotion of intestinal tract cytodifferentiation .

The adrenal medulla develops by about 10 weeks and is capable of producing epinephrine and norepinephrine .

The rate of Fetal growth increases significantly during the last trimester(3months).Surprisingly ,growth hormone of maternal, placental or Fetal origin has little effect on Fetal growth (the evidence for this is the normal weight of hypo pituitary dwarfs or anencephalic foetuses which don't have the ability to secrete growth hormone) . **Then what is the hormone regulating fetal growth ? Fetal insulin is the most important hormone in regulating Fetal growth** and glucose is the main metabolic fuel for the foetus .

Fetal insulin produced by the pancreas by week 12 of gestation has many functions such as :

- regulates tissue glucose use
- controls liver glycogen storage
- facilitates fat deposition .

Fetal insulin doesn't control the supply of glucose ,however this is determined by the maternal gluconeogenesis and placental glucose transport .

Important Note : the release of insulin in the foetus is relatively constant .

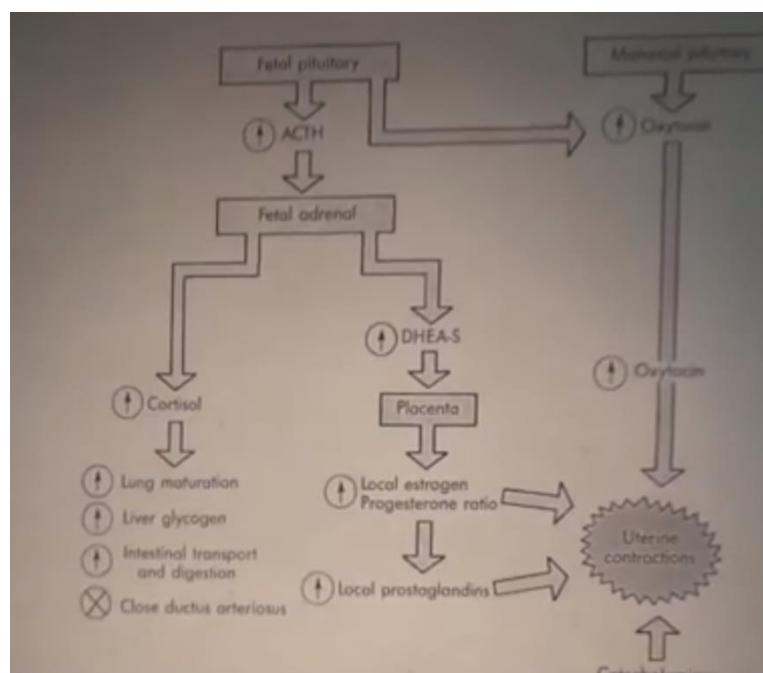
Labour (Parturition)

Throughout **most of the pregnancy ,the uterus is quiescent (inactive)**,both **progesterone and relaxin** may promote this inactivity but at the end of pregnancy these events occur:

Weak and irregular uterine contraction occur throughout the last month of pregnancy .

Then eventually , a series of regular ,rhythmic and forceful contractions occur thus -LABOR- develops. These may last for several hours , a day or even longer and eventually results in the expulsion of the foetus, placenta and membranes .

Although not all of the factors that lead to initiation of labour are known; **endocrine, paracrine and mechanical stretching of the uterus** all play a role in initiating labour .Once labour is initiated it is **sustained by a series of positive feedback mechanisms** .



Explanation of the picture : once delivery begins **ACTH**(released from the Fetal pituitary) levels increases which means that it plays a role in initiation of labour

ACTH has the following effects :

-it affects **Fetal adrenal cortex to increase release of DHEAS and Cortisol** which have the following effects :

-DHEAS (an Androgen) : affects the placenta **increasing local estrogen :progesterone** ratio which leads to **increased levels of local prostaglandins** .Both will promote uterine contractions .

-cortisol (Some are repeated from what we mentioned before):
Promotes lung maturation , Increases liver glycogen storage , Increases intestinal transport and digestion , also closes ductus arteriosus .

