GROUPE ITERG

Integrated Annual Report 2022

Committed to a healthier, more eco-friendly world

ITERG IMPROVE

Vegetable oils and proteins: a vast field of possibilities

COMMITED

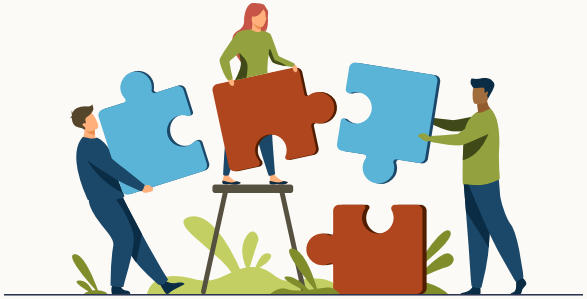
to the power of innovation in biosourcing and industrial transfer

to the nutritional and ecological transitions

to factories of the future

For a more competitive industry from upstream to downstream

Contents



Editorial

A rapidly evolving environment

> **Vegetable oils and proteins are vital parts of the solution to the challenges before us.**

As we already shared last year, the world is evolving rapidly and it seems clear that the current crises are not one-off events, and will continue to happen. The demographic explosion will heighten tensions for access to primary resources: food, water, energy... As global warming continues, decarbonization is a major challenge for the entire planet.
In this uncertain world where multilateralism is giving way to a system of blocs, innovation will more than ever be a source of progress and the solution to many problems.

The ITERG group, by combining ITERG's historical activities with those of its subsidiary IMPROVE, is particularly well positioned to play a role and provide expertise. Vegetable oils and proteins are vital parts of the solution to the challenges before us.

An organization adapted to our partners' expectations

The ITERG Group, thanks to its 135 collaborators, offers varied and complementary expertise in the areas of nutritional and environmental processes, analyses, and studies. Obtaining Qualiopi certification in 2022 has strengthened our role as a training center in our areas of expertise.

ITERG's status as an Industrial Technical Center (CTI) is part of its DNA It's time to redeploy our statutory goals according to the needs of our citizens, the evolution of public and collective funding, and closer collaboration with Interprofession Terres Univia and their Terres Inovia Technical Center.

An ambitious partnership structure

> **Its goal is to play an increasingly vital role in the nutritional, energy, and environmental transitions.**

In 2022, the Alliance that brings together the ITERG Group's activities and those of PIVERT SAS was developed. Its goal is to play an increasingly vital role in the nutritional, energy, and environmental transitions. This team of 180 collaborators allows ITERG Group to expand its offers to the areas of green chemistry and biotechnologies. The feedback from our clients and partners has been very positive. They all applaud our efforts to limit the partitioning and scattering of research structures. This makes it easier to grasp what skills are available and simplifies life for our French, and especially our foreign, clients.

The joint creation of LabCom by Terres Inovia and ITERG in 2021 is beginning to show results. The teams collaborate and new technologies are being assessed to improve crushing and cold-pressing processes. Integration of the proteins dimension thanks to the expertise brought in by IMPROVE is very valuable.

2022, a year of transitions

2022 was a complex year for ITERG. Issues with recruitment have hindered productivity in our workshops. The analytical services offering is evolving and needs to adapt to respond more effectively to changing market expectations. The balance between subsidized projects and contractual activity is affected by declining public funding. We need to boost our ability to provide services. With support from BPI, a commercial development training course was conducted in 2022.

Actions are in progress and will be deployed in 2023 thanks in large part to the arrival of a new business developer who will expand our business into exports. We've set ambitious goals for 2023 that will allow ITERG to continue its modernization efforts, in particular with the development of its technology park.

Vision - Mission

> **"The ITERG Group is constantly growing by incorporating new talents and new services."**

The vision we demonstrate for the ITERG Group is an ability to offer innovative and efficient solutions that develop biomass and agricultural resources to help the actors in our sector prevail in the three revolutions: energy, environment, and nutrition!
The ITERG Group is constantly growing by incorporating new talents and new services.

The Alliance recently formed with SAS PIVERT allows us to accompany our French and foreign industrial clients better.
We help them to develop natural resources and products with a high added-value, while at the same time limiting the environmental impact and reducing dependence on fossil fuels.

Ensuring our collaborators' development, serving our clients by developing customized solutions, creating shared value, and reducing the time to market are fundamental missions that we hold dear and that are bolstered by the commitment of all our partners.

> **"We're proud to contribute to creating the more sustainable world our societies want and expect!"**

Yves DELAINE
ITERG Chairperson
SAS IMPROVE Chairperson

Denis CHÉREAU
ITERG CEO
SAS IMPROVE CEO

With one voice

3 questions for Danièle KARLESKIND and Jean-David LEAO

How has the alliance between IMPROVE and ITERG improved your ability to offer new products and services to your clients?

The ITERG/IMPROVE alliance created a strike force of over 130 people and allowed us to consolidate this expertise and create a unique service offering in the area of oilseeds and alternative proteins.

Yes, that's especially true in the area of processes where our platforms give us the chance to create and optimize valuation models at the scale of a few kilos or a few tons all along the entire value chain: seeds, oil cakes, raw and refined oils, flours, concentrates, as well as protein isolates and lipochemistry derivatives.

Danièle KARLESKIND
Deputy CEO
SAS IMPROVE

What synergies were created?

This collaboration allows us to create synergies that cut across both sectors, analytical characterization, assessment of techno-functional properties, the development of value propositions related to nutrition and health, eco-design, and environmental labelling.

Beyond the technical advantages, a number of other synergies are starting to be deployed in the areas of human resources, communication, IT management, and business activities. These synergies appear in the form of pooled resources, collaboration on projects, or the implementation of cross-functional processes.

Jean-David LEAO
ITERG Deputy CEO

How did the Group strengthen your market position?

Communication through the group has given us increased visibility and made us more attractive to traditional clients and able to reach new markets, especially for export.

The global, integrated offering we provide makes us essential in the development of cost-effective and sustainable bioprocesses, the recovery of co-products, and the use of alternative oils and proteins.

01

Presentation of the ITERG Group

A key innovator

Since December 2020, the ITERG Group has combined the ITERG Industrial Technical Center and its subsidiary SAS IMPROVE.

A key innovator in the areas of vegetable oils and alternative proteins, the ITERG Group is playing an active role in the transition toward healthier, more sustainable, and more environmentally-friendly models while at the same time making companies in the sector more competitive.
We cover the entire value chain up to the formulated product with an eye to functional, organoleptic, nutritional, and environmental excellence in all the markets that process or use plant-based proteins and/or vegetable oils.

ITERG Group offers research, analysis, production, audit-consulting, and training services. We have numerous fields of expertise that allow us to combine talents to take on creative, multidisciplinary projects to effectively solve complex problems and develop innovative solutions.

Sharing experience and perspectives between the Group's teams and its industrial and academic partners enhances skillsets, addresses specific ecosystems, and generates results that are in line with society's expectations.

Board of Directors
2022 - 2025 on 11.30.2022

Government commissioners

Mr. **Romain BONENFANT**, Head of the Industry Department, Ministry of the Economy and Finance - GENERAL DIRECTORATE OF COMPANIES
Mr. **Thomas PILLOT** Ministry of the Economy and Finance -GENERAL DIRECTORATE OF COMPANIES
Mr. **Olivier STEMLER**, Head of the Chemistry, Materials and Biotechnologies Office - GENERAL DIRECTORATE OF COMPANIES
Mr. **Gary NORDEN**, Ministry of the Economy and Finance – GENERAL DIRECTORATE OF COMPANIES
Ms. **Maud IACOMELLI**, Ministry of Agriculture and Food – DGPE/SDFE/SDFA/BGC

General economic and financial auditor

Mr. **Lionel PAILLON**, Ministry of the Economy, Finance, and Industrial and Digital Sovereignty - GENERAL ECONOMIC AND FINANCIAL INSPECTORATE

Company director representatives

Mr. **Jean-Christophe SIBILEAU**, CEO of SAINT-HUBERT
* Mr. **Yves DELAINE**, Chairperson of FNCG
Mr. **Olivier NASLES**, Treasurer of FRANCE OLIVE
Ms. **Hacina MOSA**, Head of QSE, Grandes Huileries du Midi, PROVENCE HUILES
Ms. **Marie SAGLIO,** CEO, LESIEUR
Mr. **Hervé LIMOUZIN**, BU Director at ADM SIO

Representatives of higher or technical education or qualified persons, either in the oils and fats industry or as users:

* MR. **Paul-Joël DERIAN**, Director of Innovation & Sustainable Development AVRIL, Chairperson of SAS PIVERT
Mr. **Laurent ROSSO**, Director of Terres Univia
Ms. **Monique AXELOS**, Scientific Director of Food and Bioeconomics, INRAE
Ms. **Sophie LECLERE-BIENFAIT,** Director of Innovation, R&D Assets & Natural Ingredients, EXPANSCIENCE
Mr. **Fabrice MOULARD**, Oilseeds Federation

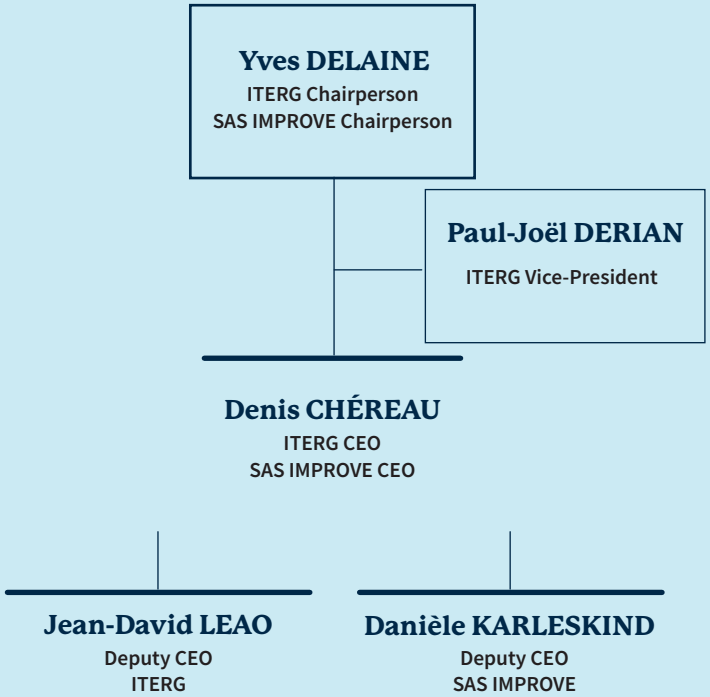
Staff observers

Ms. **Marie REULIER**, ITERG
Mr. **Christophe VINGHES,** ITERG

Auditor

Mr. **Mathias TAN** (GTAC)

Governance



* Mr. **Gil FORTEGUERRE**, PICARDIE INVESTISSEMENT
* Mr. **Christophe GRIFFART**, CRÉDIT AGRICOLE

Observers

Mr. **Hubert BOCQUELET**, FNCG Managing Director,
* Mr. **Gabriel KRAPF**, Chairperson of the Quality Commission FEDIOL
Mr. **Patrick GUILLEMOTEAU,** NOUVELLE AQUITAINE REGION
Mr. **Michel DAVID,** (FNIC-CGT)

* **Members of the SAS IMPROVE Board of Directors**

Key figures 2022

ITERG Group Resources

12,150 K€

Of which

IMPROVE

And

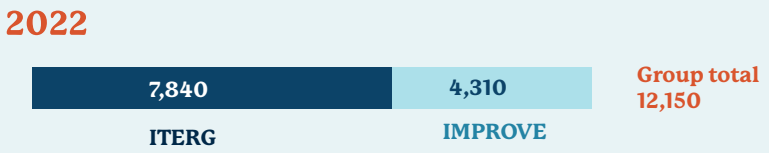
ITERG

Distribution of ITERG resources

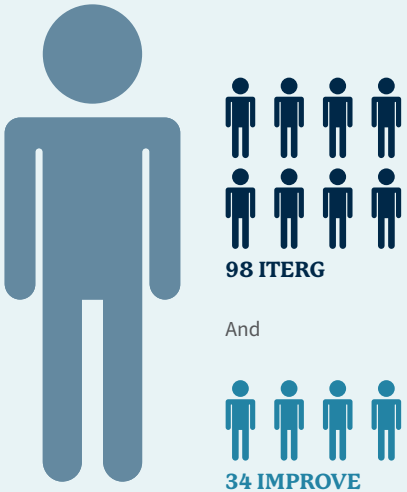
79%
Revenue

21%
Collective resources

Evolution of resources over 2 years (€K)



The men and women of the ITERG Group



98 ITERG

And

34 IMPROVE

132 collaborators

Staff scientific expertise

35%

Engineers, Scientific Doctorates or Master's Degrees

Safety training

approx.

