Lesson 4
Food Standards, Regulations & Guides-Food Additives

Additional Readings

- Kroger et al. 2006 article (re: Aspartame) Pages 37-39
- Health Canada website: "Aspartame"
- Hotchkiss and Cassens (Nitrate, nitrite & Nitroso compounds in foods)

Additional resources

- Food Additive Dictionary
- Provided links throughout the lesson 4

Lesson objectives

- discuss how regulations are established, to ensure the quality and safety of the Canadian food supply
- identify which governmental agencies are responsible for regulating the safety and quality of the food supply
- define what a food additive is
- interpret the function of food additives that are listed on the labels of ingredients of food you consume
- explain the basis upon which safety of food additives is determined; and
- articulate your set of values as they pertain to the use of food additives in foods
- compare and contrast the definition of a food additive in Canada and United States
- demonstrate the ability to do research and extract information about the Canadian food acts and regulations

Lesson 4 Food Standards, Regulations & Guides, Food Additives

Government agencies & their regulatory functions

- Food Standards, Grades

Food Additives

- Function
- Safety

Food Standards, Regulations ...

WHY do we need food standards, regulations and grades?

To ensure safety and quality

Food Standards, Regulations …

"Government responsibility for food safety and nutrition is shared among

federal, provincial, and territorial governments as well as the

Canadian Food Inspection Agency (CFIA) and the

Public Health Agency of Canada (PHAC).

The Food Directorate works closely with these partners as well as industry and health stakeholders to ensure the Canadian food supply is safe and nutritious."

Food Standards, Regulations …

Who is responsible?

Various levels of government:

Federal:

- Health Canada (HC)
  - Health Products and Food Branch (HPFB)
    - Food Directorate
- Canadian Food Inspection Agency (CFIA)
- Innovation, Science and Economic Development Canada
  - Measurement Canada

Provincial: BC Ministry of Health

Municipal: Public Health Inspectors

What are they responsible for?

Federal

- **HPFB of Health Canada** – Establishing regulations, policies & standards for safety & nutritional quality of food
  - regulations (food & drug, food additives), standards of identity and composition for foods

- **CFIA** – Enforces regulations set by Health Canada
  - inspection of food (processing plants, animal and plant health)
  - administers and enforces non-health and safety-related policies and regulations

Food labelling is a shared responsibility between HC and CFIA

What are they responsible for?

Federal cont.....

Innovation, Science and Economic Development Canada

- **Measurement Canada**-accuracy in the selling of measured goods,
  - developing and enforcing the laws related to measurement accuracy,
  - approving and inspecting measuring devices and investigating complaints of suspected inaccurate measurement


Innovation, Sciences et
Développement économique Canada
Mesures Canada
Innovation, Science and
Economic Development Canada
Measurement Canada
DATE D'INSPECTION / DATE INSPECTED
ANNÉE
YEAR
2018
2019
2021
2022
2023
MOIS
MONTH
1
2
4
5
6
7
8
9
10
11
12
ANNÉE
YEAR
2019
2020
2021
2023
2024
2025
S.O
N/A
EXPIRATION / EXPIRES
QUESTIONS OU PLAINTES
canada.ca/mesures-canada
QUESTIONS OR COMPLAINTS
canada.ca/measurement-canada
Canada

What are they responsible for?

Provincial

Food produced & sold exclusively within borders

Public Health Inspectors

Where are the specific regulations found?

Safe Food for Canadian Regulation

https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-108/index.html

Consumer protection laws

In summary:

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.

Examples of specific regulations – (1) standards of identity and composition

1. **Food and Drugs Act of Canada –**

the foundation of **consumer protection laws** includes **standards of food identity and composition**

https://inspection.canada.ca/en/about-cfia/acts-and-regulations/list-acts-and-regulations/documents-incorporated-reference

standards of identity

- States what the food shall be
- defines or identifies the food or ingredient

composition standards

- lists specific amounts of mandatory and permitted ingredients

There are stds. of ID & Comps. for **> 500** foods

Standards of food **identity** and **composition…**

- Volume 2: Alcoholic beverages
- Volume 4: Cocoa and Chocolate products
- Volume 5: Coffee
- Volume 7: Dairy products

https://inspection.canada.ca/en/about-cfia/acts-and-regulations/list-acts-and-regulations/documents-incorporated-reference

Visit one of these **volumes and**

Look for Stds. of I.D. and Composition

Food labelling for industry

http://www.inspection.gc.ca/food/labelling/food-labelling-for-industry/eng/1383607266489/1383607344939

