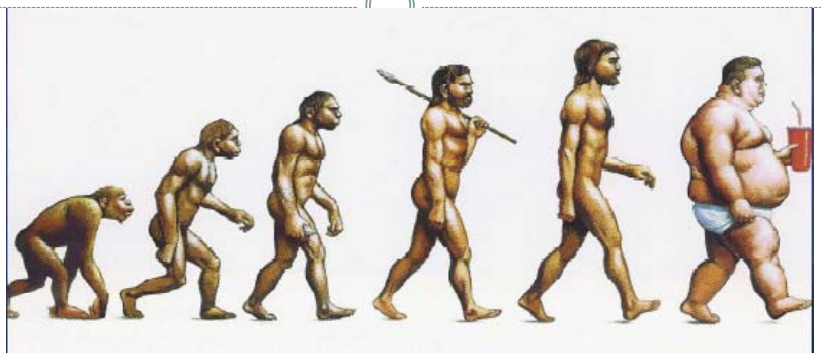
The latest buzz on sugar and low/non-calorie sweeteners

Mary Lee Chin, MS, RD

West Virginia Dietetic Association
April 28, 2010

Our Collective Sweet Tooth. . .

Human preference for sweet is biological, not learned



Session Goals

- Define the role and function alternative sweeteners play in the diet.
- Define basis for ADI and dietary recommendations for aspartame and sucralose consumption.
- Understand and interpret food and health-related scientific studies, including observational, epidemiological, controlled and clinical trials
- Evaluate scientific safety studies of alternative sweeteners and their role in metabolism, cancer, neurological disorders, chronic diseases, metabolic syndrome, hunger & satiety issues, weight loss and application in everyday use.
- Translate current research on alternative sweeteners into consumer and patient guidelines and recommendations.

Sweetener Recommendations

SUGARS, SWEETENERS AND DIETARY GUIDANCE

ADA Position Paper: Sweeteners

- By increasing the palatability of nutrient dense foods and beverages, sweeteners can promote dietary healthfulness.
- Consumers can safely enjoy a range of nutritive and non-nutritive sweeteners when consumed in a diet that is guided by current federal nutrition recommendations…as well as individual health goals.
- Non-nutritive sweeteners added to the diet have been shown to promote modest loss of weight and may facilitate long-term maintenance of reduction in body weight.
- Non-nutritive sweeteners can assist in dental health and dietary quality. -*J Am Diet Assoc*. 2004; 104:255-275

Overview of Latest Guidelines: USA

- *USDA:*
  - Suggests intakes range from 6-10% of energy from added sugars (10-18 tsp/day) based on total kcal intake.
- *Dietary Reference Intakes:*
  - Maximal intake at 25% of energy from added sugars to maintain dietary quality and adequate intake of key nutrients
    - Data show that key nutrients like calcium, vitamin A, iron, zinc can suffer above this point.
    - Est. intakes suggest up to 1 in 4 children can surpass this recommended level.

IOM Guidelines

- Acceptable Range of CHO intake:
  - 45-65% of total kcals
- Minimum CHO consumption of at least 130 gm/day.
  - Based on the average minimum amount of glucose utilized by the brain
- No Tolerable Upper Intake Level set for sugars
  - Suggests maximum 25% kcals from added sugars (based on micronutrient dilution)

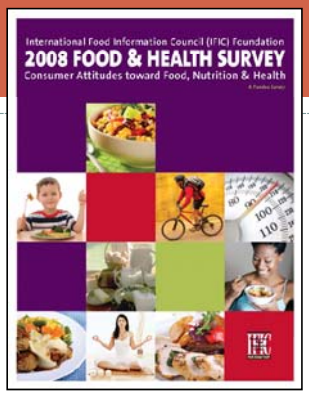
IOM Report: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids*, 2002.

Consumer Attitudes

WHAT ARE THEY EATING AND WHAT DO THEY SAY THEY WANT?

Taste (and Cost) Remains Driving Force(s) for Consumers

Consumer Attitudes: IFIC 2008 Food & Health Survey



What people *say:*

- 70% are extremely concerned about amount they eat
- 75% are concerned about their weight
- 69% trying to consume less sugar

Americans make connections between food they eat and their health

FMI's "*Shopping For Health 2008: Making Healthy Eating Easier*" Survey:

Americans strive & struggle to eat more nutritious diets:

- 80% are trying "a lot"
- Drink less soda
  - 29% of consumers choose this alternative
  - but 28% would not change their consumption.

