Master: NEUROMETABOLISM AND CELL BIOLOGY FOR CLINICIANS

Holistic training in neurometabolism and cell biology for a new generation of talented clinicians

GENERAL INFORMATION

What you will learn

- *Original and innovative clinical practice* aimed at connecting the basic mechanisms of disease to clinical symptoms
- *Biomarkers and treatments* of neurometabolic and neurodegenerative diseases
- The *biochemical and cell biology bases of neurological symptoms*

Novel paradigm

This international master aims to lay the ground for the much-needed novel paradigm in clinical neurology. While the classic approach is mainly based on clinical symptoms, here we aim to integrate different levels of complexity in agreement with the intricate operational network of the nervous system.

The neurological manifestations will be linked to genetic, molecular and biochemical markers, cellular pathways, and brain circuitries in a comprehensive manner as a necessary and new approach.

Most of all, we will provide educational tools to integrate the "pathophysiological thinking" in the clinical practice of both neurology and inborn errors of metabolism in line with the fact that >80% of diseases have neurological involvement. All of these aim towards the current development of new therapies.

Who is it intended for?

This master's degree is mainly aimed at neurologists (pediatric or adult) and doctors dedicated to inborn errors of metabolism. It is also aimed at professionals in any area of biomedicine.

- Graduate/Doctor of Medicine
- Graduate/Doctor of biomedicine sciences

Certificate: Lifelong learning master's degree certificate

Edition: 2º Edition

Length: 2 academic years

Modality: Hybrid

Places: 42

Credits: 90 ECT

Fees: 3.600,00 € / year

Start date: October, 2024

Teaching Language: English

Finish date: September, 2026

Location: Hospital Sant Joan de Déu
Passeig de Sant Joan de Déu, 2
08950 Esplugues de Llobregat,
Barcelona, Spain

Director:

Pr. García-Cazorla, MD, PhD

Head Neurometabolic Unit Sant Joan de Déu (SJD), Barcelona

Coordinators:

Pr. Jean-Marie Saudubray

Emeritus Professor of Pediatrics and Inborn Errors of Metabolism, Paris

Pr. Oscar Marin

Director of the Centre for Developmental Neurobiology at King's College, London

Dr. Juliana Ribeiro

Pediatric Neurologist at SJD, Barcelona

Pr. Fanny Mochel

Head Neurometabolic Unit, La Pitié Salpetrière, Paris

Dr. Heidy Baide-Mairena

Pediatric Neurologist at SJD, Barcelona

Dr. Nazareno Lascano

Pediatric Neurologist at SJD, Barcelona

TEACHING STAFF

Dr Tom J de Koning, MD, PhD

Dr Barbara Plecko, MD, PhD

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Dr Marie-Cecile Nassogne, MD, PhD

Dr Alejandra Darling MD, PhD.

Dr Mercedes Pineda, MD, PhD.

Dr Grant Mitchell, MD

Dr Mar O'Callaghan MD, PhD.

Dr Felipe Barros, MD, PhD.

Dr Letícia Pias, MD,

Dr Alfonso Luis de Oyarzabal Sanz, PhD

Dr Shamima Rhaman, MD, PhD.

Dr Antonio Zorzano, PhD

Dr Diego Martinelli, PhD

Dr. Carlo Dionisi-Vici, MD,

Dr Eva Morava. MD, PhD,

Dr. Thomas Opladen, MD, PhD

Dr Gabriella Horvath, MD, PhD

Dr Sofia Duarte MD

Dr Xavier Altajaf, PhD

Dr Carmen Fons, MD.

Dr Juan Dario Ortizoza, MD, PhD

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Dr Carlos Ortez, MD

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Dr. Jean-Marie Saudubray, MD

Dr. Fanny Mochel, MD, PhD

Dr. Oscar Marín, PhD

Dr. Toni Pearson, MD, PhD

Dr Roser Pons, MD, PhD

Dr Mathieu Milh, MD, PhD

Dr Alexis Arzimanoglou, MD

Dr Emilio Fernandes, MD

Dr Caroline Sevin, MD, PhD

Dr Holger Prokisch, PhD

Dr Juan Alberto Ortega Cano, PhD

TEACHING STRUCTURE

The teaching program includes **6 theoretical modules** that cover almost all neurometabolism disorders.

HYBRID FORMAT

The master's program is delivered in a **hybrid format**:

Classes are conducted on a weekly basis. **Each week, access is granted to the corresponding class via the virtual campus and is available to students,** allowing them the freedom to access it as many times as they deem necessary. One or two lectures are scheduled per week.

