

DATA requirement, data sources and tools

Kiran Bhilegaonkar

Microbial Hazard

- Characteristics of the pathogen.
 - Genus, species, strain, subtype, phagetype
 - Infectivity, virulence or pathogenicity, and disease mechanism.
 - Dose-response: Age groups, immune status
 - Genetic factors (e.g. antimicrobial resistance and virulence factors).
- Estimates of prevalence and level of contamination from farm to product
 - season, animal, climate, region, lot-to-lot variation, etc.

Microbial Hazard

- Changes in the level of contamination from the starting point to the end of the production-to-consumption pathway
- Secondary source of contamination: Presence and level of the organism on equipment, in water, on hands and on packing, and how this varies
- Growth and survival information
 - Response of the organism to decontamination measures, and how this may vary
 - Survival characteristics in the processing environment, e.g. on equipment, in water, on hands and on packaging, with an indication of variation

Food product

- Detailed description of the product and sub-product
- Domestic production and import data
- Seasonal variations in the product or its composition
- Other food consumed with the product
- Food-microbe interaction
 - Ability of product to support growth or survival
 - Temperature, pH, salt and other ingredients in the product, storage time, etc.
 - Processing causing stress on microbes

Food chain

- Information on production practices
 - Agricultural practices
 - Animal husbandry practices
- Details of pathogen testing of live animals or raw ingredients (including water)
- Processing Practices : Slaughtering
- Main processing events at each stage, with details of any variation
- Times and temperatures during processing, storage or transport, with details of any variation
- Details of mixing/partitioning

Food chain

- Cleansing and disinfection methods – how often they are undertaken and the extent to which they vary
- Hygiene and handling practices and how they vary
- Operating equipment, procedures and plant design, and how variable are these
- Use of water and how this may vary
- Good Agricultural Practice (GAP), Good Manufacturing Practice (GMP), HACCP details

Consumer

- Consumer groups characterized by age, gender, ethnic origin, health status, culture, region of the country, socio-economic factors, etc.
- Frequency of consumption of the product or sub-products
- Consumption amount or typical portion or serving sizes and variations
- Storage times and temperatures for the home and catering environments, and variations
- Cooking methods, times and temperatures for the home or catering environments, with indication of variation
- Handling practices and the extent to which cross-contamination can occur

Data sources

International Organizations

- FAO/WHO/Codex Alimentarius Commission
 - Principles
 - Guidelines
 - Expert consultations
- ICMSF (International Commission on the Microbiological Specifications of Foods)
- ILSI (International Life Sciences Institute)
- OIE (Organisation Internationale Epizooties/World Organisation for Animal Health)
- ISO (International Organization for Standardization)
- EC (European Commission)
- USFDA

National organizations

- Food production, import and export statistics: MoA, MoC, APEDA
- National food consumption and nutrition surveys: NIN, Hyderabad
- Annual health statistics: MoHFW
- National surveillance data for foodborne disease/outbreaks: IDSP of MoHFW
- Data from epidemiological surveys: NCDC, ICMR and ICAR
- Data from governmental reports : ICAR, ICMR, CSIR, MoHFW, MoFPI, DAHDF, FSSAI

Food Industry

- Food production or sales data
- Market share information
- Processing and operation details (HACCP, GHP, GMP, etc)

Published and un-published literature

■ **Journals/books**

- Microbiology: Medical/veterinary/ food
- Public health/Veterinary public health: Medical and Veterinary
- Environmental sciences

■ **Annual reports**

- Universities/Veterinary and Medical colleges
- Research institutes/organizations

■ **Students dissertation**

■ **Project/research reports**

FAO/WHO

(example risk assessments)

- **Salmonella in eggs and broiler chickens:**

- FAO/WHO. 2002a. Risk assessment of Salmonella in eggs and broiler chickens. Interpretative summary. [FAO/WHO] Microbiological Risk Assessment Series, No. 1. 44p.
- FAO/WHO. 2002b. Risk assessment of Salmonella in eggs and broiler chickens. Technical report. [FAO/WHO] Microbiological Risk Assessment Series, No. 2. 302p.

FAO/WHO

(example risk assessments)

- **Listeria monocytogenes in ready-to-eat foods:**
 - FAO/WHO. 2004a. Risk assessment of *Listeria monocytogenes* in ready-to-eat foods. Interpretative summary. [FAO/WHO] Microbiological Risk Assessment Series, No. 4. 49p.
 - FAO/WHO. 2004b. Risk assessment of *Listeria monocytogenes* in ready-to-eat foods. Technical report. [FAO/WHO] Microbiological Risk Assessment Series, No. 5. 270p.

FAO/WHO

(example risk assessments)

■ **Vibrio spp. in seafood:**

- FAO/WHO. 2005. Risk assessment on *Vibrio vulnificus* in raw oysters. [FAO/WHO] Microbiological Risk Assessment Series, No. 8.
- FAO/WHO. 2005. Risk assessment of cholerae *Vibrio cholerae* O1 and O139 in warm-water shrimp in international trade. [FAO/WHO] Microbiological Risk Assessment Series, No. 9.

