Cell Surface Specializations

- Definition

"Cell surface specialization refers to structural modifications on the surface of cells that enable specific functions, like absorption, movement, signaling, or adhesion"

→ Increase surface area (absorption)

→ Move foreign particles

- Types

i) Microvilli

》 Definition

"Short or long finger like cytoplasmic projections make up of clusters of action filaments cross linked to each other and to surrounding plasma membrane"

》Location

→ Small intestine

→ PCT

》Terminal Web

• Filamentous structure

• Found at apical surface of the epithelial cells that possess microvilli

• Composed of:

→ Actin filaments

→ Spectrin : Anchors terminal web to the apical cells

ii) Stereocilia

» Definition

"Longer branched microvilli"

→ Less motile

» Function

→ Facilitates movement of molecules

→ Increase surface area

→ Sound+ frequency detection

→ Hearing + balance

iii) Cilia

» Definition

"Cilia are tiny, hair-like structures that project from the surface of many cells"

→ Elongated + motile
→ Microtubule duplet arrangement: 9+2
→ Surrounded by cell membrane
→ Joined to each other forming an axoneme

» Basal Body

" Basal body is an electron dense structure located at the base of cilia"
→ Microtubule duplet arrangement: 9+0

» Movement

→ Move back and forth
→ Coordinated movement
→ Current of fluid propelled in one direction
→ Energy source: ATP
→ 1 ciliated cell of trache: Has 250 cilia

IV) Flagella

» Definition

"Flagella are hair-like appendages found on certain cells that function for locomotion"

→ One per cell

→ Present in spermatozoa

Clinical Correlates

● Immotile Cilia Syndrome

- Also called Kartagener syndrome
- Occur due to mutuations in the genes of cilia and flagella

● Chronic Respiratory Infection

- In chronic respiratory infections, such as chronic bronchitis or cystic fibrosis, dysfunction or impairment of cilia can occur, leading to decreased clearance of mucus and an increased risk of infection
- Cleansing action of cilia decreases

● Infertility

- Immotile sperms due loss of function of flagella causes infertility

● Celiac Disease

- Also called Gluten sensitive enteropathy or Sprue

- Loss of microvilli brush border of absorptive cell,

- Occurs due to immune reaction against wheat protein (gluten) during digestion → inflammation occurs which leads to malabsorption