SAFOSO

Animal Health Matters.
For Safe Food Solutions.

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Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO

An introduction to Risk Assessment

Marco De Nardi (SAFOSO, MSP)

Overview

- **Concepts and definitions:**
  - Risk
  - Hazard
  - Risk Analysis and Risk Assessment

- **Approaches to Risk Assessment:**
  - OIE vs Codex Alimentarius Framework
  - Qualitative vs Quantitative

- **How to implement a risk assessment**

- Concepts and definitions

Concepts

- **Risk:**

- a situation involving exposure to danger
- the possibility that something unpleasant will happen

(Compact Oxford English Dictionary of Current English)

- **Risk:**

- A function of the **probability** of an adverse health effect and the severity of that effect, consequential to a **hazard(s)** in food.

(Codex Alimentarious Commission –CAC)

Quiz 1

- How would you define an Hazard?

Concepts: hazards

- **Hazards:**

Something that has the potential to have **negative effect** on **our health**. We call that negative effect **unwanted outcome**.

- **Hazards:**

A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect (*Codex Alimentarius Commission*)

A condition or physical situation with a potential for an undesirable consequence (*Society for Risk Analysis*)

Concepts: risk

- **Risk vs Hazard:**

– **Hazard**: something with the potential to cause harm.

– **Risk**: the likelihood of occurrence and the magnitude of consequences of a specified hazard being realized.

Concepts: risk and uncertainty

- **Risk** -> likelihood of particular outcome combined with impact
- **Uncertainty** -> reflects lack of knowledge in relation to likelihood
  - Need to distinguish between **chance error** and **bias**
  - Need to distinguish from **variability**

"the more we know, the better we know what we do not know, and the more elaborate our risk awareness becomes"

- Risk analysis

Concepts: risk analysis

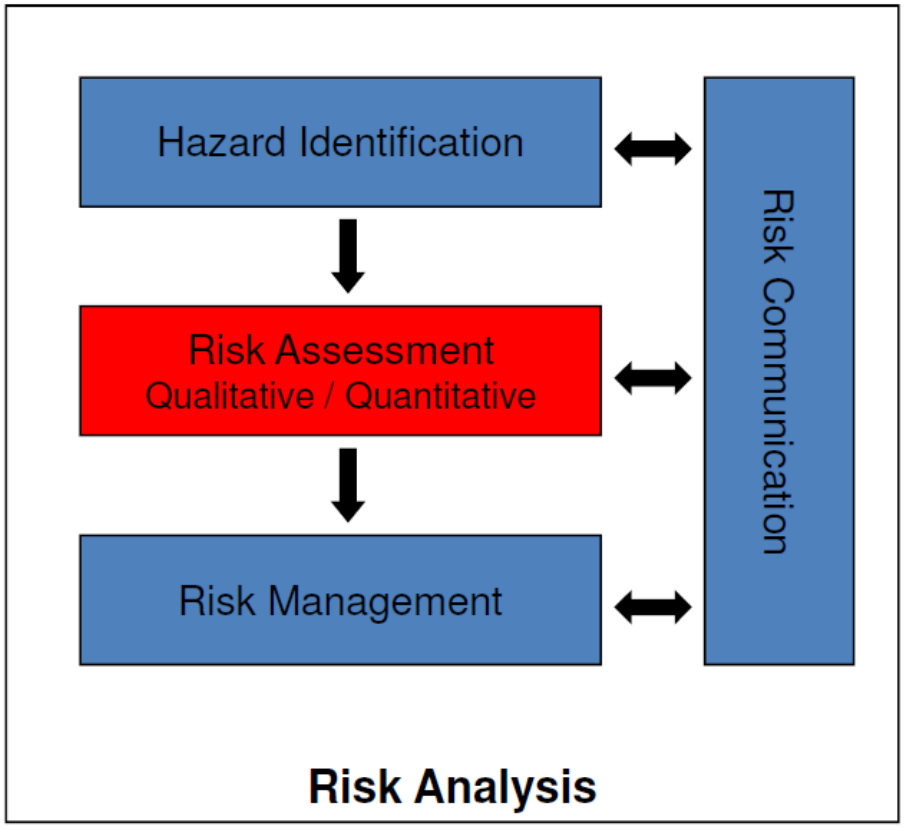
- **Risk Analysis:**
  - analytical process to estimate, evaluate and discuss the risk of an adverse event and its mitigation
  - process of estimating probabilities and expected consequences for identified risks (*Society for Risk Analysis: http://www.sra.org/resources_glossary*)
  - a structured, science-based approach
  - risk reduction (possibly elimination?)
  - documentation

