**Physiology of menstrual cycle**

* **menstrual cycle :**
	+ Series of changes a woman's body goes through to prepare for a pregnancy.
	+ About once a month, the uterus grows a new lining (endometrium) to get ready for implantation of fertilized egg.
	+ When there is no fertilized egg to start a pregnancy, the uterus sheds its lining and the next cycle starts .
	+ It is from Day 1 of bleeding to Day 1 of the next time of bleeding (bleeding days and off bleeding days .
	+ Although the average cycle is 28 days, it is normal to have a cycle that is shorter or longer.
	+ If a woman bleeds for 4 days is clean for 25 days >> her cycle is 29 days “ this is called 4 over 29 “ which means she bleeds 4 days every 29 days .
* **Normal menstrual cycle :**
	+ mean duration of the MC :

 Mean 28 days (only 15% of ♀)

 Range 21-36 (3-5 weeks , below or above is abnormal )

* + average duration of menses : 3-7days
	+ normal estimated blood loss : Approximately 20 – 80 ml
	+ When does ovulation occur ?

 Usually day 14 (in 28 days cycle )

 10-12 hrs after the onset of mid-cycle LH surge

 LH surge occurs 24-36 hr before ovulation, it triggers ovulation .

* + How many cycles can a woman have during life time? 300—400 cycle
	+ How many oocyte at birth female has ? 2 million
* **What controls the menstrual cycle?**
	+ Hypothalamus produces gonadotropin releasing hormone , it will go to anterior pituitary and stimulate the release of FSH and LH , FSH will go to ovaries and stimulate the growth of the follicle (from primary oocyte into mature graafian follicle ) and LH triggers ovulation .
	+ The hormones estrogen and progesterone play the biggest roles in how the uterus changes during each cycle.
	+ **Estrogen** is the predominant hormone in 1st half of cycle , it is produced from granulose cells , and it builds up the lining of the uterus from the basal layer .(there is few progesterone in 1st half of cycle )
	+ **Progesterone** is the predominant hormone in 2nd half of cycle **,** produced by corpus luteum (which is formed after ovulation), increases after an ovary releases an egg (ovulation) .(there is few estrogen in 2nd half of cycle ) . corpus luteum = yellow body .
* **Symptoms of painful periods :**
	1. Pains in the abdomen
	2. Pain in the vagina
	3. Feeling nauseous and generally unwell
	4. Diarrhoea
	5. Sweating
	6. Fatigue
* **Related Terms :**
	+ **Oligomenorrhoea** : Irregular, infrequent periods (5 weeks – 3 months if the period is regular OR 5 weeks – 6 months if the period is irregular )
	+ **Menarche**: is the age of the first menstrual cycle and culminates at the age of Puberty.
	+ **Dysmenorrhea** - painful menstruation , Possible cause >> prostaglandins
	+ **Amenorrhea** - absence of menstruation ( >3 months if regular period OR >6 months if irregular period)
	+ **Mittelschmerz** - middle pain; cramping in lower abdomen that occurs during ovulation “release of egg” , sometimes associated with few blood spots (good sign , indicates that lady is ovulating) .
	+ **Menopause** is cessation of regular menstrual cycle for at least 1 year .
* **Menstrual Cycle Consists of:**
	1. Ovarian Cycle
	2. Endometrial Cycle
* **The Phases of the Ovarian Cycle :**



* 1. **Follicular phase** - proliferative phase or Pre ovulatory phase :
		+ Starts from day 1 until ovulation day 14 .
		+ high levels of FSH secreted from anterior pituitary .
		+ Function is to stimulate follicles in the ovaries (from primary oocyte into mature Graafian follicle)
		+ Only One follicle begins to mature and brings an egg to maturity 1- 14 days (As the follicle mature 🢡 ⭡ estrogen 🢡 ⭣FSH “-ve feed back on the pituitary” 🢡 the follicle with the highest number of FSH receptors will continue to thrive, The other follicles “that were recruited” will become atretic .
		+ granulosa cells of the Follicle secrete estrogen
		+ Increase level of estrogen secreted by maturating follicle that leads to endometrial proliferation and increase thickness.
	2. **Ovulation :**
		+ Follicle ruptures open and releases the mature egg at day 14 , triggered by LH surge (LH surge occurs 24-36 hours before ovulation)
		+ Decrease level of estrogen
		+ Life span of ovum is 24 hrs in fallopian tubes , if not fertilized within 24 hrs it’ll die .
	3. **Luteal phase** - secretory phase or post-ovulatory phase :
		+ Starts from ovulation day 14 to the end of the cycle .
		+ after releasing an egg, the follicle turns into the corpusluteum 15 -28day (corpusluteum = mature graafian follicle – egg ) . egg is surrounded by cells “cumulous oophorus”
		+ The corpus luteum starts to secret progesterone (predominantly) 2-3 days after ovulation to Prepare endometruim for implantation and to secret glycogen and mucus , it also secrets estrogen to a lesser level.
		+ If pregnancy occurs >> the corpus luteum will not fade away and secrete progesterone until 12 weeks of gestation until the placenta is formed and it starts to produce progesterone instead .
		+ Progesterone maintains pregnancy by relaxing uterine muscles and increasing sphinctric action of internal Os .
		+ If pregnancy doesn’t occur >> the corpus luteum begins to degenerate and fade away and become fibrous tissue , that will lead to Estrogen and Progesterone decrease.
		+ Sudden drop of Estrogen and Progesterone will lead to start of next cycle .
	4. **Menstruation :**
		+ Shedding of the inner lining of the endomertium at day 28(start of a new cycle) .
		+ Just before menses the endometrium is infiltrated with leucocytes
		+ Prostaglandins are maximal in the endometrium just before menses
		+ Prostaglandins 🢡 constriction of the spiral arterioles 🢡ischemia & desquamation Followed by arteriolar relaxation, bleeding & tissue breakdown
* **The Phases of the Endometrial** **Cycle :**
	1. **Proliferative phase**
		+ Start in day 5
		+ Start endometrial proliferates in response of estrogen
		+ Increase thickness dramatically from 0.5 – 5mm (at end of cycle it becomes 5 mm).
		+ Cervical mucus becomes thin , clear , watery more alkaline near ovulation .
	2. **Secretory phase :**
		+ begins at ovulation
		+ Progesterone secreted by the corpus luteum stimulates the glands of the endometrium to start secreting the nourishing substances preparation of implantation.
	3. **Ischemic phase**
		+ If fertilization does not occur, the ischemic phase begins.
		+ Estrogens and progesterone level drop
		+ Corpus luteum degenerate.
		+ Spasm of spiral arterioles and lead of shedding of the endometrium.
	4. **menstrual phase :**
		+ Rupture of spiral arteries
		+ The beginning of menstrual flow marks the end of one menstrual cycle

Done by : Noor Daher Al-hijjaj ☺