ITRC Biological Contaminants of Emerging Concern (BioCEC) Guidance

- 1 Introduction to Biological Contaminants of Emerging Concern Guidance
- 2 Process Guide
- 3 Conceptual Exposure Model
- 4 Key Variables
- 5 Analytical Methods
- 6 Monitoring Programs/Resource Hub
- 7 Case Studies

ITRC Biological Contaminants of Emerging Concern (BioCEC) Guidance

- 1 Introduction to Biological Contaminants of Emerging Concern Guidance
 - 1.1 Introduction
 - 1.1.1 Process Guide
 - 1.1.2 Conceptual Exposure Model
 - 1.1.3 Key Variables
 - 1.1.4 Analytical Methods
 - 1.1.5 Monitoring Programs/Resource Hub
 - 1.1.6 Case Studies
 - 1.2 Case Study: Effects of Hurricane Helene on Western North Carolina Climactic Events and Implications for Biological Contaminants in Drinking Water
 - 1.2.1 Background
 - 1.2.2 Damage to Water Treatment Infrastructure
 - 1.2.3 Water Quality and BioCEC Concerns
 - 1.2.4 Post-storm Mitigation and Recovery
 - 1.2.5 Summary
 - 1.3 References
- 2 Process Guide
 - 2.1 Identification of BioCEC
 - 2.2 Actions to take
 - 2.2.1 Notification and Coordination
 - 2.2.1.1 Key Questions
 - 2.2.1.2 Discussion
 - 2.2.2 Public Communication
 - 2.2.2.1 Key Questions
 - 2.2.2.2 Discussion
 - 2.2.3 Response Planning and Implementation
 - 2.2.3.1 Key Questions
 - 2.2.3.2 Discussion
 - 2.2.4 Continued Monitoring and Surveillance
 - 2.2.4.1 Key Questions
 - 2.3 References
- 3 Conceptual Exposure Model
 - 3.1 Introduction
 - 3.1.1 What is a CEM?
 - 3.1.2 Defining Pathogen and Host
 - 3.1.3 Defining the Environment
 - 3.1.4 The Epidemiologic Triangle and Key Variables
 - 3.2 Building a Conceptual Exposure Model Using the Epidemiologic Triangle

- 3.2.1 Identification of Environment, Pathogen, and Host
- 3.2.2 Source Media
- 3.2.3 Cross-Media Transfer and Exposure Scenarios
- 3.2.4 General Conceptual Exposure Model
- 3.2.5 Iteration and Hypotheses
- 3.3 Using a CEM
 - 3.3.1 Applications
 - 3.3.2 General Conceptual Exposure Model with Regulatory Applications
- 3.4 Conceptual Exposure Model Examples
 - 3.4.1 Example 1: Biowaste Release to Soil / Land Application of Class B Biosolids
 - 3.4.2 Example 2: Pathogenic Release to Potable Water Resource
- 3.5 Case Study: Using a CEM to Address 2018 E. coli Outbreak Linked to Romaine Lettuce
 - 3.5.1 Summary
 - 3.5.2 Conceptual Exposure Model: The Environmental Transmission Pathway
 - 3.5.3 Environmental Medium
- 3.6 References
- 4 Key Variables
 - 4.1 Introduction
 - 4.2 The Epidemiological Triangle
 - 4.3 Considerations for Assessing Risks from BioCEC
 - 4.3.1 Pathogens
 - 4.3.1.1 Intra- and Extracellular Pathogens
 - 4.3.1.2 Strict and Opportunistic (or Facultative) Pathogens
 - 4.3.1.3 Infective Dose
 - 4.3.1.4 Entering Host Cells
 - 4.3.2 Environment
 - 4.3.3 Host
 - 4.3.3.1 Variables that Affect Exposure to Pathogens
 - 4.3.3.2 Variables that Affect Health Outcomes
 - 4.3.3.3 Variables that Reduce or Eliminate Host Exposure to Contaminated Environment
 - 4.3.4 Host-Pathogen-Environment Interactions
 - 4.4 Approaches to BioCEC Prioritization Strategies
 - 4.4.1 WHO Guideline
 - 4.4.1.1 The QMRA Framework
 - 4.4.1.3 What is a DALY?
 - 4.4.1.4 Best Practices in the WHO Document
 - 4.4.2 USEPA CCL5 for Drinking Water Supply
 - 4.4.2.1 Overview
 - 4.4.2.2 Limitations
 - 4.4.3 Health Canada
 - 4.5 Tools for Prioritization
 - 4.6 Limitations and Knowledge Gap
 - 4.7 References

5 Analytical Methods

- 5.1 Description of Analytical Methods
 - 5.1.1 Microscopy
 - 5.1.2 Culture-Based Methods
 - 5.1.3 Flow Cytometry
 - 5.1.4 Matrix-Assisted Laser Desorption Ionization Time-of-Flight (MALDI-TOF)

Mass Spectrometry (MS)

- 5.1.5 Polymerase Chain Reaction (PCR)
- 5.1.6 Genomics
- 5.1.7 Fluorescence In Situ Hybridization (FISH)
- 5.2 Microbial Fingerprinting Methods
 - 5.2.1 Phospholipid Fatty Acid (PLFA)
 - 5.2.2 Denaturing Gradient Gel Electrophoresis (DGGE)
 - 5.2.3 Pulsed field gel electrophoresis (PFGE)
 - 5.2.4 Multilocus sequence typing (MLST)
 - 5.2.5 Restriction Fragment Length Polymorphism (RFLP)
 - 5.2.6 Terminal Restriction Fragment Length Polymorphism (T-RFLP):
- 5.3 Isothermal Amplification Approaches
- 5.4 References
- 6 Monitoring Programs/Resource Hub
 - 6.1 Introduction
 - 6.2 Methods for consolidating the table of resources and current monitoring methods
 - 6.3 Overall findings from the systematic review of BioCEC programs
 - 6.4 Opportunities and challenges to leveraging existing programs to improve BioCEC monitoring
 - 6.5 References
- 7 Case Studies
 - 7.1 Case Study: Blastomycosis Outbreak
 - 7.2 Case Study: 2018 E. coli Outbreak Linked to Romaine Lettuce
 - 7.3 Case Study: QMRA