

## The Units of the Clermont-Auvergne-Rhône-Alpes INRAE Centre

Within the creation of INRAE on January 1, 2020, two new research centres were created in the Auvergne-Rhône-Alpes region : the Clermont-Auvergne-Rhône-Alpes Centre and the Lyon-Grenoble-Auvergne-Rhône-Alpes Centre. The Clermont-Auvergne-Rhône-Alpes Centre clusters the Units located in the Auvergne territory, spread over 8 sites from Bourbonnais to Aurillac via Clermont-Ferrand. 20 Units (including 14 Research Units, 2 Experimental Units, 2 Support Units and 2 Department administrative units) and a dozen structural experimental facilities are the cornerstone, representing a total of about 850 INRAE staff. 11 of the 14 INRAE Scientific Departments are represented. The 2 regional centres have a Common Scientific Scheme, validated by the Management Board. It is organized around 6 priority areas (see below). You will find in this document, for discovery or reference purposes, a short presentation of the Units that make up our new Centre.



### Clinical Odontology Research Centre (CROC)

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Manager : *Martine Hennequin*

÷ Parent organisations : UCA - INRAE

÷ Department : TRANSFORM

÷ Key Words: chewing, oral health, eating behaviour, dental

÷ <https://www.uca.fr/laboratoires/collegium-sciences-de-la-vie-sante-environnement/centre-de-recherche-en-odontologie-clinique-croc>



The Unit conducts research on the links between oral health and chewing, as well as on the psychosocial parameters of oral health. The first theme aims to determine the impact of physiology and chewing on the population's eating behaviour; the second, through clinical studies, aims to validate health care practices and also conducts epidemiological studies to understand the bio-psycho-social factors of oral health. This is applied research, directly useful to patients, which has an impact on professional practices in dentistry but also influences other areas of individual and/or collective health.

### UREP Grassland Ecosystem Research Unit

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Manager : *Catherine Picon-Cochard*

÷ Parent organisations : INRAE - VetAgro Sup

÷ Department : ECODIV

÷ Keywords: grassland, climate change, grass management, biodiversity, greenhouse gases, C stock, multifunctionality

÷ <https://www6.clermont.inrae.fr/urep/>



The Unit studies the grassland ecosystem works in a context of global change and agro-ecological practices. The major issues it focuses on are the impact of climate change, greenhouse gas balance, soil functions (especially regarding interfaces with plants), ecosystem services and multifunctionality, and the influence and optimization of management practices. It relies in particular on long-term environmental research observation systems and *in situ* or semi-controlled experiments to manipulate climatic factors, as well as on networks of stakeholders in the agricultural or environmental world.

### Epidemiology of Animal and Zoonotic Diseases Research Unit (EPIA)

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÷ Parent organisations : INRAE - VetAgro Sup

÷ Department : SA

÷ Key words: epidemiology, infectious diseases, animals, vectors

÷ <https://www6.clermont.inrae.fr/epia>



The Unit studies the epidemiology of infectious diseases in animal populations (including some transmissible to humans), in relation to ecological and evolutionary processes, and in the context of global change. The Research Unit focuses on pathogens and diseases of interest in terms of animal or public health (zoonoses). It concerns both directly transmitted diseases (avian influenza, Q fever, leptospirosis, etc.) and vector-borne diseases (Lyme disease, bluetongue, African horse sickness, etc.).

#### Joint Research Unit on Cheese (UMRF)

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Manager : *Christophe Chassard*

- ÷ Parent organisations : INRAE - UCA - VetAgro Sup
- ÷ Department : MICA
- ÷ Keywords: cheese, raw milk, ferments and microbial ecosystems, biopreservation, nutritional quality and health impact
- ÷ <http://www6.clermont.inrae.fr/umrf/>



The Unit's objective is to better understand the construction of the sensory and nutritional qualities of traditional cheeses with complex microbiota, to support their evolution/innovation by integrating consumer expectations and societal requirements in terms of health/safety and sustainability. Its transdisciplinary approach mobilizes diverse and complementary skills in microbial ecology, metagenomics, bioinformatics and statistics, biochemistry and biophysics. In addition, the Unit relies on a very strong professional and industrial partnership to promote the implementation of fundamental research, but above all, targeted research.

