



Animal Health Matters.
For Safe Food Solutions.



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Risk Based surveillance-categorization (adapted from RISKSUR Training Series, Module 2 Risk-based surveillance)



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Introduction

- What is RISKSUR?
- FP7 Project “Development and evaluation of scientific methodologies for cost-effective risk-based animal health surveillance”
- Aims
- To develop **support tools for the design and evaluation** of efficient risk-based **animal health surveillance systems**

The screenshot shows the RISKSUR website homepage. At the top, there is a navigation bar with links for 'Home', 'Contact us', 'Members', and 'Login'. Below this is the RISKSUR logo and the tagline 'RISK-BASED ANIMAL HEALTH SURVEILLANCE SYSTEMS'. A secondary navigation bar includes 'SANTERO', 'Project', 'Partners', 'Results', 'Terminology', 'News & Events', and 'Links'. The main content area is divided into three columns. The left column features a green circular graphic with a flowchart and a news item titled 'RISKSUR Surveillance Surgery N°6' dated 17 Sept 2015. The middle column has a group photo of the consortium members and a news item 'Get to know the RISKSUR Consortium: SAFOSO'. The right column shows a graphic of wooden letters spelling 'NEWS LETTER' and a news item 'Stay informed about the latest from RISKSUR!'. Below these is a 'Welcome to RISKSUR' section with a paragraph about the project's aim to develop decision support tools for risk-based surveillance systems, and a 'News & Events' section with a link to 'Surveillance Surgery N°6: RISKSUR Surveillance Evaluation Framework'.



Learning objectives

- To explain the concepts of risk-based surveillance
- To understand the relation to conventional surveillance
- To understand the relation to risk analysis
- To introduce concept of risk categorization



Risk Based Surveillance

- **Hazard**
 - Any agent that could produce adverse consequences to animal or human health
- **Risk**
 - A function of the **probability** of an adverse health effect and the **severity (magnitude)** of that effect, consequential to a hazard(s) in food
- **Surveillance**
 - Ongoing systematic and continuous collection, analysis and interpretation of health data (often designed to detect the appearance of specific diseases), allowing epidemiologists to follow in time and space the health status and some risk factors associated with diseases for a given population, for use in the planning, implementation and evaluation of disease control measures.



Definition: *Risk-based surveillance*

«The **use of information** about the probability of occurrence and the magnitude of the biological and/or economic consequence of health hazards to plan, design and/or interpret the results obtained from surveillance system»

