KISR

5th Saudi Conference for Food and Nutrition
Riyadh, Saudi Arabia
February 9-11, 2010

See page 16

The Dietary Exposure Assessment to Selected Food Additives and Contaminants for the GCC Countries Population

Dr. Husam Fahd Alomirah

Biotechnology Department, Kuwait Institute for Scientific Research

Overview

- Food Safety Challenges
- Risk Analysis
- Risk Assessment
- Surveillance of Mycotoxins and Antimicrobial Residues
- Estimation of Dietary Intake of Acrylamide, Selected Pesticides and Food Color Additives
- Getting Started on a Risk Assessment in GCC Countries

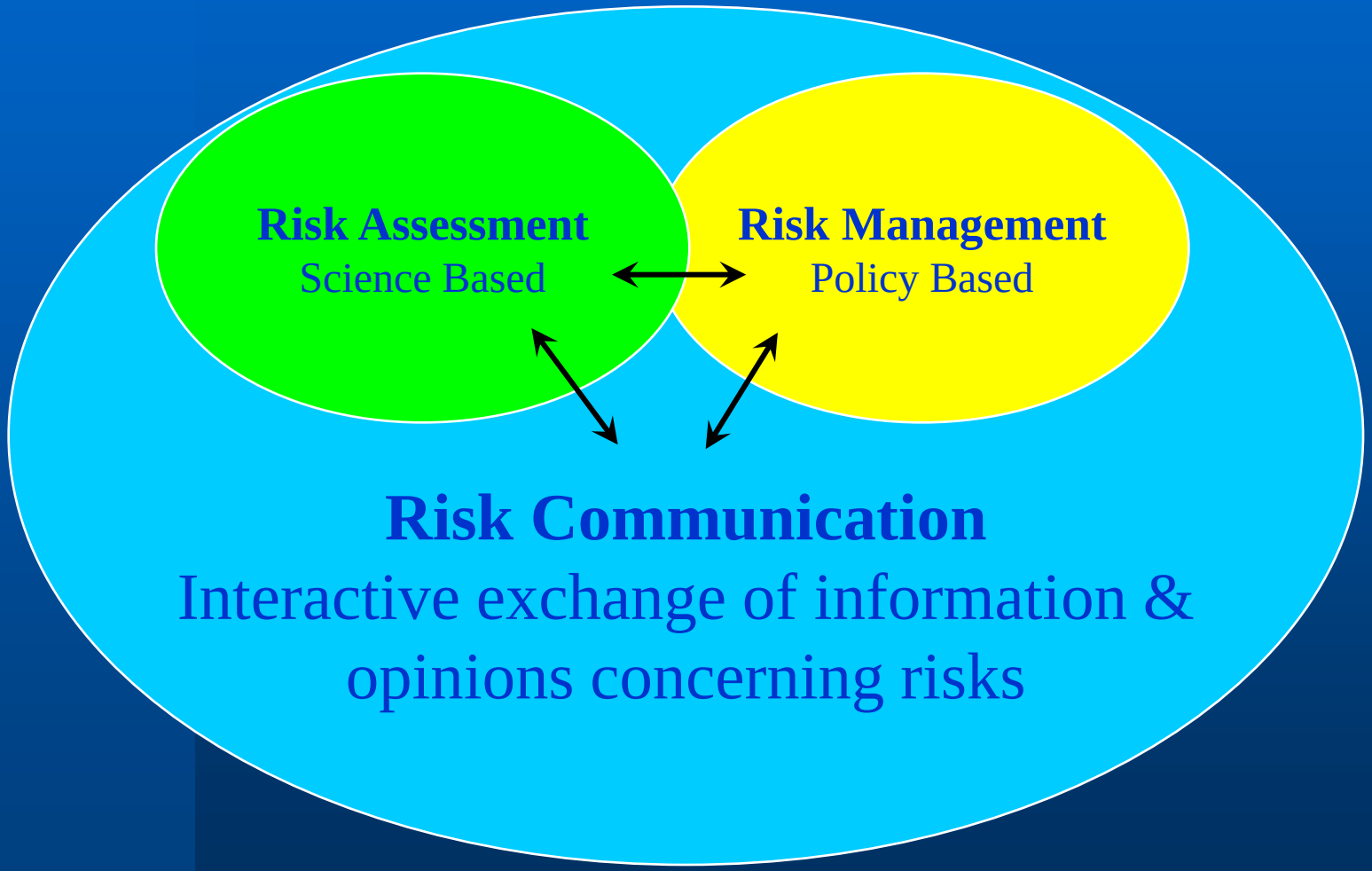
Food Safety Challenges

- New technologies
- Expanding trade opportunities and volumes
- Ethnic diversity in the population
- Changing eating patterns
- Increasing in competition (safer products for less money)
- Increasing knowledge and modern analytical tools (e.g. acrylamide)

Risk Analysis

- Structured way of examining and incorporating the wide variety of factors that impact on a decision-making process.
- Identify, assess and manage food-related health risks within a structured framework.