40%

of internal training hours

Gender pay equity

89/100

ITERG Score on the Labor Code scale

A group focused on strong values and ambitions

We're committed to future generations

- by increasing the potential of vegetable oils and proteins using natural ingredients that are good for human beings and the planet through high-quality services and R&D

- for nutritional health, safety, and quality

- to develop biomass and sustainable processes in the food industry.

We support competitiveness for the oilseeds sector

- by innovating through collective research programs for industries in the sector or B2B projects that aim to improve products and processes in order to make them more efficient and eco-responsible.

- by scaling up the transfer of new technologies, monitoring and training in the company, or the development of standards.

People are at the heart of our performance and success

- We prioritize the safety and satisfaction of our collaborators, as well as positive user experiences for our products and services.

- We integrate CSR as a key factor in our operations by applying best practices every day for the wellbeing and respect of our collaborators and by taking our energy and environmental footprint into account.

ITERG's Group strategy

On the 5-year horizon, ITERG's strategy has three main themes:

Nutrition transition

Ecological transition and bioeconomy

Digital transition and factories of the future

The current context of the vegetable oils and proteins sector is reflected in a greater focus on health, health quality and safety, the environment, and sustainable development, especially as it relates to oilseed processing and the recovery of plant-based proteins:

for the middle-term, more radical transformation of crushing and refining processes

to advance towards biorefinery models that recover interesting seed fractions in channels that are sustainable, low-carbon, traced, and high-quality for human and animal nutrition

improving technical and environmental efficiency

existing industrial installations (energy consumption, air and water emissions) and their sustainable integration into their territorial ecosystem (e.g. circular economy),

making food production safer

in relation to chemical contaminants and anti-nutritional factors

creating value for edible oils and plant-based proteins

by analyzing and promoting their nutritional and environmental properties, but also through the innovative formulation of new food products using vegetable oils and proteins, and plants in general.

creating new non-food markets

for the oilseeds sector and its co-products by encouraging innovation in plant-based chemistry (chemistry, cosmetics...)

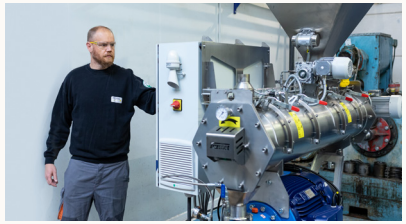
for the longer term, the use of biotechnologies

in terms of lipid biomass production (green biotechnologies, in particular using microbial methods to produce useful micro-nutrients) and industrial production (white biotechnologies).

6 Advanced Technological Platforms

Functional/sensory analysis and performance

Oils and fatty substances specialty at Canéjan and proteins at Dury

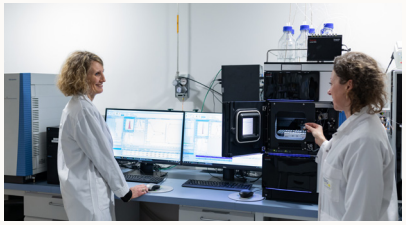


Oil extraction and refining

AT Canéjan

Dry/wet extraction and protein functionalization

AT Dury



Health Nutrition

AT Canéjan

Applied formulation

Cosmetics, food, feed, crop protection at Canéjan and dairy/meat alternatives at Dury

Plant-Based Chemistry

Canéjan

Our fields of expertise

- Food and Non-Food Formulations
- Environmental Analysis & Eco-Design
- Plant-Based Chemistry, Lipochemistry
- Biochemical Nutrition & Analysis
- Production technology
- Analytical chemistry and Sensory analysis

Targeted markets:

Producers of fatty substances and plant-based proteins:

- vegetable oils, animal-based fatty substances, margarines or spreadables
- plant-based proteins: flour, concentrates, and isolates,
- food-based or industrial lipochemistry.

Users of fatty substances, plant-based proteins or derivatives:

Foods sector

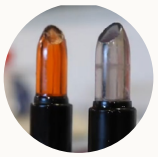
Ingredients, cookies, chocolate, deli, dairy products, health foods, fried foods, feed for animals.

Non-food sector:

Soaps, detergents, fine chemicals, cosmetics, pharmaceuticals, biofuels, bio-lubricants, bio-solvents, biocontrol.

Sector
Producers of vegetable oils, fatty substances and plant-based proteins:

Chemical Industry



Cosmetics Industry

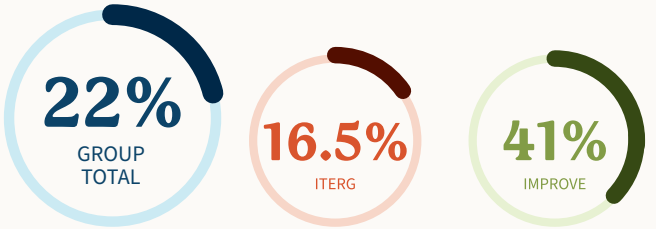
Food-production Industry

Focus on our clients

In 2022, the ITERG Group had

700 active clients with **530** at ITERG and **170** at IMPROVE

Percentage of international clients



Quality Labels

ITERG is accredited by **COFRAC**

ITERG is certified **ISO 9001:2015**
for all of its activities

ITERG is accredited by **COI** for sensory analysis, physicochemical analyses and olive oil contaminant analysis.

ITERG is certified by **FOSFA**

ITERG is certified by **Ecocert Greenlife SAS**, according to the **COSMOS** standards, for these services:

– pressing organic seeds

– refining and deodorizing organic vegetable oils,

– hydrogenation of organic vegetable oils

– grinding organic matter

IMPROVE is certified by **Ecocert,** for these services:

- cuttin,
- fractionning,
- grinding
- shaping.

-> grains and seeds

ITERG is certified **ISO 22716**

Good Manufacturing Practices for Cosmetics. Workshops in the Non-Food Development Department

ITERG is accredited by **Qualiopi**
for its training activities.

Our partners

Sector

Regions

Nouvelle-Aquitaine

Hauts de France

Biomass Development

Networks

Competitive clusters

2022, the year in review

Conference

CFIA Rennes

"Alternatives to meat and fish: challenges and perspectives for the proteins of tomorrow."
– Frédéric BAUDOUIN alongside Foodinnov

January 26/27

Convention

Lipids & Cosmetics in Bordeaux

Event organized by Cosmetic Valley in partnership with ITERG, the Agro-Resources Development Center (CVA), Bordeaux University, Nouvelle-Aquitaine region.

"New amphiphilic structures from non edible vegetable oil and properties evaluation" - Cécile JOSEPH

"Lipids and undesirable substances: quality control" - Florence LACOSTE

February 1st

ITERG

New leadership

Denis CHÉREAU began his role as CEO at ITERG and **Jean-David LEAO** was named Deputy CEO.

February 23

Round table

Manitoba Protein Virtual Summit

"What are the barriers encountered by academic institutions and the research community in collaborating with industry on a protein research ecosystem?"
- Denis CHÉREAU

March 2

Award

ITAINNOV

Guillaume CHOLLET won the prize in the category: **"LABELS & PRODUCT QUALITY"** for the Estogel M® project: an eco-responsible gelling agent with natural origins for cosmetics.
The solution proposed was developed by ITERG in partnership with the Polymer-Expert company.

March 3

Council summit

Europabio

"Acceleration of business and manufacturing - investment and policy"
- Denis CHÉREAU

March 8

April 5-7

Trade Show

INCOSMETICS Global

ITERG was present at the shared Cosmetic Valley Pavilion alongside 3 regional companies (Seprosys, Bio HC and Perles de Gascogne).
- Fabrice FARRUGIA, Cécile JOSEPH, Didier PINTORI.

Conventions

AOCS in Atlanta

"Standardized/Novel analytical methods for protein analysis in food" - Frédéric Baudouin from IMPROVE was co-chair for one of the committees.

May 1-4

May 10-12

Conference

Bridge2Food

Plant-based Foods & Proteins Summit Americas in Chicago

"How can capturing plant-proteins 2.0 contribute to affordability & sustainability?"

- Denis CHÉREAU

May 16-20

Conference

ISGC International Symposium on Green Chemistry at La Rochelle

"New amphiphile structures from non-edible vegetable oil & properties evaluation"

- Cécile JOSEPH with participation from Guillaume CHOLLET

June 9-10

Conference

37th edition of the Emulsion Club

"Evaluation and use of plant-based powders as emulsion stabilizers" - Cécile JOSEPH along with Maud SANCHEZ of PIVERT

June 15-16

Trade Show

Health Food Days (JAS) La Rochelle

- Fabrice FARRUGIA, Jean-David LEAO, Franck DEJEAN.

Round table

Adebiotech

"Industrial Biotechnologies and Reducing the Carbon Footprint" - Fabrice Bosque on the challenges of assessing the carbon impact of bio-productions

July 4

June 27

Meetings

Big Idea Ventures

Hosted over a dozen start-ups and presented the alternative oils market.

July 12

Company Life

Outdoor activities at Lac Vert, Canéjan

Workshop

Harmonization of the tasting juries

certified by the International Olive Oil Council (IOC)

September 15-16

September 28

Company Life

Corporate video filming

Spotting session in the semi-industrial workshop.

Trade Show

8th edition of NutrEvent

- Carole VAYSSE

October 4-5

Trade Show

SIAL

"Alternative proteins: which origins for which applications?"

- Denis CHÉREAU "Sial Talks"

October 15-19

October 22-23

Company Life

Participation by our teams in the Pink Ribbon at Bordeaux

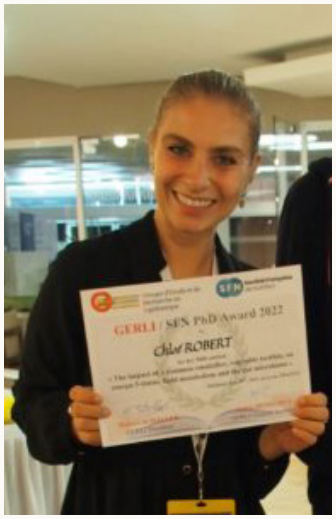
November 6-9

Award

GERLI Lipids

From membrane dynamics to signaling at St. Jean Cap Ferrat

"Plant-based lechitins as vectors of linolenic alpha acid: metabolic and inflammatory impacts related to intestinal bioavailability"- Chloé ROBERT



November 15-17

Trade Show

ENVIROpro in Nancy

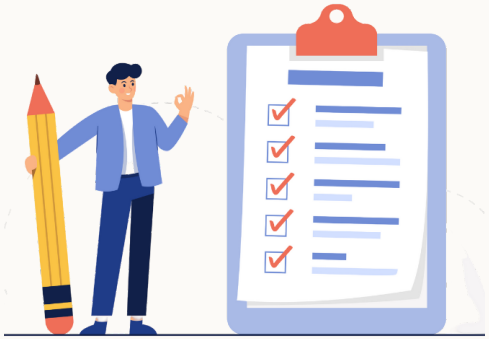
Dialogue around the ecological transition and the bioeconomy
- François LEROY

November 16

Conference

Adebiotech

"Estimate your dependence on non-renewable energies along the entire value chain through environmental assessment."
- Fabrice BOSQUE
Sustainable energy sources for the biotech, chemical, and cosmetic industries



Technical Day

CRT AGIR at PESSAC

ORGANIC TRANSFORMATION: *"Organic edible oils: nutritional advantages and consumer expectations"*
- Benjamin BUAUD

November 24

November 28-30

Conference

Bridge2Food
Plant-based Foods & Proteins Summit Asia in Singapore

"Moonshot 2030 Plant-based foods & the protein transition?"

"Being at the Forefront of Accelerating a Successful Food Transition to Serve the World"
- Danièle KARLESKIND

December 1st

Conference

NSL competitive cluster

"The alternative proteins market"
- Denis CHÉREAU

December 9

Training

International course on alternative proteins at Amiens

"(re)discover the basics of alternative proteins, from production methods to applications"
- Frédéric BAUDOUIN

December 20

Company Life

Competition for the best Christmas hat

02

For the nutrition transition

For nutritional health, safety, and quality

In response to the growing demand from consumers for healthier food, the agro-food industries want to increase innovation in the realms of formulating food products and natural ingredients.

ITERG is working to create value for edible oils and alternative proteins by analyzing and promoting their nutritional and environmental virtues, and also through an innovative formulation of food products that minimize the use of artificial additives with natural alternatives.

We look for benefits related to nutritional value, taste, and impact on consumers' health.

Mastering digestion to guarantee a diet high in nutritional value

How the nature of the protein interface affects the digestibility of lipids and proteins.

