Application of food safety risk assessment in identifying effective control measures during the animal production phase

AIMS Project
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Food safety risk assessment training in Vietnam

Broad casted by ‘Voice of Vietnam’ on 2013 September 7

http://vov.vn/Doi-song/Dao-tao-danh-gia-nguy-co-an-toan-thuc-pham-tai-cac-cl | RINES - 学内ネットワー... | Veterinary Epidemiolog... | Đào tạo đánh giá ng.

) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

Đào tạo đánh giá nguy cơ an toàn thực phẩm tại các chợ

VOV.VN - Các học viên tham gia khóa học này được giới thiệu tổng quan về các bệnh liên quan đến thực phẩm.

Lần đầu tiên một khóa đào tạo đánh giá nguy cơ an toàn thực phẩm tại các chợ được tổ chức cho các chuyên gia y tế công cộng và thú y Việt Nam.

Khóa học diễn ra từ 28/6 đến 7/9 do Trung tâm Nghiên cứu Y tế Công cộng và hệ sinh thái (Trường Đại học Y tế Công cộng Hà Nội) phối hợp với Viện Chăn nuôi Quốc tế và Đại học Rakono Gakuen (Nhật Bản) tổ chức tại Hà Nội.

Các học viên tham gia lớp học (ảnh: Văn Hải)

Các học viên tham gia khóa học này được giới thiệu tổng quan về các bệnh liên quan đến thực phẩm; sự hữu ích của phương pháp phân tích nguy cơ; đặc biệt trong phần đánh giá nguy cơ, các học viên được học về xác suất

LIÊN QUAN

- Kiểm tra an toàn thực phẩm Tết Trung thu tại 9 địa phương
- Tăng cường kiểm tra an toàn thực phẩm dịp Tết Trung thu
- Phụ huynh lo ngại về vệ sinh an toàn thực phẩm mùa thi
- Hà Nội xây chợ vệ sinh an toàn thực phẩm

TIN ĐỌC NHIỀU

Bán bát phở quá 5.000 đồng ở Sầm Sơn bị phạt 12,5 triệu đồng

Cả nước ghi nhận hơn 9.010 trường hợp mắc sốt xuất huyết

Địa chỉ từ thiện

Thanh niên người Dao, 17 tuổi, bị bỏng điện phải cắt 2 tay!

Nhói lòng trước tình cảnh bé 20 tháng tuổi bị bỏng toàn thân

Tìm người thân

Một phụ nữ SN 1974 tìm kiếm cha mẹ người Việt Nam

Tìm mộ liệt sĩ Lê Tiến Bản

Cửa sổ tình yêu

Học cách hòa thuận với mẹ chồng

Người “trám chỗ” cho tình yêu

Tình ngay, lý gian

Objective of this talk

- To share ideas for application of food safety risk assessment in improving food safety by controlling hygiene in the animal production phase

Outline

- Food safety risk assessment
  - Why important?
  - Risk assessment
  - Logic tree (event tree, fault tree)
  - Description of value chains
  - Field survey- importance of diagnostic tests
  - Construct and run a risk model
- How food safety risk assessment can be applied to improve farm hygiene?

Why food safety?

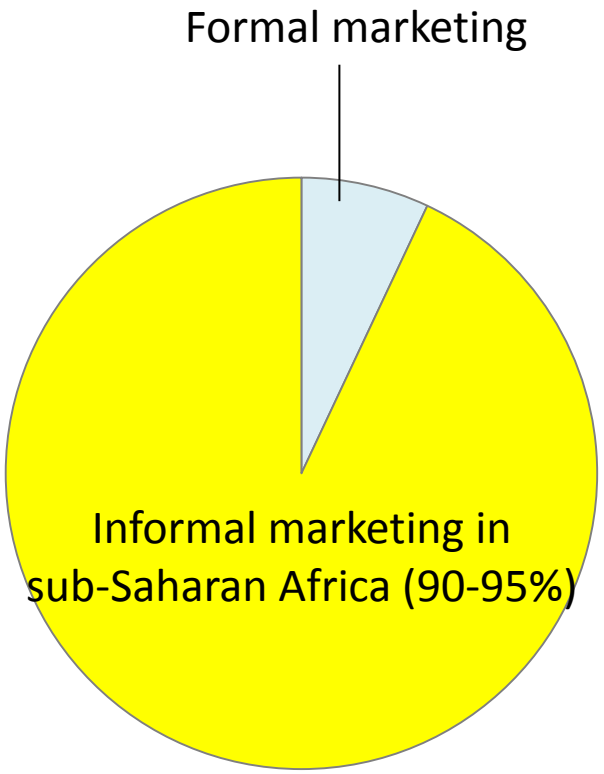
- Every year, at least 2 billion cases of diarrhea occur and 1.5 million children under 5 yrs die worldwide
- Poor, young, elderly, pregnant women and immune-suppressed most affected
- Food borne diseases include non-diarrheal severe zoonoses

Why animal source foods?

- Two-thirds of human pathogens are zoonotic – many of these transmitted via animal source food
- Animal source food is a single most important cause of food-borne disease
- Many food-borne diseases cause few symptoms in animal host
- Many zoonotic diseases controlled most effectively in animal host/reservoir

Dominance of informal markets in developing countries

"Absence of structured sanitary inspection"



Informal ≠ Illegal

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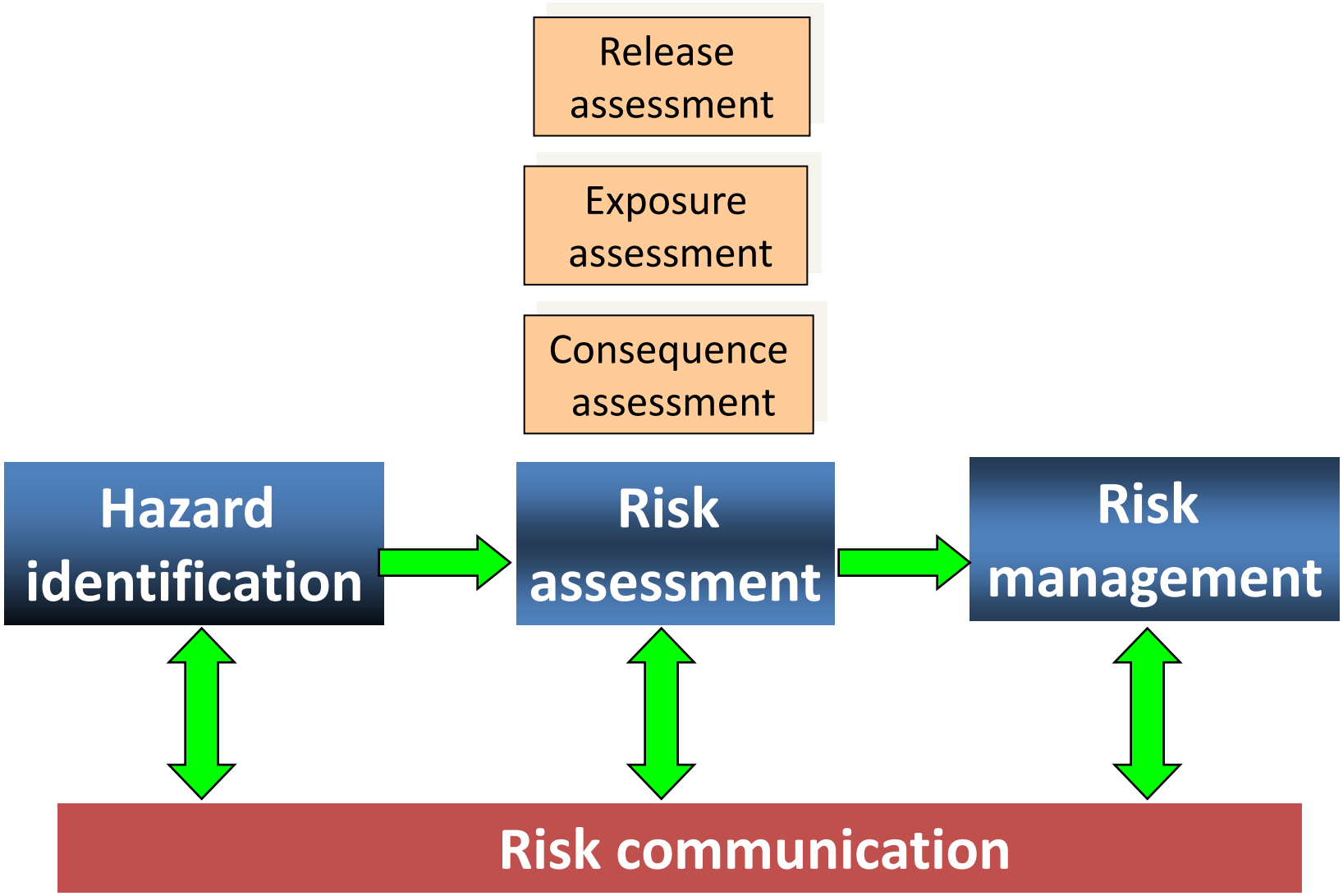
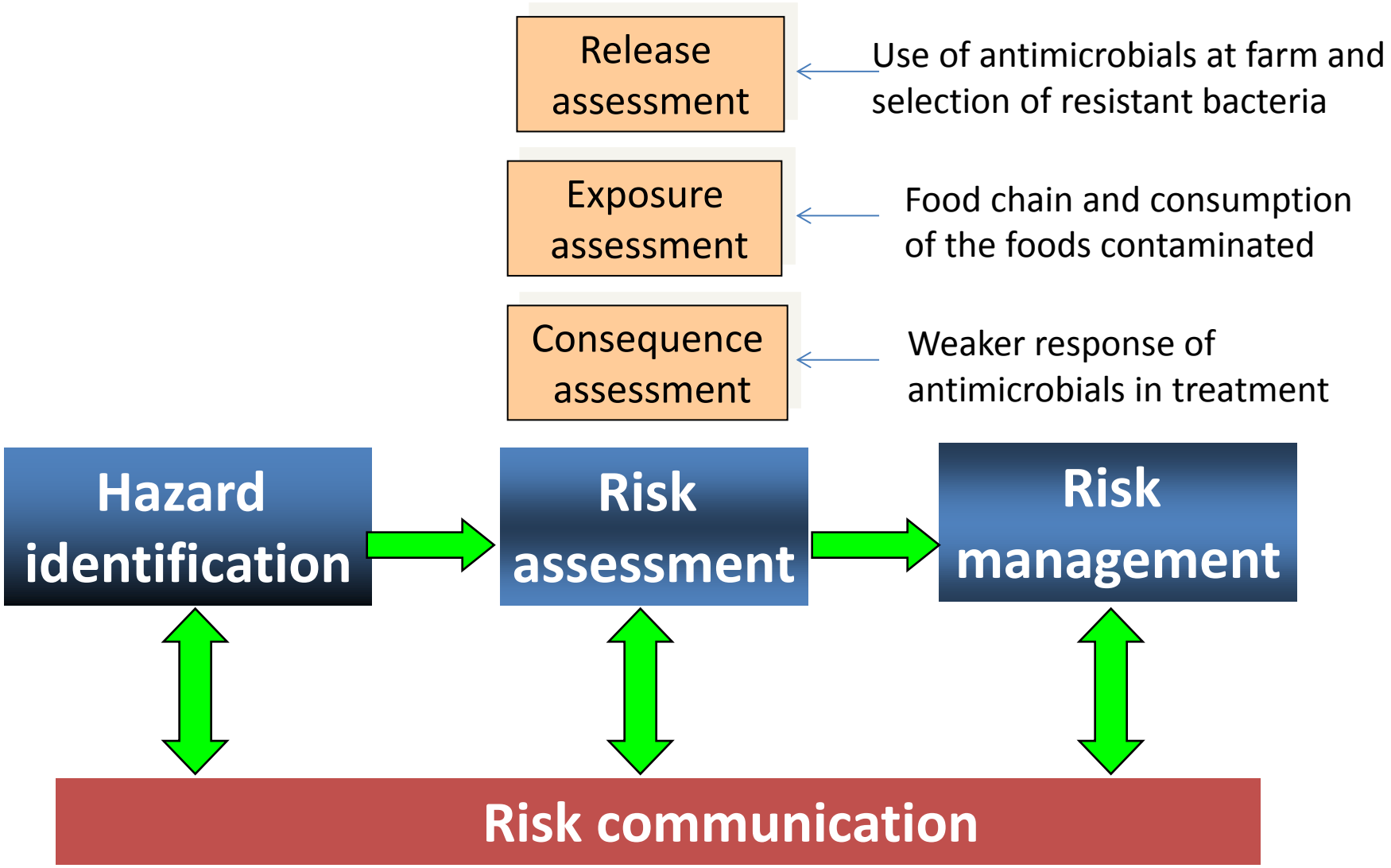
OIE Import Risk Analysis



