

One Health in Action: Tackling Pathogens, Parasites, and Vectors (6 ECTS) (Challenge Based Program and Blended Intensive Program)

This innovative course is designed for students from diverse academic backgrounds aligned with the One Health framework, including final-year Bachelor's students, Master's students, and PhD candidate from Arqus Alliances. It offers an interdisciplinary learning experience that integrates perspectives from human, animal, and environmental health to address complex, real-world biological and public health challenges.

The course is delivered as a **Challenge-Based Learning (CBL) Blended Intensive Program (BIP)** and consists of three complementary components that progressively build knowledge, skills, and applied problem-solving competences:

1. **Online Phase (30 hours | 10 webinars)** A structured series of interactive webinars combining foundational lectures, expert-led case studies, and moderated discussions. This phase establishes core theoretical knowledge in One Health and introduces students to pathogens, parasites, vectors, and environmental drivers of disease, while framing the real-world challenges that will be addressed during the on-site phase.
2. **On-Site Phase (40 hours)** Five intensive days hosted at the University of Wroclaw (Poland), featuring advanced lectures, hands-on laboratory and field activities, site visits, networking events, and mentoring workshops. This phase emphasizes practical skill development, interdisciplinary collaboration, and guided work on Challenge-Based Learning projects in international teams.
3. **Online Student-Led Forum (1 day)** An open online symposium in which international student teams present evidence-based solutions to real-world One Health challenges developed during the on-site phase. The forum engages mentors, academics from the Arqus Alliance, external stakeholders, and the wider community, fostering knowledge exchange and public engagement.

Upon successful completion of the course, students will gain a comprehensive understanding of the One Health framework, develop interdisciplinary analytical and problem-solving skills, acquire hands-on experience with relevant laboratory and field methodologies, and strengthen communication and teamwork competences in an international academic environment.

The course awards **6 ECTS credits** and an official **Arqus Certificate of Attendance**, recognizing active participation, collaborative engagement, and successful achievement of the learning outcomes.

Learning Outcomes

Upon completion of the course, participants will be able to:

A. Knowledge & Understanding:

- LO1.** Explain the One Health concept as an integrated framework linking human, animal, and environmental health across biological scales.
- LO2.** Describe the ecological, evolutionary, epidemiological and environmental drivers influencing the emergence, transmission, and persistence of pathogens, parasites, and vectors.
- LO3.** Characterize major groups of One Health-relevant biological threats, including bacterial, fungal, and parasitic pathogens, as well as arthropod vectors.
- LO4.** Explain mechanisms of antimicrobial resistance and pathogen evolution in clinical, environmental, and agricultural contexts.

LO5. Discuss the role of climate change, environmental pollutants, biodiversity, and ecosystem disturbance in shaping infectious disease dynamics.

LO6. Understand the mechanisms of surveillance One Health-related communicable diseases.

B. Analytical & Practical Skills

LO7. Interpret laboratory, field, and epidemiological data relevant to One Health challenges.

LO8. Apply interdisciplinary laboratory and field methods to investigate real-world One Health problems.

C. Challenge-Based & Problem-Solving Competences

LO9. Design evidence-based and feasible solutions to One Health challenges using Challenge-Based Learning principles.

D. Data, Ethics, and Decision-Making

LO10. Assess ethical, legal, and societal dimensions of One Health interventions and data-driven decision-making.

E. Communication & Collaboration

LO11. Communicate and present One Health analyses and solutions effectively in international and interdisciplinary team settings.

ECTS Workload and Credit Allocation

The course awards **6 ECTS credits**, corresponding to an estimated **150–180 hours of total student workload**, in line with the European Credit Transfer and Accumulation System.

The workload is distributed across structured contact hours, guided project work, and independent learning activities, ensuring a balanced combination of theoretical instruction, practical experience, and CBL.

