CYCLIC STRUCTURAL CHANGES IN ENDOPLASMIC RETICULUM AND GOLGI COMPLEX IN THE HIPPOCAMPAL NEURONS OF GROUND SQUIRRELS DURING HIBERNATION

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Repetitive remodeling and renewal of the cytoplasmic structures realizing synthesis of proteins accompanies the cycling of ground squirrels between torpor and arousal states during hibernation season. Earlier we have shown partial loss of ribosomes and nucleolus inactivation in CA3 hippocampal pyramidal neurons in each bout of torpor with rapid and full recovery after warming up. Here we describe reversible structural changes in endoplasmic reticulum (ER) and Golgi complex (G) in these neurons. Transformation of ER from mainly cysternal to tubular form and from mainly granular to smooth type occurs at every entrance in torpor, while the opposite change occurs at arousal. Torpor state is also associated with G fragmentation and loss ofi ts flattened cisternae. Appearance in torpor of the autophagosomal vacuoles containing fragments of membrane structures and ribosomes is a sign of their partial destruction. Granular ER restoration, perhaps through assembly from the multilamellar membrane structures, whorls or bags, begins as early as in the middle of the torpor bout, while F flattened cisternae reappear only at warming. ER and G completely restore their structure 2—3 hours after the provoked arousal. Thus, hibernation represents and example of nerve cell structural adaptation to alterations in functional and metabolic activity through both active destruction and renewal of ribosomes, ER, and G. Perhaps, it is the incomplete ER autophagosomal degradation at torpor provides its rapid renewal at arousal by reassembly from the preserved fragments.

Key words: endoplasmic reticulum, Golgi complex and ribosomes renewal, autophagy, neurons, functional adaptation, hibernation.

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