Lesson 4 Food Standards, Regulations & Guides- Food Additives

Required 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 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 ...

WHO is responsible?

See Table 4.1

Various levels of government:

- Federal:
  - Health Canada (HC)/
    Health Products and Food Branch (HPFB)
  - Canadian Food Inspection Agency (CFIA)
  - Industry Canada (IC)
- Provincial: BC Ministry of Health
- Municipal: Public Health Inspectors

What are they responsible for?

Federal

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

- **CFIA** – enforces these standards
  - inspection of food (processing plants, animal and plant health),
  - grade standards for products,
  - regulations with respect to labelling, packaging, advertising (shared with HC)

What are they responsible for?

Provincial–

- **Food produced & sold exclusively within borders**

- **BC Ministries of Health/Agriculture, Food & Fisheries –**
  - inspection of provincially meat and dairy processing plants, retail stores, food service outlets
- **Municipal**:
  - inspection of retail stores and food service outlets

Where are the specific regulations found?

1. **Food and Drugs Act of Canada –**
   - *<u>Do not</u> confuse with Food and Drug Administration (FDA)-U.S.*

2. **Consumer Packaging and Labelling Act**

3. **Canadian Agricultural Products Act**, sets food grades standards

A more detailed look at some examples of specific regulations

1. **Food and Drugs Act of Canada –**
   - the foundation of **consumer protection laws** (see **Box 4.1**)
   - includes **standards of food identity and composition** (Box 4.2)

Box 4.1: Consumer protection laws; Experts from the FDA of Canada; Sections 3, 4, 5 and 7:

- ***In summary:***

  "…No person shall sell, advertise, label or manufacture any food, drug, cosmetic…"

  - Has poisonous/harmful substances
  - Unfit for human consumption
  - Advertises cure/treatment for diseases**

** 2002 amendments to the *Food and Drug Regulations*

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

1. **Food and Drugs Act of Canada –**

- the foundation of **consumer protection laws** (see Box 4.1)
- includes **standards of food identity and composition** (Box 4.2)

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 **> 300** foods

standards of food identity and composition…

- There are **28** Divisions in Part B of the F&D Act:

  E.g.
  - Division 2: Alcoholic beverages
  - Division 4: Cocoa and Chocolate products
  - Division 5: Coffee
  - Division 8: Dairy products
  - Division 16: Food additives

http://laws.justice.gc.ca./eng/regulations/C.R.C.,_c._870/index.html

Visit one of these **28 Divisions**
Look for Stds. of I.D. and Composition

Examples of specific regulations –

2. Consumer Packaging and Labelling Act ("Food Labelling Requirements")

- stipulates the information that is required on pre-packaged foods

French and English!

common name of the food

name & address of responsible party

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

net quantity
540 mL

Calories and **13 key nutrients**
http://www.inspection.gc.ca/english/fssa/labeti/guide/ch6e.shtml

storage instructions:
"Refrigerate unused portions immediately"

Best before or durable life date?

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

<u>Other:</u> MSG, % milk fat in dairy prod., aspartame, ingredients that are *allergens*

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

- Disease Reduction claims
- Therapeutic claims
- Function claims
  - Nutrients claims
- General Health claims

http://www.inspection.gc.ca/english/fssa/labeti/guide/ch8e.shtml

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

Some examples of disease reduction claims

http://www.hc-sc.gc.ca/fn-an/label-etiquet/claims-reclam/permitted_claims-allegations_autorisees-eng.php
http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._870/page-54.html#docCont
http://www.inspection.gc.ca/english/fssa/labeti/guide/ch7ae.shtml

1. A diet low in sodium reduces risk of high blood pressure
2. A diet with adequate calcium and Vitamin D, and regular physical activity, reduces risk of osteoporosis
3. A diet low in saturated and trans-fats reduces risk of heart disease
4. A diet rich in vegetables and fruit reduces risk of some types of cancer
5. Does not promote tooth decay

Is this claim allowed in Canada?

