



INFRAFRONTIER

**Strategic
Roadmap**

2026 – 2031

In memory of
Prof. Dr. Johannes Beckers

This Strategic Roadmap is dedicated to the memory of Johannes Beckers, whose vision, commitment, and invaluable contributions helped shape its development.

His dedication to INFRAFRONTIER and to advancing our shared scientific mission is reflected in these pages and will continue to inspire our work for years to come.

With gratitude, respect, and fond remembrance.



**“... From *models* to
causal mechanisms,
from *mechanisms*
to *medicine* ...**

INFRAFRONTIER is the **European non-profit research infrastructure** for the **generation, phenotyping, archiving and distribution** of **rodent models** for academia and biomedical industry. More than 20 partner institutes across Europe, Israel and Canada provide services in the areas of



provision of
disease models,



systemic and
specialised
phenotyping,



archiving and
distribution of
rodent models.



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Directors' Foreword

“... INFRAFRONTIER is *Europe's research infrastructure* for modelling health and disease ...

Our mission is to advance human health by providing solutions for high-quality research on disease mechanisms, prevention and therapy development through state-of-the-art rodent model systems, complementary *in vitro* approaches, and increasingly data-driven technologies. We supply integrated resources, services, training, and data that enable researchers to uncover causal mechanisms of health at the organismal level. INFRAFRONTIER's high quality standards **support robust and reproducible *in vivo* experimental research across the research community** and addresses core components of the One Health concept.

The **establishment of INFRAFRONTIER ERIC in 2023** — following many years of coordination through the INFRAFRONTIER GmbH — marked an important step toward a stable, permanent European research infrastructure. With our appointment as Scientific and Administrative Directors in 2025, we see this moment as the beginning of a new phase for INFRAFRONTIER: one in which we build a stronger European Research Infrastructure Consortium (ERIC), expand our reach, and enhance our global impact on biomedical research.

In the coming years, our task is twofold. At the governance level, **we aim to grow INFRAFRONTIER ERIC by engaging additional Member States** — especially those long-

standing partners that already contribute to our network. At the scientific level, we will **integrate emerging capabilities** in translational research, *in vitro* systems, and *in silico* innovations into INFRAFRONTIER's established strengths.

This Strategic Roadmap 2026 – 2031 sets out how INFRAFRONTIER ERIC will move forward through four coordinated dimensions:

- **Core Excellence** to future-proof our core strengths in model generation, phenotyping, and archiving/distribution
- **Integration** of new scientific and technological capabilities — including translational services, Advanced Therapy Medicinal Product (ATMP)-related activities, *in vitro* and complex model systems, and digital innovation
- **Digital Transformation**, enabling AI-driven analysis and laying the foundations for *in silico* modelling
- **Pan-European Expansion** of the ERIC through additional Member States and a stronger European community

Together, these developments will position INFRAFRONTIER as a **fully integrated Pan-European platform for precision disease modelling** — connecting animal, *in vitro*, and

digital models, and supporting biomedical innovation with global impact.

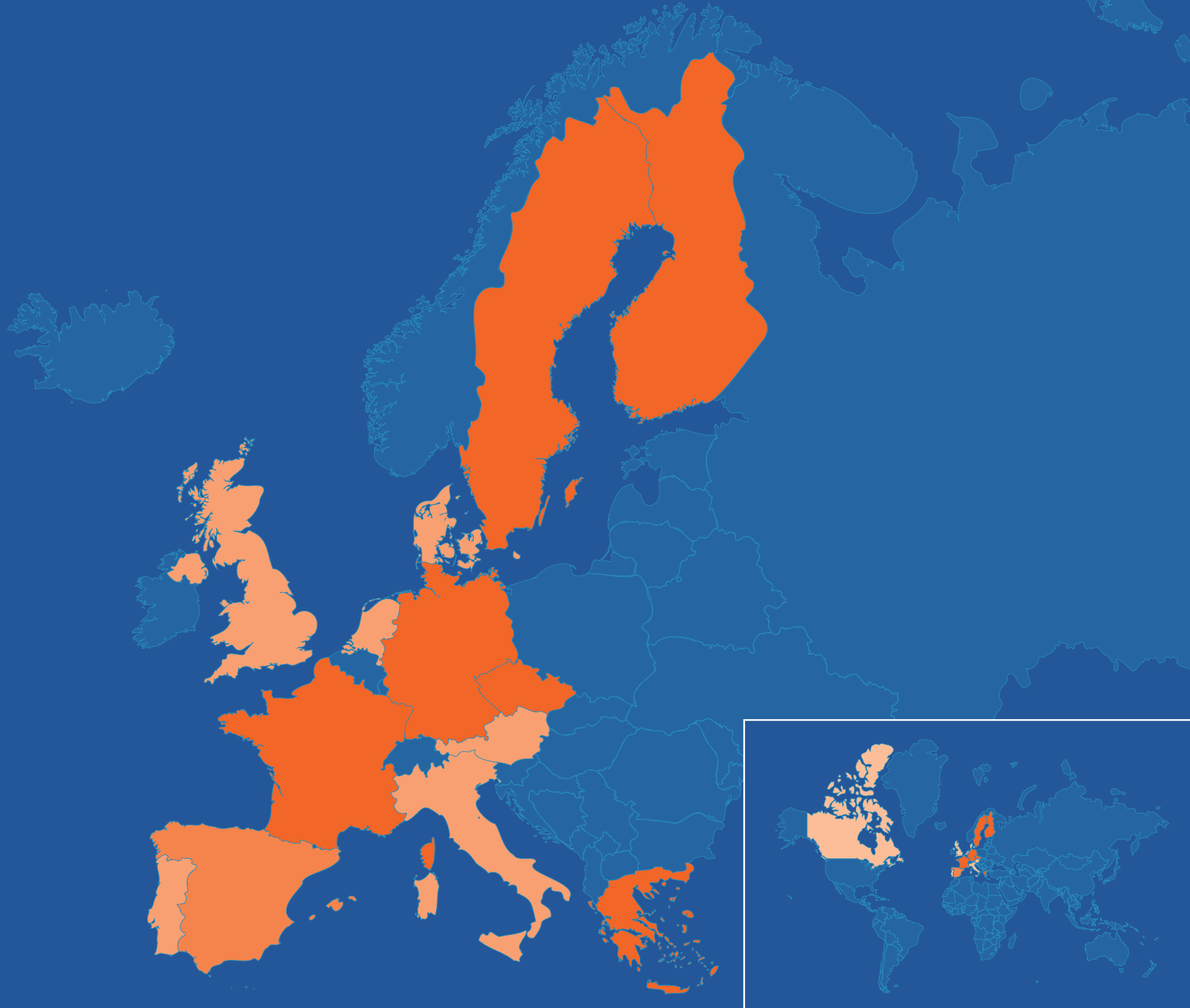
We look forward to shaping this future together with our Member States, partners and users.