Core Mandatory Labelling Requirement

- Bilingual Labelling
- Common Name
- Date Markings and storage instruction
- Nutrition Labelling
- List of Ingredients and Allergens
- Name and Principal Place of Business
- Net Quantity
- Legibility and Location
- Irradiated Foods
- Country of Origin
- Sweeteners
- Food Additives
- Fortification
- Grades
- Standard of Identity

French and English!

common name of the food

Identity and Principal Place of Business

Campbell Soup Co. Ltd.
60 Birmngham St.
Toronto, ON
1-800-410-7687

net quantity
540 mL

Legibility and location of the info

Calories and **key nutrients**
https://inspection.canada.ca/food-labels/labelling/industry/nutrition-labelling/eng/1386881685057/1386881685870

storage instructions:
"Refrigerate unused portions immediately"

Best before or durable life date/ date marking for food with shelf life of 90 days or less

Labelling-Nutrition fact table
Gram or mg per serving and %Daily Value

- Serving size
- Energy
- Fat
  - Saturated
  - Trans Fatty Acids
  - Cholestrol
- Sodium
- Potassium
- Carbohydrates
  - Dietary Fibre
  - Sugars
- Protein
- Vitamins and Mineral Nutrients
  - Calcium
  - Iron

Nutrition Facts
Valeur nutritive

Per 1 cup (250 ml)
pour 1 tasse (250 ml)

Calories 110	% Daily Value* / % valeur quotidienne*
Fat / Lipides 0 g	0 %
Saturated / saturés 0 g + Trans / trans 0 g	0 %
Carbohydrate / Glucides 26 g	
Fibre / Fibres 0 g	0 %
Sugars / Sucres 22 g	22 %
Protein / Protéines 2 g	
Cholesterol / Cholestérol 0 mg	
Sodium 0 mg	0 %
Potassium 450 mg	10 %
Calcium 30 mg	2 %
Iron / Fer 0 mg	0 %

*5% or less is **a little**, 15% or more is **a lot**
*5% ou moins c'est **peu**, 15% ou plus c'est **beaucoup**

List of ingredients (↓ order proportion):
Water, mushrooms, canola oil, cream, enriched wheat flour, salt, M-corn starch, SPI, M-milk ingred., spice, colour

Food specific:

e.g % milk fat in dairy,

Labelling-Country of Origin

wine and brandy

dairy products

honey

fish and fish products

fresh fruits and vegetables

shelled egg

processed egg

meat products

maple products

processed fruit and vegetable products

Labelling-Sweeteners

Aspartame, Sucralose, Acesulfame-potassium and/or Neotame Labelling

Polydextrose Labelling Requirements

Sugar Alcohols Labelling Requirements

Stevia vs Steviol glycoside

Monk Fruit vs Monk Fruit extract

Labelling (continue…)

Food Additives,

Grades

Fortification

https://inspection.canada.ca/en/food-labels/labelling/industry/fortificationStandard of Identity

Health claims: what they mean

https://inspection.canada.ca/en/food-labels/labelling/industry/health-claims

Nutrient Content & Diet-related **health claims**

- Disease Reduction claims and Therapeutic claims
- Function claims
- Nutrients function claims
- Probiotic claims
- General Health claims

https://inspection.canada.ca/en/food-labels/labelling/industry/health-claims

Acceptable disease reduction claims

1) Disease Risk Reduction Claims with Respect to Sodium and Potassium
2) Disease Risk Reduction Claims with Respect to Calcium and Vitamin D
3) Disease Risk Reduction Claims with Respect to Saturated and *Trans* Fats
4) Disease Risk Reduction Claims with Respect to Cancer Risk Reduction

4.1) Disease Risk Reduction Claims with Respect to Heart Disease

Risk Reduction

5) Disease Risk Reduction Claims with Respect to Dental Caries

Disease reduction claims

- a healthy diet low in sodium and high in potassium and reduced risk of high blood pressure;
- a healthy diet with adequate calcium and vitamin D and reduced risk of osteoporosis;
- a healthy diet low in saturated and trans fat and reduced risk of heart disease;
- a healthy diet rich in vegetables and fruit and reduced risk of some types of cancers;
- a healthy diet rich in a variety of vegetables and fruit may help reduce the risk of heart disease
- non-fermentable carbohydrates in gums and hard candies and reduction in dental caries

Disease reduction claims

The regulations exclude certain foods from the disease reduction claims

(e.g jams and jellies, olives, from fruit and vegetables)

It needs to be considered nutritionally solid

(e.g for saturated fat and trans fat claim, the product needs to be providing at least10% of the weighted recommended nutrient intake of a vitamin or mineral.)

The claim may accompany the following statement:

(The food name) is a good source/high in/excellent source

of (specific nutrient)

Is this claim allowed in Canada?

