

## Environmental epigenetics and risk assessment challenges and future perspectives

This advanced course is organized under the scope of the Horizon Europe Twinning project EPIBOOST (<http://epiboost.web.ua.pt/>). It offers advanced theoretical and practical training in environmental epigenetics, as well as complementary training in transferable soft skills (collaboration with other Twinning projects coordinated by the University of Aveiro).

Epigenetics is an emergent field in environmental assessment provided that epigenetic changes can be seen as meaningful molecular initiating events of adverse outcome pathways in different organisms. Despite epigenetic changes have been validated in medical fields, they are only starting to be recognized as important targets for the development of biomarkers to improve our mechanistic understanding of the ecological impacts of environmental challenges.

The course will be held online (selected days along two weeks) and face-to-face (one week, at the University of Aveiro), and it is composed of (i) theoretical lectures, where the relevant concepts and techniques in epigenetics research will be presented and critically discussed, focusing on environmental models and case studies shared by the authors with the audience; (ii) theoretical-practical and practical sessions, where the participants will have the opportunity to learn on widely used techniques for assessing on epigenetic changes, including on bioinformatic and data analysis specifics; (iii) participative sessions focusing transferable skills linked to career planning and science communication, which are critical assets to support a successful future in the competitive field of molecular ecotoxicology and essential to communicate scientific approaches, methods and results to different stakeholders.

**TARGET AUDIENCE** • The course is targeted to early career researchers, particularly but not exclusively PhD students enrolled in programmes where environmental monitoring and/or ecological risk assessment are topical, as well as professionals interested in environmental epigenetics. Previous knowledge of the epigenetics field and related techniques is not mandatory.

### CALENDAR

Registration (see dedicated section below for details) deadline: 11 February 2024

Remote autonomous preparatory work based on indicated literature\*: 26/02/2024 – 07/03/2024

Remote online sessions: 29/02/2024, 01/03/2024 and 07/03/2024 in the morning; 08/03/2024 (full day)

In-person sessions (University of Aveiro): 11/03/2024 – 15/03/2024

Examination\*\*: 15/03/2024 in the afternoon (Presentation of a group assignment)

\*Individual preparatory work is expected before the course based on literature indicated following confirmed registration.

\*\* Mandatory for participants requiring credits validation (6 ECTS).

**FORMAT** • All sessions will be held in English. Attendance will be recorded in all online and in-person sessions. For students wishing to use the course as an ECTS source, 80% attendance to the full Course programme is required in addition to a positive evaluation in the examination session. Under appropriately justified conditions (e.g., medical and social leaves), online attendance can be arranged, although the quality of the sessions cannot be guaranteed.

### COORDINATORS (and lecturers)

**Dr. Joana Luísa Pereira**, CESAM and Department of Biology, University of Aveiro, Portugal.

**Prof. Jana Asselman**, Blue Growth Research Lab, Ghent University, Belgium.

**Dr. Laia Navarro Martin**, IDAEA-CSIC, Spain.

## LECTURERS/SPEAKERS/INSTRUCTORS – SCIENTIFIC PROGRAMME

**Dr. Bruno Campos**, Unilever.

**Dr. Eduarda Santos**, University of Exeter, United Kingdom.

**Dr. Gabriela Moura**, iBiMED and Dept. Medical Sciences, University of Aveiro, Portugal.

**Guilherme Jeremias**, CESAM and Dept. Biology, University of Aveiro, Portugal.

**Inês Sousa**, iBiMED, University of Aveiro, Portugal.

**Dr. João Barbosa**, Blue Growth Research Lab, Ghent University, Belgium.

**Dr. Janan Gawra**, IDAEA-CSIC, Spain.

**Lotte Janssens**, Blue Growth Research Lab, Ghent University, Belgium.

**Dr. Maja Šrut**, University of Innsbruck, Austria.

**Dr. Noelia Diaz**, ICM-CSIC, Spain.

**Dr. Ramji Bhandari**, University of Missouri, USA.

**Dr. Rita Guimarães**, iBiMED, University of Aveiro, Portugal.

## COURSE PROGRAMME AT A GLANCE (detailed programme below)

		Remote • week 1					Remote • week 2				
		26/02	27/02	28/02	29/02	01/03	04/03	05/03	06/03	07/03	08/03
		Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri
AM					Epigenetics and epigenetic mechanisms	Epigenetics integration in Ecological Risk Assessment				Techniques & technology to assess epigenetic changes	Case-studies by invited experts
	PM	Remote autonomous preparatory work based, but not limited to, indicated literature					Remote autonomous preparatory work based, but not limited to, indicated literature				