MSOffice1

National online survey of more than 2,700 adult shoppers

Low and Non-Calorie Sweeteners

A GROWING NUMBER OF OPTIONS

Slide 11

MSOffice1 Ask Mary Lee what this means.
, 4/21/2009

Low Calorie Sweeteners Can Improve Diet Quality

- "Reported Use of Reduced-Sugar Foods and Beverages Reflects High-Quality Diets"
  - Using 2 day of dietary intakes from the CSFII (USDA 2002) of 9087 men and women.
  - When compared with "full-sugar food users," "reduced-sugar food users" consistently reported significantly higher intakes of fruit, similar or higher micronutrient intakes, lower energy intakes and lower intake of discretionary fat and added sugars.

-*J Food Sci.* Vol. 70, Nr.1, 2005, S42-S46.

Most in the News

Common name	Composition
Sucralose (a.k.a., "Splenda")	Chlorine substituted for three hydroxyl groups on sucrose molecule
Rebiana (a.k.a., "Truvia," "PureVia")	Purified extract of stevia plant, newest on market
Aspartame (a.k.a., "NutraSweet," "Equal")	Amino acid base (aspartic acid + methyl ester of phenylalanine)

Natural: The New Holy Grail

Sweetener	What makes it "more natural"	What makes it "less natural"
Rebiana	Derived from a plant	Highly processed before reaching the consumer
Sucralose	"Starts with sugar"	Chlorine added to sucrose during processing
Aspartame	Only low calorie sweetener to be digested like common foods into components from common foods	Produced through a manufacturing process versus starting with a foodstock

As is the case for much in life,
"natural" often is in the eye of the beholder . . .

Definition? Natural

- **U.S. Food and Drug Administration** policy 1993:
- "FDA has not established a formal definition for the term 'natural', however the agency has not objected to the use of the term on food labels provided it is used in a manner that is truthful and not misleading and the product does not contain added color, artificial flavors, or synthetic substances."
- **The USDA's Food Safety and Inspection Service (FSIS) defines "natural"**
- "a product containing no artificial ingredient or added color and is only minimally processed (a process which does not fundamentally alter the raw product) may be labeled natural."

Non-nutritive Sweetener Safety: Acceptable Daily Intake (ADI)

- ADI: weight of sweetener/kg bw that a person can safely consume *every day over a lifetime* without risk
- ADI is a conservative estimate:
  - Approximately 1/100 of maximum level that produces no adverse effects

ADI's for U.S. Sweeteners

ADI's set based on research:

Sweetener	ADI
Aspartame	50 mg/kg body wt/day
Sucralose	5 mg/kg body wt/day
Acesulfame K	15 mg/kg body wt/day
Saccharin	5 mg/kg body wt/day
Neotame	18 mg/day (not body weight-based)
Rebiana*	Approx. 12 mg/kg body wt/day*

** JECFA (Joint FAO/WHO Expert Commission of Experts on Food Additives) set acceptable daily intake of 0-4 mg/kg bw/day for steviol glycoside equivalents; equates to 12 mg/kg rebiana*

*

Acceptable Daily Intake (ADI): What does this mean to consumers?

Sweetener	ADI Mg/kg body wt/day	ADI Equivalent (approx.) 150 lb person ever day/entire life
Aspartame *(approx. 200X sugar)*	50 mg	**18** 12-oz cans of diet soda, OR almost **100** Equal packets
Acesulfame K *(approx. 200X sugar)*	15 mg	*Typically not used as stand-alone sweetener, but in blends*
Sucralose *(approx. 600X sugar)*	5 mg	**30** Splenda packets, OR **5** 12-oz cans of soda sweetened only with Sucralose
Rebiana A *(approx. 200X sugar)*	12 mg *(approximate)*	**16** 12-oz soda; almost **30** packets

Aspartame

A CASE STUDY OF
THE MOST USED AND
MOST OFTEN MALIGNED

Aspartame: *Product History*

- Approved in 1981 for tabletop sweeteners and various food and beverages
- 180-200 times sweeter than sucrose
- Currently appears in more than 6,000 products and is consumed by over 200 million people globally, including:
  - Yogurts, juice drinks, desserts, chewing gum
- Suitable in certain recipes for cooking and baking (no prolonged, high temperatures)
- One of the most rigorously tested ingredients in the U.S. food supply

- www.aboutaspartame.com

Some of the safety concerns listed on the Internet

- Possibility of toxicity from methanol
- Elevations in plasma concentrations of phenylalanine and aspartic acid (altering brain's neurochemical composition)
- Possibility of neuroendocrine changes
- Possible carcinogenic risk
- Postulated link with epilepsy and brain tumors
- Weight gain
- Allegations of ailments from infertility to baldness
- And more . . .

