The Sugar Comparison ¤ Sucrose vs. Trehalose

Lesson #20
Extended Version

No medical claims are intended or implied for treating or curing any disease

by JC Spencer

This lesson could easily be 145 lessons but I have kept it short as a reference for your continual use.

Sucrose Warning

Here are 145 documented health warnings for sucrose. Each warning is supported with scientific evidence in the e-textbook on glycomics and brain function ***Expand Your Mind - Improve Your Brain*** available online at www.endowmentmed.org

(1) Sucrose **contributes to obesity**.

(2) Sucrose can cause less effective functioning of albumin and lipoproteins, which **may reduce the body's ability to handle fat and cholesterol**.

(3) Sucrose **can contribute to diabetes**.

(4) Sucrose **increases the systolic blood pressure**.

(5) Sucrose **can increase size of the liver** (make liver cells divide).

(6) Sucrose **can increase the amount of liver fat**.

(7) Sucrose can **suppress the immune system**.

(8) Sucrose **can cause hypoglycemia**.

(9) Sucrose **can elevate glucose and insulin** responses in oral contraceptive users.

Trehalose Benefits

Health benefit headlines or titles of Trehalose science papers from major university studies. Each benefit is supported with scientific evidence in ***The Trehalose Handbooks*** - Vol 1, Vol 2, and Vol 3 available online at www.endowmentmed.org

(1) Trehalose Sugar **Inhibits Fat Cell Enlargement**

(2) Trehalose Sugar **Inhibits Progression of Type 2 Diabetes**

(3) Study identifies the effects of trehalose in preventing metabolic syndrome.

(4) Glycomic Insights from Oxford University into the **Multi-functional Role of Trehalose**

(5) The Sugar Trehalose **Protects Cells from Electron Beam Damage**

(6) Study Shows Trehalose **More Stable** Than Other Sugars

(7) Trehalose has **Enduring Source of Energy**

(8) New Research Study Explains **HOW** the Sugar Trehalose **Inhibits Alzheimer's**

(9) Trehalose is making its way into medicine on the point of a needle

(10) Sucrose **upsets mineral relationships** in the body.

(11) Sucrose can cause **hyperactivity**, **anxiety**, difficulty concentrating, and **crankiness** in children.

(12) Sucrose can produce a significant **rise in triglycerides**.

(13) Sucrose contributes to the reduction in defense against bacterial infection (**infectious diseases**).

(14) Sucrose causes **tissue elasticity loss and function** The more sucrose you eat the more elasticity and function you loose.

(15) Sucrose **reduces high density lipoproteins**.

(16) Sucrose **leads to chromium deficiency**.

(17) Sucrose **leads to cancer of the ovaries**.

(18) Sucrose **can increase fasting levels of glucose**

(19) Sucrose **causes copper deficiency**.

(20) Sucrose **interferes with absorption of calcium & magnesium**.

(21) Sucrose **can weaken eyesight**.

(22) Sucrose **raises the level of neuro-transmitter's: dopamine, serotonin, and norepinephrine**.

(23) Sucrose **can produce an acidic digestive tract**.

(24) Sucrose **can cause rapid rise of adrenaline** levels in children.

(25) Sucrose **malabsorption** is frequent in patients with functional bowel disease.

(26) Sucrose **can cause premature aging**.

(27) Sucrose **can lead to alcoholism**.

(10) Trehalose / Microarray Technology / NIH / and Texas A&M

(11) Trehalose and Enzyme used in **Spine Repair Study**

(12) Trehalose, **Stem Cells**, and **Huntington's Disease**

(13) New Research: Trehalose and **Neurodegenerative Diseases**

(14) Trehalose as a Natural Antifreeze

(15) Trehalose may help in **diabetes, triglycerides, kidney diseases**, and **neurodegenerative diseases**

(16) Trehalose Found Instrumental in **Hormonal Regulation** and **Gene Function in Plants**

(17) Trehalose - Hot Ingredient in Cosmeceutical & Neutraceutical Market - because of it **anti-aging functionality**

(18) Trehalose in Certain Rice Strain **Protects it from Drought**

(19) Trehalose published paper abstract - Organization and **mobility of water in amorphous and crystalline**

(20) Trehalose Can **Extend Shelf Life of Other Sugars**

(21) Trehalose **Improves Stress Tolerance** in Organisms

(22) Trehalose Used in Cryopreservation of Human Fetal **Skin for Transplantation**

(23) Trehalose **Proves Effective Kinetic Advantages**

(24) Trehalose Poster at International Conference on **Molecular Systems Biology**

(25) Trehalose **puts life on hold** - Royal Society of Chemistry

(28) Sucrose **can cause tooth decay**.

