



# VIP

VALORISATION  
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en PARTENARIAT

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## Editorial

Epizootics know no borders: they travel with people, animals, foods and vectors. Tracing and preventing them and proposing control methods are among the priorities for CIRAD researchers. To this end, its teams make use of the latest developments in the fields of genomics, proteomics, biotechnology, nanotechnology and vaccinology.

CIRAD has characterized the mechanisms of host-pathogen interactions, identified virulence or protective genes and developed vaccine supply schemes that enable the development of optimum vaccines and innovative diagnostic tests. These technological advances were achieved by taking account of the specificities of developing countries, for instance in developing thermostable vaccines.

CIRAD, which is an international reference laboratory for several livestock diseases, was involved in establishing the strategic research agenda for the European technology platform Global Animal Health, and works with the World Organization for Animal Health and the FAO. This puts it at the heart of animal health research networks. CIRAD is keen to develop its links with the pharmaceutical industry, in the hope of allowing users to benefit from progress made in controlling emerging exotic animal diseases.

If we are to outpace epizootics, we need your help: please get in touch if you would like to work with us on one of the topics covered in this newsletter.

**Véronique VISSAC-CHARLES**  
CIRAD Technology Transfer and  
Development Coordinator

### Masters in animal production and health

Since 2005, CIRAD, the *Ecole nationale supérieure agronomique* in Montpellier and the University of Montpellier II have been running the PARC Masters course in animal production in warm regions. In 2006, CIRAD is offering a new Masters in epidemiological surveillance of human and animal diseases, in conjunction with the *Ecole nationale vétérinaire* in Maisons-Alfort and the Universities of Paris XI and XII. These courses, for students and professionals from industrialized and developing countries, involve numerous animal production players.

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### Bird flu

In conjunction with national and international animal health organizations, CIRAD has just published a booklet on bird flu that sums up the main information currently available. It takes stock of the disease, which first affected Southeast Asia before spreading to Europe and then Africa early in 2006. The booklet is pocket-sized, abundantly illustrated, and can be used for teaching purposes. It is supplied on justified request.

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### Rapid genome sequencing

CIRAD organized a seminar in June 2006 in conjunction with the University of Montpellier II and the biotechnology firm Skuld-Tech, to present some rapid DNA sequencing methods developed recently in the United States and consider establishing a regional interest group. These new, very rapid methods mean that it is now possible to sequence whole genomes in a very short time and to pinpoint rare mutations.

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### Strategic monitoring

CIRAD and ADIT (*Agence pour la diffusion de l'information technologique*) have just signed a general agreement on strategy and technology monitoring and the dissemination of information supplied by scientific services at French embassies. On behalf of researchers at CIRAD, ADIT will be running a service called "SAT Monde" (active global technology surveillance), including e-mail alerts and news flows to be chosen from a list of technological topics. The system is to be funded by the French Ministry of Research.

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### Using waste water from olive oil production

CIRAD has developed a patented process for recycling the waste water produced during olive oil extraction. This water is a source of antioxidants, which are highly sought-after in the cosmetics and nutrition industries. The Moroccan firm ZINESSALAM SARL has just bought a licence for the technology, and the city of Fes has asked it to set up a pilot unit to treat all the city's waste water from olives, ie some 100 000 m<sup>3</sup> per year.

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ISSUE

BIOTECHNOLOGIES AND ANIMAL HEALTH



# Science

## ► MICROBE GENOME ANALYSIS

CIRAD is conducting a comparative study of microbe genomes in partnership with the *Institut national de la recherche en informatique et automatique* (INRIA, Rhône-Alpes), in the hope of developing new animal disease diagnostic tools and new generations of vaccines. The project is backed up by the CIRAD microbial bioinformatics platform.

Its initial work has enabled it to resolve the complete genome of two strains of the bacterium *Ehrlichia ruminantium*, which causes heartwater in ruminants in Africa and the West Indies and is now threatening the Americas. Comparing genomes served to pinpoint a set of different target genes that can be used to discriminate between different strains. A patent has been taken out on these new diagnostic tools.

Other work is under way on the pathogens that cause contagious bovine peripneumonia and contagious caprine pleuropneumonia. The project is aimed at identifying the genes associated with disease development and using biotechnology to develop vaccines. ■

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## ► FROM GENOME TO INFECTION CONTROL

Epizootics know no borders, and their expansion is fostered by movements of animals, trade in food, and the spread of the organisms that carry vector-borne diseases. In the event of infection foci in a hitherto disease-free country, epidemiological surveys are not always enough to determine the geographical origin of the infection. Recent molecular biology techniques can “trace” their origin. By analysing the genome of the pathogen involved and comparing it with a databank, links can be established with strains from other regions.

CIRAD has thus developed tools to trace viruses (*peste des petits ruminants* and African swine fever) and bacteria (contagious bovine peripneumonia and heartwater), and characterize the vectors of bluetongue virus. Their use has confirmed that *peste des petits ruminants* is circulating in West Africa and the Middle East, and a preventive vaccination campaign is under way, in conjunction with national veterinary laboratories. ■

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## ► ANIMAL HEALTH TECHNOLOGY PLATFORM

Since 2005, a global research campaign has been under way on animal diseases, involving international organizations and developing countries. A broad-ranging coalition of public- and private-sector partners from the animal health sector, backed up by the European Commission, has begun building a European technology platform called Global Animal Health, headed by the International Federation for Animal Health, in the hope of improving animal health, which is seen as a global public asset, in industrialized and developing countries.

