Infection Biology - One Health (IB-OH)



Explore this IDIL Master's track in detail, including its academic objectives, curriculum, research opportunities, admission requirements and career prospects.

TRACK OVERVIEW & LEARNING OBJECTIVES

Positioning

The IBOH track is situated at the interface of molecular and cellular infectiology, immunology, and global health. It is based on a simple premise: understanding infectious diseases, particularly emerging and zoonotic ones, requires linking three scales: the molecular scale of host-pathogen interactions, the scale of the host and its immune response, and the scale of populations and ecosystems (One Health approach). Few European programs cover this continuum in an integrated way; Montpellier's research ecosystem, which brings together human health, animal health, agronomy, and ecology on a single site, makes it a privileged location to do so.

The track is backed by the MI²OH track (Infectious and Immune Mechanisms in Global Health) of the same mention, with which several course units are shared, while distinguishing itself through 100% English-taught instruction, enhanced research immersion, and structured interdisciplinary openness specific to the IDIL format.

Main Themes

- Molecular and cellular bases of infectious diseases (viruses, bacteria, parasites, fungi).
- Fundamental immunology, innate and adaptive anti-infectious immune responses, immunopathology.
- Global health, emergence, eco-epidemiology, and human-animal-environment interfaces (One Health).
- Experimental and methodological approaches in infectiology and immunology.

Specific Strengths

- Instruction delivered exclusively in English, designed to welcome an international audience and prepare students for an international scientific career.
- Early and prolonged research immersion: In-Lab unit starting in S7, personal research project (10 ECTS), long internship in S8 (30 ECTS), multidisciplinary team project in S9 (10 ECTS), and long M2 internship (30 ECTS) — meaning more than half of the curriculum is spent in a research setting.
- Top-tier research environment: over 70 researchers and research professors authorized to supervise research (HDR), distributed across the Faculties of Science, Medicine, and Pharmacy, national organizations (CNRS, Inserm, IRD, CIRAD, INRAE), and the University Hospitals (CHU) of Montpellier and Nîmes.
- Interdisciplinary openness structured by IDIL Non-Core training units and transversal units (ecology, chemistry, data, humanities and social sciences, ethics, research management).
- International dimension: COIMBRA European network, North-South collaborations, possibility of completing internships abroad.

Pedagogical Objectives

- Train through research and for research scientists capable of designing, conducting, and promoting an original project in infection biology.
- Master the concepts and methods of infectiology and immunology, from the molecular to the organism level, and understand their application domains and limitations.
- Know how to place an infectious disease question into a One Health perspective, mobilizing the ecological, animal, environmental, and societal determinants of emergence.
- Develop autonomy, critical thinking, and the ability to communicate in English before an international scientific audience.
- Prepare primarily for doctoral studies, both in France and abroad.

KNOWLEDGE, SKILLS & COMPETENCIES

Knowledge

- Integrated understanding of the biology of infectious agents (viruses, bacteria, parasites, fungi): infection cycles, virulence factors, evasion strategies, molecular and cellular bases of pathogenesis.
- Fundamental and anti-infectious immunology: innate and adaptive immunity, mucosal immunity, inflammation, immunopathology, immune disorders.
- Determinants of pathogen emergence and circulation: reservoirs, vectors, human-animal-environment interfaces, surveillance, and global health (One Health).
- Knowledge of prevention and control strategies: vaccines, antimicrobials, diagnostics, biosecurity, antimicrobial resistance.
- Disciplinary openness beyond the main field, acquired via IDIL Non-Core training units.

Skills (Savoir-faire)

- Design an experimental approach: formulate a hypothesis, choose appropriate methodological techniques, define relevant controls.
- Implement key techniques in microbiology, virology, cell and molecular biology, and immunology in a research laboratory.
- Analyze and interpret complex biological data, including high-throughput data, and evaluate its robustness.
- Critically analyze scientific literature and report its scope and limitations.
- Write and present a project, report, and research results in English before a scientific audience.
- Work in an interdisciplinary team on a shared subject (S9 multidisciplinary team project).
- Establish links between infectiology, immunology, ecology, and public health in an integrated One Health perspective.