(29) Sucrose intake levels that are high **increases the risk of Crohn's disease**, and **ulcerative colitis**.

(30) Sucrose can cause changes frequently found in persons with **gastric** or **duodenal ulcers**.

(31) Sucrose **can cause arthritis**.

(32) Sucrose **can cause or be a factor in asthma**.

(33) Sucrose **greatly assists the uncontrolled growth of Candida Albicans (yeast infections)**.

(34) Sucrose **can cause gallstones**.

(35) Sucrose **can cause heart disease**.

(36) Sucrose **can cause appendicitis**.

(37) Sucrose **can cause multiple sclerosis**.

(38) Sucrose **can cause hemorrhoids**.

(39) Sucrose **can cause varicose veins**.

(40) Sucrose **can lead to periodontal disease**.

(41) Sucrose **can contribute to osteoporosis**.

(42) Sucrose **contributes to salivary acidity**.

(43) Sucrose **causes decrease in insulin sensitivity**.

(44) Sucrose **can lower the amount of vitamin E** in the blood.

(45) Sucrose **can decrease growth hormone**.

(46) Sucrose **can increase cholesterol**. **triglycerides, kidney diseases**, and

(47) Sucrose **causes drowsiness** - decreases child activity.

(26) Trehalose, **smart start** on the day

(27) Trehalose may be **Huntington's Hope**

(28) **Interaction** Between Trehalose and **Alkaline-earth Metal Ions**

(29) New Treatment for **Alzheimer's** and **Huntington's** Diseases Relies on Addressing the **Beta-Amyloid Pathway**

(30) New Trehalose Use in Foods - **Solution to Soggy Mash**

(31) New Uses for Trehalose - **Add to EVERY Recipe** - Here's Why

(32) Trehalose **alleviates polyglutamine-mediated pathology** in mouse model of Huntington disease

(33) Trehalose **better for teeth** than regular sugar

(34) **Trehalose Glycolipids** have Amazing Function

(35) Trehalose **Inhibits Inflammatory** Cytokine Production

(36) Trehalose plays a new role in **nano-technology and research of cell walls**

(37) Trehalose **Plays Role in cDNA Research**

(38) Trehalose **Protects Epithelial and Endothelial Cells**

(39) Trehalose **provides sustained energy** and is a **stress protectant** for proteins and membranes

(40) Trehalose Sugar **Study in Obese Men**

(41) Trehalose **Used in More Supplements**

(42) Why Is Trehalose **an Exceptional Protein Stabilizer**?

(48) High sucrose intake **increases advanced glycation** end products **(AGEs) (sugar bound non-enzymatically to protein)**.

(49) Sucrose **interferes with protein absorption.**

(50) Sucrose **causes food allergies**.

(51) Sucrose **can cause toxemia** during pregnancy.

(52) Sucrose **can contribute to eczema** in children.

(53) Sucrose **can cause cardiovascular disease**.

(54) Sucrose **can affect DNA function (alter gene expression)**

(55) Sucrose **can change protein structure**.

(56) Sucrose **can make our skin age** (change collagen structure)

(57) Sucrose **can cause cataracts**.

(58) Sucrose **can cause emphysema**.

(59) Sucrose **can cause atherosclerosis**.

(60) Sucrose **can promote LDL** (elevation low density lipoproteins).

(61) High sucrose intake **can impair the physiological homeostasis** of many systems in the body.

(62) Sucrose **lowers functionality of certain enzymes**.

(63) Sucrose intake is higher in people with **Parkinson's.**

(64) Sucrose **can cause a permanent alteration in the way certain proteins act** in the body.