The ELIPRO PROJECT aims to determine what impact the nature of the protein and/or lipid interface has within emulsions on the digestibility of lipids and proteins and on their bioavailability in the organism. This project will also evaluate, in vivo, what effect the nature of different emulsifiers, that are now present in non-negligible quantities in our food, has on the physical and chemical properties of emulsions and the bioavailability of the fatty acids they are made of, while seeking to preserve as much as possible the integrity of the intestinal barrier and its functions.

The work carried out in 2022 furthered the research into how the nature of the interface impacts the physical and chemical properties of the emulsions tested, as well as their digestibility in vitro. Different oil-in-water emulsions (with 30% lipids) were prepared with linseed oil and various surfactants (plant-based protein matrices, lecithins, tween 80). The results show that the oxidizing capacity of linseed oil is lower in emulsified forms than in non-emulsified ones.

In addition, depending on the nature of the surfactant, different levels of oxidation are observed in emulsified linseed oil. The digestibility of these formulas, evaluated according to the level of lipolysis in vitro of the linseed oil +/- emulsified, varies according to the nature of the surfactants.

Thus, emulsified linseed oil with rapeseed oil cake has a higher level of lipolysis (+8%) than non-emulsified linseed oil. On the other hand, the digestibility of the linseed/tween 80 emulsion is lower (-12%) than the non-emulsified oil.
This data shows that the choice of surfactants in the formulation of oils into emulsions has an impact on the stability of the formulation as well as on its digestibility.

The expected results of this project are to identify plant-based alternatives to the different surfactants currently used in IAA to structure emulsions, with an eventual advantage in the digestibility of valuable nutrients and/or intestinal health.

- Leslie COUEDELO
Health Nutrition & Lipid Metabolism Project Manager, ITERG

Did you know?

Within the framework of our research project, we define alternative methods to animal studies for monitoring the digestion and absorption of specific compounds.

A new cellular culture room now allows us to monitor, among others, absorption, metabolic fate, and intestinal bioavailability of liposoluble compounds or molecules.

What's new?

Discover the new website on our Nutrition and Health activities!

www.iterg-lifesciences.com

Encourage people to eat healthy foods through great taste

Learn more

ITERG's sensory analysis jury is certified by the International Olive Oil Council to provide sensory analyses for olive oil.
This certification is re-evaluated each year following the results of circular analyses.
In December 2022, ITERG received certification for the physical/chemical sensory analyses of olive oil, valid until the end of December 2023.

How was the sensory analysis method for plant-based proteins developed?

Vegetable proteins have many nutritional and environmental advantages but can present detrimental sensory characteristics for human consumption (taste and smell of cut herbs, astringency and bitterness). So it's important to make sure you qualify very precisely the flavors of the plant-based proteins in order to optimize the production process and formulations and reduce or eliminate the unpleasant flavor perceptions.

Creating this list of descriptors with the corresponding glossary according to the ISO 11035 standard (identifying and selecting descriptors which can then be used to draw up a sensory profile) enabled us to set up a methodology and a sensory analysis jury with expertise in plant-based proteins.

This method was developed in 2021 and consists of the proteins (flours, concentrates, isolates) being diluted in water, and tasted by a jury of experts.

Using 15 plant-based protein samples (soybeans, peas, fava beans, chick peas), the 11-person panel participated in generating an exhaustive list of terms that characterize the flavor (taste + smell) and the texture of the products tested.

In the end, a list of 14 descriptors was elaborated and grouped by family: legumes, grains, plants, animal, earth, sweet, feeling in the mouth, texture.

In 2022, the creation of a series of synthetic reference samples enabled us to train the jury on the 14 descriptors selected previously. Using the descriptors and reference samples allowed us in 2022 to analyze nearly three dozen products based on their sensory evaluation: 7 samples based on soy beans, 3 samples based on chick peas, 9 samples based on peas, and 10 samples based on fava beans.

With the results, we were able to create product information sheets for these products according to the type of protein: soy, peas, fava beans, chick peas.

- Sophie GELIN
Head of the sensory analyses jury, ITERG

- Florence LACOSTE
Analysis expert, ITERG

Ensuring food safety through reliable analyses

Congratulations to the team!

Last minute: Our method for the determination of mineral oil content (saturated and/or aromatic hydrocarbons) has just been accredited by COFRAC.

This method meets a strong demand from our customers to have an accredited analysis for a low limit of quantification.

Our laboratory has invested in an LC GC FID coupling with an automatic preparer, capable of carrying out the different concentration steps in order to reach the 1 mg/kg threshold.

Optimizing the dosage method for mineral oils

MOSH (Mineral Oil Saturated Hydrocarbons) and MOAH (Mineral Oil Aromatic Hydrocarbons) can get into fatty substances through raw-materials transfer (pesticides that contain mineral oils), integration during processing (contact with lubricants), or migrate from waxes contained in cardboard or burlap packaging.
The goal of this project is to see if it's possible to create a valid method allowing us to reduce the quantity limit in the method for MOSH and MOAH in order to meet the needs of manufacturers in the sector.

ITERG, in collaboration with Dr BRÜHL, three circular trials that brought together close to 40 laboratories from 11 different countries have been organized since the end of 2020. The circular trial in late December 2021 concerned 16 samples based on the following matrices:

Refined palm olein, virgin coconut oil, refined sunflower oil, refined rapeseed oil, virgin rapeseed oil, virgin olive oil, refined grape seed oil.

Thirty-six laboratories representing 10 countries from around the world participated in the test. The selected samples covered a range of concentrations from 1 mg/kg to 75 mg/kg for MOSH, and from 1 mg/kg to 7 mg/kg for MOAH.

The final results were collected in a report that was presented to the participants during a virtual meeting on June 7, 2022.

Considering the accuracy of the data, the method was considered valid starting at 3 mg/kg for MOSH and 2 mg/kg for MOAH. It was then submitted for international (ISO/TC34/SC11) and European standardizations (CEN/TC307) in November 2022. It's publication is scheduled for June 2024
"Measuring mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH) by dosage HPLC--GC--FID in line — Method for a low quantification limit" ISO 20122.

- Franck DEJEAN
Head of Department
Analysis and Expertise, ITERG

Learn more

The validation of methods for measuring mineral oil hydrocarbons was discussed in a webinar presented by Florence LACOSTE to the ITERG members in December 2022.
On line on our YouTube channel.

- Florence LACOSTE
Analysis expert, ITERG

Natural formulations

Evaluation and use of plant-based powders as emulsion stabilizers.

With the goal of reducing or eliminating synthetic additives, a strategy to evaluate the potential of various plant-based powders and co-products as emulsion stabilizers was elaborated.

Using these descriptors and reference samples allowed us to analyze close to thirty products in 2022 based on their sensory evaluation: 7 samples based on soy beans, 3 samples based on chick peas, 9 samples based on peas, and 10 samples based on fava beans.

With the results, we were able to create product information sheets for these products according to the type of protein: soy, peas, fava beans, chick peas.
We thus confirmed that many powders contribute to stabilizing an emulsion through diverse mechanisms: involving the soluble fraction, the absorption of insoluble particles (Pickering emulsions), or the structuring of a network in the dispersion medium.

The results obtained in the study can be used in applicative formulations with specific, targeted properties.
Formulations were created on the pilot scale and stabilized exclusively by the protein oil cake, demonstrating applicative properties in the food sector and various other markets.

- Cécile JOSEPH
Formulations Project Manager

- Maud SANCHEZ
PIVERT Project Manager

Launch of the JTU Actia PROFEEL: A nutritional and sustainable plant-based formulation

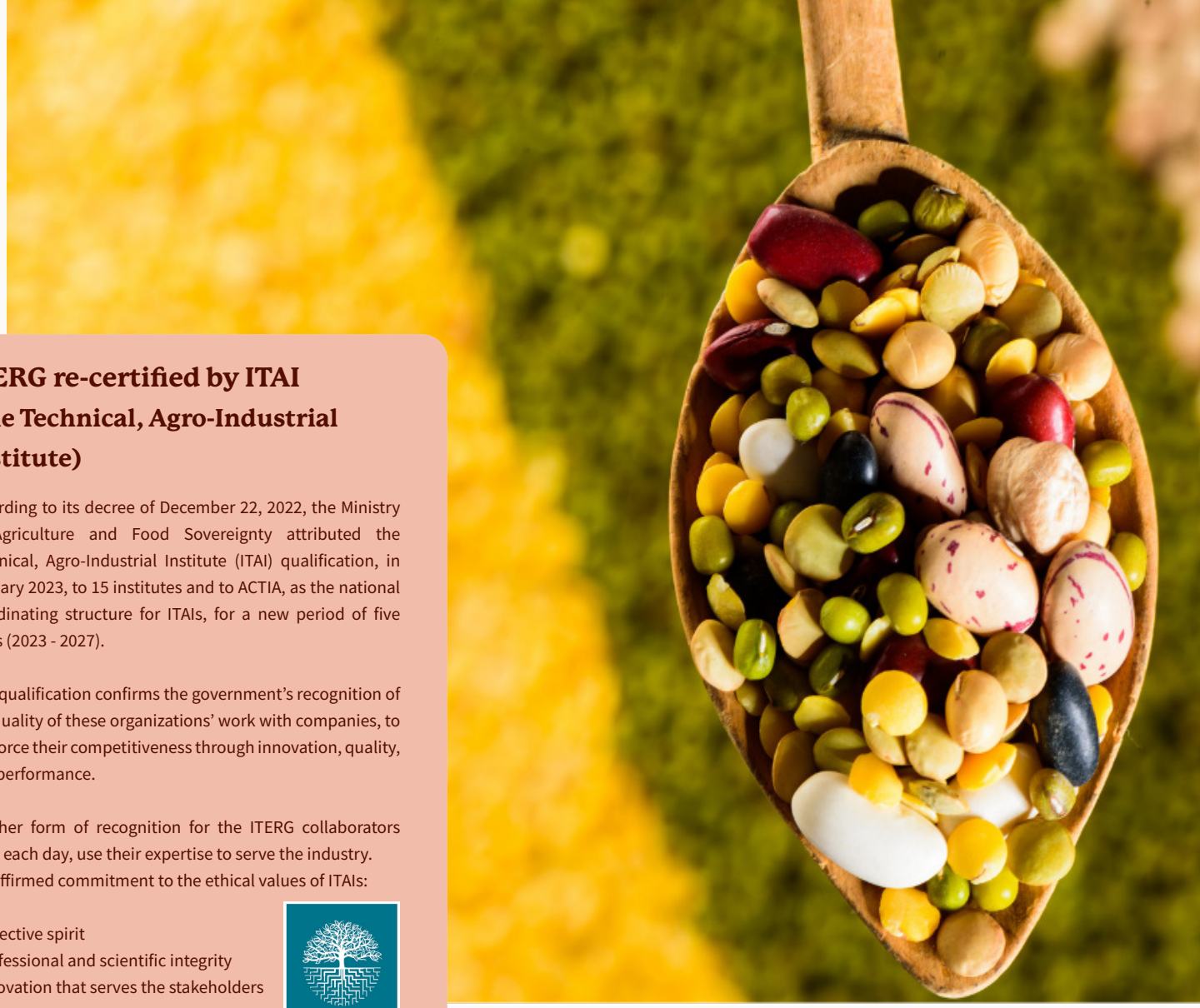
To meet the current challenges of the nutritional transition in industrialized countries, the agro-food sector must evolve its product composition by favoring “clean label” formulas. The challenge is to replace ingredients with healthier, more sustainable options without altering the product’s sensory qualities, conservation, and physical stability or nutritional value.

In this context, the joint technological unit (JTU) ACTIA PROFEEL is positioned to respond, through a multidisciplinary approach, to the challenges facing the oils and proteins sector, and to the needs for new, coherent formulation strategies with a “sustainable, functional plant-based diet” adapted to society’s expectations, regulations, and targeted applications.

This JTU, coordinated by ITERG (Cécile JOSEPH began in January 2023 for a 5-year period), in collaboration with the Centre de Recherche Paul PASCAL (CNRS, University of Bordeaux).

- Cécile JOSEPH

Formulation Project manager, ITERG



ITERG re-certified by ITAI (The Technical, Agro-Industrial Institute)

According to its decree of December 22, 2022, the Ministry of Agriculture and Food Sovereignty attributed the Technical, Agro-Industrial Institute (ITAI) qualification, in January 2023, to 15 institutes and to ACTIA, as the national coordinating structure for ITAIs, for a new period of five years (2023 - 2027).

This qualification confirms the government’s recognition of the quality of these organizations’ work with companies, to reinforce their competitiveness through innovation, quality, and performance.

Another form of recognition for the ITERG collaborators who, each day, use their expertise to serve the industry.
A reaffirmed commitment to the ethical values of ITAIs:

- collective spirit
- professional and scientific integrity
- innovation that serves the stakeholders
- commitment within our sectors.