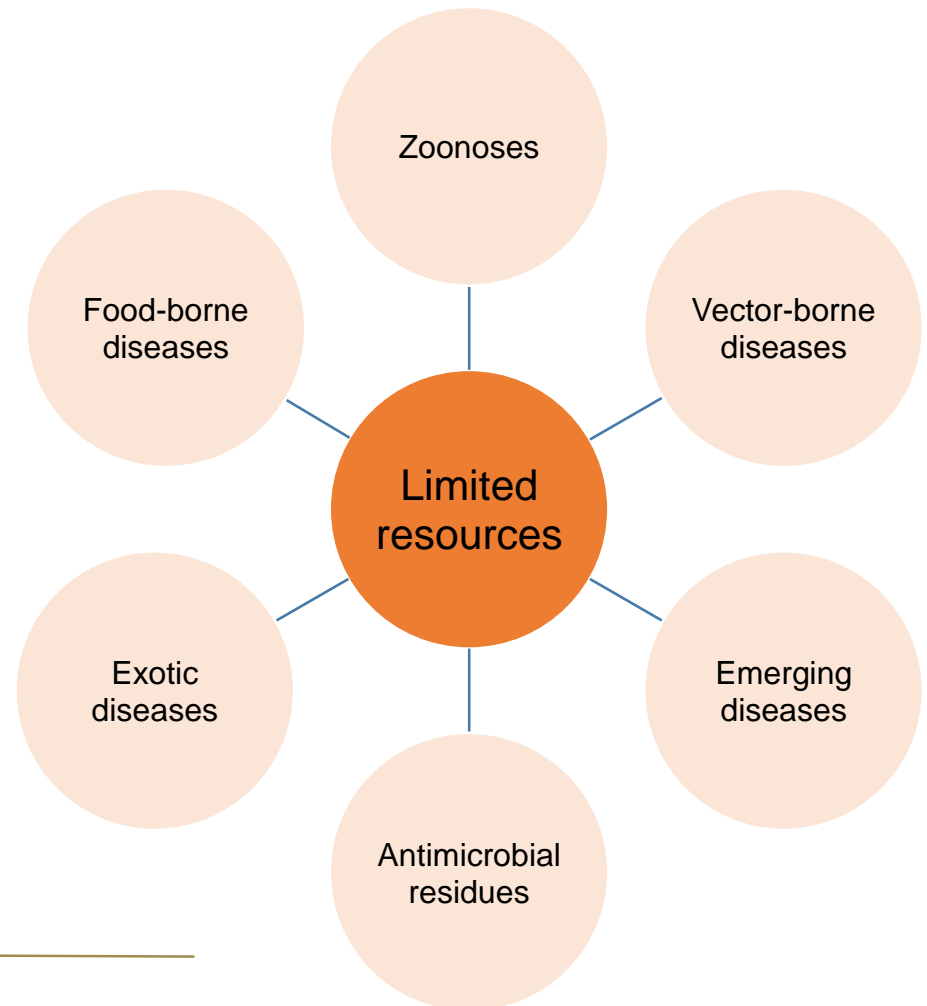
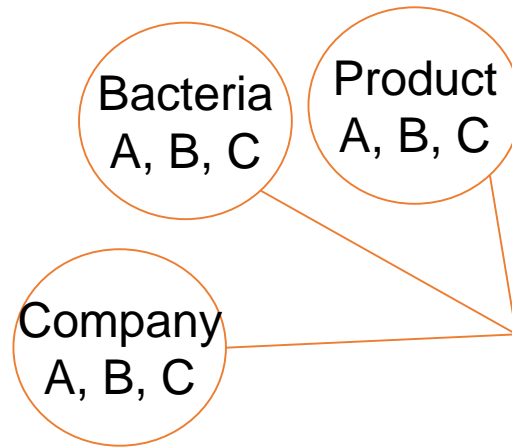
Risksur glossary

«A surveillance programme in the design of which **risk assessment** methods have been applied together with traditional design approaches in order to assure appropriate and cost-effective data collection»

Stärk et al. 2006







Background: The dilemma



Competing surveillance issues – limited resources (manpower & money)



Information-cost ratio

- Need for evidence-based decision making 
- Need for documented evidence 
- Need for surveillance 
- But: Resources 
- Optimal use of resources needed

Evidence

Cost



Risk-based designs

1. Preferential testing for **hazards** that have more serious consequences
 - Human health
 - Animal health
2. Preferential testing in **sub-populations (strata)** that have higher risk of being infected

 Risk-based surveillance (RBS)

3. But how do you identify **high risk sub-populations (strata)**?



Risk factors

- *The factors that are influencing or are associated with the risk of causing adverse effects (e.g. Infection) in specific subpopulations, or that are protective («protective factors») like vaccination.*
- The identification of such risk factors may derive from different sources:
 - **Epidemiological studies** (e.g. cross sectional, case-control, cohort studies)
 - **Experts opinion** (when gaps in documented knowledge exists)
 - **Risk assessment** studies (to provide more precise estimation of the risk for each subpopulation)



Examples of factors used to define high-risk strata

■ Spatial factors

- Climate
- Habitats, land use
- Population densities
- Trade
- Wildlife
- Vectors

■ Host factors

- Animal species
- Age of animals
- Age of human hosts
- Behaviour

■ Management factors

- Biosafety
- Husbandry
- Movement contacts
- Feeding practice
- Antimicrobial usage
- Processing practices

■ Historical risk

- History of cases
- History of risky practices



Objectives of risk-based surveillance (RBS)

