

**New Evidence on
Low Calorie Sweeteners:
*Help or Hindrance for
Weight and Diabetes
Management?***

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DISCLOSURE

- Consultant to McNeil Nutritionals, LLC
(manufacturers of Splenda Sweetener Products)

OBJECTIVES

- To Review the role LCS play in pre-diabetes, type 2 diabetes, cravings, and the obesity epidemic.
- To present evidence-based research findings on the connection between LCS and conditions related to type 2 diabetes and obesity
- To provide evidence-based responses on LCS to answer client and media inquiries and concerns.

Internet Comments on Low Calorie Sweeteners

- “Artificial sweeteners are bad. Every time I eat them I have ‘suisidal’ thoughts.”
- “A tiny bit of artificial sweetener ruined my Mom’s day”
- “Whenever I drink tea or coffee from a tea shop, I have a burning sensation in my tongue. Am I too sensitive to artificial sweeteners?”



Internet Alleged Complaints “Artificial Sweeteners Cause...”

- Instant headache
- Limited motion in left arm
- Sleeping all the time
- MS
- Holes in my short term memory
- A little trace of artificial sweetener makes me cramp for hours



Which Studies on LCS Get Covered By Media? Positive or Negative?

Media Lumps LCS as Category, Paints Broad Brushstroke Conclusions

- LCS have well-established differences in origin, composition, metabolism, and global regulatory approvals
- Studies/findings focused on one LCS shouldn't be extrapolated to all LCS
 - Basic research studies (animal or human) may focus on one or all LCS
 - RCTs, observational consumption studies generally include all LCS

Category Terminology – Alphabet Soup

- HCPs
 - No calorie sweeteners
 - Low calorie sweeteners (LCS)
 - Non-nutritive sweeteners (NNS)
- Consumers
 - Artificial sweeteners
 - Sugar substitutes
 - Diet beverages, sugar-free beverages (sugar-sweetened beverages)
- Research studies
 - Diet beverages (largest source) or all LCS and products containing LCS
- Presentation – Low calorie sweeteners (LCS) or NNS



Major LCS in Use in U.S. Today¹

NNS Name	Initial Approval/Use+	FDA Approval Route
Saccharin	US use in early 1900's	GRAS ²
Aspartame	1981	Food additive
Acesulfame-K	1988	Food additive
Sucralose	1998	Food additive
Neotame	2002	Food additive
Stevia	2008	GRAS ^{2,3}
Monk Fruit Extract (luo han guo)	2009	GRAS ^{2,4,5}

+Listed in chronological order of availability in U.S. marketplace.

FDA has found all of these LCS to be safe for their intended and permitted uses.

1. Academy Nutrition and Dietetics. Use of nutritive and nonnutritive sweeteners (position paper). J Acad Nutr Diet. 2012; 112(5):739-757.
 2. GRAS notices are submitted to FDA under its proposed rule of April 17, 1997, published in the Federal Register at 62 FR 18938-18964.
 3. What refined Stevia preparations have been evaluated by FDA to be used as a sweetener? <http://www.fda.gov/AboutFDA/Transparency/Basics/ucm214865.htm>
 4. GRAS notice no. GRN 000301 (self-affirmation notification to FDA) http://www.accessdata.fda.gov/cfsrfs/Gras_notices/grn000301.pdf 7/23/2009
 5. FDA. Agency response letter GRAS notice no. GRN 000301. <http://www.fda.gov/Food/FoodingredientsPackaging/GenerallyRecognizedAsSafeGRAS/GRASListings/ucm253511.htm>, 4/11/2011

Added Sugars Intake: Just How Much?

- ~22 tsp/day (355 cal) average intake¹
- American Heart Association Recommends:²
 - Women: ≤ 6 tsp/day (100 cal)
 - Men: ≤ 9 tsp/day (150 cal)



1. Dietary sugars intake, Academy Nutrition and Dietetics. Use of nutritive and nonnutritive sweeteners (position paper). J Acad Nutr Diet. 2012; 112(5):739-757.
 2. Dietary sugars intake and cardiovascular health. A Scientific Statement from AHA. Circulation. 2009. Online: <http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.109.192627>