What are the Facts?

Perhaps it is time "to restore science to its rightful place . . ."

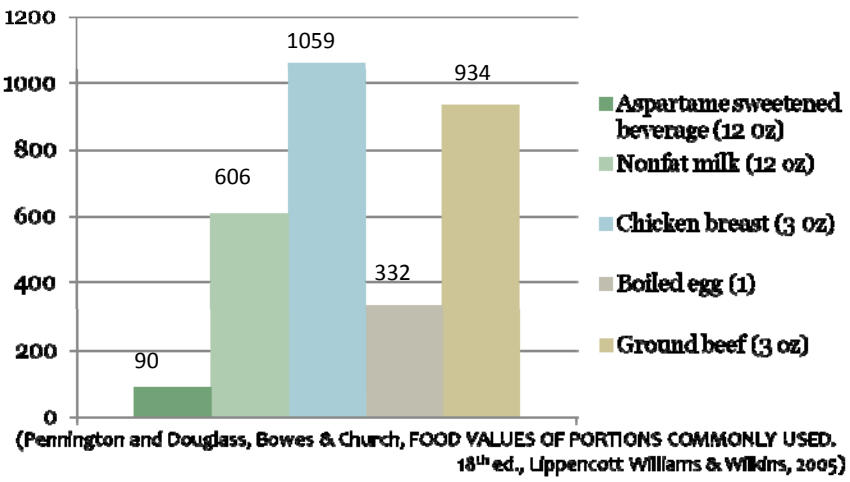
- President Barack Obama, Inaugural Address, January 20, 2009

Aspartame: *Metabolism & Excretion*

- Aspartame is metabolized to 3 common dietary components:
  - Aspartic acid, phenylalanine and methanol
- Technically is a caloric sweetener: Amino acids supply 4 kcal/g, but caloric contribution is negligible
  - About 1 kcal aspartame = about 160 kcal sugar in sweetening power
- Absorption and metabolism of constituents the same whether derived from aspartame or other food products*
- Constituents of aspartame are derived in much larger amounts from common foods

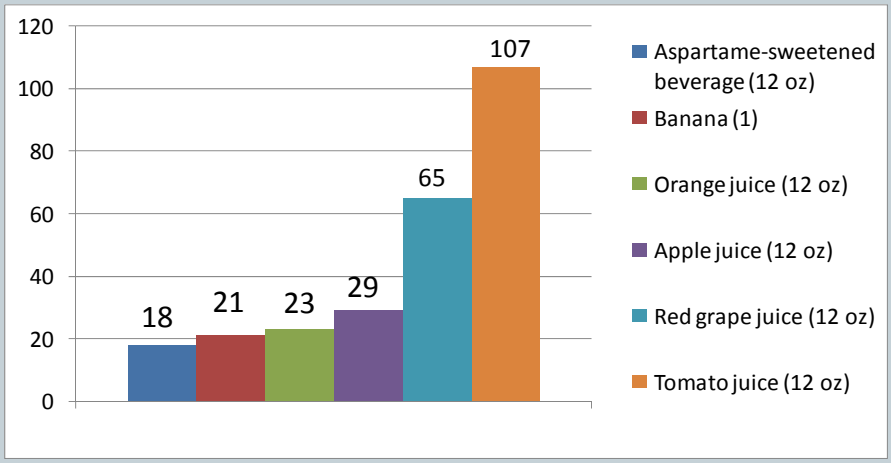
*Stegink et al. *The Clinical Evaluation of a Food Additive*. New York, NY. CRC Press; 1996.

PHE Content of Aspartame-Sweetened Beverage Compared with Common Foods (in mg)



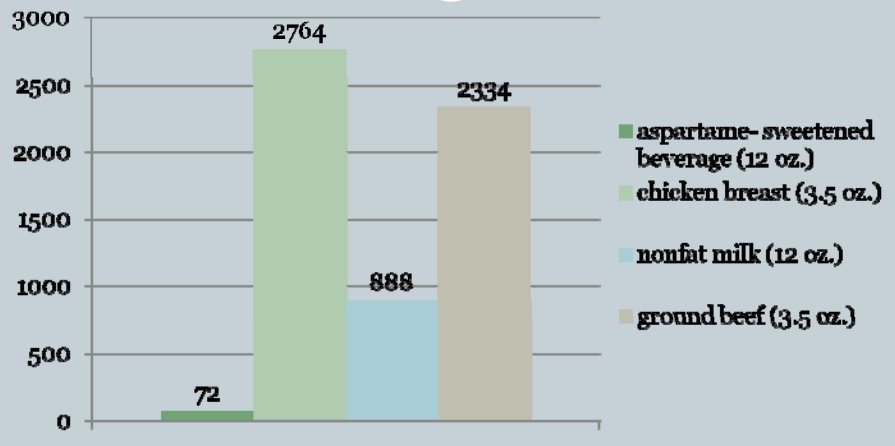
(Pennington and Douglass, Bowes & Church, FOOD VALUES OF PORTIONS COMMONLY USED. 18th ed., Lippencott Williams & Wilkins, 2005)

