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## **Question**

**Discuss the physiology of balance.**

**Answer:**

The **physiology of balance:** vestibular function. The vestibular system is the sensory apparatus of the inner ear that helps the body maintain its postural **equilibrium**. The information furnished by the vestibular system is also essential for coordinating the position of the head and the movement of the eyes.

There are two sets of end organs in the inner ear, or

labyrinth: the semicircular canals, which respond to rotational movements (angular acceleration); and the utricle and saccule within the vestibule, which respond to changes in the position of the head with respect to gravity (linear acceleration). The information these organs deliver is proprioceptive in character, dealing with events within the body itself, rather than exteroceptive, dealing with events outside the body, as in the case of the responses of the cochlea to sound.

Functionally these organs are closely related to the cerebellum and to the reflex centres of the spinal cord and Brain stem that govern the movements of the eyes, neck, and limbs.

- balance is mediated by the

vestibular nuclei in the brain stem

- the labyrinth (a part of the inner ear), is a major organ of our vestibular (balance) system
- the three semicircular canals of the labyrinth is associated with sensing rotary motion (1)
- the brain senses the direction and speed of rotation of the head by the movement of fluid in the semicircular canals (1)
- balance is maintained by the interactions between the labyrinth and other systems in the body, such as the visual and skeletal systems (1)
- the main inputs into the balance system are the:
  - vestibular labyrinths
  - visual system (eyes)
  - somatosensory

system, especially proprioception

- the main outputs from the vestibular nuclei are:
  - vestibulo-ocular:
    - ◆ permitting reflex eye movements related to posture
  - vestibulo-spinal which supply:
    - ◆ anti-gravity muscles in the lower limbs
    - ◆ reflex arcs which control gait

Although the vestibular organs and the cochlea are derived embryologically from the same formation, the otic vesicle, their association in the inner ear seems to be a matter more of convenience than of necessity. From both the developmental and the structural point of view, the kinship of the vestibular

organs with the lateral line system of the fish is readily apparent. The lateral line system is made up of a series of small sense organs located in the skin of the head and along the sides of the body of fishes. Each organ contains a crista, sensory hair cells, and a cupula, as found in the ampullae of the semicircular ducts. The cristae respond to waterborne vibrations and to pressure changes.