Prof. Dr. Johannes Beckers, EMBA - Scientific Managing Director
Dr. Michael Raess, MSc - Administrative Managing Director

And the Directors of National Nodes:

Prof. Dr. h.c. mult. Martin Hrabé de Angelis,
 Dr. Alexander Espinosa,
 Dr. Yann Hérault,
 Prof. Dr. Reetta Hinttala,
 Prof. Dr. Dimitrios Kontoyiannis,
 Prof. Dr. Lluís Montoliu (observer),
 Prof. Dr. Radislav Sedláček,
 Dr. Ana Zarubica,





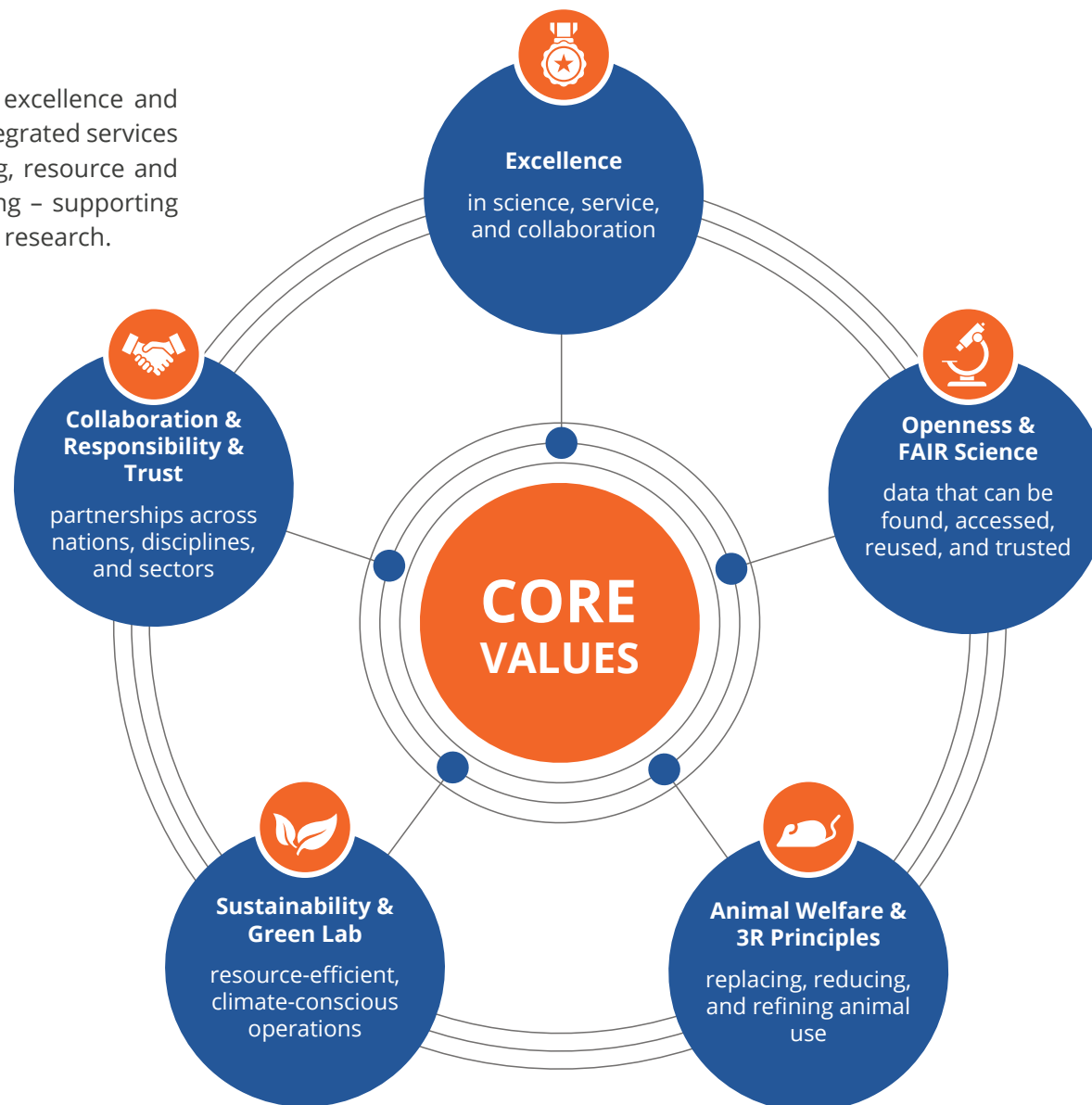
Vision, Mission and Core Values

“INFRAFRONTIER is *Europe’s central infrastructure for precision disease modelling* — integrating animal and complementary models, data analytics, and digital simulation into a coherent ecosystem for biomedical innovation.

Through *sustained excellence, ethical responsibility, and strategic growth*, INFRAFRONTIER will continue to *empower European biomedical science* — advancing from models to mechanisms to medicine.”

Our Mission:

INFRAFRONTIER enables scientific excellence and translational impact by offering integrated services for model generation, phenotyping, resource and data sharing, and *in silico* modelling – supporting the 3Rs, FAIR data, and sustainable research.



INFRAFRONTIER at a Glance

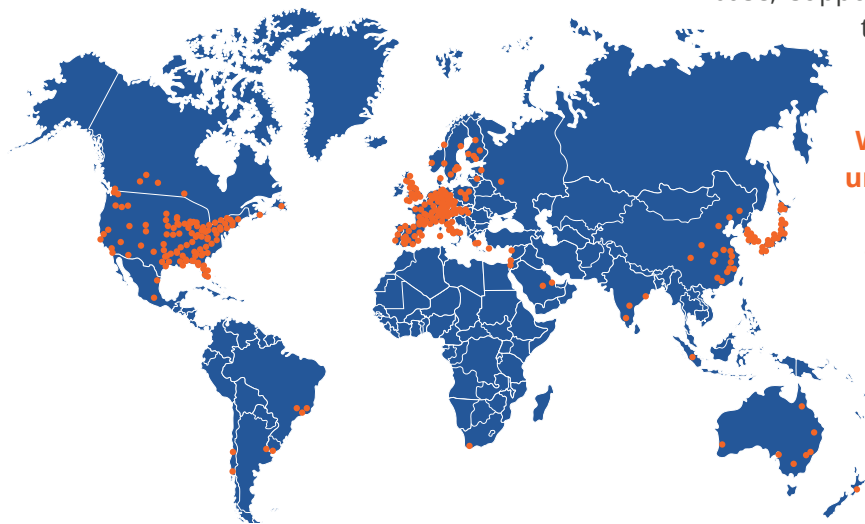
INFRAFRONTIER is a **European Research Infrastructure Consortium (ERIC)** in the field of biomedical academic research. We advance biomedical discovery by providing high-quality model systems, state-of-the-art phenotyping, and robust data resources that help researchers uncover disease mechanisms, develop preventive strategies, and accelerate therapeutic innovation.

Our strength lies in a Europe-wide network of leading research institutes, equipped with cutting-edge technologies for model generation, analysis, archiving and distribution. For more than a decade, INFRAFRONTIER has enabled thousands of research projects and contributed millions of **high-quality data points to the scientific community**. INFRAFRONTIER serves a global user base, supporting researchers on all continents through access to its services, models and data resources.

