Gametogenesis and Fertilization

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for BioS 90 & 95
12 September 2008

Life is short. Especially if you’re a sperm cell!
Used with permission of the artist, Patrick Moberg
Try to remember... when you were gametes!

Think like a sperm...

Think like an oocyte...
Gametes are prefabricated for action, a cascade of functions.

Gamete production includes unique patterns of gene expression and regulation.

Gametes have complex structure and many phenotypes.

Every Gamete is a genetically distinct human individual!

Here’s where they came from…
Your parents…

When fetuses…

PGCs, Primordial Germ Cells populated the presumptive gonadal tissue…

from Sylvia Mader, Human Reproductive Biology
Gametogenesis
from Sylvia Mader, Human Reproductive Biology, 3rd ed.
from Sylvia Mader, Human Reproductive Biology, 3rd ed.
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008

Consequence: Every product of meiosis is genetically distinct from every other one!
from Sylvia Mader, Human Reproductive Biology

250 m
273 yds
0.16 miles
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008
Duration of spermatogenesis
Mean: 74 days 95% CI: 69 - 80 days
Not affected by DSP/g or frequency of emission

Epididymal transit time
Caput+corpus: 0.7 - >3.5 days
Cauda: 1.5 - >4.5 days
Transit time varies with DSP/testis

DSP = daily sperm production ~10^8/day

1. Primary follicles contain oocyte and begin producing the sex hormone estrogen.

2. Secondary follicles contain secondary oocyte and produce the sex hormones estrogen and some progesterone.

3. Vesicular (Graafian) follicle develops.

4. Ovulation: The secondary oocyte is released.

5. Corpus luteum produces the sex hormones progesterone and some estrogen.

6. Corpus luteum degenerates.
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008
Fertilization

Green = Acrosome
Purple = Zona Pelludica
Gray = Sperm w/out Acrosome

**note that the acrosome compartment opened after contact with the zona pellucida**

http://www.nature.com/fertility/content/images/ncb-nm-fertilitys57-f1.jpg
Modification of the Equatorial Region
Mammalian Sperm-egg interaction

Figure 1. Mammalian fertilisation. Within the female reproductive tract (i) sperm undergo a series of surface and intracellular transformations, collectively termed capacitation, which enables them (ii) to bind to the zona pellucida (ZP) and (iii) undergo the acrosome reaction. (iv) The release of hydrolytic enzymes from the acrosome facilitates sperm passage through the ZP and (v) fusion with the oolemma.
From Alberts et al., Molecular Biology of the Cell, 5th ed., 2008
And then…

from Sylvia Mader, Human Reproductive Biology
Questions
Discussion
Editorials
Jokes
Thanks!