

Morphogenetic Movements

The new elements of the embryo organization appearing in gastrulation (*the archenteron*) are produced by movements and changes in the shapes of cells and groups of cells of the embryo. This special type of morphogenetic movements encompasses a variety of specific behavioral pattern of cells.

Definition:

The special type of irreversible gastrulation movement, involving different groups of cells which may have been far removed from one another and brought close enough together to undergo the inductive interactions and also enable the cells to remain in the position into which it was brought by the proceeding movement and result in the rearrangement of the embryo from the blastula to a stage characterized by the presence of 3 germ layers and appear to be movements of large parts of the whole embryo, which stretch, fold, contract or expand, is known as morphogenetic movement.

*Gastrulation is characterized by profound but well ordered rearrangements of the cells in the embryo. One of the major changes that occurs during early gastrulation is the acquisition by the cells of the capacity for undergoing directed **morphogenetic movements** encompasses a variety of specific behavioral patterns of the cells.*

Some important works:

(1)Speeman (1921) proved that the expansion of the ectoderm is active and proceeds independently of the other movements involved in gastrulation.

(2)The changes during gastrulation is denoted as morphogenetic movements by Vogt (1925) and Trinkaus (1969).

(3)Holtfreter (1943) isolated cells from developing embryo and concluded that the change in the shape of the cells is not due to forces exercised by the embryo as a whole but is performed by the cells themselves.

(4)Townes and Holtfreter (1955) investigated on whether the new positions of the cells are the results of their own special properties.

Nature of factors/ forces involved during morphogenetic movements:

a)Selective affinities (Holtfreter, 1939; Weiss, 1947; Steinberg, 1963)-

When cells touch one another as a result of their random movement, they tend to remain in contact. It is supposed that the factors holding the cells together vary, depending on the kinds of cells involved.

b)Free energy (Steinberg, 1963,1964,1970)-

A cell capable of advancing to another cell or cells may be said to possess a certain amount of free energy. This energy used to establish and maintain a contact between cells.

c)Surface tension-

This force helps aggregating cells to maintain spherical form. Cells with high surface tension always are enveloped by cells with low surface tension.

d)Centrifugal force-

Due to this force cells become flattened during morphogenetic movement.

e)Gap junctions-

These may appear very rapidly and plays important role in establishment of cells in proper position after a certain mode of morphogenetic movement.

f)Ligand molecules (Moscona, Moscona and Hausman, 1976)-

The ligand molecules are supposed to be responsible for the first contact of cells