GFORSS
Global Food Regulatory Science Society

Global Gateway

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International Trade Centre

MARKUP II
EU-EAC Market Access Upgrade Programme Phase II

REGIONAL TRAINING ON SCIENTIFIC BASIS OF CODEX WITH FOCUS ON DATA GENERATION AND SUBMISSION FOR STANDARDS SETTING

23-25 July 2025 • Zanzibar, Tanzania

Introduction to Total Diet Studies – An Integral Part of the Food Monitoring Initiatives Supporting Food Regulatory Decision-Making

Day 1: 23 July 2025

Purpose of Food Monitoring Initiatives

- Development of Data that Help Document Baseline Levels of Chemicals in Food
- Enable Identification of Key Sources of Exposure
- Support Exposure Assessment: Key Representation of a Local Risk Assessment

Focus on Management of Chemicals in Food

Ensure that Chemical hazards are not present in food at LEVELS that lead to adverse health effects to humans

HAZARD: potential for a chemical or other pollutant to cause human illness or injury (inherent toxicity of a compound)

RISK: a measure of the probability that damage to health and/or the environment will occur as a result of a given hazard

Approach to Manage Chemicals

According to the Mode of Introduction

Deliberate Addition for an Effect

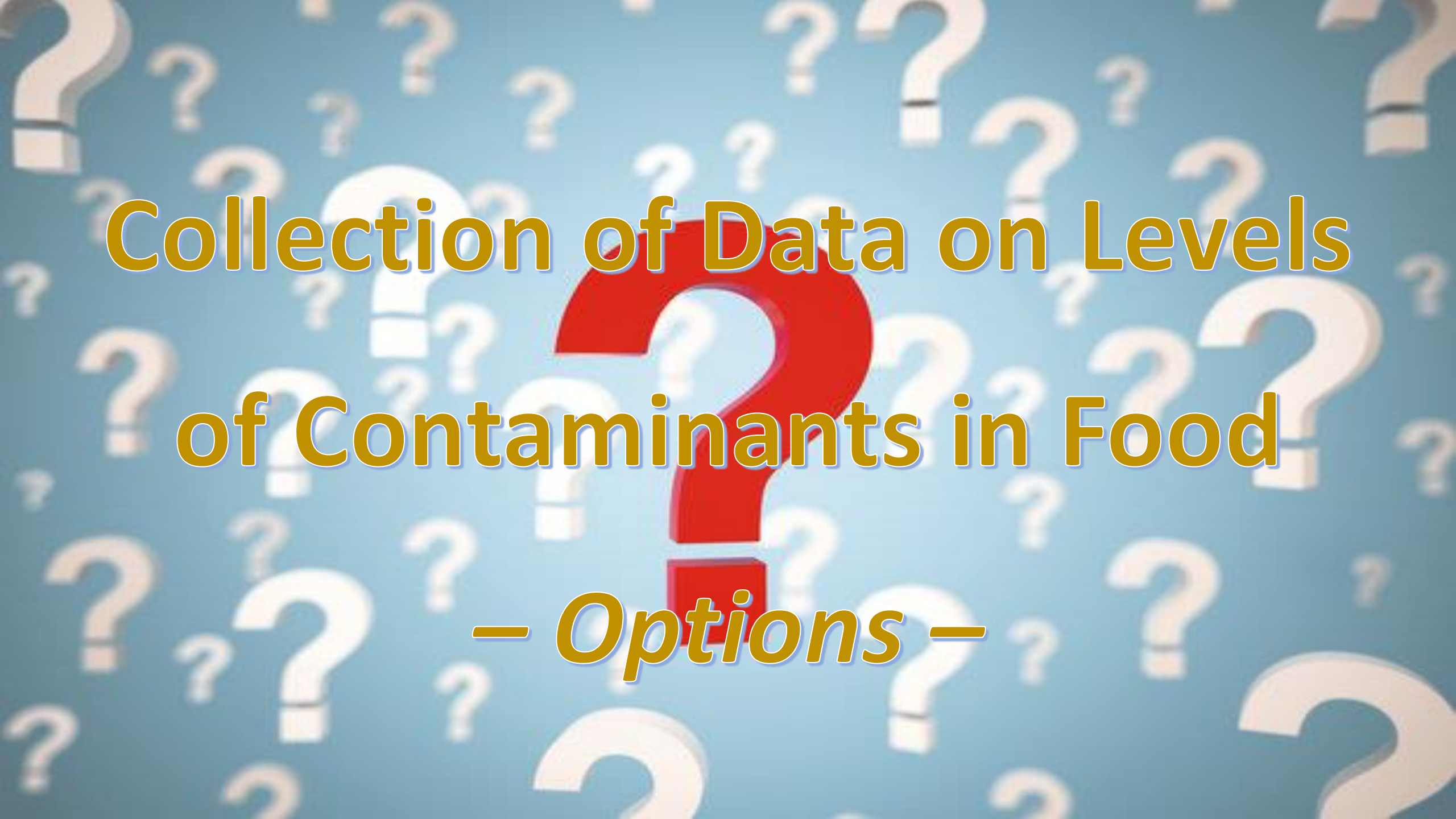
- ❑ Technological Reason, e.g.: Additives, Flavouring Agents
- ❑ Optimization of Conditions of Production