		In-person • week 3				
		11/03	12/03	13/03	14/03	15/03
		Monday	Tuesday	Wednesday	Thursday	Friday
AM		NGS requirements, QC and costs + visit to sequencing facility <b>Room 30B.3.36 (ESSUA)</b>	Lab hands-on: total methylation assessment <b>Room 8.1.18 and Lab 8.2.33 (dbio)</b>	Soft-skills workshop: career routes and mental health* <b>Anf. Renato Araújo (Rectory)</b>	Soft-skills workshop: Diversity, Equity & Inclusion; Open Science * <b>Anf. Renato Araújo (Rectory)</b>	Hands-on: R session on Data analysis in genome-wide epigenetic experiments <b>Room 8.1.18 (dbio)</b>
	PM	Lunch	Lunch	Lunch	Lunch	Lunch
		Lab hands-on: DNA quality/quantity Assessment <b>Room 30B.3.28 (ESSUA)</b>	Hands-on: Experimental design for epigenetic studies <b>Room 8.1.18 (dbio)</b>	Soft-skills workshop: Scientific publishing; CV writing* <b>Anf. Renato Araújo (Rectory)</b>	Hands-on: R session on global methylation Bioinformatic pipelines to address genome-wide epigenetic data <b>Room 8.1.18 (dbio)</b>	Evaluation: Presentations of the breakout exercise and related group discussion <b>Room 8.1.18 (dbio)</b>
		Course dinner				

\* More info at <https://www.supralife.eu/secondschool/> - Soft Transferable Skills Training Program; dbio – Department of Biology; ESSUA – School of Health Sciences (see map at the end of this document).

## REGISTRATION AND CERTIFICATES

Registration deadline: **11 February 2024, 17:00 CET**

Maximum number of participants: 20

Notification of acceptance of registration will be made via email within five working days after the deadline. In case your registration has been accepted but for any reason you cannot attend the course, please inform us as soon as possible ([cesam-epiboost@ua.pt](mailto:cesam-epiboost@ua.pt)) so another participant can be recovered for replacement.

The course has no fees, but **registration is mandatory** and confirmation of acceptance is required for attending the course. Priority will be given to PhD students from the University of Aveiro and EPIBOOST researchers. Motivation to attend the course will be considered for selection, if necessary, assessed on the basis of the replies to the registration form; decisions by the Course coordinators in this regard are final.

Certificate of attendance will be provided to all participants; certificate of approval, including or not the final classification obtained following examination only for participants requesting it in the registration form.

**Ready to Register for the Course?** Please fill the form available in the following link:

<https://forms.ua.pt/index.php?r=survey/index&sid=184196&lang=en>

## REQUIREMENTS

Participants should bring their own laptop with R (<https://www.rstudio.com>) installed and basic knowledge of R is recommended.

## DETAILED COURSE PROGRAMME (GMT, Lisbon time is used)

### REMOTE • Thursday, February 29<sup>th</sup> 2024

09:00-09:30 – Welcome to participants, context of the course and presentations.

09:30-10:30 – Epigenetics: history, general theory and applications (UAVR).

10:30-11:00 – Coffee-break

11:00-12:30 – The main epigenetic mechanisms and their activity (CSIC).

### REMOTE • Friday, March 1<sup>st</sup> 2024

09:00-10:00 – Genomic biomarkers in environmental assessment (CSIC).

10:00-11:15 – Integration of epigenetics in environmental risk assessment (UGent).

11:15-11:30 – Coffee-break

11:30-12:45 – Adverse outcome pathways (UGent).

### REMOTE • Thursday, March 7<sup>th</sup> 2024

09:00-09:30 – Global methylation assessment (UGent).

09:30-10:30 – Untargeted DNA methylation assessment (UGent).

10:30-10:45 – Coffee-break

10:45-11:45 – Targeted DNA methylation assessment (CSIC).

11:45-13:00 – Techniques and technologies regarding other epigenetic mechanisms (CSIC).