Clarification

A healthy diet
low in saturated
and trans-fats
may reduces risk
of heart disease

Case study- Danone

Danone to settle lawsuit over Activia yogurt, DanActive health claims (2012)

Read more:
http://www.ctvnews.ca/health/danone-to-settle-lawsuit-over-activia-yogurt-danactive-health-claims-1.971371#ixzz284UbDDkC

Nutrient Content & Diet-related health claims- Fat content

Food labelled as “fat-free” or “light” or other similar phrase…

Lean vs regular beef patties

https://inspection.canada.ca/food-labels/labelling/industry/nutrient-content/specific-claim-requirements/eng/1627085614476/1627085788924#a4

Food Grades

A more detailed look at some **examples** of specific regulations

- 312 - SUBDIVISION A - General
- 314 - SUBDIVISION B - Eggs
- 317 - SUBDIVISION C - Fish
- 320 - SUBDIVISION D - Fresh Fruits or Vegetables
- 322 - SUBDIVISION E - Processed Fruit or Vegetable Products
- 323 - SUBDIVISION F - Honey
- 325 - SUBDIVISION G - Maple Syrup
- 326 - SUBDIVISION H - Livestock Carcasses
- 330 - SUBDIVISION I - Poultry Carcasses

Canada's Food Grades-Example Processed fruits and vegetables

Processed fruits and vegetables are graded on:

- Flavour and aroma
- Colour
- Tenderness and maturity
- Uniformity of size and shape
- Consistency of texture
- Appearance of the liquid medium (eg. syrup)
- Freedom of defects and foreign material

can you see any difference between these two labels for canned peach slices?

Can you see the difference?

can you see any difference(s)?

Canada Choice

Canada Fancy

colour and uniformity

Canada's Food Grades-Example Beef

Canada A, AA, AAA, Canada Prime

Must comply with certain maturity level, well-muscled; **marbling*** present fat covering that is:

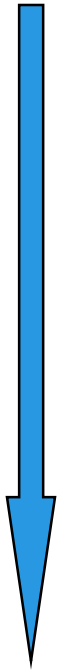
firm and white or slightly tinged with a reddish or amber colour, **and not less than 2 mm in thickness at the measurement site**.

Canada B

Visit Justice Canada

Canada D

Reserved for mature cows (meat destined for further processing: canned, stews, soups, etc)



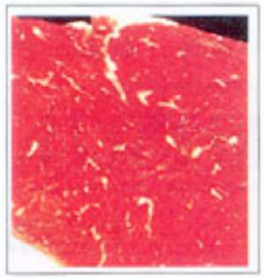
lower price

CANADA
PRIME
*

MINIMUM REQUIREMENT IS
SLIGHTLY ABUNDANT MARBLING

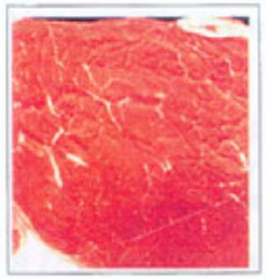
CANADA
AAA

MINIMUM REQUIREMENT IS
SMALL MARBLING



CANADA
AA

MINIMUM REQUIREMENT IS
SLIGHT MARBLING



CANADA
A

MINIMUM REQUIREMENT IS
TRACE MARBLING (NOT DEVOID)

marbling

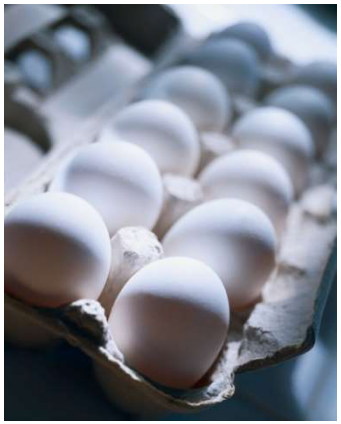
slightly abundant

small amount

slight amount

trace

Watch the video



Canada's Food Grades-Example Eggs

Grades

- **Canada A**
- **Canada B**
- **Canada C**
- **Canada Nest Run**

lower price

- weight, cleanliness, soundness and shape of shell, shape and position of yolk in the egg during "candling", size of air cell (small = fresh), abnormalities (eg blood spots)

Notes from the video

Grades

names

specification and destination

Candling

Food & Drugs Act/Food & Drug Regulations apply to food and drugs.
What if it's neither food nor drug?

Natural Health Products (NHP)

- new Directorate (1999) within **Health Canada**
- NHP - "medicinal ingredient"

Changed to Natural and Non-prescription Health Product Directorate (NNHP) in 2014

- vitamins, minerals, homeopathic preps, probiotics, botanicals, …
- safety, quality, efficacy, administration dose and route, health claims

Lesson 13

What about the international scene?

