QMRA Assessment - Norovirus

**Pathogen:** norovirus

**Assessment Date:** 2025-10-06

**Generated By:** QMRA Assessment Toolkit

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*This report was generated using the QMRA Assessment Toolkit developed by NIWA Earth Sciences New Zealand*

# Executive Summary

This Quantitative Microbial Risk Assessment (QMRA) evaluates the health risks associated with norovirus exposure. The assessment indicates a mean annual infection risk of 1.00e+00 with a 95th percentile risk of 1.00e+00.

The calculated risks exceed acceptable regulatory thresholds. Additional risk management measures are recommended.

Key Findings:

* Infection Probability: Mean = 3.25e-01
* Illness Probability: Mean = 2.27e-01
* Annual Risk: Mean = 1.00e+00
* Dalys: Mean = 4.54e-04

# Table of Contents

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# 1. Introduction

This report presents the results of a Quantitative Microbial Risk Assessment (QMRA) conducted for the project. QMRA is a systematic approach to estimating the risk of adverse health effects from exposure to pathogenic microorganisms in water, food, and environmental sources.

## 1.1 Objectives

* Quantify the infection and illness risks from pathogen exposure
* Evaluate compliance with regulatory risk thresholds
* Identify critical control points for risk reduction
* Provide evidence-based recommendations for risk management

# 2. Methodology

## 2.1 Exposure Assessment

Exposure assessment was conducted using the following parameters:

|  |  |
| --- | --- |
| Parameter | Value |
| Pathogen Concentration | 1.00e+03 |
| Exposure Frequency | 20.0 |
| Water Ingestion Volume | 100.0 |

## 2.2 Dose-Response Modelling

Dose-response relationships were modeled using established mathematical models including Beta-Poisson and exponential models, with parameters from peer-reviewed literature.

# 3. Risk Assessment Results

## 3.1 Infection Probability

|  |  |
| --- | --- |
| Statistic | Value |
| Mean | 3.25e-01 |
| Median | 3.25e-01 |
| Std | 0.00e+00 |
| Min | 3.25e-01 |
| Max | 3.25e-01 |
| P1 | 3.25e-01 |
| P5 | 3.25e-01 |
| P10 | 3.25e-01 |
| P25 | 3.25e-01 |
| P75 | 3.25e-01 |
| P90 | 3.25e-01 |
| P95 | 3.25e-01 |
| P99 | 3.25e-01 |

## 3.2 Illness Probability

|  |  |
| --- | --- |
| Statistic | Value |
| Mean | 2.27e-01 |
| Median | 2.27e-01 |
| Std | 0.00e+00 |
| Min | 2.27e-01 |
| Max | 2.27e-01 |
| P1 | 2.27e-01 |
| P5 | 2.27e-01 |
| P10 | 2.27e-01 |
| P25 | 2.27e-01 |
| P75 | 2.27e-01 |
| P90 | 2.27e-01 |
| P95 | 2.27e-01 |
| P99 | 2.27e-01 |

## 3.3 Annual Risk

|  |  |
| --- | --- |
| Statistic | Value |
| Mean | 1.00e+00 |
| Median | 1.00e+00 |
| Std | 2.22e-16 |
| Min | 1.00e+00 |
| Max | 1.00e+00 |
| P1 | 1.00e+00 |
| P5 | 1.00e+00 |
| P10 | 1.00e+00 |
| P25 | 1.00e+00 |
| P75 | 1.00e+00 |
| P90 | 1.00e+00 |
| P95 | 1.00e+00 |
| P99 | 1.00e+00 |

## 3.4 Dalys

|  |  |
| --- | --- |
| Statistic | Value |
| Mean | 0.0005 |
| Median | 0.0005 |
| Std | 0.0000 |
| Min | 0.0005 |
| Max | 0.0005 |
| P1 | 0.0005 |
| P5 | 0.0005 |
| P10 | 0.0005 |
| P25 | 0.0005 |
| P75 | 0.0005 |
| P90 | 0.0005 |
| P95 | 0.0005 |
| P99 | 0.0005 |

