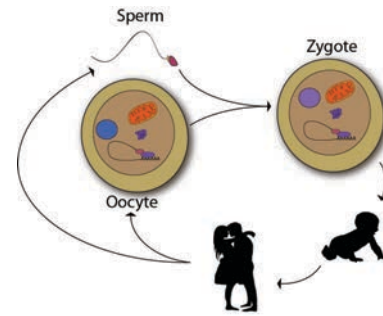


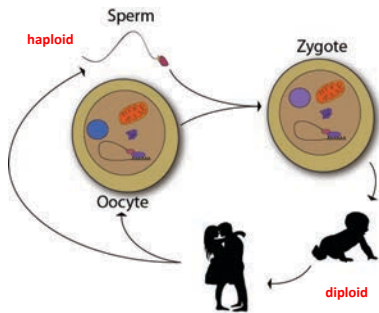
Immortality Realized: Germ Cells and the Biology of Sexual Reproduction



Our life cycle



Our life cycle

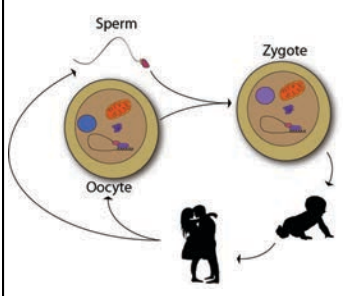


Meiosis



http://www.yourgenome.org/stories/default/the/illustration/process/meiosis_yourgenome.org

Why we find germ cells interesting



- Essential for the propagation of multicellular sexually reproducing species
- Germ cells can reprogram their genomes and the genomes of somatic cells back to a totipotent state.
- Good at repairing DSBs and repressing activity of transposons.
- Disruption of germ cell specific processes (meiosis etc.) can result in infertility and birth defects including Down's syndrome and Prader-Willi syndrome.

Several definitions

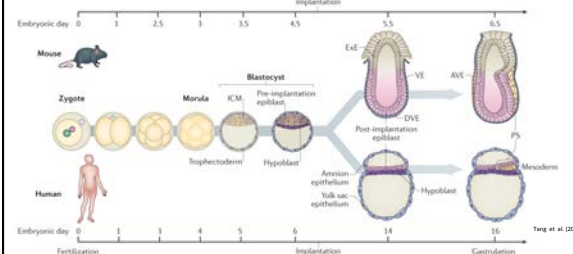
Totipotent: Ability to form all lineages of organism; in mammals only the zygote and the first cleavage blastomeres are totipotent

Pluripotent: Ability to form all lineages of body. Example: embryonic stem cells

Multipotent: Ability of adult stem cells to form multiple cell types of one lineage. Example: hematopoietic stem cells

Unipotent: Cells form one cell type. Example: spermatogonial stem cells (can only generate sperm)

