Curriculum vitae

Name : Damien Sorigué,
Maried, 2 children
Language : French (native speaker) ; English
Date and Place of Birth : 14/11/1989, Toulon (France)
Orcid : 0000-0003-1149-0757
Email : damien.sorigue@cea.fr

RESEARCH EXPERIENCE and EDUCATION

23/07/2022 – Present : **Junior Researcher** – Sabbatical via **Marie Skłodowska-Curie Global postdoctoral fellowship** in collaboration between Hyster Lab Cornell University, NY, USA and BIAM Institute, CEA, France

01/10/2019 – Present: **Junior Researcher** position at the Bioenergies and Microalgae team, at BIAM institute, CEA Cadarache, France

03/01/2017 – 30/09/2019: **Postdoc position** (BIAM, CEA Cadarache) – "Mechanism and biotechnological applications of Fatty Acid Photodecarboxylase (FAP)".

04/10/2013 – 04/11/2016: **PhD thesis** (BIAM, CEA Cadarache) – "Biosynthesis of hydrocarbons derived from fatty acids in microalgae", Aix-Marseille University, France, Supervisor: Dr. Fred Beisson

06/01/2013 – 30/06/2013: 2nd year **MSc internship** (BIAM, CEA Cadarache) - Study of the production of alkanes and alkenes by the green microalgae *Chlamydomonas reinhardtii.* Aix-Marseille University, France

02/04/2012 – 01/06/2012: 1st year **MSc internship** (Mediterranean Institute of Oceanology, Marseille) - Isolation of methane-producing microorganisms from hot springs. Aix-Marseille University, France

BSc in Cell Biology, 07/09/2009–01/07/2011 - UNIVERSITY OF AIX-MARSEILLE, France

PUBLICATIONS

D. Sorigué, B. Légeret, S. Cuiné, P. Morales, B. Mirabella, G. Guédeney, Y. Li-Beisson, R. Jetter, G. Peltier, F. Beisson (2016): Microalgae Synthesize Hydrocarbons from Long-Chain Fatty Acids via a Light-Dependent Pathway. **Plant Physiology** 171:2393-405.
This study provided the first evidence that various microalgae were able to produce fatty acid-derived hydrocarbons in a light-dependent manner.

D. Sorigué, B. Légeret, S. Cuiné, S. Blangy, S. Moulin, E. Billon, P. Richaud, S. Brugière, Y. Couté, D. Nurizzo, P. Müller, K. Brettel, D. Pignol, P. Arnoux, Y. Li-Beisson, G. Peltier, F. Beisson (2017) An algal photoenzyme converts fatty acids to hydrocarbons. **Science** 357:903-907

This work reports the discovery of the microalgal alkane-forming enzyme, which catalyzes the conversion of fatty acids into hydrocarbons using blue light. This enzyme termed Fatty Acid Photodecarboxylase (FAP) is the first photoenzyme identified in lipid metabolism.

S. L. Y. Moulin, B. Légeret, S. Blangy, **D. Sorigué**, A Burlacot, P. Auroy, Y. Li-Beisson, G. Peltier, F. Beisson. (2019) Continuous photoproduction of hydrocarbon drop-in fuel by microbial cell factories. **Scientific reports** 9, 13713.
This study is a proof of concept showing the possibility of a FAP-based production of hydrocarbons, which can be recovered in a very pure form directly from the gas phase of bacterial cultures.

D. Sorigué, K. Hadjidemetriou, S. Blangy, G. Gotthard, A. Bonvalet, N. Coquelle, P. Samire, A. Aleksandrov, L. Antonucci, A. Benachir, S. Boutet, M. Byrdin, M. Cammarata, S. Carbajo, S. Cuiné, R. B. Doak, L. Foucar, A. Gorel, M. Grünbein, E. Hartmann, R. Hienerwadel, M. Hilpert, M. Kloos, T. J. Lane, B. Légeret, P. Legrand, Y. Li-Beisson, S. L. Y. Moulin, D. Nurizzo, G. Peltier, G. Schirò, R. L. Shoeman, M. Sliwa, X. Solinas, B. Zhuang**,** T. R. M. Barends, J.-P. Colletier, M. Joffre, A. Royant, C. Berthomieu, M. Weik, T. Domratcheva, K. Brettel, M. H. Vos, I. Schlichting, P. Arnoux, P. Müller, F. Beisson. (2021) Mechanism and dynamics of fatty acid photodecarboxylase**.** **Science** 372, eabd568S
This work is a multidisciplinary detailed study of fatty acid photodecarboxylase reaction mechanism. It has yielded some unexpected findings such as the involvement of an arginine as a proton donor and the identification of bicarbonate as an intermediate co-product.

S.L. Y. Moulin, A. Beyly, S. Blangy, B. Légeret, M. Floriani, A. Burlacot, **D. Sorigué**, Y. Li-Beisson, G. Peltier, F. Beisson. (2021) Fatty acid photodecarboxylase is an ancient photoenzyme responsible for hydrocarbon formation in the thylakoid membranes of algae. ***Plant*** **Physiology**, kiab168.
This study shows that in Chlamydomonas the alkenes produced by FAP are mostly found in the thylakoids, and also shows that functional FAP homologs are present in a large array of microalgae species.

