Reproduction (Core)

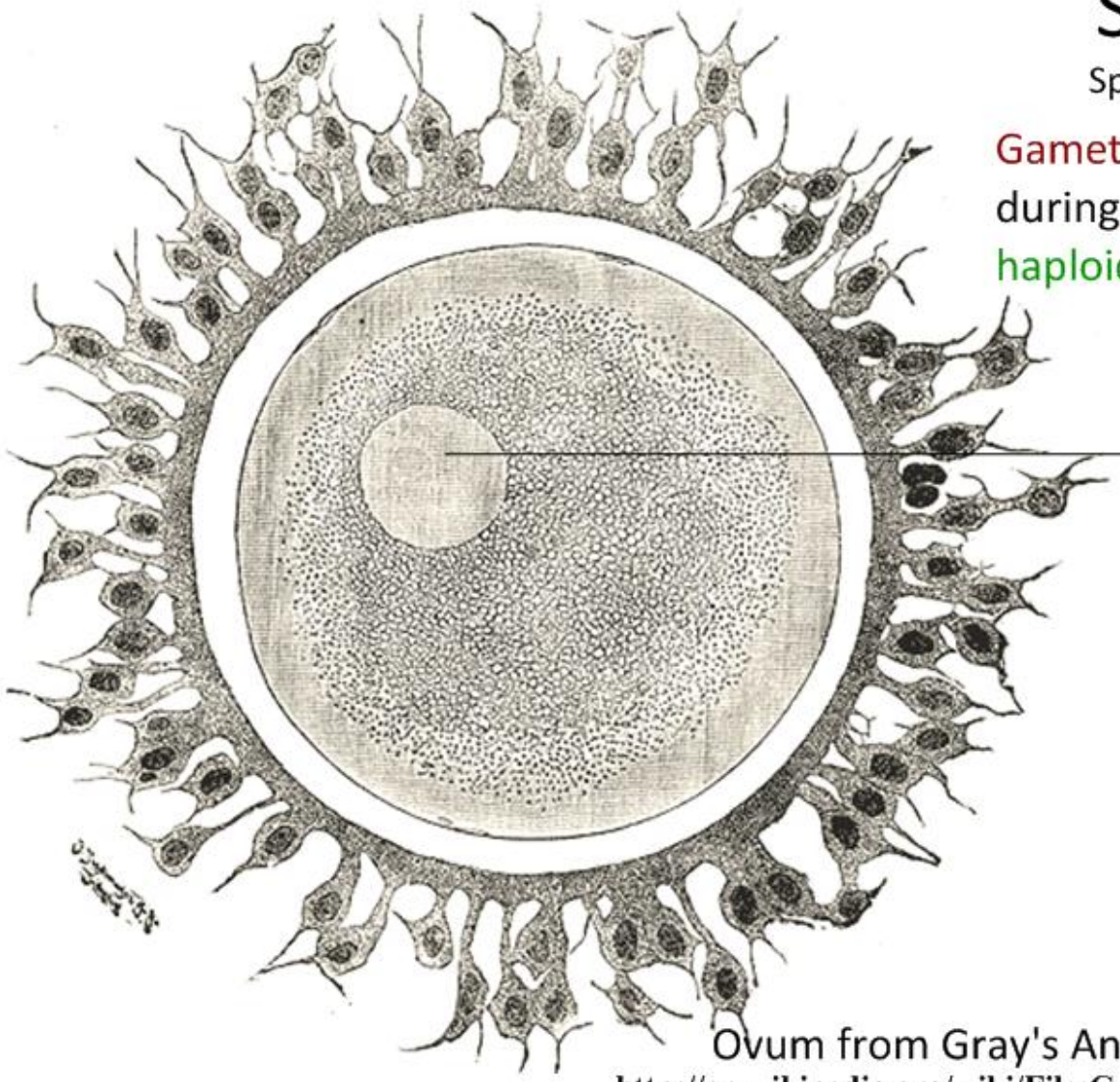
Stephen Taylor
Bandung International School

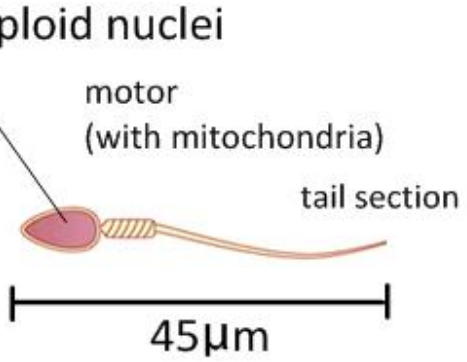
"Hand of Hope" image from:
http://www.nrlc.org/news/2008/NRL04/HandofHopeweb%20.jpg

Sperm and Egg Cells

Spermatozoan Ovum

Gametes are cells that fuse in fertilisation during sexual reproduction, combining two haploid nuclei into a single diploid nucleus.