#### Joint Research Unit on the Genetics, Diversity and Ecophysiology of Cereals (GDEC)

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Manager : *Jérôme Salse*

- ÷ Parent organisations : INRAE - UCA
- ÷ Departments : BAP, AGROECOSYSTEM
- ÷ Keywords: cereals, genetic resources, integrative biology, stress, climate change, agroecology
- ÷ <https://www6.clermont.inrae.fr/umr1095>



The Unit's research projects focus on bread wheat, a model species of agronomic importance (2nd largest field crop in the world), with multidisciplinary approaches and scales ranging from the gene to the plot. Combining fundamental and targeted research, the common objective of these projects is to improve yield stability and quality for health, to better serve sustainable agriculture, in a context of agroecological transition and climate crisis.

#### UMR Herbivores (UMRH)

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- ÷ Parent organisations: INRAE - VetAgro Sup
- ÷ Departments : PHASE, ECOSOCIO
- ÷ Keywords: herbivore, agroecology, efficiency, robustness, quality of animal products
- ÷ <https://umrh-bioinfo.clermont.inrae.fr/Intranet/web/UMRH>



The research conducted within the Research Unit focuses on 4 themes developed in ruminants (and equines): 1) animal efficiency and agroecological systems; 2) construction and prediction of the quality of ruminant products (meat and dairy products); 3) the adaptive and robustness capacities of animals; 4) ecosystem services provided by herbivore breeding systems and their environmental impacts. The objective is to support, in a context of climate change, an economically and environmentally efficient herbivore husbandry system that values resources that are not in competition with human food, and in line with society's expectations (animal welfare, product quality). The knowledge resulting from this research will serve the agroecological transition by proposing innovations and ways to assess the multi-performance of production systems for the scientific community and stakeholders throughout the industry.

#### Engineering Laboratory for Complex Systems (LISC)

9, avenue Blaise-Pascal - CS 20085 - 63178 Aubière  
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Manager : *Franck Jabot*

- ÷ Parent organisation : INRAE
- ÷ Department : MATHNUM
- ÷ Keywords: applied mathematics, computer science, statistics, decision-making support, digital experiments



The Unit develops research on the modeling of dynamic systems. This research aims to study, understand and ultimately act on the dynamics of socio-ecological systems. A key stake of this approach is to develop quantitative approaches to reflect on, criticise and support the sustainable management of these systems. In particular, the aim is to build, calibrate and validate system dynamics models, and to develop management support tools based on these models. Thus, the LISC Unit carries out theoretical work to establish concepts associated with the notion of sustainability on the basis of solid mathematics and methodological work to analyse and calibrate complex models, and more applied work on specific cases of ecological and social systems. These applications raise difficult algorithmic problems which the LISC Unit is investing a great deal of effort to solve.

#### USC M2ISH (Microbe, Intestine, Inflammation and Host Susceptibility)

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Manager : *Nicolas Barnich*

- ÷ Parent organisations : UCA - INSERM - INRAE associé
- ÷ Department : MICA
- ÷ Mots clés : *Key Words: E. coli pathobionts, intestine, inflammation, colorectal cancer, antibiotic resistance*
- ÷ <https://m2ish.uca.fr>



The Unit studies bacterial-host relationships and more specifically the *Escherichia coli* pathogens involved in chronic inflammatory bowel diseases, such as Crohn's disease and colorectal cancer. Concerning the former, the Unit has been a pioneer in the discovery of abnormal colonization of the ileal mucosa of patients ill with specific *E. coli* strains, which may play a role in the pathophysiology of the disease, and provide a new target for the development of promising new therapies. Similarly, researchers in the Unit have shown in colorectal cancer that other strains of *E. coli* play a role in the progression of tumours. In parallel, original work on antibiotic resistance in enterobacteria is being developed. To this end, the Unit uses techniques ranging from structural, molecular and cellular biology to clinical studies.