New proteins: traits , improvements, and applications

Vegetable proteins have different functions that can be developed in many food-based applications: behavior in water, emulsifying properties, foaming properties, gelling agent properties, capacity to add textures... They can also contain compounds that alter their nutritional advantages (anti-nutritional factors).

IMPROVE and ITERG developed a coherent series of methods to characterize the functional and nutritional properties of plant-based ingredients. Several techniques are also available at IMPROVE to modify the properties of proteins at the laboratory or pilot level.

• Enzymatic treatments:

Enzymes are commonly used in industrial treatments to modify the solubility and functionality of proteins.

• Physical treatments:

Thermal treatments will also have a strong impact on the functionality of proteins and on certain anti-nutritional factors. High-pressure treatments can also improve the solubility of proteins and their usage quality.

• Chemical treatments:

Strictly monitored in food applications, they can also apply to non-edible products such as detergents and pharmaceuticals.

In 2022, ITERG and IMPROVE carried out joint research supported by Cap Protéines on the links between plant sources, extraction conditions, and the functional, nutritional, and applicative qualities of plant-based proteins. IMPROVE also invested in new extrusion and application-development capacities that will be operational in 2023.

- Frédéric BAUDOUIN

Head of the Analytic Hub, IMPROVE,
Member of the ITERG Scientific Committee

Within the framework of Cap Protéines, Frédéric BAUDOUIN participated, on March 30, 2022, in the jury for Idéathon, a collective intelligence competition organized by Terres Inovia, Terres Univia, Le Village by CA, Vitagora and Bioeconomy For Change to answer the question:
How can we accelerate the transition toward plant-based proteins for human consumption?

The event had 44 participants and original ideas for new products and services to integrate plant-based proteins into the human diet!

Scientific support for the evolution of Nutri-Scores for vegetable oils and margarines

Over the last 2 years, the FNCG[1] and the Nutrition, Health & Biochemistry of Lipids team at ITERG have collaborated on a project to evaluate the nutritional quality of vegetable oils and margarines in accordance with Nutri-Scores, where vegetable fats are currently classed no better than C2.

The goal of this joint effort was to improve the Nutri-Scores attributed to vegetable fats to obtain a complete range of ratings (from A to E) and ensure that these scores reflect the actual nutritional quality of these fats, recognized by the French (ANSES[3] /SPF[4]) and European (EFSA[5]) authorities and adhere to the consumption recommendations established by the PNNS[6] "move toward rapeseed, walnut, and olive oils."

Based on their nutritional evaluation, it was possible to show that certain vegetable oils possess nutritional profiles just as good as those of olive and walnut oils (the only oils along with rapeseed to obtain the best rating of C). Rapeseed oil seems to present the best nutritional quality compared with the other oils in the study for the selected criteria. For margarines, it appeared that a large number of them could be valued according to their nutritional profile: content in nutrients of interest (omega 3 fatty acids, vitamin E) thanks to the vegetable oils they are made from, reduced fat content.

This joint study showed that it's possible to obtain a range of Nutri-Score ratings from A to E for vegetable fats and offer consumers the possibility to compare the nutritional quality of products in this category so they can make informed decisions about their consumption.

Nutri-Score's transnational scientific committee published its conclusions on the evolution of Nutri-Scores in July 2022. The algorithm modification recommended by this committee for the "fats" category allows for the valuation of the vegetable oils with the lowest levels of saturated fats, with the novel appearance of a B rating in this category for several oils: rapeseed, olive, walnut, oleic sunflower, avocado,and soy.

This is a big step forward that meets some of the ITERG/FNCG collaboration's main objectives as submitted to the authorities: obtain better valuation of vegetable oils and margarines according to their nutritional profile, and a range of Nutri-Scores for the category.

- Benjamin BUAUD

Health Nutrition & Lipid Metabolism
Project Manager , ITERG

1- National Federation of Fatty Substance Industries

2- Ratings of C and E are possible for vegetable oils, with the C rating attributed only to rapeseed, walnut and olive oils; only ratings of C or D are possible for margarines.

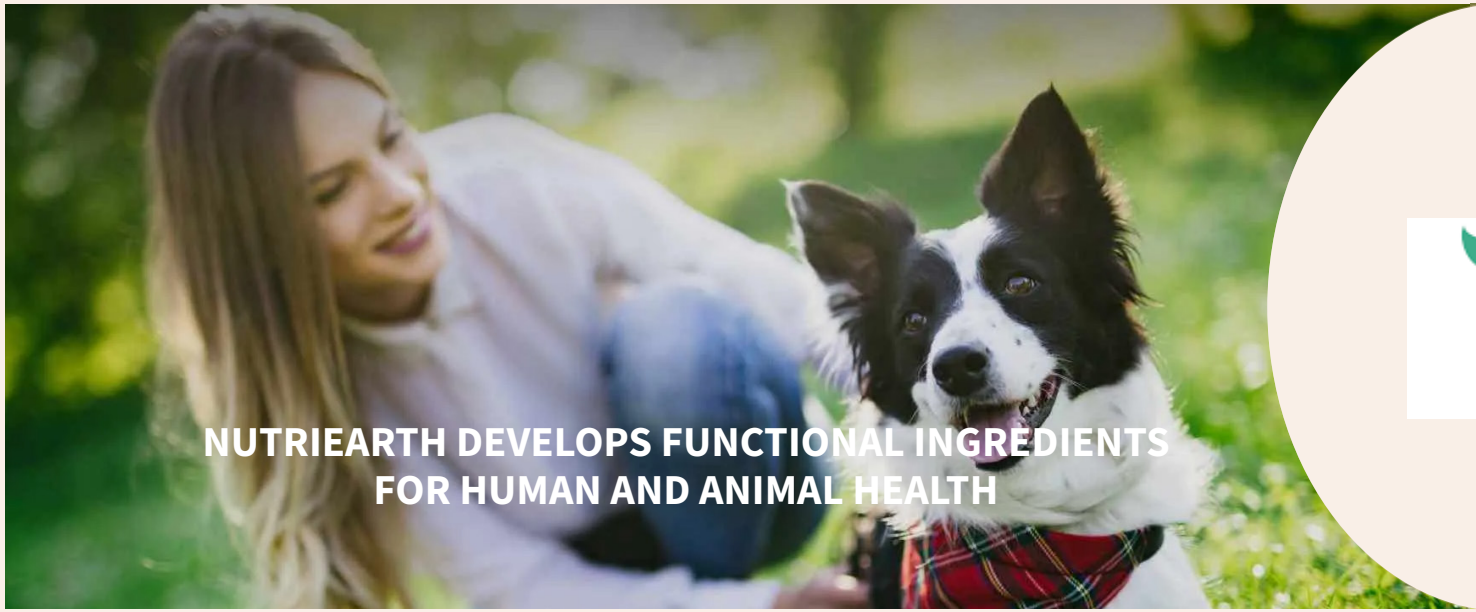
3- National Agency for Food, Environmental and Occupational Health and Safety

4- National Public Health Agency

5- European Food Safety Authority

6- National Nutrition Health Program

7- It should be noted that these changes in the algorithm won't be applied until the end of 2023 according to the French authorities, with a transition period of around two years given to the operators.



Nutriearth
ENGAGÉ POUR LA SANTÉ ET LA PLANÈTE

www.nutriearth.fr

NUTRIEARTH Testimonial

Nutriearth is a French company that develops functional ingredients for human and animal health. Our ingredients are innovative and require a marketing authorization from the European Authority on Food Safety via a Novel Food file. We relied upon the expertise of ITERG to accompany us in creating our Novel Food file submissions.

In this context, we collaborated with ITERG on various topics, including the nutritional aspect with the study of our ingredients' bioavailability in vivo, and analytical issues with the development of dosage methods for specific molecules adapted to our processes, needs, and matrices. It's important to emphasize ITERG's ability to adapt to our matrices and the specific constraints of Novel Food files.

In addition to the technical aspects, we also appreciated the direct and regular communications that allowed the various projects carried out with ITERG to be optimized and progress smoothly.

The result is that ITERG now represents a trusted partner for Nutriearth, with an experienced and multidisciplinary team that listens to our needs.

- Julien LEROY

R&D Engineer, Human and Animal Nutrition, Nutriearth

03

For the ecological transition

To make the bioeconomy an industrial reality

The use of biomass from oilseed protein cultures or co-products as a raw material for the production of bioproducts for industry is constantly evolving.

More effective and sustainable processes reduce environmental impact while at the same time creating new economic opportunities.

ITERG is developing a positioning strategy for bio-based sectors all along the value chain to support the ecological transition on the scientific and technical levels and make the bioeconomy an industrial reality for vegetable oils and proteins.

Working towards a low-carbon economy through innovative bio-based solutions.

PRIC and PEC lines from our sample library

Innovation in bio-based polymers represents an important challenge in the development of more sustainable and environmentally-friendly materials. These polymers made from plant resources are used in a large range of applications, especially for paint, adhesives, and surfactants. ITERG is innovating with new chemical derivatives from biomass whose functionalities offer a strong added value.

The bioproducts sample library created several years ago, and in particular the range of estolides, is continuing to evolve in line with performance tests, society's expectations, and regulatory changes. These custom-produced oligomers allow us to modulate the specifications and properties of polymers and adapt certain physical/chemical properties like viscosity, functionality, molar mass, etc. This approach allows us to meet the specific needs of manufacturers according to precise specifications and thus adapt to their problems as much as possible.

The castor estolides qualified as "first generation" present interesting physical/chemical properties similar to petroleum-based polymers such as polybutadiene, polyisoprene, and polyisobutylene.
The functionalization of these isocyanate, acrylate, silane (figure 1) type estolides allows us to expand the offer and reach new application sectors.

Currently, the biggest production market in terms of volume is cosmetics (6 to 10 tons per year), which is why the six most promising molecules in the PRIC line have been registered with INCI (the International Nomenclature of Cosmetic Ingredients). Also, these oligomers are not REACH regulated, due to their polymer nature, which makes their market entry easier.

Our target objectives are to increase production volumes by opening up to other markets outside the cosmetics industry. The markets we'll target are lubricants, performance additives (waterproofing, shock absorbers, for example), and plasticizers.

This growth phase is focused on the mature and well-established castor-oil-based PRIC range.

The transition toward a new PEC line (made from rapeseed oil with high erucic acid content) is in progress and, for the moment, in an intense R&D phase before upscaling promising candidates.
In parallel, a family of amphiphile-structured estolides is being studied in formulation to evaluate their application potential in comparison with commercial surfactants.

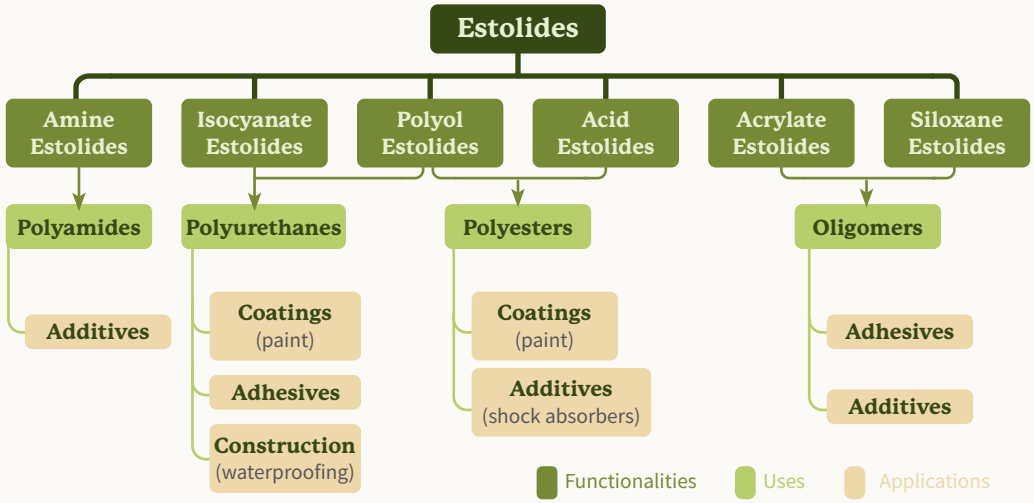


Fig 1: Panorama of applications identified for PRIC Estolides

- Guillaume CHOLLET
Department Head
Industrialization and Research & Development, ITERG

ESTOGEL M®: a novel solution for the cosmetics market

ESTOGEL is an eco-friendly gelling agent with 100% natural origins, developed in a joint project with an industrial stakeholder and an academic stakeholder.

The project originated from the development, within the framework of the Polygreen2Industry JTU between ITERG and the LCPO (Laboratoire CNRS Bordelais de Chimie des Polymères de Bordeaux), of an original, bio-based polymer from vegetable oil. ITERG is handling the maturation and transfer to market of this patented oligomer (via a framework agreement between ITERG and the SATT Aquitaine -AST).