Non-Deliberate Presence

- ❑ Contamination
- ❑ Cross Contamination (including points of introduction)

PREMARKET MANAGEMENT

POSTMARKET MANAGEMENT:


Collection of Data on Levels
of Contaminants in Food
– Options –

Chemical Data Collection – Options

- Use of data generated as a result of compliance verification campaigns:
  - Target commodities / chemicals.
  - At levels close to compliance targets.
  - Occurrence data on products as sold.
- Useful for several efforts of exposure assessment:
  - E.g. Hg in fish, Cd in seafood, etc.
- Useful to monitor compliance with:
  - MRLs, e.g. pesticides and vet drugs.
  - Fortification Levels , e.g. vitamins and minerals.

Chemical Data Collection – Options (2)

- Design and implement specific foundational surveys:
  - In Food:
    - Total Diet Study.
  - Biomonitoring:
    - Human Milk Survey.
    - Occurrence of targeted chemicals, e.g. PoPs, in other physiological fluids.
    - Health measures surveys, NHAENS, e.g. PoPs in blood, Na in urine.

- Design and implement targeted programs to address specific chemicals – additives and contaminants – in response to risk management requirements:
  - E.g. ochratoxin A in cereal-based products and coffee products (TDS may not offer a fulsome portrait of level of contamination and precise exposure levels).
  - E.g. process-induced chemicals: acrylamide (baked products, potato products, coffee), benzene (soft drinks).

Total Diet Study – TDS

- ❑TDS is the most cost-effective method of obtaining human exposure
- ❑Representative of what a population consumes:
  - Purchase of foods at retail level
- ❑Processing of foods as for consumption
- ❑Analysis for selected analytes
- ❑Calculation of dietary intakes using food intake data

TDS – Determination of Foods to be Sampled

- Based on consumption studies, including old information.
- Focus on key ingredients that make food products most consumed:
  - Dairy products.
  - Fish and fish products.
  - Meats and meat products.
  - Cereal-based products.
  - Poultry and poultry products.

Foods are Prepared as Consumed

- Composites are prepared with different representation of the manner in which food is eaten.
  - E.g. Beef:
    - Roast in oven (cross rib) at 163 °C until well-done.
    - Stewing beef simmered in pot with water until well-done.
    - Composite 1:1.

- Choices have to be made, for example:
  - Pie = apple pie.
  - Cake – 1:1, yellow : chocolate cake
  - Ice cream – 1:1, vanilla : chocolate
- Use of water available for cooking in a given city.

