

Scientific introduction

The disciplinary field, the general scientific framework, the main objectives and areas of research application of the research unit remain unchanged, focus on the study of prokaryotic and eukaryotic microorganisms and of viruses in the environment, at different levels of integration and different scales, which is considered "a basis to access the integration of knowledge, from the molecule to the ecosystem" (CNRS organism project). Our approach aims to bring together researches on genome, environment and human and animal health, by applying concepts and tools of genomics and post-genomics for a better understanding of scientific issues related to ecosystem functioning and health ecology. Consequently, the proposed research fit into the guidelines of the challenges n° 1 and 4 of the National Strategy for Research initiated by the Law on Higher Education and Research of July 22nd 2013.

A prospective analysis of our research, in connection with new developments in the scientific, human and material resources, brings us to improve the consistency of the scientific strategy of our research unit around 3 main domains: (i) parasitism and microbial ecosystems, (ii) trophic and functional ecology, and (iii) health ecology and ecotoxicology. This evolution aims to enhance the visibility of our laboratory in the context of the fusion of the two universities of Clermont-Ferrand, and at the national and international levels as well. It also aims to boost synergies between the research teams in the laboratory, since each of the major scientific domains gathers at least half the number of teams in the laboratory for the next contracting period. Finally, this choice will, undoubtedly, allow mobilizing a multidisciplinary community around major research infrastructures in the fields of ecology, environmental genomics and health.

The specific objectives of our scientific strategy are based on the self-analysis (i.e. SWOT matrix) for the coming five-year period. They aim to continuing strengthen the points identified as strengths of the laboratory, and to identify new levers to fill our gaps. The main fields of action concerned are: (i) enhance the quality of scientific production and employability of PhD students, (ii) strengthen our participation in European programs, (iii) develop research on microorganism-models in laboratory cultures, (iv) establish a modeling approach to the study of ecosystem functioning, (v) continue the development of the so-called "omics" approaches, (vi) encourage the emergence of innovative topics, (vii) ensure the maintenance and strengthening relations between training and research in the future university, and (viii) pursue the implementation of the "quality approach". These specific objectives of our research project therefore aimed to consolidate our scientific achievements, while promoting risk taking necessary to adapt the research unit to changes in the general scientific context, at short, medium and long-term periods.

In terms of laboratory organization, the research unit will host a new research team, currently labeled EA 4843 UDA. This team - "Epidemiology and Pathogenesis of Enterovirus Infections (EPIE)" - will be

composed of 9 faculty teacher-researchers and hospital practitioners and a PhD student whose work is co-directed by a current member of the laboratory. Accordingly, we propose to structure the UMR activities around 6 research teams that will constitute the functional units of the laboratory. Moreover, changes in the composition and the research themes of the VMM team (Viruses and Microbial Metabolisms in aquatic ecosystems) have led to a name change for this team: microbial biodiversity and functional adaptations (BIOADAPT). Laboratory activities, after various restructuring, are now focused on environmental microbiology, with a strengthening of the environment-health interface and increased use of genomic and post-genomic tools. In line with these considerations, it is proposed that the name of the laboratory remained unchanged, because representative of current and future activities of the research unit.

The overall feasibility of our project will be ensured through transparent and flexible governance, together with a sustained policy of scientific management, construction and partnership renewal, and scientific foresight. This leads us to propose a second deputy director of the laboratory. Finally, it is important to say that this feasibility is, at least partly, related to the adequacy of the human and material resources with our main scientific goals. On January 1st 2017, the staff of the laboratory will increase by over 20%. Accordingly, it is desired that the recurrent funds of the unit granted by CNRS and the new university (UCA) increase. Because of the importance of non-recurring credits (mainly those from ANR projects), there is an "individualization" of research funds by researcher or by research team.

Key words : Microbial ecology, Environment and health, Host-parasite interactions, Biofilms and xenobiotics, Environmental genomics and bio-informatics, Community ecology, Trophic ecology, Viral epidemiology

Invisibles à l'œil nu, les microorganismes représentent pourtant la plus grande partie de la diversité du monde vivant et des fonctions biologiques qui assurent l'évolution de la vie sur notre planète.

Seule la connaissance des relations entre changements environnementaux et changements de la diversité des communautés de microorganismes peut permettre, à terme, la maîtrise des processus microbiens qui gouvernent le fonctionnement et la pérennité de notre environnement.

Au sein du laboratoire (UMR CNRS 6023), plus de 110 chercheurs, enseignant-chercheurs, praticiens hospitaliers, ingénieurs, techniciens et contractuels, répartis dans **6 équipes de recherche**, travaillent actuellement sur les microorganismes procaryotes et eucaryotes (Archées, Bactéries, Protistes, Champignons), ainsi que sur les virus, depuis les aspects moléculaires et cellulaires jusqu'aux rôles de ces organismes dans les écosystèmes.