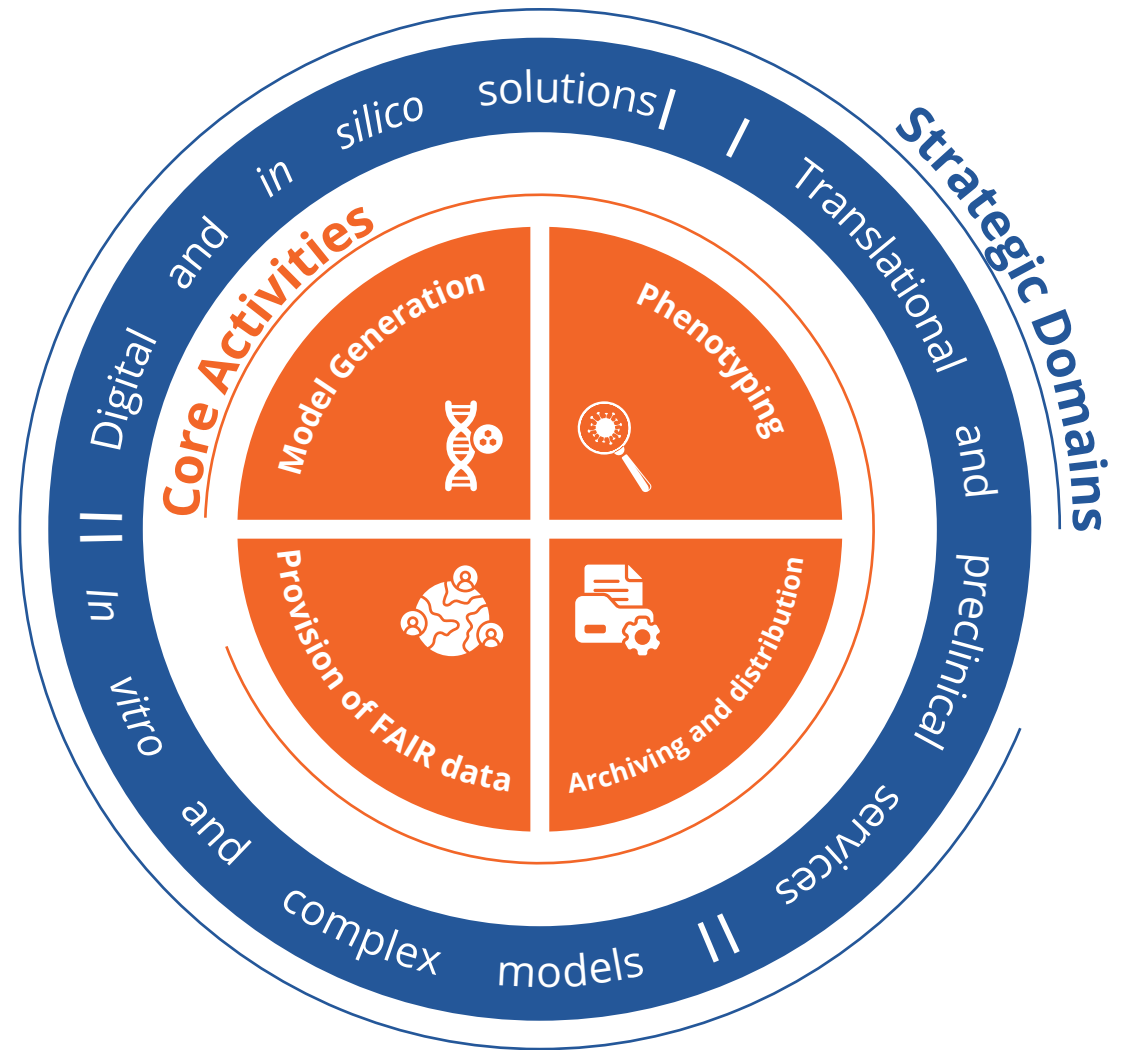
What makes INFRAFRONTIER unique

- A **strong Pan-European network** of 21 partner institutions across **15 countries (plus Canada & Israel)**, delivering sustainable access to models, data, and expertise.

- **Advanced model generation** using state-of-the-art genome engineering and humanisation technologies.
- **Systemic and specialised phenotyping** across organ systems, powered by imaging, automation, and AI-assisted analysis.
- **The European Mouse Mutant Archive (EMMA)** — one of the world's largest and most trusted academic repositories for mouse lines.
- **Portfolio of integrated and complementary services and trainings** essential for the relevant research community of mammalian genetics and model use.



“... advanced rodent model generation, systemic as well as specialized phenotyping and archiving and distribution of models that mimic health and disease are the core services of INFRAFRONTIER ...



The Integrated Model Landscape:

Combining *in vivo*, *in vitro* and *in silico* approaches

“... the *future of biomedical research* lies in a **synergistic and intelligent combination** of complementary *in vivo*, *in vitro* and *in silico* models ...

High-quality **animal models remain essential for understanding human disease**. In Europe, experiments in rodents may only be approved when **no scientifically valid alternative exists** — a principle firmly embedded in EU legislation (directive 2010/63/EU). This ensures that animal experimentation is limited to cases where it is indispensable for answering biomedical questions that cannot be resolved using alternative or complementary approaches.

Rodent models, and especially mice, have been **central to biomedical progress** for decades. A substantial proportion of research recognised with the Nobel Prize in Physiology or Medicine over the past 50 years relied on insights obtained from animal studies. Approximately half of these

achievements are directly linked to discoveries made in rodents. Their **genetic tractability, physiological complexity** and **systems-level responses** continue to **provide insights** that cannot be reproduced in simplified experimental systems.

At the same time, **complementary *in vitro* technologies** — including organoids, complex *in vitro* models (CIVM), and microphysiological systems — **offer major advantages**. They are often **faster**, experimentally more **flexible** and administratively **less demanding**. These systems allow the investigation of defined mechanisms in controlled environments, and they increasingly enable human-relevant experimental questions to be addressed.

INFRAFRONTIER occupies a unique position at the interface of these domains. By **integrating *in vitro* platforms with established *in vivo* expertise**, INFRAFRONTIER is ideally placed to address a major challenge: **the validation of *in vitro* systems**. Moreover, INFRAFRONTIER provides the ideal ecosystem in which to benchmark their translational relevance, harmonise protocols, standardise quality criteria, and make resources and training available to the wider community. Together, these activities create a **rigorous scientific framework** that enables complementary models to be used intelligently and responsibly.

Looking ahead, ***in silico* modelling** will become an **additional pillar of biomedical research**. Advances in AI, including machine learning and data integration are opening unprecedented opportunities for analysing complex biological datasets. While no computational models currently exist that can simulate complex biological organisms — let alone individual patients — the scientific foundations for this future are emerging rapidly. INFRAFRONTIER is committed to fostering this development by creating digital infrastructures, harmonised datasets and analytical tools that support predictive modelling.

We are convinced that the future of biomedical research lies in a **synergistic combination of *in vivo*, *in vitro* and *in silico* systems**. Each approach has distinct strengths, and together they form a powerful, complementary toolkit. By building an integrated infrastructure across these domains, **INFRAFRONTIER will help Europe lead the next generation of disease modelling** — accelerating discovery, refining translational science and advancing human health by providing knowledge, expertise and resources across the landscape of human disease models.

“ ... INFRAFRONTIER will *help* Europe lead the *next generation* of *disease modelling* ...

INFRAFRONTIER: Navigating the Future of Disease Modelling



The Strategic Compass of INFRAFRONTIER

Towards an integrated infrastructure for precision disease modelling

INFRAFRONTIER builds on **four long-standing pillars of activity**, which will remain at the heart of the infrastructure and will be further strengthened in the coming years:

- Generation of rodent models
- Systemic and specialised phenotyping
- Archiving and distribution of rodent models
- Provision of FAIR data

At the same time, INFRAFRONTIER is expanding into **three strategically important domains** that complement and extend these core strengths:

- **Translational and preclinical services**, including BSL-3 and microbiome platforms and models for Advanced Therapy Medicinal Product (ATMP) development
- **In vitro and complex models**, such as organoids, complex *in vitro* models (CIVMs) and other emerging methodologies
- **Digital and in silico solutions** that turn experimental data into predictive insights.

Together, these developments will enable INFRAFRONTIER to evolve from a primarily model-producing infrastructure into **Europe's integrated translational platform for precision disease modelling**. To pursue our Vision for 2031, we have formulated **eight strategic goals** that define the priorities for INFRAFRONTIER's activities in the coming years.

*“... in the next 5 years
INFRAFRONTIER will
position itself as
Europe's integrated
translational platform
for precision disease
modelling ...”*



Strategic Goals at a Glance 2026–2031



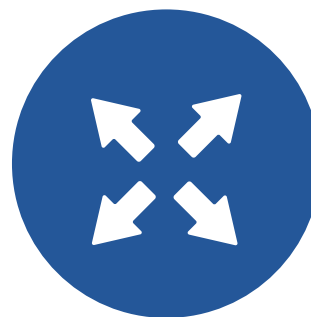
Goal 1
Strengthen and Innovate Core Services

Maintain excellence in model generation, phenotyping and archiving/distribution through continuous technological innovation.



Goal 2
Develop and Integrate Complementary Models

From complementary models, *in vitro* models, organoids to complex *in vitro* models (CIVM) – including validation against animal models.



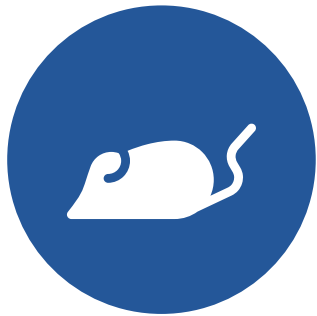
Goal 3
Expand Translational Capabilities

Bridge preclinical research and clinical relevance with advanced services for infectious, immune and ATMP-related studies.