Example of Dairy Products Composites

Dairy products	
A01	Milk, whole
A02	Milk, 2%
A03	Milk, 1%
A04	Milk, skim
A05	Evaporated milk, canned
A06	Cream, half and half (10–12% BF)
A07	Ice cream (chocolate ice cream **and**[a] vanilla ice milk)[b] {1:1}[a]
A08	Yogurt (plain, low fat **and** strawberry, sweetened, pre-stirred)
A09	Cheese (cheddar, sharp **or**[c] mild)
A10	Cheese, cottage (creamed, 4% BF)
A11	Cheese, processed (cheddar)
A12	Butter

Example of Composites

Meats and meat products	
B01	Beef, steak (sirloin) [broil in oven to medium-well done][d]
B02	Beef, roast (cross rib roast [well done in oven at 163°C][d] **and** stewing beef [simmer in pot with water until well done]) {1:1}
B03	Beef, ground (regular) [heat 350-g patties on pan in oven at 176°C until well done]
B04	Pork, fresh (roast [roast at 163°C in oven until well done] **and** chops [fry in pan on trimmed fat]) {1:1}
B05	Pork, cured (ham [bake at 176°C in oven until well done], bacon [heat at 176°C in oven until crisp] **and** sausage [heat at 176°C in oven until done]) {2:1:1}
B06	Veal (cutlets) [fry using trimmed fat]
B07	Lamb (chops) [broil on rack in oven]
B08	Cold cuts and luncheon meats (ham, salami **and** bologna, luncheon meat type, not hard) {1:1:1}
B09	Luncheon meats, canned (beef canned **and** pork canned) {1:1}
B10	Organ meats, liver **and** kidney (beef **or**[a] calf liver, **and** chicken liver **and** beef kidney) [simmer in minimum water and drain] {1:1:1}
B11	Wieners (all beef **or**[a] pork and beef) [boil and drain]
Poultry and poultry products	
C01	Eggs (medium) [boil 15 min]
C02	Poultry, chicken and turkey (small chicken **and** small turkey) [eviscerate and roast at 176°C until well done]

Addition of Special Category of Foods

Foods to be cooked in package	
M01	Popcorn (microwave)
M02	Frozen entrees (microwave **or** boiling) [boiled in water]
M03	Frozen entrees (microwave **or** boiling) [same as composite M02 but prepared in microwave oven]
M04	Frozen entrees (microwave **or** oven) [prepared in conventional oven]
M05	Frozen entrees (microwave **or** oven) [same as composite M04 but prepared in microwave oven]
M06	Frozen dinner, beef + vegetables with or without dessert [cook as label directs]
Fast foods	
N01	Pizza
N02	French fries
N03	Hamburger
N04	Fish burger
N05	Chicken burger
N06	Hot dog
N07	Chicken (breaded, fried, nuggets **or** pieces)
N08	Egg breakfast on a bun **or** bagel **or** muffin **or** croissant

Special Category may include targeted populations

Baby foods

L01	Cereals (mixed) [following label directions, prepare using whole milk composite A01]
L02	Desserts
L03	Dinners (cereal + vegetable + meat)
L04	Dinners (meat **or** poultry **and** vegetable, e.g., beef dinner, chicken dinner)
L05	Formulas, milk base, ready-to-use
L06	Formulas, soya base, powder [follow label directions]
L07	Fruit (apple **or** peaches)
L08	Meat, poultry **or** eggs
L09	Vegetables, peas

Foods to be cooked in package

Target Analytes: Examples

- Dioxins, furans, brominated diphenyl ethers
- Trace elements:
  - Pb, Cd, Al, Co, Zn, Cu, Rb, Sr, Y, Mo, Ba, La, Ce, Tl, Bi, Th
- PCBs (40 congeners)
- Pesticides (over 65 compounds)
- Acrylamide, Furan
- Nitrosamines
- Radionuclides
- Disinfection by-products