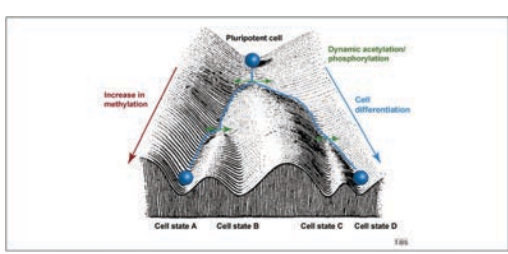
Early mammalian development



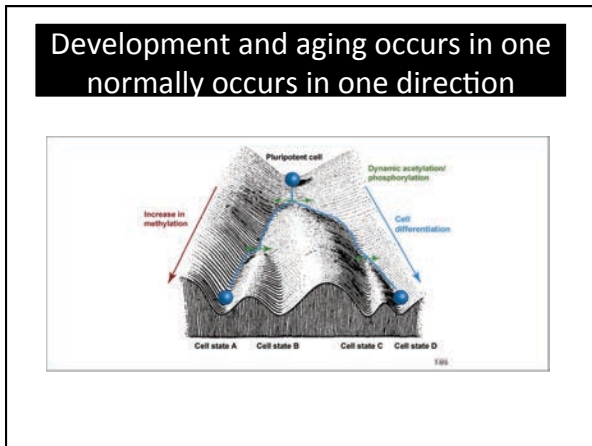
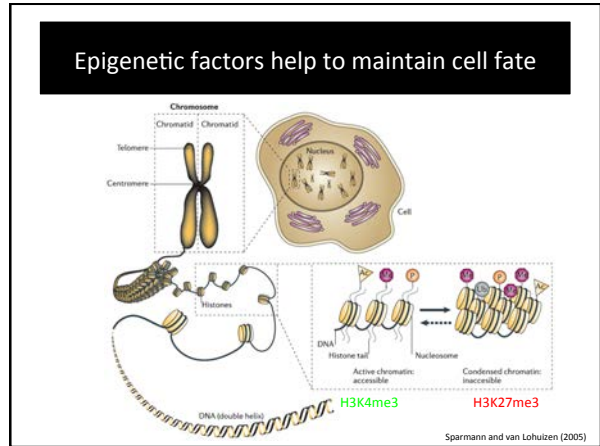
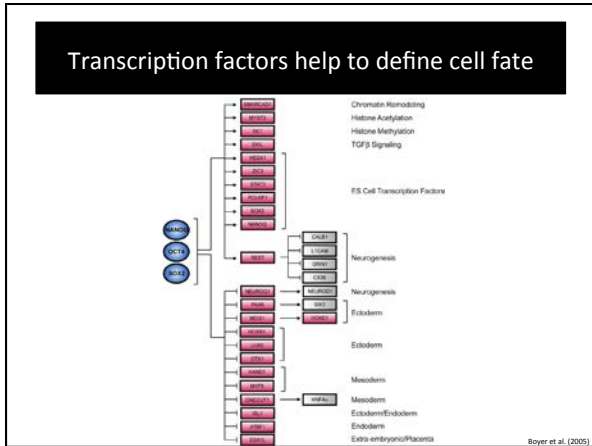
Teng et al. (2016)

Totipotent → Pluripotent → Multipotent

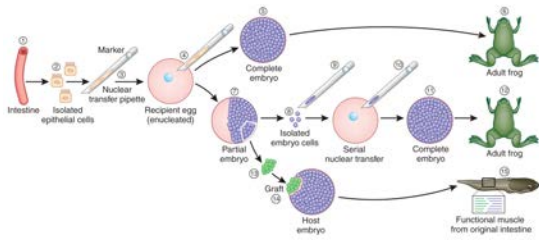
Development and aging occurs in one normally occurs in one direction



How does cell lineage become restricted?



First cloning experiments



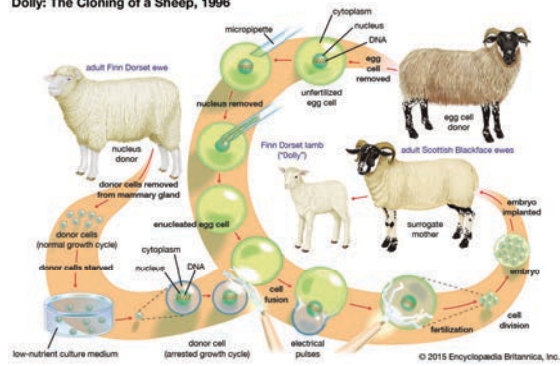
Oocytes are able to reprogram cells back to a pluripotent state

source: OI | Number: 01 | October 2009 | NCT00106342

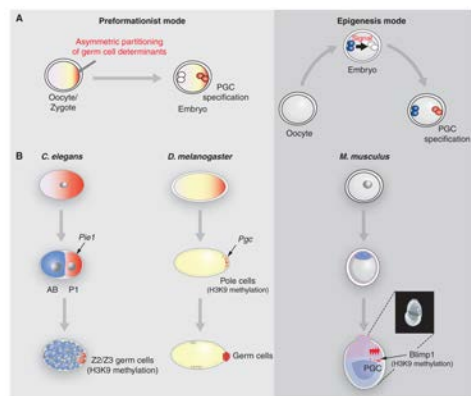
Who is this?