(43) Trehalose paper: Using disaccharides to enhance in vitro and in vivo **transgene expression** mediated by a lipid-based gene delivery system

(44) Trehalose paper: Solid-state **stability of human insulin**. Effect of water on reactive intermediate partitioning in lyophiles from pH 2-5 solutions: stabilization against covalent dimer formation

(45) Trehalose paper: The role of cell-derived oligomers of Abeta in **Alzheimer's disease** and avenues for therapeutic intervention

(46) Trehalose reduces aggregate formation and **delays pathology** in a transgenic mouse model of oculopharyngeal **muscular dystrophy**

(47) Trehalose **inhibits aggregation and neurotoxicity of beta-amyloid 40 and 42**

(48) Trehalose: a review of properties, history of use and human tolerance, and **results of multiple safety studies**

(49) Trehalose: a cryoprotectant that **enhances recovery** and preserves function of human pancreatic islets after long-term storage

(50) Trehalose paper: Tps1 **regulates the pentose phosphate pathway**, nitrogen metabolism and fungal virulence

(51) Trehalose **ameliorates the cryopreservation of cord blood** in a preclinical system and increases the recovery of CFUs, long-term culture-initiating cells, and nonobese diabetic-SCID repopulating cells

(52) **Stabilization of membranes in human platelets** freeze-dried with trehalose

(53) Multiple effects of trehalose on **protein folding** in vitro and in vivo

(54) Loading Human Mesenchymal Stem Cells with Trehalose by Fluid-Phase Endocytosis

(65) Sucrose **can increase kidney size** and produce pathological changes in the **kidney**.

(66) Sucrose **can damage the pancreas**.

(67) Sucrose **can increase body's fluid retention.**

(68) Sucrose **is enemy #1 of the bowel movement**.

(69) Sucrose **can cause** myopia (**nearsightedness**).

(70) Sucrose **can compromise the lining of the capillaries**.

(71) Sucrose **can make the tendons more brittle**.

(72) Sucrose **can cause headaches**, including **migraine**.

(73) Sucrose **plays role in pancreatic cancer** in women.

(74) Sucrose **can adversely affect** school children's grades and cause **learning disorders**.

(75) Sucrose **can cause an increase in delta, alpha, and theta brain waves**.

(76) Sucrose **can cause depression**.

(77) Sucrose **increases the risk of gastric cancer**.

(78) Sucrose **can cause dyspepsia** (**indigestion**).

(79) Sucrose **can increase your risk of** getting **gout**.

(80) Sucrose **can increase the levels of glucose**.

(81) Sucrose **can increase the insulin responses** in humans consuming high-sugar diets compared to low sugar diets.

(55) Trehalose paper: Lessons from nature: the role of sugars in anhydrobiosis

(56) Intracellular trehalose **improves the survival** of cryopreserved mammalian cells

(57) **Gene expression pattern** in HD transgenic rats and HD knock- in mice: specific effects of trehalose treatment

(58) Purification and Characterization of a Trehalose Synthase from the Basidiomycete Grifola frondosa

(59) Purification and characterization of trehalose phosphorylase from the commercial mushroom Agaricus bisporus

(60) Trehalose in yeast, **stress protectant** rather than reserve carbohydrate

(61) Trehalose **aids Fertilization and development** of frozen-thawed germinal vesicle bovine oocytes by a one-step dilution method in vitro

(62) **Extraordinary stability of enzymes** dried in trehalose: simplified molecular biology

(63) **Amorphous stability** and trehalose among adolescents.

(64) Trehalose is a skin protectant now used in many leading skin care products.

Below are some of the references to sucrose and trehalose that are published in Volume 3 of the textbook, ***Expand Your Mind - Improve Your Brain***.

Sucrose and Idiopathic Renal Stone (Nutrition Health. 1987;5(1 & 2):9-17).

Sucrose as a Risk Factor for Cancer of the Colon and Rectum: a Case-control Study in Uruguay (*International Journal of Cancer* (1998 Jan 5;75(1):40-4).

Sucrose feeding predicts rate of acquisition of cocaine self-administration by B A **Gosnell**. Psychopharmacology, 149, 286-292.

Sucrose Induces Diabetes in Cat (***Federal Protocol*** (1974;6(97)).