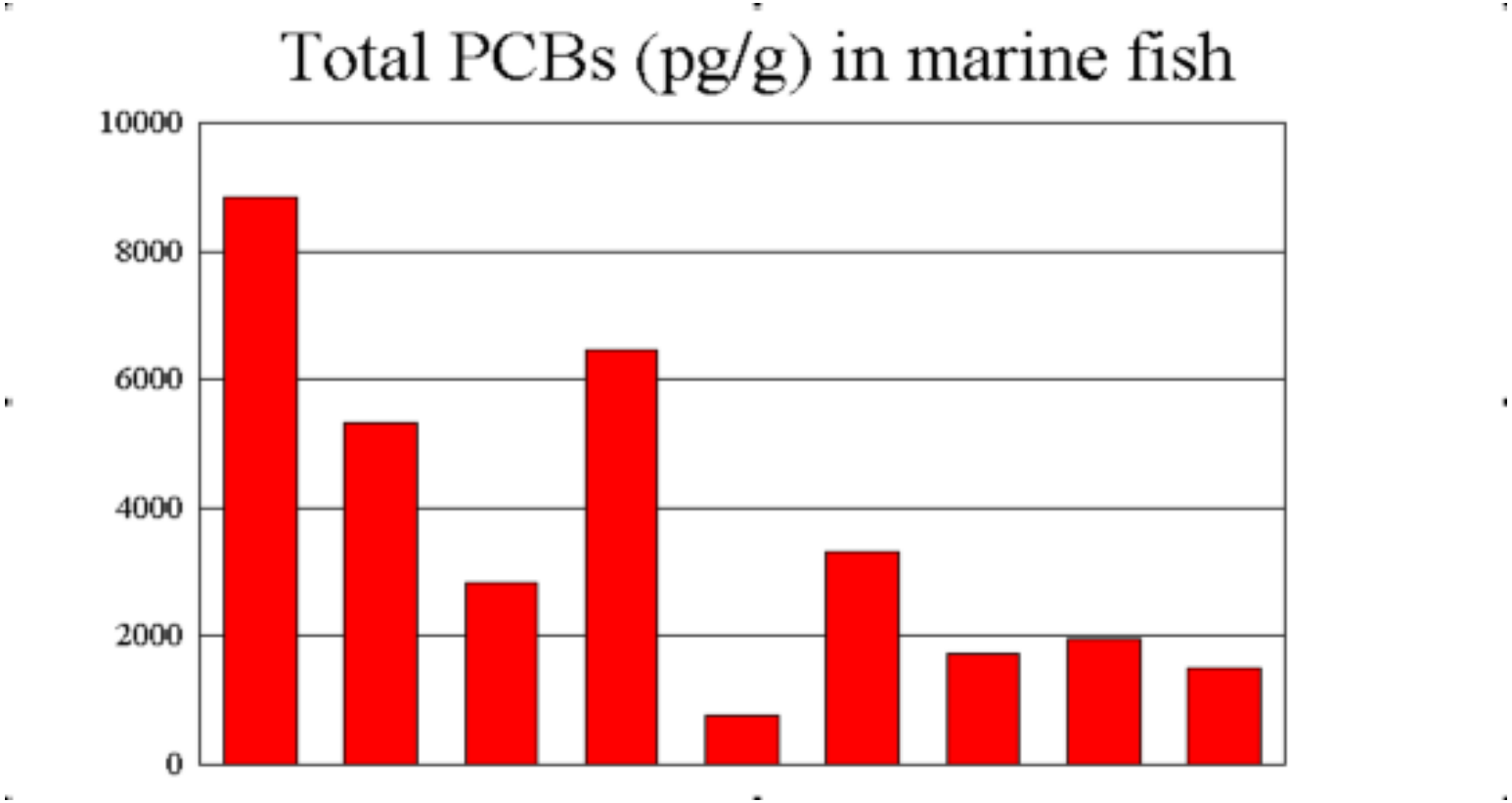
Example of Results and information obtained from TDS

