Health Canada’s Safety Assessment Process for Sugar Substitutes

Janice Weightman
Bureau of Chemical Safety
Food Directorate, Health Canada
April 24, 2014
Canada generally have a taste for sweet foods but are often concerned about the calories they contain. As a result, a variety of sugar substitutes have been developed for use as table-top sweeteners, both for use in home cooking as well as for use as additives in processed foods.

The Government of Canada is mandated to ensure that the retail food that Canadians eat is safe.

This talk will present Health Canada’s regulatory process for approving sugar substitutes, with a focus on safety assessment.
The Food Directorate is the federal health authority responsible for establishing policies, setting standards and providing advice and information on the safety and nutritional value of food.
Where does the regulation begin?

- The Government of Canada, through the *Food and Drugs Act*, is mandated to ensure that the retail food that Canadians eat is safe.

- The *Food and Drug Regulations* support the *Food and Drugs Act* by defining the application and enforcement of the legislation.

- Health Canada Guidelines interpret legislation, regulations and policy.
“food” includes any article manufactured, sold or represented for use as food or drink for human beings, chewing gum, and any ingredient that may be mixed with food for any purpose whatever (Section 2)
No person shall sell an article of food that
(a) has in or on it any poisonous or harmful substance;
(b) is unfit for human consumption;
(c) consists in whole or in part of any filthy, putrid, disgusting, rotten, decomposed or diseased animal or vegetable substance;
(d) is adulterated; or
(e) was manufactured, prepared, preserved, packaged or stored under unsanitary conditions.  (Section 4. (1))

No person shall label, package, treat, process, sell or advertise any food in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, quantity, composition, merit or safety.  (Section 5. (1))
The Governor in Council may make regulations for carrying the purposes and provisions of this Act into effect for food (Section 30 (1)).

- declaration that any food or class of food is adulterated
- respecting:
  - the labelling and packaging and the offering, exposing and advertising for sale of food
  - specifications for packaging of food
  - the sale or the conditions of sale of any food
  - the use of any substance as an ingredient in any food to prevent the purchaser or consumer thereof from being deceived or misled or to prevent injury to the health of the purchaser or consumer;
Sugar Substitutes

Sugar substitutes would be identified as “food additives”.

They meet the definition of any substance the use of which results, or may reasonably be expected to result, in it or its by-products becoming a part of or affecting the characteristics of a food, but does not include:

a) any **nutritive material** that is used, recognized, or commonly sold as an article or ingredient of food;

b) **vitamins, mineral nutrients** and **amino acids**, other than those listed in the tables to Division 16,

c) **spices, seasonings, flavouring preparations, essential oils, oleoresins and natural extractives**,  
d) **agricultural chemicals**, other than those listed in the tables to Division 16,  
e) **food packaging materials** and components thereof, and  
f) **drugs** recommended for administration to **animals** that may be consumed as food.
Foods containing an unapproved food additive cannot be sold in Canada (B.01.042 – Standardized foods; B.01.043 – Unstandardized foods; B.16.007)

Food additives must be declared in the ingredient list of most prepackaged foods (B.01.008, B.01.009)

Food additives must generally be declared by their common name in food ingredient lists (B.01.010)

Food additives must meet their respective food grade specifications (B.01.045)

Food additives are generally prohibited from use in infant foods (B.16.007, B.25.062)

Substances sold for use as food additives must declare the quantities of each additive present (B.16.001)

Substances cannot be sold as food additives unless they are approved food additives (B.16.100)
Food Additive Submission Requirements

- A food additive submission should generally contain information addressing the following areas (as per B.16.002)

  a) Description, chemical name, method of manufacture, and specifications
  b) Purpose of use, directions for use
  c) Method of analysis (where necessary)
  d) Efficacy data
  e) Safety information
  f) Residue data for use in accordance with GMP
  g) Proposed maximum limit for residues
  h) Specimens of the labelling proposed for the additive (where necessary)
  i) Samples (additive, active ingredient, food containing additive)
    (where necessary)
Guidance documents available to assist in the interpretation of policies and governing statutes and regulations, as well as to assist in preparing submissions for food products can be found on the Health Canada website at:

Three groups of scientific evaluators contribute to the safety assessment of food additives:

- Bureau of Nutritional Sciences
- Bureau of Microbial Hazards
- Bureau of Chemical Safety
The Bureau of Nutritional Sciences is responsible for policy, standard setting, risk assessment, research and evaluation activities with respect to nutrients in foods in Canada.

In the context of food additives, the primary objective of the work is to ensure that the nutrient composition of foods is not adversely affected when food additives are present in foods, and to ensure that any declared health claims are valid.
The Bureau of Microbial Hazards is responsible for policy, standard setting, risk assessment, research and evaluation activities with respect to microbial contamination in foods in Canada.

The primary objective of the work is to minimize public health risks from the consumption of foods contaminated with microbes. They also evaluate any microbial issues potentially related to proposed food additive uses (e.g. the efficacy of antimicrobial additives).
The Bureau of Chemical Safety is responsible for policy, standard setting, risk assessment, research and evaluation activities with respect to chemicals in foods in Canada.

In the context of chemical contaminants, the primary objective of the work is to ensure that chemicals are not present in foods at levels that would pose an unacceptable risk to public health.

