Geosmin and 2-MIB Affects Immunity in Rainbow Trout

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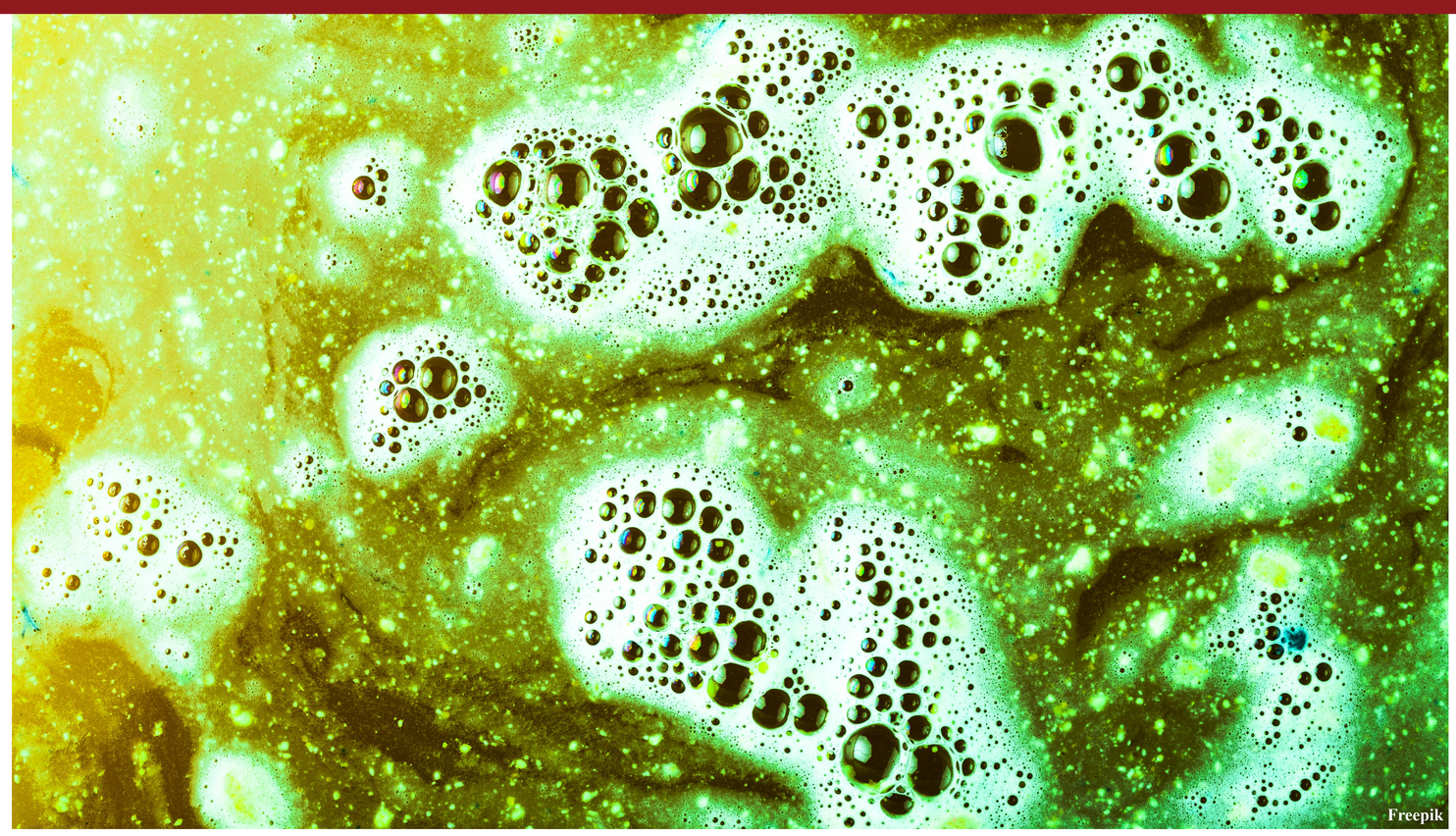


Fig. 1. Geosmin and 2-methylisoborneol are produced by a wide range of organisms, e.g., cyanobacteria.

Introduction

Geosmin and 2-methylisoborneol (2-MIB) are produced by e.g., cyanobacteria and are traditionally only associated with off-flavor. However, recent evidence suggests these compounds also have biological impacts to fish, but the effects on the immune system has largely been overlooked. Present study has elucidated the compounds effect on the immunity of rainbow trout.