Estimated Student Workload Breakdown

Learning Activity	Estimated Hours
Online Phase – Interactive Webinars (11 sessions)	30 h
On-Site Phase – Lectures, Laboratories, Fieldwork, Mentoring	40 h
Challenge-Based Group Project (teamwork, analysis, solution design)	50–60 h
Independent Study (literature review, data interpretation, preparation of outputs)	20–30 h
Preparation and Participation in the Online Student-Led Forum	10–15 h
Total Estimated Workload	150–175 h

ECTS Rationale

The allocation of **6 ECTS credits** reflects:

- the intensive and blended structure of the course,
- the integration of online learning, on-site laboratory and field activities,
- sustained student engagement in international, interdisciplinary teams,
- and the development of applied solutions to real-world One Health challenges through Challenge-Based Learning.

The workload distribution supports progressive learning, from foundational knowledge acquisition during the online phase to applied problem-solving and public presentation of results during the on-site phase and final student-led forum.

I: ONLINE PHASE-> 10 WEBINARS->30 h

The online component of the **One Health in Action** CBL-BIP program comprises **30 teaching hours** delivered in the form of interactive webinars. This phase is designed to establish a strong theoretical and conceptual foundation for the subsequent on-site activities and Challenge-Based Learning (CBL) projects.

The online phase consists of:

- **20 hours of lectures**, providing structured and research-based theoretical input,
- **6,5 hours of expert knowledge sharing**, focused on case studies, methodologies, and real-world research experience,
- **3,5 hours of moderated discussion**, encouraging critical thinking, reflection, and interdisciplinary dialogue.

The content is delivered through **10 online webinars (W01–W10)**, each lasting **2 hours, 15 minutes** and scheduled twice per week in the afternoon. Each webinar follows a consistent and student-centered structure that supports progressive learning and active engagement:

- The **first segment (approximately 2 teaching hours)** introduces key concepts related to a specific One Health domain, with emphasis on pathogens, parasites, vectors, and environmental drivers of disease. Content is grounded in current scientific literature and presented from an interdisciplinary perspective that integrates human, animal, and environmental health.
- The **second segment (approximately 30 minutes)** focuses on expert insights, during which lecturers present their own research experience, specialized methodologies, and selected case studies from ongoing or completed projects.
- The **final segment (approximately 15 minutes)** is dedicated to interactive discussion, including open Q&A sessions and guided group reflection, enabling students to critically engage with the material and relate it to emerging One Health challenges.

This structured yet flexible format ensures a balanced integration of theory, practice, and dialogue, creating a dynamic and inclusive online learning environment and preparing students for applied, challenge-based work during the on-site phase.

Schedule for Online Webinars: Tuesday and Thursday 16:30–18:45 CET, Teams platform

- **12 March 2026 – W01: Foundations of One Health: Systems, Ecosystems, and Microbial Balance**
Lecturer: dr Agata Dorotkiewicz-Jach (University of Wrocław)
 - This webinar introduces the One Health framework as an integrated and adaptive system linking human, animal, and environmental health. It explores ecosystems from a microbiological perspective, emphasizing the continuum between pathogens and microbiota. The session also frames the Challenge Based Learning (CBL) approach used throughout the course (additional 30 min session only for students involved with ERASMUS+BIP course).
- **17 March 2026 – W02: Climate Change, Environmental Stressors, and Health Risks**
Lecturers: Prof. Diego Ruiz (University of Granada)
 - This webinar examines climate change as a key driver of health risks within the One Health paradigm. It addresses the topic of climate change impact assessment, key factors related to climate change and its effects, environmental pollution in urban and natural ecosystems in the context of climate-related drivers of human diseases.



Students are introduced to environmental problems, environmental sensors, and data sources, monitoring tools, and basic measuring approaches of environmental data.

