Three-dimensional, correlative electron microscopy and immuno-labelling revealed new principles of the Golgi complex functioning

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Goal
The Golgi complex (GC) is one of the main organelles of the cell, it has a complex organization and provides transport of proteins and lipids, as well as their glycosylation. It was necessary to understand the principles of the GC operation.

Methods
The use of three-dimensional electron microscopy (EM), immune EM, and correlative light EM made it possible to abandon the use of the old radigma explaining Golgi function and provide the new one [1, 2].

Results
We have shown that membrane spherical vesicles in the area of endoplasmic reticulum (ER) exits sites are produced mostly with the help of a COPI/ARF machine. There are no completely isolated carriers between the ER and GC. COPI-dependent Golgi vesicles contain a sharply reduced content of retrograde and anterograde cargoes. At the same time, during their transport through the GC, the concentration of soluble, membrane and mega-cargoes increases, which cannot be explained using the maturation model [3, 4].
The role of cisternal perforations for intra-Golgi transport is shown [5].
It was found that the GC may be in a state of rest or transport. The non-transporting GC does not have a cis-most and trans-most cisternae attached to the poles of the medial GC. The beginning of transport leads to their attachment to the stack of medial cisternae in a GM130 and G97 dependent manner, respectively.

The size of the exit site from the GC depends on the amount of cargo being transported [3,4]. With the synchronous movement of a large number of cargo, the exit is carried out from the last two medial cisternae and TMC. When transporting a small amount of cargo, the last medial cisterna and TMC function as the Golgi exit site.

Membrane fusion is important for both moving through and exiting the GC. Post-Golgi carriers ferrying cargoes to the baso-lateral plasma membrane are not completely isolated and always pass through endosomes to change the set of their SNAREs.
The mapping of the main protein machines involved in intracellular transport in various compartments and during various functional states, as well as their changes in different phases of the cell cycle, are presented [2, 5].

Conclusion
The intracellular transport model based on the kiss-and-ran mechanism most fully corresponds to the data obtained.

Keywords:

Golgi; Electron microscopy, Transport, Correlative

Reference:

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