

Glycobiology World Congress

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Recent advances for the mechanisms involved in glycan biosynthesis

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Glycan biosynthesis has recently undergone a revolutionary change as to the understanding of how both α - and β -linked glycans are biosynthesized. Back in the 1940's C. S. Hanes observed that potato phosphorylase transferred 2-3 glucose units from α -D-Glc-1-P to the nonreducing ends of starch chains. This observation set the stage that starch biosynthesis required a primer. In the 1960's Luis Leloir found that starch was biosynthesized from ADPGlc. In the late 1960's, Robbins *et al.* using pulse and chase techniques found that Salmonella O-antigen was biosynthesized by the transfer of a tetra-saccharide from bactoprenol pyrophosphate to the reducing-ends of a growing chain. Four years later Ward and Perkins showed that the bacterial cell wall, murein, was also biosynthesized by the addition of the NAG-NAM-pentaphosphate to the reducing-ends of growing chains. A year later Robyt, *et al.* using pulse and chase experiments showed that dextran was biosynthesized by the addition of glucose from sucrose to the reducing ends of a growing dextran chains. Some years later (2007) they showed a two-site insertion mechanism for dextran biosynthesis in which glucose is added to the reducing-ends of growing dextran chains. In 2012, Mukerjea & Robyt showed that the de novo biosynthesis of starch chains by potato starch-synthase adds glucose from ADPGlc to the reducing-ends of growing starch chains. Mukerjea, McIntyre, and Robyt also found that Tris-buffers were potent inhibitors of starch-synthase and has been responsible for the perpetuation of the primer myth for starch biosynthesis, as the putative primers partially reverse the Tris-buffer inhibition.

Biography

John F. Robyt received a B.S. in chemistry from St. Louis University in 1958. In the summer of 1957, he received an Internship at the USDA Laboratory in Peoria, IL. He then went to Iowa State University in 1958 to study for a PhD, joining Prof. Dexter French's group in Carbohydrate Chemistry and Enzymology, where he received a PhD in 1962, publishing four papers: on the Action Pattern and Mechanism of Bacillus amyloliquefaciens α-amylase, Bacillus polymyxa β-amylase, porcine pancreatic α-amylase, the separation and large-scale purification of maltodextrins by charcoal column chromatography, and the development of ascending and descending paper chromatography of carbohydrates. He then went to Louisiana State University in Baton Rouge, LA on a Teaching Postdoctoral Fellowship and taught seven courses in chemistry and biochemistry; then the next year (1963) he received a NIH, Research Fellowship, to work and study at the Lister Institute of Preventive Medicine in London, England, under Prof. William J. Whelan, and published 4 papers. In September 1964, he returned to Iowa State University, as an Instructor and Research Associate with Prof. Dexter French. He was appointed an Assistant Professor in 1967, Associate Professor in 1974, and a Professor in 1982 in the Department of Biochemistry, Biophysics, and Molecular Biology. Besides working on Starch Chemistry and Enzymology, he pursued studies on Dextran Chemistry, and Enzymology, and the formation and prevention of dental plaque, supported by the NIH. He has pursued the use of TLC of carbohydrates, use of radioisotopes, and analytical methods of carbohydrates and enzymes, such as reducing-value methods, total carbohydrates by phenol sulfuric acid, and several chromatographic methods, such as ascending and descending paper chromatography, TLC, and column chromatographic methods for separating carbohydrates and enzymes.

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