(82) High refined sugar diet **reduces learning capacity**.

(83) Sucrose **can contribute to Alzheimer's disease**.

(84) Sucrose **can increase platelet adhesiveness**.

(85) Sucrose **can cause hormonal imbalance**; some hormones become underactive and others become overactive.

(86) Sucrose **can lead to the formation of kidney stones**.

(87) Sucrose **can lead to the hypothalamus** to become highly sensitive to a large variety of stimuli.

(88) Sucrose **can lead to dizziness**.

(89) Diets high in sugar **can cause** increased production of **free radicals** and **oxidative stress**.

(90) High sucrose diets of **subjects with peripheral vascular disease significantly increase platelet adhesion.**

(91) High-sugar diet **can lead to biliary tract cancer**.

(92) Sucrose **feeds cancer**.

(93) High-sugar consumption of pregnant adolescents is associated with a **two-fold increased risk for delivering a small-for-gestational-age (SGA) infant**.

(94) High-sugar consumption can lead to substantial **decrease in gestation** duration

(95) Sucrose **slows food's travel time through the gastrointestinal tract**.

(96) Sucrose **increases the concentration of bile acids in stools and bacterial enzymes in the colon**. This can modify bile to **produce cancer-causing compounds and colon cancer**.

Sugar Blues by William **Dufty** (New York: Warner Books, 1975).

Sugar Challenge Testing with Children Considered Behaviorally Sugar Reactive by D **Behar** (Nutritional Behavior. 1984;1:277-288).

Sucrose, Neutrophilic Phagocytosis and Resistance to Disease W **Ringsdorf**, E **Cheraskin**, and R **Ramsay** (Dental Survey. 1976;52(12):46-48).

Sugar Changes into Fat Faster than Fat (Nutrition Health Review (Fall 85)).

Sugar Consumption and Myocardial Infarction J **Yudkin**. Lancet..Feb 6, 1971:1(7693).

Sugars and Dental Caries (1998; 32(2)107-12) and (Oct 2003; 78:881-892).

Sugars and Fats: The Neurobiology of Preference (Journal of Nutrition. 2003;133:831S-834S).

Sugar-Induced Blood Pressure Elevations Over the Lifespan of Three Substrains of Wistar Rats (Journal of the American College of Nutrition , 1998;17(1) 36-37).

Sugar, Meat, and Fat Intake and Non-dietary Risk Factors for Colon Cancer Incidence in Iowa Women (Cancer Causes & Control. 1994:5:38-53).

Sugar-Sweetened Beverages, Weight Gain, and Incidence of Type 2 Diabetes in Young and Middle-Aged Women Matthias B **Schulze**, Dr P H; JoAnn E **Manson**, MD; David S. **Ludwig**, MD; Graham A. **Colditz**, MD; Meir J **Stampfer**, MD, ; Walter C **Willett**, MD, Frank B **Hu**, MD, *JAMA*. 2004;292:927-934.

Sugar Weakens Eyesight H Ed **Taub**. (VM NEWSLETTER; May 1986:06:00).

Sugar, White Flour Withdrawal Produces Chemical Response (The Addiction Letter Jul 1992:4.)

Sweet and Dangerous by J **Yudkin** (New York; Bantam Books:1974, 129).

The Sweet Road to Gallstones by K **Heaton** (British Medical Journal. Apr 14, 1984.

Sweetness and Food Selection: Measurement of Sweeteners' Effects on Acceptance. Sweetness (London:Springer-Verlag, 1987)

Healthy Bones by Nancy **Appleton** (Avery Penguin Putnam:1989)

Synergistic effects of dietary carbohydrate and cholesterol on serum lipids and lipoproteins in squirrel and spider monkeys. S R **Srinivasan**, B **Radharkrishnamurthy**, L S **Webber**, E R **Dalfer**, M G **Kokatnur**, and G S **Berenson** (1978) Am. J. Clin. Nutr. 31, 603-613.

Trehalose paper: ***A bifunctional TPS-TPP enzyme from yeast confers tolerance to multiple and extreme abiotic-stress conditions in transgenic Arabidopsis***

(97) Sucrose **increases estradiol** (the most potent form of naturally occurring **estrogen**) **in men**.

