metagenopolis
mgps.eu

Harnessing gut microbiome science

For health & nutrition discoveries & innovations

MetaGenoPolis

Unité de recherche INRAE de Jouy-en-Josas
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by INRAE

We pionneer, We never settle

We are an INRAE microbiome research unit, opened to the private sector and academic communities

2008
Coordination of the MetaHIT project (1st catalogue of human gut microbial genes)

2011
Coordination of the International Human Microbiome Standards (IHMS)

2012
Creation of MGP funded by the French government 'Investissments d'Avenir' (PIA) (19 m€), including ICAN and UCLY partners

2013
Creation of Enterome

2014
Creation of Maat Pharma

2016
ISO9001 certified

2019
Prolongation of the PIA support (5.7m€)

2021
Creation of Novobiome

2022
Le French Gut project launch
ISO27001 certified

Scientific excellence is in our DNA

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+ 140 publications

H-index = 48
(>2012)

Home to **Highly Cited Researchers** 2021
Clarivate

Drug & Antibioresistance

2019: *Ruppé et al.* **Nature Microbiology**, Prediction of the intestinal resistome

2021: *Forslund et al.* **Nature**, Dose-dependent drug-microbiome association

Cancer

2018: *Routy et al.* **Science**, Microbiome and epithelial cancer immunotherapy
2018: *Gopalakrishnan et al.* **Science**, Microbiome and melanoma cancer immunotherapy
2020: *Derosa et al.* **European Urology**, Microbiome and Resistance to Cancer Immunotherapy in Renal Cell Carcinoma Patients
2021: *Messaoudene et al.* **Cancer Discovery**, A Natural Polyphenol Exerts Antitumor Activity and Circumvents Anti-PD-1 Resistance through Effects on the Gut Microbiota

Metabolic disorders

2012: *Qin et al.* **Nature**, Type II Diabetes
2013: *Le Chatelier et al.* **Nature**, Richness of gut microbes and metabolic markers
2014: *Qin et al.* **Nature**, Human gut microbiome alterations in liver cirrhosis
2015: *Qin et al.* **Nature**, Accurate liver cirrhosis diagnostic
2015: *Forslund et al.* **Nature**, Drug confounders in microbiome analysis
2016: *Pedersen et al.* **Nature**, Microbiome & insuline resistance
2020: *Vieira-Silva et al.* **Nature**, Microbiome and Statin therapy
2021: *Solé et al.* **Gastroenterology**, Alterations of Gut Microbiome in Cirrhosis
2021: *Fromentin et al.* **Nature medecine**, Microbiome and metabolome features of the cardiometabolic disease spectrum

Diet

2011: *Arumugam et al.* **Nature**, Enterotypes
2013: *Cotillard et al.* **Nature**, Impact of diet on gut microbiome
2013: *Le Chatelier et al.* **Nature**, Richness of gut microbes and metabolic markers
2019: *Cox et al.* **Gastroenterology**, Low FODMAP Diet in Inflammatory Bowel Disease patients
2020: *Meslier et al.* **Gut**, Beneficial effects of Mediterranean diet

Gut-brain

2021: *Rosario et al.* **Cell reports**, Gut microbiome and Parkinson's disease

Technologies

2010: *Qin et al.* **Nature**, The human gut reference catalogue
2013: *Sunagawa et al.* **Nature Methods**, Universal phylogenetic markers
2014: *Nielsen et al.* **Nature Biotech**, Method for identifying metagenomic species
2014: *Li et al.* **Nature Biotech**, 10 millions genes reference catalog
2015: *Xiao et al.* **Nature Biotech**, A mouse gut gene catalogue
2016: *Xiao et al.* **Nature Microbiology**, A pig gut gene catalog
2017: *Costea et al.* **Nature Biotech**, Standards for microbiome studies
2018: *Plaza Onate et al.*, **Bioinformatics**, Reconstitution of metagenomic pangenome species
2021: *Marcos-Zambrano et al.*, **Front Microbiol**, Identification of human health biomarker with Machine Learning

INRAE

Our mindset : science to serve innovation

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154 projects with private collaborators