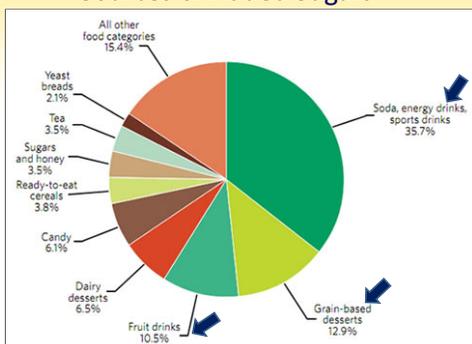
Added Sugars Intake: Recommendations

- *Dietary Guidelines For Americans, 2010*
 - “Reducing intake of all added sugars...recommended strategy to reduce energy intake”¹
 - Limit amount of added sugars when cooking or eating²
 - Consume fewer and smaller portions of foods and beverages that contain...added sugars, such as grain-based desserts, sodas, and other sugar-sweetened beverages²
- Dietary Guidelines Advisory Committee, 2015 report recommends “a maximum of 10% of total calories from added sugars per day.”



1. US Dept Agriculture and Health and Human Services. Dietary Guidelines for Americans, 2010, 7th ed. Washington, DC: US Gov't Printing Office, 2010. <http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>
 2. Dietary sugars intake and cardiovascular health. A Scientific Statement from AHA. Circulation. 2009. Online: <http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.109.192627>

Sources of Added Sugars¹



1. US Dept Agriculture and Health and Human Services. Dietary Guidelines for Americans, 2010, 7th ed. Washington, DC: US Gov't Printing Office, 2010. <http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>

Health Concerns: Added Sugars



Contribute to:

- Excess calories with minimal nutrient density¹
- Increased BMI in children and adults²
- Development of lipid dysregulation: visceral adiposity, hypertension, inflammation (chronic), coronary heart disease^{2,3}

1. US Dept Agriculture and Health and Human Services. Dietary Guidelines for Americans, 2010, 7th ed. Washington, DC: US Gov't Printing Office, 2010. <http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>.
 2. Raben A, Richelsen B. Artificial sweeteners: a place in the field of functional foods? Focus on obesity and related metabolic disorders. *Curr Opin Clin Nutr Metab Care.* 2012; 15:597-604.
 3. Kosova EC, et al. The relationships between sugar-sweetened beverage intake and cardiometabolic markers in young children. *J Acad Nutr Diet.* 2013;113(2):219-227.

LCS Q & A: Common Questions, Evidence-based Answers with Recent Research

Q: Are LCS Safe? For everyone?

- Research on various LCS has spanned decades
 - For FDA approval, global regulatory reviews, further ongoing independent research on safety and efficacy
- Yet studies and consumer articles often conclude: “more research needed”

1. American Cancer Society: <http://www.cancer.org/healthy/healthyeatgetactive/acsguidelinesonnutritionphysicalactivityforcancerprevention/acs-guidelines-on-nutrition-and-physical-activity-for-cancer-prevention-common-questions>
 2. National Cancer Institute: <http://www.cancer.gov/cancertopics/factsheet/Risk/artificial-sweeteners>

Q: Are LCS Safe? For everyone?

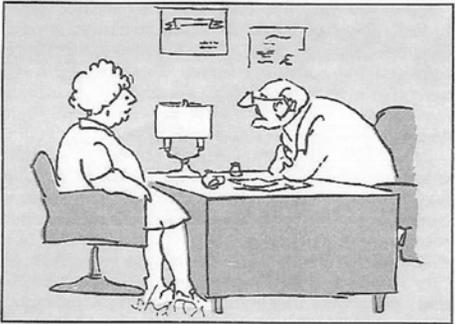
- LCS regulated, approved and reviewed around globe
- In U.S. FDA regulates, approves as food additive or GRAS^{1,2}
 - Follows established rigorous protocols for safety/safety review²
 - Standard of safety: "...reasonable certainty of no harm..."
- LCS are
 - Approved for entire population, including children, pregnant and lactating women, people with diabetes
 - As general purpose sweetener: means can be used by manufacturers in products of choosing

1. Rulis, AM, Levitt JA: FDA's food ingredient approval process. Safety assurance based on scientific assessment. Regulatory Toxicology and Pharmacology. 2009; 53:20-31.
2. Guidance for industry and other stakeholders toxicological principles for the safety assessment of food ingredients see <http://www.fda.gov/food/guidancecomplianceregulatoryinformation/guidancedocuments/foodingredientsandpackaging/redbook/default.htm>

Q. The Role of LCS in Weight Control?

- Promote weight gain?
- Increase hunger, appetite?
- Cause cravings?