OIE Risk analysis for antimicrobial resistance



HACCP 12 step roadmap

Task 1. Assemble HACCP team

Task 2. Describe product

Task 3. Identify intended use

Task 4. Construct flow diagram

Task 5. On-site confirmation of flow diagram

Task 6. List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards **(Principle 1)**

Task 7. Determine Critical Control Points **(Principle 2)**

Task 8. Establish critical limits for each CCP **(Principle 3)**

Task 9. Establish a monitoring system for each CCP **(Principle 4)**

Task 10. Establish corrective actions **(Principle 5)**

Task 11. Establish verification procedures **(Principle 6)**

Task 12. Establish documentation and record keeping **(Principle 7)**

Ensuring the Safety of Japanese Livestock Products

- In order to prevent health problems caused by livestock products, integrated risk-reduction hygiene management (food chain approach) is needed up to the point where food is served on the table through regional cooperation at each stage including the production stages.
- Therefore, MAFF provides support for hygiene management at the production, manufacturing and processing stages.

Food Chain

Production stage → Manufacturing, processing and distribution stages → Consumption stage

Supply of safe livestock products through integrated hygiene management from farms to consumers

Supporting the efforts to link HACCP (Hazard Analysis and Critical Control Points) at different stages (production, processing and distribution stages)

Production farms

1. Checking the general hygiene management program
2. Conducting hazard analysis and creating hazard lists
3. Creating a hygiene management plan
4. Verifying the implementation situation for hygiene management

Strengthening cooperation

Dairy factories, meat processing plants, etc.

[Manufacturing, processing and

1. Checking the general hygiene management program
2. Conducting hazard analysis and creating hazard lists
3. Creating a hygiene management plan
4. Verifying the implementation situation for hygiene management

Consumers

Appropriate storage, cooking, etc. in accordance with the type of food

Support for introducing HACCP — MAFF

Production stage

- ○ Creation and dissemination of certification criteria
- ○ Training farm advisors

Manufacturing and processing stages

- ○ Training on-site managers and leaders
- ○ Support for facility development

Regulation and monitoring — MHLW

- ○ Regulation and monitoring based on the Food Sanitation Act, etc.
- ○ Approval of the Comprehensive Sanitation Management and Production Process

MAFF, etc.

Information provision and risk communication through websites

Advanced Hygiene Management based on HACCP approach at Production Stage " Farm HACCP"

- Advanced Hygiene Management Guidelines based on HACCP approach at Farm Level developed (FY2002~)
- HACCP approach at Farm Level shared and promoted among local stakeholders : livestock hygiene service centers, livestock producers, livestock industry organizations, veterinarians, etc.
- Certification criteria for being recognized as "HACCP Farm" established and a certification system developed (FY2009~)
- Training for "Farm HACCP advisors "(FY2008~) and pilot project involving whole food chain (production stage, the processing, distribution to consumption stages) started (FY2009~)
- Certification of HACCP Farms by certification organizations started (FY2011~)

(As of July ,2013)

Promotion of "Farm HACCP "

Farm HACCP advisors

Advice , Monitoring, Testing and Improvement

Certification organizations : 2 orgs approved

Creation of an implementation manual by each farmer
- Hazard factor survey (Salmonella, E-coli O157, antibacterial agents, etc.)
- Hazard analysis (HA)
- Setting critical control points (CCP)
- Creation of an implementation manual

Implementation
Implementation of hygiene management based on the manual

Verification
Appropriate revision of the manual

Certification as "HACCP Farm"
Valid for 3 years

Advanced Hygiene Management Guidelines Based on the HACCP approach, model requirements for controlling or reducing hazards are developed for each type of livestock.

No. of farms working on HACCP approach : 4,587

Feedback including abattoir inspections

No. of farms certified : 27
[Dairy 3, Beef 2
Pig 16, Layer 6]

Production of safer livestock products which meet consumer high demand

Building trust of consumers in livestock products

Codex Alimentarius Commission
Food safety risk analysis

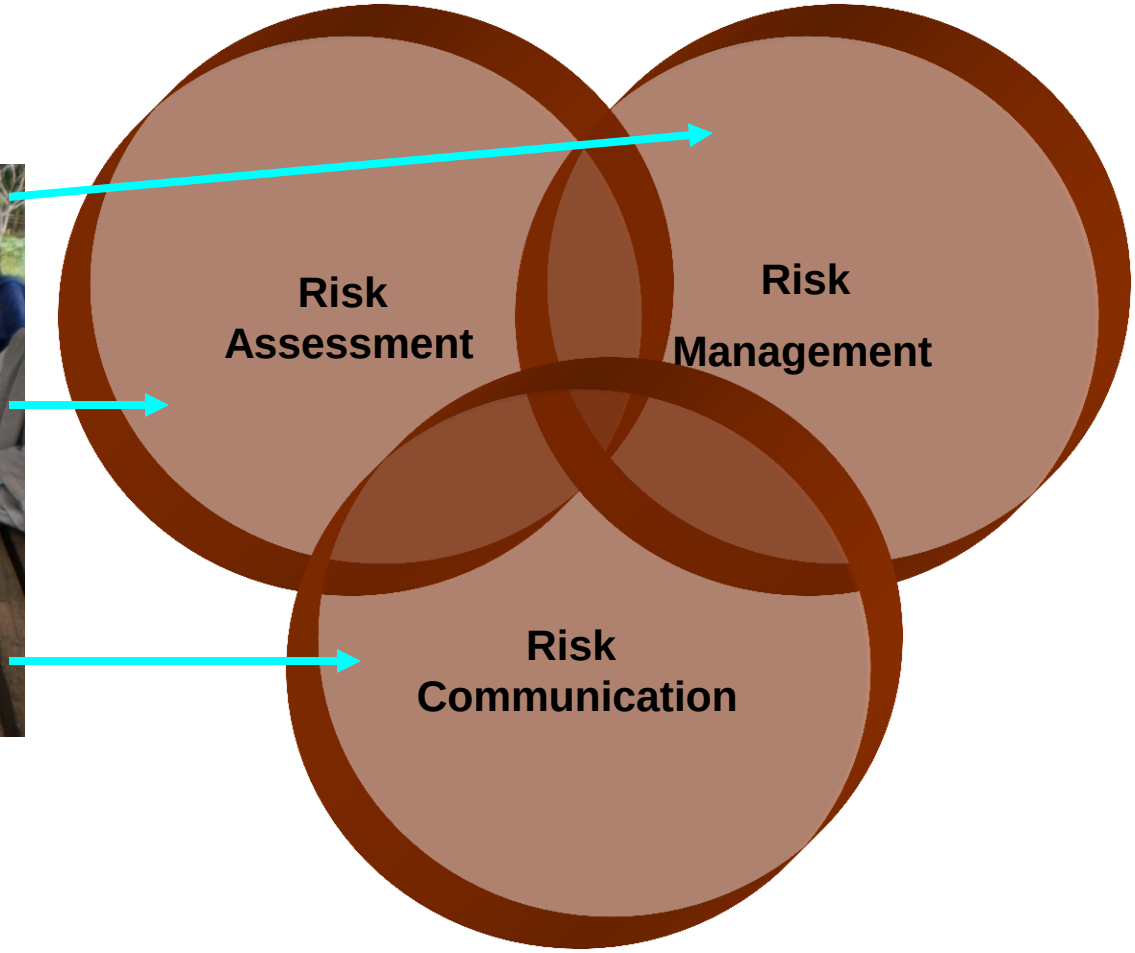
A tool for decision-making under uncertainty