3 spin-offs

Enterome — Microbiome Decoded • HealthCare Transformed

MaaT — Microbiota as a Therapy

NovoBiome — The Gut-Liver Company

36 patents

11 licences

CIR eligible

Crédit d'impôt recherche — Agrément CIR

ISO 9001 certified

Certified ISO 9001:2015 Company

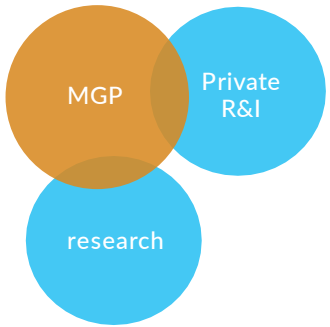
INRAE

Pushing further gut microbiome science to innovate with partners

We aim to be your trusful R&I collaborator to accelerate the development of gut microbiome-based innovations: from ideation to proof of concept studies

We ambition to be at the forefront of science to leverage as soon as possible scientific breakthroughs

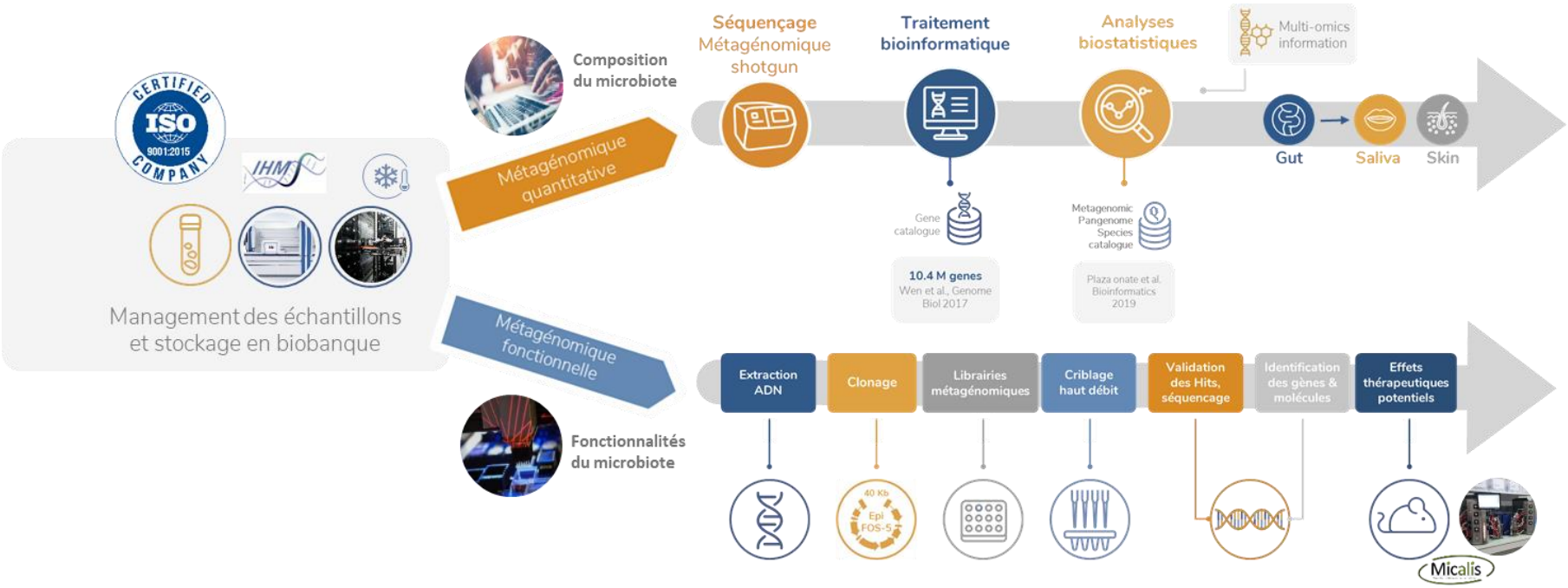
BRIDGING THE GAP BETWEEN BASIC & APPLIED RESEARCH



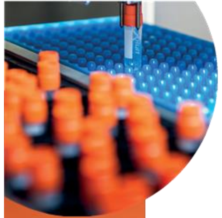
DOMAINS OF APPLICATIONS

- Elucidation of the modes of action of gut bioactives
- Personalization of medicine and nutrition (diagnostic & pronostic biomarkers)
- Development of gut directed bioactives (pro/pre/postbiotics & live biotherapeutics)

Focus on our metagenomic pipelines



OUR 5 INNOVATIVE PLATFORMS



OUR BIOSAMPLING & SEQUENCING PLATFORMS

Compliance of sample management to international standards (IHMS)

