

The Menstrual Cycle

Graduate Entry Programme
ICSM

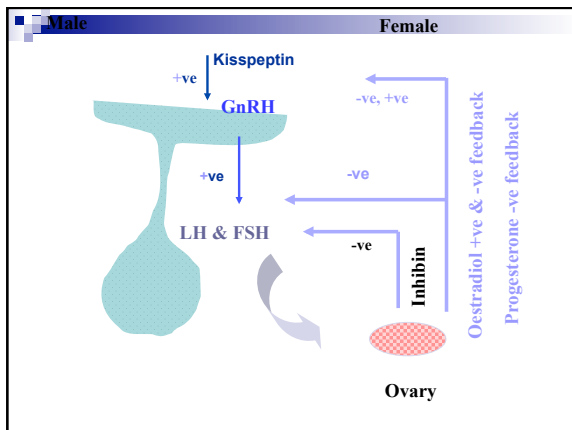
January 2013
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The Menstrual Cycle

Learning Objectives

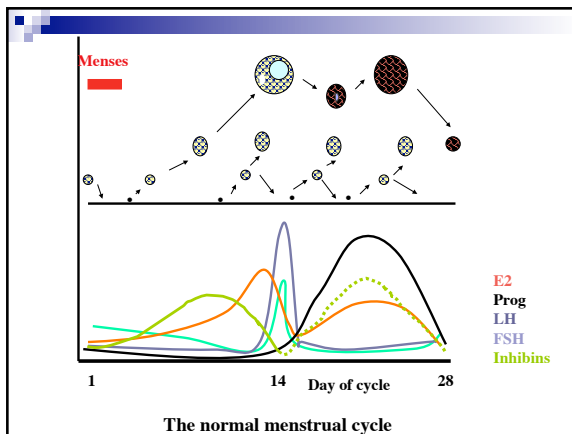
To understand the involvement of the following in the regulation of the menstrual cycle.

- The HPG
- Two cell two gonadotrophin hypothesis
- Steroidogenesis
- Dominant follicle
- Inhibin



The hormones of the HPG

- Kisspeptin stimulates GnRH
- GnRH (Gonadotrophin Releasing Hormone) stimulates LH and FSH synthesis and secretion
- LH and FSH stimulate synthesis and secretion of ovarian steroids and inhibins
- Inhibins regulate FSH synthesis and secretion
- Steroids regulate LH, FSH, GnRH and Kisspeptin



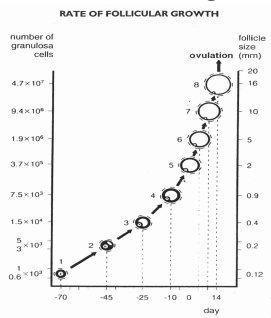
The normal menstrual cycle

- 28 days (~23-34 days)
- Ovulation occurs about day 14 (28 day cycle) following a surge in LH secretion
- The follicular phase of the cycle occurs prior to the LH surge; length variable
- The Luteal phase occurs post LH surge; length 14 days