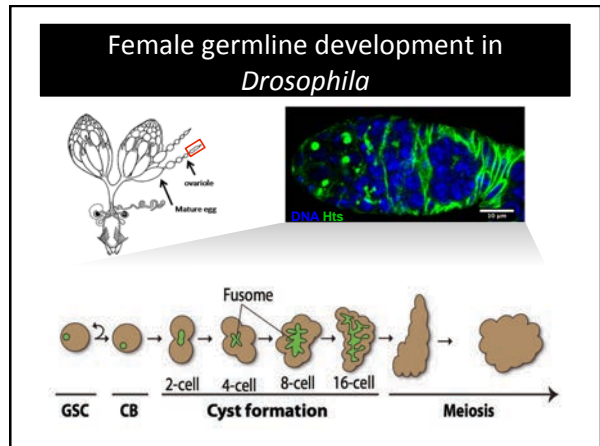
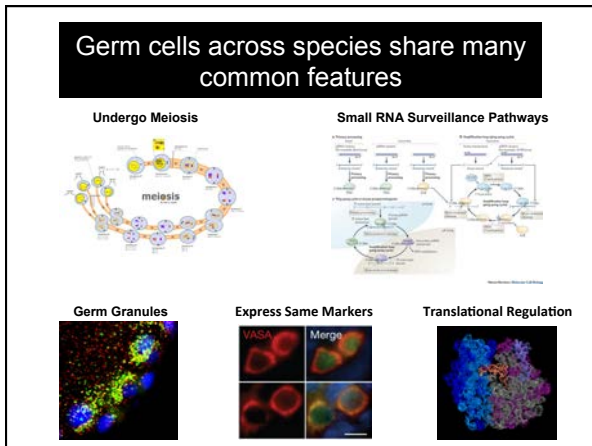
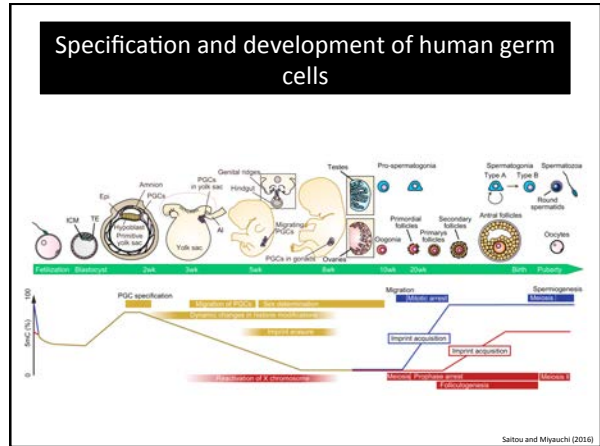
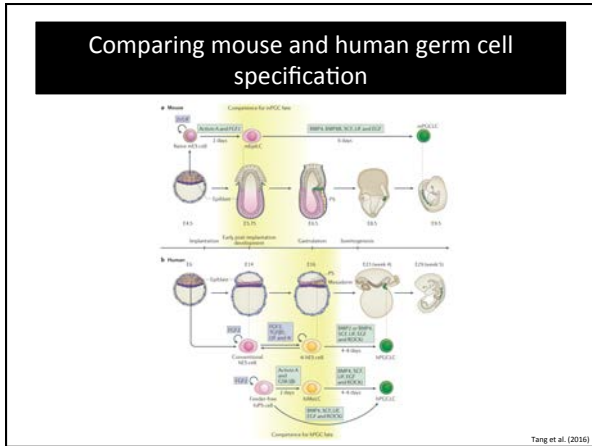
Dolly: The Cloning of a Sheep, 1996



