Contents

PART 1 AN INTRODUCTION TO FOOD AND ENVIRONMENTAL VIROLOGY

An introduction to food and waterborne viral disease

N Cook, Food and Environment Research Agency, UK, and G Richards, Delaware State University, USA

- Introduction to enteric viruses
- Food and water as vehicles of virus transmission
- Outbreaks of food- and waterborne viral illness
- Virus detection
- Control of virus contamination of food and water
- References

Prevalence of viruses in food and the environment

T Petrovic, Scientific Veterinary Institute "Novi Sad", Serbia

- Introduction
- The prevalence of virus contamination in food and water
- Gaps in current knowledge
- Conclusion and future trends
- Acknowledgement
- References

PART 2 DETECTION, SURVEILLANCE AND RISK ASSESSMENT OF VIRUSES IN FOOD AND WATER

Molecular detection of viruses in foods and food-processing environments

D Rodriguez-Lazaro, University of Burgos, Spain, and K Kovacand and M Hernández, Instituto Tecnológico Agrario de Castilla y León (ITACyL), Spain

- Introduction
- Molecular detection of viruses in foods: the process
- Current issues in molecular detection of viruses in foods
- Conclusion
- References

Sampling strategies for virus detection in foods, food-processing environments, water and air

A Rzeżutka, National Veterinary Research Institute, Poland and A Carducci, University of Pisa, Italy - Introduction

- Virus monitoring at different levels of the food supply chain
- The significance of water, air and surface sampling during food chain monitoring
- Sampling strategy in relation to food- and water-borne outbreaks
- Conclusion
- Sources of further information and advice
- References
- Appendix: sampling from food, water and air

Molecular detection of viruses in water and sewage

- G La Rosa and M Muscillo, Istituto Superiore di Sanità, Italy
- Introduction
- Sample treatment: adsorption-elution methods
- Sample treatment: ultrafiltration and ultracentrifugation
- Key assaysfor virus detection
- Advantages and disadvantages of polymerase chain reaction (PCR) and related methods
- Current applications and results
- References

Quality control in the analytical laboratory: analysing food and waterborne viruses

M D'Agostino, Food and Environment Research Agency (Fera), UK

- Introduction
- Controls for the sample treatment step
- Controls for the nucleic acid extraction step
- Controls for the amplification step
- Additional recommended controls
- Reference materials
- Conclusion
- References

Tracing the sources of outbreaks of food and waterborne viral disease and outbreak investigation using molecular methods

M Taylor, University of Pretoria, South Africa

- Introduction
- Challenges in food and waterborne outbreak tracing and investigation
- Microbial source tracking
- Molecular-based source tracking
- Molecular tracing in outbreaks
- Conclusion
- References

Quantitative risk assessment for food and waterborne viruses

A M de Roda Husman and M Bouwknegt, National Institute for Public Health and the Environment (RIVM), The Netherlands

- Introduction
- Quantitative microbiological risk assessments (QMRAs) and their outcomes
- Data gaps and needs
- Future trends
- Conclusion
- References

PART 3 VIRUS TRANSMISSION ROUTES AND CONTROL OF FOOD AND WATER CONTAMINATION

Natural persistence of food and waterborne viruses

- P Vasickova and K Kovarcik, Veterinary Research Institute, Czech Republic
- Introduction
- Methods for studying persistence
- General factors affecting the natural persistence of viruses
- Persistence in aquatic environments
- Persistence in soils
- Persistence on food related surfaces
- Persistence in food
- Acknowledgement
- References

Occurrence and transmission of food and waterborne viruses by fomites

C Gerba, University of Arizona, USA

- Introduction: the role of fomites in virus transmission
- Occurrence and survival of viruses on fomites
- Virus transferand modeling transmission
- Disinfection and other interventions to prevent fomite transmission
- Future trends
- References

Viral contamination by food handlers and recommended procedural controls I Boxman, Food and Consumer Product Safety Authority (NVWA), The Netherlands