Goal 4
Develop Data Analytics and *In Silico* Modelling

Transform phenotyping and omics data into predictive insights through big data integration and digital models.



Goal 5

Advance Sustainability, Animal Welfare and FAIR Principles

Embed 3R, Green Lab and FAIR data standards across all operations to promote ethical and sustainable research.



Goal 6

Build Capacity, Expertise and Governance

Expand membership strategically, strengthen internal cohesion and raise INFRAFRONTIER's visibility in the European RI landscape. Include "natural" partners that have successfully contributed to the success of INFRAFRONTIER in the past decade as full members of INFRAFRONTIER ERIC.



Goal 7

Partnership with Industry

Develop and offer services for start-up or scale-up industry, as well as pharma. Broaden our scope of funding opportunities and strengthen translational aspects.



Goal 8

Engage with Society

Address the societal burden of disease by engaging with patient and rare disease organisations, fostering transparency in animal research, and strengthening dialogue between biomedical science and society.



Goal 1

Strengthen and Innovate Core Services

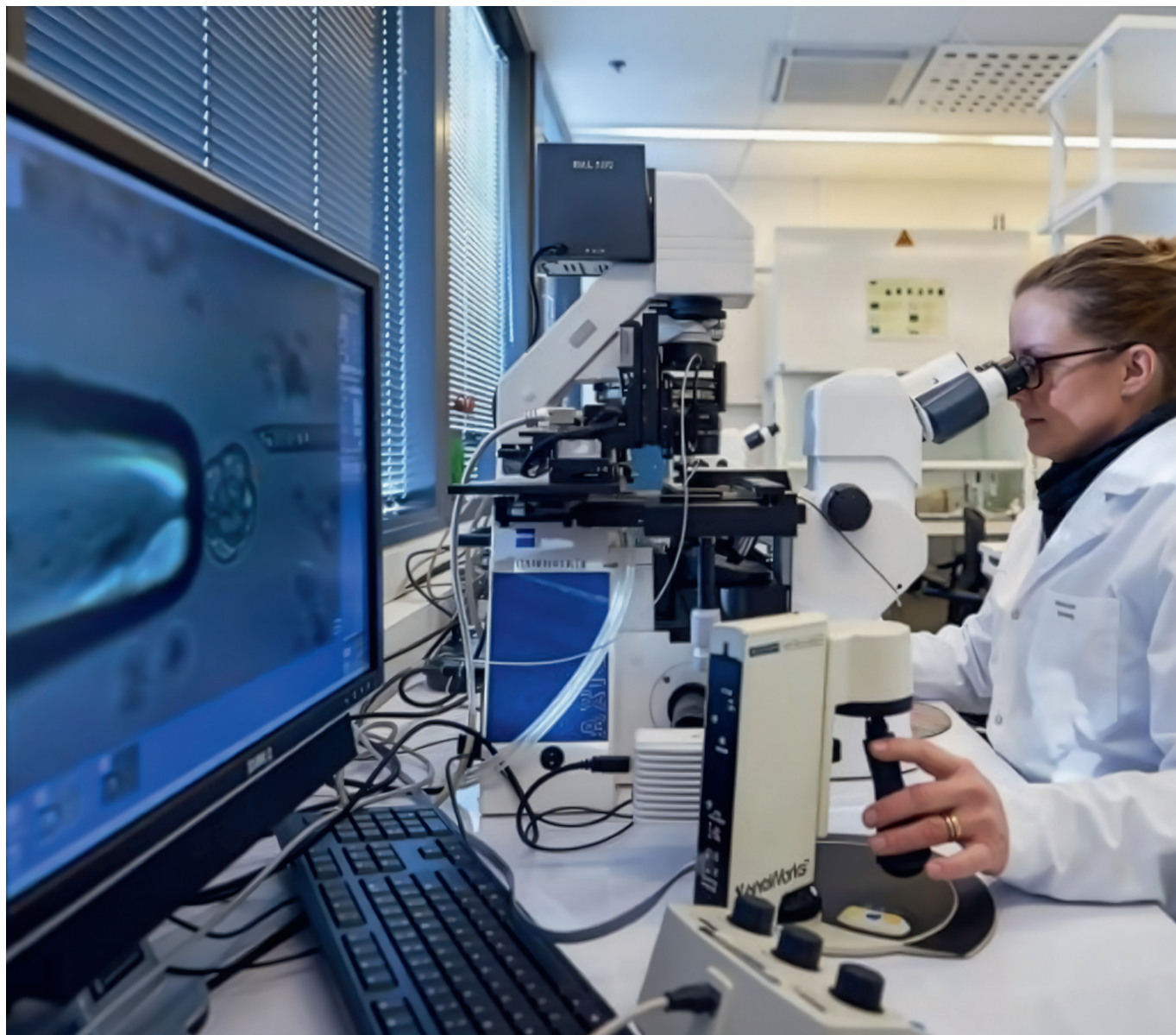
*... **keep** Europe's leading model-generation, phenotyping and archiving services **at the forefront** through **continuous innovation** and **excellence** ...*

Why it matters

INFRAFRONTIER's core services are the foundation of Europe's disease-modelling ecosystem. Strengthening these pillars **ensures scientific quality, reproducibility, and global competitiveness** — and enables all future developments in translational, *in vitro* and digital domains.

Our priorities

- **Advance genome engineering:** High-efficiency editing, humanisation, and next-generation model development.
- **Modernise phenotyping:** AI-assisted analysis, imaging innovations, deeper systemic profiling.
- **Improve cryopreservation:** Sustainable, reliable and harmonised solutions across the network.
- **Increase automation & quality:** Scalable, reproducible and standardised service delivery.
- **Reproducibility of animal experiments:** Continue to develop standards and controls for reliable and reproducible animal research.
- **Strengthen EMMA:** Enhanced archiving and global distribution capacity.





Goal 2

Develop and Integrate Complementary Models

In silico: AI & Machine Learning

In vitro: Organoids & CIVMs

In vivo: Systemic Models

Analysis

Prediction

Translation

“... expand INFRAFRONTIER’s scientific capabilities by *integrating complementary cellular models, and complex human model systems that enhance translational relevance and refine disease research* ...

Why it matters

Complementary models — from organoid systems to organ-on-chip technologies and complex human-based models — provide **essential mechanistic insight, increase translational precision, and reduce reliance on animal models.**

By integrating these systems with INFRAFRONTIER’s established strengths, we create hybrid experimental pipelines that bridge biological, cellular and digital domains.

Our priorities

- **Strengthen *in vitro* platforms:** Expand organoid, organ-on-chip and complex *in vitro* capabilities across the network.
- **Integrate complex human *in vitro* models (CIVM):** Develop, benchmark and validate complementary models alongside animal-based approaches.
- **Develop hybrid experimental pipelines:** Combine *in vitro*, *in vivo* and digital readouts for refined disease modelling.
- **Establish quality and validation frameworks:** Ensure reproducibility, interoperability and regulatory alignment for new model types.



