Applications of Quantitative Microbial Risk Assessment to Respiratory Pathogens and Implications for Uptake in Policy

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Introduction

- Lower respiratory tract infections (RTIs) are a leading cause of death globally
- Epidemiology studies are difficult to conduct, especially for rare outcomes
- Quantitative microbial risk assessment (QMRA) is an alternative to inform policy
- This review investigated policy relevance of QMRA for respiratory pathogens

Methods

Study selection

Eligibility criteria:

1) Complete QMRA frameworks
2) Respiratory pathogens
3) Airborne transmission or contact transmission

Data extraction and synthesis

1) Existing exposure assessment approaches
2) Exposure model parameter uncertainty and variability
3) Dose-response models and model parameters
4) Linkages between simulation outcomes and policy applications

Results and discussion

Exposure assessment approaches

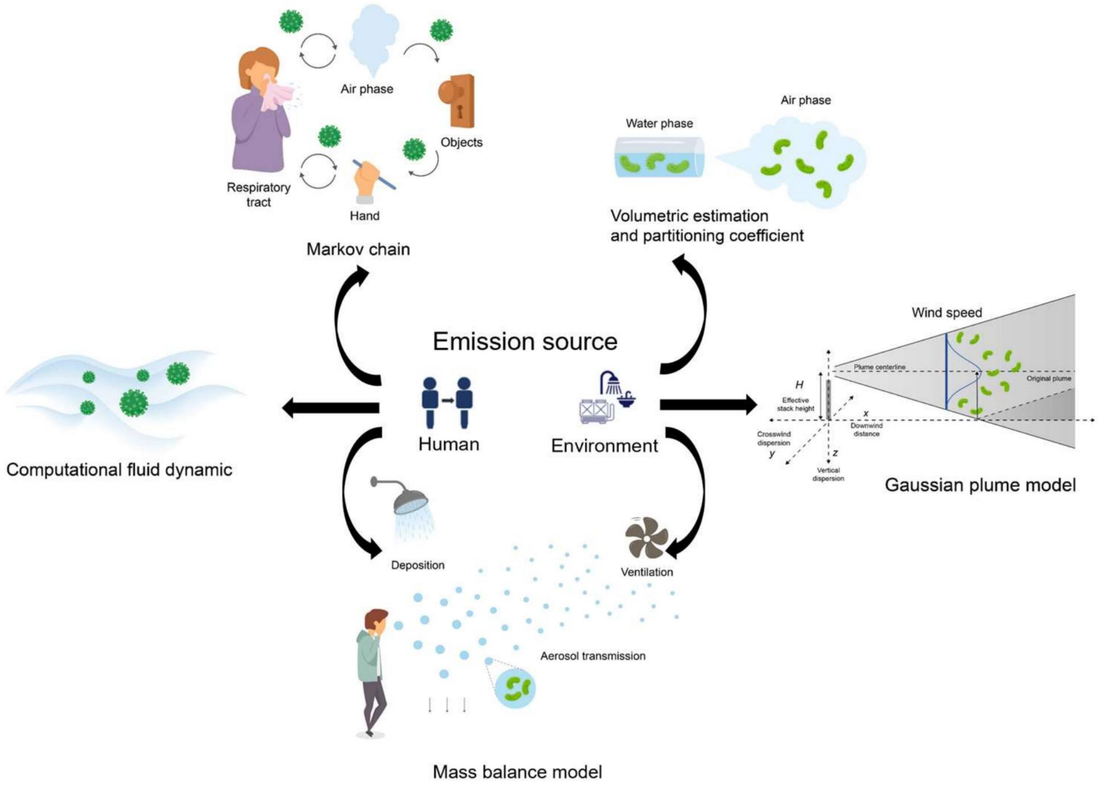


Figure 1. Conceptual representation of exposure assessment approaches used in quantitative microbial risk assessment studies for respiratory pathogens.

Exposure parameter uncertainty and variability

- Concentration of pathogen, concentration of aerosol and partitioning coefficient were mostly identified as influential parameters
- Range of uncertainty and variability can be attributed to different measurement methods, scenarios and environmental sources.
- For individual studies, parameters were arbitrarily assigned certain distributions based on simple assumptions.

