

Low-calorie Sweeteners and Weight:  
A Webinar for Health Educators




Welcome



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Low-calorie Sweeteners

**IN THE NEWS**

Do Diet Drinks Actually Cause Weight Gain?




Why are we interested in low-calorie sweeteners?

- Replace caloric sweeteners
- Potential to decrease overall calories in the diet – small changes model
- Allow for the consumption of similar foods with lowered calories
- Strategy for weight management?

**Obesity Crisis**

400 calories: mocha (medium)	280 calories: regular cola (20 oz.)	200 calories: sweet tea (16 oz.)
		
<b>880 calories</b>		

160 calories: non-fat sugar-free Latte (medium)	0 calories: diet cola (20 oz.)	0 calories: tea with artificial sweetener (16 oz.)
		
<b>160 calories</b>		



## Low-Calorie Sweeteners (LCS) and Weight Management

John D. Fernstrom, Ph.D.



University of Pittsburgh  
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### Anatomy of Taste

Higher Brain Centers

Facial Nerve

Glossopharyngeal Nerve

Taste Buds

Slide courtesy of T.E. Finger

### Sweet Receptors in the Mouth

Bitter T2Rs

Sweet T1R2/T1R3

Umami T1R1/T1R3

Taste mGluR1, 4

Brain mGluR1, 4

Epithelial cells

Taste cells

Taste bud (50-100 taste cells)

Taste nerve fibers

From: Yasumatsu Y et al. Multiple receptors underlie glutamate taste responses in mice. Am J Clin Nutr 20(suppl): 747S-752S, 2009.

### Both caloric and low-calorie sweeteners interact with the sweet taste receptor

Sucrose / Glucose / Sucralose

Aspartame/Neotame  
Monellin

Cyclamate

T1R2

T1R3

Source: S. D. Munger

### Do LCS cause weight gain ?

**No.**

Original Research Communications

Sucrose compared with artificial sweeteners: different effects on ad-libitum food intake and body weight after 10 wk of supplementation in overweight subjects<sup>1,3</sup>

Anne Raben, Tatjana H Vasilaras, A Christina Moller, and Arne Astrup

American Journal of Clinical Nutrition 2002;76:721-9.

Study Design:

- Overweight subjects (BMI ~28); n = 41: 35♀ /6♂.
- Instructed to ingest minimum amount daily of supplied liquid and solid foods, sweetened with either sucrose or artificial sweeteners, added to their normal diet. (sucrose intake calculated to be ~20% total daily energy intake)
- Liquids were carbonated soft drinks and fruit juices; solids were yogurt, marmalade, ice cream, stewed fruits.

Raben A et al., American Journal of Clinical Nutrition 76:721-729, 2002

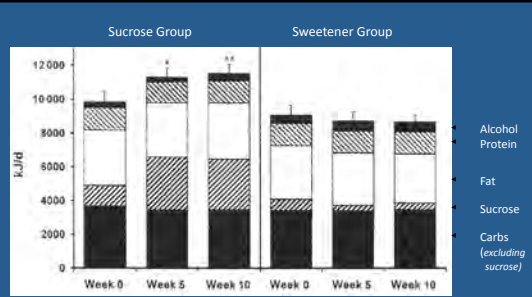


Figure 1. Mean energy and macronutrient intakes from the ad libitum diet (including supplements) before (week 0) and during week 5 and week 10 of an intervention in which overweight subjects consumed supplements containing either sucrose or artificial sweeteners daily. Note: 10,000 kJ equals ~2,400 kcal.

From: Raben A et al., American Journal of Clinical Nutrition 76:721-729, 2002.

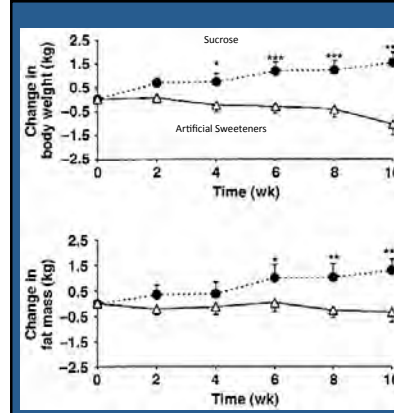


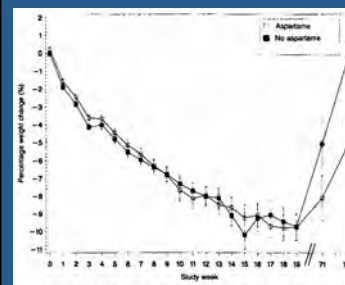
Figure 2. Mean (± SEM) changes in body weight during and intervention in which overweight subjects consumed supplements containing either sucrose (●, n=21) or artificial sweeteners (Δ, n=20) daily for 10 wk.