Concepts: risk analysis

RA is a process consisting of 3-4 components:

hazards identification (*)
risk assessment,
risk management
risk communication.

(*)= only OIE



Concepts: risk analysis

- **Hazard Identification (HI) -** The identification of biological, chemical, and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods
- (HI = included in the Risk assessment component in the CAC framework As separate component in the OIE framework.)

- **Risk Assessment** - The process of evaluating the risk resulting from a hazard. A scientifically based process consisting of the following steps:

  (i) hazard identification,

  (ii) hazard characterization,

  (iii) exposure assessment,

  (iv) risk characterization.

Concepts: risk analysis

- **Risk Management** - The process, distinct from risk assessment of weighing policy alternatives, in consultation with all interested parties, considering risk assessment and other factors relevant for the health protection of consumers and for the promotion of fair trade practices, and, if needed, selecting appropriate prevention and control options.

- **Risk Communication** - The interactive exchange of information and opinions throughout the risk analysis process concerning risk, risk-related factors and risk perceptions, among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

Applications of risk analysis

- **Engineering**
  - •Nuclear power plants
  - •Chemical industry
  - •Pharmaceutical industry
  - •Construction industry

- **Management and finances**
  - •Project management
  - •Bank loans
  - •Stock market
  - •Insurance

Risk analysis in the veterinary field

- **International trade**
  - Animals
  - Animal products
  - Food
- **Domestic**
  - Contingency planning
  - Biosecurity, biosafety
  - Surveillance design

Example 1: **Import risk analysis**

- Importation of life turkeys from country X
- Risk of diseases x, y, z …
- Risk mitigation
  - Testing in country of origin
  - Quarantine
  - Testing in country of destination
- Risk of introducing disease?

Example 2: Food safety

- New production technology
- Raw product: fresh meat
- Risk of bacterial contamination
- Risk mitigation
  - Recipe
  - Temperature, salt, sugar, water content, acidity…
  - Cooling
- Risk of contamination at consumption?

Example 3: Surveillance

- Country X is free from disease y
- Surveillance

  Survey

  Random sample (animals, herds, flocks, farms …)

  Diagnostic test
- All tests are negative
- What is the risk of the disease being present and remaining undetected?

- Approaches to Risk Analysis

Approaches to Risk Analysis

- **Risk Analysis Systems:**

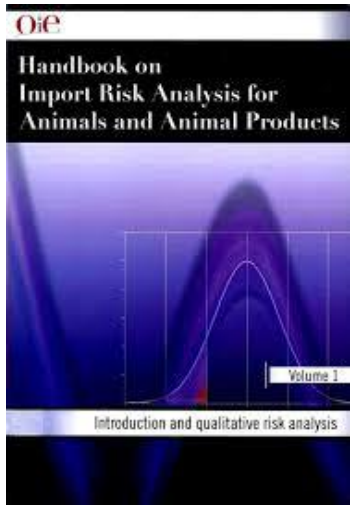
– **OIE** vs **Codex Alimentarius**

- **Risk Estimates:**

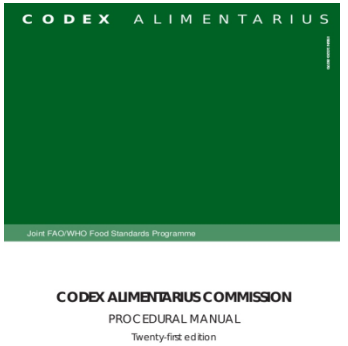
- Qualitative vs quantitative approach

Two approaches to risk analysis

- **OIE Animal Health Code approach**:
  - Based on Covello-Merkhofer model
  - **Versatile methods**. Able to answer risk questions of different types
  - Main focus: risk from importing animals or animal products