Methods

- Juvenile (~9 g) rainbow trout (*O. mykiss*) were exposed to geosmin & 2-MIB in concentrations ranging from 10-1000 ng/L.
- 24 hours post exposure; fish were challenged with intraperitoneal injected lipopolysaccharide (LPS) to induce immune response.
- 24 hours post LPS injection, fish were euthanized and immune response in liver and spleen was compared with control.
- N = 120, Gene expression of 32 immune-related genes analyzed with qPCR.

Results

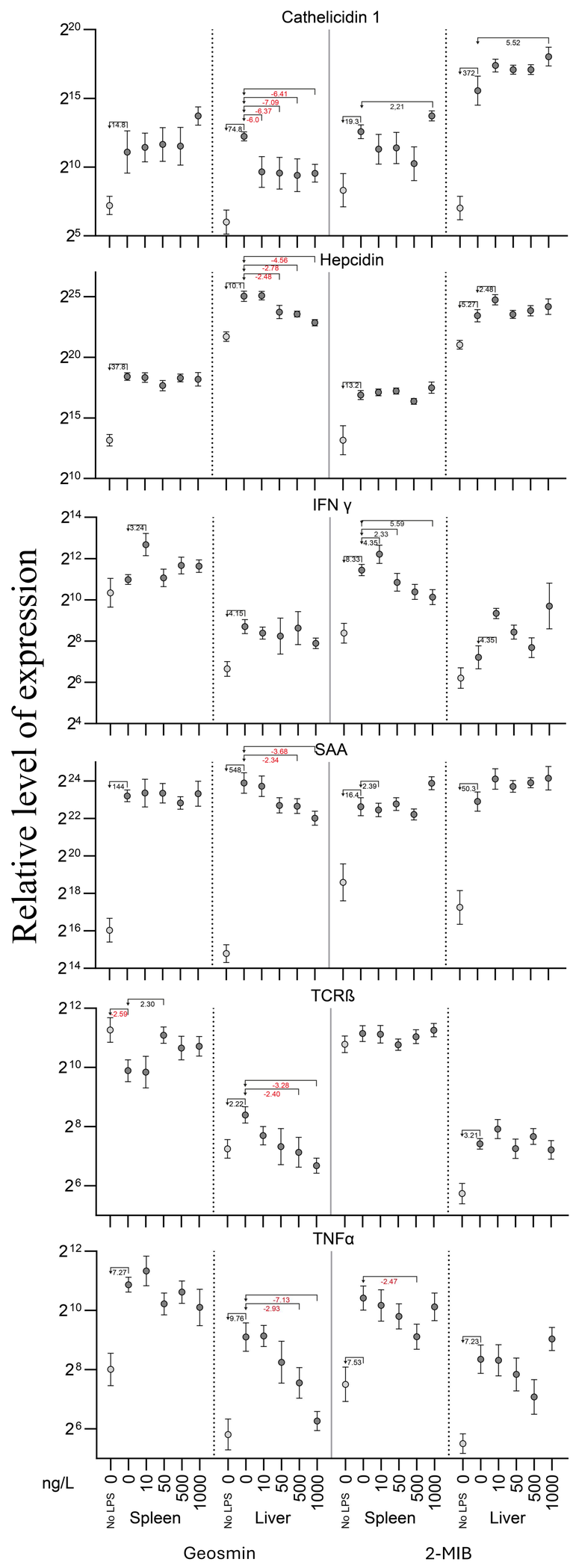
- Geosmin and 2-MIB significantly altered expression of several immune-related genes in a tissue- and concentration dependent manner.
- Down-regulation in the liver of genes encoding cytokines (IL-4/13a, IL-12, TNFα), acute phase proteins (SAA, precerebellin), antimicrobial peptides (cathelicidin 1 and 2), T cell markers (TCR, CD 8), and B cell marker (IgDm).
- Alterations in the expression of genes with associated with both the innate and adaptive immunity was observed.

Discussion

- Present study was an acute-exposure. Long term implications for temporal dynamics of gene expression in future studies will be informative.
- Our results may have implications for fish in general, particularly for species raised in eutrophicated waters with high off-flavor concentrations.



Highlights



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