The potential of functional feeds to improve fish welfare

EATiP Forum on Innovations to support Fish Welfare (26 November)

Charles McGurk, Global Health R&D Manager, Skretting Aquaculture Research Centre

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Our mission
feeding the future

30
PRODUCTION PLANTS IN 18 COUNTRIES

>2.3M
TONNES OF FEED

>3,500
EMPLOYEES

11
RESEARCH & VALIDATION STATIONS IN 9 COUNTRIES

€15M
ANNUAL INVESTMENT IN R&D

Skretting Aquaculture Research Centre

Established
1989

Collaborations with
>60
research
organisations

>140
Employees

>25
Nationalities

40
Researchers

>30
PhDs

Core competencies

Nutrition

Feed Production

Health

Research on
9 key species

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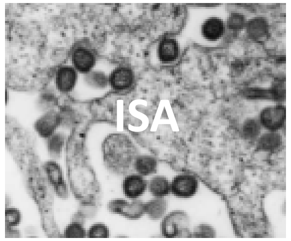
Disease is a major threat to the future of aquaculture



Focus on prevention

- Move from a therapeutic to a prophylactic approach: focus on prevention

- Holistic approach:
  - Epidemiology
  - Biosecurity
  - Genetic selection
  - Vaccines
  - **Health / Functional diets**
  - Integrated Pest Management

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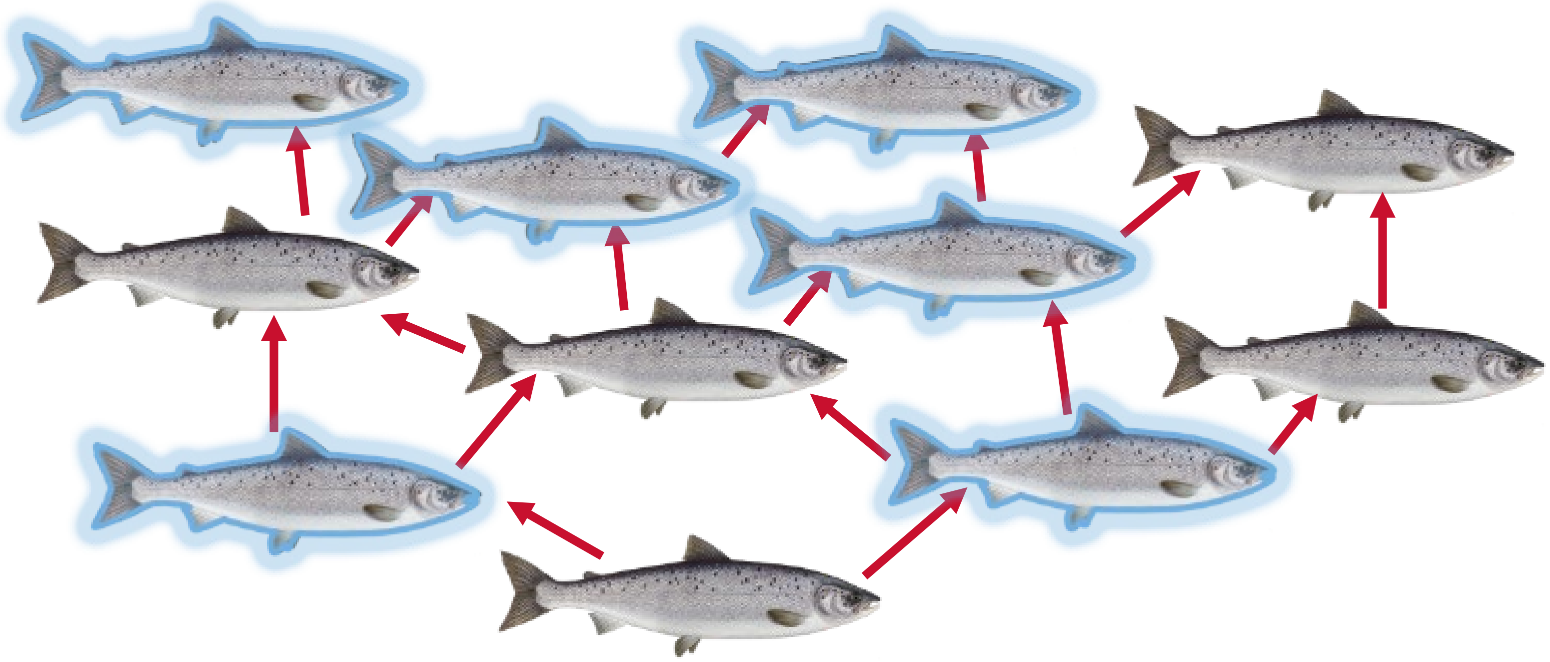
Functional nutrition: potential impact on 'herd immunity'

- Strengthen inherent defences
- Reduce pathogen replication
- Limit pathogen excretion and subsequent challenge pressure



