Press Release
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CENTRALESUPÉLEC PRESENTS THE IMPROVE PROJECT

This new major European project will develop alternative proteins from different non-traditional sources, with viability demonstrated by scientific, technical, environmental, economic and societal perspectives.

Funded by the European Union

The IMPROVE project, “Impact of Alternative Protein Sources to Improve Nutrition”, is a European research and innovation programme focusing on develop viable alternative proteins. Coordinated by CentraleSupélec (Université Paris-Saclay) which is committed in its strategic roadmap to contributing to advances in European research on ecological and environmental transition issues, the project is coordinated by Prof. Pedro E. D. Augusto, vice director of the Chaire de Biotechnologie of CentraleSupélec. Its objective is to develop novel protein foods derived from unconventional sources, offering alternatives to traditional animal protein, evaluating their impact for humans, nature and economy.

To achieve this, the project will evaluate the physic-chemical, techno-functional, nutritional, health, safety, and quality aspects of the obtained products, also considering their environmental and socio-economic impacts. It will focus on agri-food and fisheries by-products, as well as natural protein producers like fungi, bacteria, insects, micro- and macroalgae, upcycling secondary by-products for materials or energy generation. Feasibility studies will simulate industrial-scale production using various analytical tools, including Life Cycle Assessments, Lyfe Cycle Costing and AI-driven monitoring.

Assembling 18 partners from 13 EU countries, IMPROVE is receiving 5.3 M€ in funding from the European Commission for 36 months, as part of the Horizon Europe programme (Grant no. 101182324).
Project description in CORDIS - EU research results: *https://doi.org/10.3030/101182324*

New sources of proteins for Europe

Proteins make part of every living organism on Earth, being important molecules for a variety of metabolic activities. Consequently, they are essential nutrients, being part of a healthy diet. Proteins can be obtained from different sources for human nutrition, but in special from animal (meat, fish, dairy, eggs) and vegetable (soybean, pea, lentil, chickpea, etc) products.

There is a rising demand for new sources of proteins for food applications, in special those to substitute animal ones, due to environmental, health and societal changes concerns. This trend is especially true

in Europe, being aligned with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environment-friendly food system, and the EU's climate ambition for 2030 and 2050.

However, novel protein foods, derived from unconventional sources, must be fully evaluated in relation to their impact for humans, nature and economy – which has not yet been fully assessed.

IMPROVE project will focus on evaluating the global impact of alternative protein sources through a comprehensive, data-driven approach. This project aims to address key sustainability challenges such as:

- Reducing polluting emissions
- Lowering water consumption
- Improving waste disposal practices
- Enhancing renewable energy use

By integrating these factors, IMPROVE will provide a holistic vision of the protein landscape, tackling current limitations and offering strategic solutions for the food industry's ongoing shift, providing reliable benchmarks to guide both stakeholders and consumers toward a sustainable food future.

Obtaining new sources of proteins

The IMPROVE project will focus on two groups of proteins: those obtained from agri-food and fisheries by-products, ant those produced by fungi, bacteria, insects, micro- and macroalgae.

The first step is to obtain the proteins from the described sources. To achieve it, different physic-chemical, biochemical and biotransformation processes will be developed by the consortium. Micro and macro-organisms will growth using the by-products as substrate, converting them into protein-rich fractions. Different techniques will be used to modify the biomasses and organisms, extracting and purifying the proteins.

The protein-rich fractions will be fully characterized, providing a cartography of possible applications. Moreover, they will be modified using enzymes to enhance their functionality. Techno-functional, sensorial and nutritional properties will be improved through this approach, and protein-rich supplements will be produced through microencapsulation.

The novel foods nutritional properties will be evaluated using benchmark *in vitro* digestion protocols, and the protein accessibility will be compared to traditional sources considering the human needs.

Moreover, the obtained proteins will be evaluated as alternative for feed fishes in experiments conducted in the Mediterranean Sea. Growth performance and fish quality will be tracked, with the objective of reducing the environmental impact of fishery industry.

Those approaches will provide new sources of high-quality proteins for humans, at the same time promoting the valorisation of by-products and the circular economy, and reducing the environmental impact associated to human foods.

Ensuring the products viability

Once the new high-quality protein foods are obtained, further evaluation is needed to ensure their viability from different perspectives: safety, environment, economy, consumer and society perception. Different strategies will be used to ensure the project deliver viable products.

The concept of digital twin will be applied to simulate the industrial production of the obtained protein foods, demonstrating the industrial viability by different stakeholders.