*Risk is a probability of occurrence of a scenario and its size of impact (Vose, 2008)

Food safety risk analysis

in informal marketing system

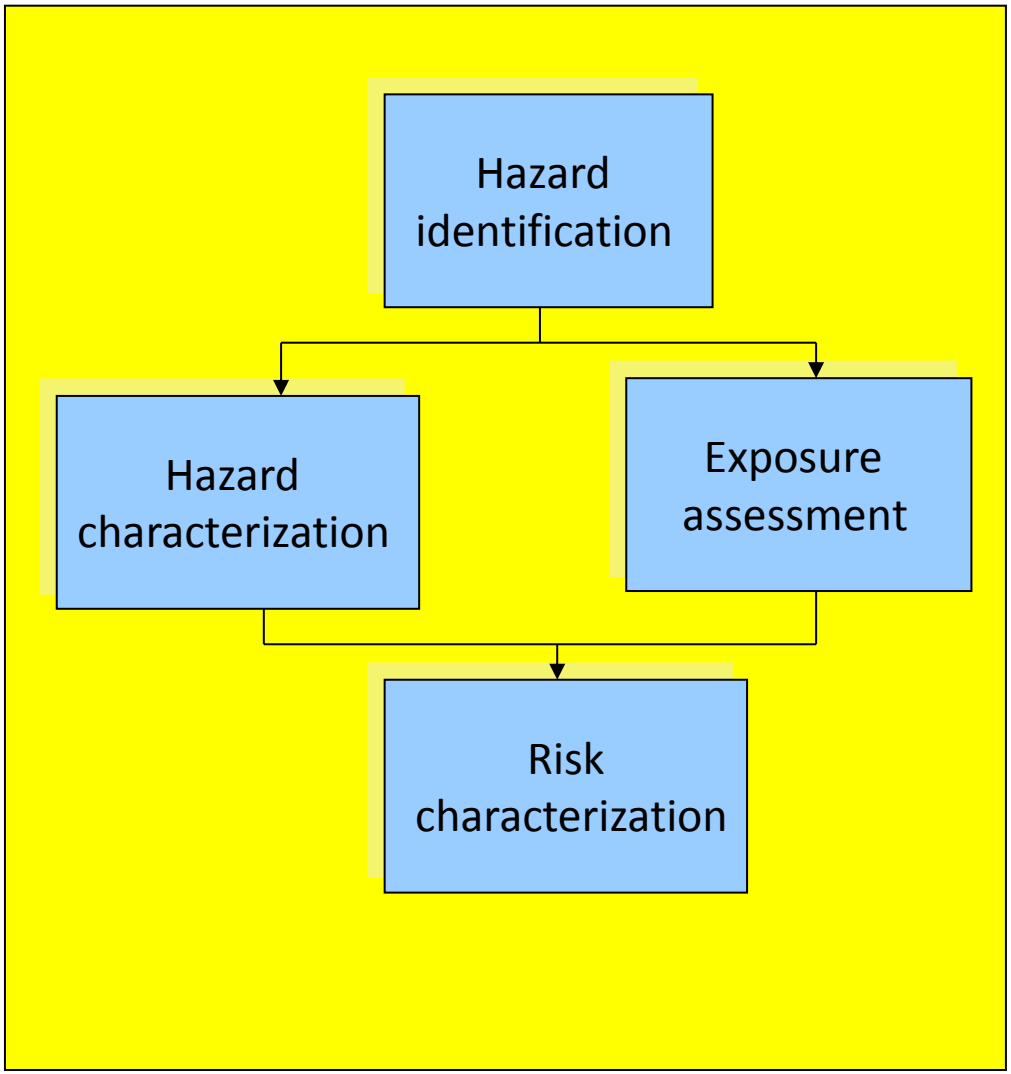
Participatory methods

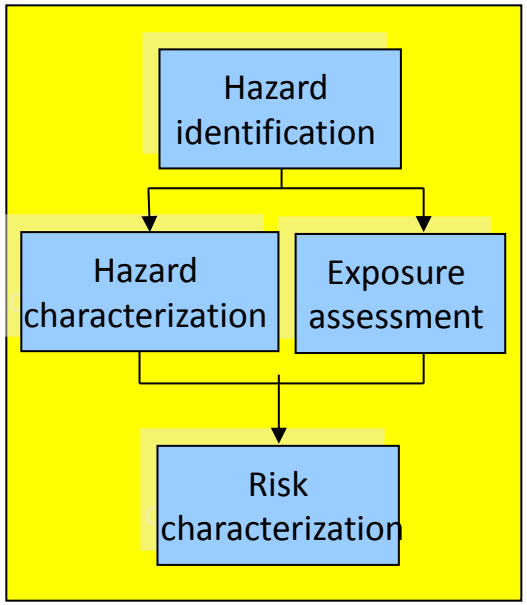


What are participatory methods?

- Participants discuss problems
- Several formats:
  - Rapid rural appraisal
  - Participatory rural appraisal
  - Key-informants interview

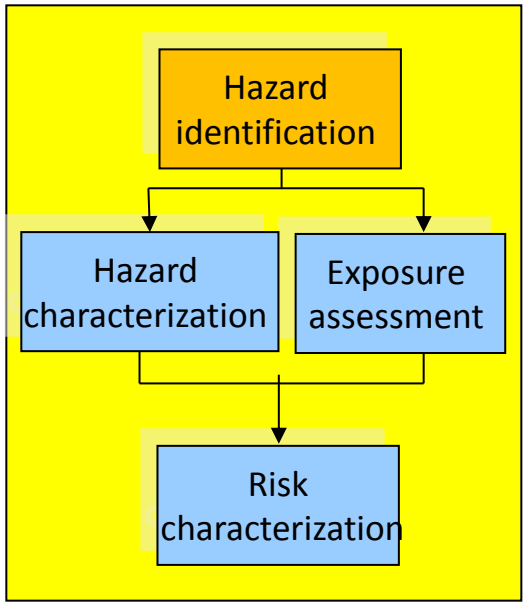
Codex Alimentarius Commission
Risk assessment framework (CAC/GL-30 (1999))





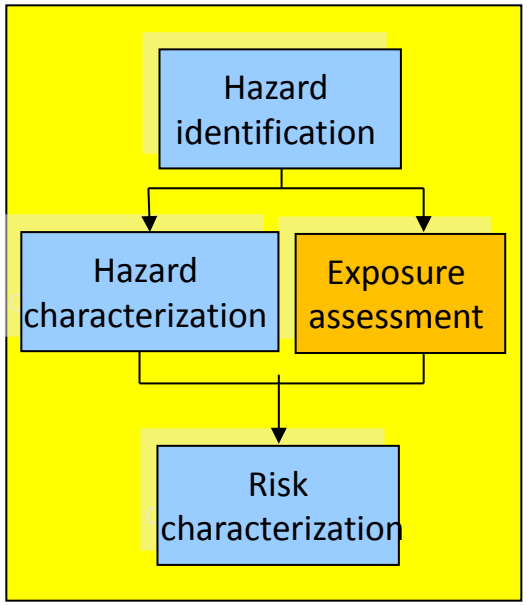
Statement of purpose of risk assessment

- Clear statement of the specific purpose of the particular risk assessment
- Output form
  - Prevalence of illness
  - Annual incidence rate (eg. case/10,000)
- Preliminary investigation phase may be required



