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## EPI-A - Épidémiologie animale

Rapport Hcéres

► **To cite this version:**

Rapport d'évaluation d'une entité de recherche. EPI-A - Épidémiologie animale. 2016, Institut national de la recherche agronomique - INRA. hceres-02034516

**HAL Id: hceres-02034516**

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Submitted on 20 Feb 2019

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# HCERES

High Council for the Evaluation of Research  
and Higher Education

Research units

HCERES report on research unit:

Animal Epidemiology

EPIA

Under the supervision of  
the following institutions  
and research bodies:

Institut National de la Recherche Agronomique - INRA

# HCERES

High Council for the Evaluation of Research  
and Higher Education

Research units

*In the name of HCERES,<sup>1</sup>*

Michel COSNARD, president

*In the name of the experts committee,<sup>2</sup>*

Mart DE JONG, chairman of the committee

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Under the decree N<sup>o</sup>.2014-1365 dated 14 november 2014,

<sup>1</sup> The president of HCERES "countersigns the evaluation reports set up by the experts committees and signed by their chairman." (Article 8, paragraph 5)

<sup>2</sup> The evaluation reports "are signed by the chairman of the expert committee". (Article 11, paragraph 2)

## Evaluation report

This report is the sole result of evaluation by the expert committee, the composition of which is specified below. The assessments contained herein are the expression of an independent and collegial reviewing by the committee.

**Unit name:** Animal Epidemiology

**Unit acronym:** EPIA

**Label requested:** UMR

**Current number:** UR 0346 INRA

**Name of Director (2015-2016):** Ms Gwenaël YOURC'H

**Name of Project Leader (2017-2021):** Ms Gwenaël YOURC'H

## Expert committee members

**Chair:** Mr Mart DE JONG, Wageningen University, The Netherlands

**Experts:** Mr Jordi FIGUEROLA, CSIC, Spain  
Ms Chantal GUIHENNEUC, Université Paris Descartes (representative of the INRA CSS)

**Scientific delegate representing the HCERES:**  
Mr Gabriele SORCI

**Representatives of supervising institutions and bodies:**  
Mr Jean-Baptiste COULON, INRA  
Mr Thierry PINEAU, INRA  
Mr Thierry ROGER, VetAgro Sup

**Head of Doctoral School:**  
Mr Jean-Marc LOBACCARO, Doctoral school n° 65, "Life, Health, Agronomy, Environment Sciences"

## 1 • Introduction

### History and geographical location of the unit

The “unité d'épidémiologie animale” (UR 0346 INRA, “EPIA”) belongs to the animal health division of INRA (“département de santé animale”). As of June 2015, the unit encompasses altogether 31 members including 22 permanent positions. The unit is located on two main sites, one at Theix, near Clermont-Ferrand (21 members) and another one at Marcy l'Étoile in the VetAgro Sup veterinary campus near Lyon (6 members). In addition, one research engineer is located at the University Lyon 1 campus at La Doua. The unit (“laboratoire d'écopathologie”) was created in 1978 to surpass the paradigm “one microbe - one disease” that did not explain many of the health problems in farming. In 1999, the unit was renamed “animal epidemiology” to promote the epidemiology discipline.

### Management team

Head: Ms Gwenaël VOURC'H

Deputy head: Ms Karine CHALVET-MONFRAY

### HCERES nomenclature

Domaine : SVE

Sous-domaine : SVE2

Sous-domaine principal : SVE2 LS8

Sous-domaine secondaire : SVE1 LS7

### Scientific domains

The unit focuses on the analyses and modelling of infectious diseases, including the diversity and the effect of global change on emergence and transmission.

## Unit workforce

Unit workforce	Number on 30/06/2015	Number on 01/01/2017
N1: Permanent professors and similar positions	4	4
N2: Permanent researchers from Institutions and similar positions	4	4
N3: Other permanent staff (technicians and administrative personnel)	14	15
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)		
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (technicians and administrative personnel)	1	
N7: PhD students	7	
<b>TOTAL N1 to N7</b>	<b>31</b>	
Qualified research supervisors (HDR) or similar positions	6	

Unit record	From 01/01/2010 to 30/06/2015
PhD theses defended	12
Postdoctoral scientists having spent at least 12 months in the unit	2
Number of Research Supervisor Qualifications (HDR) obtained during the period	

## 2 • Overall assessment of the unit

### Introduction

This is a small but very dynamic unit working on the analyses and modelling of infectious diseases, including the diversity and the effect of global change on emergence and transmission. The unit members work at the interface between human, farm, and wild animal health (one health concept).