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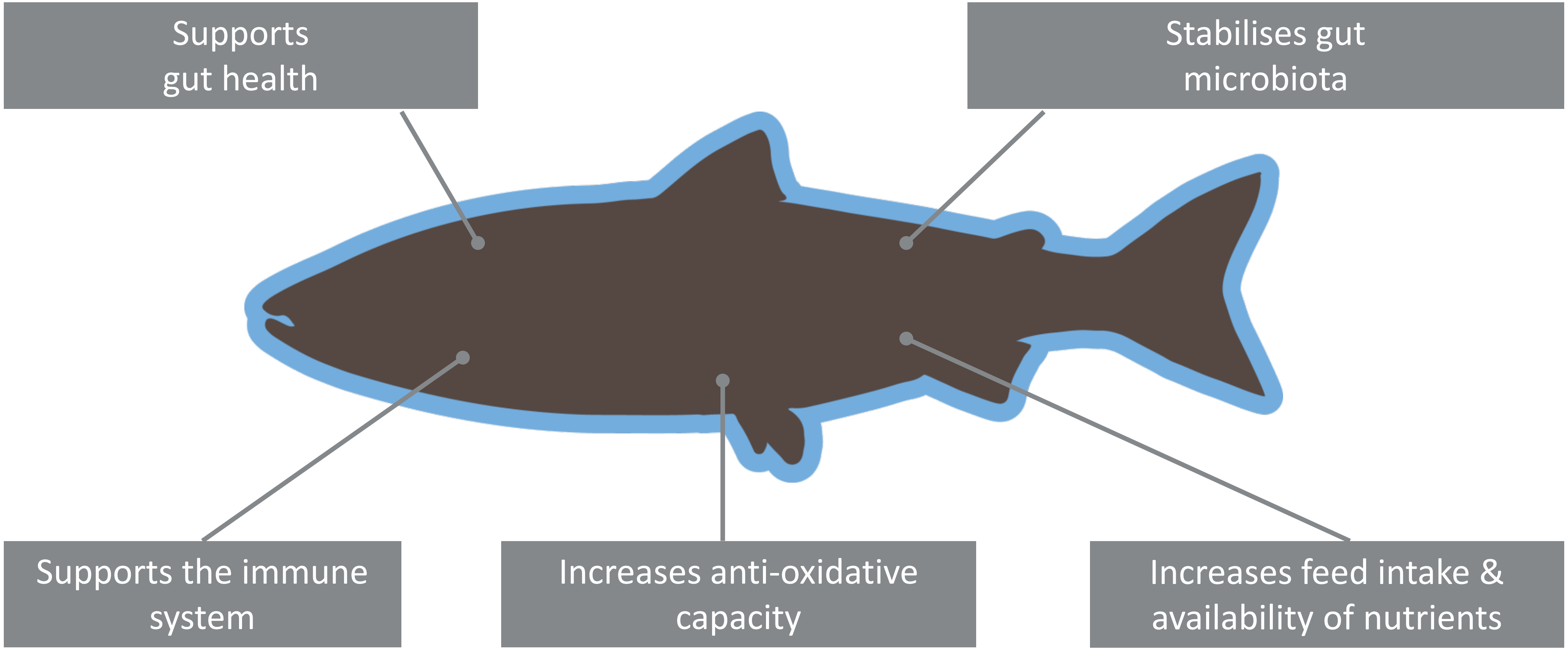
Functional nutrition: principal modes of action



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Combating sea lice through functional nutrition

Aquaculture Nutrition

Aquaculture Nutrition 2014 doi: 10.1111/anu.12222

Reducing sea lice (*Lepeophtheirus salmonis*) infestation of farmed Atlantic salmon (*Salmo salar* L.) through functional feeds

L.B. JENSEN[1,2], F. PROVAN[3], E. LARSSEN[3], J.E. BRON[4] & A. OBACH[1]

Journal of Fish Diseases 2013, 36, 311–321 doi:10.1111/jfd.12064

Proteomic analysis of epidermal mucus from sea lice-infected Atlantic salmon, *Salmo salar* L.

F Provan[1], L B Jensen[2], K E Uleberg[1,3], E Larssen[1], T Rajalahti[4,5], J Mullins[2] and A Obach[2]

Journal of Fish Diseases 2014 doi:10.1111/jfd.12314

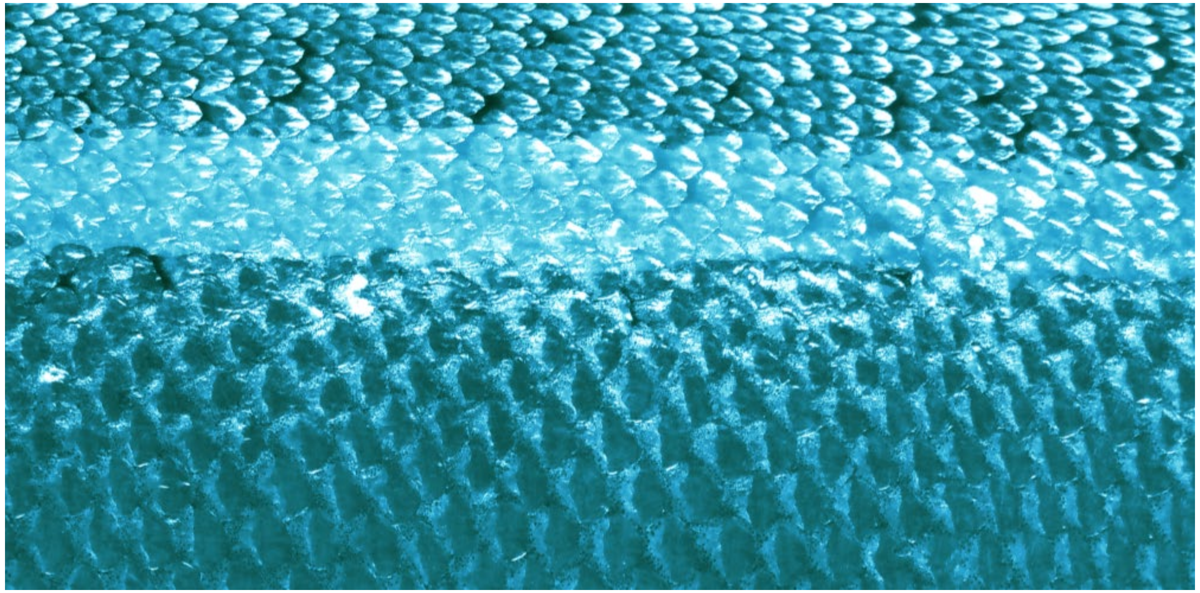
Investigating the underlying mechanisms of temperature-related skin diseases in Atlantic salmon, *Salmo salar* L., as measured by quantitative histology, skin transcriptomics and composition

L B Jensen[1,2], S Boltana[3], A Obach[1], C McGurk[1], R Waagbø[2] and S MacKenzie[3]

Fish Physiol Biochem (2015) 41:1527–1543 DOI 10.1007/s10695-015-0105-2

Effect of temperature and diet on wound healing in Atlantic salmon (*Salmo salar* L.)

Linda B. Jensen · Thomas Wahli · Charles McGurk · Tommy Berger Eriksen · Alex Obach · Rune Waagbø · Ana Handler · Carolina Tafalla



1495 University of Aberdeen

University of Stirling

IRIS International Research Institute of Stavanger

INIA Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria

NIFES National Institute of Nutrition and Seafood Research

Helse Stavanger Stavanger universitetssjukehus

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Novel technologies to investigate the role of functional diets