■ **Campylobacter spp. in broiler chickens:**

- FAO/WHO. 2007. Risk characterization of *Campylobacter* spp. in broiler chickens: Interpretative summary. [FAO/WHO] Microbiological Risk Assessment Series, No. 11.
- FAO/WHO. 2007. Risk characterization of *Campylobacter* spp. in broiler chickens: Technical report. [FAO/WHO] Microbiological Risk Assessment Series, No. 12.

Microbial Risk Assessment Tools - Windows Internet Explorer

http://www.mramodels.org/

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World Health Organization

FAO

Microbiological Risk Assessment Tools

Links

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[FAO JEMRA Page](#)

[WHO JEMRA Page](#)

One of the objectives of JEMRA (Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment) is to make risk assessment more accessible and user-friendly to the wider food safety community. The development of risk assessment tools is one approach to achieving this. Development of these tools has been driven by the international standard setting work of the Codex Alimentarius which takes a risk based approach to its standard development work and in its standards guides countries to also embrace risk based approaches.

A tool to assess the impact of control measures on the risk associated with *Cronobacter* spp. in powdered infant formula was the first tool to be developed and can be used in conjunction with the Codex Code of Hygienic Practice for Powdered Formulae for Infants and Young Children available at http://www.codexalimentarius.net/download/standards/11026/CXP_066e.pdf.

The decision support tool for the management of *Campylobacter* and *Salmonella* in chicken meat has been developed to support a risk based approach to the management of these pathogens and can be used in conjunction with the Codex

Tools

[Powdered Infant Formula](#)

[Poultry](#)

start

Microbial Risk Assess... tools

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A swift Quantitative Microbiological Risk Assessment (sQMRA) tool - FoodRisk.org - Windows Internet Explorer

http://foodrisk.org/exclusives/sqma/

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TOOLS & RESOURCES

- Tools
- Risk Assessment Models
- Risk Assessment Repository
- Databases
- Datasets
- Learning Resources
- Software

SELECTED TOPICS

- Overview of Risk Analysis
- Risk Assessment
- Risk Management
- Risk Communication
- Epidemiology & Surveillance
- Economics


Home » Exclusives » A swift Quantitative Microbiological Risk Assessment (sQMRA) tool


A swift Quantitative Microbiological Risk Assessment (sQMRA) tool

Eric G. Evers¹, Jurgen E. Chardon¹


¹National Institute for Public Health and the Environment, P.O. Box 1, 3720 BA Bilthoven, The Netherlands



A simplified Quantitative Microbiological Risk Assessment (QMRA) model was especially developed to compare the risk of pathogen-food product combinations. The swift quantitative microbiological risk assessment (sQMRA) tool is implemented in Microsoft Excel. Special attention is given to make the sQMRA tool insightful, for educational purposes. Pathogen numbers are followed through the food chain, which in this case starts at retail and ends with the number of human cases of illness. The model is deterministic and includes cross-contamination and preparation (heating) in the kitchen and a dose-response relationship. The general setup of the sQMRA tool consists of consecutive questions for values of each of the 11 parameters, always followed by intermediate model output broken down into categories of contamination, cross-contamination and preparation. In a separate sheet, model input and output are summarized and exposure as well as cases are attributed to the distinguished categories. As a relative risk measure, intermediate and final model outputs are always compared with results from a full-scale QMRA of *Campylobacter* on chicken fillet. The sQMRA-tool can serve as a guide for selection of pathogen-food combinations for applying full-scale QMRA, or for risk management — by facilitating the translation of the results of trend analysis or of a specific research project into terms of risk.




The authors welcome any comments, suggestions and questions. Please send them to Dr. Evers at eric.evers@rivm.nl .

[Download sQMRA model](#) 

Reference

- [A swift Quantitative Microbiological Risk Assessment \(sQMRA\) tool](#) . Food Control 2010, 21, 319-330.

The sQMRA tool was commissioned by the [Dutch Food and Consumer Product Safety Authority](#)  and developed by the [National Institute for Public Health and the Environment \(RIVM\)](#) .

start    A swift Quantitative ... Microsoft PowerPoint ...

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Microsoft Excel - sQMRA tool [Evers and Chardon (2010), Food Control, 21, 319-330]

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Type a question for help

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AB(D) E F G H I J K L M N O P Q R S T U V W

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

sQMRA - tool
swift Quantitative Microbiological Risk Assessment tool

QUICKSTART: Enter data for your assessment in the blue data fields

case definition
What is the pathogen of interest? pathogen X
What is the foodproduct of interest? product Y
What is the population size? 16 million people
What are the population characteristics? total Dutch population
What is the consumption period? one year

INTRODUCTION
GENERAL: The sQMRA-tool calculates the public health risk of pathogens in food (e.g.: attribution of exposure, attribution of cases and relative risk). The model uses consumption data and prevalence- and concentration data at retail level. Cross-contamination and under-preparation are taken into account in the model. A dose-respons relation is used to calculate cases of illness. It is a quantitative model that uses point-estimates in the calculations, so no account is taken for uncertainty or variability. The tool is published: Evers, E.G., Chardon J.E. (2010). A swift Quantitative Microbiological Risk Assessment (sQMRA) tool. Food Control, 21, 319-330.
INTERFACE: The sQMRA-tool has an easy to use interface: When the 11 questions are answered, the model output is presented at the bottom of this sheet and on the 'results' sheet. In between the questions, intermediate model output is presented.