Codex Alimentarius Commission
http://www.fao.org/fao-who-codexalimentarius/en/

- 1963 by the WHO and FAO of the United Nations
- international food standards countries, including Canada)
- 188 member countries

Food Additives

Food Additives
Canadian definition

"A food additive is any chemical substance that is added to food during preparation or storage and either becomes a part of the food or affects its characteristics for the purpose of achieving a particular technical effect."

The definition, does not include

additives permitted:

- **in Canada ~500**
- **in the US > 3000**

- food ingredients such as salt, sugar and starch;
- vitamins, minerals, amino acids;
- spices, seasonings, flavouring preparations;
- agricultural chemicals*;
- veterinary drugs*;
- or food packaging materials*

*** In the US the above are included as additives (indirect food additives)**

In Canada these are contaminants and a maximum level is set for them

Food Additives

Is MSG a food additive?

See the links below

http://www.hc-sc.gc.ca/fn-an/securit/addit/index-eng.php

http://www.hc-sc.gc.ca/fn-an/securit/addit/list/index-eng.php

What about MSG?

http://www.hc-sc.gc.ca/fn-an/securit/addit/msg_qa-qr-eng.php

http://www.hc-sc.gc.ca/fn-an/securit/addit/diction/dict_food-alim_add-eng.php

What Food Additives are approved?

Guidelines for use of food additives **in Canada**:

1. **safe** for continued use
2. must not lead to **deception**
3. results in an **advantage to the consumer** by improving or maintaining the nutritive value, quantity, quality or acceptability of the food

permission will not be given if the food additive does not provide and advantage even if it is proven to be safe

What Food Additives are approved?

15 categories, based on their function

note that "*Preservatives*" are one of the 15 tables

see Table in Lesson 4 **&** "Food Additive Dictionary"
And justice Canada website on Food and Drug Act

http://www.hc-sc.gc.ca/fn-an/securit/addit/list/index-eng.php

https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/food-additives/dictionary.html

Food additive regulations in **Canada**

Food and Drug Regulations = **Food Additives**

http://www.hc-sc.gc.ca/fn-an/securit/addit/list/index-eng.php

Each additive has the following information:

- **Purpose** of the food additive(s)
  (eg 1 of the 15 categories: *anti-caking agents*)
- **Name** of the additive used for that purpose
- **Foods** in which they are permitted,
  absence = not approved for that particular food
- **Maximum amount** permitted

How are food additives approved? ("The food additive approval process")

Fig 4.3 – the decision making process

Read the approval process

How are food additives approved? ("The food additive approval process")

1. Submit applications to Health Canada

   - contain specific information on the additive, amount and purpose of use, methods for analysis, safety tests, sample etc.

2. Health Canada solicits comments
   - from interested parties through an information letter

3. Panel of HC and outside experts weigh the **risks and benefits**
   - *accept* or *reject* the application

How are the **acceptable levels** of food additives decided?

animal studies:

- No Observed Adverse Effect Level (NOAEL) = highest level tested which caused no harmful effects in test animals