From: Raben A et al., American Journal of Clinical Nutrition 76:721-729, 2002.

• Keys points of Raben et al. study:

- Clearly no underlying biochemical/physiological mechanism(s) promoting eating and weight gain.
- Subjects do not compensate for loss of energy due to artificial sweetener/reduced energy foods when they do not know about it. This is not new, but the study is the lengthiest to date.
- Data do not support the claim that artificial sweeteners promote weight gain.
- The caveat is that when folks are doing this voluntarily/knowingly, the result may not be the same (i.e., they may choose to eat more food). In this case, the lack of weight control/reduction has nothing to do with the artificial sweeteners, but rather with the psychology of the subject.

Is an LCS of benefit in an extended weight-loss program ?  
Yes,



- Obese women (n=80/group).
- 19-wk treatment : diet + exercise instruction.
- 3-wk run-in period
- 16-wk dietary treatment: 1,000 kcal/day diet. 50% lo-cal diet no APM. 50% lo-cal diet with APM.
- 52-wk maintenance phase. 1,500 kcal/day diet. Continue no APM group. Continue APM group.
- Follow-up at 175 wk.

Blackburn GL et al., Am J Clin Nutr 65: 409-418 (1997).

## CONCLUSIONS

- LCS cause sweet taste – they do so by interacting with the same sweet receptor as caloric sweeteners.
- LCS facilitate weight loss in humans by reducing the caloric content of sweet foods.

## Low-calorie Sweeteners and Children: Implications for Weight Management



## Young children prefer familiar and sweet.



## Low-calorie sweeteners and weight in children

- Short term randomized controlled trials – LCS are neutral or show modest weight loss
- No strong clinical evidence to suggest pro or con with respect to body weight in children and LCS use
- Long-term effects of LCS in children and adolescents with respect to weight are unknown

### 5-3-2-1-Almost None

- 5** 5 or more servings of fruits and vegetables daily
- 3** 3 structured meals daily—eat breakfast, less fast food, and more meals prepared at home
- 2** 2 hours or less of TV or video games daily
- 1** 1 hour or more of moderate to vigorous physical activity daily
- Almost None** Limit sugar-sweetened drinks to “almost none”

Adapted from the 5-2-1-0 message promoted by the National Initiative for Children's Healthcare Quality (www.nichq.org).

The recommendation of limiting (or eliminating) SSB in children is endorsed by many professional organizations. Whether simply replacing those beverages with “diet” drinks will have an impact on body weight is yet to be determined.

## What to recommend to parents?

“The paucity of data regarding the effects of LCS use in children and adolescents creates challenges in decision making for health care providers and parents”

Foreyt J, Kleinman R, Brown RJ, Lindstrom R. The use of low-calorie sweeteners by children: implications for weight management. *J Nutr.* SUBMITTED



## Resources for more information about low-calorie sweeteners

### The International Life Sciences Institute, North America

- ILSI North America's Low-Calorie Sweeteners Committee page: <http://www.ilsinorthamerica.org/Pages/Low-Calorie-Sweeteners.aspx>

### The International Food Information Council

- Fact Sheet on Low-Calorie Sweeteners: <http://www.foodinsight.org/Resources/Detail.aspx?topic=FACTS%20ABOUT%20LOW-CALORIE%20SWEETENERS>
- Everything You Need to Know About Aspartame Brochure: [http://www.foodinsight.org/Resources/Detail.aspx?topic=Everything\\_You\\_Need\\_to\\_Know\\_About\\_Aspartame](http://www.foodinsight.org/Resources/Detail.aspx?topic=Everything_You_Need_to_Know_About_Aspartame)
- Everything You Need to Know About Sucralose Brochure: [http://www.foodinsight.org/Resources/Detail.aspx?topic=Everything\\_You\\_Need\\_to\\_Know\\_About\\_Sucralose](http://www.foodinsight.org/Resources/Detail.aspx?topic=Everything_You_Need_to_Know_About_Sucralose)



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# Questions?