Building Blocks for Oligosaccharide Synthesis

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[https://irl.umsl.edu/urs/12](https://irl.umsl.edu/urs/12)
• Carbohydrates, which include cellulose, starches, sugars, and many other compounds, are the most abundant single class of organic substances found in nature.

• Chemists in the 19th century found that carbohydrates contain the elements of carbon, hydrogen, and oxygen. Hence, they referred to them as carbon-hydrates.

• They are formed in green plants and certain bacteria by a process known as photosynthesis, in which energy derived from sunlight is used for the assimilation of carbon dioxide from the air.

\[
6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2
\]

• The life on Earth ultimately depends on this process in which carbohydrates are the first intermediates.

• Photosynthesis, through the operation of the food chain, is the ultimate source of energy for nearly all organisms.

Introduction

Building Blocks for Oligosaccharide Synthesis

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Carbohydrates – Molecules of Life and Death

• Oligosaccharides present in human milk (HMOs) can provide prebiotic effects, function as antimicrobial agents, and provide necessary nutrients for the development of the brain and cognition of infants.

• Thanks to the explosive growth of glycomics, we already know that HMOs are a unique and diverse family of glycans, but our understanding of the HMO function is far from complete.

• Adding HMOs to infant formulas could be beneficial for the infant’s health, but HMOs are challenging to produce and purify.

• Presented herein is the synthesis of two different families of building blocks. The first one will be used for the synthesis of HMOs.

• The synthesized molecules will help to investigate the exact roles of individual HMOs which remain largely unknown.

• The second family of building blocks will be used for the synthesis of high mannose N-glycans that are involved in many fundamental processes.

• The synthesized molecules will aid our collaborative efforts dedicated to understanding the roles of N-glycans in mediasion of the pathogenesis of cancers, AIDS, and other diseases.

Ultimate goals of the project

Synthesis of an Acceptor for HMOs

Synthesis of a Building Block for HMOs

Synthesis of a Building Block for High Mannose N-Glycan

Conclusions

• Successfully synthesized the building blocks for HMOs and high mannose N-glycans.

• Further synthesis is currently under progress.

Acknowledgements

References