# 5. Regulatory Compliance Assessment

The following table summarizes compliance with regulatory risk thresholds:

|  |  |  |  |
| --- | --- | --- | --- |
| Risk Metric | Calculated Risk | Threshold | Status |
| Infection Probability | 3.25e-01 | 1.00e-03 | NON-COMPLIANT |
| Illness Probability | 2.27e-01 | 1.00e-04 | NON-COMPLIANT |
| Annual Risk | 1.00e+00 | 1.00e-06 | NON-COMPLIANT |

# 6. Conclusions and Recommendations

## 6.1 Conclusions

Based on the comprehensive QMRA, the assessed health risks are unacceptable. The mean annual infection risk of 1.00e+00 has been calculated using conservative assumptions and validated dose-response models.

## 6.2 Recommendations

* Continue monitoring pathogen concentrations to validate model assumptions
* Implement identified critical control points for risk reduction
* Review and update the assessment annually or when system changes occur
* Consider additional treatment barriers if risks approach regulatory thresholds

# Appendices

## Appendix A: Detailed Statistical Results

|  |  |  |
| --- | --- | --- |
| Metric | Statistic | Value |
| Infection Probability | Mean | 0.3245 |
| Infection Probability | Median | 0.3245 |
| Infection Probability | Std | 0.00e+00 |
| Infection Probability | Min | 0.3245 |
| Infection Probability | Max | 0.3245 |
| Infection Probability | P1 | 0.3245 |
| Infection Probability | P5 | 0.3245 |
| Infection Probability | P10 | 0.3245 |
| Infection Probability | P25 | 0.3245 |
| Infection Probability | P75 | 0.3245 |
| Infection Probability | P90 | 0.3245 |
| Infection Probability | P95 | 0.3245 |
| Infection Probability | P99 | 0.3245 |
| Illness Probability | Mean | 0.2272 |
| Illness Probability | Median | 0.2272 |
| Illness Probability | Std | 0.00e+00 |
| Illness Probability | Min | 0.2272 |
| Illness Probability | Max | 0.2272 |
| Illness Probability | P1 | 0.2272 |
| Illness Probability | P5 | 0.2272 |
| Illness Probability | P10 | 0.2272 |
| Illness Probability | P25 | 0.2272 |
| Illness Probability | P75 | 0.2272 |
| Illness Probability | P90 | 0.2272 |
| Illness Probability | P95 | 0.2272 |
| Illness Probability | P99 | 0.2272 |
| Annual Risk | Mean | 0.9996 |
| Annual Risk | Median | 0.9996 |
| Annual Risk | Std | 2.22e-16 |
| Annual Risk | Min | 0.9996 |
| Annual Risk | Max | 0.9996 |
| Annual Risk | P1 | 0.9996 |
| Annual Risk | P5 | 0.9996 |
| Annual Risk | P10 | 0.9996 |
| Annual Risk | P25 | 0.9996 |
| Annual Risk | P75 | 0.9996 |
| Annual Risk | P90 | 0.9996 |
| Annual Risk | P95 | 0.9996 |
| Annual Risk | P99 | 0.9996 |
| Dalys | Mean | 4.54e-04 |
| Dalys | Median | 4.54e-04 |
| Dalys | Std | 1.08e-19 |
| Dalys | Min | 4.54e-04 |
| Dalys | Max | 4.54e-04 |
| Dalys | P1 | 4.54e-04 |
| Dalys | P5 | 4.54e-04 |
| Dalys | P10 | 4.54e-04 |
| Dalys | P25 | 4.54e-04 |
| Dalys | P75 | 4.54e-04 |
| Dalys | P90 | 4.54e-04 |
| Dalys | P95 | 4.54e-04 |
| Dalys | P99 | 4.54e-04 |