Methanol Content of Aspartame-Sweetened Beverage Compared with Common Foods (mg)



(Wucherphennig et al. Flussuges Obst. 348-354, 1983).

Aspartic Acid Content of Various Foods and Beverages (in mg.)



Highlights of Safety Confirmation: Global

- >200 toxicological/clinical studies over 30 years confirm safety
- Regulatory authorities in more than 100 countries have approved aspartame for use:
  - European Food Safety Authority (EFSA) Re-Confirms Safety of Aspartame (May 2006)
  - Scientific Committee on Food (SCF) of European Commission Reconfirms Aspartame's Clean Bill of Health-(December 2002)
  - U.K. Food Standards Agency supports conclusions of SCF- (December 2002)
  - French Food Safety Agency Supports Safety of Aspartame-(May 2002)
  - Health Canada Reaffirms Aspartame's Safety-(February 2003)
  - Joint Expert Committee on Food Additives of the WHO concluded that Aspartame is safe
  - The UN's Food and Agricultural Organization (FAO) has concluded that Aspartame is safe

Health organizations in U. S confirm safety

- American Diabetes Association
- American Dental Association
- ADA Position Paper, "Use of Nutritive and Non-Nutritive Sweeteners"
- American Medical Association Council on Scientific Affairs
- American Academy of Pediatrics, Committee on Nutrition
- American Cancer Society

2007 Expert Panel: Approach

- Goal = convene an independent international panel of toxicology experts to review all scientific studies and assess the safety of current consumption of aspartame.
- Blinded study with Ajinomoto funding: Panelists identity unknown (each side); no conflicts of interest or contact with company
- Experts: Food toxicology, metabolism, carcinogenesis, pathology, neurotoxicology, epidemiology, toxicology of methanol & formaldehyde
- Panel spent 11 months reviewing > 500 scientific articles and reports on aspartame from over the past 30 years
- NHANES data to determine how much aspartame consumed by average person

- Magnuson Aspartame: A safety evaluation based on current use levels, regulations, and toxicological and epidemiological studies. *Critical Reviews in Toxicology.* 2007. 37(8):629-727.

2007 Expert Panel Findings: Intake Low; Value in Weight Management

- Even among *heaviest users*, consumption of aspartame remains well below safe and accepted upper intake levels
- Average intake less than *one tenth* amount confirmed by FDA as safe (4.9 mg/kg/day vs. 50 mg/kg/day)
- Scientific studies support aspartame as a potential weight management tool
- No credible evidence to support an association between consumption of aspartame and development of obesity

- Magnuson Aspartame: A safety evaluation based on current use levels, regulations, and toxicological and epidemiological studies. *Critical Reviews in Toxicology.* 2007. 37(8):629-727.

Expert Panel Findings- Safe across Population Groups

- No credible evidence aspartame is carcinogenic or has any cancer-causing properties
- Extensive human studies: No link to memory loss, learning problems or any other neurological effects
- No effect on behavior, brain function or seizures in any of the groups studied
- No adverse effects on reproduction or lactation
- Safe for use by people with diabetes and may help them adhere to a lower-carbohydrate diet program to better control blood sugars

- Magnuson Aspartame: A safety evaluation based on current use levels, regulations, and toxicological and epidemiological studies. *Critical Reviews in Toxicology.* 2007. 37(8):629-727.

American Dietetic Association

Evidence Analysis Library

January 2009

Are there adverse effects associated with aspartame consumption in the general population?

- Aspartame consumption is not associated with adverse effects in the general population. Studies have found no evidence of an effect of aspartame on a wide range of adverse effects including hypersensitivity reactions, elevated blood methanol or formate levels, hematopoeitic or brain cancers. Neurological changes tested included cognitive functions, seizures, headaches and changes in memory or mood.

