

The French National Alliance for Life Sciences and Health (Aviesan) has been set up in response to the commitment to further step up the French research performances by fostering its consistency, creativity and excellence. This mission calls for scientific coordination of the main research themes (involving all the partners as well as the operational coordination of projects, resources and funding).

In particular, Aviesan's purpose is to give a fresh boost to translational research by speeding up the transfer of fundamental knowledge to clinical application, and facilitate industrial partnerships. It increases cross-disciplinarity by opening biology and medicine up to contributions from other life sciences and social sciences. Finally, it ensures defining shared objectives in terms of European and international cooperation.

[www.aviesan.fr](http://www.aviesan.fr)

AllEnvi, the French National Alliance for Environmental Research, aims to coordinate French research on environment and addresses major societal challenges. The priorities of its members are now at the top of humanity's agenda and are part of the United Nations Sustainable Development Goals (SDGs).

The alliance is a national instrument, for the implementation of the different plans, to feed the public policies, for the reinforcement of the partnerships with the socio-economic world and for the opening of constructive dialogues at both national and international levels. These actions can rely on the mobilization and the skills of its 12 founding members and 15 associate members. This broad multidisciplinary community provides knowledge, designs innovative technologies and systematically apprehends all issues related to the environment, food, water, biodiversity, climate and territories.

[www.allenvi.fr](http://www.allenvi.fr)

The French Research Agency ANRS (France REchercheNord & sud Sida-hiv Hépatites) was created in 1988, against a background of urgent scientific and public health need. It works with researchers from the Global North and South, from all disciplines, and all affiliations, on the following scientific priorities:

- better understanding of biological mechanisms (basic research)
- development of new diagnostic and therapeutic tools and strategies (clinical research)
- analysis of population-level issues (human and social sciences and epidemiological research)
- development and assessment of prevention strategies (vaccine research and public health research).

This unique organization primarily takes place in eight countries, thanks to partnership agreements bringing together researchers from the North and South around projects in line with local and national health priorities.

The ANRS funds research projects from conception through to completion and disseminates their results for the wider benefit of communities.

Since 2012, it has been an autonomous agency within Inserm.

[www.anrs.fr](http://www.anrs.fr)



AllEnvi

Alliance nationale de recherche pour l'Environnement

In the context of the Global Fund's  
6<sup>th</sup> Replenishment Conference

Centre des Congrès  
Room Bellecour 1+2, Lyon  
France

October 9<sup>th</sup>, 2019

1-3 PM

Symposium

**SUPPORTING SCIENTIFIC RESEARCH**

**AGAINST PANDEMICS:**

**A CRITICAL IMPERATIVE TO MEET  
THE SUSTAINABLE DEVELOPMENT GOALS**

# FRENCH SCIENTIFIC RESEARCH AGAINST HIV, TUBERCULOSIS, MALARIA PANDEMICS

From basic to clinical, social, and public health sciences, all aspects of research concerning the fight against AIDS, tuberculosis and malaria are supported by the French institutions (Inserm, CNRS, CEA, IRD, CIRAD, Pasteur Institute, universities, hospitals) concerned by life sciences. ANRS directly funds and coordinates research dedicated to HIV and comorbidities.

## AIDS / HIV

All research disciplines collaborate on the HIV research agenda, in France and in resource-limited settings. Programs conducted overseas include operational research looking for preventive and care solutions for the key populations, clinical research for elimination of mother-to-child transmission, tailored management of co-infection (tuberculosis, cryptococcal meningitis, viral hepatitis), simplification and optimization of antiretroviral treatment (ART) strategies.

French HIV scientists operate in 25 countries but ANRS programs are focused in eight of them (Brazil, Burkina Faso, Cameroon, Cambodia, Ivory Coast, Senegal, Vietnam for HIV and Egypt for viral hepatitis C). In these countries, long-term partnerships have been established with national authorities, research, care and public health organizations as well as civil society. Research outputs are rapidly made available to national and international health policy-makers, allowing the rapid translation of research findings in public health decisions. Three recent examples highlight these principles and their application. The ANRS 12249 TasP trial (Lancet HIV 2018) in South Africa was the first study ever evaluating a universal test-and-treat strategy at population level, exploring its consequences on HIV transmission and epidemic control. It followed the ANRS 12136 Temprano trial (New Engl J Med 2015 and Lancet Global Health 2017) in Ivory Coast, one of the two international trials concluding that immediate and systematic ART had strong individual benefits. ANRS Temprano and TasP led to major shifts in World Health Organization (WHO) decisions for the public health approach of HIV management and control. More recently, the ANRS 12313 Namsal trial (New Engl J Med 2019) in Cameroon provided the first field evaluation of dolutegravir-based regimens now recommended for 1<sup>st</sup> and 2<sup>nd</sup> line ART worldwide by the WHO. It confirmed the appropriateness of this approach but also showed its limits, e.g. for those with advanced HIV disease and high plasma viral load.

The public health impact of these studies has been rapidly reached thanks to the strong partnerships between French and national researchers in partner countries, leading more and more often to the design and construction of multi-country and multi sites studies. This has been possible through an important leveraging of co-funding by many partners (Initiative 5%, EDCTP-2, UNITAID, Bill and Melinda Gates Foundation, pharmaceutical companies).

Finally, domestic research conducted in France on HIV remission and preventive vaccines is designed to provide solutions amenable to an international and global response.