(98) Sucrose combines and **destroys alkaline phosphatase** enzyme, which makes the process of digestion difficult.

(99) Sucrose **is a risk factor for gallbladder cancer**.

(100) Sucrose **is an addictive substance**.

(101) Sucrose **can be intoxicating**, similar to **alcohol**.

(102) Sucrose **can exacerbate PMS**.

(103) Sucrose given to premature babies **can affect the amount of carbon dioxide** they produce.

(104) Lower sucrose intake **can increase emotional stability**.

(105) The body changes sucrose into **2 to 5 times more fat in the bloodstream** than it does starch.

(106) The rapid absorption of sucrose **promotes excessive food intake in obese** subjects.

(107) Sucrose **can worsen ADHD** symptoms of children with **attention deficit hyper-activity disorder**.

(108) Sucrose **adversely affects urinary electrolyte composition**.

(109) Sucrose **can slow down** the ability of the **adrenal glands to function**.

(110) Sucrose has potential of inducing **abnormal metabolic processes** in a normal healthy individual and to promote **chronic degenerative diseases**.

(111) Intravenous sugar water **can stop oxygen to the brain**.

Trehalose paper: ***Cryopreservation of fetal skin is improved by extra-cellular trehalose.*** G **Erdag**, A **Eroglu**, J **Morgan** and M **Toner** (2002). Cryobiology 44(3): 218-28.

"Lick The Sugar Habit" by Nancy **Appleton** (New York: Avery Penguin Putnam:1988).)

Trehalose paper: ***Extraordinary stability of enzymes dried in trehalose: simplified molecular biology.*** C **Colaco**, S **Sen**, M **Thangavelu**, S **Pinder** and B **Roser** (1992). Biotechnology (N Y) 10(9): 1007-11.

Trehalose paper: ***Fertilization and development of frozen-thawed germinal vesicle bovine oocytes by a one-step dilution method in vitro.*** T **Suzuki**, A **Boediono**, M **Takagi**, S **Saha** and C **Sumantri** (1996). Cryobiology 33(5): 515-24.

Trehalose paper: Fungal trehalose phosphorylase: kinetic mechanism, pH- dependence of the reaction and some structural properties of the enzyme from Schizophyllum commune. C **Eis**, M **Watkins**, T **Prohaska**, and B **Nidetzky**. Institute of Food Technology, University of Agricultural Sciences Vienna (BOKU), Muthgasse 18, A-1190 Vienna, Austria.. Biochem Journal June 15 2001; 356(Pt3): 757-767.

Some of the Selected References below were part of the list of references for trehalose regarding pH:

Eis C, **Albert** M, **Dax** K, **Nidetzky** B. ***The stereochemical course of the reaction mechanism of trehalose phosphorylase from Schizophyllum commune***. FEBS Lett. 1998 Dec 4;440(3):440–443.

Eis C, **Nidetzky** B. ***Characterization of trehalose phosphorylase from Schizophyllum commune.*** Biochem J. 1999 Jul 15;341(Pt 2):385–393.

Wannet WJ, **Aben** EM, **van der Drift** C, **Van Griensven** LJ, **Vogels** GD, **Op den Camp** HJ. ***Trehalose phosphorylase activity and carbohydrate levels during axenic fruiting in three Agaricus bisporus strains***. Curr Microbiol. 1999 Oct;39(4):205–210.

Singer MA, **Lindquist** S. ***Thermotolerance in Saccharomyces cerevisiae: the Yin and Yang of trehalose***. Trends Biotechnol. 1998 Nov;16(11):460–468.

Wiemken A. ***Trehalose in yeast, stress protectant rather than reserve carbohydrate***. Antonie Van Leeuwenhoek. 1990 Oct;58(3):209–217.

Trehalose paper: ***Lessons from nature: the role of sugars in anhydrobiosis.*** L M **Crowe**, (2002). Comp Biochem Physiol A Mol Integr Physiol 131(3): 505-13.

Trehalose paper: ***Gene expression pattern in HD transgenic rats and HD knock- in mice: specific effects of trehalose treatment.*** H **Nguyen**, M **Bonin**, M **Kuhn**, C **Holzmann**, S v **Horsten** and O **Riess** (2005). Society for Neuroscience, Washington, DC.