The social impact and consumer perception will be not only assessed but also developed through different training and interaction with the society. The acceptance, motivation and overall behaviour concerning different protein sources will be studied with focus on different target groups. Sections of education and training will be performed aiming at empowering consumers to improve their healthy eating choices. Urban living labs, surveys, interviews, lectures, workshops, press releases, informative leaflets and a complete website will be approaches to strengthen ties with society.

Finaly, a technical-economic analysis (TEA) and potential markets will be evaluated, considering aspects such as energy, environmental and cost performance of industrial processes. To achieve it, different tools will be applied, such as Life Cycle Analysis (LCA), Lyfe Cycle Costing (LCC), environmental, health, and safety Risk Assessment (RA), Decision Support System (DSS), and a connection with the European dietary guidelines and regulatory frameworks.
At the end of IMPROVE project, new viable source of proteins will be available for food nutrition.

An international and multidisciplinary research and innovation programme

Launched in January 2025, IMPROVE is an international research and innovation programme coordinated by CentraleSupélec (Université Paris-Saclay), which aims to develop new viable alternative proteins to improve human nutrition. It is made up of a consortium of 18 partners from 13 EU countries, involving academia, public and private institutes of research and development, enterprises, non-governmental organizations and public-private consortiums.

IMPROVE is funded by the European Commission as part of the Horizon Europe call for projects (Grant Agreement no. 101182324) – in the topic HORIZON-CL6-2024-FARM2FORK-01-7 - Impact of the development of novel foods based on alternative sources of proteins. With an EU contribution of 5.3 M€ for 36 months, the list of partners in the consortium is: CentraleSupélec (France), Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (Italy), University of Hohenheim (Germany), VenusRoses Labsolutions Ltd. (Bulgaria), University of West Attica (Greece), National Technical University of Athens (Greece), University of Minho (Portugal), Technical University of Denmark (Denmark), Fundaciòn CARTIF (Spain), GOLEM Integrated Microelectronics Solutions GmbH (Austria), AquaBioTech Group (Malta), Nordic Diaspora Forum (Sweden), Cyprus Consumers' Association (Cyprus), GRANT Garant, s.r.o. (Czechia), Consiglio Nazionale delle Ricerche (Italy), Agriclima (Sweden), IDENER Research & Development AIE (Spain), Consorzio per l'innovazione e la Bioeconomia (Italy).

About CentraleSupélec - www.centralesupelec.fr

CentraleSupélec is one of the most famous French public scientific, cultural and professional school of engineering, created in January 2015 from the merger of École Centrale Paris and Supélec. Today, CentraleSupélec is based on 4 campi in France (Paris-Saclay, Metz, Rennes and Reims). It has over 5,400 students, including 3,800 engineering students, and 18 laboratories or research teams. Highly internationalized (about 25% of its students and teaching staff are international), CentraleSupélec has forged over 170 partnerships with the world's leading institutions. As a leading school in higher education and research, CentraleSupélec is a benchmark in engineering and systems sciences. It co-founded the Université Paris-Saclay in 2020 and presides over the Groupe des Écoles Centrale (CentraleSupélec, Centrale Lyon, Centrale Lille, Centrale Nantes and Centrale Méditerranée), which operates international sites in Beijing (China), Hyderabad (India) and Casablanca (Morocco).

About the Chaire de biotechnologie of CentraleSupélec

The Chaire de Biotechnologie of CentraleSupélec, launched in 2010 and located in the Centre Européen de Biotechnologie et de Bioéconomie (CEBB), has three areas of expertise: Bio-based materials, Biotransformation, Processing Engineering and Downstream processing.
Backed by the Process Engineering and Materials Laboratory (LGPM), this chair is a strong link between its head institution – CentraleSupélec – and economic and academic actors; most of the R&D activities are led in regional, national and international collaborative projects. With its training of high-level generalist engineers, CentraleSupélec has a strong expertise in modeling applied to (bio)process and (bio)materials. Thus, in addition to the experimental approach, the three areas of expertise of the Chair significantly rely on a set of core skills in

Modeling, Simulation & Visualization, more particularly oriented towards the modeling of life mechanisms and the up-scaling of processes for the industry.
The Chair of Biotechnology of CentraleSupélec, renewed in 2020, is co-financed by the Département de la Marne (7 M€), Greater Reims (1 M€), the Région Grand Est and the European Union with the European Regional Development Fund (FEDER Champagne Ardenne 2014-2020 (3.65 M€), and FEDER Grand Est 2021-2027 - 3,65 M€)

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