CIRAD was involved in establishing the platform’s “strategic research agenda”. A strategy of collaboration between the pharmaceutical industry and the public research sector has been adopted, to speed up the supply of competitively priced diagnostic kits and vaccines. The conditions for efficient coordination of all the national disease surveillance services have been determined, and the partners have drawn up a list of priority diseases, headed by bird flu and swine fever. ■

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## ISSUE

# BIOTECHNOLOGIES AND ANIMAL HEALTH



Drenching cattle in Rwanda. © N. Chabeuf

## Market

### ► TROPICAL ANIMAL DISEASE DIAGNOSIS

Since 1985, CIRAD’s expertise in biotechnologies applied to animal health has been internationally recognized, notably by the OIE, World Organization for Animal Health, of which CIRAD is a collaborating centre.

For instance, CIRAD has developed ELISA (Enzyme Linked ImmunoSorbent Assay) tests to diagnose contagious bovine peripneumonia, contagious caprine pleuropneumonia and *peste des petits ruminants*, using monoclonal antibodies. The kits developed are now being marketed by regional and European private partners. These tests are now in use in many African countries.

Various viral strains of *peste des petits ruminants* have now been characterized on a genetic level, using the PCR (Polymerase Chain Reaction) technique. The classification of contagious bovine peripneumonia and contagious caprine pleuropneumonia has been improved. A real-time PCR quantitative diagnosis technique is currently being developed in partnership with a private firm in Lyons, and should make it possible to assess the efficacy of new vaccines against bluetongue. ■

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### ► NEW ANTIVIRAL TECHNIQUES

Rinderpest and *peste des petits ruminants* are major diseases of livestock in developing countries. Despite vaccination, there are still outbreaks. Controlling viruses after infection would help to reduce the number of cases of re-emergence.

CIRAD is currently developing a new generation of antivirals that significantly inhibit replication of the rinderpest, *peste des petits ruminants* and measles viruses, which belong to the same viral family. In future, these antivirals could serve as therapeutic molecules to treat infected animals.

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These results have been patented, and may be of interest to the pharmaceutical industry, particularly as regards measles. ■

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### ► VACCINE AGAINST PESTE DES PETITS RUMINANTS

*Peste des petits ruminants* (PPR) is a threat to 750 million small ruminants in developing countries. However, for almost 20 years

the strain has been the object of a technology transfer to various veterinary laboratories

now, a highly effective PPR vaccine has been available, which ensures very high immunity in

sheep and goats and protects them against the disease for life.

CIRAD has worked with the Institute for Animal Health in the United Kingdom to develop the PPR vaccine strain Nigeria 75/1. For several years now, the strain has

been the object of a technology transfer to various national and private veterinary laboratories in Africa, the Middle East and Asia, where the disease is having dramatic consequences.

Since 1999, these laboratories have produced 70 million doses (quantity to protect one animal) of PPR vaccine. Unfortunately, this is still not enough to control the disease. ■

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### ► ANIMAL HEALTH TRAINING

In addition to participating in diploma courses such as the Masters in animal production in warm regions (PARC), CIRAD, in its capacity as an OIE reference laboratory for several diseases, regularly organizes technical workshops in Montpellier and in developing countries. Its courses are intended for technicians working for national veterinary services.

In 2006, two weeks of workshops on contagious bovine peripneumonia have been organized for participants from Ethiopia, Brazil and Romania. Such courses are held each year, alternately in French and English. Likewise, a workshop on West Nile disease diagnosis was also held recently in Guadeloupe for participants from eight Caribbean countries.

CIRAD regularly organizes technical workshops in Montpellier and in developing countries

CIRAD also works with professionals, livestock farmers and veterinary surgeons. In Guadeloupe and Martinique, it is responsible for the technical supervision of sanitary protection groups working against diseases of small ruminants. It is involved in the technical committee for tick control throughout the Caribbean. ■

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### ► DEVELOPMENT OF INNOVATIVE VACCINES

Sanitary problems are a major constraint on animal production, and developing effective vaccines is thus a priority.

CIRAD uses various vaccination methods to fight a range of pathologies (tuberculosis, mycoplasmoses, morbilliviruses, etc): deleted vaccines, vaccine carriers (viruses, liposomes, etc), immunostimulants and genetically modified plants that produce vaccine proteins. Other methods are under study: biological food vaccines, biopolymers, etc, along with new administration methods, whether oral or transcutaneous. A vaccine against *peste des petits ruminants*, carried by an adenovirus and administered subcutaneously, has

biological food vaccines, biopolymers, etc, along with new administration methods are under study

been tested successfully in Ivory Coast, and nasal administration is currently being tested at CIRAD.