C. Aselmeyer, B. Légeret, A. Bénarouche, **D. Sorigué**, G. Parsiegla, F. Beisson, F. Carrière (2021) Fatty Acid Photodecarboxylase is an Interfacial Enzyme. **Biochemistry** 26;60(42):3200-3212
This article shows that FAP prefers to act on fatty acids organized at lipid-water interfaces and identifies a potential interfacial recognition site.

PATENT

D. Sorigué, B. Légeret, S. Cuiné, S. Blangy, G. Peltier, F. Beisson (2016) New fatty acid decarboxylase and its uses. *European Patent Application 16305583*

GRANTS AWARDED:

Marie Sklodowska-Curie Actions (MSCA) Global Fellowship (2022-2025) Cornell University in collaboration with Pr Todd Hyster.

Aix-Marseille University "Nouveaux Entrants" 2019 grant (10 000 euros)

Participation in other grants:
National grants: ANR SNAPsHOTS (AAPG 2018), **ANR Photoalkanes** (AAPG 2018)

Local grant: Region Sud funding for Equipment (GC-thermodesorber, project Biopetroleum 2017);

CEA internal grants: DRF impulsion Invention, projects Blue-Pulse (2018) and Alcasun (2017)

ORAL PRESENTATIONS and POSTERS

D. Sorigué, Fatty acid photodecarboxylase - a photoenzyme involved in lipid metabolism in algae. **International symposium on Plant Lipids (ISPL),** 10/07/2021 – 15/07/2021, Grenoble France (talk) **Invited speaker Paul K stumpf award Lecture**

D. Sorigué, Mechanism and dynamics of fatty acid photodecarboxylase. **Annual congress of the french society of biochemistry and molecular biology (SFBBM),** 04/07/2022 – 05/07/2022, Paris France (talk) **Invited speaker**

D. Sorigué, Mechanism and dynamics of fatty acid photodecarboxylase. **Journées de la société française de photosynthase (SFphi),** 09/06/2021 – 10/06/2021, Paris France (talk) **Invited speaker**

D. Sorigué, Mechanism and dynamics of fatty acid photodecarboxylase. **Annual congress of the french society of biochemistry and molecular biology (SFBBM),** 01/07/2021 – 02/07/2021, Paris France (talk)

D. Sorigué, Hydrocarbon production in microalgae. **Journées Chevreul of the French Society for the Study of Lipids**, 08/12/2020-09/12/2020 *(invited speaker)*

D. Sorigué, Structure function studies of a fatty acid photodecarboxylase. **14th international meeting of the French Lipidomics Group (GERLI),** 30/09/2017 – 03/10/2017, St Maximin France *(selected talk)*

D. Sorigué, A Microalgal photoenzyme converts fatty acids to hydrocarbons **GDR Solar Fuel, Journée nationale des Carburants Solaires**, 29/05/2017– 01/06/2017, Autrans France *(Poster and talk)*.

D. Sorigué, Microalgae synthesize hydrocarbons from long-chain fatty acids via a light dependent pathway. 22nd **International Symposium on Plant Lipids**, 08/07/2016 – 13/07/2016, Göttingen Germany *(poster selected for short oral presentation)*. ***Poster Prize***

D. Sorigué, G. Guedeney, F. Beisson. Synthesis of linear hydrocarbons in microalgae, **7th European Symposium on Plant Lipids**, 05/07/2015 – 08/07/2015, Harpenden United Kingdom *(poster)*

HONORS AND AWARDS:

Paul K Stumpf Award 2022 (International Symposium on Plant Lipid): Fatty acid photodecarboxylase - a photoenzyme involved in lipid metabolism in algae

French Society of Biochemistry and Molecular Biology (SFBBM). Prize "Article of the month, June 2021" for Sorigué *et al.* 2021 Science, Mechanism and dynamic of Fatty acid Photodecarboxylase.

CEA Invention Contest "3 minutes for an Invention **".** First prize from the public with the movie "Put an alga in your engine: Direct conversion of fatty acids into hydrocarbons using a photoenzyme".

French Society of Biochemistry and Molecular Biology (SFBBM). Prize "Article of the Year 2018" for Sorigué *et al.* 2017 Science, An algal photoenzyme converts fatty acids to hydrocarbons.

22nd International Symposium on Plant Lipids. Best Poster Award for the poster Sorigué et al. "Microalgae synthesize hydrocarbons from long-chain fatty acids via a light-dependent pathway".

SUPERVISOR EXPERIENCE

Oct 2020 – Present: Co-supervision with Dr. F. Beisson of a **PhD student** (A. Baca Porcel): Photoproduction of hydrocarbons in cyanobacteria.

Oct 2018 – Present: Co-supervision with Dr. F. Beisson of a **PhD student** (P. Samire): Biodiversity and substrate specificity of fatty acid photodecarboxylases.

Sep 2018 – May 2020: Supervision of **a Technician** (V. Epting): Development of a high-throughput screening based on a fluorescent alkane biosensor.

Apr 2020 – Sep 2020: Supervision of a **MSc student** (M. Landreau, MSc Internship, Ecole Centrale Marseille): Cyanobacteria/bacteria co-culture for the production of bio-based hydrocarbons.

PUBLIC OUTREACH ACTIONS:

Science Festival 2021, Saint Paul les Durance, France

Science Festival 2015, Forcalquier France

YouTube video: Put an algae in your engine https://www.youtube.com/watch?v=otDKGfFbcCI

YouTube video: At the hearth of a photoenzyme, Mechanism of Fatty acid photodecarboxylase https://www.youtube.com/watch?v=pzFyAJLlDDU