Developmental Biology Lecture 20 (Week 12, Thursday) 11/14/2014

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Okay, our last midterm exam in this class will be this Tuesday November 18th. It will cover up through this lecture (but not pages 9 and 10).

Clicker Question!

What is the phenotype of a ced-4 (gain of function) and egl-1 (loss of function) double mutant?

A) Looks like a ced-4 (gf) mutant- more cell deaths than WT
B) Looks like an egl-1 (lf) mutant- no cell deaths
C) Looks like WT
D) Animal does not survive
E) A and D

Answer is **B**! Remember, this would also be lethal (If E was B and D, that would be the correct answer)

Slide 1)
(incomplete) Reprogramming by SCNT- "cloning"
SCNT= somatic cell nuclear transfer. It is cloning because the resulting organism will have the same DNA as the donor organism. This process is not efficient. Seldom get the tadpole to grow, but never an adult. This CANNOT work for primates- and also, we cannot even attempt on humans because of ethical reasons.

Slide 2)
(missing) Genes required for development are not irreversibly altered
(missing) Gene activities depend on factors present in the cytoplasm of oocyte.

This experiment works better because the donor organism is not as developed and therefore not as differentiated- they are taken from the blastula instead of an adult organism. Adult clones can be generated. But these are not necessarily perfect clones- environmental factors can affect them. And also, mitochondrial DNA can be different (mitochondria have their own genome). Spontaneous mutation can also affect clones.

Slide 3)
(missing) Dolly the lamb was the first mammal cloned.
(missing) Reproductive cloning of important transgenic animals
(missing) Theraputic cloning

Slide 4) The pattern of the human liver cell is not fixed.
(missing) Gene activities depend on the factors present in the cytoplasm of the cell.
(missing) Mechanisms of differentiation are conserved.

Slide 6)
(missing) ES cells MAY be the key to regenerative medicine. There is hope for this, but we are not quite there yet.

Adult stem cells have proven useful for a number of different treatments so far- The most notable success being in the form of bone marrow transplants (used to treat leukemias).

Slide 7) Inner cell mass = ES cells

Slide 8) teratocarcinoma- a type of cancer that is comprised of multiple different cell types in one cluster. Tumors can even grow hair and teeth.

Clicker Question!
ES cells are currently used to successfully treat several human diseases.
A) True
B) False

The answer is false! They may be the key, but not yet. Currently adult stem cells are used for treatments.

Slide 9)
(missing) Can cause immune reaction
(missing) Ethical reasons (taking out ES cells basically destroys the embryo). There are people who take the extreme view that destroying a cluster of living cells is equivalent to murder. Makes this a very difficult area to work.
(mssing) Similar ethical issues

Slide 10)
(missing) Age related macular degeneration (this is still at clinical levels however).

Slide 11)
(incomplete) Use a mix of transfected genes to induce cells back to an undifferentiated state.

There are four different factors used- called the Yamanaka factors. Fbx15 is only expressed in ES cells and can be used as a marker. Don't worry about all the detail in this pathway (unless you are an honors student)

Slide 12)
(missing) Insertional mutagenesis. This occurs if integration happens in an essential part and causes problems (such as disrupting a crucial gene)
(missing) Tumor formation.

Slide 13) This is the process of making a knockout mouse.

Clicker Question!
What was the name of the first mammal cloned?

A) Mickey the mouse
B) Molly the cow
C) Dolly the lamb
D) Freddy the frog