These studies are being conducted in conjunction with the *Institut national de la recherche agronomique* and the *Agence française de sécurité sanitaire des aliments*, within European and African networks. While the conditions in developing countries call for thermostable vaccines and simple, economical technology, such innovative techniques are also of interest to Europe, particularly for bluetongue. ■

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### ► QUALITY ASSURANCE FOR VETERINARY LABORATORIES

Quality schemes have spread considerably in veterinary laboratories in recent years, and are now compulsory for national reference centres in France.

CIRAD, which is a national and international reference laboratory for several tropical livestock diseases, is deeply committed to promoting quality. It is set to obtain ISO 17025 accreditation, assuring the quality of its results, for its laboratories in Montpellier and Guadeloupe in 2007. Moreover, it has just been granted ISO 14001 certification, which guarantees its respect and rational management of the environment in its work.

CIRAD has coordinated the creation of an African food hygiene laboratory network

This new qualification is also applicable in developing countries. CIRAD has coordinated and supervised the creation of an African food hygiene laboratory network (23 public- and private-sector laboratories in Cameroon, Guinea, Ivory Coast, Mali, Mauritania, Senegal and Madagascar). ■

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## INSTITUT POURQUIER

*CIRAD and the Institut Pourquier, in Montpellier, have been working since 2000 to produce and market veterinary diagnostic kits, particularly for contagious bovine peripneumonia (CBPP).*

INTERVIEW with Mr Jean-Marc Pourquier, General Manager of the Institut Pourquier

### What does the Institut Pourquier do?

The Institut Pourquier is a family firm that for several decades concentrated on producing the smallpox vaccine. It contributed to the eradication of the disease, instigated by the World Health Organization. From the 1970s onwards, the Institut Pourquier diversified its operations by developing a range of veterinary diagnostic reagents for livestock. It is now one of the leaders in the field, and achieves over 40% of its turnover on the export market.

### Under what circumstances did you start working with CIRAD?

CIRAD wanted to increase production of diagnostic kits for tropical diseases. The Institut Pourquier was keen to move into the export market and broaden its range of diseases. We thus had several meetings, between 1997 and 2000, with Joseph Domenech, Geneviève Libeau and François Thiaucourt, animal health specialists at CIRAD. We now produce the CIRAD ELISA test for CBPP.

### Which diseases are you working on?

We currently sell some sixty diagnostic kits for various diseases of bovines, ovines, caprines and porcines in the tropics, including CBPP, bluetongue and brucellosis. Our bluetongue diagnostic kit has CIRAD approval. We are currently working on new reagents for pigs and poultry.

### The Institut Pourquier at a glance

Nationality: French  
Status: limited company  
Founded: 1970  
Staff: 48 employees  
Turnover: 6 million euros  
Field: veterinary diagnosis



### What type of diagnostic tests do you make?

We make diagnostic kits that can detect antibodies or viruses in blood, milk or faeces samples, using various techniques: agglutination, gel immunodiffusion, ELISA, PCR, etc. The ELISA technique, which accounts for a large share of our turnover, is currently the most widely used and best satisfies the demand from our customers. The PCR pathogen detection technique, which is more costly, is used in numerous laboratories.

We are now developing kits for swine fever and bird flu.

### What are the most striking aspects of your collaboration with CIRAD?

We have benefited from CIRAD's reputation. We now export to some fifty countries worldwide. Our ELISA test for CBPP, which is suitable for field use (sturdy, specific and thermostable), has just been improved, and is now the OIE reference test.

### Do you have any plans for new projects with CIRAD?

We are planning to produce an ELISA test for contagious caprine pleuropneumonia, which is currently a problem in the Middle East, for which there is clearly a market. We are also interested in stepping up our collaboration on bird flu and swine fever.

For further information:

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## Senegal

CIRAD is working towards food security in Senegal. Its operations are part of an overall cooperation

programme with research, higher education, development organizations, the private sector and producers' organizations.



### CIRAD IN SENEGAL

has 18 staff members and a Regional Director for Senegal, Mauritania, Gambia, Cape Verde and the Republic of Guinea. Each year, it supervises some forty PhD and other students. It hosts the International Research Unit on Pastoralism, which involves CIRAD, the University of Dakar, the *Institut sénégalais de recherches agricoles*, the *Centre de suivi écologique* and the *Ecole nationale d'économie appliquée du Sénégal*. It is involved in the regional pole of excellence in adapting crop production to drought, along with Senegalese research organizations.

Its main fields of operation include:

- natural resource management;
- pastoralism in dry zones and its integration into national policy;
- crop adaptation to drought;
- crop production (legumes, cereals, market garden crops);
- animal production (bovines, ovines, chickens);
- animal health and the environment;
- decentralization and territorial development;
- policies for developing agricultural commodity chains.

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### SPECIFIC EXPERIENCE OF ANIMAL HEALTH

CIRAD researchers are involved in the European EDEN project (Emerging Diseases in a changing European environment). The aim is to estimate the risk of the introduction of new strains (West Nile Virus) and new pathogens (Rift Valley Fever) as a result of wildlife and domestic animal movements towards Europe. The team is also working on the epidemiology, risk analysis and control component of a Wellcome Trust project on the diagnosis, epidemiology and control of the African swine fever virus.

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