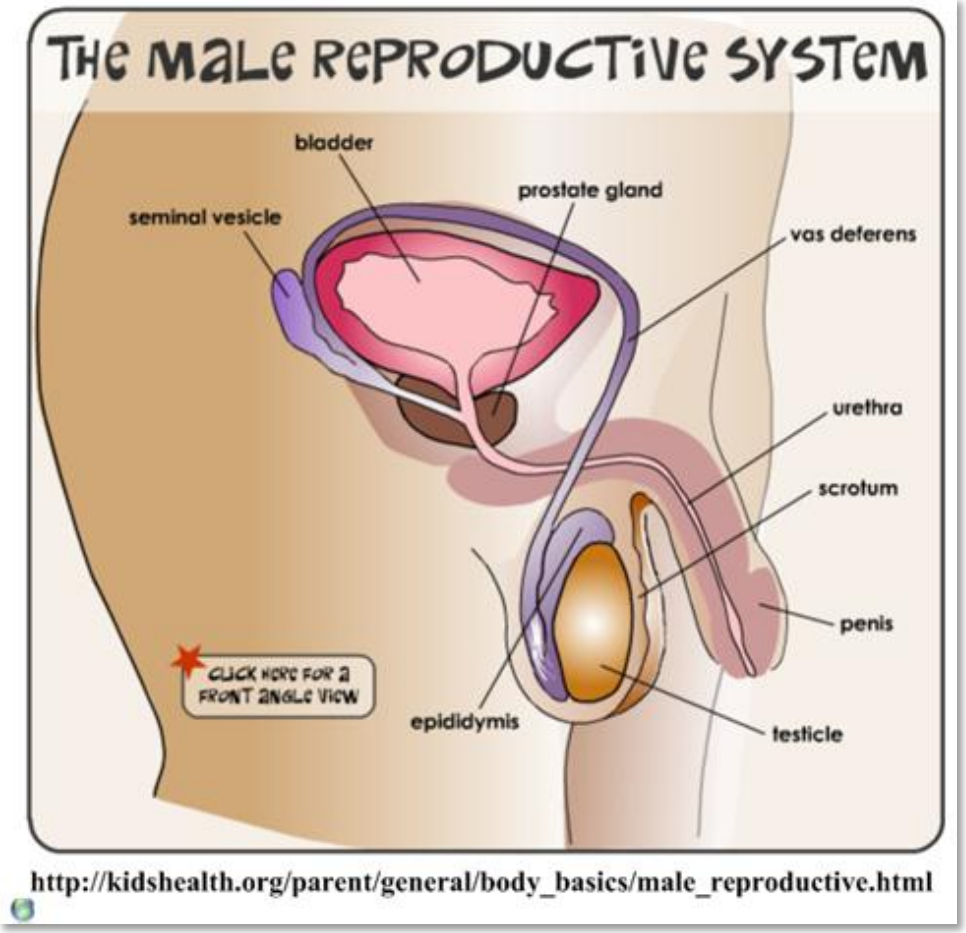


Produced through meiosis

Ovum from Gray's Anatomy
http://en.wikipedia.org/wiki/File:Gray3.png

Sperm Cell from BBC
http://tinyurl.com/2aqr2f9

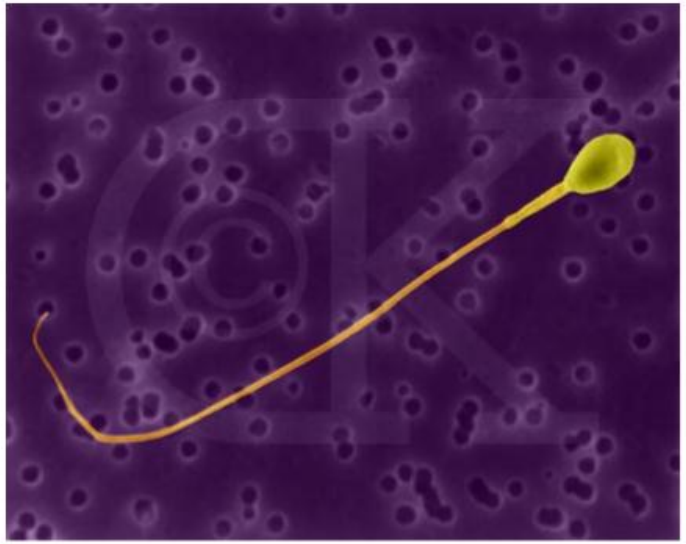
The Male Reproductive System



http://kidshealth.org/parent/general/body_basics/male_reproductive.html

The sperm's journey:

1. Spermatogenesis in the testis
2. Maturation in the epididymis
3. Carried along vas deferens
4. Fructose for energy and protective mucus picked up at seminal vesicle
5. Prostate adds fluids to neutralise acid in the vagina
6. Ejaculation through the penis, via the urethra.



http://www.cartage.org.lb/en/themes/Sciences/LifeScience/GeneralBiology/Physiology/ReproductiveSystem/HumanReproduction/97086a.jpg

Functions of Testosterone

Pre-natal development of male genitalia

SRY gene on chromosome Y causes surge of testosterone in the male fetus, causing penis and testes to develop. Testes will produce sperm in adolescence and beyond.

Secondary sexual characteristics in puberty

Increased aggression, muscle mass, pubic and body hair. Male grows taller and voice deepens. Sperm production begins and male is able to procreate.

Sex drive and aggression

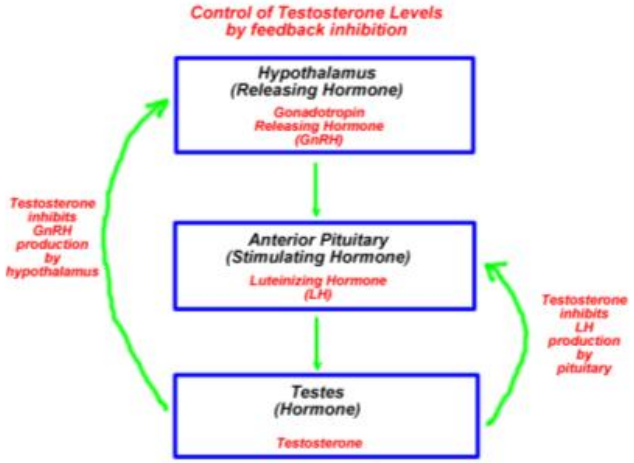
Testosterone increases male sex drive and sperm production is constant - for the rest of his life. Agression allows hunting and defense.

http://marcvz.net/blog/wp-content/uploads/2007/10/caution-this-is-sparta.jpg

Michaelangelo's *David*

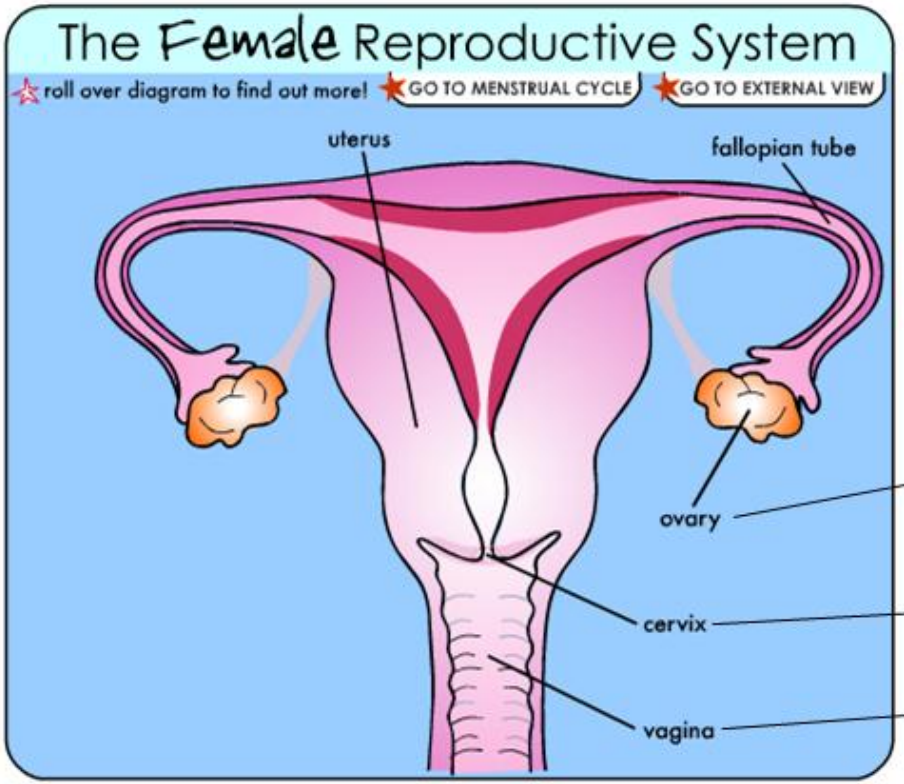
http://www.lightplan.net/images/Michaelangelo_David_1.jpg