Regulations: Nutrient Content & Diet-related health claims

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

- See Lesson 4….

Lean vs regular beef patties

- http://www.inspection.gc.ca/english/fssa/labeti/retdet/bulletins/meavia/burgere.shtml

A more detailed look at some examples of specific regulations

3. **Canadian Agricultural Products Act,**
   sets food grades standards

Complete Activity #1 using Excerpts from the Canada Agricultural Products Act at the Department of Justice Canada website http://laws.justice.gc.ca/en/C-0.4/index.html

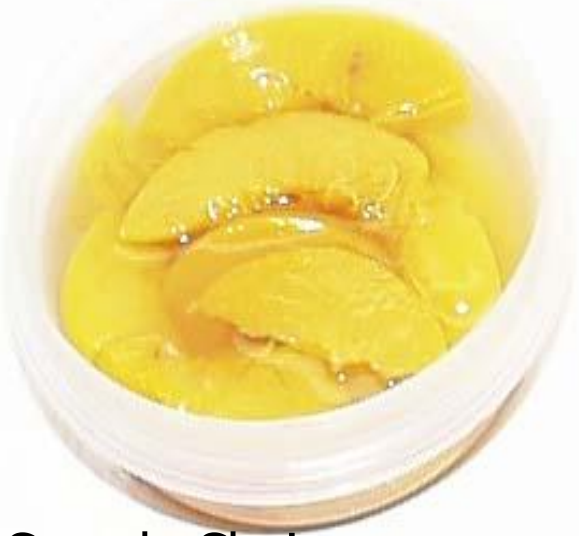
(3) Canada's Food Grades

- **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

Examples of food grade standards – 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**.