A **real-time online tutoring session** takes place **every Thursday from 17:00 to 18:00hrs (local time in Spain-CET). This tutoring session provides** an opportunity for interaction and clarification of doubts with the teacher who conducted the class that week.

The face-to-face period takes place during one week per year at the "Summer School" in Barcelona. It will take place at the end of each academic year: **the first week of July 2025 and the first week of July 2026.**

ASSESSMENT CRITERIA

Quiz: At the end of each tutoring session there will be a small exam regarding the conference of the week.

Master's Final Project (MFP):

There are several options for the Master's Final Project. It may be a clinical case that contributes to something different to what it is already known, for being a new presentation, introducing a new biomarker, a new disease, a bibliography review, etc. It can also be the description of a series of patients in an "article format". Finally, combined clinical and laboratory works are also acceptable if the students are working on some translational research topic that they would like to present as a final project.

The project is prepared in a group of 3-5 students with the same interest topic under the supervision of one or two advisors, and should enable the participants to display the knowledge, skills and competences acquired during the master's degree in an integrated way.

ADMISSION

APPLY FOR ADMISSION

The interested participants should send documents to:

neurometab.bio.master@gmail.com

- Curriculum vitae
- Motivation Letter stating why you believe it is important to do the master and the country in which you live and work

The **deadline** for sending these two documents is **February 29th, 2024 12PM (Barcelona time-CET)**

Selection criteria

- Geographical origin, a representativeness of the maximum number of countries is attempted
- Motivation letter
- Curriculum vitae
- Previous experience in inborn error of metabolism and/or neurology

NOTICE OF ADMISSION

The admission resolution will be sent to the e-mail address you specify when you send your application. In any case, whether you are selected or not, you will receive a message from our side.

In this e-mail the selected participants, will receive the link for pre-enrollment as well as the list of documents required for the enrollment starting from March 15, 2024 to June 30, 2024.

PRE-ENROLLMENT

Pre-enrollment dates: From March-15-2024 to Jun-30-2024

ENROLLMENT

Enrollment dates: From July-15-2024 to Oct-10-2024

Documents required at the time of enrollment:

To certify the validity of the studies carried out abroad, it is necessary to carry out specific procedures that allow verifying the existence of both the institution that issues them and the studies that have been completed and the titles and grades obtained.

ATTENTION: This procedure should only be carried out by people who have already been selected for the course. The documentation must be sent by email to neurometab.bio.master@gmail.com or by postal mail (below) until **June 30, 2024.** This text is for informational purposes only. The selected students will be sent complete information on this aspect.

Mailing address:

Dra Juliana Ribeiro Constante
Departamento de neurología pediátrica
Hospital Sant Joan de Déu.
Passeig de Sant Joan de Déu, 2
08950 Esplugues de Llobregat, España

1. **Photocopy of university degree certificate** with the certificate made by a registered notary in the Spanish State or by the diplomatic or consular representations of the Spanish State in the country that issued the title.

2. The **translated diploma** is made by a sworn translator (if the diploma is NOT in Catalan, Spanish, English, Italian, French or Portuguese). **If the candidate sends the photocopy of the translation, it should be certified** by a registered notary in the Spanish State or by the diplomatic or consular representations of the Spanish State. If the candidate sends the **original translation, it does not need to be certified by the Spanish authorities.**

You can find the Spanish sworn translator in the link:

http://www.ub.edu/acad/noracad/documents/traduccio.htm

Traducció oficial de documents acadèmics

Tipologies de traduccions vàlides . A. Traducció oficial realitzada per traductor/intèrpret jurat legalment inscrit a Espanya: Per a que la traducció oficial sigui vàlida el traductor/intèrpret ha de formar part de la "Llista actualitzada de traductors-intèrprets jurats" que publica el Ministeri d'Afers Exteriors i Cooperació (MAEC).

www.ub.edu

3. Copy of DNI, passport or corresponding **identity document**

4. **Authorization request** duly completed

5. **Responsible declaration** stating that you are in possession of the title provided, that the data entered are true and authorizing, where appropriate, its verification

- In the link below you can **download the authorization** request and **the responsible declaration**
  http://www.ub.edu/acad/en/admission/international/postgraduate.htm

Or by email (juliana.ribeiro@sjd.es):

1. Photocopy of the University degree (with **secure verification code**).

2. Authentic copy **with secure verification code** of the diploma translation. (if the diploma is NOT in Catalan, Spanish, English, Italian, French or Portuguese).

3. Copy of DNI, passport or corresponding identity document

4. Authorization request duly completed

5. Responsible declaration stating that you are in possession of the title provided, that the data entered are true and authorizing, where appropriate, its verification.