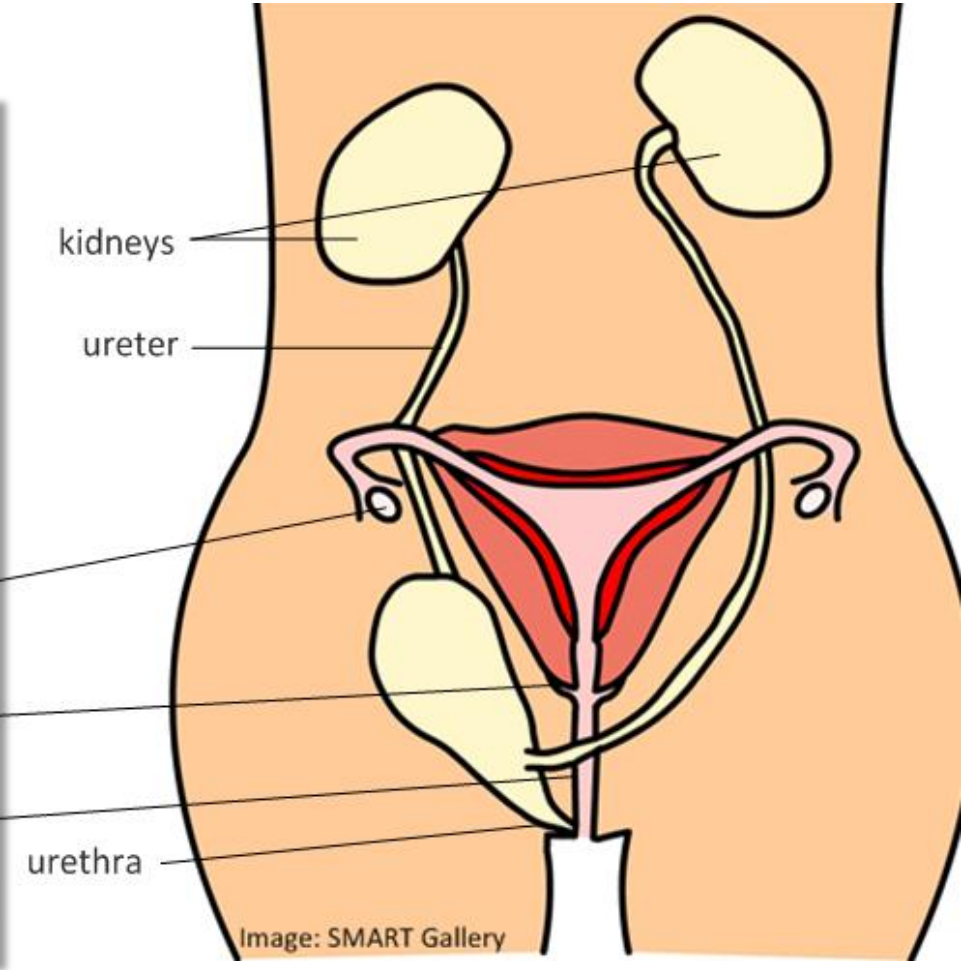
HL's think ahead...



http://www.coolschool.ca/lor/BI12/unit15/U15L04.htm

Female Reproductive System





Protecting the reproductive system is a real sperm-killer:

- Vagina is acidic, killing bacteria and sperm
- Tightly-closed cervix has a mucus plug, catching pathogens and sperm.
  This mucus mesh loosens around ovulation to allow more sperm through.

How does all this ensure that only the 'best' sperm fertilise the egg?

Menstrual Cycle Hormones

Controlled by endocrine system.

Pituitary

FSH — stimulates oocyte development

LH — matures oocyte and causes release (ovulation)

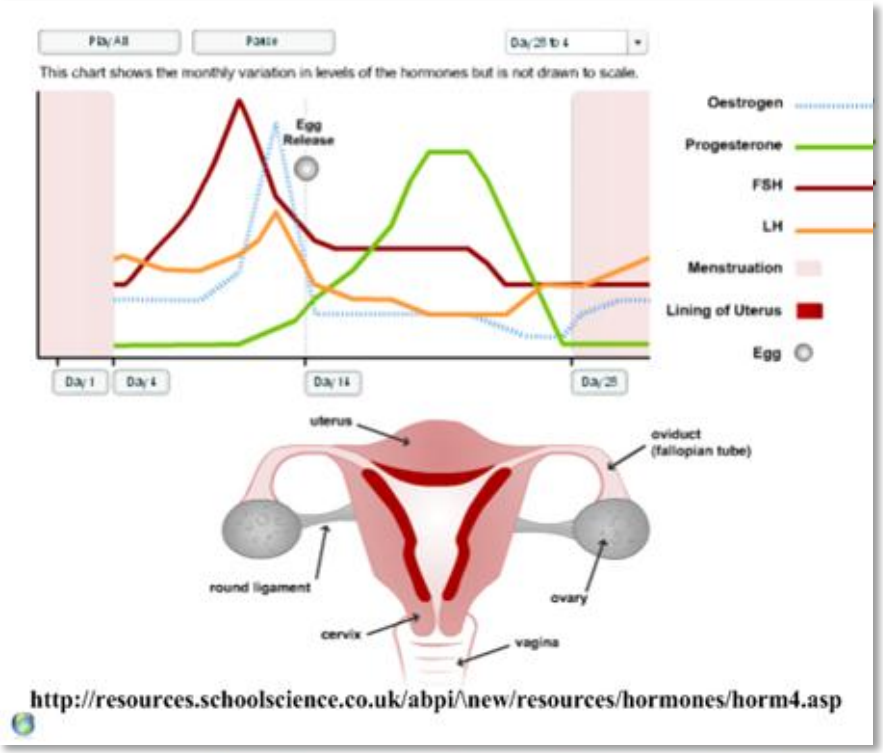
Ovaries

Estrogen — develops endometrium
early: positive feedback on FSH
late: neg. feedback on FSH & LH