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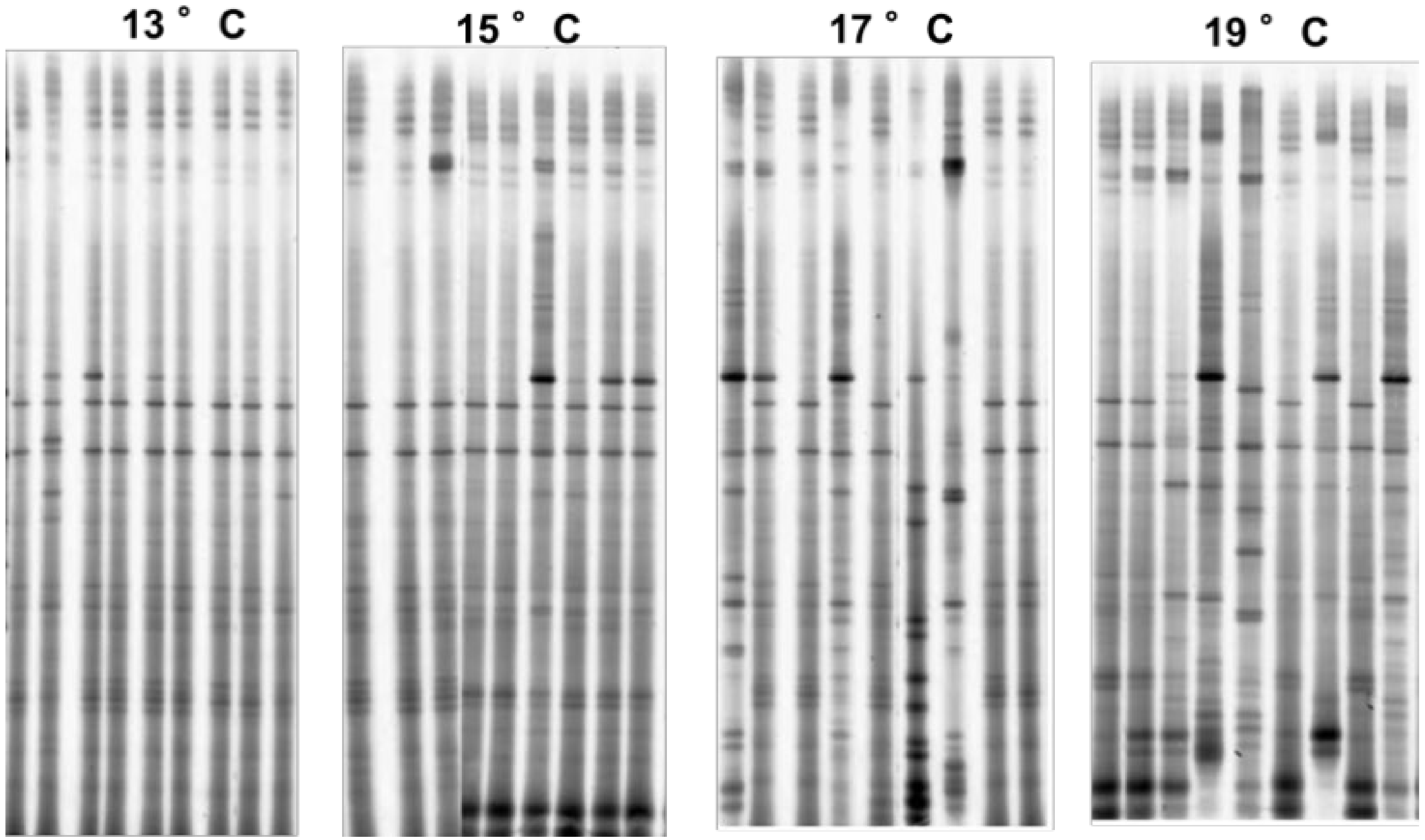
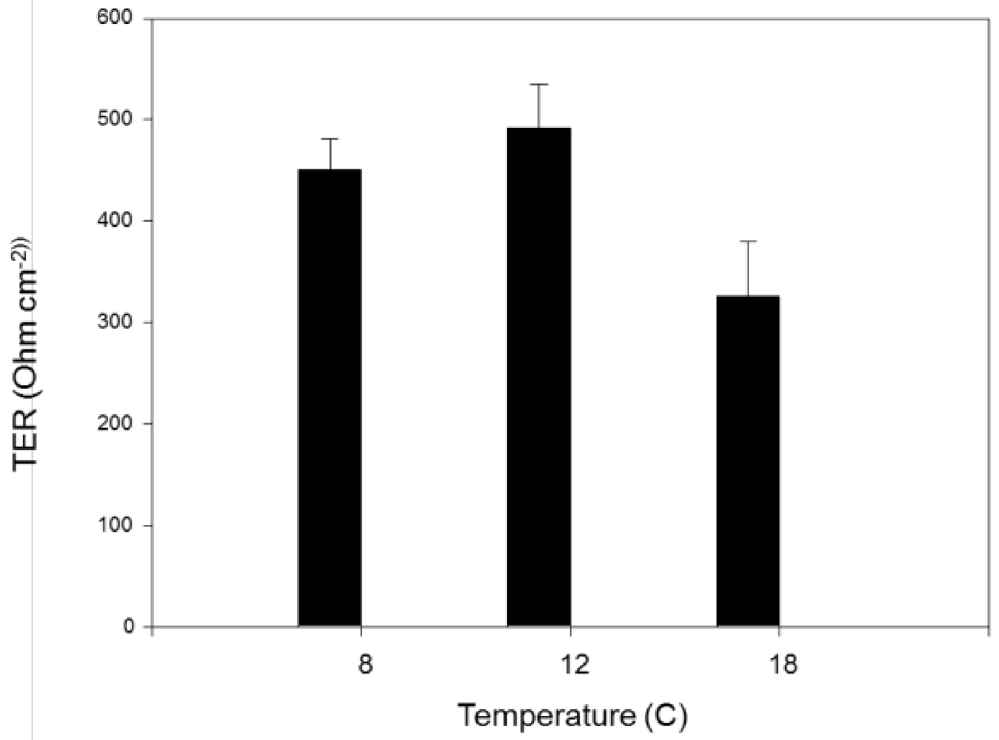
Microbiota disruption in Atlantic salmon



McGurk at al., unpublished data

Increased gut permeability in Atlantic salmon above 18°C



TER-Transepithelial resistance
Fontanillas et al., 2008, XIII- International Symposium on Fish Nutrition and Feeding