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Reik and Surani (2015)



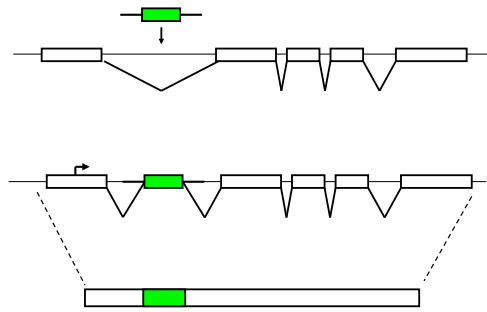
Ways we study germ cells

Gene expression-see what genes are expressed at specific points in germ cell development

Genetics- break genes and see what goes wrong

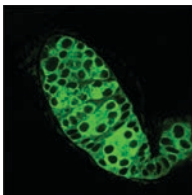
Biochemistry-determine what proteins interact and function with one another

Protein Trapping

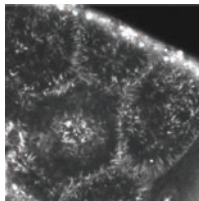


Utility of Protein Traps

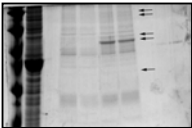
Expression pattern



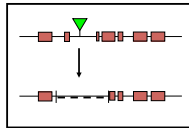
Live imaging



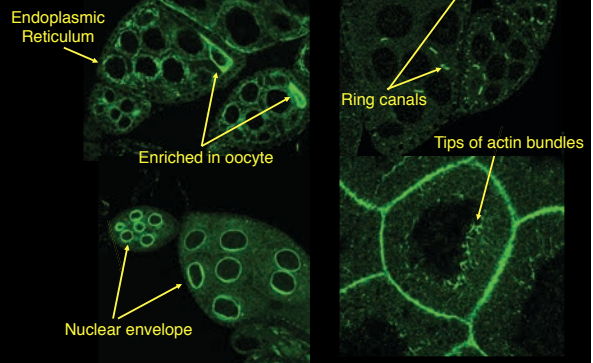
Biochemistry

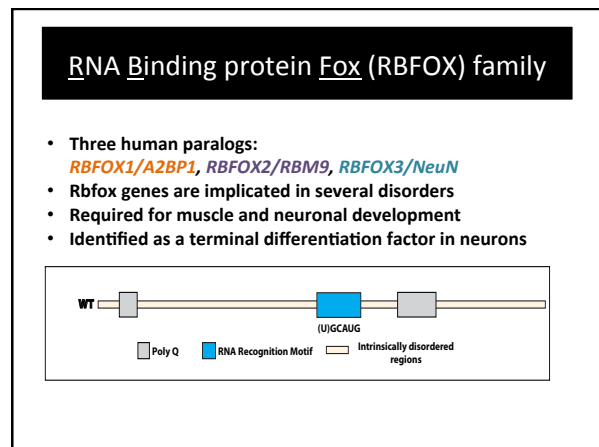
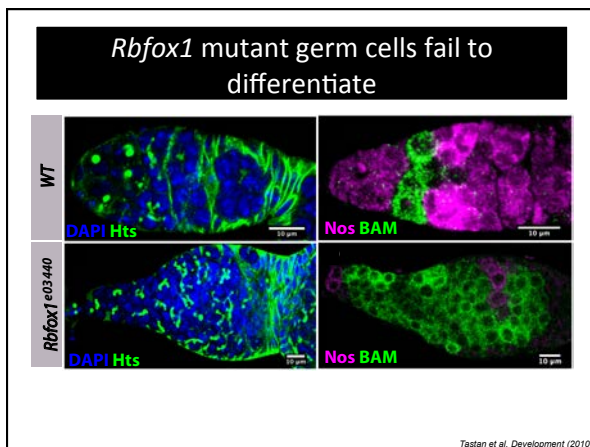
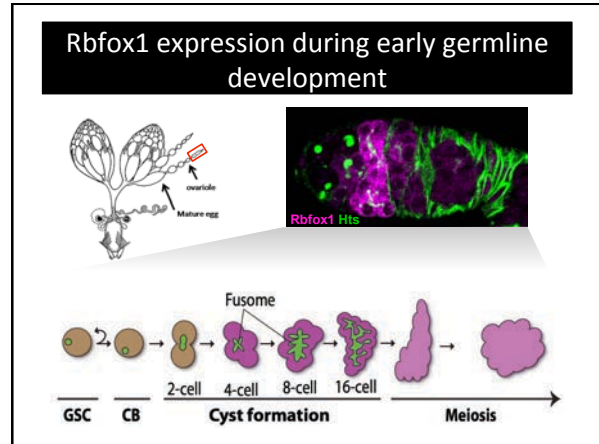
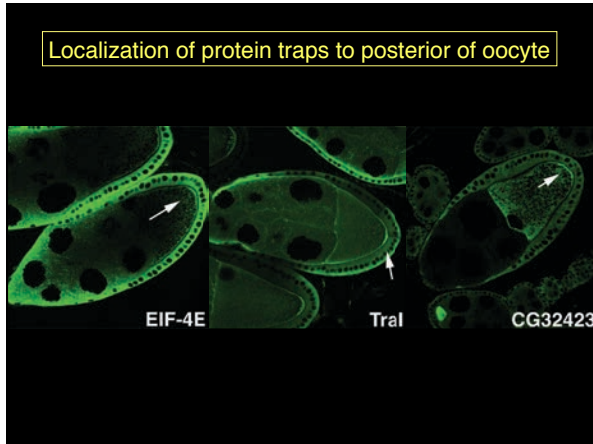


