Although most of responses to stimulation of vestibular receptors are reflex in nature, vestibular impulses also reach cerebral cortex - conscious perception of motion + orientation in space.

**Vestibular Physiology**

**CENTRAL VESTIBULAR PATHWAYS**

**ROTATIONAL ACCELERATION** in plane of given semicircular canal stimulates its **AMPULLAR CRISTA.** (LINEAR ACCELERATION fails to displace cupula and therefore does not stimulate crista).

- **Movement of cupula in one direction causes increased spike rate in single nerve fibers from its crista, whereas movement in opposite direction inhibits neural activity.**
- **Since canals on one side of head are mirror image of those on other side, endolymph is displaced toward ampulla on one side and away from it on other.**
- **When rotation is started, endolymph, because of its inertia, is displaced in direction opposite to rotation → fluid pushes on cupula, deforming it → this bends processes of hair cells.**
- **Average time course of impulse discharge from ampulla of two semicircular canals during rotational acceleration, steady rotation, and deceleration.**

**Linear Acceleration** stimulates utricular and saccular **MACULAE.**

- **Utricle responds to horizontal acceleration and saccule to vertical acceleration.**
- **Otoliths are more dense than endolymph, and acceleration in any direction causes them to be displaced in opposite direction, distorting hair cell processes + maculae also discharge tonically in absence of head movement (because of gravity pull on otoliths).**
- **Excessive stimulation causes MOTION SICKNESS.**
BILATERAL Labyrinthectomy → defects of orientation in space
- especially hazardous during diving – vision is the only remaining tool to orient where water surface is (water pressure sensed by cutaneous receptors is equal over the body); if vision is obscured, drowning may occur due to disorientation.

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