In cooperation with the POLYMEREXPERT company, ITERG undertook the work of maturation and development, targeting the cosmetics market through valuation as a gelling agent for fatty phases.

Once the performance was validated, the phases of registration and customized production were launched to begin the pre-series and priming the market. In parallel, POLYMEREXPERT registered the ESTOGEL trademark and initiated the product-series launch and marketing with one of its distributors.

One of the particularities of the ESTOGEL line is its capacity to create completely transparent gels, in lipsticks for example, which is novel, and to suspend flowers, pigments or glitter for innovative and extremely attractive products.
The second line, ESTOGEL Green came out in 2021 and is 100% bio-based.

This project demonstrates a complete innovation approach to product development, industrial transfer, and entry on the market including upstream research, registering the patent, the maturation phase, legal authorization, co-development with an industrial partner, and support in the market-entry process with the production of test batches and industrial pre-series.

Congratulations!

On March 2, 2022, at the Salon International de l'Agriculture, the Ministry of Agriculture and Food's stand hosted the prize ceremony for the 4th edition of Ita'Innov. This innovation contest is organized by ACTA and ACTIA and awards discoveries and innovations by technical centers.

On this occasion, Guillaume CHOLLET was awarded the top prize in the "PRODUCT LABELS & QUALITY" category of ITAINNOV 2022 for the project ESTOGEl M®.

Sustainable solutions for more responsible industries

The creation of new Life Cycle Inventory (LCI) data for products in the category “plant-based substitutes.”

Agribalyse is a French database developed by the Environment and Energy Management Agency (ADEME) that shows the environmental impact of food products throughout their life cycle from production to distribution, including processing and consumption. ITERG contributes to the evolution of the environmental database on agricultural and edible products by creating and improving life cycle inventories.

The AGRIBALYSE Protein project is co-financed by ADEME and aims to elaborate new Life Cycle Inventory (LCI) data for products in the “plant-based substitutes” category in order to enhance the Agribalyse database.

It fits into the framework of the ACéVOL project that aims to improve and create LCA data for vegetable oils and proteins.

2022 was dedicated to creating LCI data for 21 product references (soy and wheat nuggets, grain patties, soy patties, plant-based sausages, etc.).

- **determining an “average” rating** for the product reference using public information available in various commercial references in the LCA Simapro software,
- **modeling each ICV** using the Simapro software in a “cradle to plate” perimeter according to the methodological rules laid out in the Agribalyse database.

The data proposed by ITERG were the subject of an independent critical review. It will be given to ADEME during the first quarter of 2023 for integration in version 3.2 of the AGRIBALYSE database to be released in late 2023.

- Fabrice BOSQUE

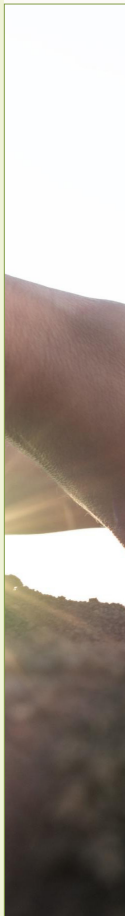
Head of Environment & Eco-Industries, ITERG

Did you know?

For the last decade, ADEME, INRAE and the Agricultural and Agro-Food Technical Institutes have worked together on assessing the environmental impact of agricultural and food products through the Agribalyse program.

As a continuation of this program, ADEME, INRAE, ACTA (Réseau des Instituts Techniques Agricoles) and ACTIA (Réseau français des Instituts Techniques de l’Agro-alimentaire) created, on September 29, 2021, a Scientific Interest Group (SIG) “Network for the Environmental Assessment of Agricultural and Food Products – REVALIM” for a period of 5 years.
ITERG headquarters, as a member of this SIG and its scientific and technical committee, aims to enhance the knowledge and tools that allow us to better understand the environmental impact of products in the agricultural and agro-food sectors.
The work done in 2022 mainly consisted of drawing up and implementing a road map that aims to:
- identify the vectors of work and research for the REVALIM SIG
- prioritize tasks based on their importance or the available resources and energies
- elaborate an action plan to reach goals in a fixed time period.
- propose a coherent scientific strategy for 2022-2026.

The 26 actions listed on this road map relate to three main themes:
- consolidating methods
- enriching and improving the AGRIBALYSE database
- contributing to the quality and influence of the AGRIBALYSE database through substantive actions.



Diag Eco-design

ITERG, a qualified expert accompanies you in the ACTIA network

ADEME and Bpifrance launched Diag Eco-design in collaboration with the Eco-design Hub to support French companies in their energy and ecological transition.

Diag Eco-design helps improve the environmental performance of products, services, or processes through an environmental assessment based on life cycle analysis (LCA) and identifying possible improvements.

In this way, SMEs can receive support subsidized by ADEME (60% or 70% depending on the size of the business) carried out over 6 to 8 months with the help of an ITERG expert.

Diag Eco-design results in a customized and actionable plan based on:

- environmental analysis based on life cycle analysis of the product or service,
- identification, formalization, and cost-evaluation of eco-design levers that can be activated by the company.

Following the consulting mission, a complete report of the study as well as a summary sheet to emphasize the value of the approach are delivered.

ITERG assists manufacturers in their sustainable development approach an offers a diagnostic service on industrial sites. 3 types of Bpifrance diagnostics are possible with an ADEME subsidy:

- Diag Eco-design
- Diag Eco.Flux
- Diag Décarbon'action

To learn more about these diagnostics, please contact:

- François LEROY

Environment and Eco-Industries
Project Manager, ITERG

Focus on

ACÉVOIL: Our free environmental evaluation tool

FOR:

- calculating the environmental footprint of products or processes
- seeing the environmental footprint of a particular ingredient
- assessing the impact of eco-design actions
- conducting an environmental assessment on behalf of one of its clients,
- understanding the LCA methodologies applied to the agro-food sector.

The oilseed sector wanted to provide a tool to producers and users of vegetable oils that can evaluate products and processes. The objective is to promote understanding of the sector's impacts and analyze the progress margins of certain stages with a view to eco-design and transparency for clients and consumers.

This tool was developed by ITERG on request from and thanks to the support of Terres Univia, the oilseed and protein crop inter-professional organization. It enables Life Cycle Assessments (LCA) to be performed in compliance with the ISO 14040 series of standards. It also complies with the methodological rules developed by the vegetable oils sector within the framework of the ACéVOL project and included in the methodological toolkit for performing LCAs in the vegetable oils sector (downloadable with the tool).
This tool can be used to evaluate the environmental impact of vegetable oils resulting from the processing of oilseeds (sunflower, rapeseed, soybean) and vegetable-oil formulated food products.

Sign-up online to use the tool:
www.iterg.com/etudes-et-prestations/environnement/

Launch of the Carnot 3BCAR FOLIBRASS Project

This project's goal is to use the plant-based powders from brewery spent grains to encapsulate bioactive fatty compounds, then, integrate the encapsulated biomolecules into typical formulated food, cosmetic, and phytopharmaceutical products:

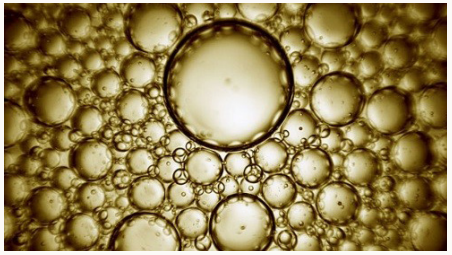
sprayable solutions, sauces, lotions and creams made in the standard conditions used by each sector (pH, salts, agitation systems and types of preservatives, in particular.)

To obtain effective encapsulation, the brewery spent-grain powders will be functionalized through physical processes (grinding, turbo and electro-separation) in a dry process with a view to "solvent-free, no chemical reaction" eco-design.

The encapsulation strategy is based on stabilizing oil-in-water emulsions (O/W) using powders issued from fractioned spent grains (emulsions stabilized by solid particles, or Pickering emulsions).
The particles around the fatty droplets containing the biomolecules would make up the encapsulation.

ITERG is a partner in the project, alongside JRU IATE, Joint Research Unit in Engineering of Agropolymers and Emerging Technologies.

- Cécile JOSEPH
Formulations Project Manager, ITERG



FlavaPulse
THE BEST OF PEA PRODUCTS

www.flavapulse.com

FLAVAPULSE Testimonial

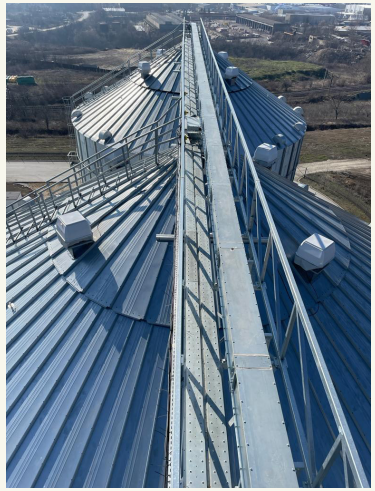
FlavaPulse transforms yellow peas to make natural ingredients. We were founded with a commitment to improving the agro-food system with a carbon neutral system and strong ethical principles.

Our factory, designed with IMPROVE's expertise, is located in northeastern Bulgaria, in the town of Shumen. We are also strongly committed to innovative technologies and R&D.

We have established a long-term partnership with a leading company in R&D and technological services in alternative proteins: IMPROVE (ITERG Group subsidiary).
We rely on their skills and expertise to optimize the process of cleaning and shelling, the process of grinding and turbo separation, and the technology to remove the bitterness from peas.

Together, we work to extract all the potential from our yellow peas, maximizing functionality, nutrition, and taste of our products. What we gain are ingredients that give us a competitive advantage in regard to specific applications, nutritional advantages, and target groups.

IMPROVE is helping us produce a new generation of ingredients rich in proteins and made using responsible processes.



- Martin ROUSSEV
Director at FLAVAPULSE

04

For factories of the future

Thanks to advanced technologies and process modeling

Companies are facing two major challenges: transitioning to an industry that better respects the environment by reducing carbon emissions, adopting a circular approach, and shifting toward the industry of the future.

The factories of the future look to transform the traditional production processes by using advanced technologies that improve productivity and the quality of processed products.

The ITERG group contributes to this work by modeling biorefining processes for oils and plant-based proteins.

The goal is to optimize process efficiency, replace or reduce the use of solvents, reduce energy usage, and improve the quality of processed products.

Innovate for greener and safer processes

Optimized and eco-friendly extraction

The goal of the SOLEXOL 3BCAR project is to provide green solvents (or mixtures) to extract natural compounds like fats and secondary metabolites from seeds and oil cakes. To eco-design these new solvents, an innovative, reverse-formulation approach based on a computer assisted design tool.

The goal is, on the one hand, to replace the (eco)-toxic solvents and on the other, to offer selective extraction processes for molecules of interest, removing solvents from oil cakes, and solvent recycling.

In 2022, some solvents were identified theoretically using computer calculations and laboratory testing. Duplicates are in progress to verify the results.

The performance of molecules or mixtures selected through this approach will be assessed, and an optimization of extraction, extract separation/purification, and solvent recycling processes will be carried out.
In addition, the environmental impacts of the alternative solution will be assessed through a lifecycle analysis.
Relevant components: UMR 1010 LCA, UMR 5503 LGC, ITERG

- Alexandre CAVACO-SOARES

Head of the Primary Processing R&D Department, ITERG

Modeling an industrial synthesis process

The goal of the EVALBIO project is to improve the environmental performance analysis of bio-based or bio-processed products in comparison with those they are replacing (often petroleum-based).

This orientation is justified by the fact that a significant amount of LCAs carried out by ITERG for bio-based products are done in the framework of research and development projects, on non-mature technologies that don't have input data on an industrial scale.

The work in 2022 mainly consisted of continuing development on a calculation tool that can easily quantify the energy flows of an industrial process at a given scale (semi-industrial or industrial) starting from operative parameters established in the R&D phase (lab or pilot) or easily accessible: integration of new functionalities, consolidation of existing models, reorganization of the interface, writing user manuals, testing the tool from the data..

If the tests show important gaps between the calculated values and the process data furnished by the industrial partner, they can be explained by the limits of the background model, based on the work of Piccino et al. (2016).

For the next stage of the project, we need to optimize the tool's functionalities, notably by basing it on a continuous and integrated approach to processes, and by mobilizing process-engineering skills.

- Lou BERNARD

Environment and Eco-industries Project Manager, ITERG

Did you know?

ITERG and Terres Inovia have entered into a partnership for R&D and technological transfer in Primary Processing for the Sector.