#### Microbiology, Digestive Environment and Health Research Unit (MEDIS)

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÷ Parent organisations : INRAE - UCA

÷ Department : MICA

÷ Key Words: microbiota, food, health

÷ <https://www6.clermont.inra.fr/medis/>



The main scientific objective of the work carried out within the Unit is to study the inter-relationships between intestinal microorganisms and diet, environmental factors and/or pathogenic agents in a health and well-being framework and in physiopathological situations. It also aims to propose nutritional (pre-, probiotic, etc.) and/or therapeutic strategies to treat or prevent the microbial disorders involved in pathological states (digestive or extra-digestive). The 3 research themes which are being developed: «Microbiota, metabolism, dysbiosis», «Zoonotic food pathogens» and «Development of innovative galenic formulations» are based on multidisciplinary skills.

#### Human Nutrition Research Unit (UNH)

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÷ Parent organisations : INRAE - UCA

÷ Department : ALIMH

÷ Mots clés : Key words: nutrition, nutritional strategy, ageing, prevention, health, biomarkers

÷ <https://www6.clermont.inrae.fr/unh/>



The Unit's research aims to develop innovative nutritional strategies to reduce the risk of cardiometabolic diseases and preserve the mobility of the elderly, for successful, disability-free ageing. The research focuses, in particular, on the mechanisms of adapting metabolism to dietary changes, maintaining muscle mass and functionality during ageing, the use of plant products in the prevention of cardiometabolic diseases, biomarker research and the development of digital tools for an individualized monitoring of eating behaviour and physical activity.

#### UMR PIAF (Integrative Physics and Physiology of Trees in Fluctuating Environments)

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÷ Parent organisations : INRAE - UCA

÷ Departments : AGROECOSYSTEM, ECODIV

÷ Key Words: trees, resilience, adaptation, environment, physics perception

÷ <http://www6.clermont.inrae.fr/piaf>



The Unit's work is at the interface of physics and biology, this originality allows it to play a unifying role in this new frontier of plant sciences. Research is aimed at gaining a better understanding of the responses of trees to physical factors of the environment affected by climatic upheaval (hydric, thermal, mechanical) and determining their acclimatization or survival. To this end, the architectural development and the functioning of trees throughout their annual cycle are studied. Particular attention is paid to the effects of extreme environmental fluctuations (drought, hot or cold spells, gales) with applications favouring the global adaptation of trees in their different forestry, horticultural, agroforestry or urban uses (identification of genotypes or ecotypes of more resistant/resilient trees, management methods improving sustainability and productive and ecosystem-based services, etc.).

#### The Animal Products Quality Unit QuaPA

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÷ Department : TRANSFORM

÷ Keywords: food safety and nutritional quality, processes, meat, animal by-products, modelling

÷ <http://www6.clermont.inrae.fr/quapa>



Meat and meat products are foods with high protein content and a good balance of essential amino acids which are perfectly adapted to humans and especially to the elderly. Improving the quality of these foods and their technology is at the heart of the work carried out by the Unit's researchers, with two main lines of research: the rational design of specific meat foods (for example for the elderly), and improving the sustainability of food systems in a context of transition, particularly through studies on the chemical safety of products, limiting the losses of products of animal origin during processing and the use of biomass issued from animal by-products.

#### UMR Territories

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Manager : *Geneviève Bigot*

÷ Parent organisations : INRAE - AgroParisTech - VetaAgro Sup - UCA

÷ Department: ACT

÷ Keywords: territories, professions, farmers, dynamics, adaptation, breeding system, sustainability

÷ <https://umr-territoires.fr/>



The Unit brings together researchers in the humanities and social sciences (geography, economics, management science, political science) and biotechnical sciences (agronomy, zootechnics systems). The Research Unit's teams share a desire to study how territories and their stakeholders adapt and innovate (or not) in the context of a fluctuating and complex economic, social and political environment, by developing strategies to mobilize and then develop their resources. The main idea is that there is a multiplicity of configurations (local and regional) and trajectories (individual and collective) leading to the coexistence of «models», or «forms of evolution», and strategies carried out within territories. The scientific project is based on the diversity of missions, professions and anchors in academic and professional networks (research, teaching and training missions, support for socio-economic stakeholders and support for public decision-making).

