

DEVELOPMENTAL BIOLOGY

TOPIC : Wnt AND TGF BETA FAMILIES

III SEM M.SC ZOOLOGY

**REMYA VARGHESE(ASSISTANT
PROFESSOR ON CONTRACT)**

Wnt and TGF beta families

PARACRINE FACTORS

Wnt Family

- The Wnt family The Wnts constitute a family of cysteine rich glycoproteins.
- There are at least 15 members of this family in vertebrates.

- Their name comes from fusing the name of the *Drosophila* segment polarity gene **wingless** with the name of one of its **vertebrate homologues**, integrated

- While Sonic hedgehog is important in patterning the ventral portion of the somites (causing the cells to become cartilage),
- Wnt1 appears to be active in inducing the dorsal cells of the somites to become muscle.

- Wnt proteins also are critical in establishing the polarity of insect and vertebrate limbs, and they are used in several steps of urogenital system development

TGF- β superfamily

- There are over 30 structurally related members of the TGF- β superfamily, and they regulate some of the most important interactions in development.
- The proteins encoded by TGF- β superfamily genes are processed such that the carboxy-terminal region contains the mature peptide.

- These peptides are dimerized into homodimers (with themselves) or heterodimers (with other TGF- β peptides) and are secreted from the cell.

- The TGF- β superfamily includes the **TGF- β family, the activin family, the bone morphogenetic proteins (BMPs), the Vg1 family, and other proteins.**

TGF- β family members

- TGF- β 1, 2, 3, and 5 are important in regulating the formation of the extracellular matrix between cells and for regulating cell division (both positively and negatively).

- TGF- β 1 increases the amount of extracellular matrix epithelial cells make (both by stimulating collagen and fibronectin synthesis and by inhibiting matrix degradation).

- TGF- β s may be critical in controlling where and when epithelia can branch to form the ducts of kidneys, lungs, and salivary glands.

- The effects of the individual TGF- β family members are difficult to sort out, because members of the TGF- β family appear to function similarly and can compensate for losses of the others when expressed together.

- Moreover, targeted deletions of the Tgf- β 1 gene in mice are difficult to interpret, since the mother can supply this factor through the placenta and milk.

- The members of the BMP family were originally discovered by their ability to induce bone formation; hence, they are the bone morphogenetic proteins.

- Bone formation, however, is only one of their many functions, and they have been found to regulate cell division, apoptosis (programmed cell death), cell migration, and differentiation.

- BMPs can be distinguished from other members of the TGF- β superfamily by their having seven, rather than nine, conserved cysteines in the mature polypeptide

- The BMPs include proteins such as Nodal (responsible for left-right axis formation) and BMP4 (important in neural tube polarity, eye development, and cell death).

- As it turns out, BMP1 is not a member of the family; it is a protease.)
- The *Drosophila* Decapentaplegic protein is homologous to the vertebrate BMP4, and human BMP4 can replace the *Drosophila* homologue, rescuing those flies deficient in Dpp