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RESEARCH

- **Title:** Development and characterization of 3D biopolymeric membranes functionalized with graphene-based nanomaterials and their integration in perfusion bioreactors for *in vitro* neural models

- **Description:**

  My research line is focused on searching new polymeric composite membranes based on graphene nanomaterials in hollow fiber configuration (3D) that could act as scaffolds in cell cultures allowing cellular growth, proliferation and differentiation for the *ex vivo* regeneration of an organ and/or tissue. These biodegradable and biocompatible polymeric membranes, by applying engineering concepts, should incorporate adequate physicochemical, mechanical, electrical and transport properties in order to improve cell proliferation and to modulate the differentiation towards specific cells. The assembly of these membranes into a perfusion bioreactor system would facilitate the nutrients supply to the cells and metabolites removal while simultaneously incorporate mechanical stimuli.

  The objective pursued is to evaluate the potential of the membranes developed as supports for 3D cell cultures to achieve regeneration of functional tissue from the central nervous system (CNS) to be used as neural model for research and drug screening tests. These 3D neuronal models are suggested as a more reliable alternative for reproducing *in vitro* more complex neural systems where synaptic functionality and neuron-glia and/or neuron-muscle fiber interactions could be modulated for understanding and studying different pathologies.

- **Publications:**

  Marian Mantecon-Oria, Nazely Diban, Maria Teresa Berciano, Maria J. Rivero, Oana David, Miguel Lafarga, Olga Tapia, Ane Urtiaga. *Novel hollow fiber membranes of PCL and PCL/graphene as scaffolds with potential to develop in vitro blood-brain barrier models.* Submitted: March 2020. Journal of Membrane Science.

- **Congress contributions:**

  María de los Ángeles Mantecón Oria, Nazely Diban, Sandra Sánchez González, Ane Urtiaga. *Design and tune up of a perfusion bioreactor with membranes as scaffolds for tissue engineering: experimental assessment and modelling*. ANQUE-ICCE 3: Student Conference, (17-18 Junio 2019), Santander (España). Póster.

María de los Ángeles Mantecón Oria, Belén García Merino. *Design of feedback controllers using simulation tools*. 10º Congreso Mundial de Ingeniería Química (WCCE10), (29-3 Octubre 2017), Barcelona (España). Póster.

- **R&D Projects:**

  Title: **X-MEM (EIG Concert Japan/PCI2018): Hacia una funcionalidad superior: materiales porosos de matriz mixta/compuestos en procesos de membranas**
  Participant entities: MINECO/EIG-Concert Japan
  Duration, since 01/04/2019 to 31/03/2022
  Main researcher: Nazely Diban
  Number of participants: 6