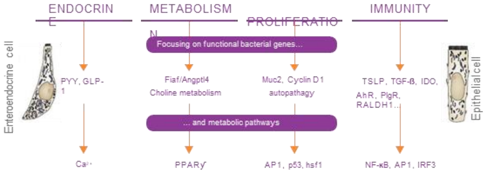
High throughput extraction performed in a P2 /L2 laboratory	Up to [illegible]00,000 biosamples & DNA storage capacity in a fully automated biobank, CRB labeled	Whole DNA sequencing with short and long read-based technologies

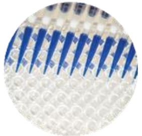
OUR FUNCTIONAL METAGENOMICS PLATFORM

An automated and certified process to explore interactions between gut bacteria & human cells

- High throughput screening of (meta)genomic libraries using cell-based reporter assays
- 75,000 clones ready to be tested (with unknown bacterial genes)
- 18 Metagenomic libraries from healthy & IBD subjects available

Assays reporting impact on immune parameters, inflammation, epithelial barrier, oxidative stress available



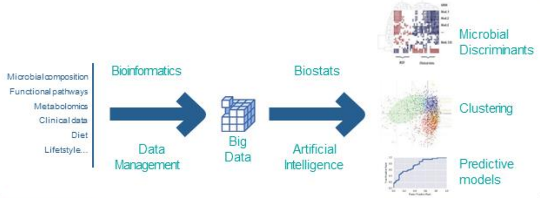


OUR COMPUTATIONAL PLATFORM

Our in-house state-of-the-art integrated meta genomic pipeline

Bioinformatics, Biostatistics and data science

- Computational capacity of 1,000 CPUs, > 2 petabytes storage space
- Use of Metagenomic species and strain level resolution
- Modeling and predicting changes in gut microbiome associated with disease
- Deepen the knowledge of the link with nutrition and gut microbiome
- Identify responders and non-responders individuals
- Build Guild & trophic networks
- Access to 20,000+ microbiome profiles (public & in-house) searchable for your project

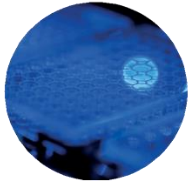


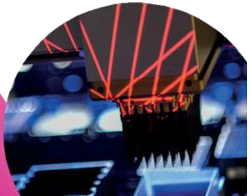
OUR COLONIC FERMENTERS PLATFORM

Artificial simulation of the intestinal tract (colon)

6 fermenters (in collaboration with INRAE MICALIS unit) available to:

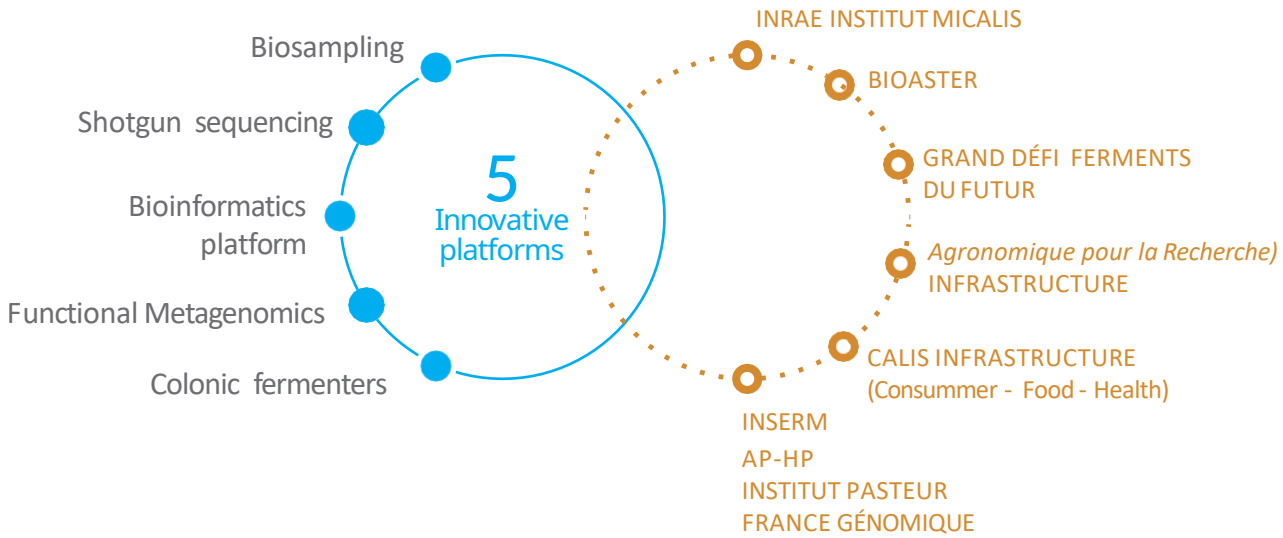
- Test bioactives on the gut microbiota composition and activities (metabolites)
- Isolate new strains as potential next generation probiotics
- Identify biological targets to develop gut microbiome modulators