On the Lite Side



"It's partly glandular and partly 8,500 calories per day."

**Q: Do LCS cause weight gain?
Can LCS assist people with weight control?**

- Accusations about weight gain stem from, fueled by media. Large observational studies have analyzed data from epidemiologic data bases such as Framingham Heart, Harvard SPH, and NHANES
- Pereira published review of evidence, conclusions:
 - Assoc between diet beverage intake and T2D "likely artifact of reverse causality"
 - People at risk for weight gain, obesity, T2D may be more likely to increase diet beverages to attempt to reduce disease risks

Special Article

NUTRITION
REVIEWS

Diet beverages and the risk of obesity, diabetes, and cardiovascular disease: a review of the evidence

Mark A. Pereira

"Diet beverages" is a common term used for drinks that are marketed with low or no calories or no calories and no sugar. This review of the evidence suggests that the association between the intake of diet beverages and weight gain, obesity, and type 2 diabetes is likely an artifact of reverse causality. People at risk for weight gain, obesity, and type 2 diabetes may be more likely to increase their intake of diet beverages to attempt to reduce their disease risks.

doi:10.1016/j.nutrev.2013.07.001

1. Pereira MA. Diet Beverages and the risk of obesity, diabetes and CVD: A review of the evidence. Nutr Rev. 2013;71(7):433-440.

Q: Do LCS cause weight gain?

- 4 recent studies, 2 RCTs, 1 cross sectional, 1 meta-analysis
- Study 1: CHOICE, Tate et al.¹
 - Details: 6 mos RCT, 318 overweight adults, mean BMI = 36
 - Eligibility: had to consume \geq 280 kcal/day SSB, willing to make a dietary change
 - 3 study groups: 1) diet beverage (DB), 2) water (W), 3) made changes of their choosing (AC)
 - Intervention: DB and W substitute \geq 2 servings per day of SSB with provided DB or W (group dependent)
 - Results:
 - 6 mos: DB had better adherence (consumed more DB)
 - 3, 6 mos: most reduced absolute caloric beverage intake of ~70 kcal more/day than W drinkers
 - 6 mos: DB greater likelihood of achieving 5% wt loss than AC

1. Tate D, et al. Replacing caloric beverages with water or diet beverages for weight loss in adults: main result of the Choose Healthy Options Consciously Everyday (CHOICE) randomized control trial. American Journal of Clinical Nutrition. 2012;95:555-563. [Link to abstract: <http://ajcn.nutrition.org/content/95/3/555.abstract>]

Q: Do LCS cause weight gain?

- Study 2: Peters et al.¹
 - Details: 12 wk RCT wt control program, 2 centers, 303 overweight adults, mean BMI of 33
 - Completion 12 wks: 92%, provided 9+ mos wt maintenance
 - Groups:
 - Intervention: drink 24 fl oz/day diet beverages (any type)
 - Control: told not to drink diet beverages, to drink 24 fl oz/day water.
 - Results:
 - 64% diet beverage group lost \geq 5% of body wt, compared with 43% control
 - Diet beverage: Lost significantly more wt, average 13 lbs vs. 9 lbs

1. Peters JC, et al. The effects of water and non-nutritive sweetened beverages on weight loss during a 12-week weight loss treatment program. Obesity Journal. 2014;22(6):1415-21. [Link to article: http://anschutz.new-media-release.com/study/downloads/oby20737_NNS_study.pdf]

Q: Can LCS assist people with weight control?

- Study 3: NWCR, Catenacci et al.¹
 - NWCR: largest longitudinal study people successfully maintained >30 lbs and kept off >1 yr
 - Established 1993, James Hill, PhD, Rena Wing, PhD
 - NWCR now tracks > 10,000 individuals with detailed questionnaires and annual follow-up surveys that examine the behavioral and psychological characteristics of weight maintainers, as well as the strategies they use to maintain their weight losses.
 - NWCR published a 10 year analysis in 2014.²

1. Thomas J, Graham, Dale S, Bond, Suzanne Pheelan, et al. Weight-loss maintenance for 10 yrs in NWCR. Am J Prev Med. 2014;46(1):17-23.
 2. Catenacci VA, Pan Z, et al: Low/No Calorie Sweetened Beverage Consumption in National Weight Control Registry. Obesity, e-pub: <http://onlinelibrary.wiley.com/doi/10.1002/oby.20834/full>

Q: Can LCS assist people with weight control?