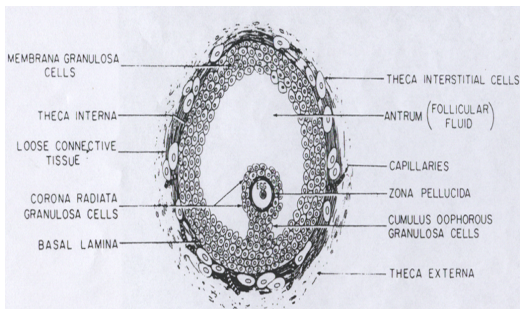
The growth of follicles

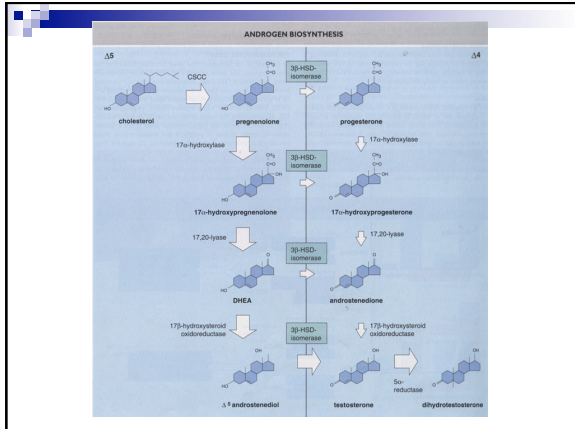
type	<340 to -190 days	-70 days	-45 days	-25 days	-10 days	day 1	day 5	day 14		
class	primordial	primary	pre-antral class 1	early antral class 2	class 3	class 4	recruitment class 5	selection class 6	dominance class 7	pre-ovulatory class 8
diameter	0.06mm	0.12mm	0.2mm	0.4mm	0.9mm	2mm	5mm	10mm	16mm	20mm
number of granulosa cells										
1 layer	6 × 10 ³	3 – 5 × 10 ³	1.5 × 10 ⁴	7.5 × 10 ⁴	3.7 × 10 ⁵	1.9 × 10 ⁶	9.4 × 10 ⁶	4.7 × 10 ⁷	6.0 × 10 ⁷	
atresia		24%	35%	15%	24%	58%	77%	50%		

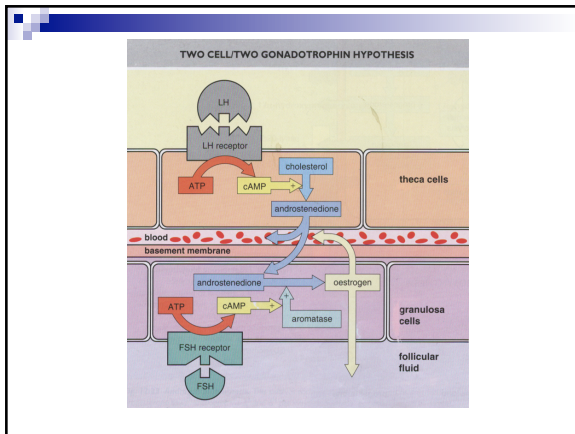
The rate of follicular growth

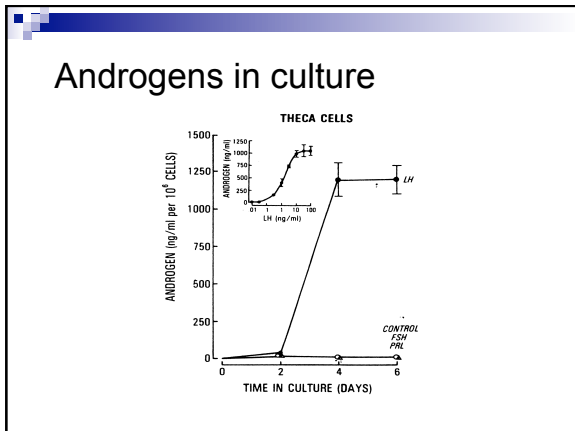


The Graffian Follicle

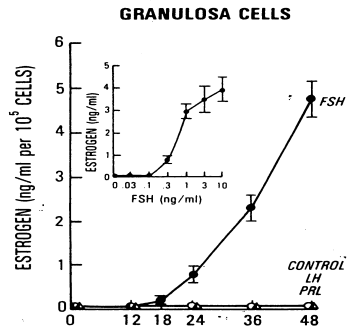








Oestrogen production in Granulosa cells

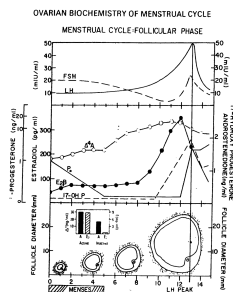


Gonadal steroids - oestrogens

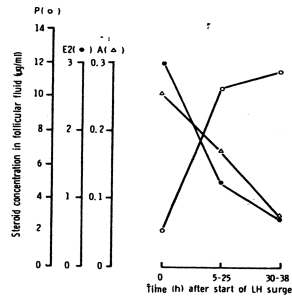
- Produced by the ovary, growing follicles, corpus luteum, adipose tissue and placenta from testosterone/androstendione
- 3 - oestrone, oestradiol and oestriol of which oestradiol is the most potent
- Oestradiol - roles in preparation of uterus and reproductive tract for conception and pregnancy.
- Oestrogens confer female secondary sexual characteristics - breast development, body shape, adipose tissue.