The context of increased demand for plant-based proteins in human and animal diets highlights the value of oil cakes made by processing oilseeds like rapeseed or sunflower. The quality of proteins during the crushing and cooking phase is thus extremely important for the industry and the sector.

In this framework, a thesis on pressing seeds is in progress in our workshops in Canéjan. It discusses the experimental study and modeling of processes involved in the mechanical production of vegetable oil.

Led by Florian ROUSSEAU of Terres Inovia, in collaboration with the CBMN Institute, it is part of the Plan Protéines, in the Cap Protéines program.

From patent to industrial scale

Reducing energy consumption is at the heart of our industry's challenges.
IMPROVE, in partnership with the POITTEMILL-FORPLEX company, patented a process of technological breakthrough in 2020 that can produce shelled or flours enriched with proteins from grains, oil cakes or legumes.

BROYEURS POITTEMILL INGENIERIE is a French company that designs, builds, and installs specialized machines for the industry, in particular for grinding and classification.

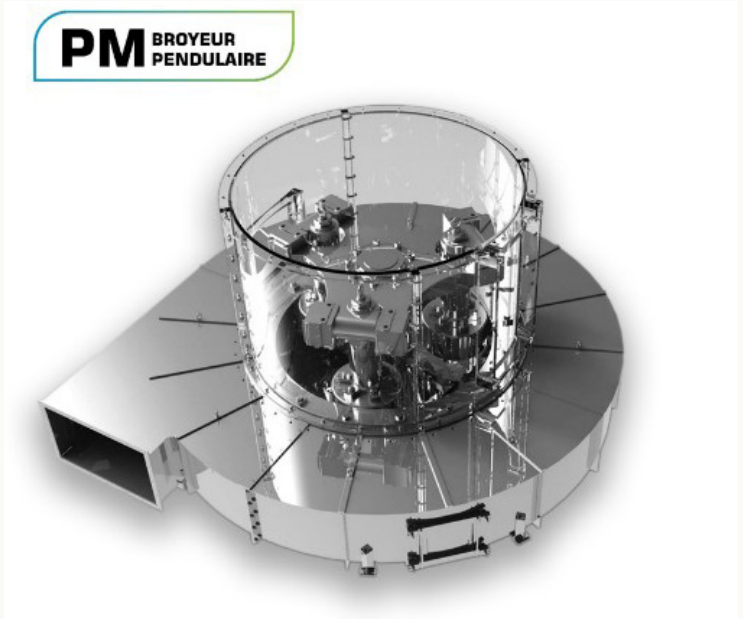
This collaboration between IMPROVE and POITTEMILL enabled development of a solution by bringing together the best expertise in the two structures:
monitoring raw materials, knowledge of the product, processes, and applications, and expert know-how in engineering and analytical tools

The innovation is based on the industrial-scale application in the human and animal food sector of the grinding principle used in antique stone mills, namely compression on a bed of material and differentiated grinding.

Robust, compact, automatable and versatile, this process is above all characterized by **greatly reduced energy consumption (20 to 50%) in comparison with conventional shelling, milling, and micronization technologies.**

These numerous advantages were adopted by several industrial projects, the first of which are scheduled to being operations in the first quarter of 2023.
Ranging from 1 to 5 t/h, these projects aim for increasingly optimized and eco-friendly production of ingredients.

- Jean-Charles MOTTE
Head of the Dry Fractioning Sector, IMPROVE



2022 saw the development of several industrial projects

IMPROVE developed its core business by focusing on know-how and innovative technologies in the areas of biomass fractioning through dry or wet processes. After several years building this expertise at the laboratory and pilot scale, from an economic and environmental point of view, and closely linked to an understanding of the techno-functional properties of the products, the conversion of different types of biomass resulted in processes with growing impact on the value chain.

Proof of concept examples were presented to several French and international manufacturers. Some of these developments have even been patented, six since 2020.

2022 saw the development of several industrial projects:

→ Completed construction of a dry fractioning plant for seeds and legumes

allowing for production of protein concentrates. The entire process was laid out by IMPROVE. It uses, notably, a grinder co-developed and patented with the company POITTEMILL. Production at the factory in Bulgaria is scheduled to begin in Q2-2023. It will be carried out with active support from IMPROVE.

→ Industrial opening in Spain of a legume fractioning workshop.

It uses, notably, a grinder co-developed and patented with the company POITTEMILL.

→ Creation of an industrial demonstration unit in Canada

for our patent on the production of 2nd generation pea protein isolates The workshop will begin production in Q1-2023 with IMPROVE's support.

→ Signature of a licensing agreement for Europe for the patent to produce protein isolates from legumes.

The client confirmed that the samples produced with this technology are superior in quality to those currently on the market.

→ Two other projects using IMPROVE's technologies and know-how in the area of dry fractioning

are currently in their installation phase. Planned opening dates for the lines are late 2023 and 2024.

→ Several advanced contacts are looking to transfer new technologies to manufacturers in the area of organoleptic improvement.

of flour or protein concentrates, or allow for better control of the density and size of particles in the flour. A client has already signed a license agreement for these two patents.

IMPROVE is currently working to develop its internal "pipe" innovation in order to prepare the next technology transfer contracts.

05

For
a more competitive sector

By collective innovation and industrial transfer

In a global economic environment that's constantly evolving, the competitiveness of industries is a crucial challenge to ensuring a country's economic prosperity. **Collective innovation and industrial transfer** are two necessary levers to increasing the performance of companies.

Collective innovation brings together competencies and creates synergies, encourages the emergence of new ideas and new solutions in phase with the needs of companies.
Industrial transfer, on the other hand, allows for rapid dissemination of the state of the art, the results of research and innovation, to companies to help improve their productivity and competitiveness.

These two approaches allow companies to adapt to new challenges and save time and money while benefitting from the latest scientific and technological advances.

Boost industrial competitiveness through scientific progress

Our research and innovation activities

The ITERG Group promotes the competitiveness of companies through research and innovation, giving them access:

- to cutting edge technology platforms from the laboratory to the industrial scale.
- to multidisciplinary skills from idea generation to market applications.
- to high-level collaborations
- to knowledge updates through monitoring systems and training programs.

The R&D actions carried out by ITERG collectively for the sector or in a more competitive way in B2B by the entire group, meet the requirements of sustainability, preservation of natural resources, development of biomass (oils, proteins and derivatives), and safety and quality of downstream products.
As an Industrial Technical Center, ITERG carries out general interest missions in accordance with the Research Code. They are intended to support the industrial fabric in innovation to accompany the technological and societal changes. Thus, ITERG's mission is to promote and organize studies in the area of oilseeds, responding to the general interest concerns of primary processing industries that produce vegetable oils, margarines, and plant-based proteins and those involved in lipochemistry.

ITERG participates in the FNCG Technical Committee (Fédération des Industries des Corps Gras) that brings together manufacturers from the plant-based fats production and transformation sectors. These committees are an opportunity for productive dialogue on the orientation and results of collective research carried out by ITERG.
By working in close proximity with the professional federation, ITERG enjoys a better understanding of the needs and expectations of companies in the sector so that it can offer relevant and well-adapted services.

In parallel, regular contact with our clients or in the framework of B2B prospecting with manufacturers in our sectors, allows us to measure industrial priorities and understand more clearly the expectations of each market and the related challenges.

Finally, the ITERG Group participates in various initiatives to structure the plant-based proteins sector in France (AFNOR, vegetable proteins barometer, Idéathon). These are also opportunities to share and discuss trends, innovations, and questions related to research in the sector.

Academic and industrial resourcing: the motor for enlightened research

ITERG benefits from upstream resourcing through collaboration with academic partners and downstream resourcing with industry. It's the interface between research and industry.

Upstream resourcing is provided by doctoral theses and multidisciplinary research projects. The goal is to develop new knowledge, technologies, and innovations to meet the industry's needs in the future.
Integration in the Carnot 3BCAR network and the JTU/RMT ACTIA are the foundation for this resourcing. It's also guaranteed within the framework of our collaborative projects with ANR, ADEME, Regions, Europe or through the technical centers with which we share common resourcing needs (Terres Inovia for example).

The downstream resourcing aims to remain connected to the state of the art in industry.
Manufacturers, whose knowledge is complementary to our own, enable crossed resourcing and mutual enrichment on the basis of our particular skills.
Finally, our material suppliers related to "processes" in France and abroad allow us to quickly acquire and benefit from usage experiences.

Support from the Regions

ITERG's scientific and technical resourcing is co-financed by the Nouvelle-Aquitaine Region and the European Union with the FEDER: Green chemistry, Nutrition & Health, Formulation, Environment and Processes.

UNION EUROPÉENNE
RÉGION Nouvelle-Aquitaine
L'Europe s'engage en Nouvelle-Aquitaine avec le Fonds européen de développement régional

IMPROVE has received European Union financing within the framework of the Opérationnel FEDER-FSE Picardie program designed to support companies after the Covid-19 pandemic and was thus able to invest in the purchase of more equipment needed to carry out its services.

(See the new equipment appendices).

UNION EUROPÉENNE
Financement dans le cadre de la réponse de l'Union à pandémie de COVID-19
l'Europe s'engage en Hauts-de-France avec le FEDER

Theses in progress

SACCHOIL
Bio-based amphiphiles that combine oligosaccharides and fatty acid derivatives **Manon CARRÉ**
Academic partner:
Henry CRAMAIL, UMR 5629 LCPO CNRS, Bx INP et UBx.

FOLIDE
Functionalization of depolymerized lignin, doctorate by **Maëva PELOILLE**.
Academic partner:
Henry CRAMAIL, UMR 5629 LCPO CNRS, Bx INP et UBx.

PROLIDIA
Lipid-protein interactions from oilseeds, doctorate by **Lina TOUTIRAIS**.
Academic partner: Stéphane WALRAND –Head of theDiet, Muscular Health, and Sarcophenia team
(ASMS; JRU 1019 / Human Nutrition Unit).

2022 Thesis Prize

On June 16, 2022, the scientific board of GERLI (Groupe d'Etude et de Recherche en Lipidomique) awarded the thesis prize SFN-GERLI to Chloé ROBERT, PhD, for her work entitled *"Plant-based lechitins as vectors of linolenic alpha acid: metabolic and inflammatory impacts related to intestinal bioavailability."*, carried out under the co-direction of Marie-Caroline MICHALSKI (CarMeN Laboratory, Lyon) and Carole VAYSSE, Head of Nutrition, Health & Biochemistry of Lipids at ITERG.

Offering appropriate solutions to companies in the sector to increase their performance and attractiveness

Evaluating the technical potential of raw materials for the protein ingredients market

All the industrial processes of protein-ingredient production are based on a common principle: maximize the potential of the raw materials. However, seed performance varies greatly depending on the variety and the soil and climate conditions. The inherent complexity of plants implies that the chemical composition of the seed alone is not enough to predict the resulting technological performance.

For example, IMPROVE showed that identical legume seeds in terms of protein that are processed in the same conditions can produce outputs that vary by 10% for the same quality of protein concentrate. The influence the variety has on the taste or functionality of ingredients was also demonstrated using methods developed by IMPROVE.

This varietal selection is even possible in an emerging sector as long as the profitability for all the actors in the value chain is established.

The emblematic example is fava beans, whose development is problematic because of the presence of two molecules that are toxic for certain populations: **vicine and convicine**. Having seized the opportunity this seed represents for the human diet sector, certain varieties with low **vicine and convicine** content have been developed. These varieties are now the basis for the industrial installations and projects under development that aim to produce fava bean protein flours, concentrates or isolates.

Whether for quality, output, or organoleptic, nutritional, and economic problems, it's crucial to control sourcing in the production processes for protein ingredients.

For this reason, IMPROVE developed a panel of tests and analyses that can qualify a source for the protein ingredients market. Whether it's evaluating the potential of oilseeds, protein producing seeds, or grains, IMPROVE is now able to predict the output, composition, functionality and applicative value of these raw materials for the isolate and concentrate market.

- Jean-Charles MOTTE

Head of the Dry Fractioning Sector, IMPROVE

Did you know?

Vicine and convicine are molecules specific to fava beans that can cause hemolytic reactions to genetically sensitive individuals.
They are implicated in the phenomenon of "favism" (*an endemic illness in many countries in the Mediterranean basin and Africa*).
These are antinutritional factors that cause reduced digestibility of fava beans in non-ruminants and negative effects on performance for species that lay eggs.
The dosage of these compounds is therefore very important to evaluate the nutritional qualities of different varieties of fava beans.

We carry out an analysis by HPLC UV detection on all matrices containing fava beans, mainly flour.

Control of the crushing processes

ITERG contributes to different works projects out in partnership with Terres Inovia. The goal is to produce shelled rapeseed and sunflower oil cakes with different levels of oil removal for nutritional and zootechnical testing.

Two levels of shelling:
50-60% (*mid range*) and 80-90% for high-range.