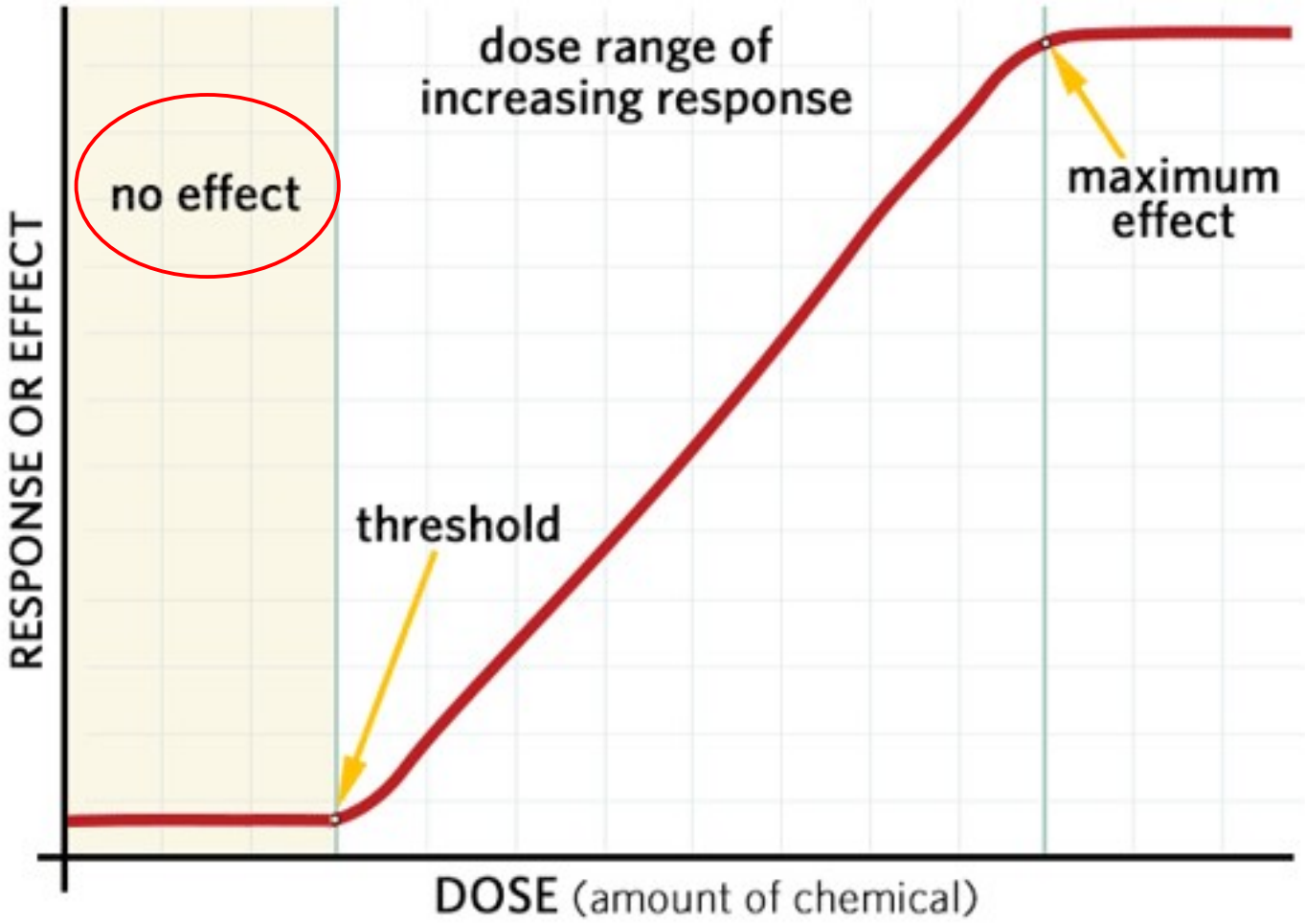
humans:

- **no effect level** = animal NOAEL ÷ safety factor (100 or 1000)

Acceptable Daily Intake (ADI) – daily dose which over an entire lifetime appears to be "without appreciable risk"

take into account the **Probable Daily Intake** (based on food consumption estimates)

Only approve if PDI < ADI



No effect level ÷ safety factor = ADI

How are the permissible or acceptable levels of food additives decided?

animal studies:

- No Observed Adverse Effect Level (NOAEL) = highest level tested which caused no harmful effects in test animals

humans:

- **no effect level** = animal NOAEL ÷ safety factor (100 or 1000)

- **Acceptable Daily Intake (ADI)** –
  daily dose which over an entire lifetime appears to be "without appreciable risk"

- estimate the **Probable Daily Intake (PDI)**
  based on food consumption estimates

How are the permissible or acceptable levels of food additives decided?

According to FAO:

- Maintain nutritional quality
- Enhance stability/shelf life
- Make the food attractive without deception
- Essential aid to food processing

Only approved if PDI < ADI *and*

there is a **justified** need **(function)** for that additive

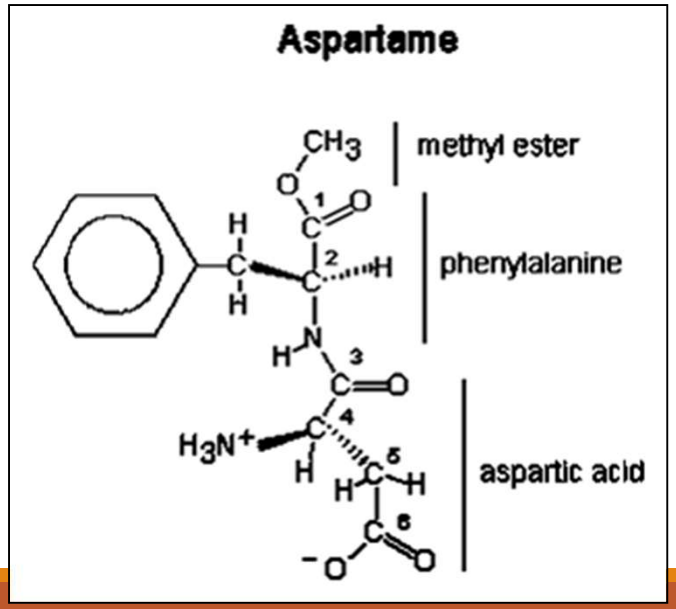
RISK-BENEFIT ANALYSIS OF FOOD ADDITIVES

Example 1: **Aspartame**

1) Food Additive

2) Classified as: **Sweetener** (see definition!)

