

# Master Infection Biology, Alemania, Argentina - AMIBA



The Hannover Medical School and the Universidad Católica de Córdoba offer the study program "M. Sc. Infection Biology – Alemania-Argentina (AMIBA)" as a joint venture. This binational, double degree master's program focusing on cutting-edge research in infection biology and translational medicine both in Germany and Argentina.

The program is successfully accredited by the Zentrale Evaluations- und Akkreditierungsagentur Hannover (Zeva) ([www.zeva.org](http://www.zeva.org)) in Germany and by the Coneau in Argentina ([www.coneau.gov.ar](http://www.coneau.gov.ar)).



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## 1. Objectives of the master program Infection Biology

The aim of the master's program is an international study program for German and Argentinean students which provides a sound training for hands-on scientific questions with a high proportion of laboratory courses in infection research. In a networked world the binational study course should also contribute to enhanced academic science exchange with Argentina.

The study with the degree "Master of Science" (M.Sc.) prepares, among other things, for a career as a scientist in academia or as a manager in (research) companies or government agencies. The course forms the basis for further independent scientific research for promotions and for international doctoral programs (PhD) or professional activities, as the courses are entirely taught in English. Knowledge of the local language is offered as compulsory modules and contributes to international exchange in science and culture.

## 2. Application / requirements / selection

The application for the Master of Infection Biology takes place at the Hannover Medical School and the Universidad Católica de Córdoba using a joint online platform.

Applications for the first semester 2018 (starting in August with language classes; Lectures start in September in Argentina) with all necessary documents:

- Letter of motivation
- Certificates (Bachelor/Licenciado degree including diploma supplement, if applicable, training certificates, work references etc. – all as copies certified by an apostille according to the Hague conventions) or proof of immatriculation transcript of records (supplied by the examination office), copy of the registration of the bachelor thesis
- Certificate of the University entrance degree
- Language certificates
- Proof of longer stays in in English speaking countries, if applicable
- CV in English

must be submitted online ([www.master-amiba.de](http://www.master-amiba.de)) until 01.06.2018.

Contact:

Andrea von Craushaar  
Coordinator Germany  
Medizinische Hochschule Hannover / Twincore  
M.Sc. Infection Biology  
Feodor-Lynen-Str 7  
GERMANY  
www.twincore.de  
Tel.: 0511/22002-7113, Fax: -7186  
E-mail: [master-amiba@mh-hannover.de](mailto:master-amiba@mh-hannover.de)  
[AMIBA@mh-hannover.de](mailto:AMIBA@mh-hannover.de)

Program Director Germany  
Prof. Dr. Tim Sparwasser  
E-mail: [Sparwasser.Office@mh-hannover.de](mailto:Sparwasser.Office@mh-hannover.de)

Coordinator Argentina  
Milton E. Escobar  
Secretario de Asuntos Internacionales. Área de Cooperación  
Internacional e Intercambio Académico. Universidad Católica de Córdoba  
X5016DHK - Ciudad de  
Córdoba Tel/ Fax: +54 351  
4938121 ARGENTINA  
www.ucc.edu.ar  
E-Mail: [dirdere@uccor.edu.ar](mailto:dirdere@uccor.edu.ar)

Program Director Argentina  
Prof. Dr. Hugo Luján  
E-Mail: [hlujan@ucc.edu.ar](mailto:hlujan@ucc.edu.ar)

The conditions for access to the master's degree in Infection Biology are given in the current [admission regulations](#).

The master program is directed at Bachelor and Licenciado students who successfully completed their study in a biological or related field of study.

The course starts in September (Spanish course for Germans in August) in Argentina, during the second year teaching will take place in Germany.

DAHZ/CUAA's funds will cover costs related to flights, international health insurance and living costs abroad for the applications

- from Germany/Europe (1st year)
- from Argentina/South America (2nd year)

The scholarship will not cover living costs during the program holidays.

Every year 8 students are admitted to the program, 4 from Argentina and 4 from Germany.

The students are selected in a joint multi-phase and multi-level admission process and are enrolled at both universities.

*Requirements:*

Official Bachelor degree issued by Argentinian University or equivalent to a German degree of at least 180 credits (i.e. three years of full-time studies), in biology, (bio)medicine, biotechnology, bioscience, and others related with relevant knowledge in cell biology, genetics (bio)chemistry and molecular biology. Particular suitability is assumed if at least 150 credit points (German system) / 3.5 years of study (Argentinean system) are already present even if the final degree has not yet been received at the time of application.

English proficiency, normally attested by means of an internationally recognized test such as TOEFL (internet-based not less than a score of 80; no part less than a score of 20) or IELTS (Minimum 6,5 points; no part less than a score of 5,5). Proof of longer stays in English speaking countries will also be considered.