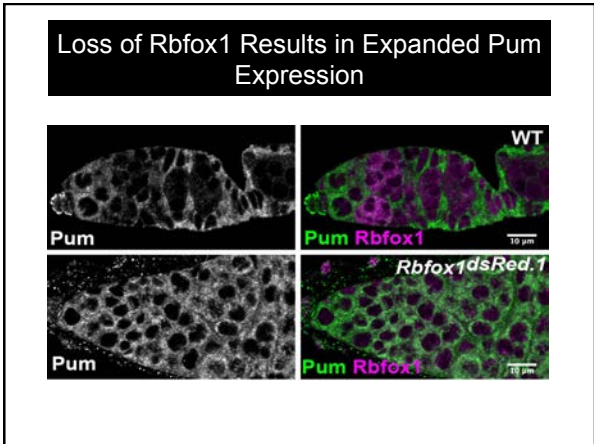
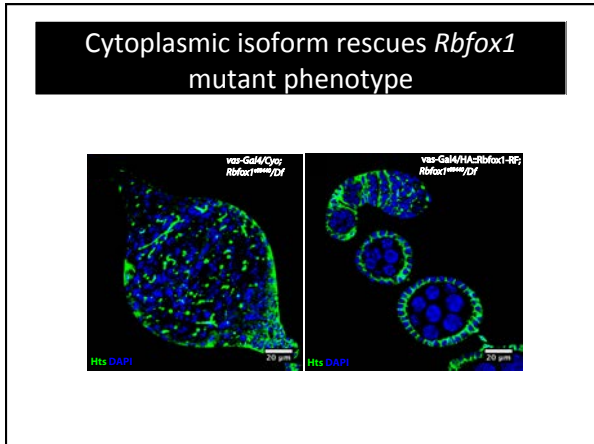
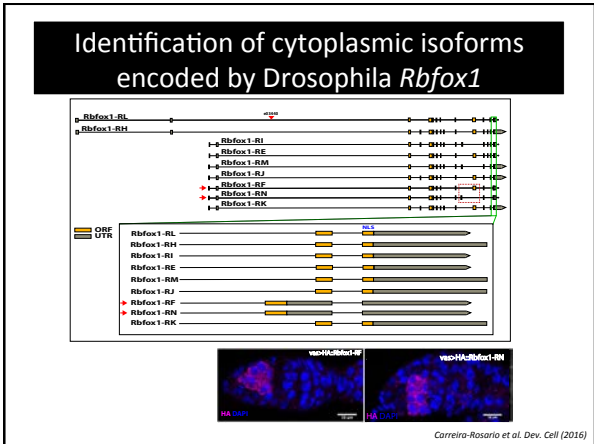
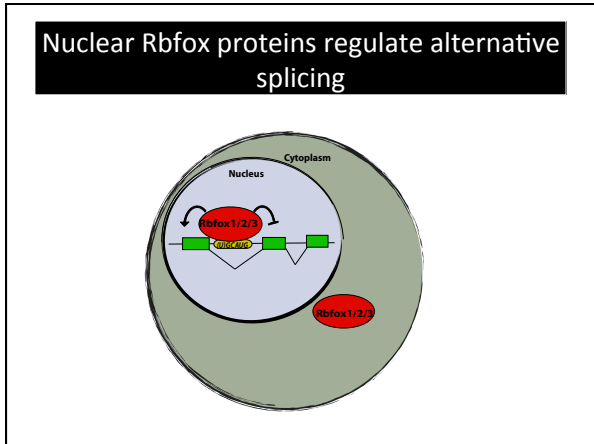
Genetics