Goal 3

Expand Translational Capabilities

*... strengthen INFRAFRONTIER's ability to **support preclinical and translational research** by expanding services that **bridge experimental models** with clinical and therapeutic development ...*

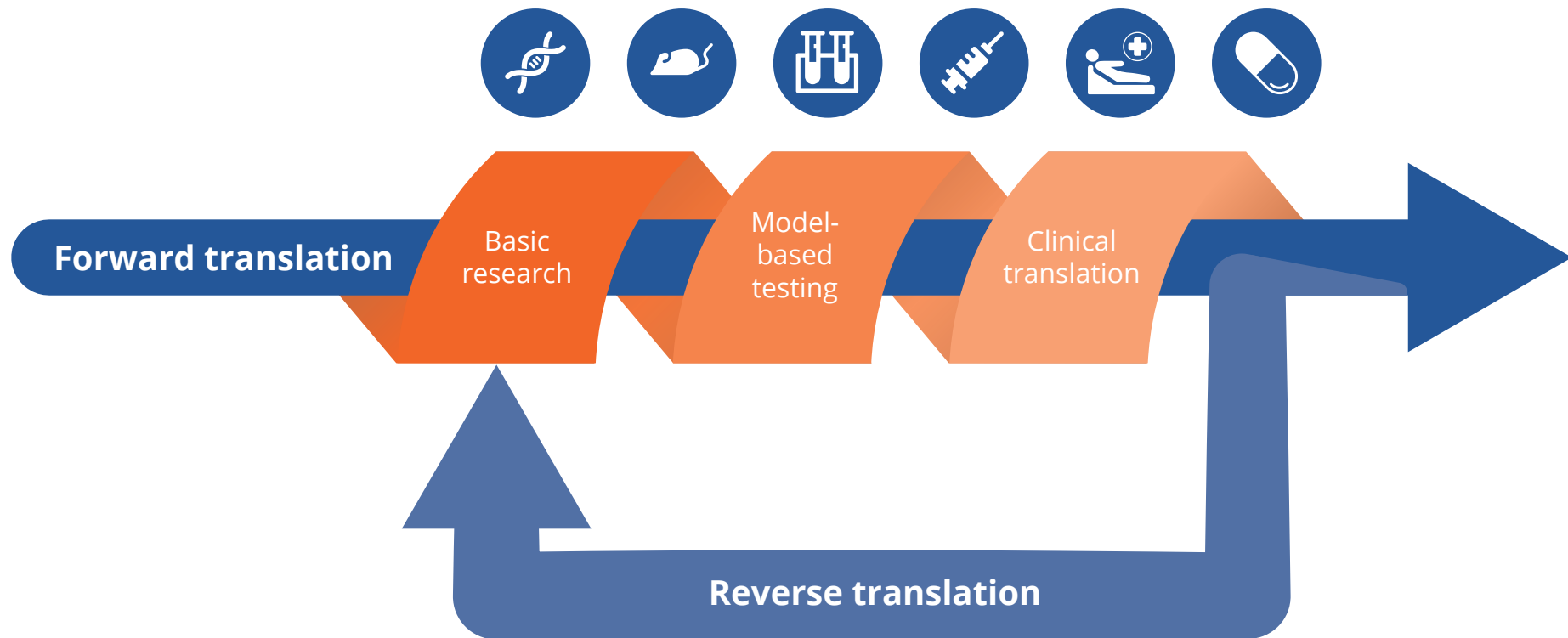
Why it matters

Translational research requires model systems and technologies that **reflect human disease mechanisms with high fidelity**. By expanding capabilities such as BSL-3 platforms, axenic and gnotobiotic facilities, and ATMP-related services (Advanced Therapy Medicinal Products), INFRAFRONTIER can provide critical infrastructure for infectious disease studies, microbiome research, therapeutic testing, and advanced therapy development.

These capabilities are essential for **making disease modelling more predictive**, for **supporting industry and clinical partnerships**, and for **increasing Europe's competitiveness** in biomedical innovation.

Our priorities

- **Develop ATMP-related services:** Provide infrastructure for gene and cell therapy validation in preclinical models, also by engaging in collaborations with other biomedical European research infrastructures,
- **Strengthen BSL-3 and infectious disease platforms:** Enable safe, high-quality studies of pathogens and host responses.
- **Expand axenic and gnotobiotic capabilities:** Support microbiome, immunology and metabolic research with high precision.
- **Enhance preclinical testing pipelines:** Harmonise protocols and workflows from model selection to therapeutic evaluation.
- **Build translational partnerships:** Engage clinicians, industry and regulatory stakeholders to improve relevance and impact.





Goal 4

Develop Data Analytics and *In Silico* Modelling Capacity

*... Build a **modern digital ecosystem** that **unlocks** the full value of **INFRAFRONTIER's complex data** and paves the way for **future in silico modelling approaches** ...*

Why it matters

INFRAFRONTIER generates increasingly complex datasets — from systemic phenotyping to high-resolution imaging and translational readouts. To fully exploit this potential, the infrastructure must strengthen its analytical power, develop interoperable digital tools, and offer user-friendly data services.

By enabling robust data discovery, advanced analysis and secure access, INFRAFRONTIER will support the scientific community more effectively and create the foundation for predictive, simulation-based disease modelling in the future.

Our priorities

- **Harness complex experimental data:** Improve capture, organisation and integration of phenotyping, imaging, microbiome and translational datasets, also by engaging in collaborations with other relevant European research infrastructures
- **Strengthen analytical capabilities:** Develop pipelines for advanced analysis, including machine learning, image processing and multi-modal data integration.
- **Provide digital services to the community:** Offer tools for data browsing, visualisation, annotation and secure federated access across INFRAFRONTIER nodes.
- **Ensure FAIR and interoperable data standards:** Harmonise metadata, formats and ontologies to enable efficient data sharing and cross-infrastructure collaboration.
- **Lay the groundwork for *in silico* disease modelling:** Prepare data architectures and analytical frameworks that enable future digital twins, simulations and predictive models.





Goal 5

Advance Sustainability, Animal Welfare and FAIR Principles

*... make **sustainability, animal welfare** and **FAIR data** core **pillars** of INFRAFRONTIER's operational excellence and a visible benchmark for **responsible biomedical research** in Europe ...*

Why it matters

INFRAFRONTIER operates at the interface of animal research, advanced technologies and large-scale data generation. This comes with a particular responsibility: to **minimise environmental impact**, to **use animals only where indispensable** and with the **highest welfare standards**, and to ensure that data are shared in a way that maximises scientific value.

By systematically implementing **Green Lab practices**, strengthening **3R principles** and embedding **FAIR data standards** across all services, INFRAFRONTIER can reduce its ecological footprint, lower animal use through smarter design and cryopreservation strategies, and increase the impact and transparency of the research it enables.

Our priorities

- **Develop and support Green Lab standards:** Introduce measurable CO₂ reduction targets, energy-efficient operation and sustainable resource management across INFRAFRONTIER nodes.
- **Optimise cryoarchiving strategies:** Use improved cryopreservation and colony management to reduce animal use, waste and environmental footprint while safeguarding model availability.
- **Embed 3R principles in all activities:** Systematically replace, reduce and refine animal use through better study design, complementary models and shared best practices.
- **Promote FAIR and open data:** Ensure that data generated with INFRAFRONTIER resources follow FAIR principles and are accessible via interoperable, well-annotated platforms.
- **Act as European role model for responsible biomedical research:** Share guidelines, tools and training on sustainability, animal welfare and FAIR data to inspire and support the wider biomedical community.





Goal 6

Build Capacity, Expertise and Community

*“... grow INFRAFRONTIER ERIC into a **stronger, more cohesive European Research Infrastructure** by expanding ERIC membership, strengthening expertise and enhancing collaboration across the community ...*

Why it matters

INFRAFRONTIER represents a long-standing and **well-established network** of leading institutes in the field of biomedical research across Europe. The INFRAFRONTIER ERIC, was created to provide a stable, legally anchored framework for this mature scientific community. With currently six contributing Member States, the ERIC aims to broaden its membership base and bring additional national nodes into the organisation. Gaining new Member States **strengthens governance, secures long-term sustainability, expands scientific capabilities** and ensures that Europe's key disease-modelling infrastructure becomes truly pan-European.

At the same time, a growing ERIC requires a **highly skilled community, harmonised standards** and **strong internal cohesion**. By investing in training, staff exchange, knowledge-sharing and network integration, INFRAFRONTIER ERIC builds the human and organisational capacity necessary to support its scientific and strategic ambitions.

Our priorities

- **Expand ERIC membership:** Actively engage additional European countries — especially long-standing partners — to join INFRAFRONTIER ERIC and strengthen its scientific, financial and political foundation.
- **Strengthen the European INFRAFRONTIER network:** Deepen collaboration among existing and future nodes, ensuring interoperability, shared standards and consistent service quality.
- **Strengthen research community engagement:** Facilitate knowledge-sharing through user meetings, scientific events, partnerships with other ERICs and international networks.
- **Support the next generation of experts:** Build training pipelines for young scientists, technicians and data specialists through structured programmes and EU-funded initiatives.
- **Enhance training and capacity building:** Provide courses, workshops and hands-on training in model generation, phenotyping, *in vitro* systems, translational platforms, digital tools and 3R principles.
- **Promote staff exchange and mobility:** Support technician exchanges, short visits and collaborative placements to spread expertise and build cohesion across the network.