### REMOTE • Friday, March 8<sup>th</sup> 2024

09:00-10:00 – *Epigenetic studies with invertebrates* (Maja Šrut, University of Innsbruck, Austria)

10:00-11:00 – *TBD* (invited speaker, CSIC)

11:00-11:30 – Coffee-break

11:30-12:30 – *OMICS integration in Ecological Risk Assessment* (Bruno Campos, Unilever)

12:30-13:30 – *Effects of exposure on a fish model across generations* (E. Santos, U. Exeter)

13:30-14:30 – Lunch

14:30-15:30 – *Studying human methylomes with DNA microarrays* (Gabriela Moura, iBiMED-UA)

15:30-16:10 – *Transgenerational effects in copepods* (Lotte Janssens, U. Ghent)

16:10-17:10 – *Epigenomic edition* (Ramji Bhandari, University of Missouri, USA)

IN-PERSON • Monday, March 11<sup>th</sup> 2024

09:00-10:00 – Sample requirements and quality control in NGS works (UAVR).  
10:00-10:30 – Costs of quality control and sequencing (UAVR).  
10:30-11:00 – Coffee-break  
11:00-13:00 – Tour of the iBiMED sequencing facility | Ice-breaking exercise (UAVR).  
13:00-14:30 – Lunch  
14:30-16:00 – Lab Hands-on: DNA quality/quantity assessment (UAVR).  
16:30-16:30 – Coffee-break  
16:30-17:30 – Post-lab Hands-on: DNA quality/quantity assessment (UAVR).

IN-PERSON • Tuesday, March 12<sup>th</sup> 2024

09:00-10:00 – Lab hands-on: Total methylation assessment - planning (UAVR).  
10:00-10:30 – Coffee-break  
10:30-13:30 – Lab hands-on: Total methylation assessment - doing (UAVR).  
13:30-14:30 – Lunch  
14:30-16:00 – Hands-on: Experimental design for epigenetic studies (UAVR, UGent, CSIC).  
16:00-16:30 – Coffee-break  
16:30-18:00 – Hands-on: Experimental design for epigenetic studies (UAVR, UGent, CSIC).

IN-PERSON • Wednesday, March 13<sup>th</sup> 2024

09:00-10:30 – Soft Transferable skills workshop: career routes.  
10:30-11:00 – Coffee-break  
11:00-12:30 – Soft Transferable skills workshop: mental health and the imposter phenomenon.  
12:30-14:30 – Lunch  
14:30-16:00 – Soft Transferable skills workshop: Scientific publishing and Ethics.  
16:00-16:30 – Coffee-break  
16:30-18:30 – Soft Transferable skills workshop: CV writing for Academia vs. Industry.  
**20:00 – Course dinner**