La spécificité du laboratoire consiste à associer, au sein d'une même structure, des compétences au niveau de la **génomique** et de la **post-génomique** d'une part, et au niveau de la biologie des populations et des écosystèmes et de l'écologie, d'autre part. Une autre spécificité de l'unité réside dans son positionnement renforcé à l'**interface environnement – santé**, ce qui lui permet de mener des recherches

liées aux enjeux scientifiques émergents dans le domaine de l'écologie de la santé.

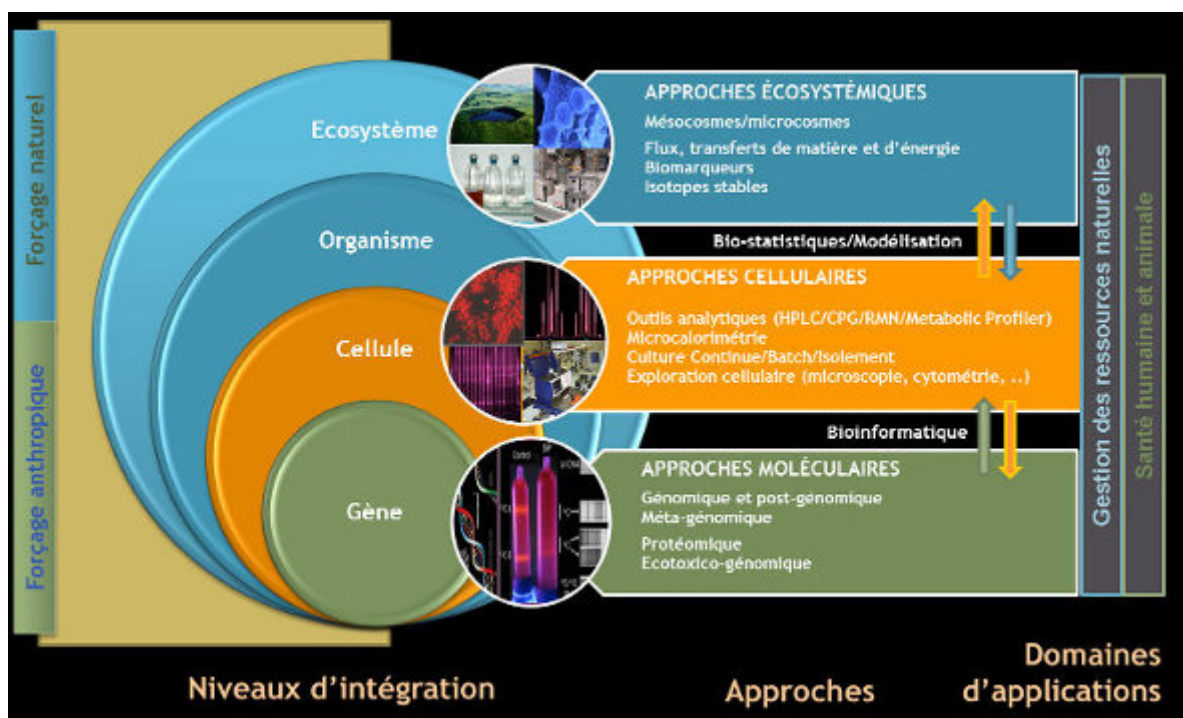
Notre démarche vise donc à rapprocher génome, environnement et santé, en mettant les concepts et les outils de génomique et de post-génomique au service de questions scientifiques ayant trait au fonctionnement des écosystèmes et à l'écologie de la santé. La stratégie scientifique de l'unité est construite autour de 3 grands domaines scientifiques :

- (i) parasitisme et écosystèmes microbiens,
- (ii) écologie trophique et fonctionnelle,
- (iii) écologie de la santé et écotoxicologie.

Plus précisément, les microorganismes sont étudiés en tant que acteurs essentiels

- (i) dans le fonctionnement des écosystèmes (notamment aquatiques et terrestres) sous forçage naturel et /ou anthropique,
- (ii) dans l'analyse des risques liés à l'introduction de contaminants biotiques et abiotiques, et
- (iii) comme sources de maladies infectieuses en lien avec des problématiques environnementales (nosémoses d'abeilles, maladies émergentes, infections nosocomiales, présence d'entérovirus et autres pathogènes, circulation des gènes de résistance aux antibiotiques,...).

Ces recherches, fondamentales, sont porteuses d'enjeux socio-économiques et biotechnologiques, dans les domaines de la gestion des ressources naturelles, des services écosystémiques et de la santé humaine et animale.



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