



MSc Defence

The Impact of Pre-exposure to high concentrations of Vitamin D₃ on the Toxicity of a Bacterial Endotoxin in Zebrafish (*Danio rerio*) Larvae

Spencer Leuschner

Date: November 14, 2025 at 1:00pm

The MSc Defence for Spencer Leuschner has been scheduled for November 14, 2025 at 1:00pm. The defence will be held online via Teams and in ANNU 141: https://teams.microsoft.com/l/meetup-join/19%3ameeting_MDJkYjMxYjUtMGExOC00NDVILTlkYzgtNWM5ZTU2NjJkYjUx%40thread.v2/0?context=%7b%22Tid%22%3a%22be62a12b-2cad-49a1-a5fa-85f4f3156a7d%22%2c%22Oid%22%3a%22dfbebf32-99ae-4022-a68f-422f93e11c7f%22%7d

Examining Chair: Dr. Wendy Pearson

Advisor: Dr. Neil Karrow

Advisory Committee Member: Dr. David Huyben

Additional Member: Dr. Terry Van Raay

Abstract:

Vitamin D₃ (VD₃) is an essential immunomodulatory nutrient for fish, but it is toxic at high doses. This study aimed to examine interactions between VD₃ and bacterial lipopolysaccharide (LPS) endotoxin using larval zebrafish (*Danio rerio*). Larvae were pre-exposed to VD₃ at 72 hours post fertilization (hpf) and at 96 hpf the media was replaced with LPS solutions; survival was assessed at 120 hpf. Total RNA was extracted at 72 and 96 hpf to quantify expression of VD₃-metabolizing enzymes and transcriptomic changes using quantitative PCR and RNA-sequencing, respectively. Pre-exposure to 5, 10 and 20 µg/mL VD₃ significantly reduced survival to LPS challenge in a dose-dependent manner. Basal expression of *cyp2r1*, *cyp27a1*, *cyp27b1*, *cyp3a65*, and *cyp11a1* was upregulated between 72 and 96 hpf. VD₃ exposure upregulated *cyp24a1* expression and downregulated *cyp2r1*, *cyp27b1*, and *cyp3a65* expression. Transcriptomic analysis revealed differentially expressed genes involved in inflammation, stress, and cell death positively correlated with endotoxin chemosensitization.