lower price

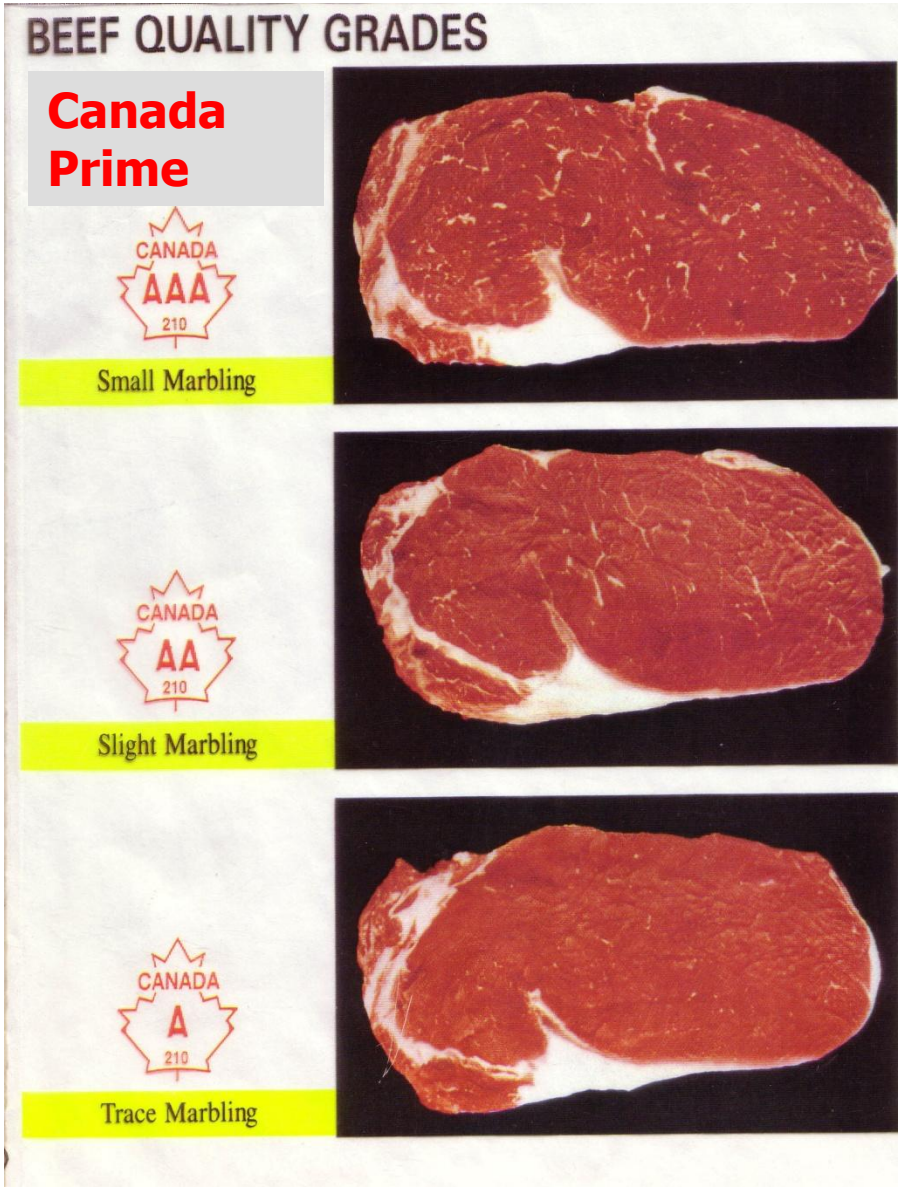
Canada B

Visit Justice Canada

Canada D

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

marbling



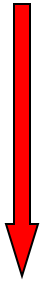
slightly abundant, small amount

a slight amount

traces

Examples of food grade standards - Eggs

- **Grades**
  - **A**
  - **B**
  - **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)

Video time

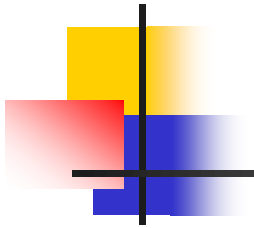
Food & Drugs Act/Food & Drug Regulations apply to food and drugs. **What if it's neither food nor drug?**

- Natural Health Products (NHP) –
  - new Directorate (1999) within **Health Canada**
  - NHP - "medicinal ingredient"
    - 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
  - 1963 by the WHO and FAO of the United Nations
  - international food standards (>160 countries, including Canada)



Food Additives

Food Additives

- Canadian Definition

  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**

Food Additives

Definition of food additive in Canada

does NOT include:

- nutritive material, vitamins, amino acids, mineral nutrients (Part D: Divisions 1-5)
- spices, seasonings, flavourings …

See the links below

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

Food Additives

additives permitted:

- **in Canada ~300**
- **in the US > 2,600**

Definition of Food Additive in Canada

does NOT include:

- nutritive material, vitamins, amino acids, mineral nutrients
- spices, seasonings, flavourings …
- food packaging components*
- drugs administered to animals consumed as foods*
- agricultural chemical residues*

***In the US the above are included as additives (unintentional)**
In Canada these are contaminants

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

Food additive regulations in **Canada**

Food and Drug Regulations **Division 16** = **Food Additives**

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

http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._870/page-160.html#docCont

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, and the **Maximum amount** permitted
  - absence = not approved for that particular food

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 + outside experts weigh the **risks and benefits**
   - *accept* or *reject* the application

How are the acceptable levels of food additives decided?

Animal studies**:**

- **no effect level** (NOEL) **=** highest level tested which caused no harmful effects in test animals