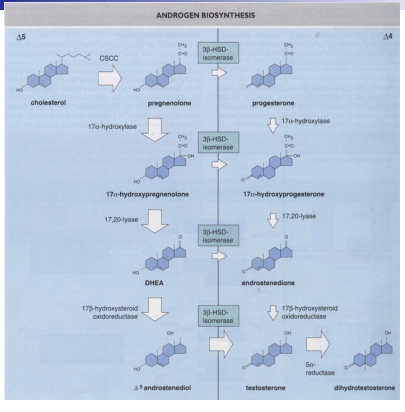
Ovulation

- Poorly understood
- Dominant follicle at ovarian surface ~20mm
- LH surge
- Final maturation and
- Expulsion of the egg
- Progesterone production

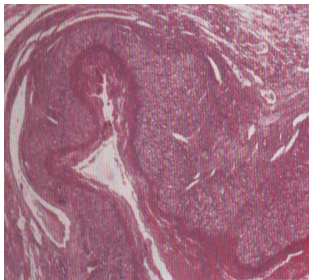


The steroids in follicular fluid in relation to the LH surge

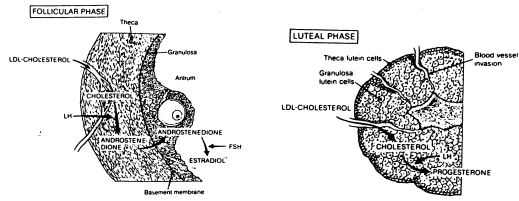




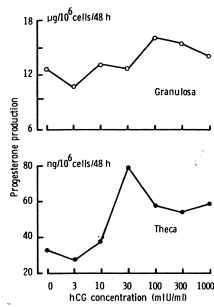
Corpus luteum



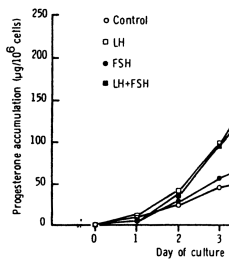
Steroids in the Follicular and Luteal Phases



Progesterone production

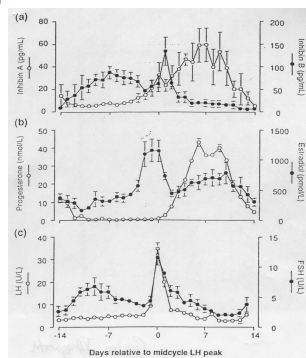


Progesterone in culture



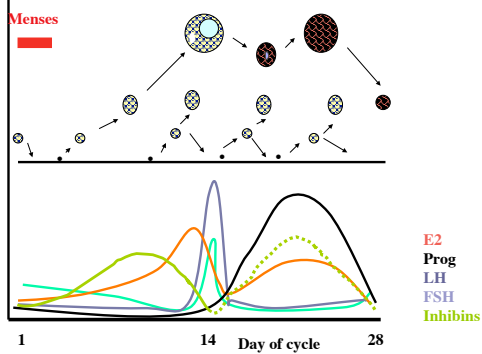
Gonadal steroids - progesterone

- Produced by the Corpus Luteum and the placenta
- Essential for maintenance of the endometrium, and therefore implantation and the maintenance of pregnancy

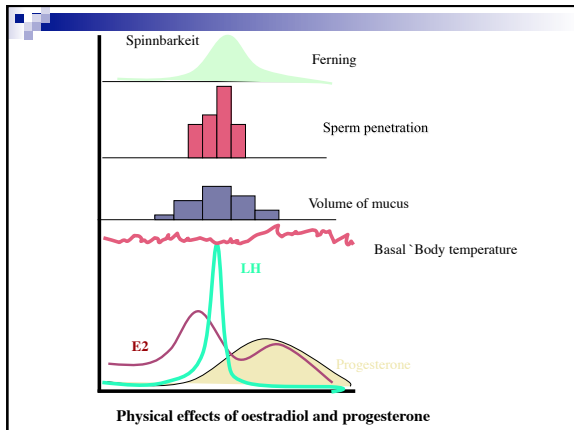


Inhibins during the menstrual cycle

(Groome et al 1996
J Endoc Metab)



The normal menstrual cycle



What do we measure?

- Progesterone >20nmol/L in the luteal phase consistent with ovulation
- LH and FSH days 3-5 useful for exclusion of the menopause
- The above and oestradiol may be used in ART treatments