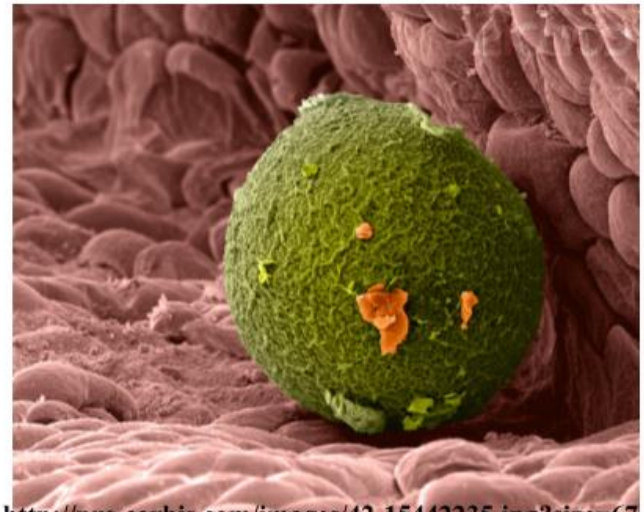
Progesterone — maintains endometrium
negative feedback on FSH and LH

HCG — Pregnancy hormone: keeps estrogen and progesterone high

Oxytocin — Birth hormone: contractions of uterus

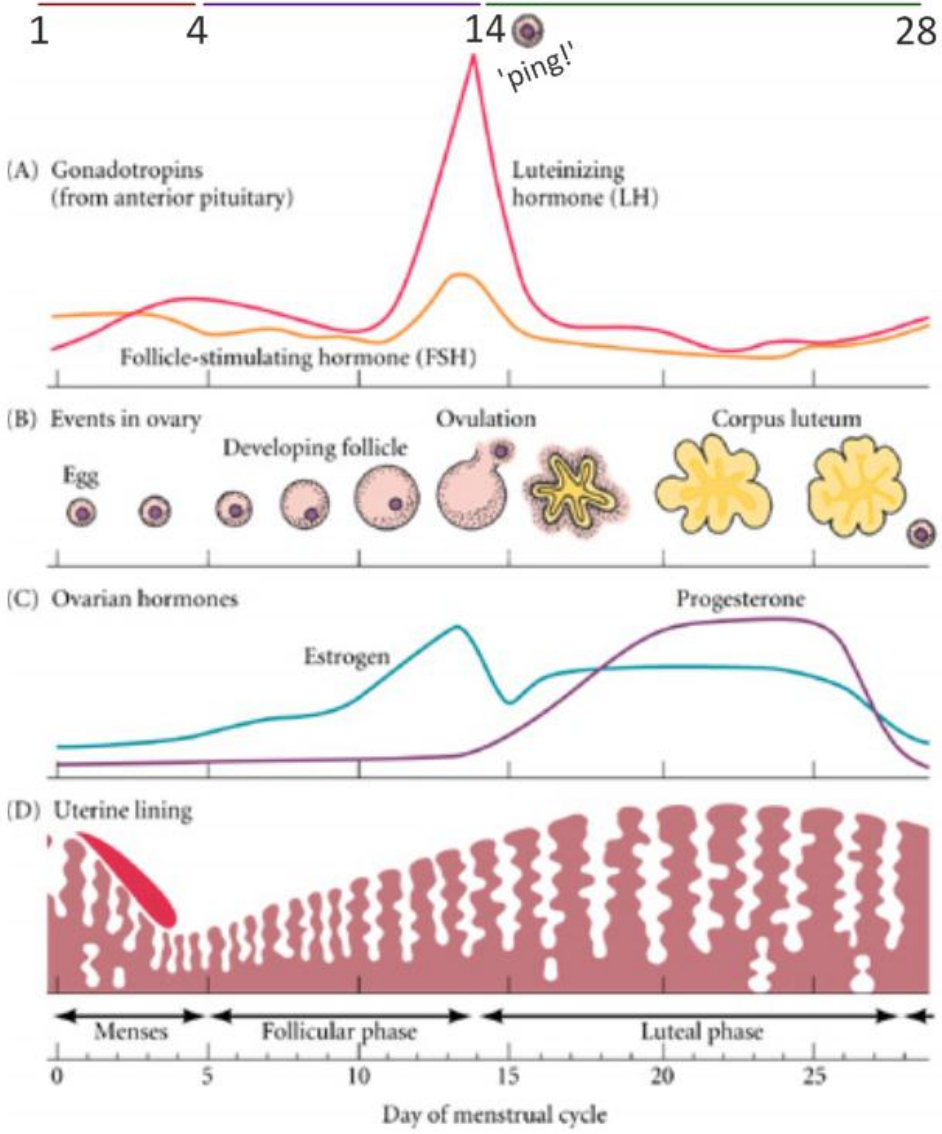


http://resources.schoolscience.co.uk/abpi/\new/resources/hormones/horm4.asp



http://pro.corbis.com/images/42-15442235.jpg?size=67&uid={016A1831-A287-4E75-A0D1-41E30415CCB2}

Hormones in the Menstrual Cycle



http://8e.devbio.com/images/ch19/11.HMEM.01.thumb.jpg

Day 1-4 (Follicular phase)

-Menstruation. Endometrium shed.

-FSH increases, stimulating follicle development.

Day 5-14 (Ovulatory phase)