- **Codex Alimentarius Commission (CAC) approach**:
  - Based on USA National Academy of Science model (NAS-NRC)
  - Designed originally to answer questions in relation to maximum levels of substances or pathogens in food;
  - Main focus: Emphasis on food safety (**Microbiological Risk Assessment**, concerned with the risk from consuming food products)



Quiz 2

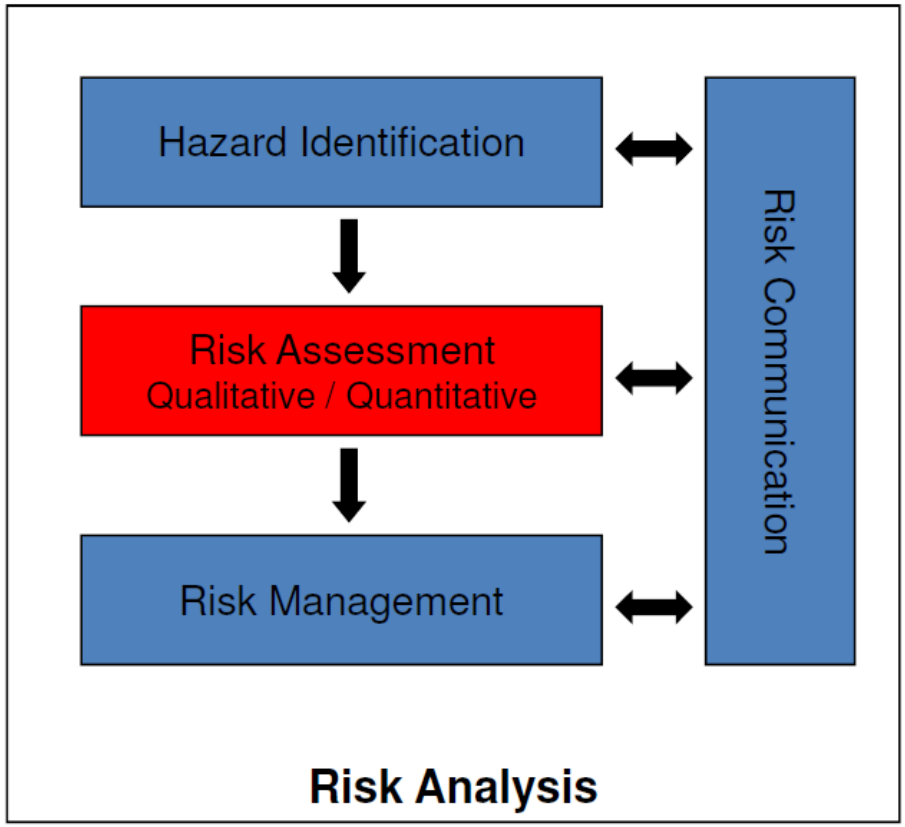
- Which approach would you use in the MSP?

➢ **<u>Not really important</u>. The differences are subtle. And whichever system is being used the same kind of information must be collected and organized an similar, transparent ways.**

- Risk assessment

Concepts: risk assessment

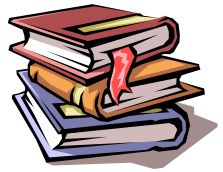
- Risk assessment is only part of the whole process of risk analysis:



What is risk assessment?