% CONTRIBUTION OF FOOD GROUPS TO TOTAL MERCURY AND DIOXIN TEQ INTAKES BY 1-4 YEAR OLDS

FOOD CATEGORY	Hg	TEQ
MILK, DAIRY	22	62
MEAT	8	17
POULTRY	8	13
FISH	40	1.1
SOUPS	1.7	1.5
FATS AND OILS	0.3	2.2

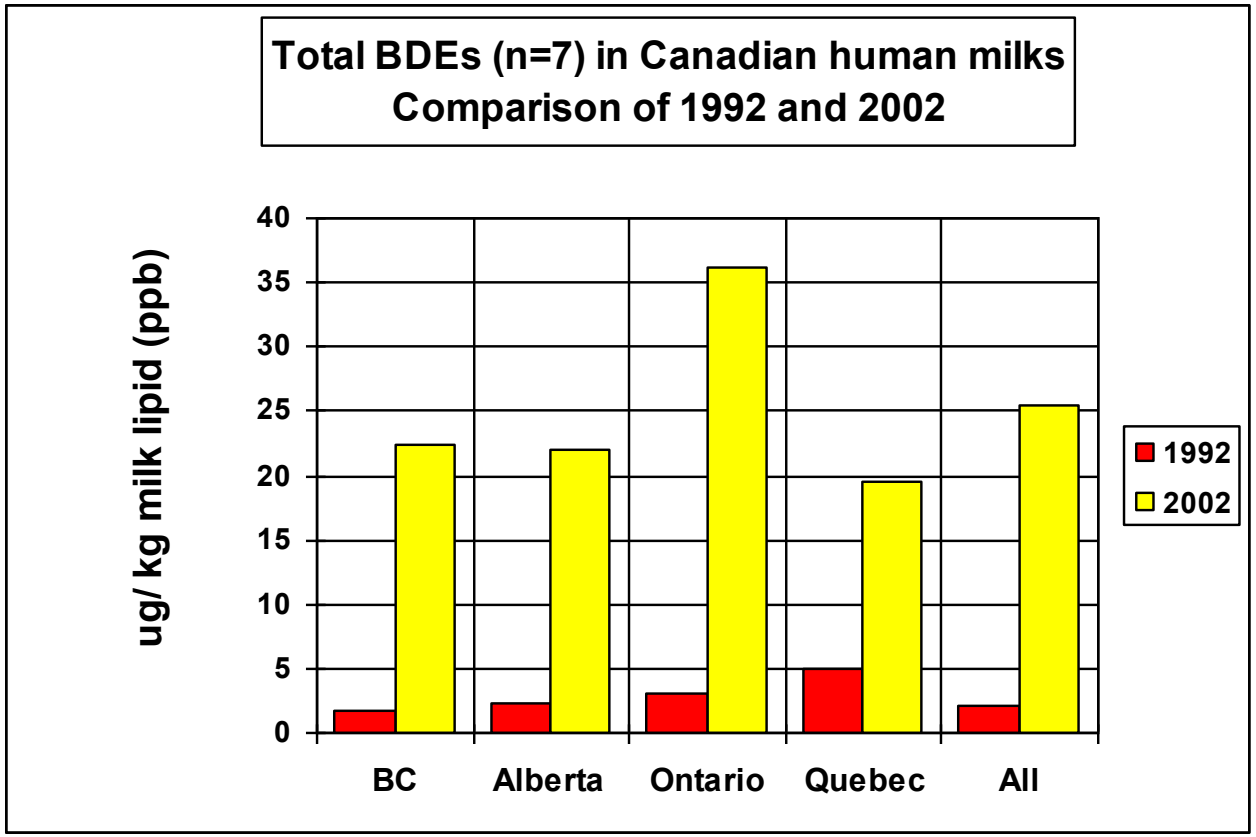
Importance of TDS

Effectiveness of Risk Management Strategies



Importance of Other Surveillance / Monitoring Activities

Human Biomonitoring – Human Milk




Monitoring of Chemicals in Food
Is an Important Element of
Risk Management Strategies
for Chemicals in Food