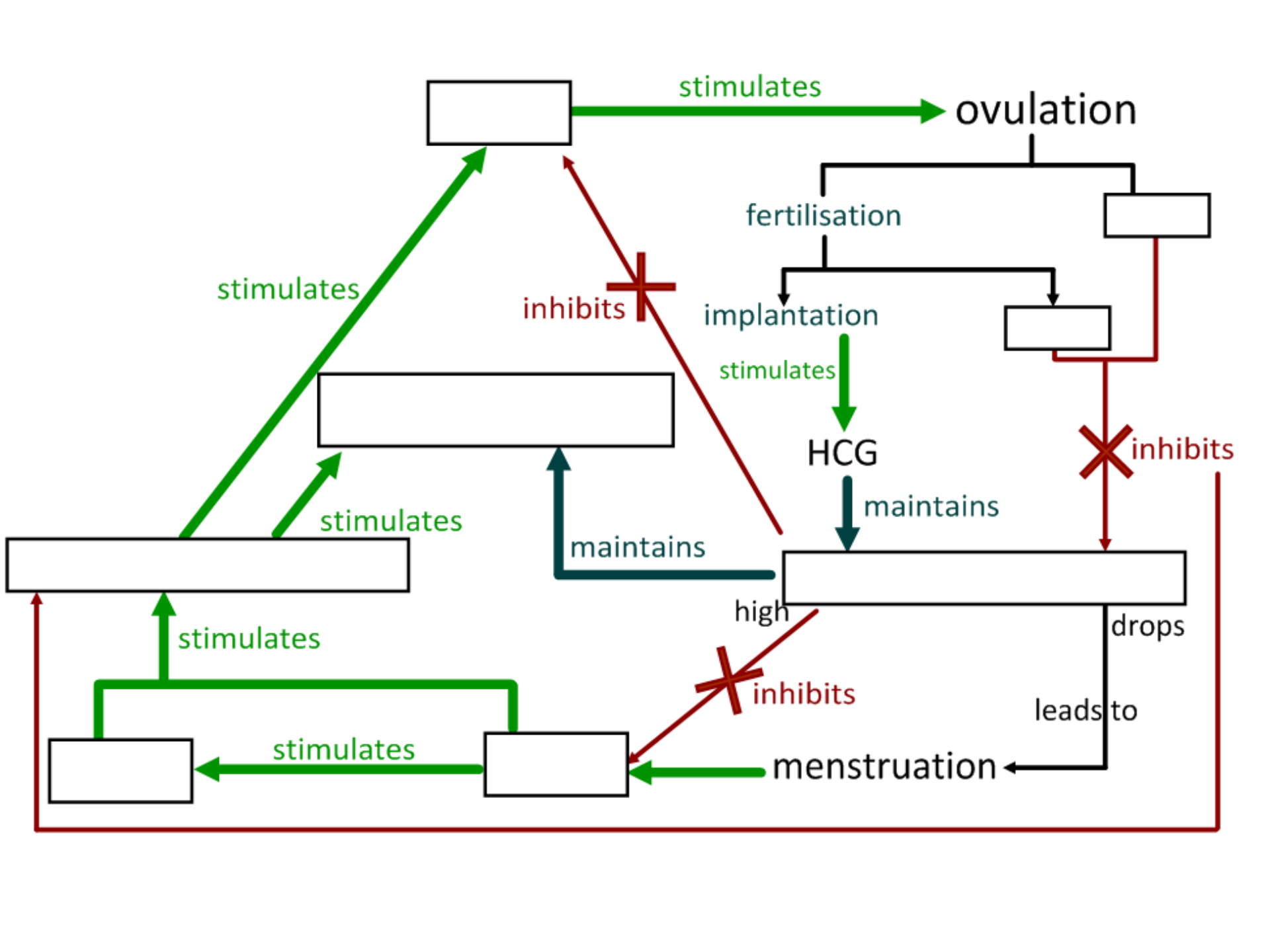
-FSH and follicle stimulate oestrogen release

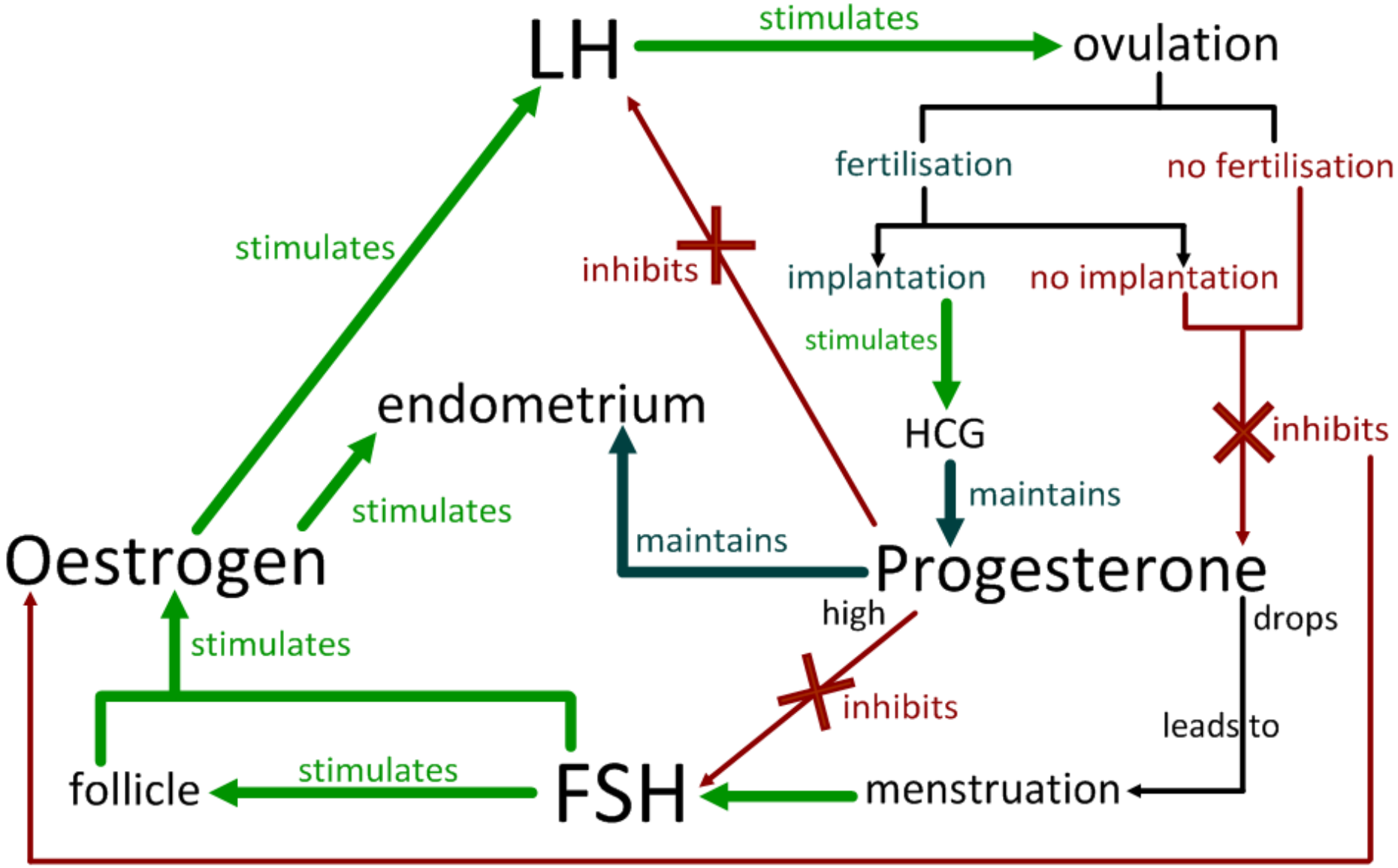
- Oestrogen stimulates endometrium development
- Oestrogen stimulates LH
- Peak in LH causes ovulation (Day 14)

Day 14-28 (Luteal Phase)

- Fall in LH. Corpus luteum forms from now-empty follicle
- Corpus luteum releases progesterone
- Progesterone maintains the endometrium and inhibits FSH and LH

If no fertilisation and implantation occurs, progesterone and oestrogen drop, triggering menstruation and FSH release.

