NAGASE

# D-Sedoheptulose

## - Efficient Production of Rare Sugar -

NAGASE & CO. targeted the D-sedoheptulose produced by *Streptomyces* and developed technology to mass produce it using N-STePP™

### 【What is D-Sedoheptulose?】

D-Sedoheptulose (sedoheptulose) is a rare naturally-occurring sugar. While glucose is a six-carbon monosaccharide and xylose is a five-carbon monosaccharide, sedoheptulose is unique in being a seven-carbon monosaccharide, which is very rare in nature (Figure 1). Sedoheptulose was discovered in *Sedum spectabile* in 1917[1], yet due to its rarity almost no research was carried out on its bioactive properties. It is an interesting question whether or not there is a causal relationship between *Sedum spectabile's* desiccation tolerance and the ample amount of sedoheptulose it contains.

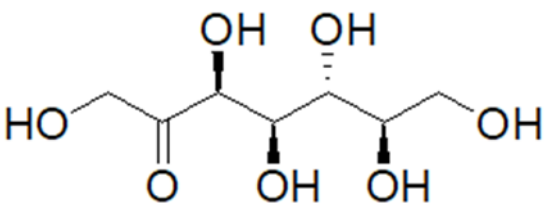


Figure 1 D-Sedoheptulose

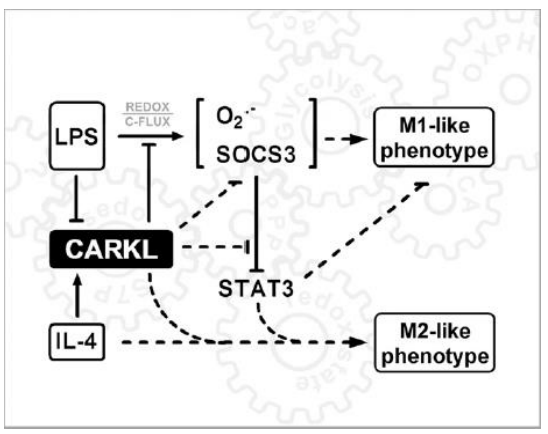


Figure 2 CARKL Regulation
Cell Metabolism (2012) 15:813-826 Figure 7.

Sedoheptulose 7-phosphate, an organophosphate of sedoheptulose, is an intermediate in the pentose phosphate pathway, part of the central metabolism of organisms, and is also an intermediate in the Calvin-Benson pathway, a carbon fixation pathway in photosynthesis, so it fulfills an important role in the metabolism of organisms.

Recently, it was found that a sedoheptulose kinase (CARKL) that catalyzes the phosphorylation of sedoheptulose can control the inflammatory immune response through metabolic control (Figure 2)[2]. These results corroborate the existence of a mutually dependent relationship between metabolism and immunity, and further research may show what role sedoheptulose plays in this relationship.

### 【Production of Sedoheptulose by *Streptomyces*】

It has long been known that *Streptomyces* produces sedoheptulose, but the amount was minimal[3]. And while sedoheptulose is anticipated to have uses in treating and preventing inflammation[4], or in supplements and health foods[5], it has not yet been put to practical use. The Nagase BIO-INNOVATION CENTER, while developing technology to produce materials using *Streptomyces* as a host, discovered that sedoheptulose production could be dramatically increased through metabolic engineering[6]. By developing this technology, the Nagase BIO-INNOVATION CENTER was able to accelerate research into the functions of sedoheptulose and contribute to studies for its practical applications.

### 【References】

1. F.B.La Forge and C.S. Hudson. Sedoheptose, a new sugar from Sedum Spectabile. I J. Biol. Chem. (1917) 30:61-77
2. Haschemi A, et al. The Sedoheptulose Knase CARKL Directs Macrophage Polarization through Control of Glucose Metabolism. Cell Metabolism (2012) 15:813-826
3. Okuda T, et al. Accumulation of sedoheptulose by Streptomyces. J. Biochem. (1963) 54:107-108
4. WO2014147214
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The NAGASE BIO-INNOVATION CENTER is committed to developing processes for efficiently producing a wide range of compounds with proprietary fermentation technologies.

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