Institute of Experimental Morphology, Pathology and Anthropology with Museum
Bulgarian Anatomical Society

Acta morphologica et anthropologica, 23
Sofia ● 2016

Petri Nets Representation and Analysis of the Synthesis of Dolichol-Linked Precursor of N-Glycans

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Synthesis of dolichol-linked precursor of N-glycans is a complex biological system with numerous interdependent processes. Modeling this process is indispensable if we want to analyze this system for potential problems. We used Petri nets mathematical formalism to construct the synthesis of dolichol-linked precursor of N-glycans. Our analysis show that Dol-P is a critical point, but reduced levels of this substrate can be compensated by the oxidative pathway involving dolichol [9], from Dol pool by phosphorylation (EC 2.7.1.108) or PP-Dol pool by dephosphorylation (EC 3.6.1.4). Reactions of dolichol pathway can be controlled at least at three places by availability of substrates Man-GDP [6], Man (β) – P – Dol [5] and Glc(β) – P – Dol. Reduced levels of proteins with consensus Asn-X-Ser or Asn-X-Thr sites, through lack of essential amino acids, can also be a bottleneck in the synthesis.

Key words: petri net, glycosylation.