- In the link below you can **download the authorization** request and **the responsible declaration**
  http://www.ub.edu/acad/en/admission/international/postgraduate.htm

Many countries signed the Hague Convention. The " Hague apostille " would be accepted only if it has a QR code that shows that the signature of the document is authentic and also the document itself. The Hague apostille verifies the signature, not the document itself.

IMPORTANT NOTES:

- The university needs the university degree NOT the specialist degree
- The university degree needs to be certified by the Spanish authorities.
- If the photocopy of the certificate degree has a secure verification code that the university can verify the document authenticity online, you can send it by email. Otherwise, you need to send it by postal email
- If the diploma is NOT in **Catalan, Spanish, English, Italian, French or Portuguese** it should be translated by a sworn translator RECOGNIZED by the Spanish State.

- If you mail me the original translation it does not need to be certified, but if you mail the photocopy, it should be certified by the Spanish authorities.

- If the documents do NOT have a QR code they need to be sent by postal mail to:

Dra Juliana Ribeiro Constante
Departamento de neurología pediátrica
Hospital Sant Joan de Déu.
Passeig de Sant Joan de Déu, 2
08950 Esplugues de Llobregat, España

Enrollment fee:

- First year: 3.600,00 €
- Second year: 3.600,00 €
- An increase of 10% is applied to the price, up to a maximum of € 70, as administration fee

CERTIFICATION

To obtain the degree, it is essential:

- To be approved in each of the modules with 80 of attendance to the tutoring classes and grade higher than 7.0 (out of 10 points*) in each module separately.
- To participate in the summer schools
- To be approved in the final project

*The points of each module correspond to the average points of all the quizzes of the module (every week, for each seminar, there will be a tutorial class, after which a small quiz will be carried out. Each exam has a maximum score of 10 points).

Distribution of the final grade of the Master:

- Participation in the summer school: 10% of the final grade (maximum score of 10 points)
- Final Project: 15% of the final grade (maximum score of 10 points).
- Modules: 75% of the final grade

QUALIFICATION AWARDED

A diploma of Master Degree of **Barcelona University*** in Neurometabolism and cell biology with 90 ECTS credits will be issued.

The Diploma will be issued in a bilingual version, Catalan-English.

When the student fills out the data for registration for the course in which he enrolls, he has the option to specify if he wants a trilingual, Catalan-English version and another official language in Spain or the European Union.

***What is a University Lifelong learning master's degree?**

The University of Barcelona's Lifelong learning master's degrees (formerly known as **own degree** masters) are intended for the specialization and deepening of practicing professionals.

This kind of master degree is a **unique qualification certified by the UB**. Their recognition depends on the institutions or companies to which they are submitted by their holders. In order to guarantee their **academic rigor**, they are subject to similar quality control processes to those used for official programs taught at the UB. It should be kept in mind, however, that this type of qualification, specific to a Spanish university, does not give access to PhD programs in Spain.

What is the difference between own degrees and official degrees?

In accordance with section g) of article 2 of Organic Law 6/2001, of December 21, on Universities, the State grants Spanish universities the autonomy to issue official titles valid throughout the national territory and its own diplomas and titles. With this measure, the University is enabled to expand its official training offer through so-called **own degrees**. Official degrees require a series of procedures and evaluations by different public bodies such as the National Agency for Quality Assessment and Accreditation (ANECA) and are required for the doctorate. **Own degrees** are specialized courses with various names (master's, postgraduate, expert, etc.) and do not require the validation of institutions such as ANECA. They are designed to respond in an agile way to the needs posed by the labor market and society, so they are aimed at achieving objectives such as:

- Provide specialized training with immediate professional projection.
- Update the knowledge of professionals to promote training for professional practice.
- Establish a connection between academic activity and social reality

SCIENTIFIC PROGRAM

The master's teaching program lasts two academic years**.** The educational content of the first year is related to basic knowledge on brain metabolism and cellular neurobiology. The second year aims to connect neurochemistry and cell biology to the main neurological syndromes

FIRST YEAR

Part I: Cellular Neurochemistry and related diseases

I-A. Basis of Brain Chemistry

- I-A. 1-An overview of cell biology and main types of molecules (simple, complex, energy metabolites)
- I-A. 2- Classification of Inborn Metabolic Diseases based on chemistry groups and clinical symptoms
- I-A. 3-Brain circuits and Neurochemistry. Associated neuropsychiatric manifestations

