

Quadrant II – Transcript and Related Materials

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Notes

Torsion in Gastropods

Molluscs are generally bilaterally symmetrical organisms with a posteriorly placed mantle cavity but in Gastropods, this symmetry is lost due to two processes known as coiling and torsion.

Definition:

Torsion is the twisting visceropallial complex, anti-clockwise from site of torsion to the rest of the body, through 180° which occurs during gastropod development. It occurs in gastropodal veliger larvae and transforms the symmetrical larva into an asymmetrical adult. Torsion only persists in prosobranch gastropods, such as *Acmaea* (marine limpet), *Pomatias*, *Patella* and *Haliotis* and Euthyneurans undergo reversal of torsion known as detorsion.

Process:

Torsion starts at neck region just behind the head region. The head and foot are fixed and do not participate in torsion. Torsion process occurs in 4 stages, first the pretorsional stage where the larvae is symmetrical and alimentary canal is straight with anus placed posteriorly. In next stage ventral flexure takes place where alimentary canal loops bringing mouth and anus closer and shell becomes exogastric. In third stage lateral flexure occurs, due to differential growth only left side tissues continue to grow. In last stage complete 180° torsion occurs.

Developmental stages:

In gastropods torsion is resulted in two stages. Stage-1 last for few hours where, the contraction of the larval retractor muscles leads to 90° rotation of the visceral mass. At the

end of Stage-1, the mantle cavity comes on the right side. In Stage-II, the rest of the torsion occurs as a result of differential growth and is usually longer in duration.

Effects:

Torsion in gastropods brings about a lot of changes in the organism's body, first the mantle cavity & pallial complex displaces from the posterior to anterior area. The anus, ctenidia, and renal apertures faces forwards after torsion which was placed backwards earlier. The auricle, which was located behind the ventricle, moves in front of it. The alimentary canal forms a loop & pleuro-visceral nerve connectives are twisted into the shape of a "8"-Chastoneury. The exogastric position of the visceral sac and shell becomes endogastric. Atrophy of organs and anal displacement results in loss of the symmetry.

Significance:

- 1) Torsion is advantageous to larvae as it protects the vulnerable portions like mantle cavity, delicate head and velum.
- 2) Operculum sealed the aperture, the cilia of velum stopped beating, so that larva could fell to the sea bottom and avoid its enemies swimming in the water.
- 3) The mantle cavity containing gill was situated posteriorly before torsion, so that when the animal moved upstream, the water-flow and the current due to movement of the animal opposed the respiratory current entering the mantle cavity from behind the animal but after torsion, mantle cavity is placed anteriorly above the head, so that all the three currents now flow in the same direction, thus flushing the mantle cavity continuously with fresh clean water and increasing its ventilation.
- 4) It promotes stability in the adult by placing bulky mass of animal nearer the substratum.
- 5) Osphradia continuously sample the sediment and incurrent water stream and the animal orients itself properly with the help of the sense organs on the head.
- 6) Instead of shield-like shell, a conical shell on the dorsal surface for protection.

Detorsion:

The reversion of torsion is known as detorsion. In this process, the pallial complex moves back to posterior end, ctenidia point backwards and auricles move behind the ventricle. Visceral loop becomes untwisted and symmetrical and secondary exterior symmetry gets restored. Total detorsion is shown by Opisthobranchia (Aplysia), followed by a reduction of shell and disappearance. Detorsion is incomplete in Pulmonata such Acteon and Bulla. In Nudibranchia, such as Eolis and Doris the mantle cavity, visceral hump, external shell, and even ctenidia is lost by detorsion. The pallial complex is displaced in pulmonata, but there is no chastoneury due to visceral commissure shortening.