We work in and with an ecosystem

We operate 5 innovative platforms which can be complemented by the technologies of our strategic partners



Pharmaceutical industry applications

Identification of bacterial biomarkers associated with dysbiosis: microbiome signatures used as a diagnostic or prognostic tools

Stratification of individuals to a better personnalized medecine: microbiome responders vs non responders, side effects of drugs

Impact of drugs on the gut microbiome: composition, functions, level of intestinal antibiotic resistance genes/resistome, resilience

Identification and culture of new species with function of interest: next generation probiotics...

Identification of microbial genes & metabolites able to interact with human cells: anti-inflammatory, antiproliferative, satiogenic, gut barrier effect ...

Identification of genes of interest for your product (probiotics, commensal bacteria...) *on targeted intestinal functions* (endocrine, metabolism, gut barrier, immunity)

Agri-food industry applications

Impact of prebiotics, probiotics, functional food on the gut microbiome: composition, functions, SCFAs...

Tracking of your probiotics and live biotherapeutic strains in the gut microbiome

Identification of probiotics of interest: new isolates/ mode of action

Stratification of individuals to a personalized nutrition: differentiation of good and poor responders to specific diet

Impact of various diet: fermented / vegan / low FODMAP/ mediterranean / high-fibers...

Guidelines to design a new functional food product benefic for the gut microbiome

Animal health : Impact of drugs, prebiotics, probiotics, food product on the gut microbiome

Academic & Private Collaborations

European Science projects

2018-2023 :
HomoSymbiosus |Symbiosis microbes - Human

2018-2024 :
GEMMA | Autism

2018-2025 :
MicrobPredict | Liver diseases

2021-2025 :
Human Microbiome Action

Some of our industrial partners

Some of our (disclosable) success stories

With our private collaborators

We identified potential microbiome targets involved in the gut brain dialog

- doi: 10.1016/j.bpsgos.2022.01.009

We developed a gut microbiome-directed bread enriched with rationaly selected fibers

- doi: 10.1080/19490976.2022.2044722

We deciphered the effects of a prebiotic on the gut microbiome

- doi: 10.1002/mnfr.202101091

We investigated the effects of a drug (diosmectite) on the gut microbiome

- doi: 10.1186/s12866-022-02464-7

With our spin-off start-ups

We support the French biotech sector by helping our sisters start-ups

- MaaT Pharma is the first biotech company to initiate a Phase 3 trial in haemato-oncology with a microbiome-based biotherapy

Le microbiote français
Le French Gut

National contribution to collect 100,000 faecal samples and associated nutritional and clinical data by 2027

Project initiated by MetaGenoPolis-INRAE and supported by INRAE

Consortium le French Gut

INRAE consortium with public institutions (APHP, INSERM, Pasteur) and 9 private partners

Pilot phase in 2022

A first phase of 3000 participants will be launched in 2022

INRAE · Assistance Publique Hôpitaux de Paris · Inserm · Institut Pasteur

Lallemand · Danone Nutricia Research · Gnosis by Lesaffre · Biocodex · Biofortis · Nahibu · gmt · Nexbiome · Greentech

INRAE | Le microbiote français Le French Gut

Expand your R&I with us...

Let's co-build!

Business developer & strategic partnership manager:
karine.valeille@inrae.fr

We tailor our pipelines & tools to the needs of our partners

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Work in progress

HUMAN SKIN

ADULT GUT

- *10.4 M genes*
- *1990 species*

Coming soon

HUMAN ORAL

INFANT GUT

13 M genes

Internal catalog

Work in progress

CHICKEN GUT

MOUSE GUT

- *2,6 M genes*
- *541 species*

13 M genes

COW RUMEN

PIG GUT

7.7 M genes