- Design: Random sample (N=434) of NWCR participants (mean wt loss: 34.2 ± 18.5 kg maintained for 7.8 ± 5.2 yrs) responded to online survey about their consumption of low/no calorie sweetened beverages (LNCSB)¹
- Results
 - 53% regularly used LNCSB, while 10% regularly consumed SSB.
 - 78% who regularly used LNCSB reported they helped them control calorie intake
 - Top 5 reasons for using LNCSB were: taste (54%), satisfy thirst (40%), part of their routine (27%), reduce calories (22%), go with meals (21%).
 - Participants reported:
 - Changing their beverage choices was “very important” to successful weight loss (42%) and weight maintenance (40%) efforts.
 - Increasing water consumption was the second most common strategy reported with reducing SSB intake.

1. Catenacci VA, Pan Z, et al: Low/No Calorie Sweetened Beverage Consumption in National Weight Control Registry. Obesity. 2014;22(10): 2244-2251. <http://onlinelibrary.wiley.com/doi/10.1002/oby.20834/abstract>

**Q: Do LCS cause weight gain?
Can LCS assist people with weight control?**

- Study 4: Miller, Perez¹
- Details
 - Meta-analysis: analyzed results from 15 RCTs, 9 prospective cohort studies after literature review
 - Topics: LCS and body wt, fat mass, BMI, and waist circumference
- Results
 - RCTs: LCS reduced body weight compared to placebo and modestly, but “significantly” reduced BMI, fat mass, and waist circumference
 - Observational cohort studies: No correlation found between LCS and body wt gain, fat mass
- Conclusions supports existing evidence that judicious substitution of LCS and foods sweetened with them does not cause weight gain and may actually help people manage their weight

1. Miller PE, Perez V: Low-calorie sweeteners and body weight and composition: a meta-analysis of randomized controlled trials and prospective cohort studies. American Journal of Clinical Nutrition. 2014. (need to complete when published in August). Link to full article: <http://ajcn.nutrition.org/content/early/2014/06/18/ajcn.113.082826.full.pdf+html?sid=ca87f169-822a-439c-88d1-465270c7f1c1>

QUESTION:

- Do LCS cause cravings?
- Do LCS cause people to eat more sweets?



Q: Do LCS cause cravings for sweets?

- Study: Antenucci and Hayes¹
- Details
 - 401 people 18-64 yo
 - Series of taste tests with various beverages conducted over 4 days
 - 12-15 drinks with caloric sweeteners (maple syrup, agave nectar and sucrose) and LCS (sucralose, aspartame, acesulfameK, and rebaudioside A).
 - Drinks designed to be equivalent in sweetness based on each sweetener's sweetness potency*
 - Participants rated perceived sweetness of each drink sample
- Results
 - Participants perceived sweetness of LCS at lower concentrations than caloric sweeteners
 - Participants indicated caloric sweeteners all had higher sweetness ratings than LCS
- Conclusion: Results don't support claim that LCS over-stimulate sweet taste receptors

*LCS are often referred to as "high intensity" sweeteners. Antenucci et al., point out that they should instead be called high potency sweeteners. Authors note the word intensity is not synonymous with potency and suggest that referring to them as "high intensity" sweeteners has led to misinterpretations in the scientific literature and the media.

1. Antenucci RG, Hayes JE. Nonnutritive sweeteners are not supernormal stimuli. *Int J Obes*, 2015;39(2):254-9.

Q: Do LCS increase hunger or help control it?