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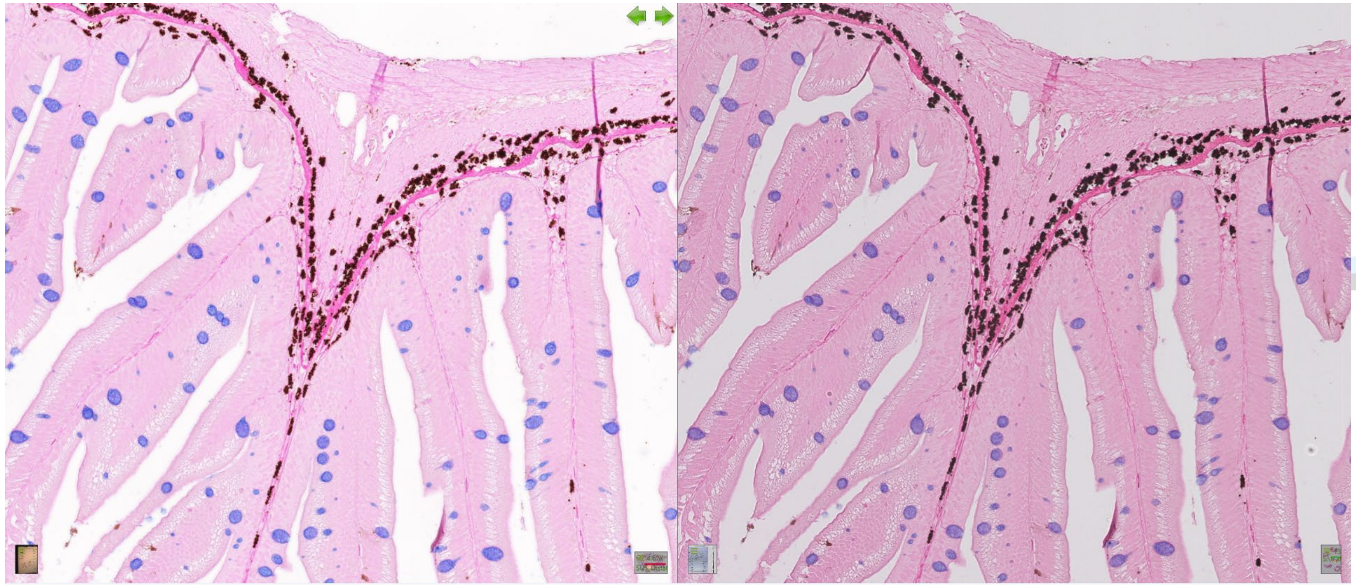
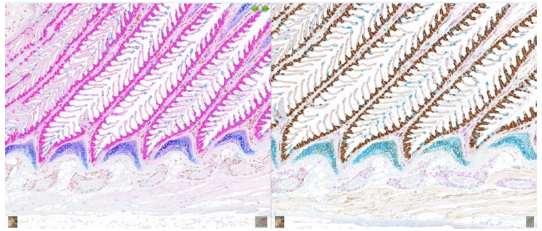
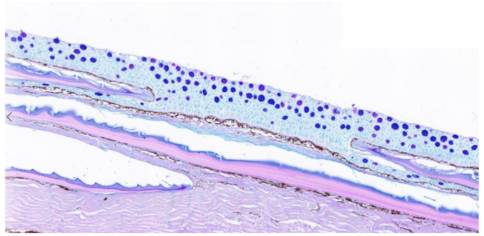
Histology

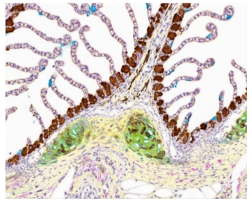
Study of the microanatomy of cells, tissues, and organs as seen through a microscope