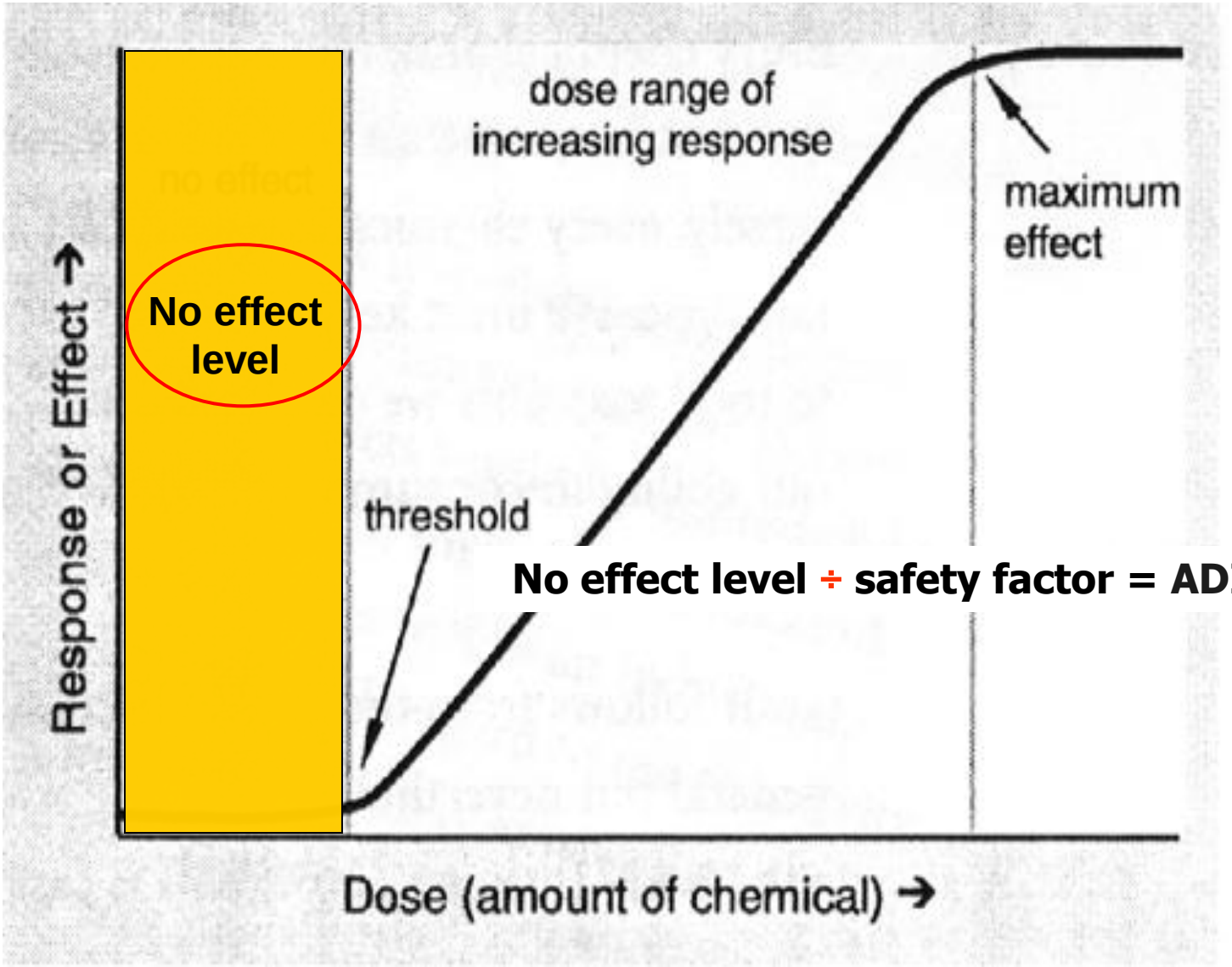
Humans:

- **no effect level =** animal NOEL **÷** 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 effect level (NOEL) = highest level tested which caused no harmful effects in test animals

humans:

- **no effect level** = animal NOEL ÷ 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

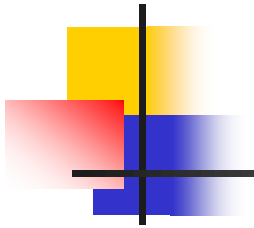
How are the permissible or acceptable levels of food additives decided?