- to target surveillance efforts at identified **high risk groups**
- to **set priorities**
- to allocate resources **effectively and efficiently**

- **Evaluation of risk-based surveillance systems shall prove that the efficacy of the risk-based approach is equal or higher than that of traditional surveillance;**
- **however, the efficiency (cost-benefit) shall be higher in risk-based systems.**



Limitations/disadvantage

- It requires **prior epidemiological knowledge** (e.g. data and information on risk factors)
- It requires **epidemiological skills** to design and evaluate it correctly
- Very difficult to make **inference** from the results to the entire population
- **Comparison with other surveillance designs**, e.g. between trading partners, is more challenging



Definition: *Risk-based surveillance*

*„A surveillance programme in the design of which **risk assessment** methods have been applied together with traditional design approaches in order to assure appropriate and cost-effective data collection,,*



Risk assessment is an element of risk analysis. It is a systematic and structured approach to collect, organise and evaluate information related to the likelihood of an undesired event as well as its biological and economical consequences.



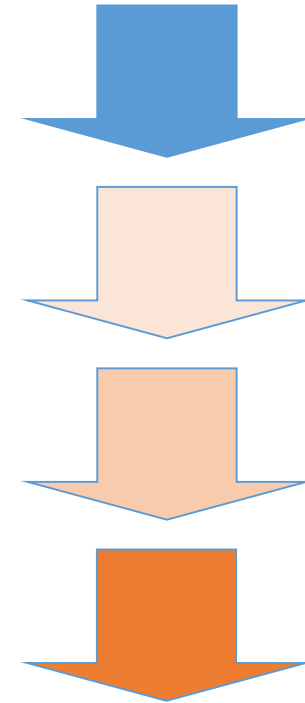
Risk-based surveillance: Design steps

Risk assessment to select **hazards**
to be surveyed

Risk assessment to select **strata**
to be surveyed

Risk assessment to select **product**
to be surveyed

Random sampling



Framework for comparison (1)

Steps / elements	Conventional surveillance	Risk-based surveillance
Objectives	The objectives of a surveillance programme are a key determinant of the design.	The objectives of a surveillance programme are a key determinant of the design.
Hazard selection	The hazard of interest (virus, bacteria, disease syndrome) is selected.	The hazard of interest (virus, bacteria, disease syndrome) is selected using risk assessment.
Case definition	Case definition is based on available diagnostic procedures.	Case definition is based on available diagnostic procedures.
Test procedures	Sensitivity and specificity of the diagnostic tests are major determinants of the validity of the surveillance results.	Sensitivity and specificity of the diagnostic tests are major determinants of the validity of the surveillance results.



Framework for comparison (2)

Steps / elements	Conventional surveillance	Risk-based surveillance
Target population(s)		
Region, location	Usually selected at random.	Selected based on risk factor studies.
Species	Selected based on hazard biology.	Selected based hazard biology and risk factor studies.
Farms	Usually selected at random.	Selected based on risk factor studies.
Animals	Usually selected at random.	Selected based on risk factor studies.
Timing, interval	Usually selected based on the epidemiology of the agent and considering infection dynamics	Usually selected based on the epidemiology of the agent and considering infection dynamics, risk factor studies.



Framework for comparison (3)

Steps / elements	Conventional surveillance	Risk-based surveillance
Statistical analysis, outcome	Standard statistical analyses	Standard statistical analyses and additional analyses for comparison to conventional surveillance
Communication of results	A series of options are available: Oral, written, web, media etc.	A series of options are available: Oral, written, web, media etc.
Consequences of positive outcome	The action steps following positive results need to be determined and organized.	The action steps following positive results need to be determined and organized.
Feedback mechanisms	Feedback to the people involved in data collection is essential for quality assurance.	Feedback to the people involved in data collection is essential for quality assurance. Inclusion in risk assessment.