- 2 studies
- Study 1: CHOICE¹
 - Secondary analysis of dietary patterns by Piernas¹:
 - Both study groups (diet beverage, water) reduced total energy, carbohydrates, total sugar, added sugar and other calorie containing nutrients
 - Diet beverage group > reduction of desserts compared to water drinkers at 6 mos.
- Study 2: Peters et al.²
 - Hunger ratings:
 - At 12 weeks increased slightly water group, declined slightly in the diet beverage group resulting in significantly less hunger in diet beverage group

1. Piernas C, et al. Does diet-beverage intake affect dietary consumption patterns? Results from the Choose Healthy Options Consciously Everyday (CHOICE) randomized clinical trial. *American Journal of Clinical Nutrition*. 2013;97:604-611. (Link to abstract: <http://ajcn.nutrition.org/content/97/3/604.abstract?doi=10.3945/ajcn.112.248111>)

2. Peters JC, et al. The effects of water and non-nutritive sweetened beverages on weight loss during a 12-week weight loss treatment program. *Obesity Journal*. 2014;22(6):1415-21. (Link to article: http://anschutz.new-media-release.com/study/downloads/oby20737_NNS_study.pdf)

AJCN, Hill Editorial¹ on Miller, Perez Meta-Analysis on LCS and Body Weight²

- “It means that LCSs seem to be doing exactly what they were designed to do: helping reduce total energy intake while providing the sweet taste we value.”
- “You can confidently use this tool (LCSs) without worrying that you might be unintentionally hurting your weight-management efforts.”
- “We need more tools to help people permanently reduce or avoid obesity and our best science suggests that the use of LCSs is one such tool.”

Editorial by James O. Hill, PhD.
What do you say when your patients ask whether low-calorie sweeteners help with weight management?
Am J Clin Nutr 2014 100: 3 739-740;
 First published online July 30, 2014.

1. Hill JO: What do you say when your patients ask whether low-calorie sweeteners help with weight management? *American Journal of Clinical Nutrition*. 2014 100: 739-740.
 2. Miller PE, Perez V: Low-calorie sweeteners and body weight and composition: a meta-analysis of randomized controlled trials and prospective cohort studies. *American Journal of Clinical Nutrition*. 2014 100: 765-777.

Role of LCS in Weight Management: Evidence is Growing...^{1,2}

- What is the impact of Diet Beverages on the overall diet?
 - Diet soda users had markers of healthier diets: higher intakes of fruits, vegetables, whole grains, low fat dairy products; less saturated fat and sodium.¹
 - Compared to control (SSB) at 6 mos, the DB & water groups consumed < added sugars & calories. No evidence to support DB vs. water > preference for sweet foods/beverages.²



Healthy weight: quality of food choices, total food intake, with healthy behaviors/lifestyle.

1. Nettleton JA, et al. Diet soda intake and risk of incident metabolic syndrome and type 2 diabetes in the multi-ethnic study of atherosclerosis (MESA) *Diabetes Care*. 2009; 32: 688-694.
 2. Piernas C, et al. Does diet-beverage intake affect dietary consumption patterns? Results of the Choose Healthy Options Consciously Everyday (CHOICE) randomized clinical trial. *Am J Clin Nutr*. E-pub 2013;11:9-63.

Q: Is Diet Beverage Intake Associated with Abdominal Obesity?

Headlines: ***Diet Soda linked to increase in Belly Fat in Older Adults, 65 years of age and older.***

- Fowler, et al. 2015, SALSA study
- 749 Mexican & European-Americans, 65+ yo. (375 final follow up)
- Began in 1992 with 3 follow up visits, 2000, 2001 & 2003
- Waist circumferences tripled in daily Diet Bev users vs non users: 0.8 inches vs 3.16 inches (but not significant) after 9.4 yrs

Limitations: No info on diet or calorie intake, family hx, lifestyle or cultural differences. Not all subgroups were evaluated.

Cannot show cause and effect.

Role of LCS in Weight Management: Evidence is Growing...¹

Key points:

- ...recent longer term intervention studies point toward a beneficial effect of [NNS] on energy intake, body weight, liver fat, fasting and postprandial glycemia, insulinemia, and lipidemia compared with sugars.
- [NNS], especially in beverages, can be a useful aid to maintain reduced energy intake and body weight and decrease risk of type-2 diabetes and CVD compared with sugars.
- Concerning beverages, [NNS] are, from a metabolic point of view, a more healthy choice than sugar, but water is still the primary choice.

Abstract

Artificial sweeteners: a place in the field of functional foods? Focus on obesity and related metabolic disorders

Raben A, Richelsen B. *Curr Opin Clin Nutr Metab Care*. 2012; 15:597-604.