Trehalose paper: ***Intracellular trehalose improves the survival of cryopreserved mammalian cells.*** A **Eroglu**, M J **Russo**, R **Bieganski**, A **Fowler**, S **Cheley**, H **Bayley** and M **Toner** (2000). Nat Biotechnol 18(2): 163-7.

(112) High sucrose intake may increase lung cancer risk factor.

(113) Sucrose **increases the risk of polio**.

(114) High-sucrose intake **can cause epileptic seizures**.

(115) Sucrose **causes high blood pressure** in obese people.

(116) In Intensive Care Units, **limiting sucrose saves lives**.

(117) Sucrose **may induce cell death**.

(118) Sucrose **can increase** the craving for excess food.

(119) Children in juvenile rehabilitation camps, put on a low sucrose diet, had a 44% drop in **anti-social behavior**.

(120) Sucrose **can lead to prostate cancer**.

(121) Sucrose **dehydrates newborns**.

(122) Sucrose **increases estradiol** in young men. Estradiol is a sex hormone predominant present in females.

(123) Sucrose **can cause low birth weight** babies.

(124) Greater consumption of refined sugar is associated with **a worse outcome of schizophrenia**.

(125) Sucrose **can raise bloodstream homocysteine** levels.

(126) Sweet food items **increase risk of breast cancer**.

(127) Sucrose **is a risk factor in small intestine cancer**.

(128) Sucrose **may cause laryngeal cancer**.

Trehalose paper: ***Loading Human Mesenchymal Stem Cells with Trehalose by Fluid-Phase Endocytosis.*** A E **Oliver**, K **Jamil**, J H **Crowe** and F **Tablin** (2004). Cell Preservation Technology 2(1): 35-49.

Trehalose paper: ***Multiple effects of trehalose on protein folding in vitro and in vivo.*** M A **Singer** and S **Lindquist** (1998). Mol Cell 1(5): 639-48.

Trehalose paper: ***Stabilization of membranes in human platelets freeze-dried with trehalose.*** J H **Crowe**, F **Tablin**, W F **Wolkers**, K **Gousset**, N M **Tsvetkova** and J **Ricker** (2003). Chem Phys Lipids 122(1-2): 41-52.

Trehalose paper: ***Tps1 regulates the pentose phosphate pathway, nitrogen metabolism and fungal virulence***

Trehalose paper: ***Trehalose alleviates polyglutamine-mediated pathology in a mouse model of Huntington disease.*** Motomasa **Tanaka**; Yoko **Machida**; Sanyong **Niu**; Tetsurou **Ikeda**; Nihar R **Jana**; Hiroshi **Doi**; Masaru **Kurosawa**; Munenori **Nekooki**; Nobuyuki **Nukina** (2004). Nat Med 10(2): 148-54.

Trehalose paper: ***Trehalose ameliorates the cryopreservation of cord blood in a preclinical system and increases the recovery of CFUs, long-term culture-initiating cells, and nonobese diabetic-SCID repopulating cells.***" X B **Zhang**, K **Li**, K H **Yau**, K S **Tsang**, T F **Fok**, C K **Li**, S M **Lee** and P M **Yuen** (2003).

Trehalose paper: ***Trehalose: a cryoprotectant that enhances recovery and preserves function of human pancreatic islets after long-term storage.*** G M **Beattie**, J H **Crowe**, A D **Lopez**, V **Cirulli**, C **Ricordi** and A **Hayek** (1997).

Trehalose paper: ***Trehalose: Cryopreservation of fetal skin is improved by extracellular trehalose."*** (2002) ***Cryobiology*** 44(3): 218-28.

Trehalose paper: ***Trehalose: a review of properties, history of use and human tolerance, and results of multiple safety studies.*** A B **Richards**, S **Krakowka**, L B **Dexter**, H **Schmid**, A P **Wolterbeek**, D H **Waalkens-Berendsen**, A **Shigoyuki** and M **Kurimoto** (2002). Food Chem Toxicol 40(7): 871-98.