GRADE 1

Cancer Claims: The Ramazzini Study

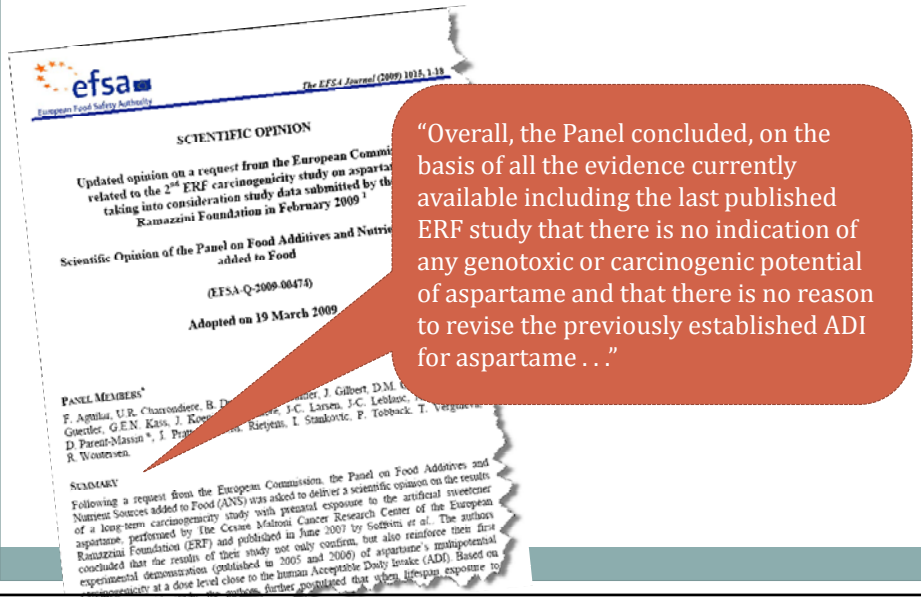
- Claimed to be largest animal study ever done on aspartame.
- Aspartame + feed was fed to 1,800 (male and female) 8 wk old rats (100-150/sex/group)
- Concentrations: 100,000/50,000/10,000/2,000 400/80/0 ppm
- Treatment lasted until spontaneous death
- Researchers said aspartame caused a statistically significant dose-related increase in lymphomas and leukemias in females
- No statistically significant increase in malignant brain tumors compared to controls
- Wide media pickup

- Soffriti et. al. Aspartame induces lymphomas and leukemias in rats. *Eur. J. Oncol.*, vol. 10, no. 2, pp. 108-116.

The Ramazzini Study: *International Response (EU, US, NZ, AU)*

- Not a single regulatory body endorsed findings; cite large database of credible evidence showing absence of a carcinogenic effect
  - Blasted by EFSA in two separate reports
- Experts believe animals were sick; pathology likely disease-related
- Institute would not provide access to outside pathologists to analyze all of the tissue samples where cancerous tumors were found (standard practice)
- Criticized by experts for numerous flaws in design, implementation and data reporting
  - Did not follow international protocol for animal carcinogenicity studies (or that of the National Toxicology Program)
- Conflicts with large body of credible studies thoroughly reviewed by regulatory authorities around the world
- Statistical approach used did not fully adjust for age-related effects

The Ramazzini Study: *EFSA Updated Response (March 19, 2009)*



efsa
European Food Safety Authority

The EFSA Journal (2009) 1015, 1-19

SCIENTIFIC OPINION

Updated opinion on a request from the European Commi
related to the 2nd ERF carcinogenicity study on aspartam
taking into consideration study data submitted by th
Ramazzini Foundation in February 2009 [1]

Scientific Opinion of the Panel on Food Additives and Nutrie
added to Food

(EFSA-Q-2009-00474)

Adopted on 19 March 2009

PANEL MEMBERS*

F. Aguilar, U.R. Charrondiere, B. D
Guertler, G.E.N. Kass, J. Koen
D. Parent-Masson [a], J. Pratt
R. Woutersen.

SUMMARY

Following a request from the European Commission, the Panel on Food Additives and
Nutrient Sources added to Food (ANS) was asked to deliver a scientific opinion on the results
of a long-term carcinogenicity study with prenatal exposure to the artificial sweetener
aspartame, performed by The Cesare Malroni Cancer Research Center of the European
Ramazzini Foundation (ERF) and published in June 2007 by Soffritti et al. The authors
concluded that the results of their study not only confirm, but also reinforce then first
experimental demonstration (published in 2005 and 2006) of aspartame's multipotential

"Overall, the Panel concluded, on the basis of all the evidence currently available including the last published ERF study that there is no indication of any genotoxic or carcinogenic potential of aspartame and that there is no reason to revise the previously established ADI for aspartame . . ."

