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## Osama O Ibrahim

BioInnovation LLC, USA

### Functional oligosaccharide: Chemicals structure, manufacturing, health benefits, applications, and regulations

Functional oligosaccharides are carbohydrates that have two to ten monosaccharides units linked together with glycosidic bonds. The two linked monosaccharides (disaccharides) of maltose, sucrose, and lactose are digestible oligosaccharides by human gut enzymes. These, digestible disaccharides are sugars and not classified as functional oligosaccharides. Functional oligosaccharides are non-digestible by human gut enzymes, and providing health benefits as fibers and probiotics. The common known functional oligosaccharides are fructose-oligosaccharides, galacto-oligosaccharides, lacto-sucrose, malto-oligosaccharides, isomalto-oligosaccharides, trehalose, cyclodextrins, xylo-oligosaccharides, and soy-oligosaccharides. Functional oligosaccharides have mildly sweet taste and other characteristics such as, mouth feeling. This mouth feeling characteristic interest food industry to incorporate these functional oligosaccharides in foods as a partial substitute for fat and sugars, and to improve food texture. With the exception, of malto-oligosaccharides and trehalose, functional oligosaccharides are non-digestible in small intestine digestive enzymes, and reached large intestine (colon) where it acts as a growth factor (prebiotics) to enhance the growth of beneficial bacteria (probiotics), and inhibit pathogenic bacteria in the colon via competitive exclusion. These benefits to colon and other health benefits, plus unique characteristics have increased the global market of functional oligosaccharides applications in foods, pharmaceuticals, and in other industrial sectors. Due to, the increase demand of functional oligosaccharides for their health benefits and characteristics, functional oligosaccharides are currently produced enzymatically at higher yield, and lower cost from different natural sources of carbohydrates as a replacement of costly plants extraction methods. Two of these enzymatically produced functional oligosaccharides are cyclodextrins and trehalose. In addition, to their highlighted health benefits, both have an important pharmaceutical application in drugs delivery systems, in the case of cyclodextrins, and as cryoprotectants of biological materials, viable cells, and foods, in the case of trehalose.

### Biography

Osama Ibrahim received his B.S. in Biochemistry with honor and two M.S. degrees in Microbial physiology/ Fermentation and in Applied Microbiology. He received his Ph.D in Basic Medical Science (Microbiology, Immunology and Molecular biology) from New York Medical College. His research dissertation was on the construction of plasmid for the expression of a fusion protein of VEGF121/ Shiga-like toxin as a therapeutic protein for targeting angiogenesis (cancer treatment). Since 1979 he is a member of American Chemical Society, American Society of Microbiology, and Society of Industrial Microbiology.

[bioinnovation04@yahoo.com](mailto:bioinnovation04@yahoo.com)

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