Goal 7

Strengthen Collaboration with Industry

*... **Deepen and expand INFRAFRONTIER's engagement with industry** to accelerate translational research, co-develop innovative technologies and enhance Europe's biomedical innovation ecosystem ...*

Why it matters

In addition to collaborations with other academic biomedical research infrastructures, industry partnerships are **essential for translating scientific discoveries into therapies, diagnostics and technologies** that benefit patients. INFRAFRONTIER's capabilities — from advanced model generation and phenotyping to *in vitro* systems, microbiome expertise, BSL-3 platforms and digital innovation — provide unique assets for pharmaceutical, biotech and medtech companies.

By strengthening collaboration frameworks, enabling co-development and offering industry-relevant services, INFRAFRONTIER can contribute directly to therapeutic innovation, support ATMP (Advanced Therapy Medicinal Product) development, advance complex *in vitro* models's (CIVM) validation and enhance Europe's competitiveness in biomedical R&D.

Our priorities

- **Develop industry-relevant service pipelines:** Provide tailored access to model generation, phenotyping, *in vitro* platforms, microbiome technologies, ATMP testing and translational services to commercial users.
- **Co-develop new technologies and models:** Establish alliances with industry partners in collaborative R&D, including CIVM validation, digital tools, microphysiological systems and data-driven approaches.
- **Strengthen ATMP and preclinical pipelines:** Offer high-quality infrastructure for gene and cell therapy validation, safety assessment and advanced preclinical modelling.
- **Build strategic partnerships and frameworks:** Establish long-term collaborations with pharma, biotech, medtech and SMEs to create shared roadmaps and innovation programmes.
- **Promote data and digital collaboration:** Develop interoperable digital platforms, FAIR data access, AI-ready datasets and opportunities for computational model development.
- **Support ethical, sustainable innovation:** Advance 3R principles, FAIR practices and high animal-welfare standards as part of all industry-facing activities.





Goal 8

Engage with Society

*“... Biomedical research **serves society** — and must be **conducted in open dialogue** with those it aims to benefit ...*

Why it matters

Diseases impose a profound burden on individuals, families and societies. Addressing this burden requires not only scientific excellence, but also meaningful engagement with patients, caregivers and the wider public. As a European research infrastructure dedicated to modelling human disease, INFRAFRONTIER has a **responsibility to contribute to societal dialogue**, particularly in areas of high unmet medical need such as rare diseases.

At the same time, biomedical research involving animal models requires **transparency, openness** and **trust**. In Europe, animal experimentation is subject to strict ethical and regulatory frameworks, and is permitted only where no scientifically valid alternatives exist. **Proactive communication about why, how and under which conditions** animal studies are conducted is essential to foster informed public understanding and confidence in biomedical research.

By engaging with society, patient organisations and advocacy groups, INFRAFRONTIER **strengthens the societal relevance** of its work, aligns research priorities with real-world needs, and reinforces its commitment to responsible, transparent and ethical science.



Our priorities

- **Engage with clinicians, and patients' and rare disease organisations:** Establish structured dialogue with patient foundations, advocacy groups and rare disease associations to better understand unmet needs and societal priorities.
- **Address the societal burden of disease:** Highlight how disease modelling contributes to prevention, diagnosis and therapy development, with a particular focus on conditions with high individual and societal impact.
- **Promote transparency in animal research:** Communicate clearly and openly about the role of animal models, ethical standards, regulatory oversight and the implementation of the 3R principles.
- **Strengthen public dialogue and trust:** Contribute to informed societal discussions on biomedical research through outreach activities, educational formats and accessible communication.
- **Align scientific excellence with societal responsibility:** Ensure that INFRAFRONTIER's research infrastructure evolves in close connection with societal values, expectations and ethical frameworks.



The background of the slide features a blue-tinted photograph of several scientists in a laboratory setting. They are wearing white lab coats and are focused on their work, with some looking at equipment or documents. The image is overlaid with a pattern of concentric white circles, creating a sense of depth and focus.

Powered by an excellent research network: **National Nodes of Member States and a Pan-European Research Network**

“... The INFRAFRONTIER ERIC's Member States **demonstrate a strong and long-term commitment** to INFRAFRONTIER as a European research infrastructure ...

INFRAFRONTIER has been part of the **European Strategy Forum on Research Infrastructures (ESFRI)** Roadmap since 2006 and became an ESFRI Landmark in 2016.

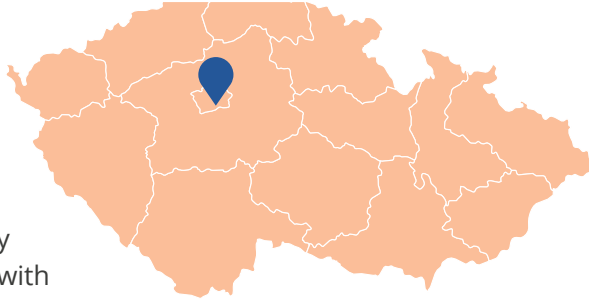
With the **establishment of INFRAFRONTIER ERIC in 2023**, the infrastructure gained a stable and permanent legal framework. At the beginning of 2026, INFRAFRONTIER ERIC brings together **six contributing Member States**, each represented by a National Node and formally participating in the infrastructure's decision-making through the **Assembly of Members**. Through their financial contributions, these Member States demonstrate a strong and long-term commitment to INFRAFRONTIER as a European research infrastructure. As of 2025, **Spain participates as an Observer**, reflecting the growing interest of European countries in engaging with INFRAFRONTIER ERIC.

The National Nodes of the Member States form the scientific and operational backbone of the infrastructure: they host state-of-the-art facilities, deliver advanced services, and contribute expertise across model generation, phenotyping, data integration and translational research.

This distributed network of excellence is one of INFRAFRONTIER's most valuable assets. It links national investment with European coordination, ensures scientific quality and resilience, and provides a solid foundation for the future growth of the ERIC through the inclusion of additional Member States.

Czech Republic

The **Czech Centre for Phenogenomics (CCP)**, hosted at the Institute of Molecular Genetics of the Czech Academy of Sciences, is the Czech National Node of INFRAFRONTIER ERIC. Fully operational since 2016, with ~145 staff, CCP uniquely integrates genome engineering, phenotyping, SPF animal facilities, cryopreservation, GLP-certified preclinical services, a PDX/cancer platform, a BSL-3 infection unit, and the RD-Factory rare disease programme in a single infrastructure. Contributing ~5% of all IMPC mutant lines and generating over 2.2 million data points per year, CCP is one of the largest and most productive INFRAFRONTIER nodes in Europe.



Key contributions

- CRISPR/Cas9, electroporation and microinjection; >120 models/year incl. patient-relevant alleles
- Systemic phenotyping up to 1,000 parameters/model; deep-phenotyping for disease-focused research
- Advanced imaging (micro-CT, MRI, ultrasound), metabolomics and AI-assisted bioinformatics
- SPF facilities, cryo/archiving as Czech EMMA node; GLP preclinical testing, PDX and BSL-3 services
- RD-Factory programme on rare diseases, gene therapy and iPSC/3D complementary models

Finland

Biocenter Oulu Transgenic and Tissue Phenotyping (BCO-TTP), is the Finnish National Node of INFRAFRONTIER ERIC. Since 2010, TTP core facility has been serving as the northernmost EMMA node

TTP core facility offers services related to genetically modified mice such as generation, cryopreservation, recovery and rederivation to both international and national customers. The unit has special expertise in embryonic stem cells, in vitro fertilization, CRISPR-Cas9 and digital pathology. TTP core facility works in close collaboration with the Laboratory Animal Centre of UOULU. In addition, the unit coordinates activities of the national Biocenter Finland FinGMice network.