- **19 March 2026 – W03: *Pathogen Evolution and Antimicrobial Resistance Across Ecosystems***
Lecturer: Pr. Maria-Halima Laaberki (Université Lyon 1)
 - This session explores the evolutionary dynamics of pathogens under environmental and anthropogenic pressures. Topics include horizontal gene transfer, the emergence of bacterial pathogens and antimicrobial resistance (AMR), and the role of ecosystems in shaping resistance dissemination. AMR is presented as a system-wide One Health challenge rather than a purely clinical problem.
- **24 March 2026 – W04: *Bacteriophages and the Evolutionary Arms Race with Bacteria***
Lecturer: Prof. dr hab. Zuzanna Drulis-Kawa (University of Wrocław)
 - This webinar focuses on bacteriophages as both therapeutic tools and ecological drivers of bacterial evolution. It discusses phage–bacteria coevolution, mechanisms of phage resistance, and the limitations of phage-based therapies. The lecture encourages critical evaluation of alternative antimicrobial strategies.
- **26 March 2026 – W05: *Fungal Pathogens in the One Health Context***
Lecturer: dr Agata Piecuch (University of Wrocław)
 - This session highlights fungal pathogens as an often-overlooked component of One Health. It covers environmental and clinical reservoirs of fungi, antifungal resistance, and transmission pathways. The webinar broadens the pathogen perspective beyond bacteria and viruses.
- **09 April 2026– W09: *Vectors and intracellular bacteria***
Lecturer: Fabrice Vavre (Université Lyon 1)
 - This session introduces the diversity of intracellular bacteria living in arthropod vectors, notably those vertically-transmitted. It discusses how these symbionts influence host biology, vector competence, and disease transmission. The webinar discuss the frontiers between parasitism and mutualism, present organisms and ecosystems as integrated One Health units, and discuss their potential use in disease control.
- **14 April 2026– W08: *Biology, Ecology, and Microbiota of Mosquito Vectors***
Lecturer: Claire Valiente Moro (Université Lyon 1)
 - This webinar examines the biology and ecology of mosquito vectors with a particular focus on mosquito–microbiota interactions. It explores how mosquito microbiota influence vector biology, immunity, and pathogen transmission, and discusses microbiota-based approaches as potential alternative vector control strategies within the One Health framework.
- **16 April 2026 – W06: *Protozoan Parasites and Zoonotic Transmission Pathways***
Lecturers: dr hab. Prof. Agnieszka Perec-Matysiak (University of Wrocław)
 - This webinar introduces protozoan parasites of zoonotic importance and their complex life cycles. Emphasis is placed on transmission routes between animals, humans, and the environment. The session prepares students for laboratory-based parasitological analyses during the on-site phase.
- **21 April 2026– W07: *Helminths and Ectoparasites in One Health Systems***
Lecturers: dr hab. Prof. Joanna Hildebrand (University of Wrocław)
 - This webinar introduces protozoan parasites of zoonotic importance and their complex life cycles. Emphasis is placed on transmission routes between animals, humans, and



- the environment. The session prepares students for laboratory-based parasitological analyses during the on-site phase.
- ecosystems as integrated One Health units, and discuss their potential use in disease control.
- **23 April 2026 – W10: Epidemiology, Integrated Surveillance, Data Sharing, and Ethics in One Health**
Lecturer: Pilar Requena (University of Granada)
 - This webinar focuses on the epidemiology of One Health-related communicable diseases. It addresses how these diseases spread in the human population, the strategies for prevention and control, as well as their surveillance tools. Ethical and legal challenges related to data sharing and public health decision-making are discussed.

II: ON-SITE PHASE (5 DAYS→ 40 h)

The on-site phase of the **One Health in Action** program consists of **five intensive days of face-to-face activities**, delivering a total of **40 teaching hours**. This phase represents the core experiential component of the CBL-BIP and is designed to translate theoretical knowledge from the online phase into applied skills, interdisciplinary collaboration, and real-world problem-solving.

The on-site phase will be hosted at the **University of Wroclaw (Poland)** and is planned for the period **04–08 May 2026**. It combines advanced thematic lectures, hands-on laboratory and field activities, site visits, structured mentoring, and networking opportunities. The learning design ensures close integration between scientific content, practical experience, and collaborative project work.

Thematic Structure of the On-Site Phase

Day 1 – Ecosystems, Ecological and Climatic Drivers of Health

The first day is dedicated to understanding ecosystems as key determinants of public health within the One Health framework. Participants will take part in a **field trip** to observe local ecosystems and collect environmental samples, including water samples and material for the assessment of mosquito and tick presence. During the field activities, participants will meet with **biocontrol experts** and representatives of municipal authorities responsible for mosquito population management in Wroclaw. The day concludes with a networking event and the securing of collected samples for subsequent laboratory analyses.