The unit has succeeded in meeting the previous recommendations, in terms of improving international visibility and publishing in better quality journals. They also formalized their collaboration with VetAgro Sup by formulating a proposal to become a joint research unit (INRA, VetAgro Sup).

### Global assessment of the unit

The group is very strong in those research areas where they combine diversity with dynamics and evolution of pathogens. The scientific quality is excellent with many papers in good journals (given the size of the unit). The

research of the unit has important societal implications, such as change in the perception of infection risk from alternative hosts, and transfer of knowledge to risk managers and policy makers.

### Strengths and opportunities in the context

The strength of the unit is now in the analysis of pathogens with multiple hosts. This surpasses the traditional view that prevailed in animal epidemiology based on the one pathogen - one host concept.

From there, they have moved to pathogen interactions within hosts and they plan to include the non-pathogenic microbes i.e. the microbiota. This seems a natural extension to the existing research building on current strengths and using new technologies. Even though the study of the microbiota is now very timely, taking into account how microbiota diversity affects transmission represents a novel approach in animal epidemiology.

They have been involved in the study of zoonotic diseases (e.g. Lyme, Q-fever), which are topics in tight connection with societal demands (one health).

They are able to be multidisciplinary in that they have all in their own hands: fieldwork, molecular biology, statistical and mathematical modelling. Given the small size of the unit, this represents a remarkable effort.

From the interviews, it seems that the management is successful despite the fact that unit members are located in two distant sites.

### Weaknesses and threats in the context

There is definitely a need to attract more external funding, in particular European grants (H2020).

The unit seems to depend too much on the subjects on which funding is available even when these may not fit in the research strategy of the unit.

In the future the unit will have to adapt to a reduction of the technical help, as this is the policy within INRA and this will be a threat for the unit.

Even though the international visibility and profile has been improved, the unit still has a relatively modest international visibility, one issue being the accessibility for non-French speaking researchers.

### Recommendations

The unit should focus on new original projects with societal relevance for which the expertise of the unit is useful. Strong examples of current approaches in this line are Lyme disease and Q fever. This involves extending these approaches to include humans as one of the hosts through cooperation with human medical doctors.

The unit should be more proactive to attract high profile young researchers as postdocs or junior INRA scientists.

There are opportunities, given the societal interest for the "one health" concept, to get more external funding.

The unit could increase its international profile by attracting postdocs and visiting scientists from abroad.

The unit should reconsider its strategy to have all the computing facilities (hardware and personnel) in house. A more effective alternative may be to share them with other units with similar requirements.

The methodology theme plays a very important role in providing tools that are used by the whole unit. This deserves to be better acknowledged.

### 3 • Detailed assessments

#### Assessment of scientific quality and outputs

The unit has three missions: “detection of infectious diseases and associated risk factors”, “dynamics (called circulation in some instances) and evolution of pathogens and their interaction with host”, and “method development”. In the past, there have been three research themes: “diversity”, “global change”, and “method development”. The output is documented based on these latter themes. The strong points are the study of multi-host systems (including vectors as alternate host), and looking at the diversity of the pathogens in these hosts and the implications for population dynamics.

The unit has produced some important contributions on the circulation of tick-borne pathogens in multi-host systems. In particular they found that the spirochete *Borrelia burgdorferi*, the agent of the Lyme disease, has a better transmission rate when infecting an introduced rodent species (the Siberian chipmunk) compared to native rodents. This result links the epidemiological risk of a human disease to the ecological concerns related to invasive species. A population genomic approach on *B. burgdorferi* also showed that distinct genetic clusters have different epidemiological and transmission dynamics.

The development of molecular biology techniques to identify several pathogens in the same sample is an important progress for this line of research. It allows moving from one pathogen and multiple hosts to more pathogens per host and to how these pathogen communities are transmitted between different hosts (species).

The original work of the group on communities of pathogens within a host can also be extended to work on beneficial or non-pathogenic microbes i.e. to the different microbiota of the host.