Advantages and disadvantages

Conventional

- + Methods available
- + Well validated
- + Commonly accepted
- Expensive
- Low information content (all negative)
- Not efficient

Risk-based

- + Higher benefit-cost ratio
- + More efficient
- + Suitable for rare events
- - Data availability?
- - Analytical methods to be developed
- - Equivalence assessment to be developed
- - Acceptance?



Application on dairy sectors



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Designing a risk-based surveillance program for *Mycobacterium avium* ssp. *paratuberculosis* in Norwegian dairy herds using multivariate statistical process control analysis

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F. Brülisauer, T. Berger, B. Klein and J. Danuser

Risk based surveillance of milk and dairy products

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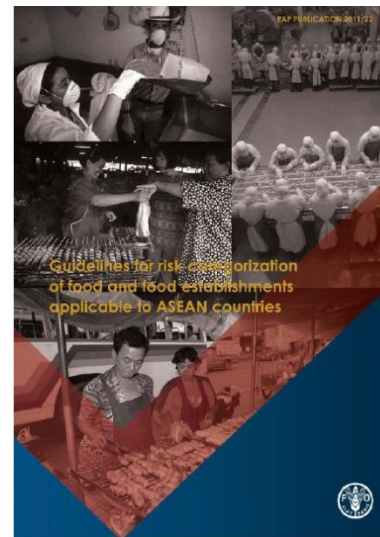
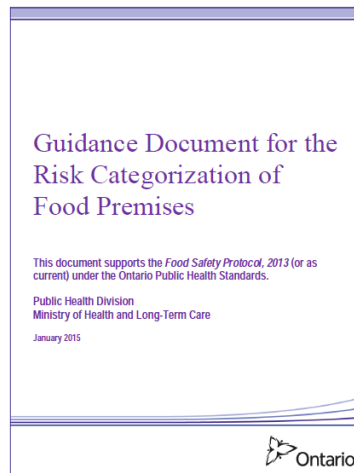
³Cantonal Laboratory, Epalinges, Switzerland.

- A **risk assessment** on the public health impact of milk and dairy product was conducted in 2001
- Based on this risk assessment a **risk based sampling** plan for milk and dairy product was established
- Pasteurized milk and 16 dairy products (>10.000 samples) were sampled during one year
- Results showed a low prevalence of pathogens and high microbial quality standard of milk and dairy products
- However, room for quality (hygiene) improvement was revealed and resulted in suggesting **official inspection** on a regular basis



Risk categorization

- The purpose of classifying food businesses according to risk category, is to allow the regulatory agency responsible to food inspection to prioritise inspections of food businesses based on those which pose the greatest potential risk to the population if the safety of food is out-of control.

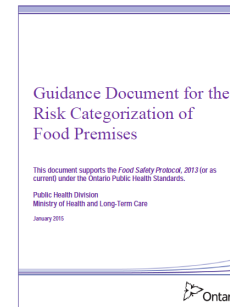


Guidelines for risk
categorization of food
and food establishments
applicable to ASEAN
countries

2011
FAO ROAP, Bangkok, Thailand



Risk categorization



Levels of risk are attributable to a number of risk factors including:

- **Profile factors:**
 - the type of operation,
 - population served,
 - complexity and extent of food handling
- **Performance factors** such as those that are attributable to the operators' performance and commitment to food safety practices
 - compliance with regulations,
 - commitment to training of food handlers,
 - the extent to which they incorporate food safety plans into their operations.



Risk categorization

- Risk Categories
- A risk category of **high**, **moderate**, or **low** will be assigned for each food premises based on the total calculated **risk score**

Table 1: Risk Category and Frequency of Inspection

Risk Category	Score	Frequency of Inspection
High	55-230	Not less than once every four months
Moderate	20-54	Not less than once every six months.
Low	0-19	Not less than once every twelve months





Guidelines for risk categorization of food and food establishments applicable to ASEAN countries