3) **ADI=** 40 mg/kg bw



Risk/benefit analysis for **Aspartame**

Benefits:

<u>Sweetener</u> for:

- Lower caloric content in diet- *why?*
- Diabetics- *why?*
- reducing dental caries- *why?*

Risks:

any evidence of harm to our health?

Risk/benefit analysis for Aspartame

metabolized to

- aspartic acid, phenylalanine = amino acids naturally occurring in proteins
- methanol – **toxic** at high doses, formed in other foods too
  - Pectin of fruits & veg., juices
    - 1 cup tomato juice = **6x** more methanol > 1 cup diet pop
  - Metabolic pathways – excreted
  - no effect observed at doses equivalent to **50** 12-oz cans of beverage!

Risk/benefit analysis for **Aspartame**

Other…

- Long-term storage *or* high temp:

  DKP (diketopiperazine)
  - not a common food ingredient
  - will cause loss of sweetness intensity
  - no evidence of carcinogenicity (?)

Risk/benefit analysis for **Aspartame**

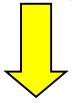
Health Canada

- Evaluated toxicological tests in Lab animals
- Continue examining results of clinical studies (humans)
- No evidence to pose a health hazard to consumers
- **ADI: 40 mg/kg b.w.**

Joint Expert Committee on Food Additives – (JECFA) UN/FAO

World Health Organization

Scientific Committee for Food of the EC



safe

Risk/benefit analysis for **Aspartame**

No evidence of harm to our health Except:

- metabolic disorder *phenylketonuria (PKU)*
  - **inability to metabolize phenylalanine**

- Mandatory labeling specific for Aspartame

Risk/benefit analysis for Aspartame-Labeling requirement

- contain a statement on the label saying "contains Aspartame" or sweetened by Aspartame"; individually or in conjunction with other sweeteners
- list aspartame in the list of ingredients; and
- must also indicate the aspartame content expressed in milligrams per serving of the stated size.
- stating " Aspartame contains phenylalanine”

Risk/benefit analysis for Aspartame
Consideration for minimizing risk

1. Continue research for possible harm
2. Encouragement for alternatives/potentiators
3. Customize labelling requirements

Risk/benefit analysis for Aspartame

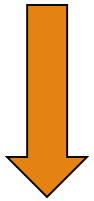
Consideration for minimizing risk

1. Continue research for possible harm
2. Encouragement for alternatives/potentiators
3. Customize labelling requirements

Risk/benefit analysis for Aspartame-Outcome

Benefits outweigh the risks

Complies with food additive regulations



Therefore approved as food additive

Risk/benefit analysis for Aspartame-Outcome…

Aspartame – **Sweetener** (Sw)

Permitted at specific levels of use in:

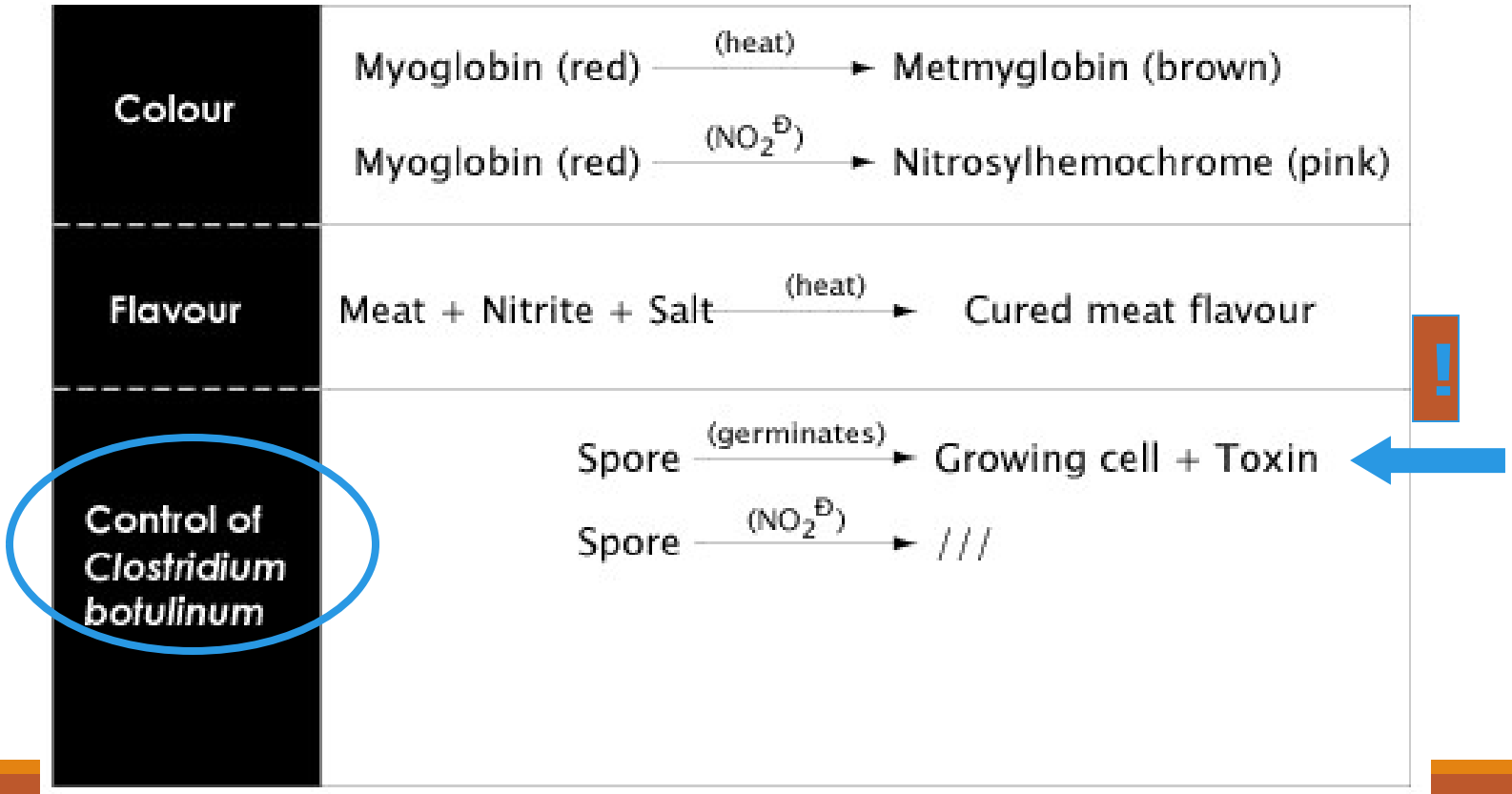
Beverages, breakfast cereals, Desserts, yogurt, spreads,…

Example 2: **Nitrites**

Recommended Reading: "Nitrate, Nitrite & Nitroso compounds in foods"