Two levels of oil removal:
9-11% (*standard level*) and 5-6% for the improved level

Shelling is a great lever to concentrate proteins in oil cakes. The protein content varies between 39% - 45% MS for rapeseed oil cakes and from 42-53% MS for sunflower oil cakes, while generally, unshelled oil cakes are respectively around 33% and 27%.

The raw materials obtained using this method for producing oil cakes can be real alternatives to soy oil cakes for raising livestock. Nonetheless, nutritional and zootechnical tests are still necessary to confirm their true potential in comparison with soy oil cakes, that remain the reference.

- Alexandre CAVACO-SOARES
Head of the Primary Processing R&D Department, ITERG

Focus on

Our 1st Processing Workshop

ITERG offers a 1st Processing technical platform that, in particular, prepares the seeds before pressing, grinding, shelling, cooking, and extrusion.
This preliminary preparation offers an essential advantage to optimize the oil output without using extraction solvents.

ITERG defines a technical itinerary directly with the manufacturers according to their matrices and market constraints.

170 Tons
of seeds pressed in 2022

from two dozen plant varieties, both conventional and more atypical: sunflower, rapeseed, sweet almonds, camelina, hemp, fruit seeds, legume seeds, exotic fruits, etc.

ITERG is monitored by Ecocert Greenlife SAS, in accordance with the COSMOS standard.
(see the four related services on page 18)

Transfer knowledge and skills to ensure the future of companies.

Training and audit-consultancy are essential tools to ensure the effective transfer of knowledge and improve the company's best practices. Beyond levelling-up skills and practices, ITERG also offers full support over the different production stages up to the industrial level.

Professional training

It's provided by the ITERG group on an inter-company basis or on a customized basis within a company. In collaboration with ENSMAC, ITERG also organizes introductory training courses in the option " *Lipids and Industrial Applications Specialization* " with students in their third and last year of engineering.

A training session on alternative proteins was organized on December 9, by Frédéric BAUDOUIN (IMPROVE) and brought together 52 professionals from six countries.

In 2022, it was

102
People trained

Out of a total of,

10
Trainings on widely varied themes

- Composition & properties of fatty substances
- Overview of vegetable oils
- Virgin olive oils
- Refined oils, frying oils, edible vegetable oils
- Alternative proteins

Audit-Consulting

This activity within the ITERG Group is based on a team that can be mobilized on very diverse questions:

- optimizing a process (*extraction, frying*),
- developing a raw material (*seed, fruit, co-product*),
- improving efficiency and quality (*lipid and protein matrices*).

The auditors create a status report on the situation and offer advice, paths for improvement, or innovative solutions. They guide clients through implementation of the adopted solution and the industrial transfer.

In 2022, these audits were carried out in a dozen companies in different sectors: oils, agro-food, and cosmetics.

Did you know?

SEPTEMBRE
28

Qualiopi
processus certifié
RÉPUBLIQUE FRANÇAISE
Le certificat Qualité a été délivré au titre de la catégorie d'action suivante :
ACTIONS DE FORMATION

Since September, ITERG is Qualiopi certified.

The Quality certificate was delivered according to the following action categories:

TRAINING ACTIONS

Discover our online catalogue!

Developing processes and scaling them up to the pilot and semi-industrial level

The study of processes at the pilot and semi-industrial scale are essential in transitioning an idea or innovation into a feasible commercial production. They allow us to optimize the steps in the production process and demonstrate the technical and economic feasibility of a project before it goes into production on a large scale.

Developing processes and scaling them up to the pilot and semi-industrial level is tested on the Green Chemistry platform in order to best meet the expectations and demands of our industrial partners.

In 2022, the developments were focused on:

- the hydrogenator:
  • scale 300L => Tests and development of plant-based extraction
- the SKID A reactor
  • optimizing the synthesis processes for bio-based polymers
- the distillation skid:
  • rectifying distillation of complex mixtures.

- Guillaume CHOLLET

Department Head
Industrialization and Research & Development, ITERG

Standardization

Analytical standardization guarantees product quality to manufacturers and clients based on reliable, standardized methods of analysis.
As an Industrial Technical Center, ITERG must act as a reference laboratory for the professions, particularly in the event of a commercial dispute or international crisis.
The provision of effective analysis methods, which are validated and recognized through standards, enable this mission to be accomplished. It is also a valuable operational capacity for all industrial players in the event of a health crisis.

In 2022, the new project NP 20122 by the International Standards Organization (ISO) - Vegetable Oils -- Dosage of Mineral Oil Saturated Hydrocarbons (MOSH) and Aromatic Hydrocarbons (MOAH) with in-line HPLC-GC-FID coupling analysis -- Method for low-limit quantification" was approved by members of the committee for inclusion in the ISO TC34/SC11 committee "Animal and Vegetable Fats and Oils" as a new area of work.

This standardized method, internationally recognized and validated, specifies a dosage procedure for Mineral Oil Saturated (MOSH) and Aromatic Hydrocarbons (MOAH) (from C10 to C50) in vegetable fats and oils using in-line HPLC GC-FID coupling. *(see page 28)*

CONGRATULATIONS!

Following Florence LACOSTE'S retirement,

Lionel LAGARDÈRE was named

Chair of the AFNOR /60C Commission *"Animal and vegetable origin fats"* for a period of three years *(January 2023 to December 2025)*.

Monitor & Answer questions

Scientific, technological, regulatory and standards monitoring is carried out by ITERG on behalf of companies that produce and process oil and derivatives in the framework of general interest missions, and for users of oilseeds and pulses.
This monitoring, along with answers to science-related questions, allows all the ITERG personnel, including researchers and project managers, to stay up to date on changes that could impact companies in the short, middle, or long term.
For the last two years, the monitoring has been extended to include issues related to vegetable proteins.

The Questions and Answers service is highly appreciated by companies in the sector and subscribers.
In 2022, that represented:

250 **replies from the Monitoring Info-Comm unit in response to external questions.**

Did you know?

ITERG offers a membership service allowing members to follow developments in the realm of vegetable oils and plant-based proteins through different documentary products delivered regularly.

Scan to discover our subscription offer!

Participation in public or professional expert committees

ITERG participates in prominent expert committees, both in national bodies and in national and international professional entities.
Through participation in these committees, our experts contribute to discussions and decision-making on public-interest issues.

In 2022, ITERG was represented in the following groups of experts:

- **ANSES** (*National Agency for Food, Environment, and Occupational Safety*) The "Evaluation of Substances and Processes Subject to Authorization as Human Food - (ESPA)" working group - The "3rd Total Food Study (EAT3)" working group
- **BIPEA** (*Inter-professional Analytical Studies Bureau*) The Technical Committee of the "21 - Fatty Substances" circuit
- **Terres Univia** : Human Food Committee
- **FOSFA** (*Federation of Oils, Seeds and Fats Associations*): Technical Committee
- **FNCG** (*National Federation of Fatty Substance Industries)*: The Technical Committee.

Saipol

www.saipol.com

SAIPOL Testimonial

SAIPOL is the leading French company for processing oilseeds, especially rapeseed and sunflower, and one of the leaders in Europe in crushing, refining vegetable oils, and producing biodiesel.

A subsidiary of the AVRIL Group, SAIPOL develops solutions for its clients by commercializing edible vegetable oils and derivatives, oil cakes that are rich in proteins, and renewable energies with low carbon emissions (biodiesel Diester®, Oleo 100).

To maintain our postilion as a leader in these areas, we depend on the expertise of Technical Centers like ITERG that provide resources and a reliable and undeniable expertise in the processing of oilseeds.

We collaborate with ITERG on various themes from physical/chemical characterization to industrial feasibility studies on processes and their demonstration.

Beyond the undeniable expertise, flexibility, and accessibility, the teams provide dialogue and help build the relevant research and development programs we need to unlock techniques and processes before industrial implementation.

The partnership with ITERG is thus long-term because it allows SAIPOL to experiment with innovative technologies that enable it to meet society's expectations regarding diet and low carbon emission energies.

- Sophie SAMBOU

Innovation Project Manager, SAIPOL

06

People are at the heart of our performance and success

Our priorities:
- safety and quality of work life,
- client satisfaction.

ITERG is committed to a CSR approach that integrates social, environmental, and economic concerns by placing people at the heart of its activities and decisions.

To do that, we are careful to take into account the safety and quality of life at work for our collaborators while also guaranteeing the loyalty and satisfaction of our clients.

We place client satisfaction at the center of our concerns.

Client satisfaction is assessed through the number and type of client complaints received and through different types of questionnaires.

ITERG considers and follows up on all complaints from its clients according to the stipulations of the ISO 9001 standard.

To assess client satisfaction, ITERG talks to clients in all its activities each year by implementing various tools such as rating scales and annual client satisfaction surveys through written questionnaires or telephone interviews.
Listening to customers is the daily task of our mission/ business managers and heads of departments.

The information collected during these phone interviews is shared in internal meetings, and business and commercial meetings.
Customer feedback actions are also scheduled throughout the year (*site visits, trade fairs, business conventions, information days, targeted telephone feedback*).

ITERG strives to maintain and expand its Quality recognitions in order to meet the expectations of its interested parties.
All of its recognitions have been maintained for 2022, its Training activity have been certified by QUALIOPI, and the COFRAC accreditation has been extended to several methods.

Satisfaction within the Analysis & Expertise Department

The department's rating: **17/20**

out of **50%** of answers for **115 contacted companies**

Noted strong points

Competency and reliability of results **82%**

ITERG's reputation for **34%**

Availability, rapidity, and fluidity of communications

Satisfaction with the Training activities

An enriching year with **interns trained** **102**

85% responded to our customer satisfaction survey

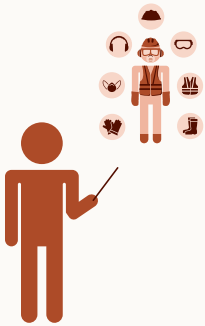
Training activities received a rating of **8.85/10**

Health and safety at work: a priority for everyone, a shared responsibility

Health and safety at work are essential to creating a safe, healthy, positive and productive work environment.

In 2022, behavioral audits focused on safety were implemented, These audits are a maximum of 15 to 30 minutes, are realized on all sites at unexpected times, and concern all collaborators.
The goal is for 100% of employees to undergo at least one audit per year. Immediate actions following these observations are the priority, but the QSE team also uses them for more global observations that could eventually lead to broader actions.

Beyond the actions carried out following the behavior audits, it is each person's level of being conscientious and acquiring good daily behaviors and practices that's targeted in this initiative.



OHS flashes are regularly delivered to collaborators by email. They give information on best practices, risks, and indicators regarding occupational health and safety.

Finally, safety training is still an important part of the training hours in the Skill Development Plan in order to maintain certifications and reflexes in case of work accidents/incidents: in 2022 they accounted for **36 % of the training hours for ITERG and 47% for IMPROVE.**

We also held 11 internal training sessions for new arrivals (35 people trained) on the issues of Health, Safety, and ATEX risks.

Working together to reduce our environmental impact

Mindful of reducing its environmental impact, ITERG raises awareness among its collaborators and instigated eco-attitude actions in its daily workings.
These eco-friendly practices are part of a CSR strategy that is more global, and based on company culture and the adoption of sustainable and ethical practices.

The eco-attitude behaviors include:

- the distribution of an internal newsletter and addition of a suggestion box to share ideas, hacks, and tips for a more eco-friendly attitude.
- limiting travel for collaborators by prioritizing virtual meetings.
- reducing paper consumption, limiting the number of photocopies and printing.
- information on the carbon footprint of emails and encouraging the sharing of documents in network spaces reserved for that purpose.
- encouraging ride-sharing among colleagues
- encouraging the use of alternative modes of transportation, like bicycles or public transport, to come to work *(specifically, indemnity per km for bicycles, reimbursing a part of public transport costs)*.

For personal fulfilment and collective performance

Quality of life at work

The ITERG group is particularly attentive to its collaborators' QLWC (*Quality of Life and Working Conditions*).
This includes paying particular attention to **work-life balance** (85% global satisfaction) and offering a dynamic plan for**career development**with at least one training every three years.

Our new collaborators follow an **integration path** that includes actions related to OHT awareness, quality, and also best practices for the IT system. The technical, scientific, and administrative staff also undergo training specific to the theme of vegetable oils and proteins. **Internal evolution is given priority and management training is provided to collaborators who are in a position to take responsibility for teams.**

An internal newsletter is distributed to all our collaborators in order to strengthen cohesion around a shared view of the stakes, the challenges, and the values of the Group. It allows us to pass information vertically and horizontally, and recognize collaborators by spotlighting their achievements and contributions to our collective success.

