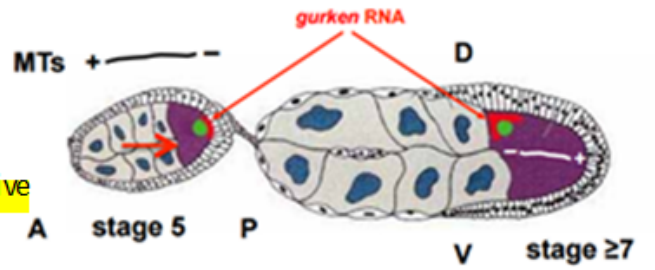
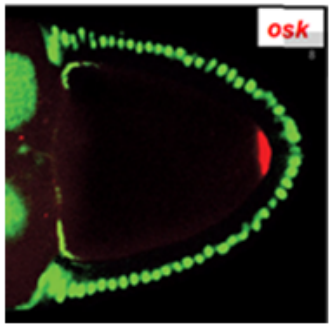
GURKEN



- Encodes a signalling molecule which is a TGF-α-like ligand.
- This triggers a TGF receptor.
- Grk is transcribed in nurse cells (where everything is made) and transported to the oocyte by microtubules which have their negative charge at the posterior portion of the oocyte.
- Dynein motors transport the mRNA to the negative end.
- The mRNA is not transcribed until after it reaches its final destination at the posterior of the oocyte.
- Protein is now transcribed here, and signals to the overlying subset of follicle cells.
- These cells receive the signals and change, allowing them to signal back to the oocyte.
- The consequence of this is a shift in polarity. The negative end of the microtubules is now at the anterior of the oocyte.
- This causes the transportation of Grk to its final place at the anterior dorsal corner (along with the nucleus).
- Grk translation occurs again and signals are sent to the new overlying follicle cells.
- These follicle cells become dorsal cells.

The oocyte now has dorsal-ventral surfaces. Thanks to this one RNA, and its transport within the oocyte both body axis's are set up! The out come of this is the expression of different transcription factors within different regions of the embryo.

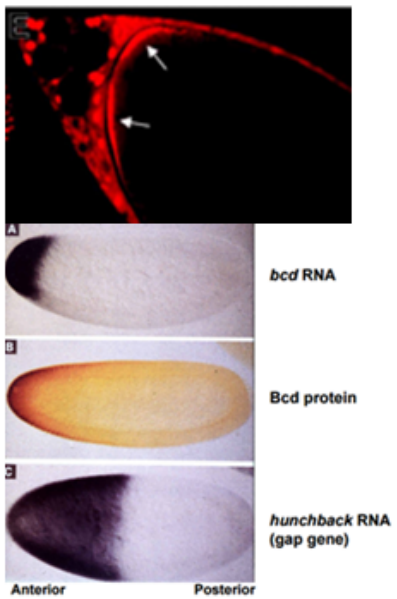


OSKAR

- In the later stages of oocyte development, the positive ends of the microtubules is located to the posterior of the oocyte.
- Osk mRNA localises posteriorly to these plus-ends, moved by kinesin motors.
- Again Osk protein not translated until destination is reached.
- Activities of Osk protein:
  - Tether more Osk RNA to the posterior, so get even more protein. This is a positive feedback loop, forming aggregates of Osk forming "pole plasm" at the posterior of the oocyte.
  - Pole plasm inhibits expression of "anterior" genes. (Blastoderm cells that inherit the pole plasm develop as germ cells).
- When egg gets laid, there is still pole plasm. The nuclei that get pole plasm become pole cells. (also inhibit somatic 'anterior' genes).

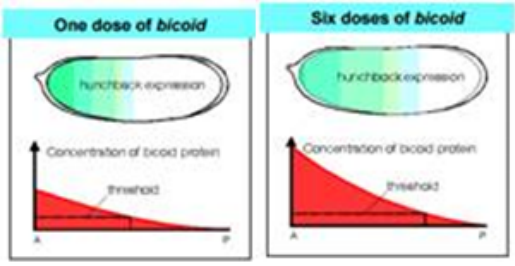
The Oskar protein determines pole cells.

BICOID



- Bcd mRNA localisation occurs after Grk has caused polarity shift.
- Bcd moves to the anterior of oocyte, transported by dynein, like Grk (must be some other factor though as doesn't have same localisation as Grk - located to whole anterior surface. Maybe Grk sticks to something specific in the corner).
- mRNA translation is repressed in the oocyte until after fertilisation.
- Bcd encodes a transcription factor which can diffuse in syncytium of egg.
- This sets up a gradient, and acts as a morphogen, activating different target genes in different regions.
- Gradient triggers Gap gene hunchback expression

Bicoid specifies anterior structures.



Discovery of morphogens:

- Threshold for hunchback just has to be above a certain levels.
- If the maternal dose is changed (now 6 copies of gene), get lots more Bcd protein. Changes the position of hunchback threshold more posteriorly, changing hunchback domain of expression.