



Título de las prácticas/*Practice Title:*

Inference and modeling of metabolic interaction networks in the microbiome

Descripción de las funciones del alumno/*Description of student functions*

The student will join a transdisciplinary research group that investigates the evolutionary dynamics of microbial and viral populations by combining computational models and comparative (meta)genomics. The student will work with metagenomic data from the gut microbiome and other microbial communities, applying advanced bioinformatic methods to reconstruct the network of metabolism-based ecological interactions in the microbiome. Such networks will reflect competition for nutrients and facilitation via cross-feeding, and will be used to formulate realistic models describing the effect of gene gain and loss on the structure and stability of microbial communities. The student will also participate in group meetings and discussions aimed at developing her/his science communication skills in a multidisciplinary environment.

Requisitos: *(indicar titulación y curso); otros requisitos adicionales (idiomas, informática, otros conocimientos, etc)/ Required formation and skills of the student*

Computational Biology Master student with computer programming skills (Python, C++, Matlab, etc). Knowledge of basic bioinformatic tools for comparative (meta)genomics and/or mathematical modeling is desirable, although these skills can be acquired during the training period.

Proyecto formativo/*Student Formation Program*

Módulo PRACTICAS EXTERNAS. El objetivo fundamental de las Prácticas Externas es guiar al alumno para que aplique en el mundo real los conocimientos que ha adquirido previamente en un entorno de trabajo en grupo que reproduzca de una manera realista las condiciones que se puede encontrar en su futuro lugar de trabajo. El estudiante podrá familiarizarse con el mundo laboral (horarios, responsabilidad, actitud, organización, etc), y con la metodología de trabajo adecuada a la realidad profesional, contrastando y aplicando los conocimientos académicos adquiridos.

EXTERNAL PRACTICE module. The fundamental objective of the External Practices is to teach the student to apply in the real world the knowledge that he has previously acquired in a group work environment that reproduces in a realistic way the things that can be found in his future place of work. The student can become familiar with the working world (schedules, responsibility, attitude, organization, etc.), and with the work methodology appropriate to the professional reality, contrasting and applying the academic knowledge acquired.

Actividades a desarrollar en la práctica académica/*Activities to carry out during the academic practices*

The general goal of these academic practices is to provide the student with a comprehensive overview of scientific research in the context of a transdisciplinary study of the microbiome. The student will be involved in data collection and analysis, computational modeling based on the real



data, hypothesis testing, and dissemination of results. The student will perform the following specific tasks, with the support of the supervisor:

- 1) Reconstruction of genome-level metabolic networks for the most prevalent members of the human gut microbiome, starting from those available in the AGORA repository and curating them to reflect instances of gene gain and loss.
- 2) Inference of metabolism-based ecological networks by identifying sets of strains involved in cross-feeding and competition for nutrients.
- 3) Comparative study of the interaction networks that characterize different microbial communities, e.g. those associated to relapse and remission stages in Crohn's disease.
- 4) Realization of the "Trabajo de Fin de Master". Preparation of a manuscript for submission to an international research journal.

Besides the specific skills required to accomplish these goals (use of bioinformatics tools for gene function prediction, metabolic reconstruction, and flux balance analysis; formulation, simulation, and analysis of microbiome ecological models), the student will acquire transversal skills in oral communication, scientific writing, and critical thinking.

Nº de plazas:	1
¿El alumno tendrá trato habitual con menores?	No
Fecha de inicio:	1/2/2020
Fecha de fin:	1/7/2020
Horas semanales:	25
Horario jornada laboral:	A convenir
Importe Ayuda/Bolsa de estudio:	€/mes
Tutor académico:	Jesús Israel Pagán Muñoz
Email:	jesusisrael.pagan@upm.es
Departamento tutor académico:	Biología Vegetal – Biotecnología



POLITÉCNICA

AGRONÓMICA,



E.T.S. DE INGENIERÍA

ALIMENTARIA Y DE BIOSISTEMAS

Tutor empresa:	Jaime Iranzo Sanz
Email tutor empresa:	jaime.iranzo@upm.es
Departamento tutor empresa:	CBGP
Ubicación de la estancia de las practicas	Campus Montegancedo - UPM
ENTIDAD COLABORADORA:	UPM
A cumplimentar por Oficina Prácticas ETSIAAB: Créditos a reconocer (Nº ECTS):	

Enviar por email a: OFICINA DE PRÁCTICAS ACADÉMICAS EXTERNAS – ETSIAAB
secretaria.pei.etsiaab@upm.es – Secretarias: Visitación Pérez / Susana Pardo - Tfno: 913363686)