



**Título de las prácticas/Practice Title:**

Metabolic engineering for organic acid production at neutral pH from renewable sources

**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 and mathematical models and comparative (meta)genomics. One of the mayor problems in the production of organic acids through fermentation of waste products is the extreme acidification of the culture media. The student will use techniques based on stoichiometric analysis and mathematical modeling to find metabolic pathways that allow efficient organic acid production while keeping the pH under control. The project will explore the whole set of known biochemical reactions and propose candidate organisms for the expression of pathways of interest. Through this project, the student will acquire skills in Python programming and a deep understanding of metabolic modeling, which implies the use of linear programming and other forms of optimization commonly used in engineering as well as basic mathematical modeling through differential equations. 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 good computer programming skills (Python, C++, Matlab, etc). Familiarity with mathematical modeling is desirable, although these skill 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 goal of the External Practices is to introduce the student to a real-world, group-oriented work environment where she will apply the knowledge and skills acquired during the Master's Program. The student will become familiar with the dynamics of a workplace (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 specific problem of scientific and technological interest and the basic tools to solve it so she/he can learn the process of scientific research in a project-oriented manner. The student will be involved in data collection and analysis, hypothesis testing, and dissemination of results. The student will perform the following specific tasks, with the support of the supervisor:

- 1) Finding biochemical reactions that imply a net increase in the pKa of the products with respect to the substrates.
- 2) Designing an algorithm to identify organic acid production pathways that include reactions identified in 1) so that the net pH alteration of the culture media is as neutral as possible.
- 3) Determine the feasibility of the selected pathways in terms of theoretical estimations of the yield of organic acid produced and organisms that could harbor these pathways.
- 4) Propose a set of candidate organisms and genetic modifications for experimental validation of the results.
- 5) Write and present the “Trabajo de Fin de Master”.

Besides the specific skills required to accomplish these goals, the student will acquire transversal skills in oral communication, scientific writing, and critical thinking.

<b>Nº de plazas:</b>	<b>1</b>
<b>¿El alumno tendrá trato habitual con menores?</b>	<b>No</b>
<b>Fecha de inicio:</b>	<b>1/2/2023</b>
<b>Fecha de fin:</b>	<b>1/7/2023</b>
<b>Horas semanales:</b>	<b>25</b>
<b>Horario jornada laboral:</b>	<b>A convenir</b>
<b>Importe Ayuda/Bolsa de estudio:</b>	<b>€/mes</b>
<b>Tutor académico:</b>	<b>Jesús Israel Pagán Muñoz</b>
<b>Email:</b>	<b>jesusisrael.pagan@upm.es</b>



**POLITÉCNICA**

AGRONÓMICA,



E.T.S. DE INGENIERÍA

ALIMENTARIA Y DE BIOSISTEMAS

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

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