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



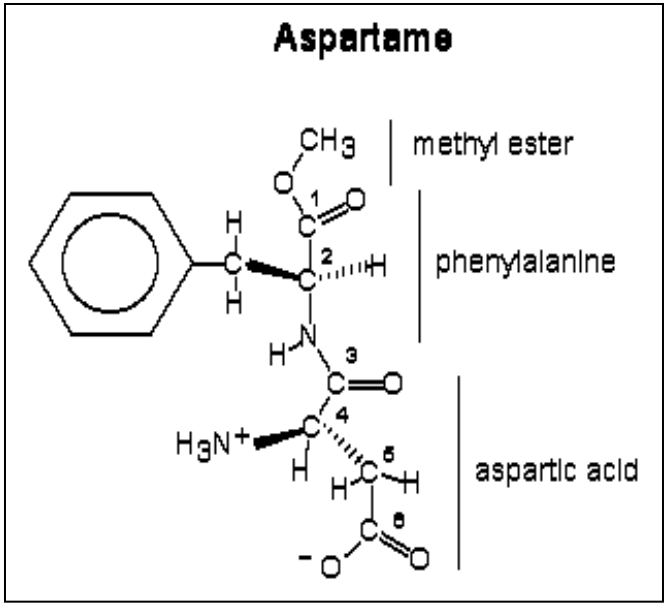
- **maintain nutritional quality**
  - preservatives
- **enhance and stability/shelf life**
  - preservatives, pH adjusting agents, sequestering agents; anti-caking agents, starch-modifying agents
- **make the food attractive without deception**
  - sweeteners, colouring agents, glazing agents …
- **provide essential aids to food processing**
  - emulsifying, gelling, stabilizing, thickening agents,
  - carrier or extraction solvents
  - starch modifying agents
  - enzymes ….

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 equiv 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

Risk/benefit analysis for Aspartame

No evidence of harm to our health Except:

- metabolic disorder *phenylketonuria (PKU)*
  - **inability to metabolize phenylalanine**
  - LABELLING is mandatory!

"Contains Phenylalanine"

Read the specific labeling info in lesson4

(50 in the US)

What is the ADI of Aspartame ?

ADI – **40 mg/kg** body weight per day

? How much diet pop does this represent?

- see Lesson 4 for the calculation → almost 5 litres!

What is your Probable Daily Intake?

Note: 49 mg aspartame/100 ml used for calculation – based on aspartame as the sole sweetener in the diet pop.

In Canada, many diet pop products contain blends of aspartame & acesulfame K (per 100 ml)

eg. diet sprite	21 mg	14 mg
diet Coke	37 mg	4.3 mg

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

1. Submit applications to Health Canada
2. Health Canada solicits comments
3. Panel of HC + outside experts weigh the **risks and benefits**
   - *accept* or *reject* the application

According to FAO:

1. Maintain nutritional quality
2. Enhance stability/shelf life
3. Make the food attractive w/o deception
4. Essential aid to food processing