1. Raben A, Richelsen B. Artificial sweeteners: a place in the field of functional foods? Focus on obesity and related metabolic disorders. *Curr Opin Clin Nutr Metab Care*. 2012; 15:597-604.

QUESTION:

- Do LCS worsen glucose control or glucose tolerance?
- Do LCS cause diabetes?

Q: Do LCS worsen glucose control/tolerance?

- 2 recent studies led to significant media headlines on this topic
- Pepino et al. in *Diabetes Care*¹
 - Details: small human sample young morbidly obese women, focus on impact of sucralose on glucose levels
 - Response/LTE in *Diabetes Care*: Actual peak plasma glucose was within normal range for 75g OGTT. Glucose rise didn't demonstrate clinically significant impact on glycemic control.²

1. Pepino et al. Sucralose affects glycemic and hormonal responses to an oral glucose load. *Diabetes Care*. 2013;36:2530-2535.
2. Grotz V, Jokinen J. Letter to editor: Sucralose affects glycemic and hormonal responses to an oral glucose load. *Diabetes Care*. 2014; 37:e148.

Q: Do LCS worsen glucose control/tolerance? Cause diabetes?

- Suez et al., in Nature¹
 - Details: complex 4 part study, mice and human, focus on gut microbiome and glucose tolerance
 - Response on Nature:² “...conclusions do not agree with results of extensive testing of these sweeteners required for approval, including human clinical studies conducted in healthy and diabetic participants [short term or long term] including glycemic indices and insulin.”

1. Suez J, Korem T, Zeevi D, Zilberman-Schapira G, Thaiss CA, Maza O, et al. Artificial sweeteners induce glucose intolerance by altering the gut microbiota. *Nature*, 2014 (e-pub 9/19).

2. Comments on Nature Study by B. Maguson: <http://www.nature.com/nature/journal/v514/n7521/full/nature13793.html#comments>

Q: Do LCS worsen glucose control/tolerance? Cause diabetes?

- Large body of evidence from animal, human data over many years contradicts Pepino, Suez findings
 - Wu et al.,¹ repeated Brown et al.,² with sucralose & AceK: No change in BG, plasma insulin and total GLP-1 with water or sweetened drinks
 - Large studies conducted with sucralose for FDA approval in T1D, T2D and healthy subjects: sucralose does not affect BG levels, insulin, or HbA1c^{3,4,5}
 - FDA, in approval (1998) stated, sucralose has no influence on insulin secretion or FPG, PPG in animals or humans⁶

1. Wu T, et al. Artificial sweeteners have no effect on gastric emptying, GLP-1, or glycemia after oral glucose in healthy humans. *Diabetes Care*. 2013;36: e202-03.

2. Brown RJ, et al. Ingestion of diet soda before a glucose load augments GLP-1 secretion. *Diabetes Care*. 2009;32:2184-2186.

3. Meentis NH, Maggio CA, Koch P, Quddoos A, Allison DB, Pi-Sunyer FX. Glycemic effect of a single high oral dose of the novel sweetener sucralose in patients with diabetes. *Diabetes Care*. 1996;19(9):1004-1005.

4. Grotz V, Henry RR, McGill JB, Prince MJ, Shanson H, Trout JR, Pi-Sunyer FX. Lack of effect of sucralose on glucose homeostasis in subjects with type 2 diabetes. *J Am Diet Assoc*. 2003;103(12):1607-1612.

5. Baird IM, Shephard NW, Merritt RJ, Hildick-Smith G. Repeated dose study of sucralose tolerance in human subjects. *Food Chem Toxicol*. 2000;38(12):1447-1452.

6. Grotz V, Jokinen J. Letter to editor: Sucralose affects glycemic and hormonal responses to an oral glucose load. *Diabetes Care*. 2014; 37:e148

Q: Do LCS worsen glucose control/tolerance? Cause diabetes?

- ADA 2013¹: “Use of nonnutritive sweeteners (NNSs) has the potential to reduce overall calorie and carbohydrate intake if substituted for caloric sweeteners without compensation by intake of additional calories from other sources.” Regarding glycemic effect, it concludes research supports that NNSs do not produce a glycemic effect unless other calorie containing ingredients are in the product.
- FDA response 9/14²: “have been thoroughly studied,...reasonable certainty of no harm to consumers.”