In a desire for transparency and to promote the engagement of our collaborators, following the monthly Executive Committee meeting, managers provide the key performance indicators (KPI) to their teams. These KPI are indicators of the structure's "health." They allow us to keep our results and goals aligned, and also serve to motivate commitment toward a common objective.

Finally, in terms of gender equality in the company, ITERG enjoys of a score of 89 points out of 100 on the scale given by the Labor Code.

A stimulating work environment and development opportunities: our employer brand

ITERG works to reinforce its attractiveness to the best talent and retain its collaborators.

An advantageous social policy

Promoting learning for future generations

Priority on work-life balance

Recognized expertise

Each year, the ITERG group welcomes around 15 interns with education levels from CAP to BAC +5 within its administrative services, laboratories, and chemistry and technology workshops. One of the goals of these internships is to prepare students to integrate the world of industry through guidance and providing them with the means to gain knowledge and skills in a professional situation.

By training students in cutting edge technologies and current industrial practices, the ITERG Group contributes to the performance of the next generation of professionals in the sector.

They are

8 in work-study

15 interns

recruited and trained

In 2022, a company video was filmed and broadcast on our networks. Our collaborators also gave testimonials on their experiences, the atmosphere at work, and shared professional anecdotes in dynamic and attractive videos capsules, based on good humor.

In late 2022, it was the IMPROVE collaborators that showed their daily life in the company.
Discover them now on our YouTube channels.

> ***"Company loyalty is a concept that's always hard to explain, but very strong at ITERG."***
>
> *- Statement from Christophe VINGHES*
> *Head of theLaboratory Analysis team*

Appendices

- Membres du Comité Scientifique d'ITERG

- Publications

- Communications orales

- Nouveaux équipements

- Contacts

Membres du Comité Scientifique d'ITERG au 15.12.2022

Présidente

Mme **Isabelle LEMARIE**, Directrice Qualité & Innovation, SAIPOL GROUPE AVRIL

Représentants des Pouvoirs Publics

Mme **Maud IACOMELLI**, Ministère de l'Agriculture et de l'Alimentation, DGPE/SDFE/SDFA/BGC
M. **Gary NORDEN**, Adjoint au chef de bureau, chargé de la chimie du végétal et des biotechnologies - Ministère de l'Economie et des Finances
M. **Thomas PILLOT**, Sous directeur de la chimie, des matériaux et des éco-industrie - Ministère de l'Economie - Secrétariat d'Etat à l'Industrie et au Numérique, DGE/SI
M. **Olivier STEMLER**, Chef du Bureau chimie, Matériaux et biotechnologies, DGE

Membres Industriels

M. **Henri BENATS**, Sales Manager Technical Applications, CARGILL
M. S**ylvain BRIDOUX**, Responsable Assurance Qualité, HUILERIES CROIX VERTE & TOURANGELLE,
Mme **Stéphanie BUREAU**, Directrice R&D et Affaires Réglementaires, SIO
M. **Edouard CASALA**, Responsable Affaires Réglementaires et Scientifiques, BUNGE
M. **Florent ETIENNE**, Responsable Qualité, Huilerie DE LAPALISSE
M. **Olivier GALET,** Responsable R&I Protéines, AVRIL
Mme **Martine JEAN**, Business Unit QA Manager, CARGILL OIL PACKERS
M. **Jean-Pierre LALLIER**, Responsable veille & Relations extérieures Innovation, OLEON
Mme **Béatrice LEMOIS**, Directrice Qualité R&D, Saint Hubert
Mme **Anne RENAULT**, Executive Coach, Conseil en Innovation et gestion de Crise, Evidence BY C
M. **Mickael WATIEZ**, Responsable Centre Recherche Innovation & Développement, LESIEUR

Instances Professionnelles

M. **Hubert BOCQUELET**, Délégué Général, FEDALIM, FNCG, SYFAB, GEPV
Mme **Corinne PEYRONNET**, Responsable Pôle AVAL, TERRES UNIVIA

Représentants des Pouvoirs Publics

M. **Frédéric BAUDOUIN**, Responsable du pôle analytique, IMPROVE
M. **Frédéric FINE**, Directeur Valorisation des Graines Oléagineuses, TERRES INOVIA
M. **Michel LAGARDE**, Professeur émérite, INSA Lyon
M **Fernando LEAL CALDERON**, Professeur Bordeaux INP, Directeur de Recherche UMR CBMN, Directeur laboratoire Clip'In
M. **Michel LINDER**, Professeur, ENSAIA Directeur du LIBio,
M. **Didier MAJOU,** Directeur, ACTIA
Mme **Marie-Caroline MICHALSKI**, Directeur de Recherche, INRA, GIS IMBL
M. **André POUZET**, Président ACTIA, membre correspondant de l'Académie d'Agriculture, section 1 Productions Végétales
Mme **Pascale SUBRA-PATERNAULT**, Directrice de Recherche, CNRS
M. **Pierre VILLENEUVE**, Chargé de Recherches CIRAD
Dr **Stéphane WALRAND** - Professeur d'Université - PH Université Clermont Auvergne et CHU Gabriel Montpied - UNH

Invités permanents

Mme **Isabelle CHASSEDIEU**, Chargé de Projets, FNCG
M. **Yves DELAINE,** Président, FNCG, IMPROVE, ITERG
Mme **Jennifer MICHAUD**, Chargée des Affaires Réglementaires et Scientifiques, FNCG
Mme. **Elodie TORMO**, Ingenieur Alimentation Humaine, TERRES UNIVIA

Publications

Lipochimie

- Biobased Symmetrical Fatty Amides for High Heat Deflection Temperature of Poly(l-lactide)-Based Materials
ACS Applied Polymer Materials 2022– J. Rubinstein, E. Grau, P. Dole, G. Chollet, V. Coma, H. Cramail

Technologie

- Bio-Refinery of Oilseeds: Oil Extraction, Secondary Metabolites Separation towards Protein Meal Valorisation—A Review
Processes, vol. 10, n°5, 2022 – N. Nehmeh, I. Rodriguez-Donis, A. Cavaco-Soares, P. Evon, V. Gerbaud, S. Thiebaud-Roux

Nutrition Santé

- Effect of Gum Acacia on the Intestinal Bioavailability of n-3 Polyunsaturated Fatty Acids in Rats
Biomolecules, vol. 12, n°7, 2022 – L. Couëdelo, C. Joseph, H. Abrous, I. Chamekh-Coelho, C. Vaysse, A. Baury, D. Guillemet

- Circulating Human Serum Metabolites Derived from the Intake of a Saffron Extract (Safr'InsideTM) Protect Neurons from Oxidative Stress: Consideration for Depressive Disorders
Nutrients, vol. 14, n°7, 2022 – F. Wauquier, L. Boutin-Wittrant, L. Pourtau, D. Gaudout, B. Moras, A. Vignault, C. Monchaux de Oliveira, J. Gabaston, C. Vaysse, K. Bertrand, H. Abrous, L. Capuron, N. Castanon, D. Vauzour, V. Roux, N. Macian, G. Pickering, Y. Wittrant

- La digestion des isomères de diacylglycérol par les lipases gastriques et pancréatiques et son impact sur les voies métaboliques de re-synthèse des TAG dans les entérocytes
Biochimie, 15 janvier 2022 – Jean-ClaudeBakala N'Goma, Leslie Couëdelo, Carole Vaysse, Marion Letisse, Véronique Pierre, Alain Géloen, Marie-Caroline Michalski, Michel Lagarde, Jean-David Leao, Frédéric Carrière

Communications orales

Formulation

Congrès Lipids & Cosmetics | Cécile Joseph ("New amphiphilic structures from non edible vegetable oil and properties evaluation" et Florence Lacoste ("Lipids and undesirable substances: quality control").

37ème édition du Club Emulsion 2022 | Cécile Joseph a présenté : un poster "New amphiphile structures from non-edible vegetable oil and properties evaluation" et une communication orale, aux côtés de Maud Sanchez de PIVERT, sur "l'évaluation et l'utilisation de poudres végétales en tant que stabilisants d'émulsions", dans le cadre de la nouvelle Alliance ChemBooster.

Marché des protéines

CFIA Rennes | Intervention de Frédéric Baudouin aux côtés de Foodinnov à la conférence «*Alternatives à la viande et au poisson : défis et perspectives pour les protéines de demain*».

Bridge2Food Plant-based Foods & Proteins Summit Americas à Chicago | Intervention de Denis Chéreau le 11 mai : "*How can capturing plant-proteins 2.0 contribute to affordability & sustainability?* "

Panorama des protéines végétales Regards croisés entreprises/recherche | Présentation de Frédéric Beaudouin « *Caractérisation multi-dimensions des protéines alternatives* » et présentation de Florence Lacoste « *Développement d'une méthode d'analyse sensorielle des protéines végétales* »

SIAL | Intervention Denis Chéreau à session "Sial Talks" « *Les protéines alternatives : quelles origines pour quelles applications ?*»

Bridge2Food Plant-based foods & Proteins Summit Asia à Singapour | Intervention Danièle Karleskind à table ronde "*Moonshot 2030 Plant-based foods & the protein transition*" et communication orale : «*Being at the Forefront of Accelerating a Successful Food Transition to serve the world*».

Analyse

Journée Atelier du goût végétal à Institut Paul Bocuse | Intervention de Florence Lacoste "*Développement d'une méthode d'analyse sensorielle des protéines végétales* »

Webinaire ITERG | Florence Lacoste « *Validation des méthodes de détermination des hydrocarbures d'origine minérale*".

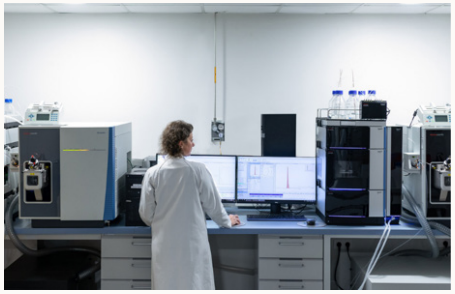
Environnement

Matinée Adebiotech sur les Sources d'énergies durables pour industries Biotech, chimiques et cosmétiques – Intervention de Fabrice Bosque : « Estimer sa dépendance aux énergies non renouvelables sur toute la chaîne de valeur par l'évaluation environnementale »

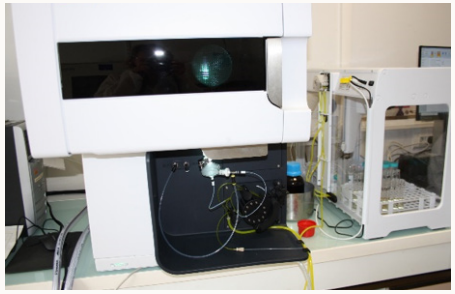
Nutrition Santé

Journée technique transformation bio à Pessac | Intervention de Benjamin Buaud « *Huiles alimentaires bio : intérêt nutritionnel et attentes des consommateurs* «.

Nouveaux équipements

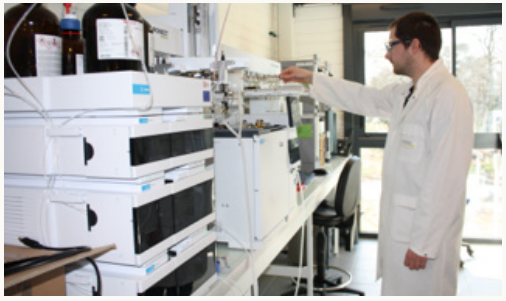


HPLC MS-MS



ICP-OES

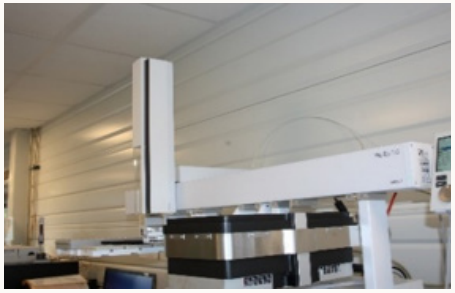
GC-FID



LC GC

Salle de culture cellulaire

GC MS-MS



PAL RSI 120

Homogéinisateur à Haute pression

Equipement financé par la région Nouvelle-Aquitaine et l'Unon européenne avec le FEDER

Abraseur pour du décorticage par frottement

Nettoyeur séparateur

Trieur optique (UV-Vis et Infra-Rouge

Broyeur pour huile hydrogénée

Pasteurisateur par échangeur tubulaire ou par injection de vapeur

Meule de pierre professionnelle

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Président IMPROVE

Paul-Joël DERIAN

Vice-Président ITERG

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Directeur Général IMPROVE

Jean-David LEAO

Directeur Général Adjoint ITERG

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Franck DEJEAN

Responsable
Département

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Lionel LAGARDERE

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Fractionnement par Voie Sèche

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À Canéjan

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Integrated Annual Report 2022

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