Key contributions

- Generation and archiving of genetically modified mouse models
- Mouse embryonic stem cell generation and genome modification
- Tissue processing and digital pathology
- Contribution to EMMA distribution and European access programmes

France

France contributes to INFRAFRONTIER through **PHEN-ICS (Institut Clinique de la Souris)**, the **Typing and Archiving of Animal Models (TAAM)** and the **Center of ImmunoPHEnomics (CIPHE)**, providing complementary expertise in systemic phenotyping, model generation and translational research.

PHEN-ICS (Mouse Clinic & EMMA Node)

PHEN-ICS delivers advanced genome engineering and standardised systemic phenotyping pipelines covering behaviour, metabolism, neurology, cardiovascular and respiratory functions, clinical chemistry and histopathology. It ensures long-term archiving and distribution of mouse models through EMMA and alignment with international initiatives such as IMPC.

CIPHE (Translational and Immuno-phenomics Expertise)

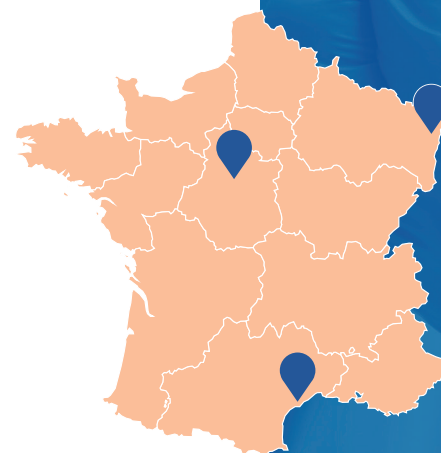
CIPHE provides integrated *in vivo* and *in vitro* platforms for translational research in immunology, infectious diseases, inflammation, cancer and rare diseases, including BSL-3 capabilities and advanced 3R-compliant model systems.

TAAM (EMMA Node, Gnotobiology Models & Functional Imaging).

The TAAM is a CNRS Support and Research Unit specializing in rodent models (rats and mice) for fundamental, biomedical, and pharmaceutical research. With extensive expertise in long-term archiving, germ-free rederivation, distribution and imaging, TAAM provides comprehensive services for murine model management.

Key contributions

- Advanced genome editing (CRISPR/Cas9) in mouse and rat models
- Systemic and immunophenotyping pipelines
- Advanced *in vivo* imaging
- Infectious disease and host-pathogen models (BSL-2/BSL-3)
- Organoid-based and microfluidic *in vitro* systems
- Integrated *in vivo/in vitro* translational pipelines
- EMMA archiving and European access programmes



Germany

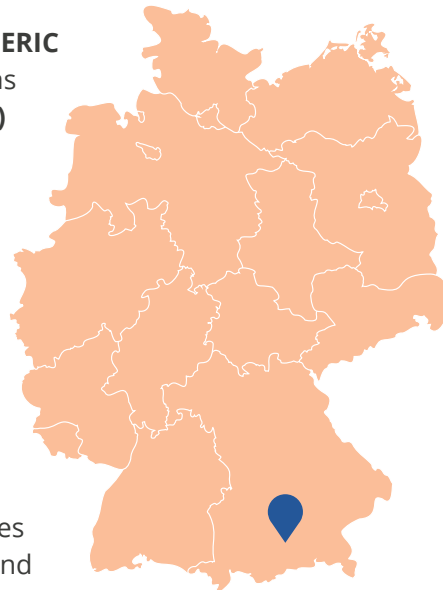
Germany hosts the **INFRAFRONTIER ERIC Headquarters** at Helmholtz Munich, as well as the **German Mouse Clinic (GMC)** and the **German Node of the European Mouse Mutant Archive (EMMA)**, forming a central hub of coordination, phenotyping, archiving and distribution of models and data integration.

The ERIC Headquarters coordinates the strategic development of INFRAFRONTIER, manages European projects, operates the central access portal and IT infrastructure, and serves as the primary interface to national and international stakeholders.

The German Mouse Clinic provides large-scale, standardised, high-throughput phenotyping across multiple physiological systems, closely aligned with international standards and in co-ordination with other academic European phenotyping centers. The GMC and the EMMA node in Munich are founding members of INFRAFRONTIER.

Key contributions

- ERIC coordination, governance support and user access management
- Large-scale systemic phenotyping and imaging
- EMMA archiving and global model distribution
- Expertise in study design, data analysis and interpretation
- Integration of animal and emerging *in vitro* approaches



Greece

BSRC Fleming is the Greek National Node of INFRAFRONTIER ERIC and an EMMA node, with a strong focus on disease-oriented phenotyping and preclinical research.

Key contributions

- Generation of precision mutant mouse models
- EMMA archiving and distribution
- Disease-oriented screening and preclinical phenotyping pipelines
- Expertise in inflammatory, autoimmune, infectious, neurological, cardiovascular and metabolic diseases
- 3D intestinal organoid modelling
- Data analysis services
- Training, consulting and knowledge sharing



Spain (Observer)

Spain participates in INFRAFRONTIER ERIC as an Observer through two partner institutions: the **National Centre for Biotechnology (CNB-CSIC)** and the Centre of Animal Biotechnology and Gene Therapy (CBATEG, Autonomous University of Barcelona).



CNB is one of the largest research centres of CSIC and has served as the Spanish EMMA node since 2007, operating a large mouse facility with BSL-2 capacity and a dedicated sperm and embryo cryopreservation unit. CBATEG focuses on transgenic models and *in vivo* gene transfer using AAV vectors for diabetes and inherited metabolic disorders, and hosts platforms for metabolic, morphological and pathological phenotyping, as well as training activities in mouse pathobiology.

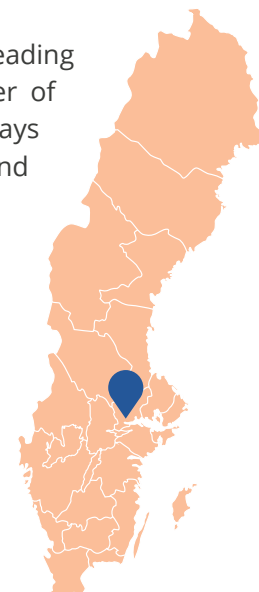
Key contributions

- Spanish EMMA node with extensive cryopreservation and distribution of mouse lines
- Generation of genome-edited, disease-relevant rodent models
- BSL-2 animal facility for infectious and disease models
- Development of AAV-based gene therapy approaches for metabolic and genetic diseases
- Metabolic, morphological and pathological phenotyping services
- Training and education in mouse pathobiology and phenotyping (e.g. PATHBIO)

Sweden

Karolinska Institutet (KI) is one of the world's leading medical universities and has been a founding member of INFRAFRONTIER. KI hosts the Swedish EMMA node and plays a central role in the generation, breeding, phenotyping and archiving of genetically modified mice across its research community.

Karolinska Institutet has a long tradition in gnotobiology and has recently invested in state-of-the-art animal facilities, including a broad range of imaging modalities, a dedicated behavioral facility (ABCF) and a core facility for morphological phenotype analysis (FENO). Mouse production and archiving are coordinated by **Karolinska Centre for Transgene Technologies**, which offers a comprehensive portfolio of genome editing and transgenic technologies.



KI also contributes to INFRAFRONTIER's scientific impact through pioneering work in single-cell transcriptomics, helping to define molecular blueprints of organs and developmental stages in the mouse.