Selection will be based on previous academic studies with emphasis on grades in relevant fields, previous experience of laboratory work and additional qualifications, as well as CV and personal interview.

### **3. Program description / curriculum / instruction**

The scientific focus on immunology and infection biology will be covered in various courses on drug discovery, antibacterial agents, genomics and proteomics, medical aspects of infectious diseases as well as the use of microorganisms in biotechnological applications. Of unique importance is the practical and international nature of the Program, providing insight into state-of-the-art research at the MHH and the UCC, where students will be instructed in cutting-edge techniques and technologies of infection biology. In this way, you will be empowered by these unique exposures to competitively pursue academic careers at the university or professional careers in the industry in biotechnology or pharmaceutical companies in either Europe or South America.

Through studies at both Universities, you will greatly benefit from an excellent theoretical education in Argentina, complemented by experience with high-tech equipment for your practical education in Germany. Immerse in an intercultural environment, you will gain knowledge of the different education systems and be exposed to the different research focuses of the two countries, including different pathogens and different technical approaches.

We offer you:

- funded study periods abroad in Germany and Argentina (for each 4 students from Germany and Argentina)
- an interdisciplinary education program focusing on infectious diseases and host-pathogen interaction
- scientific knowledge and state-of-the-art experimental experience in current and emerging biomedical research areas
- translational research for vaccine development and novel therapies to treat endemic infectious diseases
- language courses in German and Spanish
- small classes with 1-to-1 supervision

### *Curriculum Structure:*

The curriculum was adapted according to the German and Argentinean Educational regulations (120 ECTS credits and 2321 tuition hours) and was designed to be completed over two years. These are divided into 4 semesters, which in turn are divided into 12 modules and a master thesis.

During the 1st semester in Córdoba (Argentina) you will attend theoretical and practical training required to level the differences in background knowledge of the students arriving from different institutions. This first semester will provide the basis for the remaining program.

The 1st semester in each country also includes a compulsory language course (Spanish/German) that will allow you to gain knowledge of the partner language and culture.

The next two semesters (2nd and 3rd semester) will take part in Córdoba (Argentina) and Hannover (Germany) and will deepen the theoretical knowledge in the field of immunology and infection biology. Simultaneously, laboratory rotations will deepen your methodological abilities. In addition, these laboratory rotations will allow you to get into contact with the Argentinean and German Labs and their Principal Investigators (PIs).

By the end of the 3rd semester, you will be able to select one PI from the UCC side and one PI from the MHH side as "supervising tandem" for your master thesis.

During the 4th semester, you will complete your master thesis in either of the countries.

### *Training:*

Teaching consists of lectures, seminars, laboratory rotations and master thesis project work.

During the program you will gain a broad overview of immunological topics ranging from basic knowledge of the functions of the immune system (allergy, autoimmunity) and defenses against pathogens (bacteria, viruses, parasites). Furthermore, you will learn the molecular and biochemical bases of the processes involved in an immune response and will be trained in translational medicine to bridge basic research and medical applications in the "bench to

bedside" approach. In addition to your theoretical training, you will learn essential techniques in immunological research using state-of-the-art equipment. Through practices and master thesis, you will learn how to plan, conduct, evaluate, and summarize scientific research questions. Thus, at the end of the master program, you should: 1) have a comprehensive understanding of immunological processes; 2) discuss scientific topics in the English language; 3) possess the ability to handle specific projects in an independent, analytical manner and critically evaluate the quality of research by others and published data; 4) properly document own data according to Good Laboratory Practices guidelines; 5) interpret research findings and draw appropriate conclusions; 6) summarize and articulate scientific ideas, procedures, results and conclusions in both oral and written formats using appropriate means and language. Furthermore, you will be trained in matters concerning regulation, ethics and safety in research.

You will also develop excellent English language skills prompted by an international environment and German/Spanish as a third language.

Classes are in English.