Risk Analysis



WHO/FAO, 2005

Risk Analysis

Do we tell children to never cross a road because we believe it is too dangerous?
No -we assess the risk and introduce suitable control measures, e.g. Always use the green cross code!

Elephant in the room…(or on their way)

An improperly conducted risk assessment is riskier than any risk that you may find…

Risk Analysis

Evidence derived from quality scientific data and information

- **Food Surveillance**
  - **Continuous survey of microbiological and chemical contaminants (domestic and imported foods)**
- **National Nutrition Survey**
  - **5 to 10 years**
- **Food Composition Program**
  - **Generate and compile nutrient composition data for national foods (composition tables and electronic databases)**
- **Total Diet Study**
  - **dietary exposure (intake) to a range of food chemicals including food additives, nutrients, pesticide residues, contaminants and other substances.**
- **Monitoring and evaluation**
  - **impact, effectiveness and appropriateness of implementing key food regulatory measures**

Risk Assessment

- **Hazard identification: The identification of known or potential health effects associated with a particular agent which may be present in food.**
- **Hazard characterization: The quantitative evaluation of the nature of the adverse effects associated with that agents (dose-response assessment)**

Risk Assessment

- **Exposure assessment: The qualitative and/or quantitative evaluation of the degree of intake likely to occur.**
  - **combining data on concentration in all food products with data on their consumption**
- **Risk characterization: Integration of the above into an estimation of the adverse effects likely to occur in a given population.**

Surveillance of Mycotoxins

Contam.	Country	Year	Commodity	No. of samples	Levels
Afl. (M1)	UAE	1995	Human milk	445	99.5% were contaminated with levels ranging from 2 ppt to 3 ppb.
Afl. (M1)	Kuwait	2001	Dairy products	54	28% were contaminated with 6% above the MPL.
Afl. (M1)	Kuwait	2009	Milk, cheese and feed	445	80% were contaminated with 2-15% above the MPL .
Afl. (B1)	UAE	1999	Rice	500	64% of long grain rice and 32% of short grain rice were contaminated at levels ranging from 1.2 to 16.5 ppb.
Afl.	Oman	2002	Spices	105	45% were contaminated but did not exceed the MPL.
Afl., OTA, ZEA, DON	Qatar	2004	Food products	106	3.7-26.5% were contaminated in the range of 0.15-183 ppb .
Afl., OTA, STC, PAT.	Saudi Arabia	2009	Green coffee bean	30	43% were contaminated with a mean concentration of 29.7 ppb.

Maximum tolerance limit of M1 in human milk in European Union and USA (25 ppt) and Australia and Switzerland (10 ppt).

Maximum tolerance limit of B1=2 ppb, Total= 4 ppb, Feed= 20 ppb, M1=25 to 50 ppt

Surveillance of Antimicrobial Residues

Contaminants	Country	Year	Commodity	No. of samples	Levels
Tetracyclines	Saudi Arabia	2000	Poultry products	33 broiler and 5 layer farms.	70% (broiler) and 60% (layer) of products were contaminated in these farms and at least one sample exceeded MRL/+ve farm.
Tetracyclines	Kuwait	2009	Dairy products, eggs and tissue samples	1517	5% of poultry and 18% of milk samples exceeded the MRL
β-lactams	Oman	2004	Milk	5 brand for 15 months	Antimicrobial activity present in all brands
Tetracyclines Streptomycyin Chloramphenicol Sulphamethazene	Oman	2004	Goat and sheep meat	40	Almost all samples were contaminated but did not exceed the MRL.
β-lactams, Tetracyclines Sulfonamides Chloramphenicol	Kuwait	2007	Dairy products	1000	29% of fresh milk, 5% of pasteurized milk and a 10% of cheese samples exceeded the MRL

Surveillance of other Contaminants

- Heavy metals
- Microbiological contaminants
- PAHs, OCPs, PCBs
- Migration of packaging materials