2006 NIH/NCI Research

- Conducted independently of any funding or ties to industry groups
- Subjects included 556,990 men and women ages 50-69 years in the NIH-AARP Diet and Health Study
- Self-administered FFQ in 1995-1996 computed daily consumption of aspartame in food and beverages
- RR and CI (95%) were estimated using Cox proportional hazards regression (adj. for age, sex, ethnicity and BMI, smoking and DM history)
- Five years of follow up

- Lim et al. Prospective study of aspartame-containing beverages and risk of hematopoietic and brain cancers, *Cancer Epidemiol Biomarkers Prev* 2006;15(9). September 2006

2006 NIH/NCI Research: *Results*

- Compared with no consumption of aspartame-containing beverages, increasing levels of consumption were not associated with any risk of overall hematopoietic cancer (95%CI=.72) or cancer (95% CI=0.49) in men or women
- Association remained null for main subtypes of lymphoma cancers and non-Hodgkin lymphoma subtypes and non-lymphoid leukemias reported in the Ramazzini study

- Lim et al. Prospective study of aspartame-containing beverages and risk of hematopoietic and brain cancers, *Cancer Epidemiol Biomarkers Prev* 2006;15(9). September 2006

2007 Non-nutritive Sweetener Case-control Study

- Confirmation aspartame consumption not linked to cancers. Evaluated case-control studies > 7,000 men and women of all ages.
- ". . . no evidence that saccharin or other sweeteners (mainly aspartame) increase the risk of cancer at several common sites in humans."

- Gallus, S. et. al. Annals of Oncology. 18(1):40-44, January 2007

Do Low Calorie Sweeteners Make You Fat?

THE HYPE AND THE FACTS ABOUT WEIGHT GAIN AND METABOLIC SYNDROME RISK

Why the media hype re: "weight gain"?

- Rat study conducted in Psychology Department at Purdue.
- Rats fed food sweetened with saccharin (which they very much like) ate more than those fed diets with glucose (a not-so-sweet sugar) or diets without any sweetener.
- They ate more and gained more weight.
- Surprised?

The Scientific Consensus

" . . .Taken together, the evidence summarized by us and others suggests that if nonnutritive sweeteners are used as substitutes for higher-energy-yielding sweeteners, they have the potential to aid in weight management."

- Mattes RD and Popkin BM, Nonnutritive sweetener consumption in humans: effects on appetite and food intake and their putative mechanisms. *Am J Clin Nutr* 2009;89:1-14.

American Dietetic Association

Evidence Analysis Library

January 2009

In adults, does aspartame affect appetite or food intake?

Conclusion:

"There is good evidence that aspartame does not affect appetite or food intake."

Grade 1

Metabolic Syndrome (MetSyn)

Several studies have made link between soft drink (including diet) and/or diet soft drink consumption alone with MetSyn. Is there reason for concern?

- One studied hypothesized a relationship between "Mediterranean Diet" and MetSyn. As that hypothesis was not confirmed, authors sought other statistical relationships. Suggested people with MS were more likely to drink soda. AHA issued subsequent release clarifying study did **not show** cause/effect.
- Another study suggested aspartame link to MetSyn, but aspartame was not even approved for use during significant period of study timeframe during which authors said it was having an effect. (Presumably this fact was author oversight.)

Metabolic Syndrome (MetSyn)

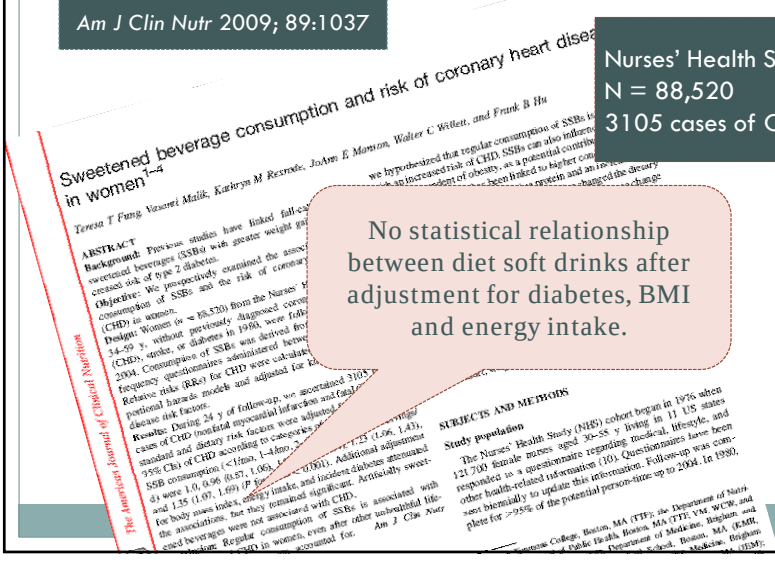
What we know in terms of low calorie sweeteners