Only approved if PDI < ADI *and*

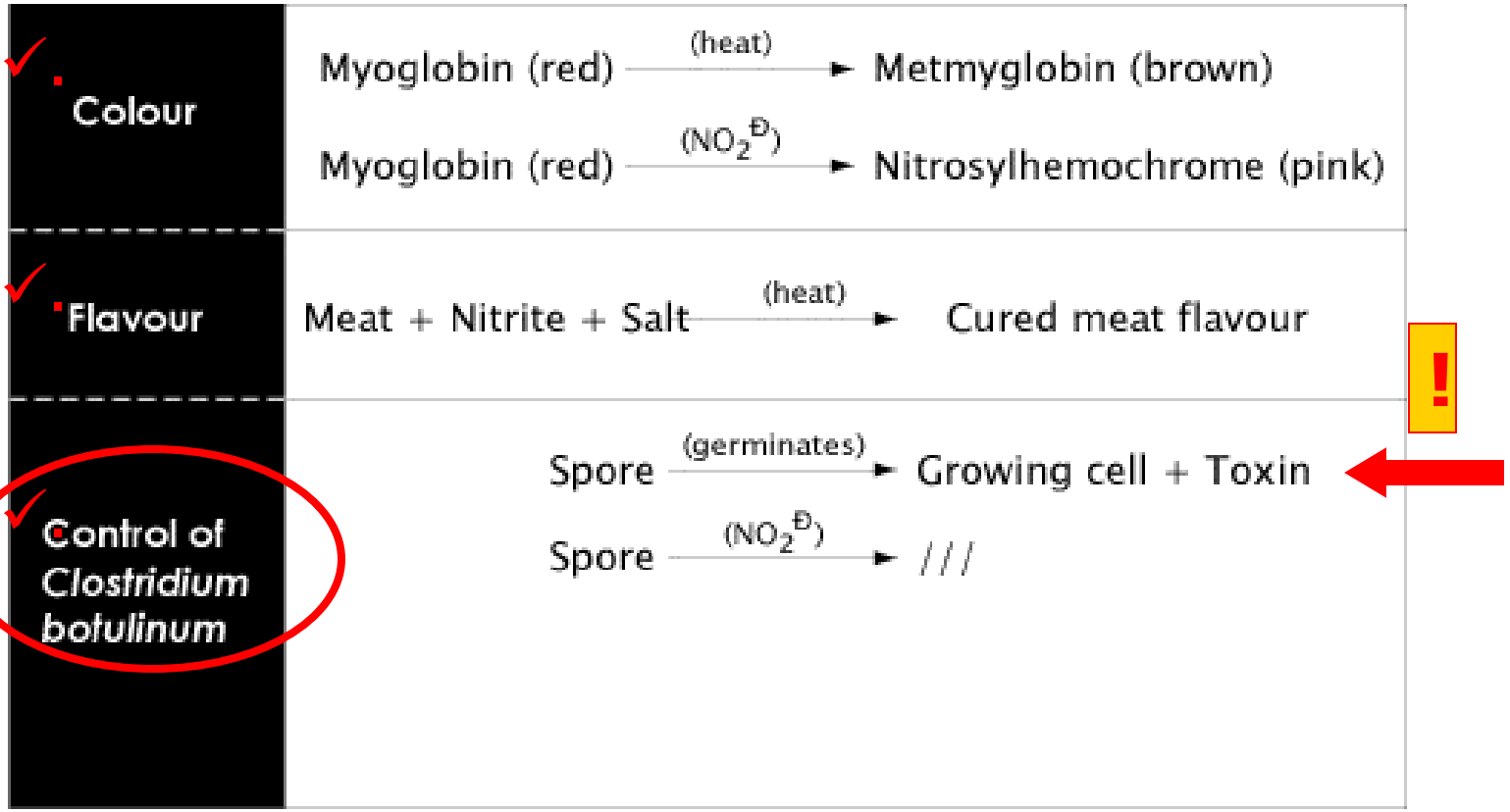
there is a **justified** need **(function)** for that additive