Hazard identification

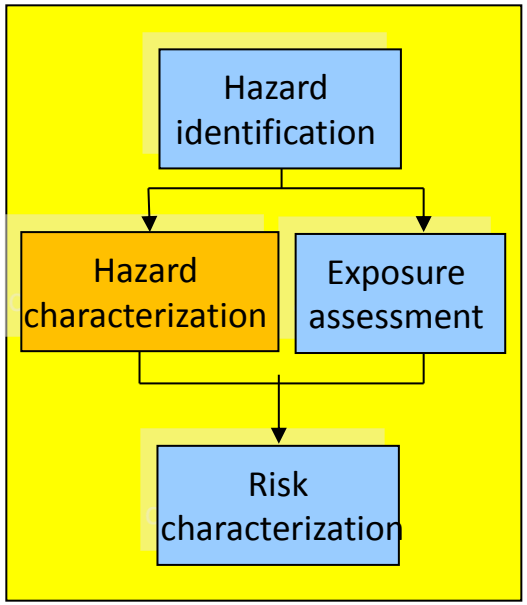
- The identification of biological, chemical, and physical agents –
- capable of causing adverse health effects –
- and which may be present in a particular food or group of foods



Exposure assessment

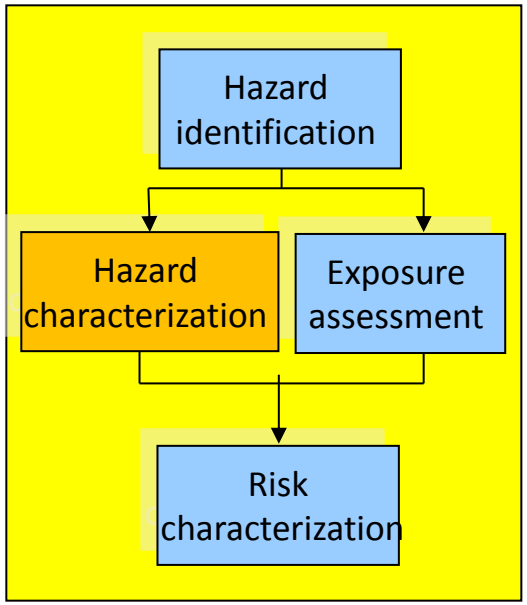
- Assessment of the extent of actual or anticipated human exposure

- Based on potential extent of **food contamination** by a particular agent or its toxins, and on **dietary** information



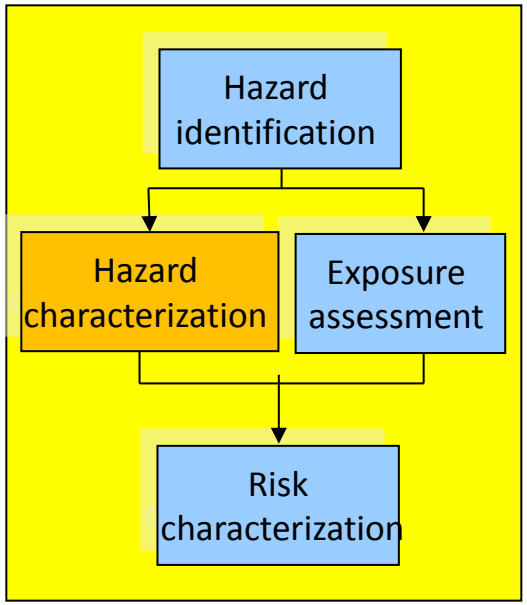
Hazard characterization

- Qualitative or quantitative description of the **severity and duration** of adverse effects that may result from the ingestion of a microorganisms or its toxin in food
- A **dose-response** assessment should be performed if the data are obtainable



Factors that need to be considered in hazard characterization

- Factors related to the microorganism
  - Speed of replication
  - Virulence and infectivity
  - Delay of onset following exposure
  - Attributes altering pathogenicity, e.g., high fat content of a food vehicle
- Factors related to the host
  - Genetic factors
  - Host susceptibility characteristics
    - Age, pregnancy, nutrition, immune status etc.
  - Population characteristics
    - Population immunity, access to and use of medical care etc.



Dose-response Assessment

- Determination of the relationship between the **magnitude of exposure** (dose) to a chemical, biological or physical agent and the **severity and/or frequency of associated adverse health effects** (response)

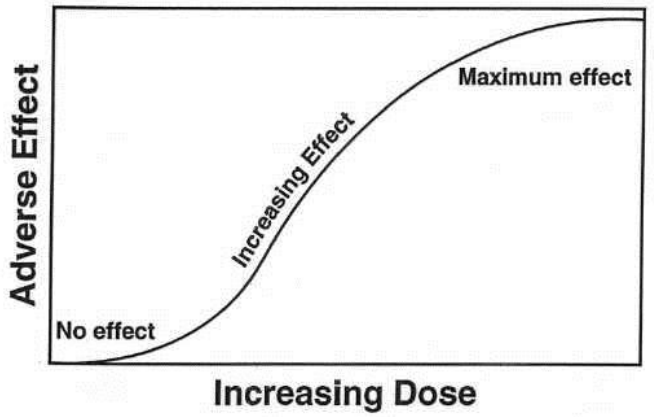
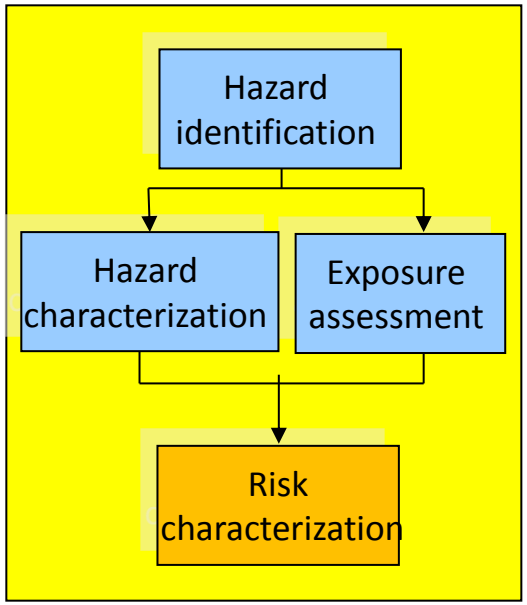


FIGURE 3.1. Adverse response as a result of increasing dose.



Risk characterization

- Integration of previous three steps
- A qualitative or quantitative estimate of the **likelihood and severity** of the adverse effects which could occur in a given population
- Degree of confidence: **uncertainty and variability** (stochastic model)
- Influence of factors to the risk estimate: **sensitivity analyses**

Types of risk assessment and their outputs

- Qualitative
  - Eg). high, middle, low, negligible
- Quantitative
  - Deterministic (point estimate)
  - Stochastic (probability distribution)

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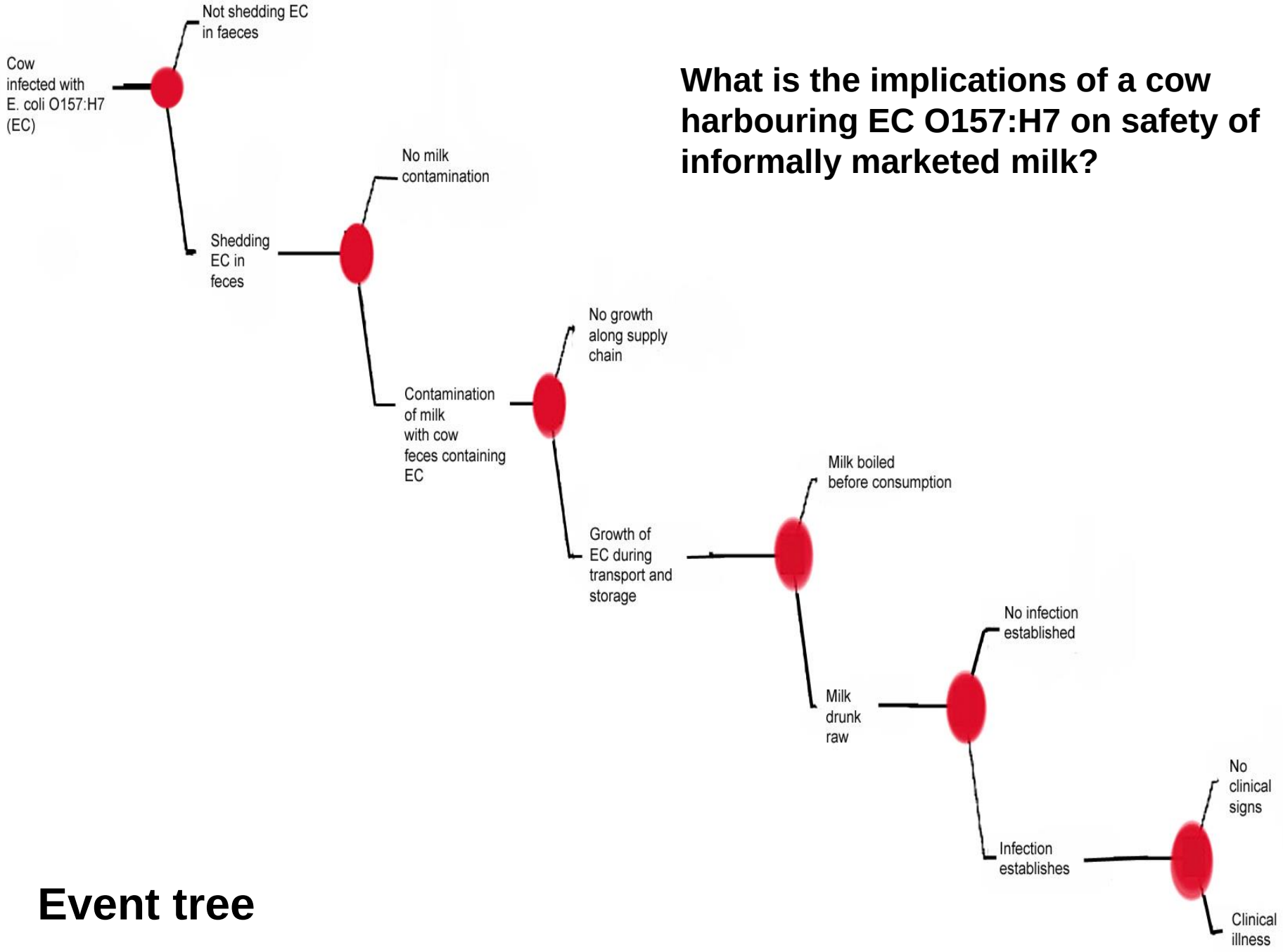
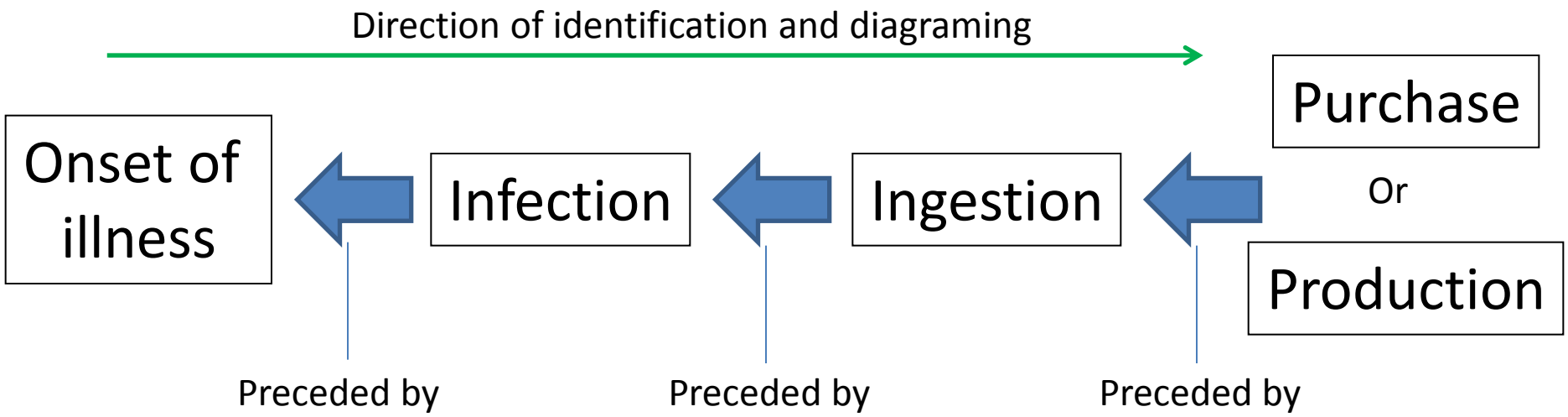
What is the implications of a cow harbouring EC O157:H7 on safety of informally marketed milk?