Trehalose paper: ***Trehalose differentially inhibits aggregation and neuro-toxicity of beta-amyloid 40 and 42.*** R **Liu**, H **Barkhordarian**, S **Emadi**, C B **Park** and M R **Sierks** (2005). Neurobiol Dis 20(1):74-81.

Trehalose paper: ***Trehalose reduces aggregate formation and delays pathology in a transgenic mouse model of oculopharyngeal muscular dystrophy.*** J E **Davies**, S **Sarkar** and D C **Rubinsztein** (2006). Hum Mol Genet 15(1): 23-31.

Trehalose paper: ***Trehalose Puts Life On Hold*** John **Bonner**, Salvatore **Magazù** *Chemistry World*, 28 July 2005 Royal Society of Chemistry. Paper reproduced with permission from the Royal Society of Chemistry as Chapter **19**:115-117

Trehalose paper: ***Using disaccharides to enhance in vitro and in vivo transgene expression mediated by a lipid-based gene delivery system***

(129) Sucrose **induces salt and water retention**.

(130) Sucrose **may contribute to mild memory loss**.

(131) Sucrose increase in 10 year-olds, causes a **linear 210**.

(132) A newborn exposed to sucrose results in a heightened addiction to sugar at 6 month and 2 years of age.

(133) Sucrose **causes constipation**.

(134) Sucrose **can cause brain impairment** in prediabetic and diabetic women.

(135) Sucrose **can increase the risk of stomach cancer**.

(136) Sucrose **can cause metabolic syndrome**.

(137) Sucrose ingestion by pregnant women increases **neural tube defects in embryos**.

(138) The higher the sucrose consumption, the more chances of getting **irritable bowel syndrome (IBS)**.

(139) Sucrose **could affect central reward systems**.

(140) Sucrose **can cause cancer of the rectum**.

(141) Sucrose **can cause endometrial cancer**.

(142) Sucrose **can cause renal (kidney) cell carcinoma**.

(143) Sucrose **can cause liver tumors**.

(144) The more soft drinks, fruit juice and sugary snacks one eats, the **lower the HDL** (high density lipoproteins).

(145) Sucrose consumption **can cause myocardial infarction**.

Trehalose paper: Amorphous stability and trehalose. C **Colaco**, J **Kampinga** and B **Roser** (1995). Science 268(5212): 788.

Trehalose paper: ***Repeatability of the sugar-absorption test, using lactulose and mannitol, for measuring intestinal permeability for sugars.*** R M **van Elburg**, J J **Uil**, F T **Kokke**, A M **Mulder**, W G **van de Broek**, C J **Mulder** and H S **Heymans** (1995). J Pediatr Gastroenterol Nutr 20(2): 184-8.

Trehalose paper: ***The role of cell-derived oligomers of Abeta in Alzheimer's disease and avenues for therapeutic intervention.*** D M **Walsh**, I **Klyubin**, G M **Shankar**, M **Townsend**, J V **Fadeeva**, V **Betts**, M B **Podlisny**, J P **Cleary**, K H **Ashe**, M J **Rowan** and D J **Selkoe** (2005). Biochem Soc Trans 33(Pt 5): 1087-90.

Trehalose paper: ***Solid-state stability of human insulin. II. Effect of water on reactive intermediate partitioning in lyophiles from pH 2-5 solutions: stabilization against covalent dimer formation.*** R G **Strickley**, and B D **Anderson** (1997). J Pharm Sci 86(6): 645-53.

"*Several theories have been proposed as to why trehalose exerts far greater protective effects than other disaccharides like sucrose and maltose. These include suggestions that its special properties are due to a higher glass transition temperature or that it forms direct hydrogen bonds with lipids in cells, replacing similar bonds with water molecules.*"

From ***Trehalose Puts Life On Hold*** John **Bonner**, Salvatore **Magazù** *Chemistry World*, 28 July 2005 Royal Society of Chemistry. Paper reproduced with permission from the Royal Society of Chemistry as Chapter **19**:115-117 of ***Expand Your Mind - Improve Your Brain*** by JC Spencer

More References are available in the glycomics / brain function in ***The Trehalose Handbooks*** Vol. 1, 2, and 3 available at www.endowmentmed.org.