#### 4. Timetables / module descriptions

<b>1. Semester (August-December) in Argentina</b>	<b>2. Semester (December-June) in Argentina</b>	<b>3. Semester (June-January) in Germany</b>	<b>4. Semester (February-July) in Germany or Argentina</b>
<u>YEAR 1: 2017-2019</u> Lectures: Aug -Dec 2017 (Holidays: 23.12.17- 31.1.18)	<u>YEAR 1: 2017-2019</u> Lectures: Feb - May 2018 (Holidays: 1.6.18 - 15.6.18)	<u>YEAR 1: 2017-2019</u> Lectures: Jun 2018 - Jan 2019 (Holidays: 15.8.18 - 5.10.18)	<u>YEAR 1: 2017-2019</u> Feb – Jul 2019 in Germany or Argentina
<u>YEAR 2: 2018-2020</u> Lectures: Aug -Dec 2018 (Holidays: 22.12.18- 31.1.19)	<u>YEAR 2: 2018-2020</u> Lectures: Feb - May 2019 (Holidays: 31.5.19 - 14.6.19)	<u>YEAR 2: 2018-2020</u> Lectures: Jun 2019 - Jan 2020 (Holidays: 15.8.19 - 4.10.19)	<u>YEAR 2: 2018-2020</u> Feb – Jul 2020 in Germany or Argentina
<b>Soft Skills: Spanish for Germans</b> 135 hours 5 ECTS (August)	<b>Molecular and Cellular Biochemistry Biology</b> 270 hours 10 ECTS	<b>Soft Skills: German for Argentinians</b> 135 hours 5 ECTS (June)	<b>Thesis-Workshop:</b> Scientific Writing 54 hours 2 ECTS  Master Thesis 756 hours 28 ECTS
<b>Basic Immunology</b> 270 hours 10 ECTS	<b>Advanced Immunology</b> 216 hours 8 ECTS	<b>Translational Medicine</b> 162 hours 6 ECTS	
<b>Infection Biology</b> 324 hours 12 ECTS	<b>Lab Training I</b> 270 hours 10 ECTS	<b>Methods II</b> 162 hours 6 ECTS	
<b>Methods I</b> 162 hours 6 ECTS		<b>Methods III</b> 189 hours 7 ECTS	
		<b>Lab Training II</b> 270 hours 10 ECTS	
<b>33 ECTS (Germans) 28 ECTS (Argentinians)</b>	<b>28 ECTS</b>	<b>29 ECTS (Germans) 34 ECTS (Argentinians)</b>	<b>30 ECTS</b>

Contents (supported by MHH e-Learning platform):

1. Module: **Soft Skills**

Spanish for Germans. Students with Spanish knowledge pass test for credits.

2. Module: **Basic Immunology**

Development lymphoid organs. Innate immunity. Pathogen recognition. Antigen presentation. Adaptive immunity. Effector mechanisms. Signaling. Cytokines. Memory. Immune evasion. Immunodeficiencies. Allergy. Hypersensitivity. Autoimmunity. Diagnostics.

3. Module: **Infection Biology**

Medical Microbiology. Basic principles. Classification of bacteria. Morphology, cell wall structure and synthesis. Metabolism and growth. Genetics. Viruses, Fungi, Parasites: classification, structure, replication. Sterilization and disinfection. Microscopy. Molecular & Serological diagnostics. Pathogenic mechanisms. Antimicrobial agents. Acute and chronic diseases. Pathogenesis, dissemination, virulence, susceptibility. Prevention and control. Emerging diseases.

4. Module: **Methods I**

Sampling techniques: selection of research animals; inoculation/immunization techniques; recovery of samples. Culturing techniques, production of antibodies; Sample analysis: fluid sample analysis; cell phenotyping; cellular activation; cytokine/protein production and secretion; signaling; gene expression; tissue analysis; Practical training: isolation and stimulation of immune cells. ELISA. Western Blotting. Flow Cytometry.

5. Module: **Molecular and Cellular Biochemistry**

Glycobiology of host-pathogen interactions. Theory: Role in cell recognition and host cell invasion. Glycan-based vaccines, diagnostics tools and glycoproteins as therapeutics. Signaling. Practical training: Sample preparation for glycan analysis. Extraction and purification. Fluorophore labelling, Glycan Cleanup. Sample preparation for HPLC.

6. Module: **Advanced Immunology**

Transplantation Immunology. Neuroimmunology. Mucosal Immunology. Intestinal Immune System, GALT. Tolerance versus effector responses. Microbiota. Functional food. Respiratory immune system. NALT and BALT. Immunobiology of the respiratory epithelium. Host-pathogen relationship. Natural antimicrobial peptides. Mucosal Vaccines. Practical training: Isolation of probiotic bacteria for functional food business. Evaluation of probiotic properties in vitro. Immunostaining and colocalization of proteins transiently expressed in cell lines.

7. Module: **Lab Training I**

Laboratory Training: new methodologies and theoretical concepts

8. Module: **Soft Skills**

German for Argentineans. See above.

9. Module: **Translational Medicine**

Vaccine development & Immunodiagnostics. Good Laboratory Practice. Ethical considerations. Clinical trials, Preclinical development: Immunogenicity and safety. Future vaccines. Trial design. Animal models, Adjuvants. Immunization route. Regulatory aspects. Entrepreneurial aspects. Safety issues and controversies.