Dose-response relationships for respiratory pathogens

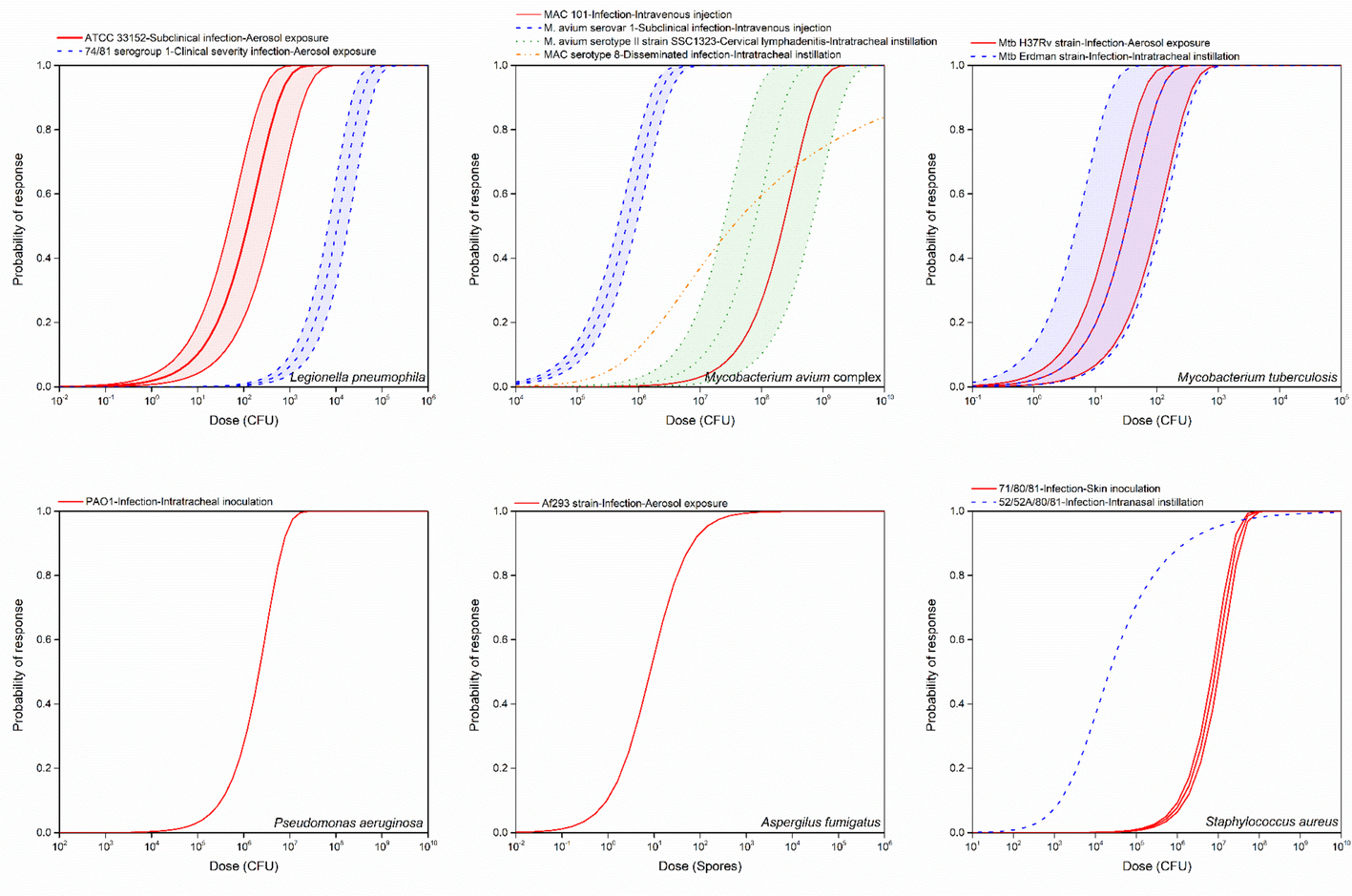
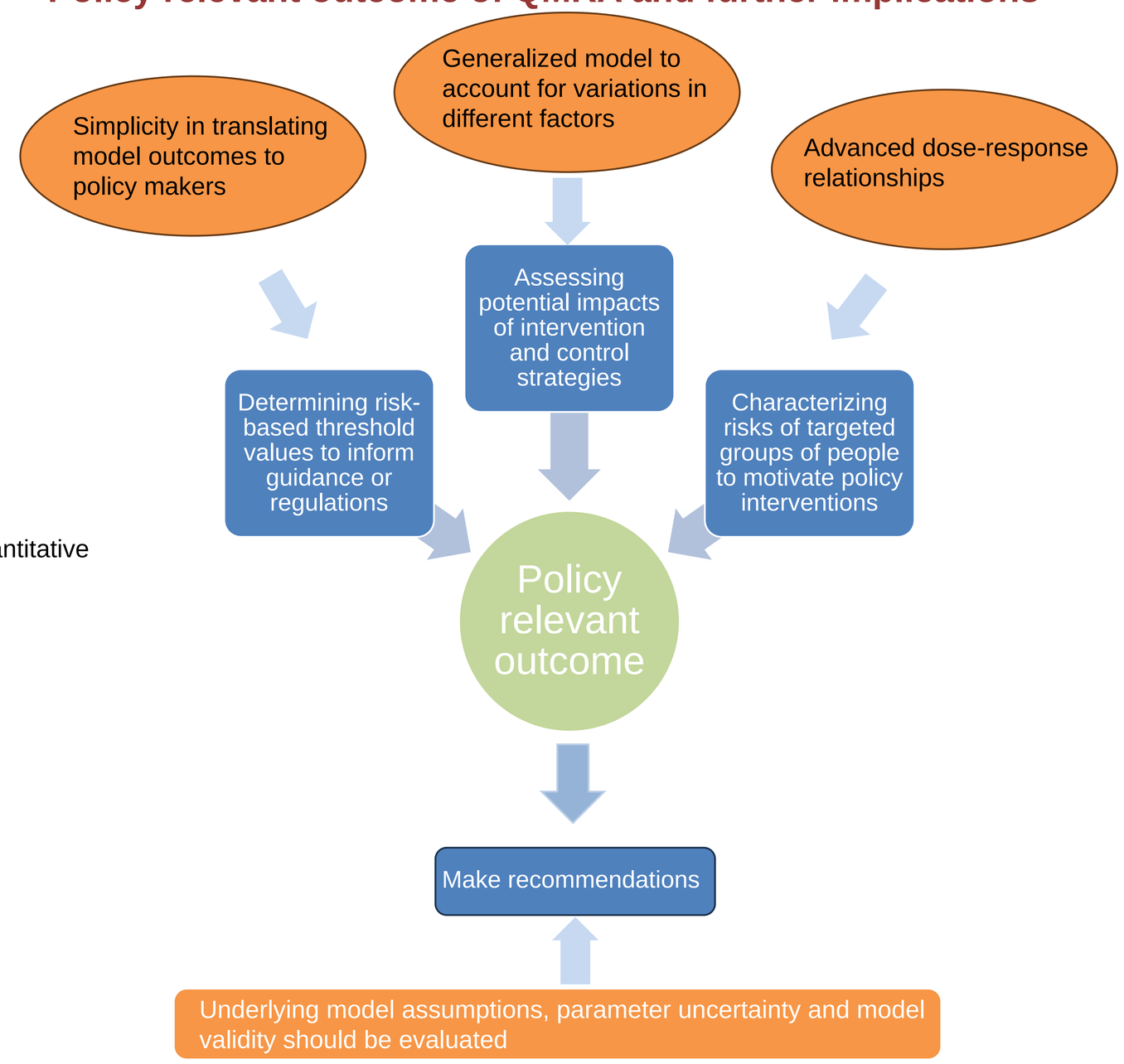


Figure 2. Dose-response relationships for respiratory pathogens (bacteria). The legends represent strain type-endpoint-exposure route. The filled aeras indicate ranges between 5 percentile and 95 percentile values. CFU refers to Colony Forming Units.

- Strain types, endpoints, hosts and exposure routes can contribute to variability of dose-response model parameters.
- Limited dose-response relationships available.
- Exposure routes applied in animal or human challenge studies may not be related to respiratory tract infections

Conclusion

Policy relevant outcome of QMRA and further implications



This research was funded by the Federal Food Safety and Veterinary Office (FSVO), in partnership with the Federal Offices of Public Health (FOPH) and Energy (SFOE) in Switzerland, through the project LeCo (Legionella Control in Buildings; Aramis nr.:4.20.01) and Eawag discretionary funding