Soft Skills (Savoir-être)

- Autonomy and adaptability: work independently, integrate quickly into a new research environment, take relevant initiatives.

- Organization: plan work, respect deadlines, maintain rigor and regularity.
- Reflective posture: self-evaluate, recognize mistakes, and turn them into learning opportunities.
- Interdisciplinary and intercultural openness: engage in dialogue with different scientific disciplines and cultures within an international curriculum and cohort.
- Collaborative spirit: listen, argue, contribute constructively to collective work.
- Responsibility and respect: toward individuals, equipment, infrastructure, and organisms handled.
- Scientific integrity: cite sources, avoid plagiarism, do not falsify data, respect the rules of scientific publication.
- Ethics and biosecurity: apply regulations regarding the handling of pathogens, biological sample processing, and animal experimentation.

Other Transversal Competencies

- Competencies developed in IDIL transversal units (S7 and S9): project management, open science and data management, research ethics, scientific communication and outreach, preparation for professional integration and doctoral studies.
- Advanced scientific English, written and oral, through daily practice.

DETAILED CURRICULUM

Semester 1 (S7)

- Structural Biology or Cellular Biology (choice) – HAV712V / HAV703V (5 ECTS) – shared core curriculum of the Life-Health mention
- Molecular and Cellular Bases of Infectious Diseases – HAV714V (6 ECTS) – shared with the MI²OH track
- Practical Approaches in Infectious Diseases (3 ECTS) – shared with the MI²OH track
- Global Health in Infectiology (2 ECTS) – shared with the MI²OH track
- In-Lab Unit – QAM1ILAB (2 ECTS)
- Personal Project: Research Project – QAM1PPRJ (10 ECTS)
- IDIL Transversal Training Units – QAM1TTRA (2 ECTS)
- IDIL Non-Core Training Unit (one of choice from the list below) (2 ECTS)

Semester 2 (S8) — 30 ECTS

- Research Internship (30 ECTS) – long internship in a research laboratory, in France or abroad

Semester 3 (S9)

- Immunity and Disorders (4 ECTS) – shared with the MI²OH track
- Physiopathological Immune Responses – HAV907V (5 ECTS) – shared with the MI²OH track
- Molecular, Cellular and Global Aspects of Infection (5 ECTS)
- Multidisciplinary Team Project – QAM2MUTP (10 ECTS)
- IDIL Transversal Training Units 2B – QAM2TTRA (2 ECTS)
- IDIL Non-Core Training Unit (one of choice from the list below) (2 ECTS)

Semester 4 (S10) — 30 ECTS

- Research Internship – HAV001V (30 ECTS) – long internship in a research laboratory, in France or abroad

IDIL Non-Core Training Units (2 ECTS, one choice in M1 and one in M2):

- Mediterranean Terrestrial Ecosystems – HA1I01B (2 ECTS)
- Scientific Openness to Earth and Water Issues under Global Change – HA1I01T (2 ECTS)
- Defusing Quantitative Bullshit – HA1I01H (2 ECTS)
- Innovations for Personalized Medicine – MAM1IDIN (2 ECTS)
- Plant Health 2.0: a Global War – HA1I01V (2 ECTS)
- Sustainable Management Basics – KAPMS790 (2 ECTS)
- Why is Democracy Hard? – DAPCNCM1 (2 ECTS)
- Challenges in Chemistry for Health and Environment – PAM1IDCH (2 ECTS)
- The Bionic Man – HA1I12E (2 ECTS)
- One Health and Eco-Epidemiology – HA1I03B (2 ECTS)
- How the Way We Move Reveals Who We Are – SAMIDNC1 (2 ECTS)

In-Labs:

- In-Lab Unit – QAM1ILAB (2 ECTS, S7): immersion in a research team alongside coursework, allowing students to discover the daily operation of a laboratory, learn techniques used, and prepare their personal research project.
- Host Laboratories: partner research units of the track (see "Partnerships & Networks" section).

