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Petri Net Representation and Analysis of Mannose Type O-Glycan Biosynthesis

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We provide a model and analysis of mannose type O-glycan biosynthesis. Synthesis of Core M1, M2 and M3 glycans is a complex biochemical pathway with numerous interdependent processes. We used Petri nets mathematical formalism to construct the synthesis and extension of Core M1, M2 and M3 glycans. Our analysis show that (Man)1 (Ser/Thr)1 is a critically important substrate for synthesis of all three types of glycans. Gene mutations in POMT1/POMT2 {1'} enzyme lead to muscular dystrophies type A, B and C, congenital muscular dystrophies (CMDs) and limb-girdle muscular dystrophy (LGMD). Core M1 [(Gal)1 (GlcNAc)1 (Man)1 (Ser/Thr)1] and Core M2 [(Gal)2 (GlcNAc)2 (Man)1 (Ser/Thr)1] glycans are also indispensable, as gene mutations in {3'} and {5'}, involved in Core M1 and M2 synthesis, bring forward congenital disorders of glycosylation (CDG) type II.

Key words: O-type glycosilation, Petri nets