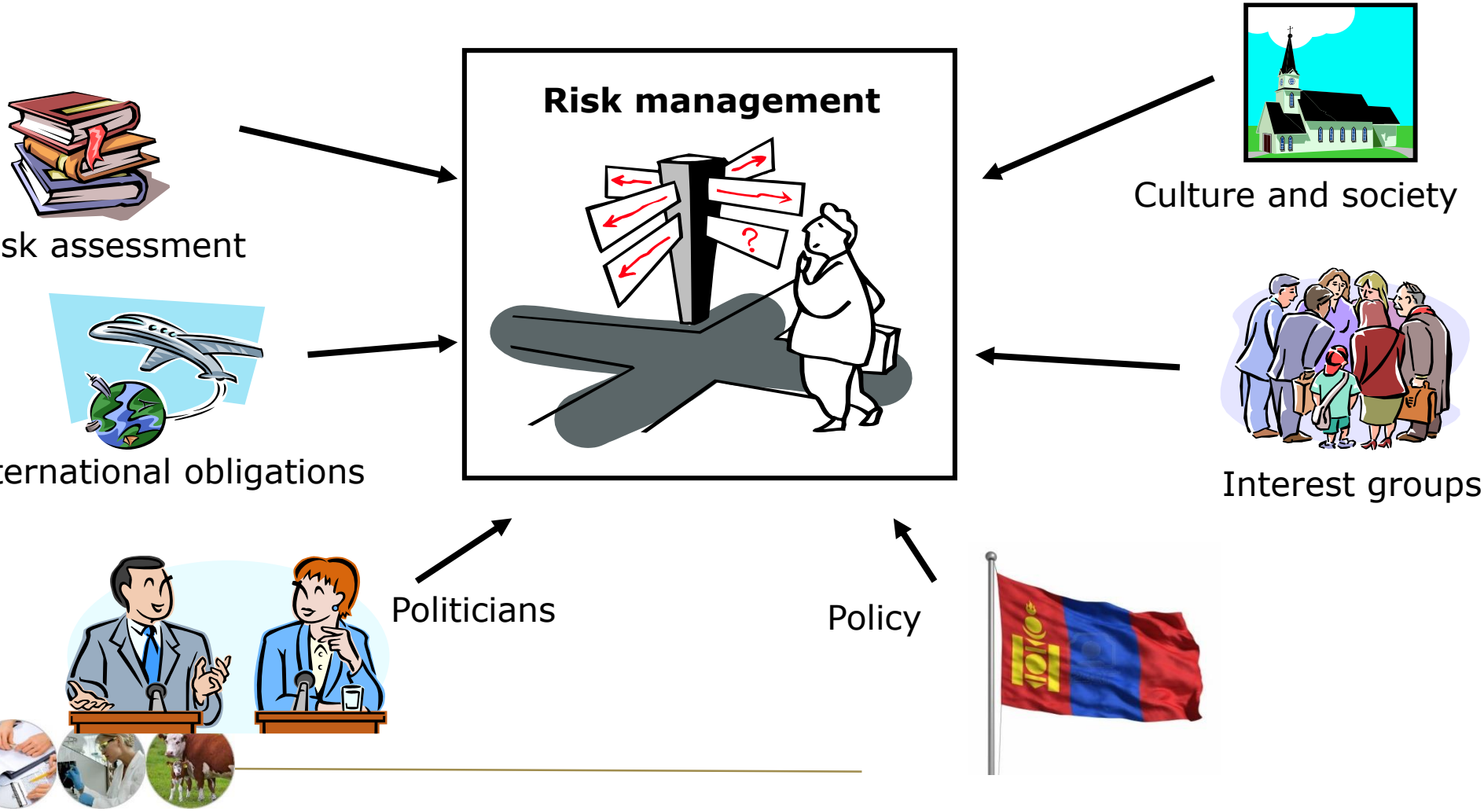
- Risk assessment is a **scientific process**

- Risk assessment is a **decision-support tool** for decision-makers (risk management)



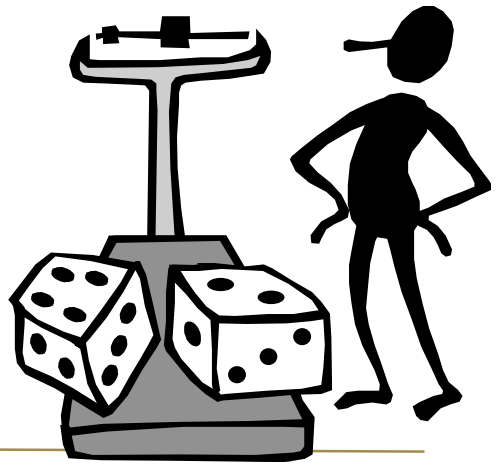
Risk assessment

What is risk assessment?