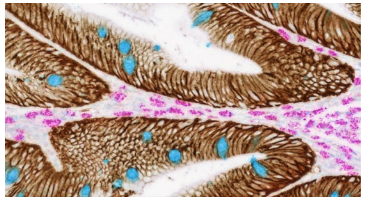


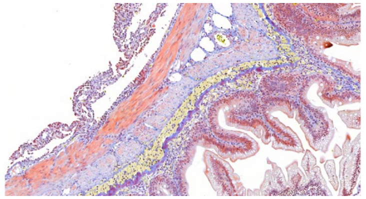
New possibilities with new equipment





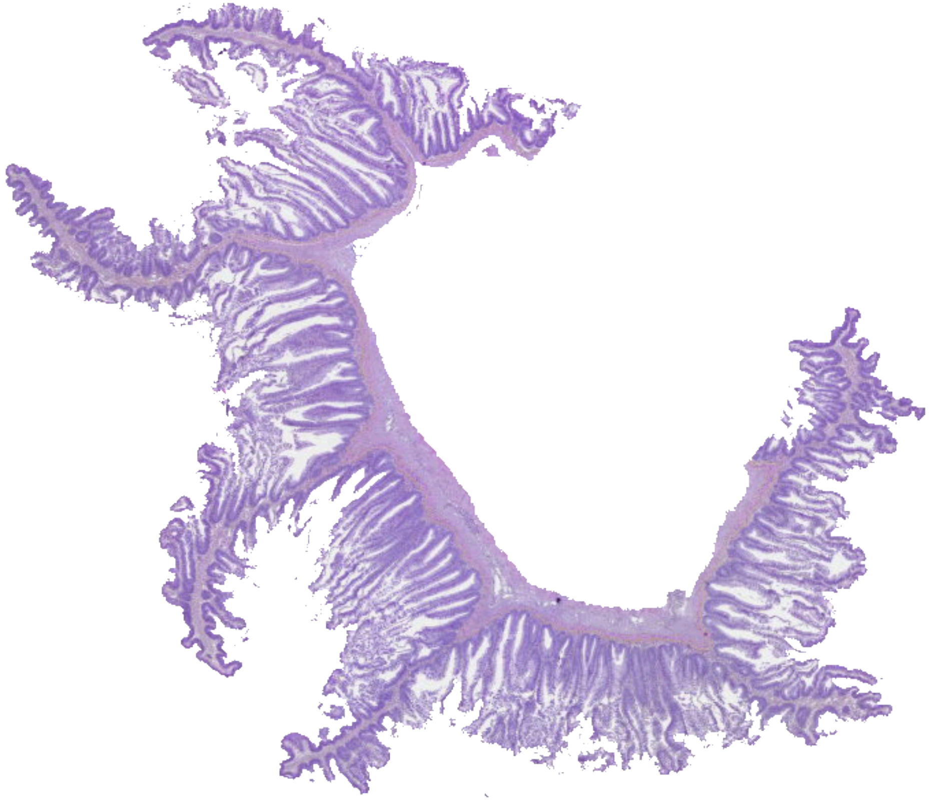


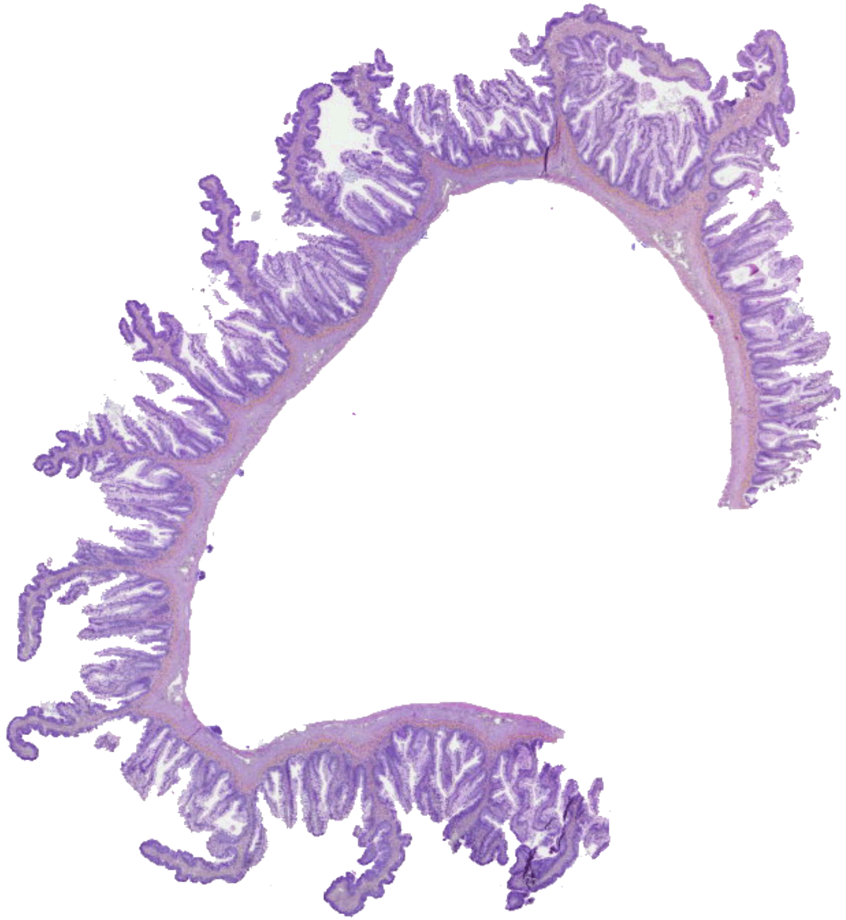




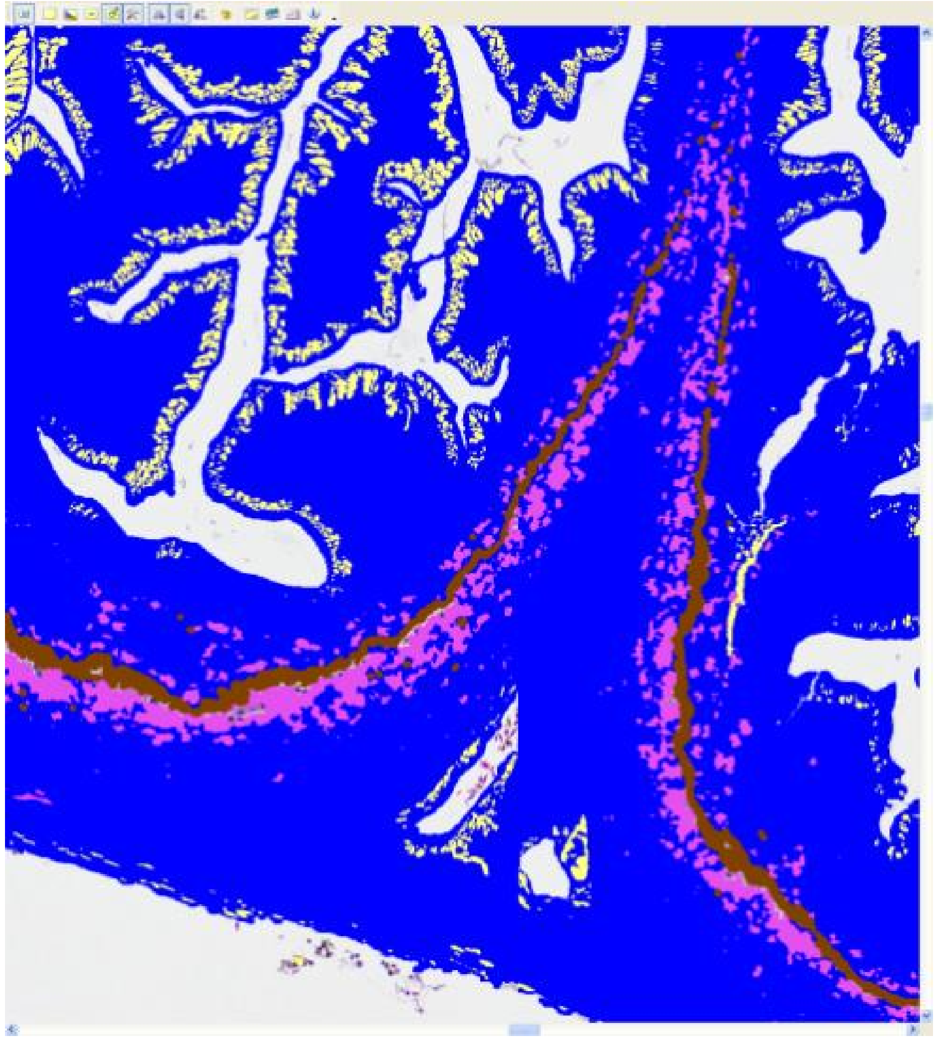
Gut stabilization