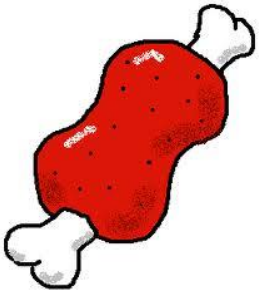
Event tree

Fault tree analysis in food safety

- How the illness can occur

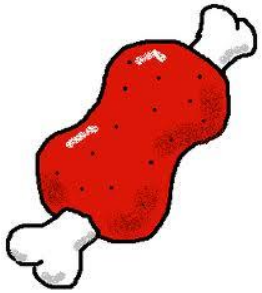


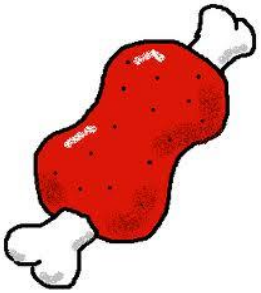
Value chain



A producer ⟶ ⟵ A consumer

Value chain





Producers → ← Middle men → ← Consumers

Actors in informal milk sales in Kampala, Uganda

Shop with a bulk cooler

Shop with a small refrigerator

Boiling centre

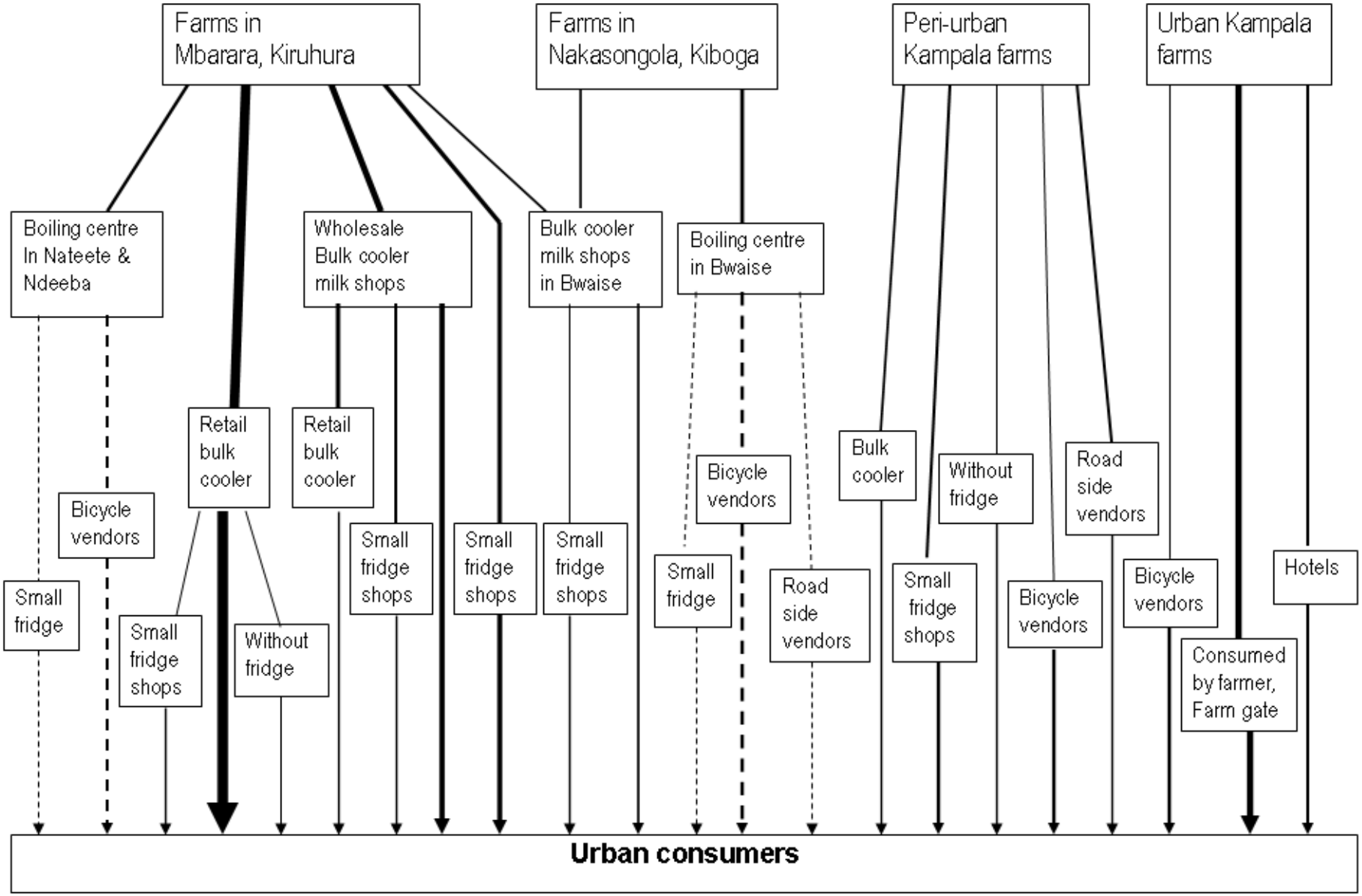
Trader with cans on a bicycle

Roadside vendor

Roadside vendor

- Plus milk retail shop without refrigerator and dairy farmers selling at farms

Quantitative dairy value chain in Kampala, Uganda



Source: Makita K. et al. (2010). How human brucellosis incidence in urban Kampala can be reduced most efficiently? A stochastic risk assessment of informally-marketed milk. PLoS ONE 5 (12): e14188.

Field survey – Importance of diagnostic tests

Nyama-choma in Tanzania

My bitter experience in *Campylobacter* risk assessment…

<1st survey for prevalence>
High prevalence using culture without rigorous identification

⟺

<2nd survey for MPN>
Low prevalence using PCR after culturing

Constructing a risk model

- Model value chains which include
  - Mixing
  - Separation
  - Growth
  - Inactivation

- In a stochastic model, computer simulation is used (I show you a demo briefly..)

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How food safety risk assessment is applied to improve farm hygiene?