2011
FAO ROAP, Bangkok, Thailand

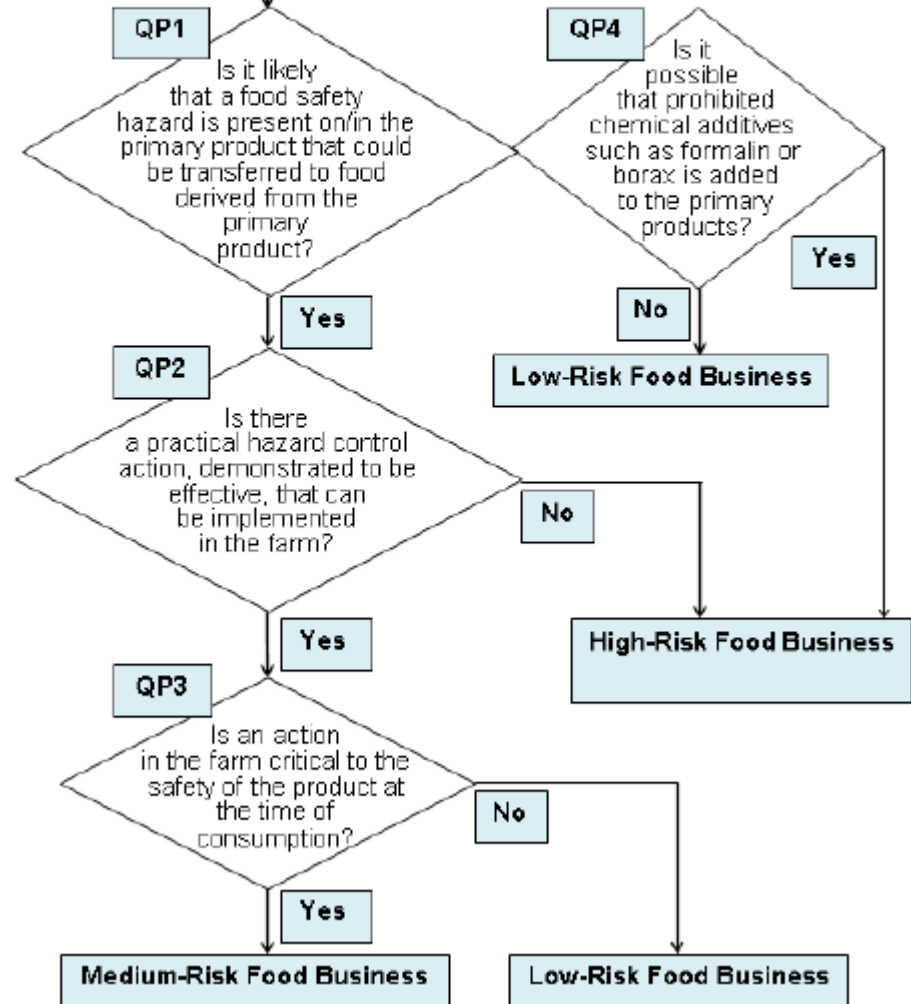


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Check if the primary product is:

- live animals(livestock, fish, poultry) up to the point of slaughter;
- fish (chilled fresh, head on, gut in);
- harvested live shellfish and live crustaceans; or
- grain (producers, handlers, storage).



Risk categorization

Businesses dealing with primary foods	Main Activity	QP1	QP2	QP3	QP4	Risk-Category		
						High	Medium	Low
Beef Cattle	Animal husbandry, slaughtering, fresh handling	yes	no			X		
Piggery	Animal husbandry, slaughtering, fresh handling	yes	no			X		
Dairy Farm, small scale	Animal husbandry, milking	yes	no			X		

Table 2. Risk categorization in *businesses dealing with secondary foods*

Businesses dealing with secondary foods	Main activity	QS1	QS2	QS3	Risk-category		
					High	Medium	Low
Manufacturer							
Dairy products							
• Pasteurized milk	HTST processing, aseptic packaging	yes	yes	yes	X		
• Sterilized milk	UHT processing, aseptic packaging	yes	yes	yes	X		
• Sweet condensed milk	Formulating, heat processing, packaging	yes	yes	no		X	
• Milk powder	Pasteurization, spray drying, packaging	yes	yes	no		X	
• Ice cream	Formulation, freezing, packaging	yes	yes	yes	X		
• Yogurt	Formulation, fermentation, packaging	yes	yes	yes	X		
• Cheese	Curdling, fermentation, packaging	yes	yes	yes	X		