A risk assessment must determine:

- **What** can go wrong?
- How **likely** is it to go wrong?
- How **serious** would it be if it went wrong?
- What **can be done** to reduce the likelihood and/or the seriousness of it going wrong?



Examples of risk assessments

Trop Anim Health Prod
DOI 10.1007/s11250-01

ORIGINAL RESE

Risk assess

Kohls *et al. Virology Journal* 2011, **8**:187
http://www.virologyj.com/content/8/1/187

VIROLOGY JOURNAL

SHORT REPORT **Open Access**

Avian influenza virus risk assessment in falconry

Rev. sci. tech. Off. int. Epiz., 2009, **28** (3), 917-931

A qualitative risk assessment of factors contributing to foot and mouth disease outbreaks in cattle along the western boundary of the Kruger National Park

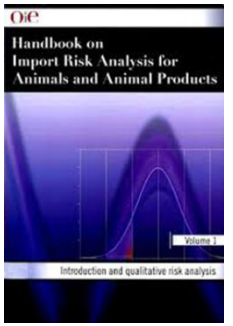
F. Jori [1, 2], W. Vosloo [5, 6], B. Du Plessis [3], R. Bengis [4], D. Brahmbhatt [8], B. Gummow [2, 9] & G.R. Thomson [7]

PS one

Can

- Risk assessment OIE and CAC

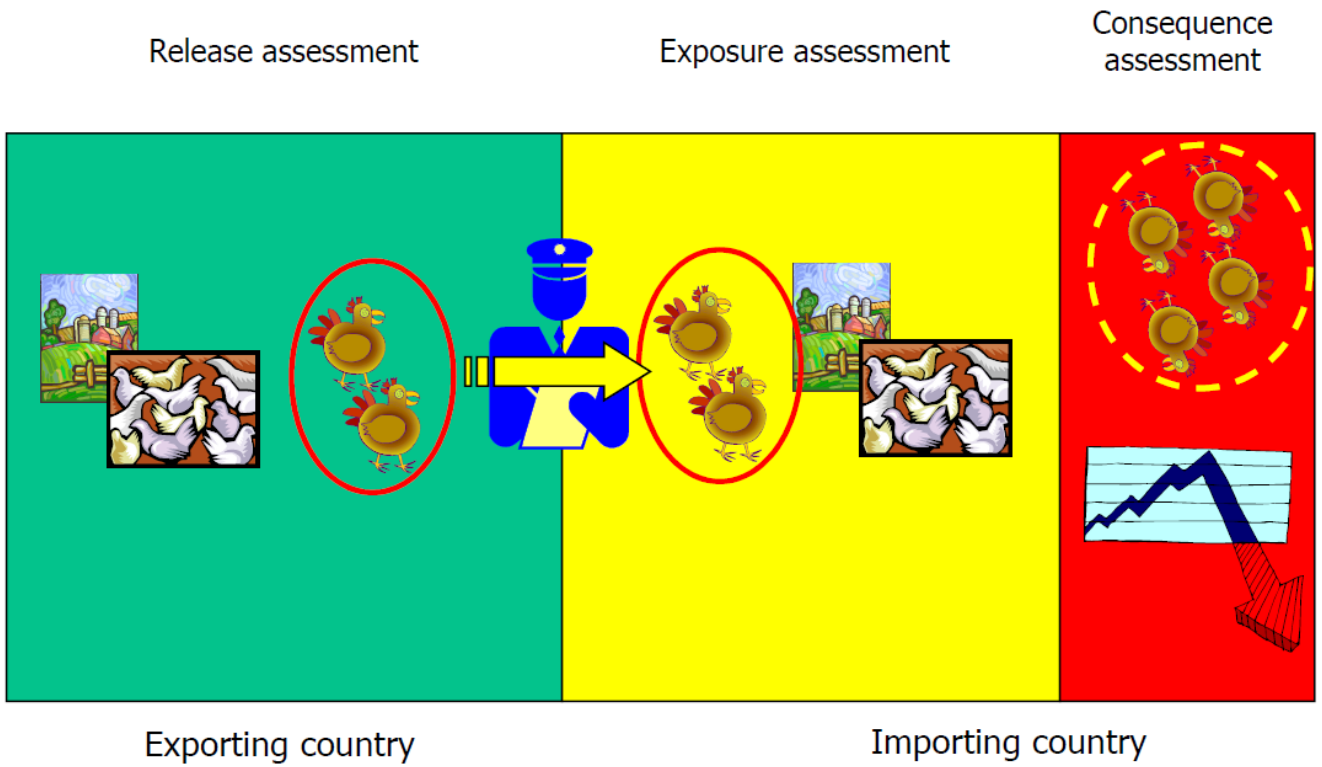
OIE International Animal Health Code



The risk assessment includes the following steps:

- **Release assessment**: description of biological pathways for release of hazard and estimation of its probability.
- **Exposure assessment**: description of biological pathways necessary for exposure of humans / animals to the hazards released and estimation of its probability.
- **Consequence assessment**: description of relationships between exposures to hazards and consequences of those exposures (biological and economic).
- **Risk estimation**: Integration of results from previous 3 steps to produce overall measures of risk associated with the hazards

OIE International Animal Health Code



Cristóbal Zepeda, Centers for Epidemiology and Animal Health USDA-APHIS /Animal Population Health Institute, Colorado State University

Codex Alimentarius Commission (CAC) approach:

- Risk assessment is defined for the purposes of the Codex Alimentarius Commission as "*A scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, and (iv) risk characterization*."

- **Hazard identification** is "The identification of biological, chemical, and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods."

- **Hazard characterization** is "The qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents which may be present in food.
  - For chemical agents, a dose-response assessment should be performed.