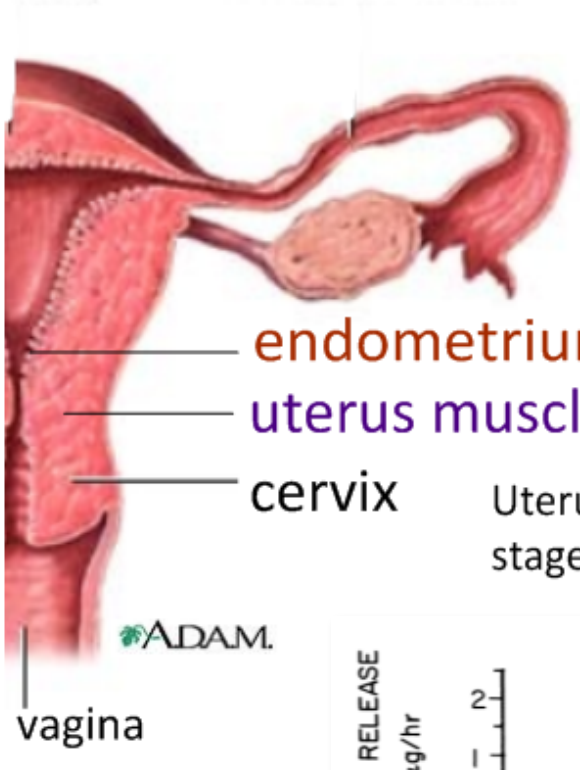

stimulates
ovulation
fertilisation
stimulates
inhibits
implantation
stimulates
HCG
inhibits
maintains
stimulates
maintains
high
drops
stimulates
inhibits
leads to
stimulates
menstruation


LH
stimulates
ovulation
fertilisation
no fertilisation
stimulates
inhibits
implantation
no implantation
stimulates
endometrium
HCG
inhibits
stimulates
maintains
maintains
Oestrogen
Progesterone
high
drops
stimulates
inhibits
leads to
follicle
stimulates
FSH
menstruation

Menstrual Cramps: What Causes Them?

Off topic
HPD link

If no pregnancy occurs, the endometrium needs to be replaced.
Menstruation clears out the endometrium to make way for a new one.

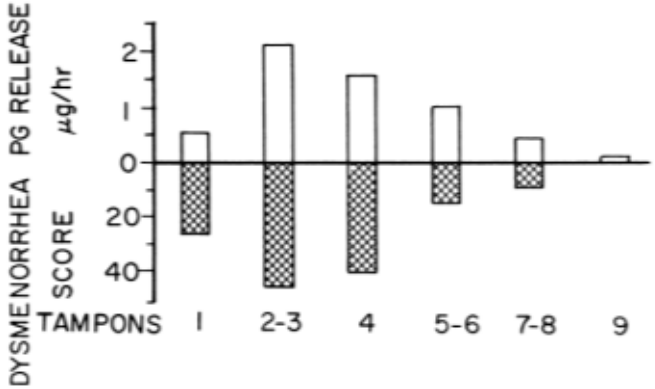


Up to 50% of women experience menstrual cramps, with around 15% suffering from severe pain. This is known as dysmenorrhea. Type I dysmenorrhea begins in puberty. Type II begins much later and coule be a sign of an internal health problem (and should be checked).

endometrium breaks down, releasing prostaglandin hormones.

uterus muscle contracts, restricting blood flow to endometrium.

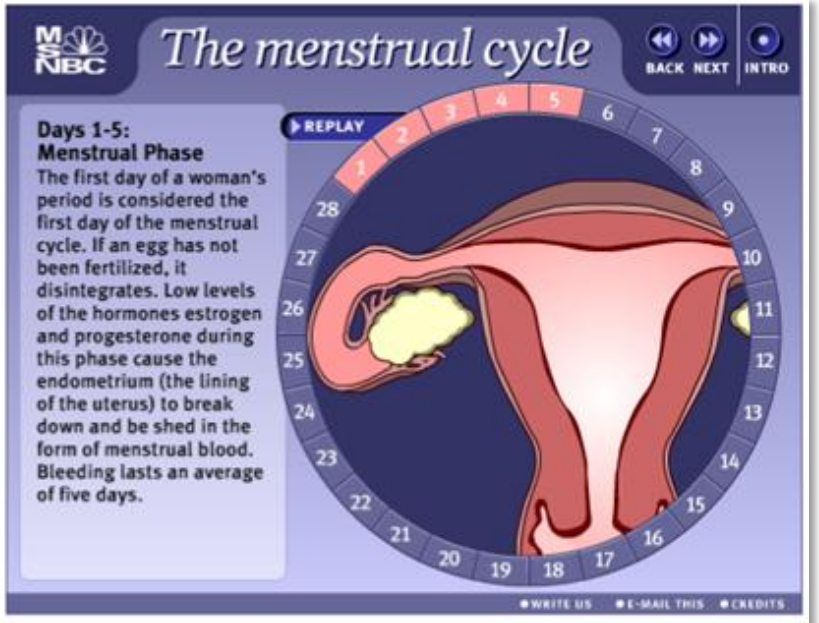
cervix Uterus lining dies and contractions force it out through the cervix in stages. Clots or small blockages might make cramps more painful.