Summary of the **factors that affect uterine contraction so the delivery occurs normally** :

- 1- increased local estrogen :progesterone ratio
- 2- increased levels of local prostaglandins
- 3- oxytocin secreted from maternal pituitary (the dr said in the video only maternal pituitary gland , but the diagram shows the contribution of the fetal pituitary as well)
- 4- catecholamines from the mother and the fetus

Lactation

Once the baby is born , she/he needs milk from the mother which in turn needs prolactin to be produced so what modulates prolactin release ?

estradiol modulates prolactin release in two ways :

1st estradiol **increases the sensitivity of lactotrophs** (the cells that synthesize and secrete prolactin) to **stimulation by TRH**(thyroid releasing hormone).

2nd estradiol **decreases the sensitivity of lactotroph to inhibition by dopamine** .

If the mother does not nurse her child , prolactin levels **fall generally to non pregnant levels after 1 to 2 weeks** .if the mother **does breast feed ,increased prolactin secretion is maintained for as long as suckling continues** .

Suckling inhibits the ovarian cycle ↓

Lactation generally **inhibits the ovulatory cyclic function**. Suckling likely **reduces the release of GnRH** (gonadotropin releasing hormone) by neurons in the arcuate nucleus and the preoptic area of the hypothalamus .

Extra: This is because suckling causes the release of prolactin and oxytocin , and prolactin has inhibitory effects on the Hypothalamic release of GnRH , that's why in the normal lactation period , ovulatory cycle is inhibited .

However,if the mother **continues to nurse her child for prolonged period ,ovulatory cycle eventually resumes** .

In a study they found that in breast-feeding Bangladesh women the period of Anovulation (no ovulatory cycle) averages 18 to 24 months .but if the mother doesn't nurse her child then the ovulatory cycle resumes on average of 8-10 weeks after delivery with a range of up to 18 weeks.

Oxytocin and psychic stimuli initiate milk ejection (also Called let-down reflex)

Infertility

Infertility affects **one of five women** in the US and also in other parts of the world . A thorough understanding of female endocrinology ,anatomy and physiology is critical to gain insights into solving this major health problem .Several factors can cause infertility **by interfering with follicular development and or ovulation as :**

- Environmental factors
- Disorders of the CNS
- Hypothalamic diseases
- Pituitary disorders
- Ovarian abnormalities

If normal ovulation occurs **structural ,pathological and /or endocrine problems associated with the oviduct and/or uterus** can prevent fertilization ,impede transport or implantation of the embryo and ,ultimately, interfere with the establishment and/or maintenance of pregnancy .

However , the most common cause of female sterility is failure to ovulate .(Important)

Contraception

TABLE 39.A Contraceptive Use and Efficacy Rates in the United States

Method	Estimated Use (%)	Accidental Pregnancy in Year 1 (%)
Pill (Hormones)	32	3
Female sterilization (Tubal Ligation)	19	0.4
Condom	17	12
Male sterilization (Vasectomy)	14	0.15
Diaphragm (Sperm Barrier)	4-6	2-23
Spermicides (Sperm-killing chemicals)	5	20
Rhythm	4	20
Intrauterine device	3	6

The Dr read the whole table above that shows method of contraception along with its estimated use and accidental pregnancy percentage within 1 year ; Additional notes not found in the table are below:

❑ **Contraceptive Pills (Hormonal Method)** have many types such as :
1-combined oral contraceptive pills(COCP) : combination of estrogen and progesterone

2-progestrone only pills (POP): Made only of progesterone .

3-emergancy pills : high doses of estrogen and progesterone .

4-depot(contraceptive injection – IM injection which is works for 8-12 weeks)

5-implants (works up to 5 years)(Found in slide : Implants are also only Progesterone)

***all of them work by inhibiting ovulation except emergency pills they inhibit implantation** .contraceptive pills are **highly effective** (all have effectiveness ratio of 99% except emergency pills which has an effectiveness ratio of 95% so all of them 95% and above)

- ❑ **Intrauterine device(IUD)** : an object placed in the uterine cavity prevents implantation -> **a woman using this method should have at least 1 child.**

The explanation the Dr mentioned for this idea is not clear , he said exactly " The woman that uses this method should have at least one child ; otherwise she will be used to not to have children"

Extra : I searched the internet and there is nothing that says that this method shouldn't be used if the woman hasn't any child , the only thing I found is that the failure rates of this method increases in women who haven't ever had child because of the smaller size of the uterus but for the exam just keep in mind what the Dr said and how this method should only be used if she has at least 1 child .