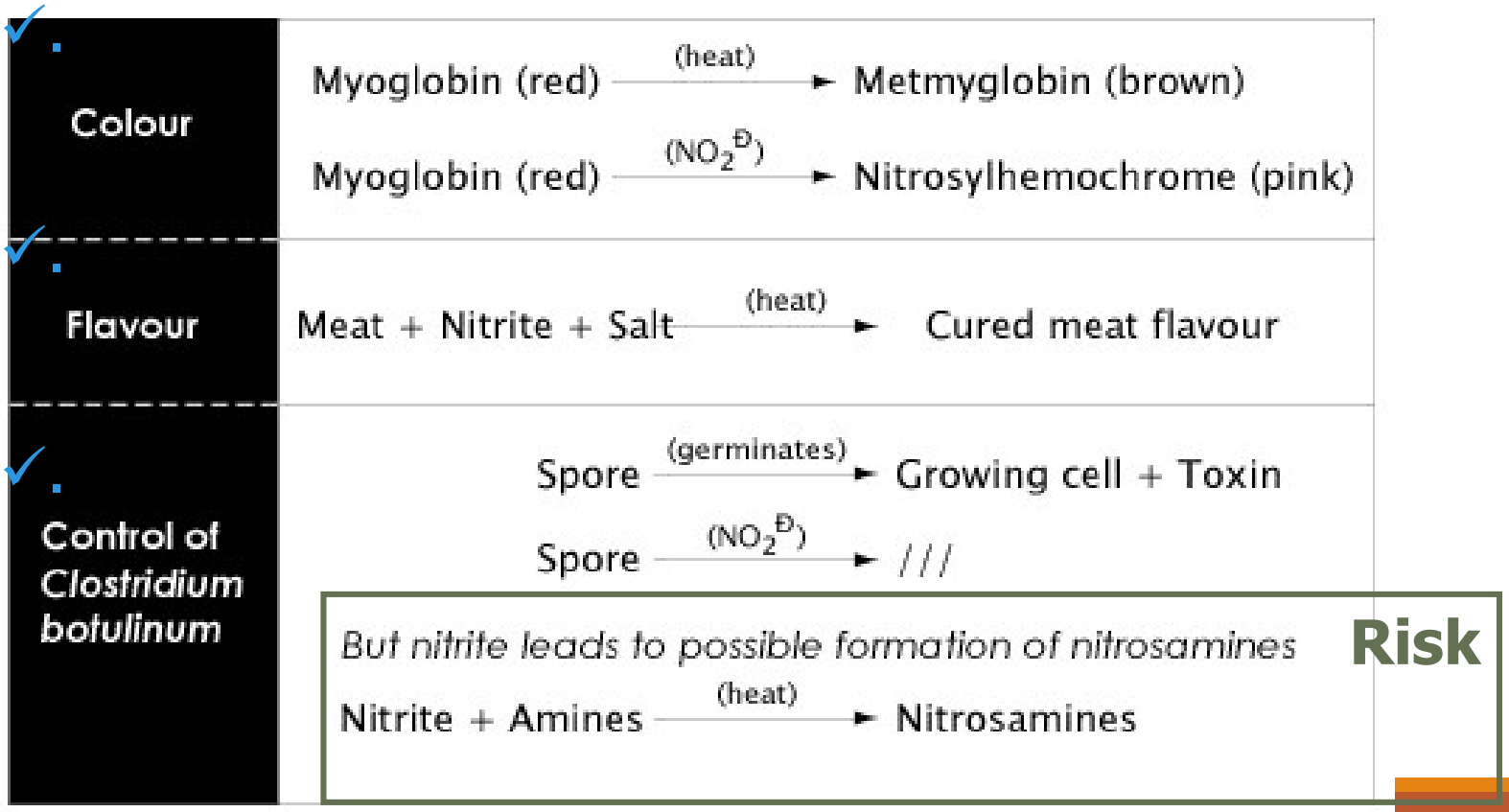
Risk/benefit analysis for **Nitrites**

Benefits



Risk/benefit analysis for Nitrites

Benefits



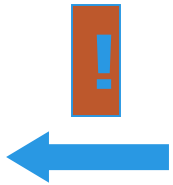
Risk/benefit analysis for **Nitrites**

Benefits:

- **Antimicrobial (most important)**

(against *Clostridium botulinum* – botulism)

- **Enhanced colour, flavour, texture**



Risks:

production of nitrosamines (carcinogenic)

take a look at:

Concentrations of nitrosamines, nitrite and nitrate in foods from total diet study 2001 (Health Canada)

Nitrates (NO_3^-)

↓

Nitrites (NO_2^-) + Amines → **Nitrosamines** (nitroso compounds)

Note: **Cured meats are <u>not</u> the major sources of nitrates (NO_3) and nitrites (NO_2)**

Risk/benefit analysis for Nitrites

- *cured meats* - minor contribution to our total nitrites
  - tobacco products, beer, fried bacon – much higher
  - **intrinsic** production via nitrates → nitrites in our saliva

Risk/benefit analysis for Nitrites-Outcome

- Nitrates (NO_3) – naturally in vegetables; also in our saliva;
  - Vegetables: **86**%; cured meat: **9**%; other foods: 5%

- Nitrites (NO_2) – converted from nitrates in our saliva
  - saliva: **77**%; cured meat: **21**%; other foods: 2%

Risk/benefit analysis for Nitrites-Outcome

Table 3 in Reading:

estimated relative exposure to nitrosamines

(micrograms per person/d):

cigarette smoking (17) > beer (0.3-0.97) > automobile interiors > cosmetics > cooked bacon (0.17) > Scotch whiskey

Risk/benefit analysis for Nitrites- Consideration for minimizing risk

1. Continue research for possible alternatives/potentiators
2. Upper limit has been established
3. Educate consumers

Risk/benefit analysis for Nitrites-Outcome

How important are cured meats in contributing to nitrosamine exposure?

Not all nitrosamines are carcinogenic

Cured meats -relatively minor contribution,

BUT should still try to minimize nitrosamines in them:

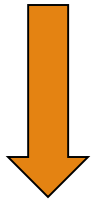
- **Ascorbic acid**, **Na-erythorbate** (isoascorbate), **tocopherol** (Vit E)
- **Lactic acid** cultures + fermentable sugar (→ acidic pH) to control ***C. botulinum***

Risk/benefit analysis for Nitrites-Outcome

Most importantly:
No other product as effective against *Clostridium botulinum*

Benefits outweighs the risks

Complies with food additive regulations



Therefore approved as food additive

Risk/benefit analysis for Nitrites-Outcome…

Nitrites – **preservative** (P)

Permitted at specific levels of use in:

dry sausage, preserved meat products, ripened cheese, side bacon, pumping pickle, cover pickle, dry cure

Terms to remember

Health Canada

Canadian Food Inspection Agency

Food and Drugs Act and Regulations

Standards of identity and composition

Food Grades

No Adverse Effect Level (NAOEL)

Acceptable Daily Intake (ADI)

Probable Daily Intake (PDI)

Diketopiperazine (DKP)

Phenylketonuria (PKU)

Clostridium botulinum

Nitrosamines