- Likely role of "reverse causality": People with metabolic syndrome tend to be heavier and trying to manage weight, therefore may be more likely to consume diet products.
- Research* shows no effect of aspartame on:
  - Glycemic response in normal or diabetic individuals
  - Metabolic control
  - Insulin release

**Crit. Rev. Toxicology, 2007*

Diet Soda and CHD: No relationship

Am J Clin Nutr 2009; 89:1037


Sweetened beverage consumption and risk of coronary heart disea
in women[1–4]

Nurses' Health Study Cohort
N = 88,520
3105 cases of CHD

No statistical relationship between diet soft drinks after adjustment for diabetes, BMI and energy intake.

No Diet Soft Drink Relationship: Diabetes

ORIGINAL INVESTIGATION

Sugar-Sweetened Beverages and Incidence of Type 2 Diabetes Mellitus in African American Women

Julie R. Palmer, ScD; Deborah A. Boggs, MS; Supriya Krishnan, DSc; Frank B. Hu, MD; Martha Singer, MPH; Lynn Rosenberg, ScD

Background: Type 2 diabetes mellitus is an increasingly serious health problem among African American women. Consumption of sugar-sweetened drinks was associated with an increased risk of diabetes in 2 studies but not in a third; however, to our knowledge, no data are available on African Americans regarding this issue. Our objective was to examine the association between consumption of sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes mellitus in African American women.

Methods: A prospective follow-up study of 59 000 African American women has been in progress since 1995. Participants reported on food and beverage consumption in 1995 and 2001. Biennial follow-up questionnaires ascertained new diagnoses of type 2 diabetes. The present analyses included 43 960 women who gave coordinate dietary and weight information and were free from diabetes at baseline. We identified 2713 incident cases of type 2 diabetes mellitus during 338 984 person-years of follow-up. The main outcome measure was the incidence of type 2 diabetes mellitus.

Results: The incidence of type 2 diabetes mellitus was higher with higher intake of both sugar-sweetened soft drinks and fruit drinks. After adjustment for confounding variables including other dietary factors, the incidence rate ratio for 2 or more soft drinks per day was 1.24 (95% confidence interval, 1.06-1.45). For fruit drinks, the comparable incidence rate ratio was 1.31 (95% confidence interval, 1.13-1.52). The association of diabetes with soft drink consumption was almost entirely mediated by body mass index, whereas the association with fruit drink consumption was independent of body mass index.

Conclusions: Regular consumption of sugar-sweetened soft drinks [illegible] is associated with an increased risk of type 2 diabetes among African American women. While there have been concerns about the adverse health effects of [illegible], little attention has been given to fruit drinks, which are marketed as a healthier alternative to soft drinks.

Arch Intern Med. 2008;168(14):1487-1492

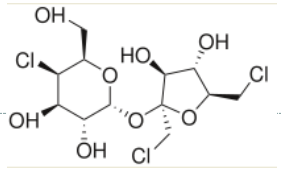
Arch Intern Med 2008; 168(14):1487

Prospective study, 43,900 African American women, 2713 cases of type two diabetes mellitus

"... Reducing consumption of soft drinks or switching from sugar-sweetened soft drinks to diet soft drinks is a concrete step that woman may find easier to achieve than other approaches to weight loss..."

SUCRALOSE
REBIANA

Sucralose: *A Brief History*



- Discovered in 1976
- Three hydroxyl groups on sugar molecule are switched to chlorine
- Commercially known as Splenda ®
- Approximately 600x sweeter than sugar
- Zero calories - packet contains bulking agents contributing less than 5 kcals and 1 gm CHO
- FDA approval:
  - 1998 for use in 15 food & beverage categories
  - 1999 expanded as a "general purpose" sweetener

Sucralose Characteristics

- Exceptionally heat stable-retains its sweetness over a wide range of baking and cooking temps.
  - Good across pH levels
  - Can be used wherever sugar is used, although does not provide bulk functionality due to intense sweetness
- Available to clients both as SPLENDA® brand sweetener in a variety of products.
  - Cereals, fruit drinks, carbonated beverages, candy
- Has rapidly become one of the most widely used non-nutritive sweeteners in the U.S., particularly in tabletop sweeteners

Sucralose: *Digestion and Metabolism*

- Sucralose provides essentially no energy: it is poorly absorbed (range 11% to 27%) and excreted unchanged in the feces.
- Any absorbed sucralose is excreted in the urine unchanged within 24 hours-does not bioaccumulate.
- Radiolabel studies show that sucralose is not actively transported across the blood-brain barrier, the placental barrier, or the mammary gland.