Molecular Medicine. Virus bioengineering. Gene transfer strategies. Genetic therapy in immunodeficiencies and neurodegenerative diseases. iPS generation. Practical training: Experimental design of theoretical problems.



Molecular Diagnostics. Human genome. Genetic variation. New Generation Sequencing (NGS). Future technologies. Complete Genome Sequencing. Exome sequencing. Practical training: Experimental design of theoretical problems.

10. Module: **Methods II**

- a. Multicolor Flow Cytometry
- b. Detection and purification of specific cell types
- c. Sample analysis, Sequencing
- d. Fluorescence microscopy
- e. Image processing

The students will be able to choose the courses according to their interests and the available vacancies for each course.

11. Module: **Methods III**

- a. Animal models
- b. Advanced methods for the analysis of the immune response Module: Thesis workshop
- c. Laboratory Animal Handling. Laboratory health and safety. Ethical principles and laws. Alternative models to the use of animals.

12. **Master Thesis including course Scientific writing** (english)

Advanced research phase, independent research project. Master Thesis as "tandem format", including a Principal Investigator from each country (Germany and Argentina).

## 5. Exams /graduation

Binational Degree

After completing 120 ECTS points ,you will be awarded with the double degree consisting of:

- 1) Magíster en **Biología de las Infecciones** at UCC (Argentina)
- 2) Master of Science (M.Sc.) in **Infection Biology** at MHH (Germany)

## 6. Fees and contributions

Total semester fee: 2800 euros (for all 4 semesters)

The program guarantees the best applications the access to DAHZ – CUAAs funds to cover costs related to international flights, accommodation and general cost of living in Argentina (for four German students) and Germany (for four Argentinian students).

The scholarship will not cover living costs during the program holidays.

## 7. Legal / regulations / forms

[Admission regulations \(English\)](#)  
[German \(Zulassungsordnung\)](#)  
[Spanish \(Normas de acceso y autorizacion\)](#)

[Study regulations \(English\)](#)  
[German \(Studienordnung\)](#)  
[Spanish \(Reglamento de estudios\)](#)

[Examination regulations \(English\)](#)  
[German \(Prüfungsordnung\)](#)  
[Spanish \(Reglamento de exámenes\)](#)

[AMIBA Application form](#)

Application Master Thesis

Information on exams

## 8. Contact / consultancy

Coordinator Germany  
Andrea von Craushaar  
Medizinische Hochschule Hannover / Twincore  
M.Sc. Infection Biology  
Feodor-Lynen-Str 7  
GERMANY  
www.twincore.de  
E-mail: [AMIBA@mh-hannover.de](mailto:AMIBA@mh-hannover.de)  
Tel.: +49 0511/22002-7113 – 7186 (fax)

Coordinator Argentina  
Milton E. Escobar  
Secretario de Asuntos Internacionales. Área de Cooperación I  
nternacional e Intercambio Académico. Universidad Católica de Córdoba  
Campus - Av. Armada Argentina  
3555 X5016DHK - Ciudad de Córdoba  
Tel/ Fax: +54 351  
4938121 ARGENTINA  
www.ucc.edu.ar  
E-Mail: [dirdere@uccor.edu.ar](mailto:dirdere@uccor.edu.ar)

Program Director in Germany  
Prof. Dr. Tim Sparwasser  
TWINCORE – Centre for Experimental Infection Research  
Feodor-Lynen-Str. 7, 30625 Hannover, Germany  
Tel.: 0511/22002-7201, Fax: -7203  
E-mail: [Sparwasser.Office@mh-hannover.de](mailto:Sparwasser.Office@mh-hannover.de)

Program Director in Argentina  
Prof. Dr. Hugo Luján  
Laboratorio de Bioquímica y Biología Molecular. Facultad de Medicina. Universidad Católica de Córdoba.  
Centro de investigación y Desarrollo en Inmunología y Enfermedades Infecciosas (CIDIE-CONICET)

Av. Armada Argentina 3555, CP X5016HDK, Córdoba, Argentina  
Tel.: +54 351 4938094/95  
E-Mail: [hlujan@ucc.edu.ar](mailto:hlujan@ucc.edu.ar)

## **9. Further information**

Career:

Employment may be found in academia and in international companies performing research in vaccine or antibiotic development with a focus on clinical trials in South America or companies requiring quality control for vaccine and drug production. Other examples are companies dedicated to the development of functional food, such as prebiotics and probiotics. In addition, national institutions for medicinal food and product safety or agriculture may represent potential employers. In the public sector there is a need for surveillance, analysis and follow-up of outbreaks, both nationally and on a global scale.