1. Evert A, Boucher J, et al. Nutrition therapy recommendations for the management of adults with diabetes. *Diabetes Care* 2013;36(11):1382-1384.

2. <http://www.cbsnews.com/news/artificial-sweeteners-linked-to-diabetes/>

Q: Do people who use LCS eat healthier, stay healthier or not?

- Study: Drewnowski, Rehm¹
- Details
 - Data from a sample of 22,231 adults obtained with 5 cycles NHANES data (1999-2008)
 - Single 24-hour recall used to ID consumers of LCS beverages, foods and tabletop sweeteners
 - Diet quality assessed using the Healthy Eating Index 2005 (HEI 2005)*
 - Health behaviors of physical activity, smoking and alcohol use assessed

*HEI was developed by USDA to measure compliance with U.S. dietary recommendations and guidelines.

1. Drewnowski A, Rehm CD. Consumption of LCS among U.S. adults is associated with higher healthy eating index (HEI 2005) scores and more physical activity. *Nutrients*. 2014;6:4389-4403.

Q: Do people who use LCS eat healthier, stay healthier or not?

- Study: Drewnowski, Rehm¹
- Results
 - LCS consumers had higher HEI* 2005 scores than non-consumers, largely explained by better SoFAAS** (principal sources of “empty calories”)
 - LCS consumers had better HEI subscores for vegetables, whole grains and low-fat dairy, but worse subscores for saturated fat and sodium compared to non-consumers
 - LCS consumers were more likely older, female, non-Hispanic whites, born in U.S., higher education and incomes. Age range for peak LCS consumption was 45–74 years.
 - LCS consumers less likely to smoke, more likely to engage in recreational physical activity.

*HEI was developed by USDA to measure compliance with U.S. dietary recommendations and guidelines.

**SoFAAS = calories consumed from solid fats, added sugar and alcohol.

1. Drewnowski A, Rehm CD. Consumption of LCS among U.S. adults is associated with higher healthy eating index (HEI 2005) scores and more physical activity. *Nutrients*. 2014;6:4389-4403.

2. Infographic with study results: http://depts.washington.edu/uwcp/hn/reports/lcs_infographic.pdf

**ADA/AHA Scientific Statement:
NNS Current Use and Health Perspectives (2012)¹**

Conclusions...LCS (tabletop and foods/beverages)

- Not magic bullet for wt loss, one tool within comprehensive plan
- May, within structured eating plan and with substitution, result in modest energy intake reductions IF incomplete calorie compensation
- If used judiciously, wt loss/control, beneficial effects on metabolic parameters

AHA/ADA Scientific Statement

Nonnutritive Sweeteners: Current Use and Health Perspectives

A Scientific Statement From the American Heart Association and the American Diabetes Association

Christopher Gardner, PhD, Chair; Judith Wylie-Rosett, EdD, EdD, Co-Chair; Samuel S. Gidding, MD, PhD, Lisa M. Scriver, PhD, MPH, RD, FAHA; Rachel K. Johnson, PhD, MPH, RD, Diane Reade, PhD, CHE, Alan H. Lichtenstein, Dr. PhD, on behalf of the American Heart Association Nutrition Committee and the Council on Nutrition, Physical Activity and Metabolism, Council on Cardiovascular, Thoracic and Vascular Biology, Council on Cardiovascular Disease in the Young, and the American Diabetes Association

A 100% American Heart Association scientific statement. From acceptance of NNS to developing the scientific statement, a voting program management committee of 15 members of the American Heart Association and the American Diabetes Association met to review the manuscript and approve the final statement.

1. (Published simultaneously) Nonnutritive Sweeteners: Current Use and Health Perspectives. Scientific statement from American Diabetes Association (ADA) in *Diabetes Care*: <http://care.diabetesjournals.org/content/early/2012/07/06/4512-9002.full.pdf.html> and American Heart Association in *Circulation*: <http://circ.ahajournals.org/content/early/2012/07/09/CIR.0b013e31825c42ee>.

Academy Nutrition and Dietetics: 2012¹

FROM THE ACADEMY
Position Paper

**Position of the Academy of Nutrition and Dietetics:
Use of Nutritive and Nonnutritive Sweeteners**

...consumers can safely enjoy a range of nutritive and NNS sweeteners when consumed within an eating plan...guided by current federal nutrition recommendations, such as the *Dietary Guidelines for Americans*...

