

## **Looking for Sweetness Without the Calories**

**Don Mercer**

**Associate Professor, Food Science  
Kemptville Campus University of Guelph**

It's one of those basic facts of life - most people like to eat food and drink beverages that are sweet. From the coffee we drink to the desserts that tempt us to over-indulge just a little too much, the sweetness is often just too strong to resist. Although there is absolutely nothing wrong with a moderate amount of sugar in most of our diets, the real problem is excessive amounts that somehow squeeze their way onto our mouths. As a result, there has been an ongoing quest to find substitutes for "sugar" that have all of the sweetness and none of the calories, while still being safe to consume.

The following is a snapshot of alternate sweeteners or sugar substitutes over the years.

Surprisingly, the search for alternate sweeteners has been going on since the time of the ancient Romans. Unfortunately, they used a slightly sweet chemical compound containing lead which had the obvious negative side effects associated with lead poisoning.

Perhaps the oldest artificial sweetener is "saccharin" which was discovered in 1879. Being over three hundred times sweeter than sucrose (i.e., table sugar), it gained popularity over the years. Due to a number of health-related concerns, its sale was banned in Canada in 1979. However, saccharin is still popular in the United States and many other countries.

Cyclamates were a class of artificial sweeteners discovered in 1937. They eventually fell into disfavour and were banned in the United States in the late 1960's. They are allowed in a number of countries in the world, although some restrict the levels of usage.

Aspartame® is probably the most familiar sugar substitute. It was approved for use in Canada and the United States in 1981. Being about 200 times sweeter than sucrose, it is not surprising that Aspartame® has found its way into many food products and beverages.

An interesting thing about cyclamates and Aspartame® is that their discovery as sugar substitutes was accidental in both cases. It is reported that the researcher who discovered cyclamates was working on anti-fever medication. Apparently, he set a cigarette he was smoking down on the lab bench and noticed that it had a sweet taste when he picked it up again. Laboratory practices certainly have changed since then!

Aspartame® was discovered in 1965 when a medical researcher spilled a solution of the chemical on his hand. Later when he licked his fingers, he noticed a very sweet taste which was attributed to the residue of the spilled solution.

Acesulfame-potassium, another artificial sweetener was granted approval for use in the United States in 1988 and is also allowed in Canada. It is about 200 times sweeter than sugar.

One of the most recent artificial sweeteners to gain acceptance and popularity is “Sucralose” which is sold under the trade-name “Splenda”®. It was discovered by a group of British scientists in 1976. Later that year, Tate & Lyle patented it. “Sucralose” was granted approval for sale in Canada in 1991 but had to wait until 1998 for approval in the United States. According to internet sources, there literally thousands of products using this non-caloric sweetener which is about 600 times sweeter than table sugar.

The actual structure of “Sucralose” is rather interesting. The process for manufacturing it begins with the sucrose which it is designed to replace. Through a somewhat complicated process, three of the hydroxyl groups on the sugar molecule are replaced by chlorine atoms. This chemical substitution enhances the sweetness of the resulting compound and creates a product which is not utilized for its energy content in the body. For those of you wondering about the naming of this compound as “Sucralose”, just think how lucky we are that we don’t have to call it by its official chemical name of “1,6-dichloro-1,6-dideoxy-β-D-fructofuranosyl-4-chloro-4-deoxy-α-D-galactopyranoside”.

All artificial sweeteners seem to have their advocates and their detractors. It is certainly difficult to understand the intricacies of all the safety studies done on these materials. In response to these safety concerns, Health Canada issued a statement regarding “The Safety of Sugar Substitutes” in 2008. The statement, available on-line, stresses the need for moderation in the intake of any food, including sugar substitutes, and provides a brief overview of their benefits and risks. It can be found by typing “Health Canada Safety of Sugar Substitutes” into your Internet search engine.