- Introduction

- Role of food handlers in virus transmission
- Current knowledge and hygienic practices among food handlers
- Guidance documents on food hygiene
- Guidelines on the application of general principles of food hygiene to the ontrol ofviruses in food
- Designing HACCP with the viruses NoV and HAV in mind
- Conclusion and future trends
- Acknowledgement
- References

Foodborne virus inactivation by thermal and non-thermal processes

- L Baert, Ghent University, Belgium
- Introduction
- Thermal processes
- Non-thermal processes
- Appropriateness of surrogates
- Future trends
- Sources of further information and advice
- References

Preventing and controlling viral contamination of fresh produce

- S Bidawid, Health Canada, Canada
- Introduction: why food contamination occurs
- Contamination of produce
- Attachment, adsorption and internalization
- Prevention
- Recommendations
- Additional intervention strategies
- Future trends
- Sources of further information and advice
- References

Preventing and controlling viral contamination of shellfish

- J W Woods and W Burkhardt, US Food and Drug Administration, USA
- Introduction
- Human enteric viruses in the environment
- Enteric viruses in sewage and shellfish
- Survival of enteric viruses in the environment
- Mitigation strategies and depuration
- Current regulations
- Conclusion
- References

Viral presence in waste water and sewage and control methods

- C Gerba, M Kitajima and B Iker, University of Arizona, USA
- Introduction: virus occurrence in wastewater
- Natural treatment systems
- Disinfection of wastewaters
- Future trends
- References

PART 4 PARTICULAR PATHOGENS AND FUTURE DIRECTIONS

Advances in understanding of norovirus as a food and waterborne pathogen and progress with vaccine development

D Allen, M Iturriza-Gómara and D Brown, Health Protection Agency, UK

- Introduction
- Norovirus virology and clinical manifestations

- Susceptibility, immunity and diagnosis
- Epidemiology of norovirus gastroenteritis associated with food, water and the environment
- Prevention and control
- Conclusion
- References

Advances in understanding of hepatitis A virus as a food and waterborne pathogen and progress with vaccine development

- R M Pintó and A Bosch, University of Barcelona, Spain
- Introduction: hepatitis A infection
- Susceptibility in different sectors of the population
- Highly effective vaccines for hepatitis A prevention
- Risk assessment and risk management in water and food
- Unique properties of hepatitis A virus
- Quasispecies dynamics of evolution and virus fitness
- Conclusion
- References

Advances in understanding of rotaviruses as food and waterborne pathogens and progress with vaccine development

- F M Ruggeri and L Fiore, Istituto Superiore di Sanità, Italy
- Introduction
- Background
- Clinical manifestation
- Rotavirus detection in different samples
- Epidemic outbreaks
- Zoonotic transmission
- Future trends
- References

Advances in understanding of hepatitis E virus as a food and waterborne pathogen and progress with vaccine development

W van der Poel and A Berto, Wageningen University and Research Centre, The Netherlands

- Introduction
- Viral proteins
- Hepatitis E virus replication, pathogenesis and clinical symptoms
- Susceptibility and effects in different sectors of the population
- Epidemiology of hepatitis E virus
- Hepatitis E virus stability and inactivation
- Diagnostic procedures
- Hepatitis E virus prevention and control
- References

Epidemiology, control and prevention of emerging zoonotic viruses

- R Santos and S Monteiro, Instituto Superior Técnico, Portugal
- Introduction
- Emerging viruses:geographical factors
- Clinical manifestations of some emerging types
- Possible control measures
- Conclusion
- References

Possible impacts of climate change on viral pathogens in food and water, and other emerging issues

- C-H von Bonsdorff and L Maunula, University of Helsinki, Finland
- Introduction
- Viruses of concern
- Impact of short-term climate changes
- Impact of long-term climate changes

- Conclusion References

Virus indicators for food and water

R Girones and S Bofill-Mas, University of Barcelona, Spain

- Introduction

- Introduction
 Usage and definition of viral indicators
 Viruses proposed as indicators
 Viruses as microbial source tracking (MST) tools
 Future trends
 References