CONSUMPTION DATA

consumption data
1. How many portions (N) are consumed in the population per consumption period? 1.0E+08 portions
2. What is the average size of one portion? (M) 100 grams

RETAIL

prevalence data
3. What percentage (Sr/+) of the portions is contaminated at retail? (non detects included) 30%

portion category	portions	
	percent	number
contamination at retail		
+	30%	3.0E+07
-	70%	7.0E+07

concentration data
4. What is the average concentration of cfu's per 0.3 cfu/gram

MODEL RESULTS contact

Ready NUM

start http://foodrisk.org/d... tools MRA tools Microsoft Excel - sQM...

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Camrawiki - Windows Internet Explorer

http://wiki.camra.msu.edu/index.php?title=Quantitative_Microbial_Risk_Assessment_%28QMRA%29_Wiki

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Quantitative Microbial Risk Assessment (QMRA) Wiki






QMRAwiki is the QMRA community's portal for current quantitative information and knowledge developed for the Quantitative Microbial Risk Assessment (QMRA) field. It is an [evolving repository](#) for QMRA knowledge and data available to the risk analysis community. To [add or edit](#) QMRAwiki content, please [create an account](#).

Get Started

The [QMRAwiki](#) offers a variety of ways to find what you're looking for. This section offers quick links to popular items. Below, click on one of the "Risk Assessment - Five Sections" to visit that section of the wiki.

What is QMRA?	How to Contribute	Quick Reference	Apps & Calculators	In the News	Help
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Quantitative Microbial Risk Assessment - Five Sections.

				
HAZARD IDENTIFICATION	DOSE RESPONSE	EXPOSURE ASSESSMENT	RISK CHARACTERIZATION	RISK MANAGEMENT

start

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Hazard Identification (Home Page) - Camrawiki - Windows Internet Explorer


http://wiki.camra.msu.edu/index.php?title=Hazard_Identification_(Home_Page)

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Hazard Identification (Home Page)



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HAZARD IDENTIFICATION

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Agent Overviews

Summary Table (all agents)

Important Outbreaks

What is Hazard Identification?

Hazard identification (often referred to Hazard ID) is one of the initial step in a quantitative microbial risk assessment (QMRA). After the problem formulation which may include discussion of the venues, situations and problems to be addressed, the list of hazards associated with these problems needs to be articulated. For QMRA the Hazard ID comprises general information about the microbial agent (pathogens) and the adverse consequences to the host from infection and incorporates a wide array of information about the infectious agents. A microorganism that can infect host organisms and reproduces is associated with an endpoint of infection and may cause asymptomatic infections without disease (% without asymptomatic rates). The disease and the disease process itself can be described quantitatively, which includes, latency, incubation times, duration of infectiousness and disease, % of cases with various symptomology, excretion Rates (see Exposure) and immunity (eg. time for immunity to wane; % immune in adult population; seroprevalence;

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Dose Response (Home Page) - Camrawiki - Windows Internet Explorer

http://wiki.camra.msu.edu/index.php?title=Dose_Response_(Home_Page)

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Dose Response (Home Page)



DOSE RESPONSE

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What is dose response?

In the QMRA framework, the dose response assessment phase is an essential quantitative element of the risk estimate. It estimates the risk of a response (for example, infection, illness or death) given a known dose of a pathogen. Dose response models are mathematical functions that describe the dose response relationship for specific pathogens, transmission routes, and hosts.

What is Dose Response?

Table of Recommended Best-Fit Parameters

Completed Dose Response Models

Mathematical & Statistical Approaches

Dosing Experiments

Dose Response Equations



In general, we use the exponential model and the beta-Poisson model to describe dose response relationships. The slope of the beta-Poisson dose response curve is more shallow than the exponential. The exponential model has one parameter and is a special case of the beta-Poisson model (which has two parameters).

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Dose Response (Hom... tools

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Exposure Assessment (Home Page) - Camrawiki - Windows Internet Explorer

http://wiki.camra.msu.edu/index.php?title=Exposure_Assessment_(Home_Page)


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EXPOSURE ASSESSMENT

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[Introduction](#)[Pathogen-Specific Exposure Parameters](#)[General exposure parameters](#)[Pathogen List](#)

What is Exposure Assessment?

Exposure at the simplest level is the dose of the pathogen that an individual ingests, inhales, or comes in contact with. This number feeds into the dose-response models to predict the probability of infection. However exposure assessment is very complex and involves a combination of addressing the methods used to measure the microbes and the concentrations in the water or air for example, as well as the timing of the exposure. In most cases exposure can be viewed as a pathway from the source of the pathogen (eg shedding of pathogens by infected individuals, or concentrations in sewage) to the actual exposure (swimming at the beach). This also involves understanding the transport and survival of the microbe.

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Thanks