(An example)



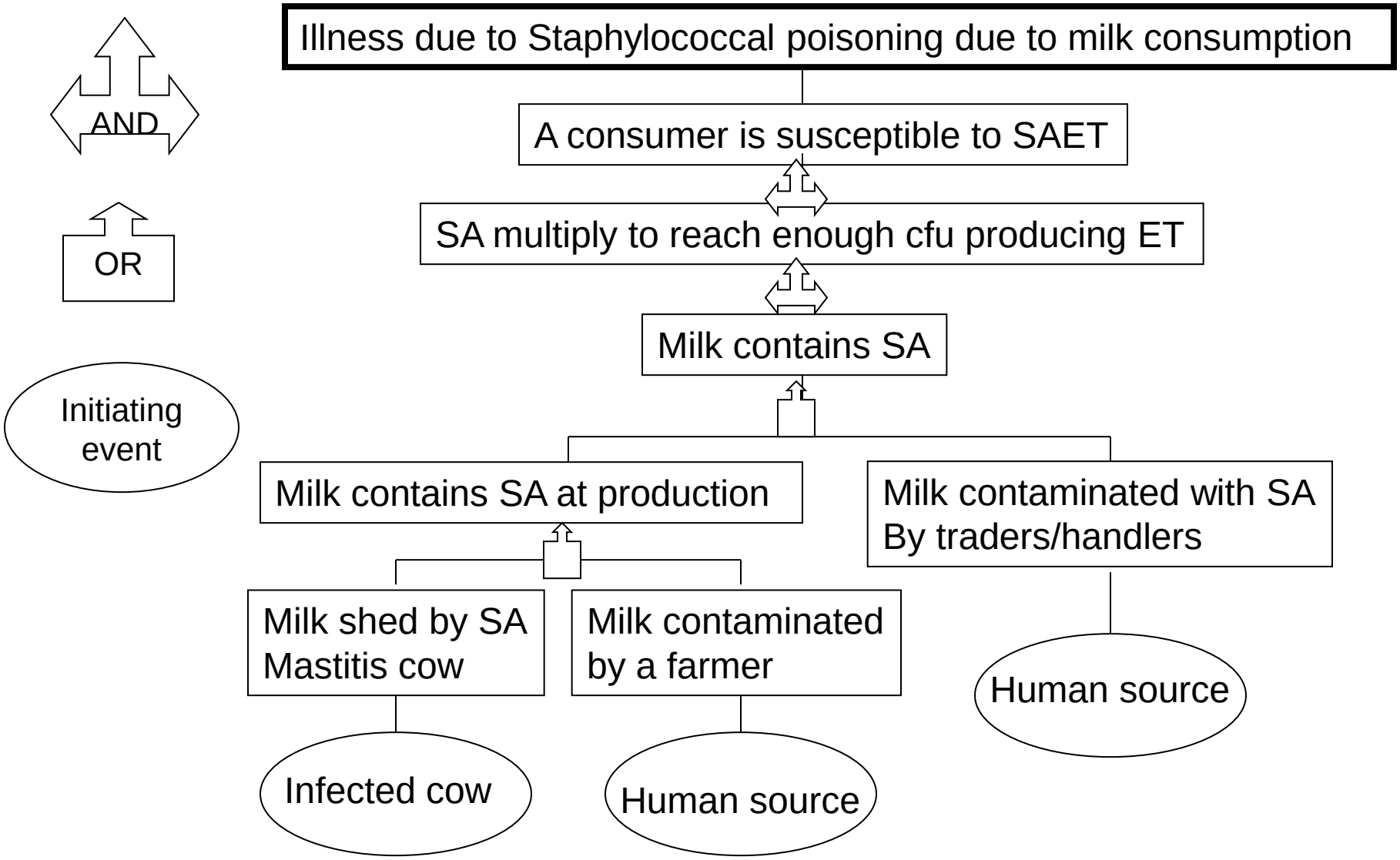
Risk assessment of staphylococcal poisoning due to consumption of informally-marketed milk and home-made yoghurt in Debre Zeit, Ethiopia (Makita et al. (2012) Int. J. Food Microbiol. 153: 135-141.)

Hazard identification

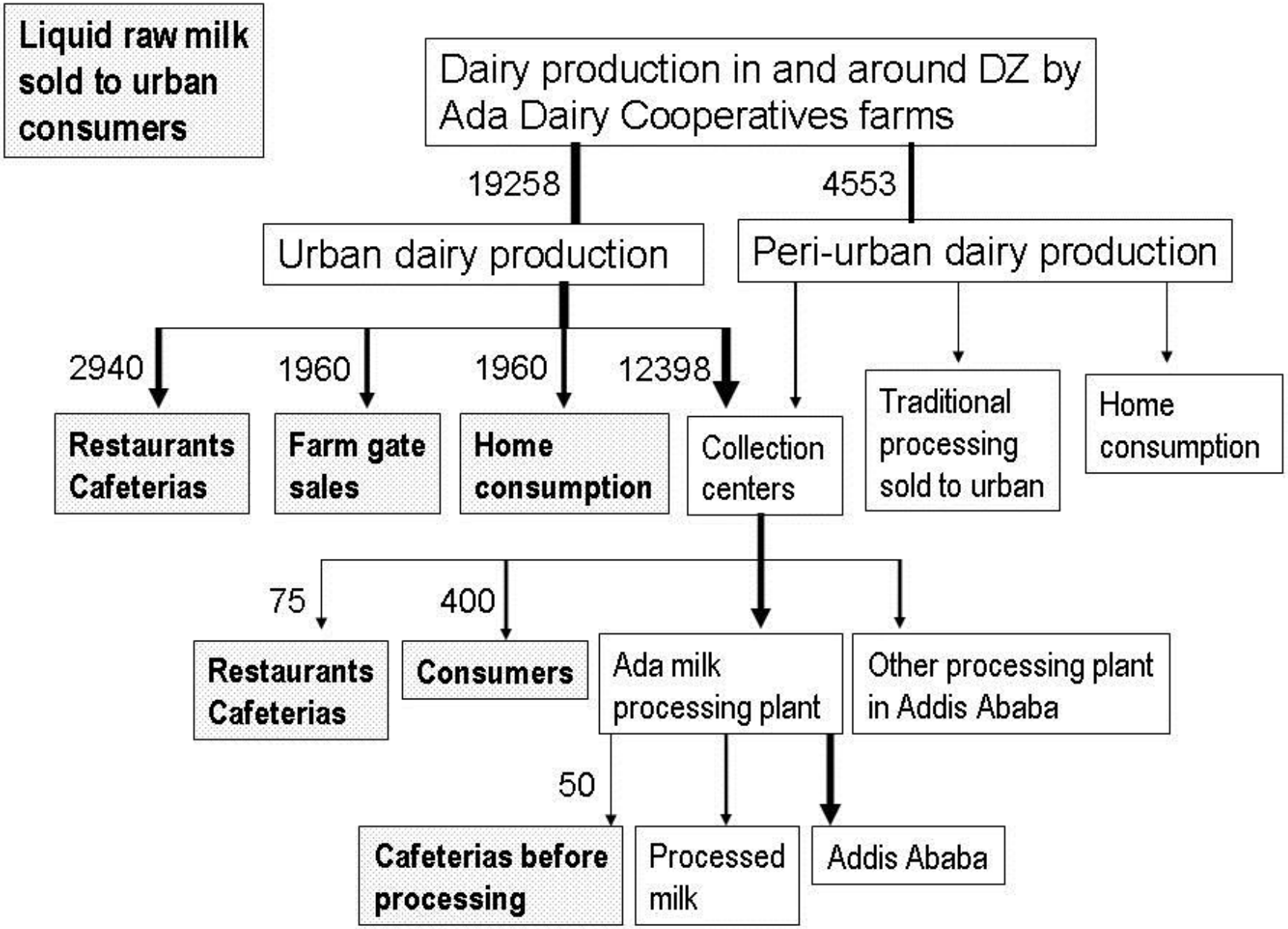
- Hazard
  - *Staphylococcus aureus* enterotoxin
  - Produced by *S. aureus* when the concentration in milk exceeds $10^{6.5}$ CFU/ml