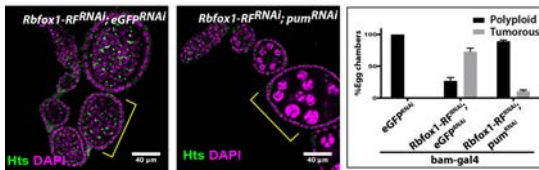
Protein Traps localize to various structures in the ovary



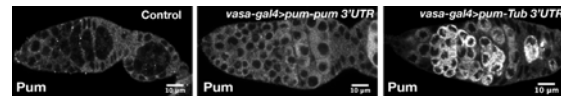
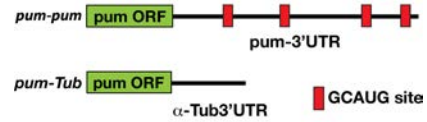




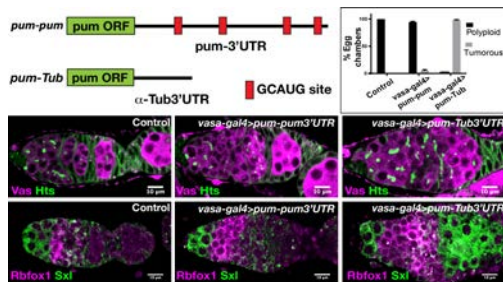
Loss of *pumilio* suppresses *Rbfox1* loss-of-function phenotype



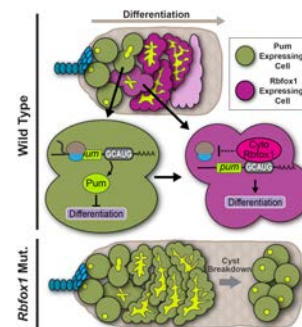
Transgenic Pumilio Expression



Ectopic expression of Pum disrupts germ cell differentiation



Summary





<u>People who did the work</u>	<u>Reagents</u>	<u>Funding</u>
Varsha Bhargava	Scott Hawley	NIH
Courtney Goldstein	Kim McKim	E.E. and Greer Garson
Samantha Hustak	Terry Orr-Weaver	Fogelson Endowment
Victor Palacios	Jim Kadonaga	
Arnaldo Carreira	Bloomington Stock Center	
Mayu Inaba	Drosophila Genetic Resource Center	

<u>Collaborators</u>
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Adrian Rothenfluh
Jim Amatruda
Ralf Kittler
John Abrams