IN-PERSON • Thursday, March 14<sup>th</sup> 2024

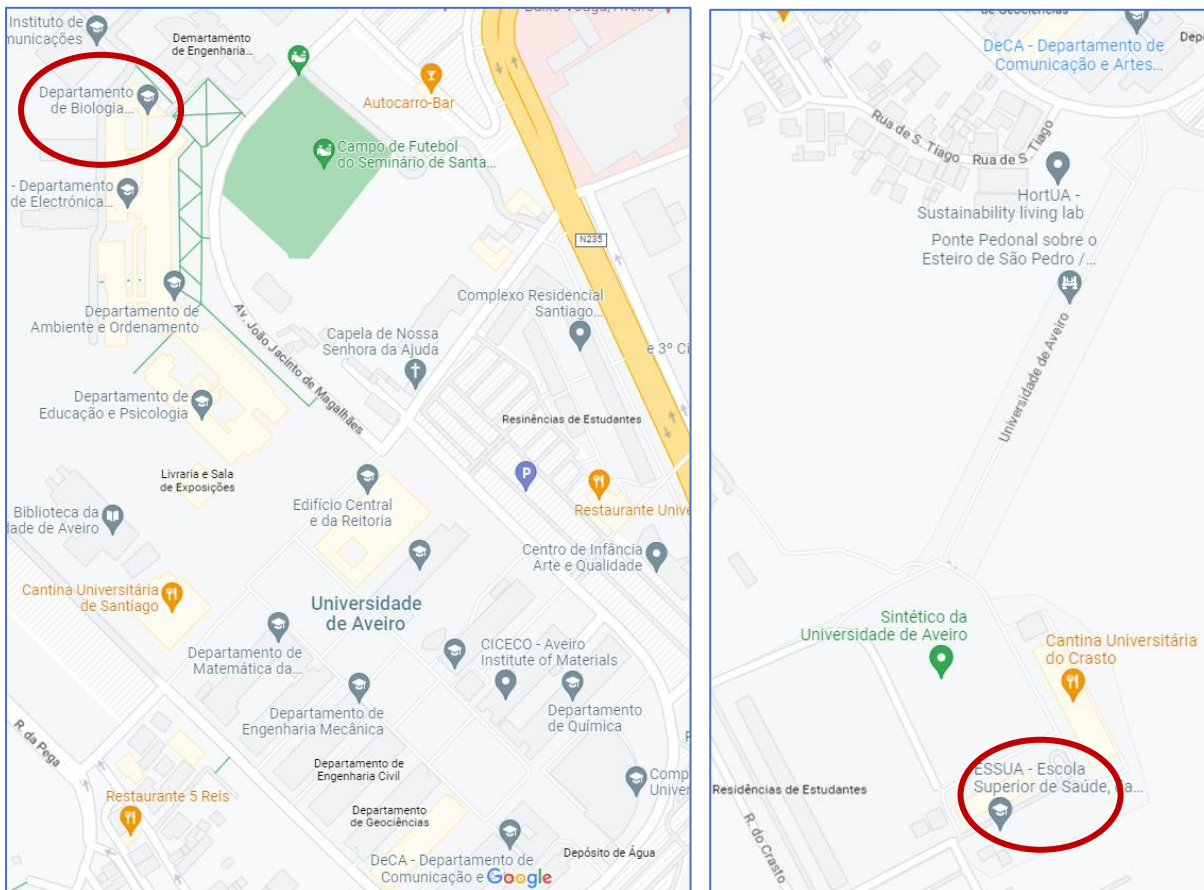
09:00-10:30 – Soft Transferable skills workshop: diversity, equity & inclusion.  
10:30-11:00 – Coffee-break  
11:00-12:30 – Soft Transferable skills workshop: Open Science.  
12:30-14:00 – Lunch  
14:00-15:30 – Use of R-Studio for basic data analysis in environmental epigenetics (CSIC).  
15:30-16:00 – Coffee-break  
16:00-18:00 – Bioinformatic pipelines to address genome-wide epigenetic data (CSIC).

IN-PERSON • Friday, March 15<sup>th</sup> 2024

09:00-10:30 – Hands-on: Data analysis in genome-wide epigenetic experiments in R (UGent).  
10:30-11:00 – Coffee-break  
11:00-13:00 – Hands-on: Data analysis in genome-wide epigenetic experiments in R (UGent).  
13:30-14:30 – Lunch  
14:30-16:30 – Group assignments presentation and discussion.  
16:30-17:00 – Coffee-break  
17:00-18:00 – Farewell and Evaluation.

## OTHER USEFUL INFORMATION

Light coffee-breaks are supported by the organization, but lunch is supported by participants. There are several possibilities for having lunch on the Campus, near the course rooms. Participants can also bring their own lunch and use the canteen of the Department of Biology to have their meal (fridge, microwave, water, and capsule-based coffee machine available). Light meals (soup, sandwiches, and snacks) can be acquired in the cafeteria of the Department of Biology (anticipated ordering is common and the best way of avoiding delays). Other cafeterias are available through the campus providing the same kind of supplies, and two campus canteens serve complete social or non-social hot meals, including to persons external to the University of Aveiro (for details and prices please check <https://www.ua.pt/en/alimentacao>). The course dinner is a complementary social activity; thus, it is not supported by the organization – pricing range and menu details are provided in the registration form.



dbio – Department of Biology (<https://goo.gl/maps/HTLU4cKZPUihFHjk7>)

ESSUA – School of Health Sciences (<https://goo.gl/maps/VcEjMBJrAWQr28Mz8>)

Detailed UAVR map at: <https://www.ua.pt/file/57160>

**CONTACT FOR FURTHER INFORMATION OR CLARIFICATION:** [cesam-epiboost@ua.pt](mailto:cesam-epiboost@ua.pt)

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Disclaimer: Views and opinions expressed in the Course are those of the authors only and do not necessarily reflect those of the European Union or the Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.



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