Risk Category	Frequency of Inspection (every x months)		
	Starting Point	Maximum	Minimum
High-Risk Food Business	6	3	12
Medium-Risk Food Business	12	6	18
Low-Risk Food Business	18	12	24





Raw milk-associated foodborne infections: A scoring system for the risk-based categorisation of raw dairy farms

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Table 1

Results of the AHP exercise – prioritization of the variables in the first two levels of the hierarchical structure. The numbers indicate the relative value of each variable as calculated by the software.

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8
Farm structures	0.20	0.19	0.30	0.24	0.07	0.10	0.17	0.24
Farm management	0.52	0.66	0.54	0.70	0.78	0.70	0.76	0.65
Herd health status	0.28	0.15	0.16	0.06	0.15	0.20	0.07	0.11
<i>Farm structures</i>								
Adult animals	0.19	0.16	0.28	0.24	0.52	0.11	0.25	0.22
Calves	0.05	0.04	0.08	0.08	0.04	0.04	0.03	0.06
Milking machine	0.27	0.30	0.23	0.21	0.26	0.36	0.49	0.42
Milk storage	0.33	0.32	0.25	0.40	0.13	0.43	0.17	0.27
Feedingstuffs storage	0.16	0.18	0.16	0.07	0.05	0.06	0.06	0.03
<i>Farm management</i>								
Milking machine management	0.27	0.34	0.30	0.24	0.06	0.21	0.13	0.35
Milk storage	0.21	0.21	0.14	0.36	0.05	0.27	0.07	0.10
Farm general management	0.10	0.14	0.10	0.06	0.12	0.13	0.03	0.03
Milking management	0.25	0.20	0.27	0.23	0.51	0.28	0.55	0.35
Farm hygiene	0.17	0.11	0.19	0.11	0.26	0.11	0.22	0.17
<i>Herd health status</i>								
Health and hygiene conditions	0.27	0.12	0.28	0.16	0.56	0.15	0.15	0.45
Incorrect dietary balance	0.14	0.11						
Animal welfare	0.22	0.22						
"Raw milk" cows separated from the others	0.37	0.55						
Total inconsistency	0.02	0.03						

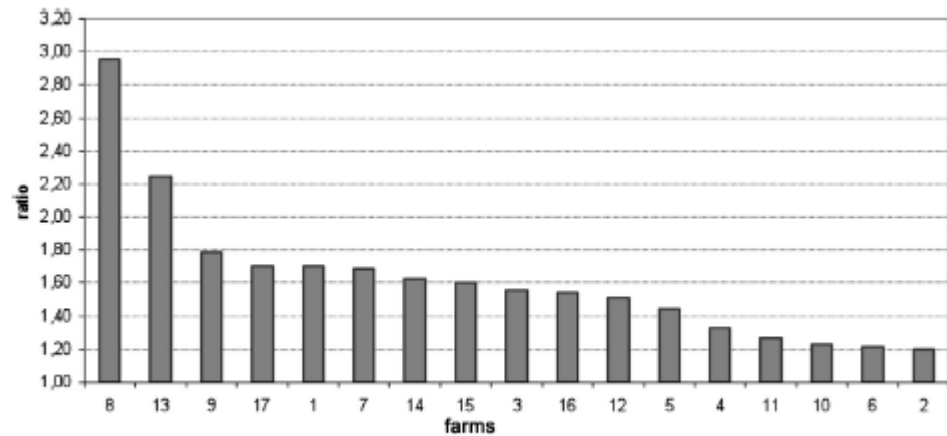


Fig. 2. Farms ranking based on the ratio between the calculated and the minimum potential score.





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Thanks