1. Academy Nutrition and Dietetics. Use of nutritive and nonnutritive sweeteners (position paper). J Acad Nutr Diet. 2012; 112(5):739-757.

There Are No Magic Bullets, *But*

Low Calorie Sweeteners are:

- ➡ Safe
- ➡ Affordable
- ➡ Widely Available
- ➡ Low or No Calorie
- ➡ Good Tasting
- ➡ and Easy to Use

In Summary

- **Dietary Guidelines For Americans, 2010: Reduce added sugars to reduce energy intake¹**
- **Academy of Nutrition and Dietetics: Consumers can safely enjoy a range of nutritive and Nonnutritive sweeteners²**
- **NNS are safe options to assist in reducing calorie and added sugars intake without sacrificing taste^{2,3}**
- **Evidence is growing that NNS, foods and beverages sweetened with NNS can assist with weight management^{3,4}**
- **Encourage consumers to take a small-steps approach to reduce added sugars and energy intake**

1. US Dept Agriculture and Health and Human Services. Dietary Guidelines for Americans, 2010, 7th ed. Washington, DC: US Gov't Printing Office, 2010.
<http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>
2. Academy Nutrition and Dietetics. Use of nutritive and nonnutritive sweeteners (position paper). Jour Acad Nutr Diet. 2012; 112(5):739-757.
3. (Published simultaneously) Nonnutritive Sweeteners: Current Use and Health Perspectives. Scientific statement from American Diabetes Association (ADA) in Diabetes Care: <http://care.diabetesjournals.org/content/early/2012/07/06/612-9002.full.pdf+html> and American Heart Association in Circulation: <http://dx.doi.org/10.1161/CIR.0b013e31825c429e>
4. Mattes R, Popkin B. Nonnutritive sweetener consumption in humans: effects on appetite and food intake and their putative mechanisms. Am J Clin Nutr. 2009;89:1-14.



When you hear/see new LCS study, headline practice the 3 Rs – Read, Reflect, Rely



- 1. Read** Go beyond press release, spin and headlines from institutions, media outlets to original research
- 2. Reflect** On new research within existing body of scientific evidence, accepted government and/or association recommendations and position papers
- 3. Rely** On the vast body of scientific research, not just one new study

Thank You!

Q & A

Key References

1. Rulis, AM, Levitt JA: FDA's food ingredient approval process. Safety assurance based on scientific assessment. Regulatory Toxicology and Pharmacology. 2009; 53:20-31.
2. US Dept Agriculture and Health and Human Services. Dietary Guidelines for Americans, 2010, 7th ed. Washington, DC: US Gov't Printing Office, 2010. <http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>
3. Academy Nutrition and Dietetics. Use of nutritive and nonnutritive sweeteners (position paper). J Acad Nutr Diet. 2012; 112(5):739-757.
4. Raben A, Richelsen B. Artificial sweeteners: a place in the field of functional foods? Focus on obesity and related metabolic disorders. Curr Opin Clin Nutr Metab Care .2012; 15:597-604.
5. Nonnutritive Sweeteners: Current Use and Health Perspectives. Scientific statement from American Diabetes Association (ADA) in Diabetes Care: <http://care.diabetesjournals.org/content/early/2012/07/06/dc12-9002.full.pdf+html>) and American Heart Association in Circulation: <http://circ.ahajournals.org/content/early/2012/07/09/CIR.0b013e31825c42ee>.
6. Mattes R, Popkin B: Nonnutritive sweetener consumption in humans: effects on appetite and food intake and their putative mechanisms. Am J Clin Nutr 2009;89:1-14.

Cancer and LCS?

- American Cancer Society: “Current evidence does not show a link between these compounds and increased cancer risk.”¹
- Nat’l Cancer Institute: “...no clear evidence that the artificial sweeteners available commercially...in U.S. are associated with cancer risk in humans.”²

1. American Cancer Society: <http://www.cancer.org/healthy/eathealthygetactive/acsguidelinesonnutritionphysicalactivityforcancerprevention/acs-guidelines-on-nutrition-and-physical-activity-for-cancer-prevention-common-questions>

2. National Cancer Institute: <http://www.cancer.gov/cancertopics/factsheet/Risk/artificial-sweeteners>
