Seminal plasma contains what hormone to stimulate contractions of the FRT?

- PGF2A

True/False: Sperm are anabolic

- False, anabolic metabolism = "building" and sperm cannot repair themselves
- Sperm are catabolic meaning they breakdown substrates into chemical energy and once these run out, they die (sperm "wear out" as it metabolizes).

What acrosomal enzymes are released from a true acrosome reaction and what do they do?

- Vesiculation (pores) allow for the release of these enzymes!
- Hyaluronidase : breaks down COC because it is held together by the extracellular matrix which is made of hyaluronic acid
- Acrosin : digests the ZP by creating small holes

Describe the difference between a true and a false acrosome reaction:

- True : fusion of sperm plasma membrane and outer acrosomal membrane
  - Occurs as capacitated sperm attach to ZP
  - Causes vesiculation: pores develop and acrosome enzymes are released
- False : damaged acrosome = sperm are unable to fertilize the oocyte

The ZP is made up of 3 glycoproteins. What are they?

- ZP1/ZP2 : structural proteins
- ZP3 : receptor that binds to proteins on sperm membrane

Match the following terms to their definitions:

C Zygote A Blastomere D Morula B Blastocyst

a. Cell that results from first cleavage of zygote still located within the ZP
b. Has a fluid filled cavity (blastocoele) from morula outer cells flattening. Composed of the ICM=embryo and trophoblast= chorion, fetal portion of placenta that produces proteolytic enzymes
c. A result of syngamy, single-celled embryo
d. A solid ball of cells (too many to count), separated into inner and outer cells.

Explain the 2 cells in the morula (inner and outer cells):

- Inner cells : develop the gap junctions for intercellular communication
- Outer cells : develop tight junctions which change permeability

After fertilization, all cell divisions are? Why?

- Mitotic because meiosis II is completed after fertilization

What 3 forces govern the blastocyst hatching?

1. Growth and fluid accumulation within the blastocyst (increase pressure)
2. Proteolytic enzymes from trophoblast (forms placenta)
3. Contraction of blastocyst

What are the 3 prenatal growth phases?

1. Ovum/zygote to blastocyst (fertilization → implantation)
    - Zygote * cleavage * → morula → blastocyst
2. Embryo (implantation → maternal recognition)
    - Gastrulation occurs
    - Ectoderm: Nervous system, hair, skin
    - Mesoderm: muscle, skeleton, repro/cardio system, becomes chorion and amnion
    - Endoderm: digestive system, lungs, endocrine system, forms the yolk sac
3. Fetus (maternal recognition → birth)

What effect does maternal nutrition have on muscle and fat development of the conceptus?

- Decrease muscle mass and marbling in offspring

What does MOET stand for? What does this do?

- Multiple Ovulation and Embryo Transfer : a donor dam produces a large number of oocytes by super ovulation which are then flushed out and transplanted into recipients

What happens if the ICM splits?

- TWINS

These 4 steps must be achieved before the embryo can attach to the uterus. Place them in order below:

Maternal recognition of pregnancy	3
Hatching of blastocyst from ZP	2
Development within confines of ZP	1
Formation of extraembryonic membranes	4

What are the consequences of capacitation?

1. Cholesterol efflux = decreased motility
2. Calcium = needed for hyperactivation
3. Bicarbonate = increases cAMP, PKA, and sperm motility
4. pH = sperm pH increases as it travels up the FRT

What is the perivitelline space?

- Space between the oocyte and the ZP – sperm travel here after they enter the ZP
- After, sperm attach to the vitelline (oocyte) membrane at the equatorial segment and cortical granules are released
    - The fusion protein on the equatorial segment allow for the sperm to bind to the oocyte
- Sperm is then engulfed by the oocyte

How does a female prevent polyspermy?

1. Zona block: (slow response) ZP biochemically changes and sperm cannot penetrate (turns to "concrete")
2. Vitelline block: (fast response) removes the receptor for binding

- Cortical granules fuse to vitelline membrane and release contents to degrade receptors for sperm and stimulate zona and vitelline block

Duration of Fertilization Ability of Sperm in FRT:

Species:	Fertile Life (in days)
Cow	1.5 – 2
Mare	4 - 5
Woman	5 - 6