Example 2: Nitrites

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

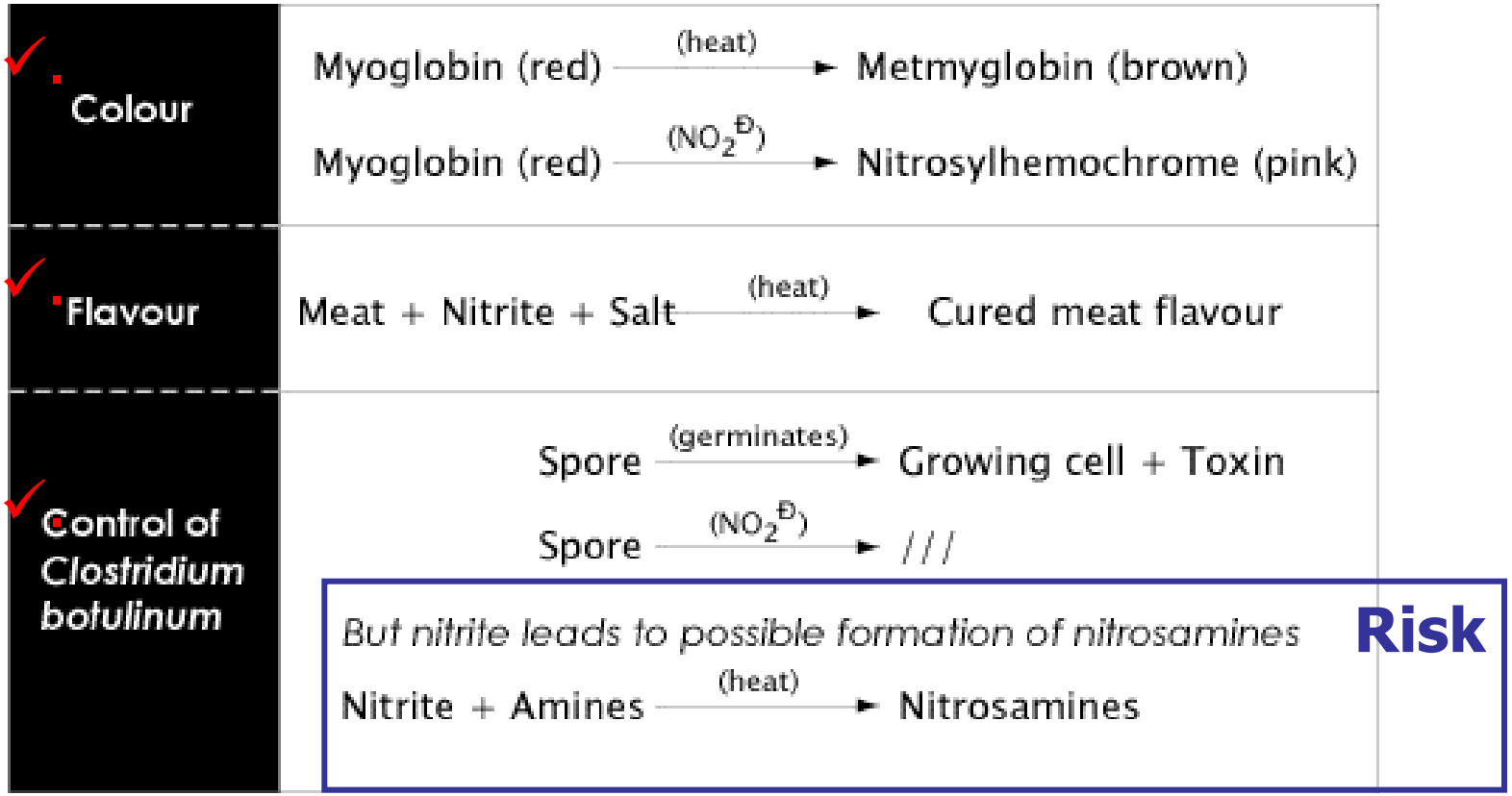
Risk/benefit analysis for Nitrites

Benefits



Risk/benefit analysis for Nitrites

Benefits



Risk/benefit analysis for Nitrites

Benefits:

Safe, stable cured meats

- **antimicrobial**

  (against *Clostridium botulinum* – botulism)

- 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

Outcome of the analysis

- 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%

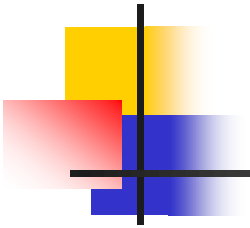


Table 3 in Reading:

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

How important are cured meats in contributing to nitrosamine exposure?

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 + fementable sugar (→ acidic pH) to control *C. botulinum*

Based on the risk/benefit analysis …

Nitrites – **preservative** (P)

Permitted in or on (at specific levels of use):

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 Effect Level (NOEL)**
- **Acceptable Daily Intake (ADI)**
- **Probable Daily Intake (PDI)**
- **Diketopiperazine (DKP)**
- **Phenylketonuria (PKU)**
- ***Clostridium botulinum***
- **Nitrosamines**