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## Multiple Studies Reveal Diabetic - Neurological - Trehalose Link

*Trehalose contributes to the proper folding of proteins at the very beginning of protein production.*

Part 2 of 4 - Making G-Proteins

Glycoscience Lesson #26

by JC Spencer

An insulin study in Japan with rabbits compared two disaccharides, Trehalose vs. Maltose. Both sugars are two glucose molecules bonded together but at different angles. The unique angle of the Trehalose bond provides major functionality not found in any other sugar.

Activity of the enzyme trehalase that transports and metabolizes Trehalose to glucose was measured in the serum and kidney of rabbits. Both glucose **and insulin** were increased by the Trehalose infusion. Maltose infusion resulted in elevated serum glucose while NO increase of insulin was detected. Scientists concluded that Trehalose infused rabbits resulted in a positive nitrogen balance suggesting that Trehalose is used as an energy source and has the potential for parenteral nutrition (intravenous feeding).

### The Maillard Phenomenon

Jim Wing, our webmaster, asked his favorite Chinese restaurant to provide the same dish, Oriental Orange Chicken, for a comparison taste test. One dish was prepared with Trehalose and the other with regular table sugar. All four taste testers agreed that the Trehalose not only enhanced the flavor but also had no lingering aftertaste. Everyone noticed that the sauce of the Trehalose dish was lighter in color.

The Maillard caramelizing reaction is a non-enzymatic browning of amino acids with a reducing sugar. Enzymatic browning is oxidation that causes pigmentation darkening as in fruit starting to spoil.

Simple sugars are called “reducing sugars”; however, Trehalose is classified as a “non-reducing sugar.” That is why the sauce was lighter in color. Trehalose does not easily oxidize and works well in an acid environment and does not contribute to producing more acid like regular table sugar does.

Exciting puzzle piece: **Trehalose can be stored with amino acids which are the protein building blocks. Trehalose contributes to the proper folding of proteins at the very beginning of protein production.**

To improve flavor was serendipitous. My main interest was to discover how Trehalose achieves proper folding of proteins. Misfolding proteins cause neurological malfunctions that result in neurological diseases.

The Maillard biochemical phenomenon can be quite complicated as we examine the effect it has on foods and other protein-based technologies. The process is accelerated in an alkaline environment and the type of amino acid and pH determine the resulting flavor and functionality.

The Maillard process gives rise to a wide spectrum of different flavors and fragrances. Flavor scientists apply the Maillard reaction phenomenon to change the taste and aroma. Trehalose improves flavor.

Trehalose influences a lower glycaemic and insulinaemic response than glucose. A randomized single-blind, crossover study was conducted with ten overweight subjects ingested drinks made with glucose or Trehalose. Trehalose had a lower peak glucose response than glucose.

In Part 3, we will study the unseen influences on the folding of the proteins in collaboration with Smart Sugars that influence all neurological processes in the human body.

### Sources and References

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