Monitoring … Helps us Check our Progress Towards

***A**s*

***L**ow*

***A**s*

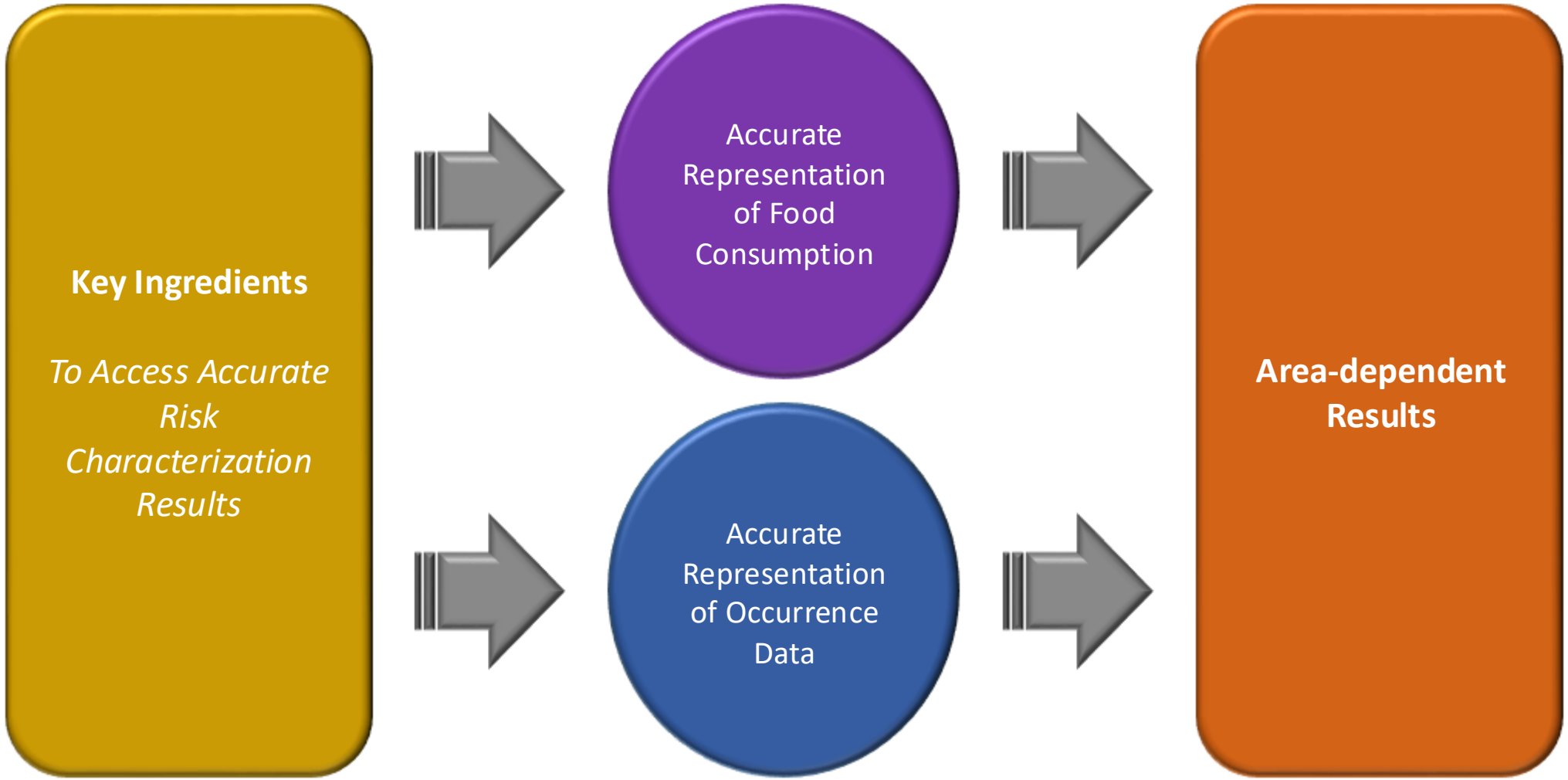
***R**easonably*

***A**chievable*

Same Old... Same Old... Yet NEW... Priorities

- Persistent organic pollutants (POPs):
  - E.g. Dioxins/Furans, PCBs, old pesticides – OCs.
- Emerging contaminants:
  - E.g. PBDEs, PFCs, etc.
- Priority toxic elements:
  - E.g. Lead, methylmercury and cadmium.
- "Ionic toxicants":
  - E.g. Perchlorate.
- Process-induced chemicals:
  - E.g. Acrylamide in fried and baked foods, furan in baby foods, semi-carbazide in baby jar sealants or in baked foods, Benzene in soft drinks
- Sudan colours in food (Fraud Issues).
- Malachite green in seafood (domestic and imported) – Fraud Issues (Illicit Fungicide Use).
- Unapproved veterinary residues in foods:
  - Chloramphenicol in seafood and honey, nitofurans / fluoroquinolones in aqauculture products.

Risk Characterization – Key Ingredients




thank you
merci
gracias
danke
謝謝
ngiyabonga
teşekkür ederim
tapadh leat
спасибо
dank je
obrigado
obrigada
bedankt
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go raibh maith agat
mochchakkeram
dakujem
arigatô
grazie
terima kasih
kop khun krap
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