Histological indicators of gut inflammation

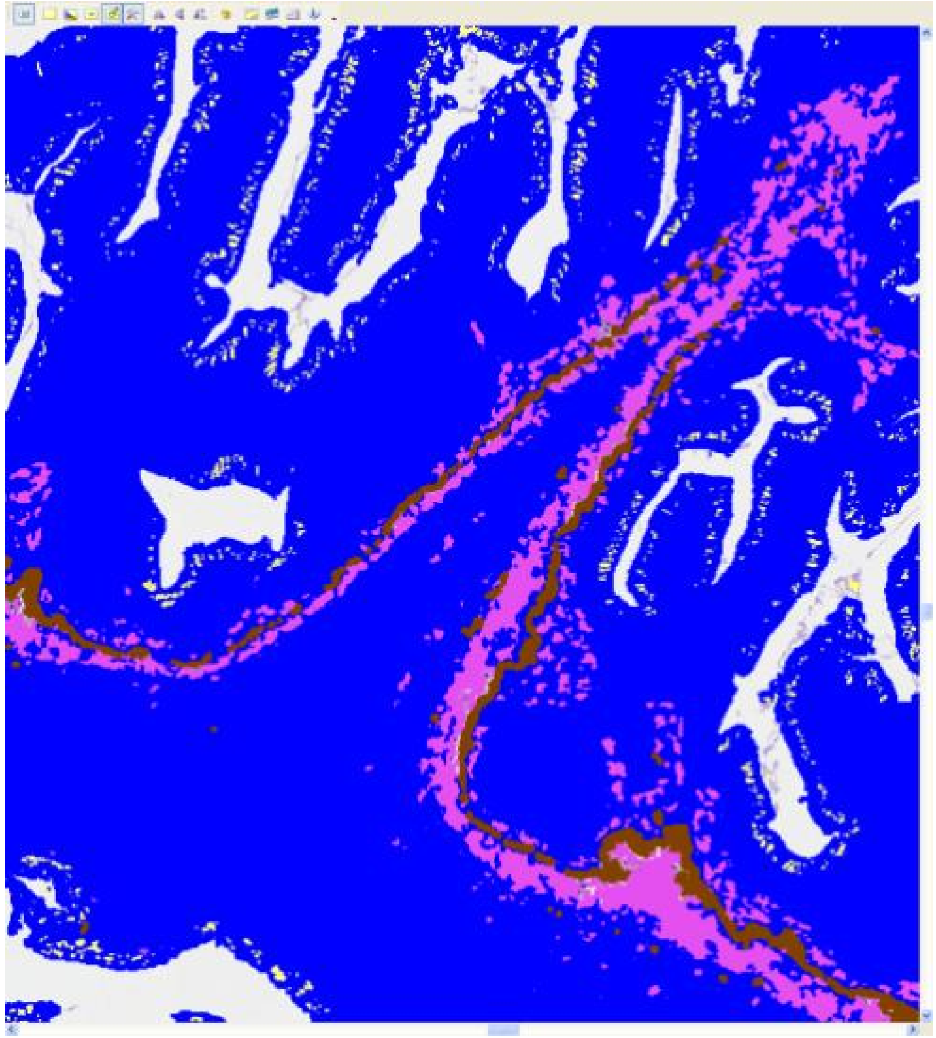




Gut stabilization
Histological indicators of gut inflammation



Control diet: 12°C



Control diet: 18°C

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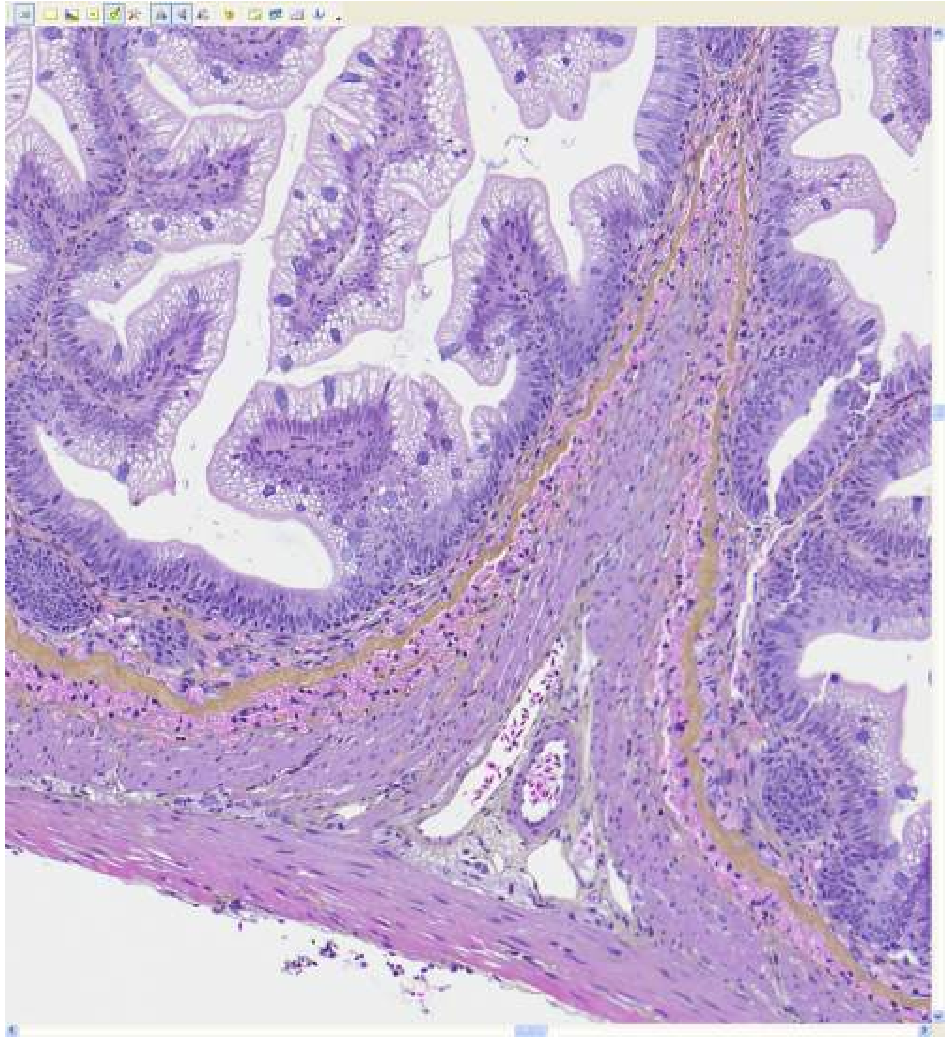
Gut stabilization