Rhythm method(Timing) –important-

The average duration of normal ovarian cycle is 28 days(in most woman) but few women have less or more 28days duration with the wide range being 21-35 days –very few women may have more than 35 days duration , some records say that it may reach 42 days but very rarely .

The first 4-5 days are the menstrual phase.

Ovulation happens in day 14.

Life span of the ovum and sperm (in the female reproductive tract) is 2 days. So, if a couple doesn't want to have children they should avoid intercourse for 3 days before and 3 days after the day of ovulation (i.e. between days 11 and 17 in a typical 28 days cycle)(This period is called the unsafe period because having intercourse during may result in pregnancy)

Its Important to understand that whatever the duration of the cycle was (if it was 21 days or 28 or 35 or whatever) the duration between Ovulation and the End of the Cycle is always 14 Days (The duration of the Luteal Phase is always 14 days) and variability in the cycle is due to variability in the follicular phase (first 14 days).

The safe period: From day 17 to the end of the typical cycle (day 28)

Possible safe period : from the end of menses –roughly day 4- to the 11th day.

These 2 periods during which conception(pregnancy) is least likely to occur

The unsafe period : from day 11 to 17 , during which pregnancy can occur .

If the cycle duration of a woman doesn't change during her reproductive life and stays unchanged in the range of 21-35 days- this means it is a normal cycle .

As we said before : Always there are 14 days after ovulation till end of the cycle , despite the duration of the cycle .We can use this to determine the unsafe ,safe and possible safe periods how ?

Lets say X is the day of Ovulation

Thus $X - 3$ till $X + 3$ is the Unsafe Period

And also $X + 14 = \text{Duration of Cycle}$

And by rearranging $X = \text{Duration of Cycle} - 14$

Example 1 in a specific woman:

$X + 14 = 24$ (thus the duration of cycle is 24)

$X = 24 - 14$

$X = 10$ (Day of ovulation in this woman is 10)

So the Unsafe period is from $10 - 3$ till $10 + 3$

Unsafe Period is from 7 to 13

Possibly safe Period is from menses (day 4) till day 7

safe Period is from day 13 till day 24

Example 2:

$X + 14 = 34$ (thus the duration of cycle is 34)

$$X = 34 - 14$$

$X = 20$ (Day of ovulation in this woman is 20)

So the Unsafe period is from $20 - 3$ till $20 + 3$

Unsafe Period is from 17 to 23

Possibly safe Period is from menses (day 4) till day 17

safe Period is from day 23 till day 34

These examples explain The reason we named the duration between menses and ovulation as possibly safe period ; because this duration can change if the female has an irregular cycle as we saw in the examples before, but the safe period duration never changes .

Hormonal therapy for ladies and beauty maintenance

Hormonal therapy for ladies is necessary throughout all stages of life especially after age of 50 specifically in these cases :

1. Maintain the density of bone and stop osteoporosis (In slides : Taking vitamin D and Calcium alone without estrogen or testosterone is not good enough to maintain a good posture)
2. Maintain the beauty of complexion(skin) and prevents wrinkles
3. Treatment of extreme facial and body hair .
4. For the low desire for sex compared to spouse (it increases sexual desire)
5. Maintain the size of breast and prevent its atrophy especially after menopause .
6. Prevent urine incontinence in ladies (involuntary urination)
7. Treatment of Alzheimer and amnesia

From Slides (Exactly copied and pasted) Hormonal Treatment has many kinds and different doses and is not given by the public . In the West women take the right hormones by the supervision of the doctor.



Stay positive

Stay strong

Stay ambitious

Best wishes Doctor 2016

Your colleague: Aya Alomoush