Key contributions

- Swedish EMMA node for production and archiving of genetically modified mouse lines
- Comprehensive genome editing and transgenic technologies (KIMM)
- Gnotobiology expertise and advanced animal facilities
- Phenotyping, imaging and morphological analysis platforms (ABCF, FENO and others)
- Pioneering single-cell transcriptomic profiling and mouse organ/developmental atlases



INFRAFRONTIER's Pan-European Network

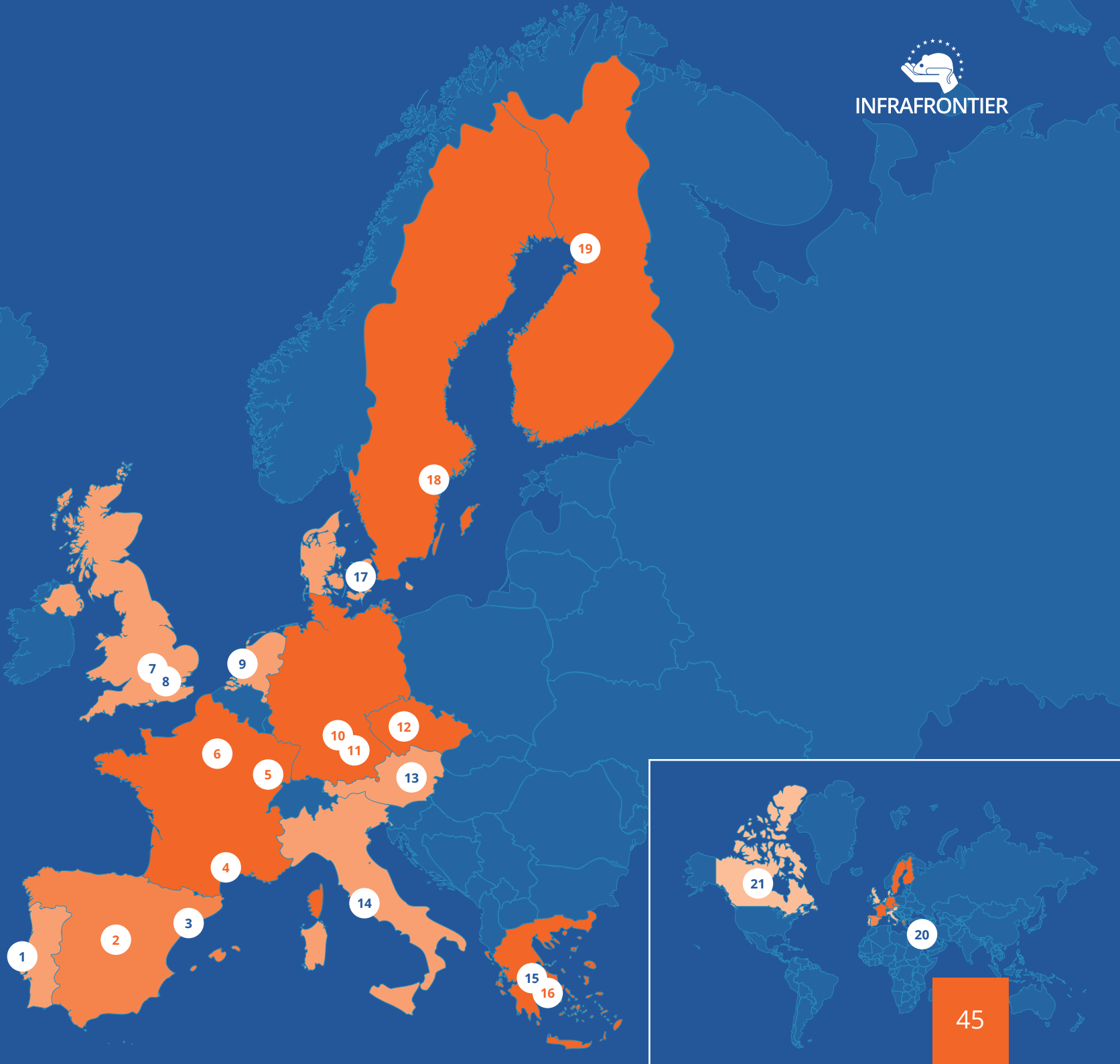
Beyond its legal and financial framework, INFRAFRONTIER is powered by a **highly integrated and genuinely Pan-European research network**, developed through long-standing European collaborative projects. Today, this network comprises **21 partner institutions** across Europe and beyond, including partners in **Israel and Canada**.

This distributed and decentralised structure is a key strength of INFRAFRONTIER. It brings together complementary expertise, infrastructures and technologies across national boundaries, promotes trans-national scientific exchange, and enables the infrastructure to draw on the specific strengths of different locations. By coordinating these diverse capabilities at the European level, **INFRAFRONTIER maximises scientific impact while preserving the excellence and specialisation of its individual partners.**

1. Instituto Gulbenkian de Ciencia (IGC)
2. **National Centre for Biotechnology (CNB-CSIC)**
3. Universitat Autònoma de Barcelona (UAB)
4. **Centre d'Immunophénomique (PHENOMIN-CIPHE)**
5. **Institute Clinique de la Souris (PHENOMIN-ICS)**
6. **PHENOMIN-TAAM**
7. European Bioinformatics Institute (EMBL-EBI)
8. Mary Lyon Centre at MRC Harwell
9. The Netherlands Cancer Institute (NKI)
10. **INFRAFRONTIER ERIC (Coordination Office)**
11. **Helmholtz Munich**
12. **Czech Centre for Phenogenomics (CCP)**
13. University of Veterinary Medicine Vienna
14. Consiglio Nazionale delle Ricerche (CNR)
15. Biomedcode Hellas SA
16. **Biomedical Research Center "Alexander Fleming"**
17. University of Copenhagen (UCPH)
18. **Karolinska Institutet (KI)**
19. **University of Oulu**
20. Tel Aviv University (Israel)
21. Toronto Centre for Phenogenomics (Canada)



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Implementation and Monitoring

The implementation of this Strategic Roadmap will follow a **coordinated and transparent governance process** that ensures alignment across all INFRAFRONTIER ERIC bodies, Member States and National Nodes.

All activities will be developed and executed in close collaboration with the **Directors of National Nodes**, who play a central role in shaping and operationalising the services of the infrastructure. Strategic decisions regarding membership, governance and long-term commitments will be taken by the **Assembly of Members (AoM)**, which brings together the official representatives of all contributing states. The ERIC reports formally to the AoM on progress, achievements and strategic developments.

Implementation will be structured through **annual work programmes**, which will define:

- **Key priorities and actions** under each strategic goal
- **Responsible units and partners**, including ERIC Headquarters and National Nodes
- **Milestones and indicative timelines** for 2026–2031

- **Performance indicators** where they are meaningful, measurable and proportionate
- **Opportunities for adjustment**, allowing the ERIC to refine, streamline or discontinue activities that do not deliver sufficient scientific or strategic value

The four strategic directions of the Roadmap — *maintaining excellence, integration, digital transformation and expansion of the ERIC* — will be pursued in **parallel throughout the full five-year period**. Each direction does not represent a sequential “phase”, but a continuous focus area whose intensity and resource allocation will be adjusted annually based on needs, opportunities and Member State priorities.

The pursuit and realisation of the strategic objectives are overseen by the **Scientific and Administrative Directors**, who coordinate progress across all operational units. Findings and recommendations will be integrated into the annual reporting cycle to the **Assembly of Members**, ensuring full transparency and alignment with national priorities. Where appropriate, the AoM may provide guidance, mandate adjustments, or initiate strategic actions

such as the admission of new Member States or the development of new governance or funding frameworks.

This dynamic implementation and monitoring structure ensures that INFRAFRONTIER ERIC remains **responsive, scientifically competitive and accountable** — enabling sustained progress in advancing INFRAFRONTIER ERIC as Europe’s integrated translational infrastructure for precision disease modelling.



INFRAFRONTIER



The Board of National Nodes



**Prof. Dr. h.c. mult. Martin Hrabě
de Angelis**

Helmholtz Munich



Dr. Alexander Espinosa

Karolinska Institute



Dr. Yann Hérault

PHENOMIN ICS

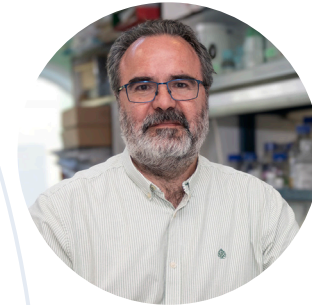
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