- *S. aureus* is known to be prevalent in milk in Ethiopia by previous reports

Fault tree: understanding the logic of illness



Exposure assessment



Dairy value chain- RRA and interviews

Exposure assessment

Contamination rate - a survey

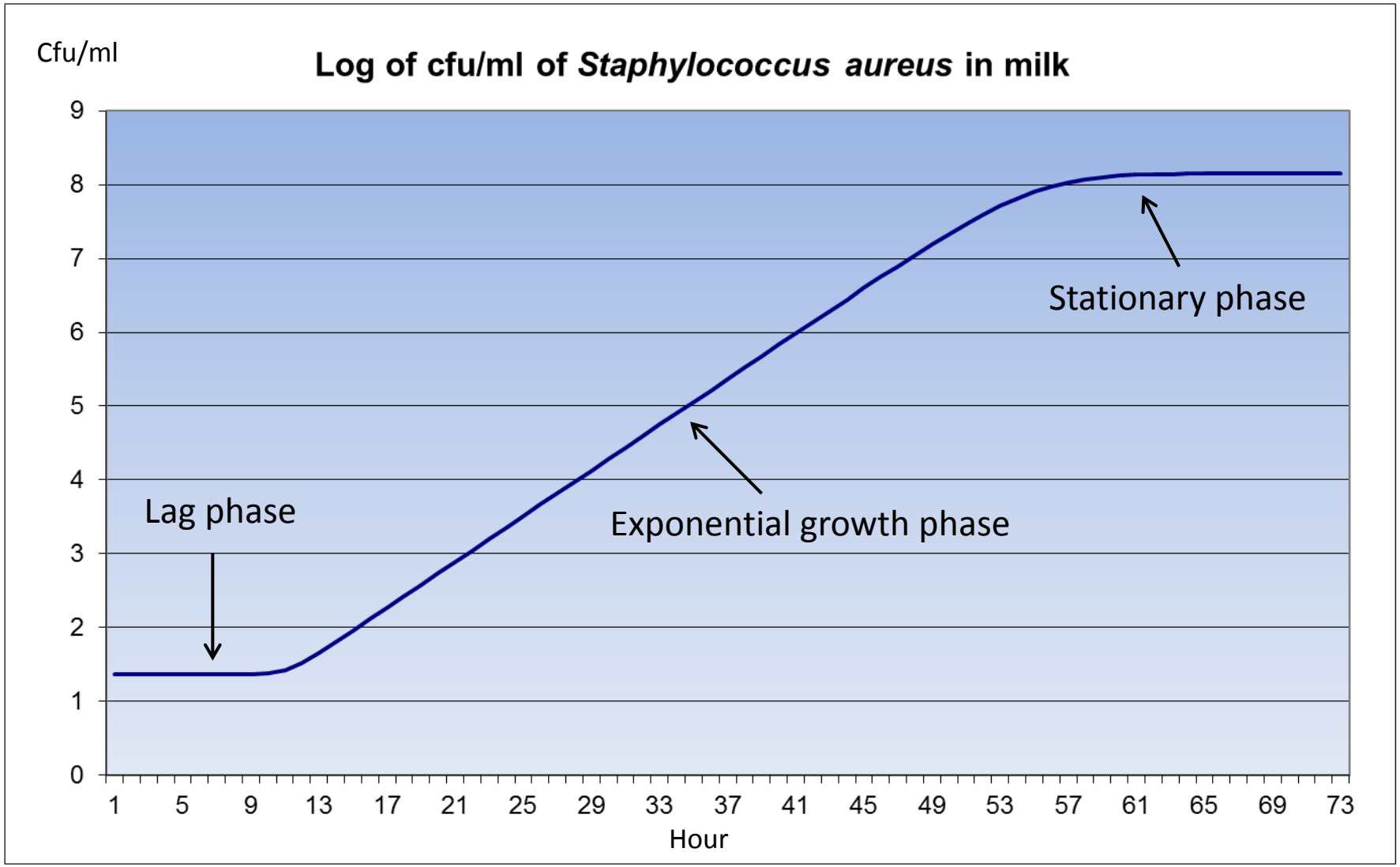
	Isolation of *S aureus*	Boiling before sales
Milk collection centre (n=25)	18 (70.4%)	0
Dairy farm (n=170)	74 (43.6%)	0

Risk mitigation by consumers -participatory and interviews

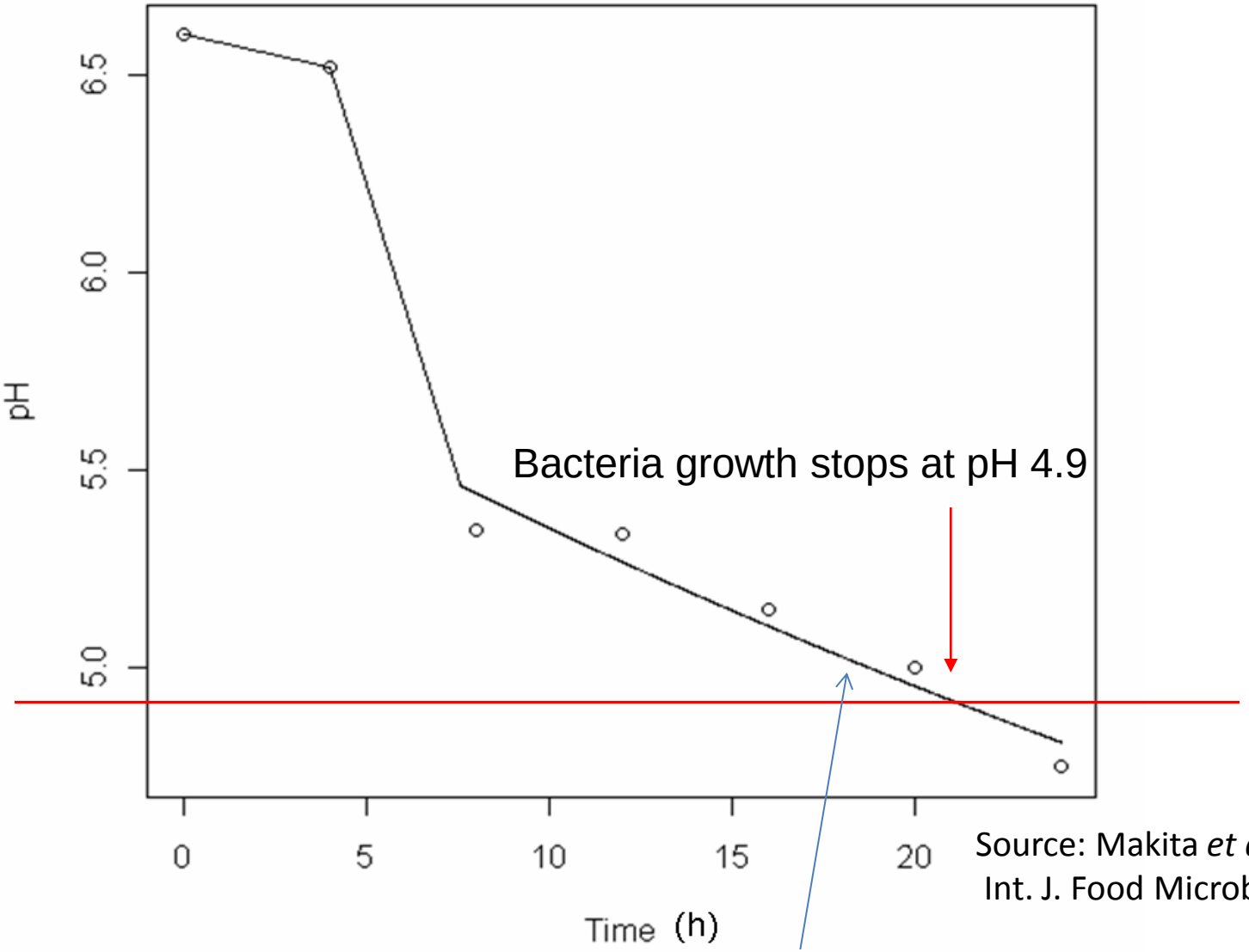
	Boil milk before consumption	Percentage
Dairy farming households (n=170)	116	68.2
Consumers (n=25)	16	64.0

Growth model:

Fujikawa and Morozumi (2006)
modified logistic model



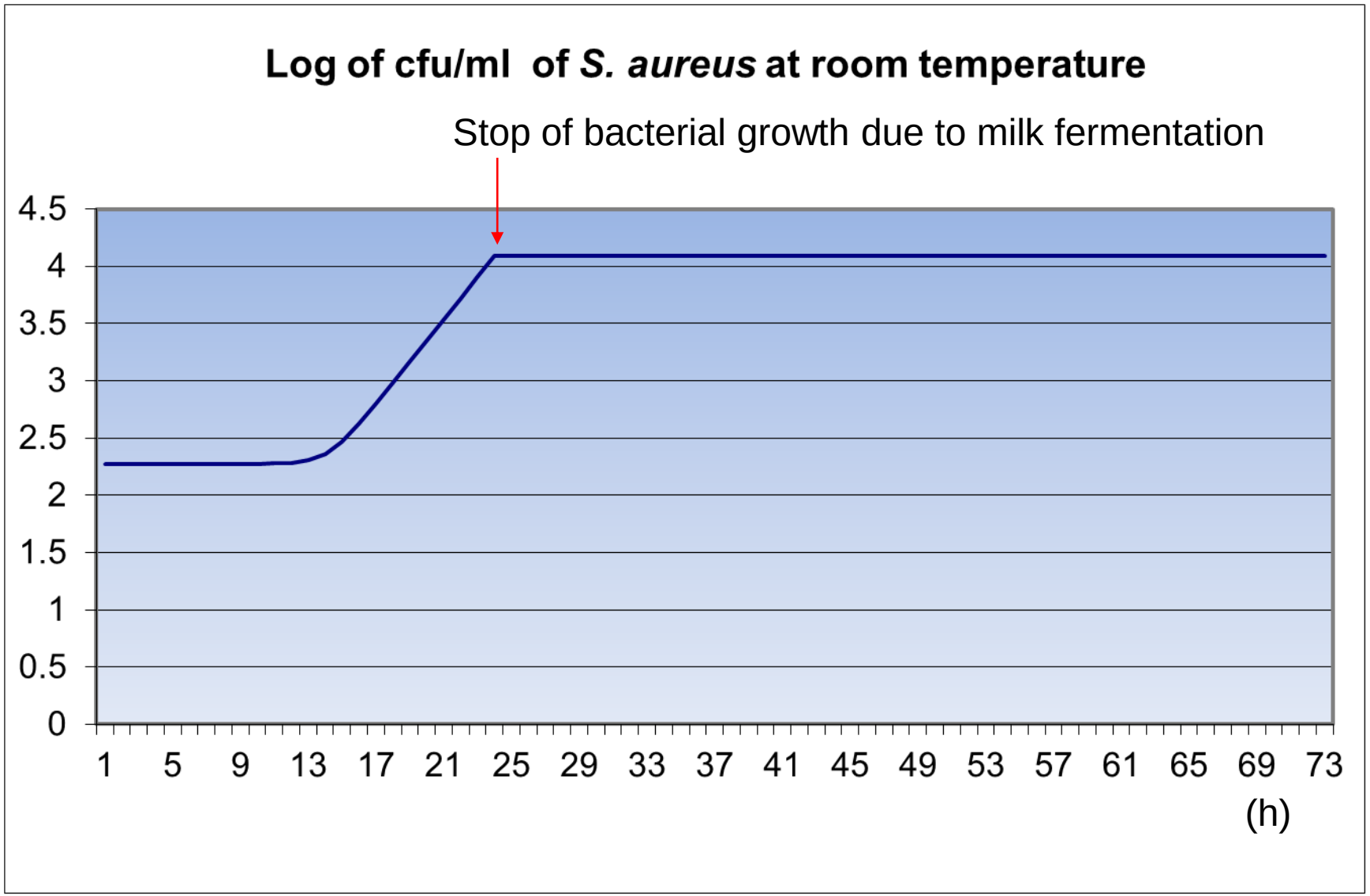
Risk mitigation by traditional milk fermentation- Modeling using reported data (Gonfa et al., 1999)