In the context of food additives, the primary objective is to ensure the safety of any proposed uses of additives under defined conditions of use.
Policy support, standard setting, risk assessment, safety evaluations, research and evaluation activities with respect to ensuring that chemicals are not present in foods sold in Canada at levels that would pose an unacceptable risk to health.
Safety Assessment – Toxicology

- Absorption, Distribution, Metabolism and Excretion studies
- Acute oral toxicity studies
- Short-term oral toxicity studies
- Long-term oral toxicity studies, including cancer assays
- Genotoxicity studies
- Reproductive and Developmental studies
- Special studies, e.g. human tolerance studies
Safety Assessment – Toxicology

- Toxicological studies are used to determine the potential hazard associated with a food additive.

- These studies provide information for the characterization of the hazard, including a No Observed Adverse Effect Level (NOAEL).

- Based on the studies, the Acceptable Daily Intake (ADI) of the food additive can be calculated.
The Acceptable Daily Intake (ADI) is an estimate of the amount of a substance in food or drinking water, expressed on a body-weight basis, that can be ingested daily over a lifetime without appreciable risk.

ADI = NOAEL / Uncertainty Factors

Uncertainty Factors are applied to account for various sources of uncertainty and variability within a toxicological database. Examples of applied uncertainty factors are interspecies and intraspecies variation.
### Safety Assessment – Toxicology

<table>
<thead>
<tr>
<th>Sweetener</th>
<th>Acceptable Daily Intake</th>
<th>Critical Study and Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acesulfame-Potassium</td>
<td>15 mg/kg bw/d</td>
<td>In a long-term toxicity study in rats, no adverse effects were observed.</td>
</tr>
<tr>
<td>Aspartame</td>
<td>40 mg/kg bw/d</td>
<td>In a long-term toxicity study in rats, no adverse effects were observed.</td>
</tr>
<tr>
<td>Steviol glycosides</td>
<td>4 mg/kg bw/d</td>
<td>In a long-term toxicity study in rats, no adverse effects were observed.</td>
</tr>
<tr>
<td>Sucralose</td>
<td>8.8 mg/kg bw/d</td>
<td>In a short-term study in dogs, no adverse effects were observed.</td>
</tr>
<tr>
<td>Sugar alcohols</td>
<td>ADI not specified</td>
<td>People consuming excess amounts of these sweeteners can suffer gastro-intestinal and laxative effects.</td>
</tr>
<tr>
<td>Thaumatin</td>
<td>0.9 mg/kg bw/day</td>
<td>In a short-term toxicity study in dogs, reduced red blood cell count were observed.</td>
</tr>
<tr>
<td>Saccharin</td>
<td>Reinstatement as a food additive sweetener is pending.</td>
<td></td>
</tr>
</tbody>
</table>
Exposure to a food additive can be estimated based on the assumption that all foods that allow the use of the food additive actually contain the food additive at the maximum level requested.

How much of those foods Canadians eat, and in turn how much of the additive may be ingested, is based on data from the Canadian Community Health Survey, Cycle 2.2 (2004).

Exposure can be expressed as the Estimated Daily Intake (EDI).
A food additive can be considered safe when the Acceptable Daily Intake is greater than or equal to the Estimated Daily Intake.

\[ \text{ADI} \geq \text{EDI} \]
Safety Assessment of Food Additives

- The safety assessment involves an evaluation of the potential hazard and the characterization of that hazard.
- The exposure assessment involves an estimate of the potential exposure to the food additive.
- Nutritional evaluation (as necessary).
- Microbial evaluation (as necessary).
- Conclusion regarding the safety of use of the food additive.

Note: Additionally, a technological justification and an efficacy review is conducted for food additives.
When are Lists of Permitted Food Additives modified?

- Food additive submissions are provided in support of requests to:
  - use a food additive not previously approved in Canada;
  - extend the food areas of use of an already listed additive;
  - amend the maximum level of use of an additive;

- A food additive submission, prepared according to B.16.002 of the F&DR, is received and must clear Health Canada’s safety evaluation.
When are Lists of Permitted Food Additives modified?

- Only if the proposed additive use is shown to be safe and efficacious are the Lists modified to legally enable the use of that additive under prescribed conditions of use.

- New science on safety emerges – possible outcomes can include **restricting the conditions of use** (if the toxicological characterization changes) or **delisting** if the compound is no longer appropriate for use as an additive.
Assessments From Other Jurisdictions

- Safety assessments may have also been conducted by other jurisdictions or organizations (e.g. EFSA, JECFA, US FDA, FSANZ).

- Health Canada conducts an independent review of food additives which reflects the exposure characteristics that are specific to Canadians (e.g. types of products and Canadian intake information).

- Assessments from other jurisdictions are taken into consideration but the decision for allowing the use of a food additive in Canada is based on Health Canada’s independent assessment. Health Canada’s conclusions may differ from other jurisdictions for a number of different reasons (e.g. exposure assessment).
The regulation of food additives, including sugar substitutes, is mandated by the *Food and Drugs Act* and the *Food and Drug Regulations*.

A safety assessment is required, and only if no safety issues are identified can a food additive legally be used in food sold in Canada.
A safety assessment is based on all nutritional, microbial, chemical, and toxicological data available.

A safety assessment must be science-based.

Part of the safety assessment is the determination of the uncertainty in its evaluation.

Ultimately, the process is established to ensure that there are no unsafe uses of food additives in Canada.
Take home message

- Petitioners wanting to use a new food additive must provide safety data to Health Canada.

- Health Canada must conduct a safety evaluation and approve the food additive before it can be added to food sold in Canada.

- Canada has regulatory oversight of all food additives.

- Canadians can be confident that food additives approved for use in Canada are safe to eat.
Thank You

Bureau of Chemical Safety
bcs-bipc@hc-sc.gc.ca

Janice Weightman
Janice.Weightman@hc-sc.gc.ca