Instructors/Lecturers:

Piotr Jawień, Aleksandra Czułowska, Dagmara Dyczko, Justas Kazys, Diego Ruiz (TBC)

Days 2–3 – Bacterial Pathogens, Antimicrobial Resistance, and Alternative Therapies

The second and third days focus on **pathogenic bacteria** and contemporary strategies to address **antimicrobial resistance (AMR)**. Morning lectures introduce experimental approaches, diagnostic methods, and alternative therapeutic strategies. Participants engage in **two intensive laboratory days**, including experimental work and guided analysis of obtained results. One of the key components is a **visit to a hospital microbial diagnostic laboratory**, providing insight into the clinical application of One Health principles.

Instructors/Lecturers:

Agata Dorotkiewicz-Jach, Zuzanna Drulis-Kawa, Ângela Maria Oliveira Sousa França

Day 4 – Parasites and Zoonotic Diseases

The fourth day is devoted to **parasitology and zoonotic diseases**. Participants learn diagnostic approaches and conduct practical laboratory analyses focused on the identification of parasites and the investigation of transmission routes.

Instructors/Lecturers:

Agnieszka Perec-Matysiak, Joanna Hildebrand

Day 5 – Challenge-Based Learning Projects and Integration

The final day is dedicated to **Challenge-Based Learning project work**. Under the supervision of mentors from all partner universities, international student teams refine and integrate their project outcomes. A **field trip to the Arboretum in Wojsławice** provides an additional ecological perspective and serves as a reflective component linking biodiversity, ecosystems, and health. The day concludes with a synthesis workshop integrating knowledge and experiences gained throughout the course.

Instructors/Mentors:

All Arqus partner lecturers and mentors

Challenge-Based Learning Projects

As an integral part of the *One Health in Action* course, students will participate in **Challenge-Based Learning (CBL) projects** designed to address real-world One Health problems at the interface of human, animal, and environmental health. Students will work in **international and interdisciplinary teams of 4–6 participants**, supported by academic mentors from partner universities. Each team will tackle one predefined challenge, develop an evidence-based solution, and present the outcomes during the **Online Student-Led Forum**.

The CBL projects are designed to:

- integrate knowledge from the online and on-site phases,
- foster interdisciplinary and international collaboration,
- develop applied problem-solving and decision-making skills,
- strengthen communication and public engagement competences.

III: ONLINE STUDENT-LED FORUM FOR PROJECT PRESENTATIONS

(1-DAY OPEN ONLINE CONFERENCE)

The final component of the **One Health in Action** program is an **Online Student-Led Forum for Project Presentations**, organized as a **one-day open online conference**. This forum serves as the culminating academic and dissemination event of the CBL-BIP.

During the forum, international student teams present the outcomes of their collaborative work developed throughout the online and on-site phases. Project results are showcased in the format of a **student-led symposium**, highlighting evidence-based analyses, proposed interventions, and integrated One Health solutions addressing real-world challenges related to pathogens, parasites, and vectors.

The forum brings together **students, mentors, lecturers, and invited academics from the Arqus Alliance**, as well as external stakeholders where relevant. By opening the event to the wider academic community and society, the forum fosters knowledge exchange, interdisciplinary dialogue, and public engagement beyond the classroom setting.

This final stage emphasizes **teamwork, creativity, and critical reflection**, while strengthening students' ability to communicate complex One Health challenges and solutions to diverse audiences. It also provides participants with practical experience in international academic collaboration, scientific presentation, and stakeholder-oriented dissemination, reinforcing the applied and transdisciplinary

Lecturers and Instructors – Short Biographies

University of Wroclaw (Poland)

Dr Agata Dorotkiewicz-Jach

Microbiologist at the University of Wroclaw specializing in bacterial pathogenesis, antimicrobial resistance, and alternative antimicrobial strategies. Her research integrates microbiology and environmental perspectives within the One Health framework. She is the **originator, academic coordinator, and main organizer** of the *One Health in Action* course and leads its Challenge-Based Learning design.

Prof. dr hab. Zuzanna Drulis-Kawa

Professor of microbiology and internationally recognized expert in bacteriophage biology and phage therapy. Her research focuses on bacteriophage–bacteria interactions, antimicrobial resistance, and innovative therapeutic approaches, bridging basic research with clinical and applied microbiology.