Overall the unit has published 117 papers in international peer-reviewed journals. These include high profile journals within the field of parasitology and infectious diseases, such as PLoS Pathogens (2), Trends in parasitology (1), emerging infectious diseases (1), eurosurveillance (2), Critical Reviews in Microbiology (1), ISME Journal (1), Frontiers in Microbiology (1). Seventy one percent of these papers have been published in journals that are classified as excellent (54%) or exceptional (17%) by the NORIA classification system. Members of the unit were first or senior authors in 60% of them, and 35% involved an international collaboration.

#### Short appreciation on this criterion

The study of differences among pathogens and how those are associated with different hosts/host species seem an important strength, also because of the combination of field data collection, molecular biological techniques and modelling. The scientific quality and outputs are excellent, given the size of the unit.

#### Assessment of the unit academic reputation and appeal

The unit participates in two European projects (EMIDA-VICE and EDENEXT) and the French LabEx ECOFECT, but they do not lead any of these. The unit has also been involved in three other national projects (ANR). Moreover, the members of the unit have organized three European workshops on the joint risk score in Paris.

A member of the unit has set up the R2A2 network on the use of antibiotics and the risk of resistance to antimicrobials in farm animals.

In other respects, the international profile of the unit is not very strong: PhD students and postdocs are essentially from France. Also, there are no visiting scientists from abroad e.g. for sabbatical leave.

A member of the unit is in the editorial board of Infection, ecology and epidemiology.

The quality and number of the other scientific contacts (invitation to 9 international conferences and 10 national ones) seem good for a group of this size. Given the quality of the research this implies that improvement is possible.

#### Short appreciation on this criterion

The academic reputation and appeal of the unit are very good.



### Assessment of the unit interaction with the social, economic and cultural environment

The unit has partnership with public and private stakeholders. The collaboration with Merial is noteworthy: it results in the production of a weekly updated estimate of spatial explicit risks of tick abundance. This product has veterinarian practitioners as their main users. Members of the unit also participate to the development and use of the diagnostic tests on Q fever with the IDvet and Adigen companies, and a collaboration with the *fédération nationale des chasseurs* to assess the seroprevalence of Q fever in wildlife (roe deer and wild boar).

One member of the unit is the chair of an interdisciplinary research network on the use of antibiotics in farm animals (R2A2).

The unit has produced 8 software applications for implementing different analyses (for instance the R package GraphScan).

Due to their expertise, researchers from the unit have been involved in more than one hundred expertise opinions for the European Food Safety Authority and ANSES.

The research results produced by the unit have been communicated through professional and technical meetings and publications and direct interaction with decision-makers (29 articles in professional journals and 11 invited talks in professional conferences).

#### Short appreciation on this criterion

The unit has excellent interactions with the social, economic and cultural environment.

### Assessment of the unit organisation and life

A difficulty is the necessity to manage several distant sites: Theix with 21 members, Marcy l'Étoile with 6 members and Lyon 1 University (1 member). A scientific committee was created in 2014 with 4 persons: 2 directors, a chargé de recherche and an ingénieur de recherche. The committee was impressed by the organization of several meetings giving a dynamic life inside the unit in spite of this geographical spread: A general assembly meeting every month, a scientific meeting every month, a PhD day per year and a 2-day seminar.

Moreover, three working groups "statmathinfo", "laboratory activity group", "genomic group" manage the unit's global strategy on topics covering various multidisciplinary themes.

The unit's budget (without wages) has increased from 2011 to 2014 with a total today of about 400 kEuros. Moreover, the contribution from contracts to the budget has become larger than the contribution from INRA. Thus, the composition of the budget demonstrates the increased success of the unit in obtaining external funding. However, compared to other groups in INRA, this is still insufficient.

Each scientist is responsible for the budget of its own project. However, for large projects (over 60,000 euros), 10% are provided to the unit to fund projects having no - or insufficient - external support. This organised solidarity is praiseworthy as it allows, in particular, the promotion of innovative projects.

Finally, several transverse activities like "prevention", "quality", "skill-building", "computer management", "technical and scientific information", "laboratory analyses" and "fieldwork" are also organised collectively, showing again the positive atmosphere and attitude in the unit. Note that these transversal activities are managed by different persons of EPIA, leading to a wide sharing of responsibilities.

