

Signalling Molecule Glossary

20-Hydroxyecdysone – 20E

This hormone functions during insect development, specifically it causes larval moults when in combination with JH, pupa formation when JH levels begin to fall and differentiation of imaginal discs when JH is no longer present (L17). 20E is also the mechanism of seasonal polyphenism relating to butterfly eyespots as it is expressed at increased levels when the temperature is higher (L24)

Acetylcholine - Ach

Signalling molecule used to bind to cholinergic receptors on vagal neural crest cells (L10)

Alk2

Molecule involved in primordial germ cell specification in mouse embryos (L23)

Antennapedia – Antp

A protein which is involved in the development of legs, as such it is not normally expressed in the developing head of *Drosophila*. However, ectopic expression of Antp in the head results in legs developing in the place of antennae (L17)

Anti-Mullerian Hormone – AMH

AMH expression is induced by Sox9 during the male development pathway in humans (L22). It is released by the testis to actively remove the Mullerian ducts (L21).

APC

An enzyme in the Wnt signalling pathway involved in the degradation of Beta-catenin. APC mutation causes constitutive presence of beta-catenin signalling leading to cancer/malignancy especially in the colorectal area (causes formation of adenomatous polyps which develop into colorectal carcinomas) (L18).

Apterous

A gene expressed in the dorsal surface of the imaginal wing disc of *Drosophila* (L17)

Aromatase

An enzyme which converts testosterone to oestrogen, found at high levels at the female determining temperature in species with temperature dependent sex determination (L21)

Atrazine

Atrazine is the single most used herbicide in the world, and it is an endocrine disruptor. It induces aromatase production, which increases oestrogen levels in animals and converts testes into ovaries (L24)

BAM

BAM signalling in the germinal stem cells of the *Drosophila* ovary causes differentiation. As part of the stem cell niche, BMP is released by the cap cells to downregulate BAM signalling and prevent differentiation of these cells. Therefore, BAM is only activated when the germinal stem cells divide asymmetrically and one of the daughter cells moves away from the niche. BAM mutation in the ovary causes an over-proliferation of germline stem cells as it does not cause these cells to differentiate (L18)

In the *Drosophila* testes, BAM signalling does not immediately activate differentiation of germinal stem cells. Differentiation does not occur until a threshold level is reached; this allows for mitotic expansion of cells before differentiation. BAM mutation in the testes results in a proliferation of spermatogonia (L18)

Beta-Catenin

Maternal determinant found throughout the *Xenopus* egg but localises to the dorsal side after fertilisation/cortical rotation (L3). Beta-catenin begins the process of early development in *Xenopus* until the zygote genome is activated by altering the fate of cells in the embryo (L2)

Beta-catenin can act as an anchor for cell membrane cadherins (e.g. E-cadherin) but when it is present unbound in the cell cytoplasm it is degraded by the action of GSK3 (L3). When Wnt signalling is activated/GBP is present, beta-catenin can enter the nucleus and alter transcription (L3).

Beta-catenin is important in dorsal-ventral axis specification in *Xenopus* eggs through specification of a dorsal fate. It induces Siamois expression alongside Tcf3 to activate the Nieuwkoop centre and acts with VegT/Vg1 to induce Nodal expression (L3)

Sox9 inhibits beta-catenin and in return is inhibited by beta-catenin to determine male/female development while inhibiting the other (L21)

Beta-Crystallin

Lens fibre cell specific marker used in transgene experiments to determine the role of FGF in lens fibre differentiation (L14)

Bicoid

A maternal gene whose mRNA is implanted into the embryo by the mother involved in patterning of the anterior-posterior axis of *Drosophila*. Since it is implanted by the mother, Bicoid mutants arise when the mother is a null mutant for Bicoid and is unable to implant the mRNA in the embryo (regardless of the embryo's phenotype – maternal effect gene) (L16)

Bicoid is involved in patterning of the anterior regions of the embryo via regulation of other genes like hunchback and even-skipped. The mRNA is tethered to the anterior end of the embryo, but the translated protein is able to diffuse throughout the embryo to produce a morphogen gradient (L16)

Bindin ligands

Ligands on the membrane of sea urchin sperm which contact Bindin specific receptors on the egg vitelline membrane. This acts to confer species specificity in fertilisation and the limited number of Bindin receptors on the egg membrane contributes to the prevention of polyspermy (L2)

Blimp1

Gene expressed in germ cells which inhibits somatic cell gene expression (L23)

Bone Morphogenetic Proteins - BMP

BMPs are an important set of proteins during development with many varied functions throughout many species.

- During gastrulation in chick embryos BMP is produced in the ventral mesoderm and antagonised by Chordin, Noggin and Cerberus produced in the dorsal mesoderm/organiser regions (L8). This BMP expression patterning, alongside Wnt expression patterns, is important in the overall patterning of the ectoderm/brain structures (L8).
 - High BMP/high Wnt signalling produces epidermal structures