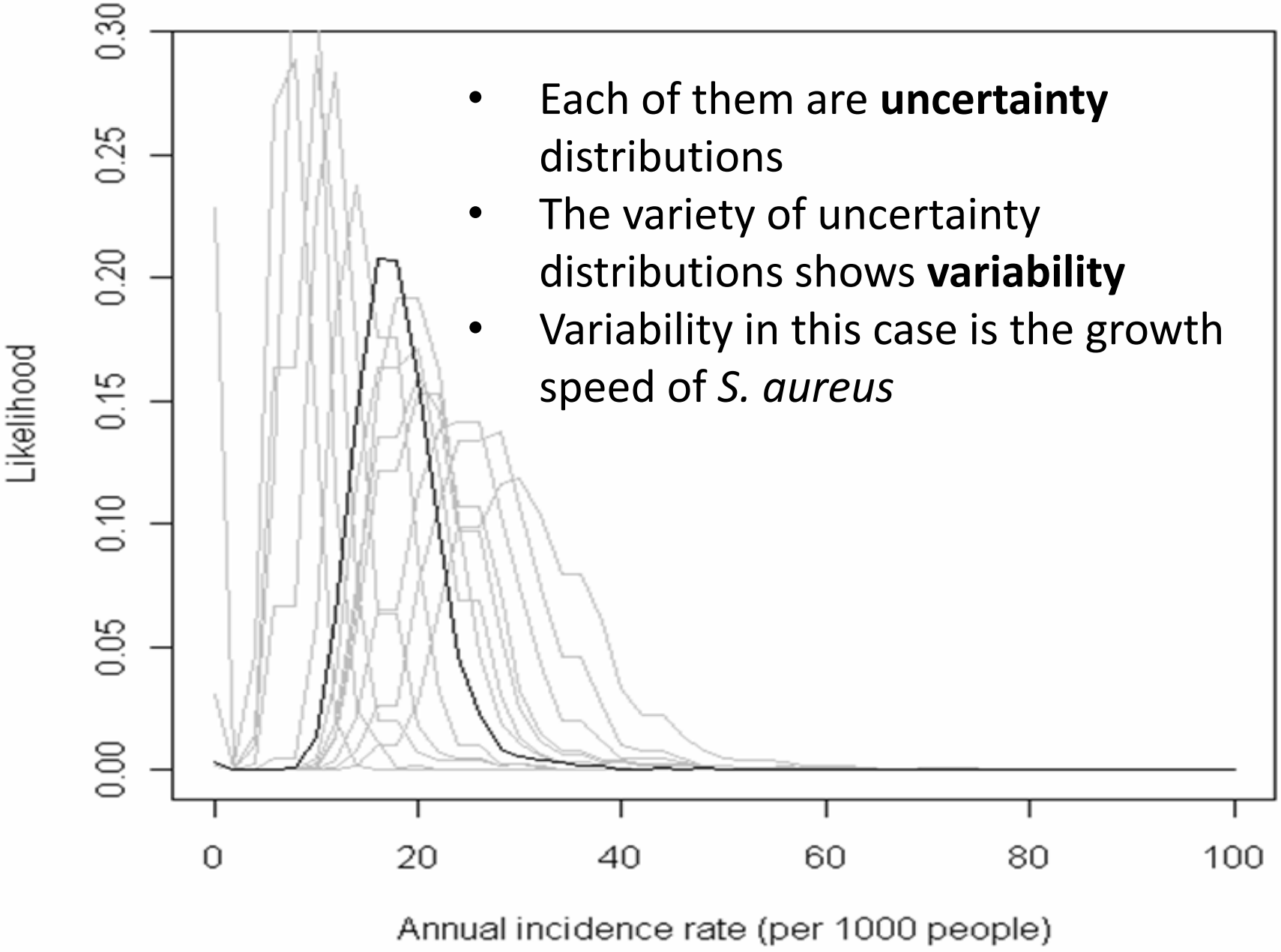
Source: Makita *et al.*, 2012 Int. J. Food Microbiol.

1/pH=0.002 t (h)+1.187 (df=3, r2=0.90, p=0.009)

Stop of growth of *S. aureus* in milk by low pH



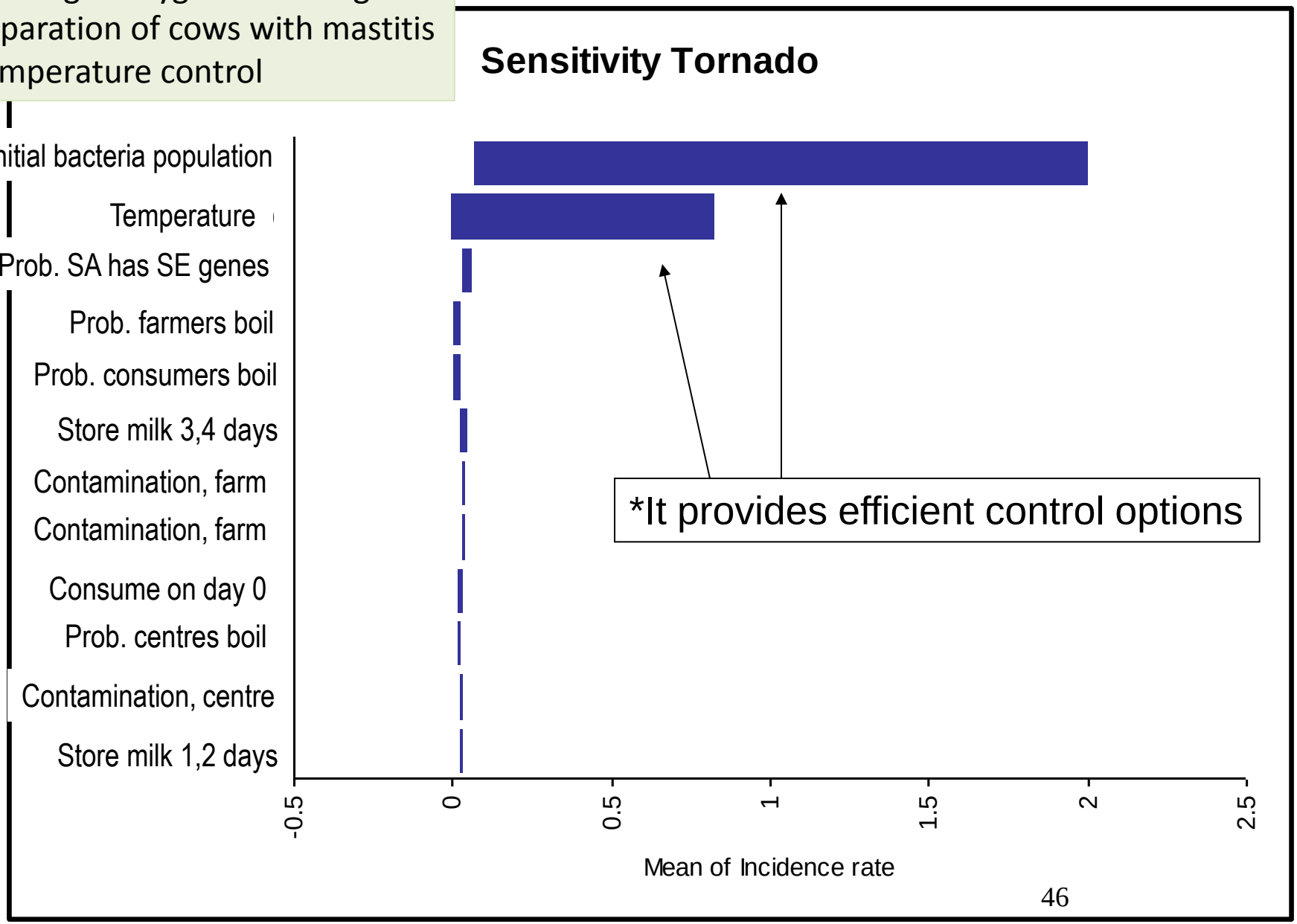
Risk characterization



- Each of them are **uncertainty** distributions
- The variety of uncertainty distributions shows **variability**
- Variability in this case is the growth speed of *S. aureus*

Sensitivity analysis

- Training for hygienic milking
- Separation of cows with mastitis
- Temperature control



Conclusion

- Food safety is important in public health
- Risk assessment is useful in identifying factors reducing the risk, including animal production phase
- Improvement of farm hygiene contributes food safety