Histological indicators of gut inflammation



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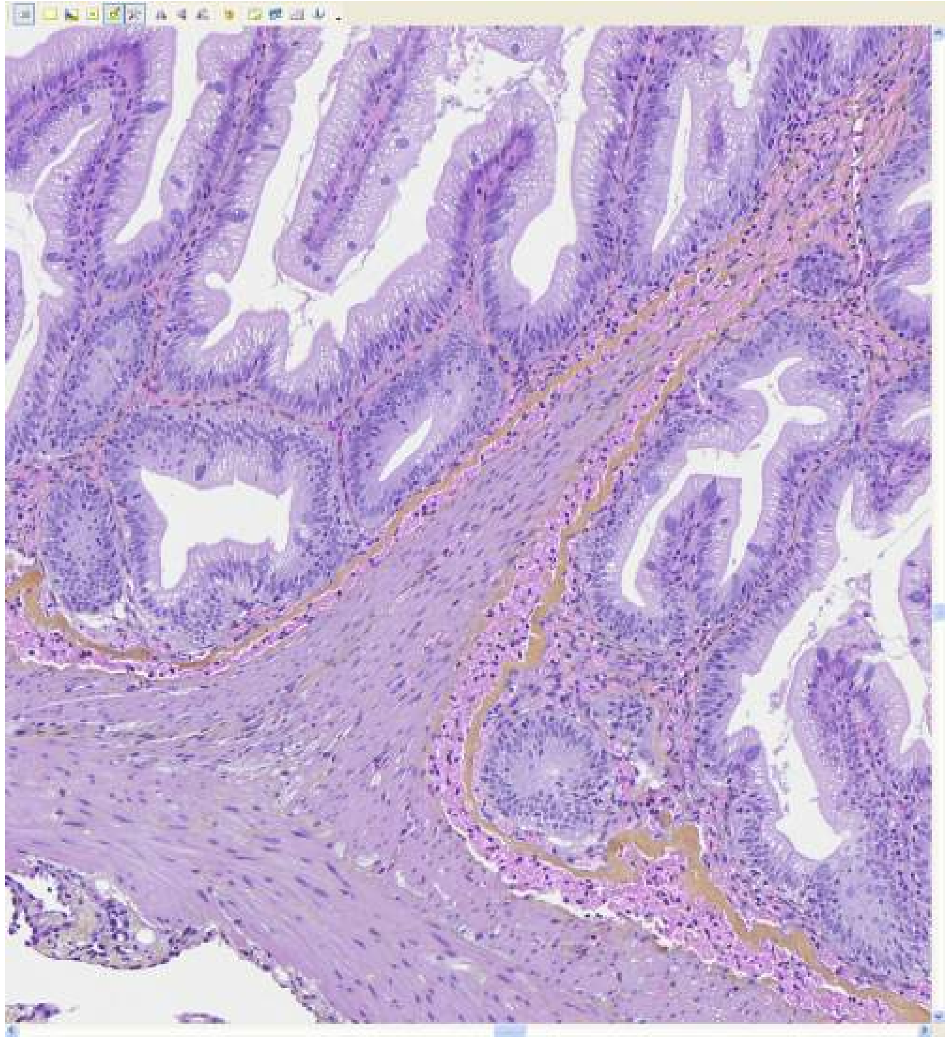

Control diet: 18°C

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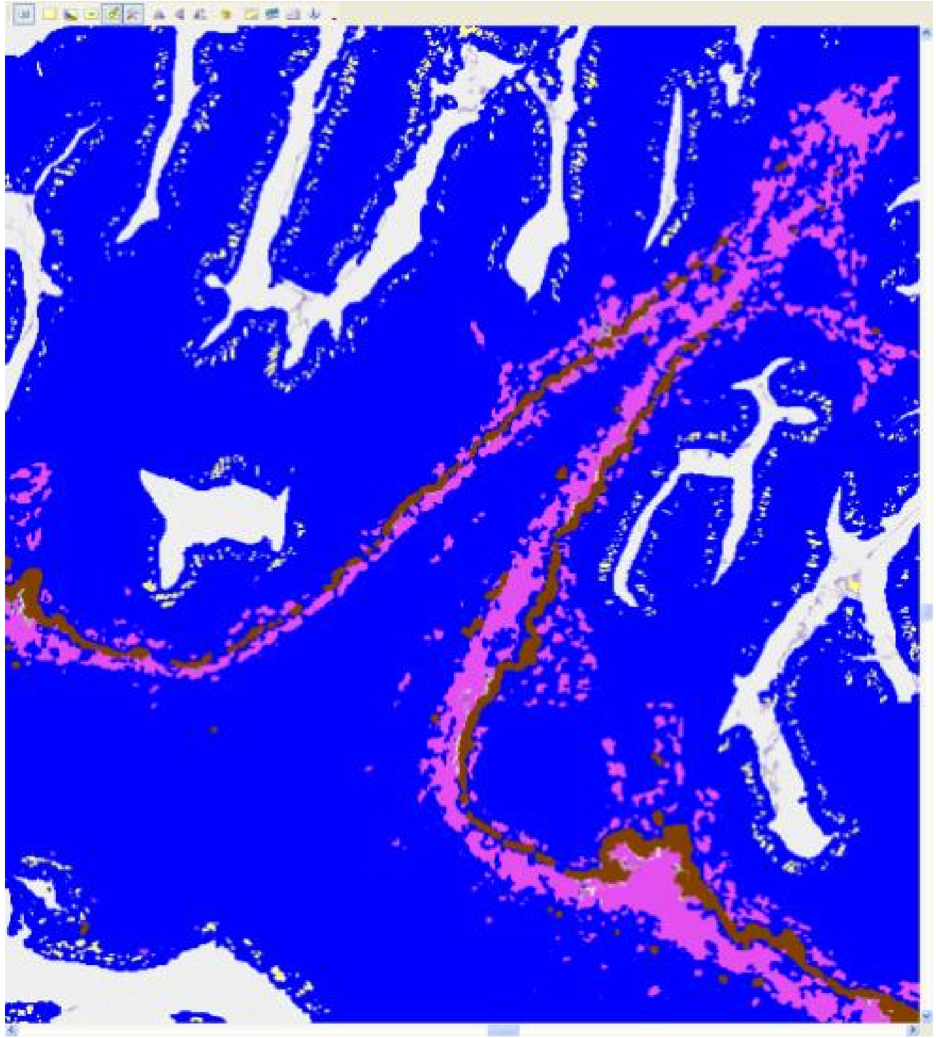
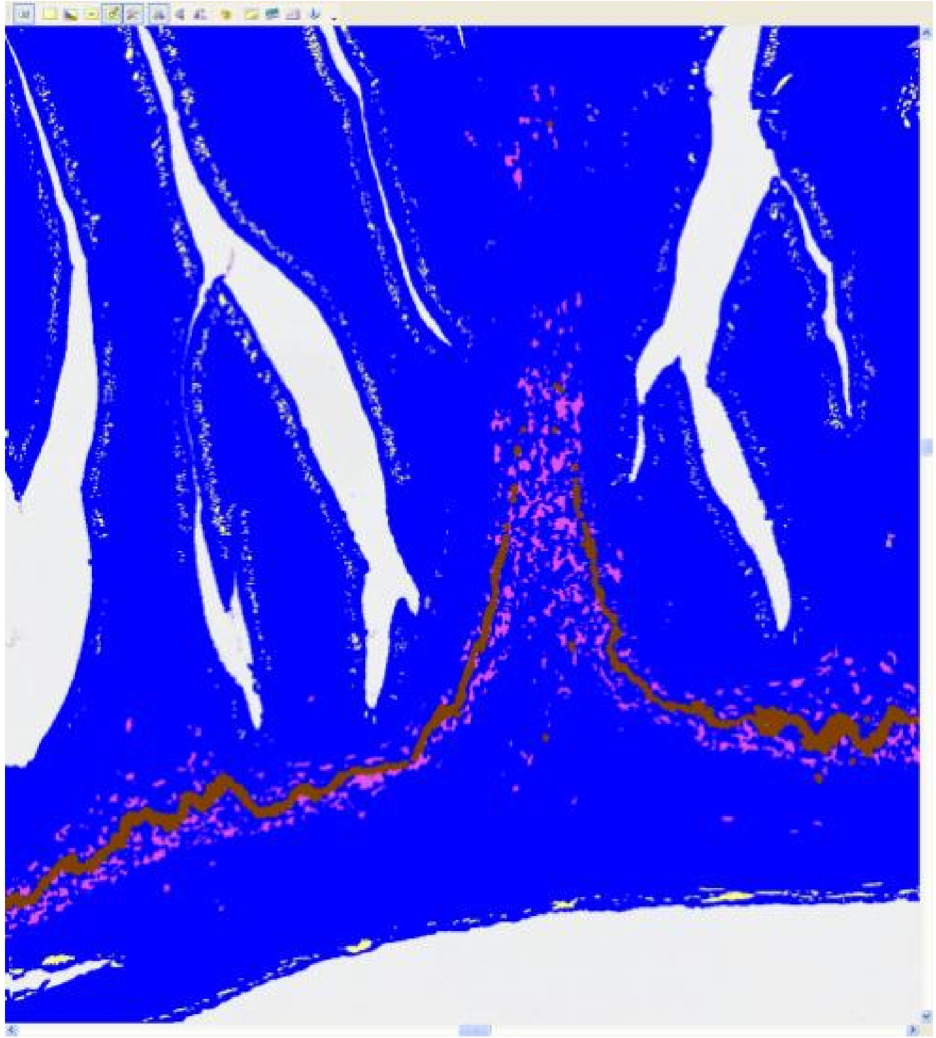
Gut stabilization
Histological indicators of gut inflammation