ADMISSION REQUIREMENTS & STUDENT PROFILE

Expected Degrees

- Entry into M1: Bachelor's degree (Licence) in life sciences, biology, life-health, microbiology, biotechnology, or an equivalent French or foreign degree validating 180 ECTS.
- Entry into M1 is also open to students from Faculties of Medicine, Pharmacy, or Veterinary Medicine wishing to acquire molecular and cellular training on infectious agents and the immune response.

- Direct entry into M2: first year of a Master's degree (240 ECTS) in infectiology, immunology, microbiology, or cell and molecular biology, or an equivalent degree.

Recommended Knowledge and Skills

- Fundamentals in molecular biology, cell biology, microbiology (bacteriology, virology, parasitology), and immunology (molecular and cellular aspects).
- Basics in genomics and biological data analysis.
- Initial laboratory experience (internship, tutored project) appreciated.
- Minimum B2 English level required, as the track is entirely taught in English; a C1 level is recommended.

Target Student Profile

- French or international student primarily aiming for a doctorate, motivated by intensive research training and early laboratory immersion.
- Strong interest in infectious diseases, immunology, and global health issues, with an affinity for interdisciplinary work.
- Ability to work independently, in English, within an international scientific environment.

Admission Requirements

- Admission based on application file (prior academic record, transcripts, cover letter, research experiences, English level) and, where applicable, an interview, according to the selection procedures of the IDIL graduate program and the Life-Health mention.

CAREER OPPORTUNITIES

Doctoral Studies — Main Career Path

- The track is designed as preparatory training for a doctorate. Graduates predominantly pursue a PhD within the doctoral schools of the University of Montpellier (notably CBS2 – Chemical and Biological Sciences for Health, and GAIA), at other French universities, or abroad, with facilitated access to international doctoral programs thanks to an entirely English-taught curriculum.

Targeted Professions

- Researcher and university lecturer (*chercheur et enseignant-chercheur*) in infectiology, immunology, microbiology, or global health (after a PhD).
- Research engineer, study engineer, project manager, or technological platform manager in the public or private sector.
- Research and Development project manager: vaccines, antimicrobials, immunotherapies, in vitro diagnostics.
- Project officer in epidemiological surveillance, health risk assessment, or public health.
- Interface professions: scientific communication and outreach, scientific publishing, consulting, regulatory affairs, research project management (with a dual competence where applicable).

Sectors and Employers

- Public research organizations and universities: Inserm, CNRS, IRD, CIRAD, INRAE, Institut Pasteur and its international network.
- University hospital centers (CHU) and medical biology laboratories.
- Pharmaceutical, veterinary, biotechnology, and diagnostic industries.
- Public health and health security agencies and institutions (Santé publique France, ANSES, ECDC, EFSA) and international organizations (WHO, FAO, WOAH).
- Non-governmental organizations and global health operators, particularly in the framework of North-South partnerships.

RESEARCH LABORATORIES & ACADEMIC PARTNERS

Institutional Framework

- University of Montpellier — Master's mention Life-Health, hosting component: Faculty of Sciences; in partnership with the Faculties of Medicine and Pharmacy.
- IDIL graduate program (I-SITE MUSE / University of Montpellier), of which the track constitutes an Intensive Research Graduate track.
- Track backed by the MI²OH track of the Life-Health mention, with which several course units are shared.

Associated Research Organizations

- Inserm, CNRS, IRD, CIRAD, INRAE.
- CHU of Montpellier and CHU of Nîmes.
- Host research units (to be confirmed): PCCEI (Inserm U1058), IRIM (CNRS UMR 9004), LPHI (CNRS UMR 5294), MIVEGEC (IRD/CNRS/UM), ASTRE (CIRAD/INRAE), IRMB (Inserm U1183), CBS (CNRS UMR 5048), and other Montpellier units in the fields of infectiology, immunology, and global health, representing over 70 researchers authorized to supervise research (HDR).

International Networks and Partnerships

- European network of Coimbra Group universities: student exchanges and internship placements.
- European and international research projects led by host teams (Horizon Europe programs, North-South partnerships in West and Central Africa), offering international internship opportunities.

Socio-Economic Partnerships

- Hosting students for internships in biotechnology, diagnostic, human, and animal health companies.