

## Stress, Pathology, Immune Response, and Environmental Health (1002879)

**Course size** (nominal values; actual values may depend on programme)

**Credits 8.0**                      **Study time 200 h**

**Course offerings in academic year 2025-2026**

A (semester 1)                      English                      Gent

**Lecturers in academic year 2025-2026**

Constenla Matalobos, Maria	BARCELO7	lecturer-in-charge
Balasc Alemany, Juan Carlos	BARCELO7	co-lecturer
Padrós Bover, Francesc	BARCELO7	co-lecturer
Roher Armentia, Nerea	BARCELO7	co-lecturer
Sala Pallares, Roser	BARCELO7	co-lecturer
Soler Membrives, Anna	BARCELO7	co-lecturer
Teles Pereira, Mariana	BARCELO7	co-lecturer
Tort, Lluís	BARCELO7	co-lecturer

**Offered in the following programmes in 2025-2026**

<a href="#">International Master of Science in Health Management in Aquaculture</a>	<b>crdts</b>	<b>offering</b>
	8	A

**Teaching languages**

English

**Keywords**

*Health management, Immunity, stress, immune modulation, mucosal immunity, acute and chronic stressors, neuro-immuno-endocrine interaction, glucocorticoids, energetics, fish welfare, stress and pain, stress and welfare indicators, epidemiology, fish pathology, disease prevention, biosecurity, bacterial diseases, viral disease, parasitic diseases, diagnostics, immunoprophylaxis & vaccines, nutritional management for health, nutraceuticals & health, therapeutics, organic waste, toxic effluents, toxic algae, climate change*

**Position of the course**

*This course focuses most of the applied aspects related to prevention and management of fish & aquatic animal diseases based in correct health, nutrition and welfare practices that may affect aquatic animal resilience (stress and immune system) and the effects of biotic factors (pathogens) and abiotic factors as potential causes of disease.*

**Contents**

**1. Immunity, stress and welfare**

- Definition and concept of stress and stressors
- Response to stress: primary, secondary, tertiary. Main indicators of stress.
- Immunity and stress, immune suppression.
- Immune response after biotic and abiotic challenges in fish
- Systemic and mucosal immunity
- Immune response variability in aquacultured and model fish species
- Fish stress, immune responses and management in aquaculture conditions
- Immune response in invertebrates of commercial interest.
- Preventive strategies in molluscs and crustaceans
- Applied immunoprophylaxis
- Integrative analysis: Host-pathogen, functional diets, fish husbandry and health
- Welfare in fish and aquatic animals. Indicators of welfare. Welfare management

## **2. Pathology of aquatic animals and environmental health**

- One Health concept in aquaculture
  - Water quality and its relationship with health-disease.
  - Disease diagnostic methods
  - Diseases in fish (viruses, bacteria, parasites, fungi and other organisms).
- Diseases by non-biological causes.
- Diseases of molluscs and crustaceans.
  - The problem of the dispersal of pathogens and other consequences to cultured fish escapes.
  - Applied therapeutics: types of treatments, dispensing techniques and their potential impact on the environment
  - Nutrition, feed management and health under sustainable aquaculture.
  - Waste generated by fish farms and their control and elimination systems.
  - Toxic algae and aquaculture.
  - Climate change and aquaculture.

### **Initial competences**

General biology, general physiology, zoology, animal health, parasitology

### **Final competences**

- 1 Identify the health management bases in aquaculture and assess their impact on the environment and animal welfare.
- 2 Maintain the health and welfare of the animals prioritizing the prevention strategy and not the therapy and detecting the main symptoms of diseases, being able to make a diagnosis.
- 3 Assess and interpret the health parameters of cultivated animals, considering economic and welfare criteria.

### **Conditions for credit contract**

This course unit cannot be taken via a credit contract

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Group work, Seminar, Excursion, Lecture, Practical, Independent work, Peer teaching

### **Study material**

None

### **References**

- Ashley, P.J. (2006). *Fish welfare: Current issues in aquaculture*. Applied Animal Behaviour Science.
- Balasz, J.C. & Tort, L. (2019). Netting the stress responses in fish. *Frontiers in Endocrinology*. 10:62. doi: 10.3389/fendo.2019.00062
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- Ferguson, H.W. 1989. *Systemic pathology of fish: a text and atlas of comparative tissue responses in diseases of teleosts*. Iowa State Univ.Press. Ames. Iowa. USA.
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- González Serrano, J.L. et al. 1999. *Estudio sobre repercusiones de los factores medio ambientales en las empresas de acuicultura continental*. Ministerio de Agricultura, Pesca y alimentación, Madrid.
- Hites, R.A., Foran, J.A., Carpenter, D.O., Hamilton, M.C., Knuth, B.A. y Schwager, S.J. 2004. *Global assessment of organic contaminants in farmed salmon*. *Science*, 303: 226-229.
- LeRoy Creswell, R. y Flos, R. 2002. *Perspectives on responsible aquaculture for the new millennium (reviewed presentations)*. EAS publications-162, Oostende.
- Lim, Ch., Webster, C.D. 2001. *Fish nutrition and health*. CRC Press. Taylor & Francis Group.
- Nakagawa, H., Sato, M., Gatlin III, D.M. 2007. *Dietary supplements for the health and quality of cultured fish* CABI books.

Noga, E.J. 1996. *Fish Disease. Diagnosis and treatment*. Iowa State University Press, Ames, Iowa, USA.

Roberts, R.J. (2012). *Fish pathology*. Wiley-Blackwell

Schreck, C., Moyle, P.B. 1990. *Methods for fish Biology*. Amer. Fish Soc. Bethesda.

Schreck, C.B., Tort, L. et al. (2016). *Biology of stress in fish*. *Fish Physiology Series* vol. 35. Academic Press-Elsevier. 590. Ed by: C.B. Schreck, L. Tort, Farrell, T. and Brauner, C. pp. ISBN: 978-0-12-802728-8. 590 pp.

Smith Nicole C., Rise Matthew L., Christian Sherri L. (2019). *A Comparison of the Innate and Adaptive Immune Systems in Cartilaginous Fish, Ray-Finned Fish, and Lobe-Finned Fish*. *Frontiers in Immunology*. DOI=10.3389/fimmu.2019.02292

Stickney, R.R. y McVey, J.P. 2002. *Responsible Marine Aquaculture*. CABI Publishing, New York.

Treves-Brown, K.M. 2000. *Applied Fish Pharmacology*. Kluwer Academic Publishers. Dordrecht. The Netherlands.

Uriarte, A, y Basurco, B. 2001. *Environmental impact assessment of Mediterranean aquaculture farms*. *Cahiers Options Méditerranéennes*. Vol. 55. Zaragoza.

Woo, P.T.K., Bruno, D.W., Lim, L.H.S., 2002. *Diseases and disorders of finfish in cage culture*. Cabi Publishing, U.K.

#### **Course content-related study coaching**

*Teacher available for student counselling*

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Oral assessment, Written assessment with multiple-choice questions, Written assessment with open-ended questions, Written assessment, Assignment

#### **Examination methods in case of periodic assessment during the second examination period**

Oral assessment, Written assessment

#### **Examination methods in case of permanent assessment**

Professional practice, Oral assessment, Skills test, Participation, Assignment

#### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

#### **Calculation of the examination mark**

*25% Case report; Oral presentation 20%; Presentation of experimental design 15%; Written exam 35%; Whole duties attendance and accomplishment 5%. Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.*