#### Short appreciation on this criterion

The unit has a very good to excellent management in spite of the difficulties coming from the geographical dispersion. It is remarkable that members have numerous exchanges and have all the opportunity to discuss with the management if necessary. Finally, the quality of atmosphere and wellbeing within the unit are noticeable. The regular and important improvement of budget shows a good management of the unit, but further improvement is needed to reach the level of other units in INRA. A challenge is to deal with less technical support and more researchers.

### Assessment of the unit involvement in training through research

Unit members taught 60h per year at (1) the masters of University Joseph Fourier Grenoble in the field of modelling in biology and medicine, more precisely on dynamic modelling for pharmacokinetics and for epidemiology (22 h per year) (master 1 « ingénierie pour la santé et le médicament », master 2 « modèle, innovation technologique, imagerie », at (2) École des Hautes Études de Santé Publique (12h/year 2010-2012) (international master of public health) on zoonosis, and at (3) the doctoral school of university of Lyon (“évolution écosystèmes microbiologie modélisation” E2M2) (9h per year). The unit members also give lectures (about 9h per year) at “École Nationale des Services Vétérinaires”, a post graduated school.

Twelve PhD theses were defended, 8 PhD theses are still in progress and 10 Master 2 are supervised. In addition 6 veterinary in equine medicine interns are supervised for their research report. The unit belongs to the “école doctorale des sciences de la vie, santé, agronomie, environnement” (ED 65).

#### Short appreciation on this criterion

The unit is involved in various national and international courses. The number of hours per year is reasonable but the unit could profit from doing more teaching at the international level. The number of PhD theses (defended or in progress) has considerably increased since the last period, which reveals an increasing commitment to the PhD training. Overall, the unit has a very good involvement in training.

### Assessment of the strategy and the five-year plan

The general objective of the research unit is to study the epidemiology of infectious diseases in relation to ecological and evolutionary processes. The research program is structured in three main research themes: detection of infectious diseases and identification of risk factors, ecological and evolutionary processes that shape the transmission processes and development of new methods. The three main research themes fit into the research priorities defined by INRA and VetAgro Sup. The research strategy is a continuation of the strategy followed until now by the unit.

The choice of research topics is timely, as there is a demand from society and policy makers for improved knowledge on the surveillance and management of animal infectious diseases, especially those with a zoonotic component.

The different themes include research on a wide range of pathogens, which is not a problem as the nature of disease outbreaks often modifies the research agenda of this type of institutes, and the comparison of a range of pathogens with different characteristics may be an added value. However, how the interactions and synergies between themes will occur is not always clear. A good integration of the three research themes through better exchanges would confer an added value to such a small unit

The SWOT analysis may benefit from a better identification of potential new stakeholders for the research of the unit especially at the international level. Cooperation with human medicine is important for the study of zoonotic diseases.

Given the current expertise of the unit members, the planned work seems certainly feasible.

#### Short appreciation on this criterion

The strategy for the next five years is excellent.

## 4 • Conduct of the visit

### Visit date

**Start:** 13<sup>th</sup> January 2016 at 8:30 a.m.

**End:** 13<sup>th</sup> January 2016 at 6:00 p.m.

### Visit site:

**Institution:** INRA

**Address:** Route de Theix, 63122 Saint Genès Champanelle

### Conduct of the visit:

The visit started at 8:30 a.m. with a short presentation of the HCERES missions by the scientific delegate. The head of the unit presented then the past research activity and achievements. The deputy head presented the future plan for the up-coming five years, followed by the presentation of the three scientific themes of the unit (global change, biodiversity, methods). The panel then had meetings with the faculty and technical staff. After lunch, the panel met the PhD students and post-docs, the representatives of INRA and VetAgro Sup, the representative of the doctoral school, and finally the head and the deputy head of the unit. The closed door meeting of the panel started at 3:30 p.m. and finished at 6:00p.m.

## 5 • Supervising bodies' general comments

HCERES  
Evaluation des unités de recherche  
Vague B

Theix, 16 mars 2016

Response to the evaluation report,

We have received the evaluation report of the HCERES committee. We are thankful for the constructive analysis and recommendations.

We thank you again for the quality of the discussions we had during the visit of the committee on January 13<sup>th</sup>.

Sincerely,



**G. VOUREH**  
Directrice de l'Unité de Recherche  
D'épidémiologie Animale



Gwenaël Vourc'h  
Directrice

Karine Chalvet-Monfray  
Directrice adjointe