

GOLGI APPARATUS, SECRETION

rvsd 10/26/92, 10/25/93, 10/26/94, 10/28/96, 10/15/99, 23 Oct 00, 24 Oct 01, 28 Oct 02, 7Nov07, 21Nov08
BPR. p. 239-254, BKH 4th pp339-357, BKH 5th: pp333-353, 6th: 328-349, 7th: 333-

Discovered by Camillo Golgi in 1898 (stained with osmium tetroxide),
not believed until '50s when studied with EM (dictyosomes in plants)

(p 335)

- cis face** (forming face) receives **transition vesicles** from rough ER, empty into **cisternae** in Golgi Apparatus. Shuttle vesicles transfer between cisternae
- coated vesicles:** covered with clathrin, or cytosolic coat protein (COP) common feature which marks vesicle for inter compartmental transfer.
Proteins address-marked for lysosomes with oligosaccharides mannose-6-PO₄
- trans face** (**maturing face**) vesicles bud off as secretory granules

Highly dynamic: pulse and chase shows
40 minutes from one face to trans face.

(See p 341)

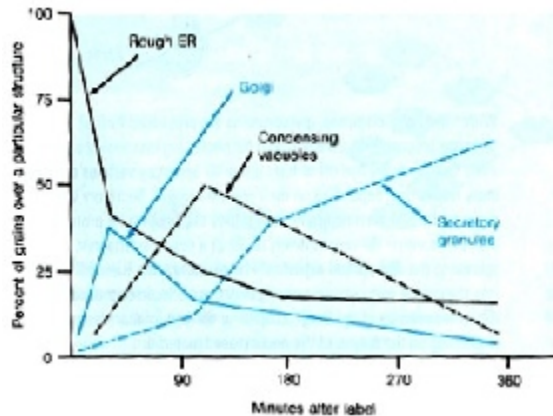


Figure 9-16 **Autoradiographic Evidence of the Secretory Pathway.**
To trace the path of newly synthesized protein in the cell, George Palade and his colleagues injected rabbits with a radioactively labeled amino acid and used autoradiography to determine the distribution of radioactivity within the parotid gland cells at various times during the first six hours after injection. Initially, most of the radioactivity (measured as silver grains on the autoradiogram) was in the rough ER. Then it moved through the Golgi complex to vesicles called condensing vacuoles and finally to mature secretory granules for secretion by exocytosis.

Glycosylation: (p 336) **core oligosaccharide** (NAG and mannose) synthesized on cytosol side
"Flippase" moves polysaccharide to lumen side
Additional glycosylation inside
polysaccharide attached to N terminal asparagine of protein being labeled

Transferred to Golgi apparatus where **Terminal glycosylation** takes place

Most important enzymes for Golgi: glycosyl transferase
glucan synthetases

Attach sugar groups to proteins for export

Best overall diagram: p 338

EXOCYTOSIS: p 338

- concentration of contents occurs at periphery of golgi,
- condensing vacuoles forming secretory granules: zymogen granules
- Ca⁺⁺ triggers discharge from cell, elevation caused by hormones, etc
- Mech not clear: probably recog sites on plasma membrane (polarized secretion: only apical surface)

ENDOCYTOSIS: p 339

Occurs in phagocytic cells, leads to major membrane exchange

PINOCYTOSIS: esp in macrophages, kidney cells, GI epithelial cells, plant roots.

- Triggered by specific proteins, amino acids, or ions in medium
- These bind to receptors, causing invagination

RECEPTOR-MEDIATED ENDOCYTOSIS: p 341

It is the major means for uptake of **macromolecules & peptide hormones**

one mechanism by **coated pits**, clathrin (lattice-work - agent) lined. (same as coated basket vesicles)

ligands on external molecule bind to specific **membrane-bound receptors:**

ligand-receptor complexes **collect clathrins**, migrate laterally

coated pits are formed

invagination, release of vesicle into cell H⁺ injected into vesicle, clathrin released, goes back to plasma membrane

Net result is major shuffling of membranes between compartments.