Dr hab. prof. Agnieszka Perec-Matysiak

Professor of parasitology at the University of Wroclaw, specializing in protozoan zoonotic parasites, and wildlife parasite biodiversity. Her work addresses transmission pathways and public health implications of parasitic diseases, combining laboratory and field-based approaches.

Dr hab. prof. Joanna Hildebrand

Professor of parasitology at the University of Wroclaw with expertise in helminths and vector-borne parasites, and host-parasite relationship. Her research focuses on parasite life cycles, transmission dynamics, and molecular and phylogenetic analysis, with links to public health applications.

Dr Agata Piecuch

Mycologist at the University of Wroclaw with expertise in medical mycology. Her research addresses fungal pathogens, antifungal resistance, and host–pathogen interactions in clinical and environmental contexts.

Dr Piotr Jawień

Environmental biologist with expertise in field-based environmental monitoring, biodiversity assessment, and ecosystem analysis, with an emphasis on mosquito ecology as it relates to environmental health and vector-borne disease risk. His research focuses on species composition and the spread of invasive mosquitoes. He combines field sampling, long-term monitoring, and spatial/environmental data to translate ecological evidence into actionable recommendations for conservation, public health, and local environmental management..

Dr Aleksandra Czułowska

Researcher at the University of Wrocław, specializing in ticks and tick-borne pathogens. Her work examines the ecology, distribution and seasonal activity of tick species in southwestern Poland, including *Dermacentor reticulatus*, *Ixodes ricinus*, and *Haemaphysalis concinna*. She also investigates the prevalence of vector-borne pathogens.

Dr Dagmara Dyczko

Research interests focus on understanding the role of hosts and environmental factors that influence tick population dynamics and pathogen infection rates. The research also encompasses biological control of hematophagous arthropods, particularly ticks, and the monitoring of mosquito populations in urban environments, with a special emphasis on invasive species.

Université Claude Bernard Lyon 1 (France)



Fabrice Vavre

Research Director at CNRS, localized in Université Lyon 1, specializing in the evolution of symbiosis and vertically transmitted endosymbionts. His research explores microbial influences on host biology, vector competence, and biological control strategies.

Claire Valiente Moro

Professor at Université Lyon 1 with expertise in vector biology, particularly mosquitoes and vector–pathogen interactions. Her research addresses vector ecology, microbiota, and innovative vector control approaches within One Health.

Pr. Maria-Halima Laaberki, DVM, PhD

Professor of Infectious disease at National Veterinary School of Lyon. At the Center for Integrative Research in Infectious diseases and Immunology (CIRI) in Lyon 1 University, her work focuses on horizontal gene transfer, antimicrobial resistance, and bacterial adaptation across environmental and clinical ecosystems..

University of Granada (Spain)

Pilar Requena

Researcher at the University of Granada specializing in communicable diseases. Her research focuses on the epidemiology, the study of vaccines and the burden of these diseases in specific vulnerable populations such as pregnant women and migrants.

Prof. Diego Ruiz

Professor at the University of Granada specializing in environmental health, pollution monitoring, and data-driven environmental analysis. His work integrates sensor technologies, data analytics and AI-based tools for environmental pollution and assessing environmental stressors and health impacts.

Vilnius University (Lithuania)

Justas Kazys

Associate Professor at **Vilnius University**, a climate scientist specializing in climate change applications, including biometeorology. His research focuses on how climate change interacts with natural and socioeconomic systems. He also investigates climate–health relationships, particularly the environmental drivers of vector-borne and water-borne diseases.

Universidade do Minho (Portugal)

Ângela Maria Oliveira Sousa França

Assistant Researcher (tenure-track) at the University of Minho, Centre of Biological Engineering. Her work focuses on the mechanisms of bacterial persistence (including antibiotic resistance and tolerance mechanisms), biofilm-associated infections, and host–pathogen interactions, combining advanced transcriptomics, genetic manipulation, and translational approaches to better understand bacterial survival strategies.

Course coordinator:

dr Agata Dorotkiewicz-Jach,

University of Wrocław (Poland),

Faculty of Biological Sciences,

Department of Pathogens Biology and Immunology.

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