#### UR TSCF (Technologies and Information Systems for Agro-Systems)

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÷ Departments : MATHNUM, AGROECOSYSTEM

÷ Keywords: robotics, digital agriculture, fertilization, sowing, agro-equipment, impacts, agroecology

÷ <https://www6.clermont.inrae.fr/tscf>



The Unit's goal is to provide solutions to environmental challenges through technological innovation by mobilizing engineering sciences and information and communication sciences and technologies. Finalized research focuses on the assessment, optimization and design of information systems, technologies and innovative methods for the sustainable management of agriculture and the environment. Combining models and simulation/experimental approaches, this research contributes, in particular, to the development of eco-technologies and smart systems in the fields of agricultural robotics, fertilization, sowing, the impact of machines on the soil and digital agriculture.

#### UE Herbipôle

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÷ Parent organisation : INRAE

÷ Department : PHASE

÷ Keywords: herbivores, grassland areas, mountains, breeding systems

÷ <http://www6.clermont.inrae.fr/herbipole>



The Herbipôle is an experimental unit spread over 3 of the Centre's sites: Laqueuille and Theix in the Puy-de-Dôme and Marcenat in the Cantal. It is a multidisciplinary experimental platform for research on herbivores and grasslands with a regional, national and European vocation. The Herbipôle is open to scientific and professional partners and pools together complementary scientific approaches and disciplines in a single system. The research projects conducted by Herbipôle focus on ruminant breeding systems in mountain grassland areas, preserving their well-being and the relation to the qualities of their products (milk, cheese and meat) and their impact on the environment. The experimental herds include 900 cattle and 800 sheep spread over more than 1,100 ha of grassland located at an altitude ranging from 850 to 1,500 meters above sea level.

#### UE PHACC (Crops Field Phenotyping Facility)

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÷ Parent organisation : INRAE

÷ Departments : BAP, SPE

÷ Keywords: cereals, protein crops, fields, phenotyping, the environment

÷ <https://www6.clermont.inrae.fr/ue1375>



The EU PHACC carries out field experiments on 2 sites, under very different conditions: 85 ha in the Limagne plain at the Crouël site (mainly on soft wheat), and 10 ha in the mid mountains at the Theix site for forage and cold tolerance trials (cereals and protein crops). It is recognized for its medium and high throughput phenotyping capacity on different themes: varietal screening, nitrogen stress, water stress, diseases, the cold, etc. Since 2016, the EU has been managing the Pheno3C High Throughput Phenotyping Platform, which is part of the Future PHENOME (Infrastructures of Excellence, 2011) Investment project. This facility and its entire agricultural domain are used for field experiments, mainly for the UMR GDEC and GEVES research teams.

#### UAR SDAR (Decentralized Research Support Services)

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Manager : *Edwige Lassalas*

÷ SDAR Coordination Department

The different services that make up the SDAR Unit contribute via their cross-functional missions to the smooth running of the Centre, particularly with a view to providing support to the Units. They guarantee the conformity of the management acts carried out and act as an interface with the national support departments, the research units and the various interested parties of the Center, partners, etc. The Unit pools together all the support services : human resources, finance, accounting, assets and logistics, procurement contracts, partnerships, prevention, communication, scientific and technical information, social and environmental responsibility quality management.

#### UAR SIIR (Interregional IT Unit)

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Manager : *Nicolas Guilhot*

÷ Information Systems Department

The Auvergne-Rhône-Alpes Interregional IT Unit (SIIR) is one of the seven INRAE SIIRs covering France. Under the coordination of the SIIR IT Department, it operates the IT infrastructures of the region's INRAE facilities (networks, servers and national services and local services, etc.), supports users across all the departments in the IT Department's catalogue (Ariane), and participates in its development in line with new expressed needs.

#### UAR Human Nutrition and Food Safety Department (ALIMH)

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Departmental Head : *Lionel Bretilton*

The administrative team of Human Nutrition and Food Safety Department is based at the Centre. The main objective of the Human Nutrition and Food Safety Department is to provide scientific elements for improving health and well-being by encouraging the development of foods which are better adapted to humans. The research is based on a compromise between individual well-being and the economic and socio-professional context. A further mission of the Department is to build a scientific community around chemical risk.

#### UAR ACT

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Departmental Head : *Christophe Soulard*

The Centre is home to the Actions and Transitions Department's support team, whose research focuses on the knowledge and analysis of territorial stakeholder systems, their actions and the dynamics of complex territorial systems to support decision-making, innovation and transitions support.