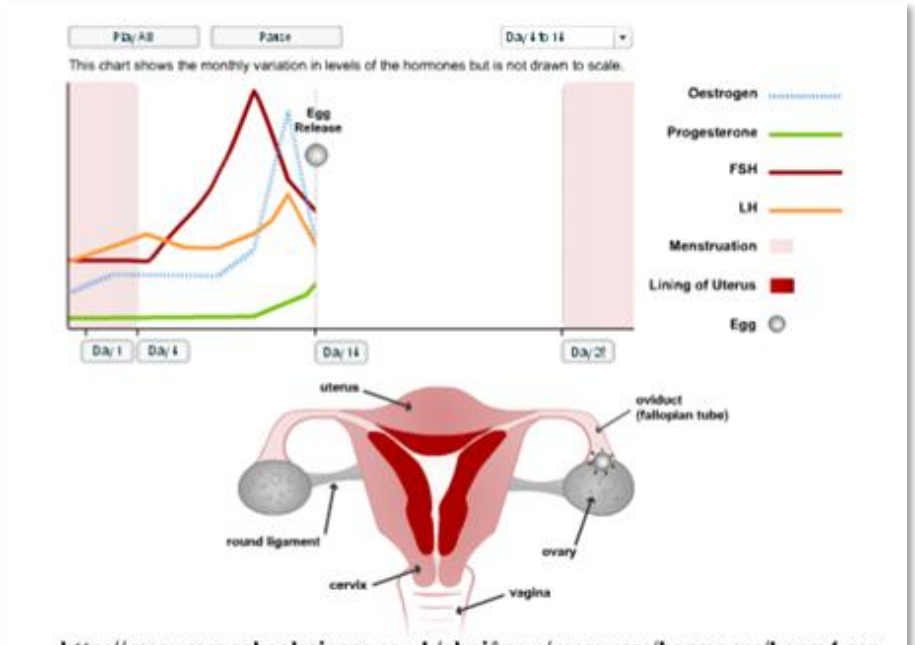
There is strong correlation between prostaglandin (PG) levels and cramping pains. There is also some evidence that use of oral contraceptives can reduce blood PG and thus reduce symptoms of dysmenorrhea.

Read more here:
http://tinyurl.com/yfs2cd4
Global Library of Women's Medicine

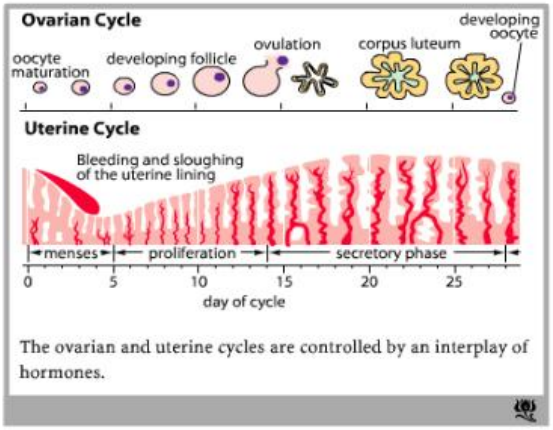
Menstrual Cycle Animations



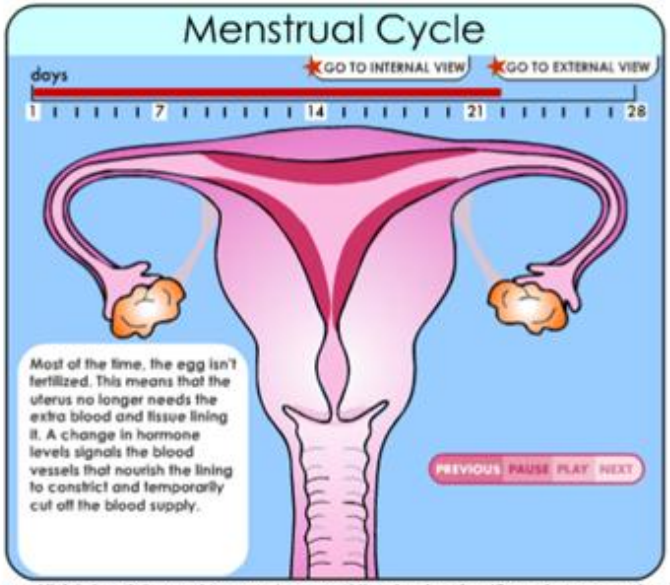
http://www.msnbc.com/news/wld/graphics/menstrual_cycle_dw2.swf