Control diet: 18°C



HT: 18°C

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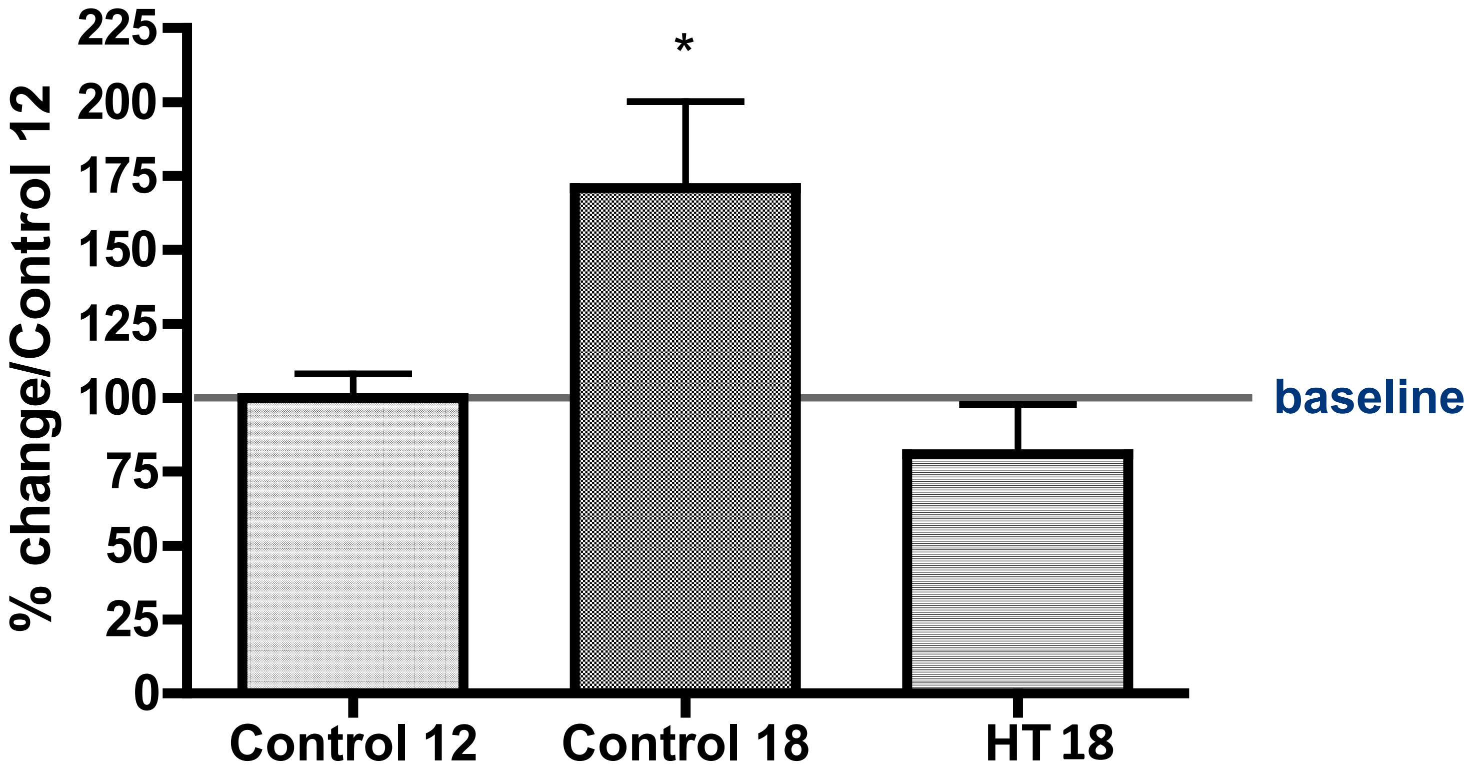
Gut stabilization

Histological measurement of inflammatory gut cells



Rapid analytical tools

Development of diagnostic tools to assess rapidly fish/shrimp health

Rapid analytical tools - opportunities

Biological

Chemical

Summary

- Disease and environmental stress comprise fish health and welfare

- Functional nutrition can play a role in mitigating health challenges

- Supporting natural defence mechanisms can reduce reliance on drug treatments and resultantly antimicrobial resistance development

- Novel technologies are employed to reveal the modes of action and functionality of potential novel dietary characteristics

- Rapid diagnostic tools have the potential for optimising prevention and control strategies

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