

**Master 2 internship project
Year 2025-2026**

Laboratory/Institute: TIMC
Team: PRETA

Director: Pr. Alexandre Moreau-Gaudry
Head of the team: Dr Julie Fontecave-Jallon

Name and status of the scientist in charge of the project: Dr Jean-Pierre Alcaraz

HDR: yes ☐ no ☒

Address: Laboratoire "Recherche Translationnelle et Innovation en Médecine et Complexité" (TIMC)

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Program of the Master's degree in Biology:

- ☐ Microbiology, Infectious Diseases and Immunology ☐ Biochemistry and structure
☒ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

Title of the project: effect of dihydrogen in topical treatment of psoriasis.

Objectives (up to 3 lines):

The objective of the internship is to develop an innovative medical device for the topical delivery of dihydrogen and to test the efficacy and safety of this device on *in vitro* skin model, and then *in vivo* in preclinical trials, as part of the ANR-funded HydroPso (Hydrogen for Psoriasis treatment) project 2025-2029.

Abstract (up to 10 lines):

Dihydrogen is used as a therapeutic molecule with no adverse effect. Its **antioxidant and anti-inflammatory properties** make it promising for the treatment of many diseases, such as cardiovascular disease and cancer. In 2020, TIMC lab has conducted 2 clinical trials to test H₂ inhalation and H₂-rich water (HRW) ingestion to treat COVID-19. Recently, we have developed methods to measure H₂, and studied its effect in preclinical studies. H₂ efficacy has been also proven against serious skin disorders such as **psoriasis**. H₂ was administrated by inhalation, ingestion or bath of HRW. We have patented new **H₂ generating and administering medical devices** (H₂-GAMED) to topically deliver H₂ to patient's skin. This project, called HydroPso, has been recently funded by the ANR.

Methods (up to 3 lines):

Galenic preparations and skin dressing development, *In vitro* skin culture and animal experimentation (rodents). *In vitro* and *ex vivo* analyses such as imaging techniques, histology, inflammation marker tests, toxicity tests, RT-qPCR.

Up to 3 relevant publications of the team:

- Salomez-Ihl, C., Tanguy, S., Boucher, F., Pascal Moussellard, V., Bedouch, P., Stephanou, A., Alcaraz, J. P & Cinquin, P. (2024). **Development of a preclinical tool for measuring percutaneous transfer of dihydrogen, with a view to optimizing medical devices adapted to focal therapies in dermatology**. In Molecular Hydrogen in Health and Disease (pp. 401-416). Cham: Springer Nature Switzerland.
- Salomez-Ihl, C., Tanguy, S., Alcaraz, J. P., Davin, C., Pascal-Moussellard, V., Jabeur, M., ... & Boucher, F. (2024). **Hydrogen inhalation: in vivo rat genotoxicity tests**. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis*, 894, 503736.
- Pascal-Moussellard, V., Alcaraz, J. P., Tanguy, S., Salomez-Ihl, C., Cinquin, P., Boucher, F., & Boucher, E. (2025). **Molecular hydrogen as a potential mediator of the antitumor effect of inulin consumption**. *Scientific Reports*, 15(1), 11482

Requested domains of expertise (up to 5 keywords):

- cellular biology, molecular biology, animal experimentation, physiology