I-B. Small molecules and related diseases

- I-B. 1-An overview of clinical manifestations and treatments
- I-B. 2-Amino acid accumulation disorders
- I-B. 3-Amino acid deficiency disorders
- I-B. 4-Inborn errors of vitamins affecting the nervous system
- I-B. 5-Neurological impairment of Disorders of galactose, fructose, and other small carbohydrates
- I-B. 6-Neurological impairment of Disorders of purine and pyrimidines
- I-B. 7-Disorders of metals and neurological dysfunction (Disorders of peptides and neurotransmitters will be developed at Part III)

I-C. Complex molecules and related diseases

- I-C. 1-An overview of clinical manifestations and treatments in complex molecule defects
- I-C. 2-Disorders of Sphingolipids
- I-C. 3-Disorders of Cholesterol Biosynthesis, Niemann-Pick and Lipofuscinoses
- I-C. 4-Disorders of phospholipids and intracellular triglycerides
- I-C. 5-Peroxisomal disorders
- I-C. 6-Glycosaminoglycans and Oligosaccharides Disorders
- I-C. 7-Disorders of RNA and DNA metabolism

I-D. Energy molecules and related diseases

- I-D. 1-An overview of brain energy metabolism
- I-D. 2-Energy molecule transporters and related disorders
- I-D. 3-Cytoplasmic energy defects and related disorders
- I-D. 4-Mitochondrial oxidative phosphorylation and related disorders
- I-D. 5-Mitochondrial machinery and related disorders

Part II: Nervous system compartments 1: Intracellular communication and related diseases

- II. 1-An overview of intracellular communication and related diseases
- II.2-Disorders of the exocytic compartment.
- II.3-Disorders of the endocytic compartment
- II.4-Disorders of autophagy
- II.5-Disorders of axonal and cytoskeleton transport
- II.6- Neurological aspects of Congenital Disorders of Glycosylation

Part III: Nervous system compartments 2: Intercellular communication and related diseases

- III. 1-An overview of intercellular communication and related diseases
- III. 2-Signaling molecules I: monoamine neurotransmitters and related diseases
- III. 3-Signaling molecules II: amino acid neurotransmitters and related diseases

- III. 4-Signaling molecules III: other signaling molecules (peptides, growth factors)
- III. 5-Cellular mechanisms of neuronal signaling and related diseases
- III. 6-Glia-Neuronal communication and related diseases

Summer school

SECOND YEAR

Part IV: Neurodevelopment and Systems Neurobiology

- IV.1-Development of the Nervous System
- IV.2-Neurobiological Mechanisms underlying neurodevelopmental disorders: an overview
- IV.3-Neurobiological Mechanisms underlying neurodegenerative disorders: an overview
- IV.4-Genetics of Neurological disorders

Part V: Clinical syndromes and related biological mechanisms

- V. 1-Early onset encephalopathies with predominant epilepsy
- V. 2-Early onset encephalopathies with predominant motor symptoms
- V. 3-Microcephaly
- V. 3.1-congenital
- V. 3.2-post-natal
- V. 4-Macrocephaly
- V. 5-Epilepsy from early to late childhood (2-12)
- V6-Epilepsy in adolescence and early adulthood (>12)
- V. 7-Congenital Ataxias
- V8-Ataxia in childhood and adolescence
- V. 9-Ataxia in adulthood
- V. 10-Genetic forms of spastic cerebral palsy
- V. 11-Spastic paraparesis and spastic-ataxia spectrum
- V. 12-Hyperkinetic movements in early childhood---mixed forms
- V. 13-Hyperkinetic movements with prominent chorea

- V. 14-Hyperkinetic movements with prominent dystonia
- V15-Other predominant hyperkinetic movements
- V. 16-Hyperkinetic movements in adolescence and early adulthood
- V. 17-Hypokinetic movements in early childhood (or infancy and childhood)
- V. 18-Hypokinetic movements in adolescence and early adulthood
- V. 19, 20-Intellectual disability 1, 2 (2 classes)
- V. 21, 22-Autism 1, 2 (2 classes)
- V. 23-Prominent behavior abnormalities in neurodevelopmental disorders
- V. 24-Neuromuscular disorders I
- V. 25-Neuromuscular disorders II

Part VI: Biomarkers and New treatments

- VI. 1-New biomarkers: metabolomics and lipidomics
- VI. 2-Brain image biomarkers: demyelinating disorders in children
- VI. 3-Brain image biomarkers: hypomyelinating disorders in adults
- VI. 4-Brain image biomarkers: basal ganglia involvement
- VI. 5-Brain image biomarkers: cerebellum and brainstem involvement
- VI. 6-Advanced treatments I: bone marrow transplant and cell therapy
- VI. 7- Advanced treatments II: genetic therapy

Summer school