http://resources.schoolscience.co.uk/abpi/\new/resources/hormones/horm4.asp

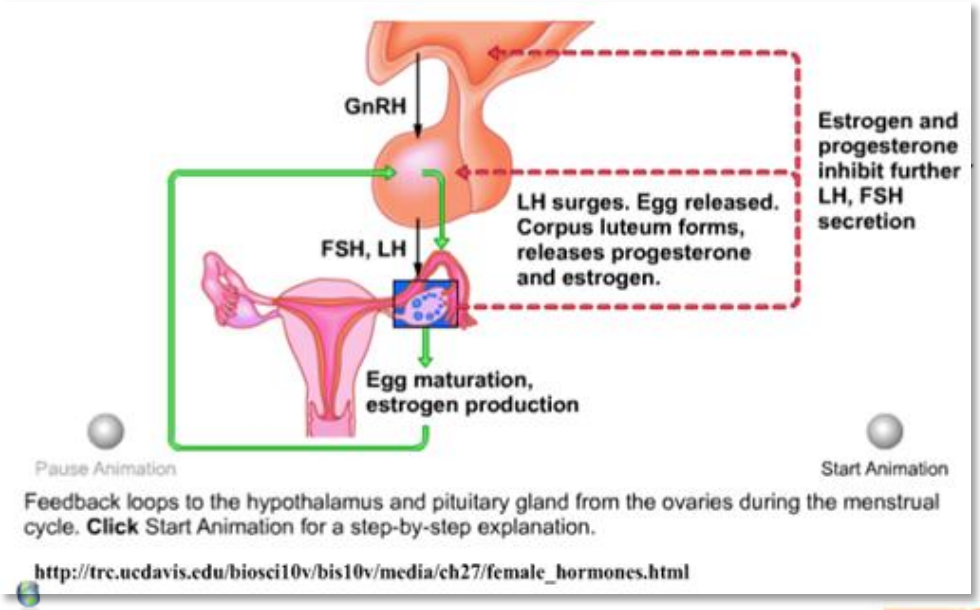


http://www.sumanasinc.com/webcontent/animations/content/ovarianuterine.html



http://kidshealth.org/parent/general/body_basics/female_reproductive_system.html

Hormones and Contraception

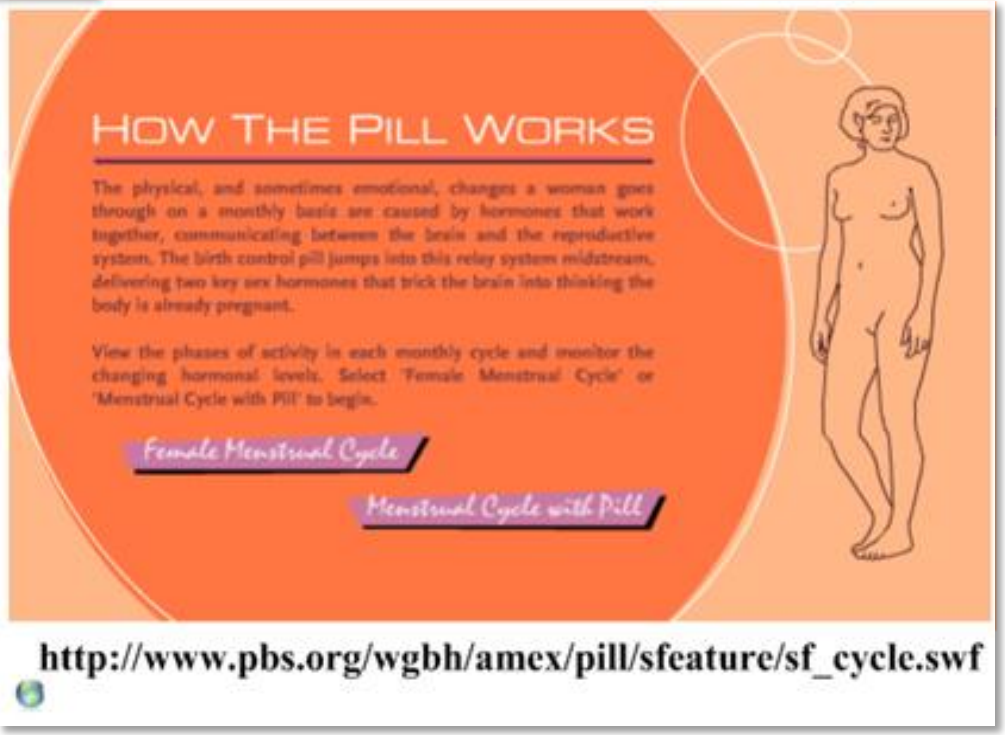


Knowing the effects of hormones on the mentrual cycle has allowed for various contraceptive pills to be produced.

A woman takes 'the pill' most days of the cycle. Different brands work in different ways but they will usually prevent ovulation or implantation of a fertilised egg.

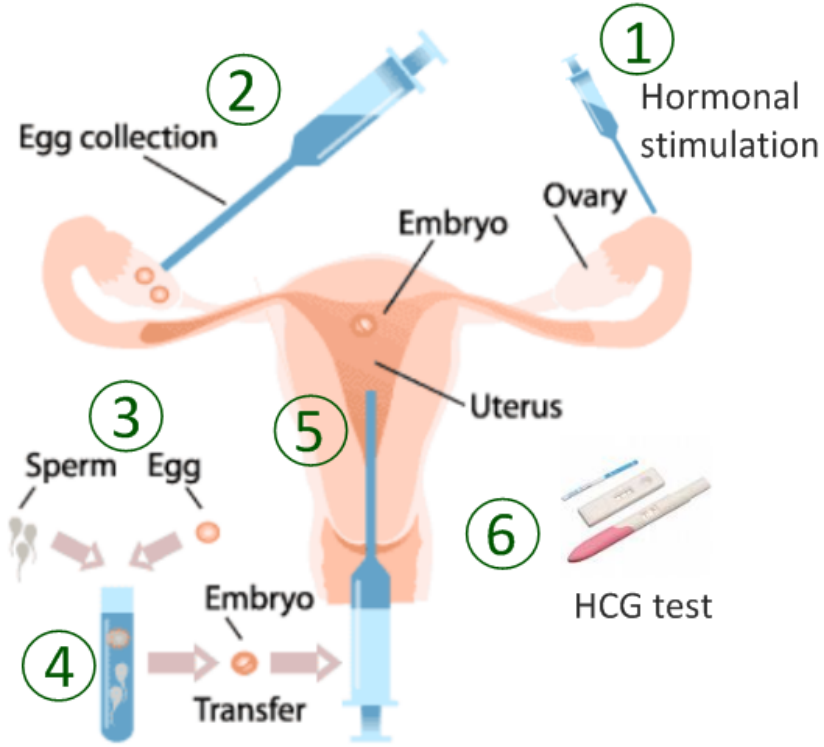
How does contraception with 'the pill' compare to using condoms in terms of:

- efficacy against pregnancy?
- ease of use?
- pleasure of sexual intercourse?
- protection against sexually transmitted infections?



In-Vitro Fertilisation (IVF)

1. After determining suitability for IVF, FSH and LH are given to stimulate multiple egg releases.
2. These eggs are collected.
3. Eggs are fertilised with father's sperm, in a dish, and incubated. This is 'IVF'.



http://www.ivf.net.in/ivf&icsi/

Start here:

http://www.abc.net.au/science/lcs/swf/ivf.swf

4. After incubation, viable (fertilised) blastocysts are selected and developed into embryos.
5. Guidelines state that up to 3 embryos can be selected for implantation. Hopefully one or more will 'take'. There is a risk of multiple pregnancy.
6. After bedrest and a month or so, a pregnancy test is administered. If positive, pregnancy continues as normal. If not, a woman may wait a few months and attempt another cycle.

IVF and Ethical Considerations

Before discussing the ethical issues of IVF, visit these sources to learn more:

http://www.ivf.net/

http://www.beep.ac.uk/content/188.0.html

Simply, we could list the 'pros and cons' of IVF:

Arguments for IVF	Arguments against IVF
The right to have children	Religious: is it playing 'God'?
Improving medical technology makes it safer than ever before	The risk to the mother and fetuses of multiple pregnancies
Some governments cover costs on NHS	Extreme costs can be associated with IVF
Hope is given to those who cannot conceive by 'traditional' means	Emotional cost of failure can be high, especially with all the extra hormonal load
Unused embryos can be stored and used later, donated or as a source of stem cells	Does termination of excess embryos count as ending a human life? Where is the line drawn?

But is this approach too simplistic? Can we go deeper?

IVF and ethics: a recent case study

guardian.co.uk

News | Sport | Comment | Culture | Business | Money | Life & style

News › World news › United States

Mother of octuplets already has six children

Dan Glaister in Los Angeles
The Guardian, Saturday 31 January 2009
Article history
http://www.guardian.co.uk/world/2009/jan/31/mother-octuplets-children

In this recent news story, a mother of six was given IVF. She went on to have octuplets. This led to international debate - how and why did this happen?

Your task is to read and watch the sources associated with this story.

What are the ethical problems with this case?

http://www.youtube.com/watch?v=sdhJJdrP4dA

Who are the stakeholders* in this case and in IVF in general? What is their right or point of view?

If there was an ethical breakdown in this case, what was it and how could it be avoided in the future?

**e.g. the mother, the IVF clinic, the newborns, the siblings, the health service, the family...*

For more IB Biology resources:

http://sciencevideos.wordpress.com

Permanent link to this comic: http://xkcd.com/699/