Estimated Dietary Intake of Acrylamide

Country	Subject/age group	Dietary Exposure (µg/kg bw/day) /Age group	Food Items/ Sample Analyzed	Food sample with highest mean concentration (µg/kg)	Food contributors to total exposure (%)
United Arab Emirates (2004)	637 subjects (12-65 yrs.)	Mean (>20 yrs.) 0.9-1.0 Mean (12-20 yrs.) 1.2 Mean (<12 yrs.) 2.0	116	Potato chips = 1063 Deep fried food = 191 Bakery products = 132	Potato chips and crisps = 44% Pizza = 14% Fried grilled potatoes = 13%
Kuwait (2008)	5,490 subjects (2 mos-92 yrs.)	Total Population Mean 1.9 90th Percentile 3.9	800 (13 Food categories)	Potato chips = 572 Potato crisps = 332 Biscuits = 235	Potato chips = 32% Mixed dishes = 27% Potato crisps = 13%
Saudi Arabia (2009)	50 subjects (18-20 yrs.) 50 subjects (infants: first 6 months)	Mean (18-20 yrs.) 0.87 Mean (6 months) 0.075	30 (12 Food Categories)	Grilled eggplant = 950 Soluble coffee = 820 Korse omar cookies = 350	Arabian bread = 18% Soluble coffee = 13% Barely coffee = 11%

Estimated Dietary Intake of Selected Pesticides

- Dietary intake of pesticides residues in Kuwait, 1999.
- 11 Food groups, 664 food items.
- 6,700 subjects (5 months- >65 years) divided in 19 different population group.

Pesticides	Food group with highest concentration levels (µg/kg)	Subject (age group)	Exposure (ng/kg bw/day)
7 OPs	Grains 10-840 Composite dishes 10-330 Vegetables 50-200	30-39 years 15-19 years	62.6 52.3
3 OCs	Fruits 13-470	30-39 years 15-19 years	9.0 8.4
2 Carbamates	Fruits and Vegetables 63-5000	30-39 years 15-19 years	119.2 29.2
2 Benzimidazoles	Fruits 400-500	30-39 years 15-19 years	19.25 17.5
1 Phenylureas	Fruits 600	30-39 years 15-19 years	24.7 20.0

Total daily intake of these pesticides did not exceed the ADI per body weight set by the FAO/WHO 1993 but exceeded those of the USFDA.

Estimated Dietary Intake of Food Color Additives

- Dietary exposure to artificial food colors in Kuwait, 2006.
- 9 food categories, 344 food items analyzed.
- 3,141 children, 5 to 14 years old children from 58 schools
- 9 permitted and 2 non-permitted artificial food color additives
- The average daily intake of tartrazine, sunset yellow, carmoisine and allura red were substantially higher than their ADIs

9 Food Colors	Highest Concentration (mg/kg)	Highest Percentage Contribution	ADI (mg/kg bw)	Dietary Exposure (mg/kg body weight)							
				6 yrs		7 yrs		8 yrs		9 yrs	
				M	F	M	F	M	F	M	F
Tartrazine	Chewing Gum 0.1-1189	Drinks and Juices 83%	0-7.5	8.31	6.16	16.97	10.45	8.57	8.46	8.64	7.11
Sunset yellow	Chips and Pufak 0.1-1088	Drinks and Juices 68%	0-2.5	9.84	5.64	10.94	9.64	6.93	9.68	5.41	6.80
Carmoisine	Chewing Gum 2.8-1949	Drinks and Juices 87%	0-4	8.81	9.52	7.12	7.53	6.09	6.50	5.14	4.70
Allura Red	Drinks and Juices 0.1-2335	Drinks Juices 42%	0-7	21.03	13.86	10.90	13.25	5.66	7.91	6.45	27.50

Needed Food Safety Related Sciences

- Microbiology
  - (classical, predictive and molecular),
- Molecular genetics and genomics,
- Toxicology (chemical, veterinary pharmaceutical and biological),
- Allergy and food intolerance,
- Risk assessment, management and communication,
- Novel food technologies and packaging
- Consumer sciences.

Getting Started on a Risk Assessment in GCC Countries

- Predict and monitor the behavior and fate of relevant known and emerging biological and chemical hazards,
- Develop and improve risk assessment and risk-benefit evaluation process,
- Develop surveillance tools to ensure the safety of consumed food
- Understand and address consumer concerns with food safety issues

Thank you for your attention

- **Hazard: A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.**
- **Risk: = Likelihood of an adverse health effect**

X

Consequence of that effect.

Getting Started on a Risk Assessment in GCC Countries

- Assemble team
- Determine structural and operational chains of command and reporting mechanisms
- Evaluate and compile risks:
  - Phase 1: Review, Assessment, Measurement
  - Phase 2: Develop Risk Management and Compliance Structure
  - Phase 3: Implementation
  - Phase 4: Monitor