-*J Am Diet Assoc*. 2004; 104:255-275.

History of Safety Testing: *Research Summary*

- No known side effects
- No toxicity, even in test diets simulating the sweetness of 40+ pounds of sugar/day /life
- No bioaccumulation
- No carcinogenicity
- No genotoxicity
  No effects on fetal or neonatal development (multigenerational studies)
- No neurotoxicity
- No effect on carbohydrate metabolism (sucralose is not hydrolyzed or broken down for energy)
- No calories or carbohydrates
- No effect on short- or long-term glucose control or on serum insulin levels

- *Food and Chemical Toxicology*, "Sucralose Safety Assessment." 38 (2): S1-S129, 2000.

Organizations Supporting Sucralose in the USA

- American Dietetic Association
- American Council on Science and Health
- American Diabetes Association
- American Dental Association
- American Association of Family Physicians

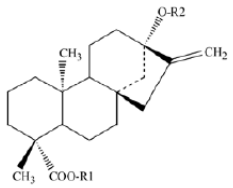
Sucralose and Blood Glucose Control

Multi-center, double blind placebo controlled, randomized study.

- 128 subjects with type II diabetes ages 31 to 70 years.
- Sucralose administered at 3x the maximum Estimated Maximum Intake (EMI) for 3 months.
- There were no significant differences between the sucralose and placebo groups in HbA1c, fasting plasma glucose, or fasting serum C-peptide changes from baseline.
- Sucralose was as well tolerated as the placebo.

- Grotz et al. Lack of effect of sucralose homeostasis in subjects with type II diabetes. *J Am Diet Assoc*. 2003; 103:1607-1612.

The "New" Sweetener: Stevia/Rebiana



- Derived from leaves of South American plant
- About 200 times sweeter sugar, zero calories
- Approved since 1995 in US as dietary supplement, but no reference to sweetness allowed

GLOSSARY

STEVIA – Name of plant; also describes extract (core structure: "steviol")

STEVIOSIDE – Glycosides of steviol responsible for sweeteners

REBIANA – Extract of stevia, high in Rebaudioside A

REBAUDIOSIDE A – One of the main steviosides in Rebiana

- Source: B. Magnuson, 2/2009

Metabolism

- Steviol glycocides not metabolized by digestive enzymes
- Steviol glycocides metabolized in lower gut by colonic microflora
- Steviol glycocides largely unabsorbed whereas steviol rapidly passes through gut to systemic

Current Products

Trade name	Company/ Collaborators	Ingredients listed in tabletop product
truvia	Cargill/Coke	Erythritol, rebiana, natural ingredients
PureVia™ All Natural Zero Calorie Sweetener	Whole Earth (Merisant)/ Pepsico/ Pure Circle	Erythritol, Isomaltulose

To Be Determined . . .

- Consumer reaction to **taste**
- Manufacturers and consumer reaction to **cost**
  - Packet for packet tabletop cost*:
    - 2.5 X the cost of Splenda
    - 3 X the cost of Equal

**New York Times, 4/15/09*

IN CLOSING

Key Positive and Negative Perceptions about Low Calorie/Non-Nutritive Sweeteners

- Positive Perceptions:
  - Help consumers fit their favorite foods into nutrition, weight and health goals.
  - Helps them follow a variety of diets (low carb, low cal, glycemic control, diabetic).
  - Helps them make realistic choices in a "grab & go" culture.
- Negative Perceptions:
  - Possible concerns about safety for themselves and their families.
  - Very easy access to information that consumers perceive as valid and authoritative.

Translating Information to Clients/Patients/Consumers

- Listen to client/patient concerns with empathy.
- Provide consumers with sound, science-based nutrition information and help clients to recognize and avoid misinformation.
- Use both sugar and non-nutritive sweeteners as an appropriate part of meeting client nutrition and weight goals.
- Appropriate use of non-nutritive sweeteners to help clients maintain short term and long term blood glucose control and kcal management.
- Stay abreast of the latest research and product trends.

Summary

- Non-nutritive sweeteners can offer significant benefits to individuals looking for small steps to help manage calories and weight.
- There is an unbelievable amount of misinformation about sweeteners in the public domain. Views even among professionals appear as dependent on emotion as on scientific fact.
- FDA-approved sweeteners currently available in the U.S. have completed rigorous scientific evaluations, and experts continue to confirm their safety and value.

"Try to get more exercise."