  - For biological or physical agents, a dose-response assessment should be performed if the data are obtainable."

Codex Alimentarius Commission (CAC) approach:

- **Exposure assessment** is "The qualitative and/or quantitative evaluation of the likely intake of biological, chemical, and physical agents via food as well as exposures from other sources if relevant."

- **Risk characterization** is "The qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population based on hazard identification, hazard characterization and exposure assessment."

  (World Health Organization, 2010)

Two approaches cont.

OIE method (Covello-Merkhofer)	Codex Alimentarius method (NAS-NRC)
Hazard identification	
Risk Assessment - **Release assessment** - **Exposure assessment** - **Consequence assessment** - **Risk estimation**	**Risk Assessment** - **Hazard identification** - **Hazard characterization** - **Exposure assessment** - **Risk characterization**
Risk management - Risk evaluation - Option evaluation - Implementation - Monitoring and review	**Risk management** - Risk evaluation - Option assessment - Monitoring and review
Risk communication throughout	**Risk communication** throughout

Two approaches cont.

- Altought differences exist both models systems conclude with a step which utilizes the results of the previous steps to give a **final estimate of risk**:

- Risk estimation (OIE)

- Risk characterization (CAC)

- They basically include the **same fundamental steps** even though in a slightly different order

OIE vs CAC : examples

OIE

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect

Preventive Veterinary Medicine 86 (2008) 43–56

PREVENTIVE VETERINARY MEDICINE

www.elsevier.com/locate/prevetmed

Quantitative risk assessment of foot-and-mouth disease introduction into Spain via importation of live animals

B. Martínez-López [a,*], A.M. Perez [b,c], A. De la Torre [d], J.M. Sánchez-Vizcaíno Rodriguez [a]

CAC

ELSEVIER

Preventive Veterinary Medicine 37 (1998) 129–145

PREVENTIVE VETERINARY MEDICINE

Quantitative risk assessment of human listeriosis from consumption of soft cheese made from raw milk

N. Bemrah[a], M. Sanaa[a,*], M.H. Cassin[b], M.W. Griffiths[c], O. Cerf[a]

[a] *Epidemiology and Animal Health Management Laboratory, Alfort Veterinary School, Maisons-Alfort, France*
[b] *Decisionalysis Risk Consulting, Cambridge, UK*
[c] *Department of Food Science, University of Guelph, Guleph, Ontario, Canada*

- Questions?