## TUBERCULOSIS

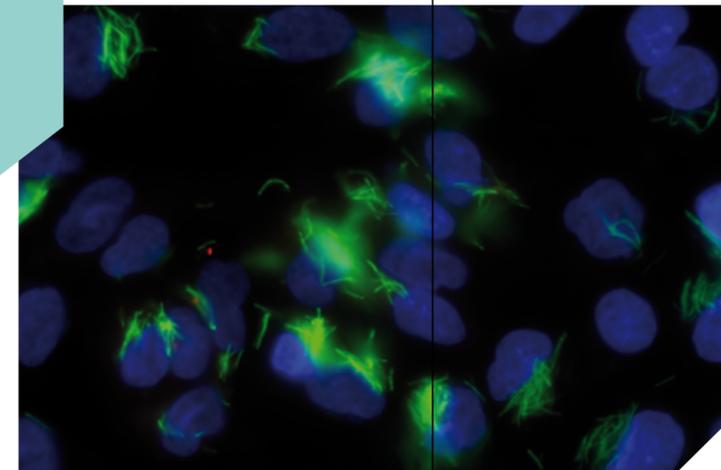
French teams involved in research on tuberculosis (TB) are scattered throughout the country, with important sites located in Paris, Lyon, Lille, Montpellier, Nantes and Toulouse. They cover a wide range of research areas, from fundamental to epidemiological, clinical and operational science. Most of the research is carried out in collaboration within French institutes part of the French alliance Aviesan, along with extensive collaborations with international institutions.

A major effort is undertaken on TB vaccine research. Besides a number of field studies on TB-vaccine-related issues carried out in sub-Saharan Africa and South-East Asia, essentially by Inserm, ANRS and IRD, several French institutions including Inserm, CNRS, Pasteur Institute in Paris and in Lille, as well as the private company Transgène, are also involved in pre-clinical vaccine-discovery. These institutions collaborate within large European and international consortia and participate in the European TB-Vaccine Initiative. Their research covers all stages of the disease, for which vaccines can be useful, such as pre-exposure, post-exposure, heterologous prime/boost and therapeutic vaccines. Novel live attenuated vaccines are being developed at the CNRS in Toulouse and at the Pasteur Institute in Paris. These two institutions also work on novel viral vector-based antigen-delivery platforms, such as non-integrative lentiviral vectors. Non-live delivery vectors, such as novel nanoparticle-based delivery systems, are also explored at the CNRS. Inserm and Pasteur Institute in Lille explore heterologous prime-boost strategies, priming with BCG and boosting with purified latency antigens, such as the heparin-binding hemagglutinin and co-regulated antigens. A similar approach is taken by the CNRS in Toulouse, where novel lipid antigens are being discovered for potential use in heterologous prime/boost strategies. Finally, Transgène in Strasbourg and Lyon exploit their Modified Vaccinia Ankara platform to express a number of different antigens fused to each other, which represent the various stages of infection.

Other initiatives are ongoing on the development of new diagnostics for TB and drug resistant-TB. For example, the TB-Speed project, coordinated by the Bordeaux university and IRD and supported by ANRS, Inserm and MSF, aims at reducing childhood mortality from TB by evaluating innovative cost-effective approaches for resource-limited settings. The approach includes the use of a molecular diagnostic assay applied on nasopharyngeal aspirate and stool sample, introduction of digital chest radiography. This project is multi-site, including six African countries and the Pasteur Institute in Cambodia. Important efforts are also being undertaken on the development of new molecular diagnostic assays by IRD and CNRS in collaboration with the Pasteur Institute international network based on microarray and NGS technologies. In addition, French laboratories in a private-public partnership between Inserm/CNRS/ Pasteur Institute of Lille and GenoScreen are involved in the development of novel tools for the diagnosis of drug resistant TB, based on deep sequencing. They have been evaluated in Europe, Asia and Africa and were shown to identify multidrug-resistant TB that were not detected by WHO-endorsed commercial tests. Finally, important efforts in Lille are focused on the diagnosis of latent TB and risk-stratification using novel cytokine release assays.



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Tuberculose - BCG fluorescents dans les macrophages

## MALARIA

Institutional French teams involved in research on malaria are spread throughout the country and abroad thanks to the existence of international joint units, research institute networks and an intense partnership network with scientists, national malaria programs and health professionals in malaria endemic countries.

Work covers a wide range of investigations, from basic research on parasite biology, vector biology and host-parasite interactions to epidemiological, clinical and anthropological studies, antimalarial drug screening and vaccine development. Major discoveries are obtained thanks to collaborations between French, international institutions and laboratories in endemic countries, mainly in Africa and Asia. Research is devoted to the main problems posed by malaria: alarming spreading of *P. falciparum* resistance to first-line treatments, absence of fully efficient vaccines, gaps in local health care systems and inadequate implementation of control measures in populations at risk, the crucial role of asymptomatic infections in the disease dissemination, increasing resistance of vector mosquitoes to insecticides, absence of non-toxic drugs able to get rid of *P. vivax* dormant forms that compromise eradication of this species.

Partnerships between academic laboratories and firms have been established, such as Anacor Pharmaceuticals, Glaxo Smith Kline, Pierre Fabre, Novartis, Biomérieux or Celgene. Some laboratories have close contacts with MMV (Medicines for Malaria Venture) in order to move potential drugs candidates into preclinical studies. Funding from private public partnership structures, such a DNDI (Drugs for Neglected Diseases Initiative), FIND (Foundation for Innovative New Diagnostics), the Bill and Melinda Gates Foundation or the Mériex Foundation is to be emphasized.

In this context, significant progress has been made over the last decade, such as: new ways of impregnating mosquito nets; *Plasmodium* diversity in African great apes and the potential for ape-to-human transfer; first RNA-seq analysis of dormant liver parasites; identification of new inhibitors that “awake” the dormant hepatic parasite (new “wake and kill” concept); discovery of parasite factors and drugs modulating the deformability of gametocyte-infected erythrocytes; identification of new steroid compounds efficient against chloroquine-resistant *P. falciparum* parasites; potential inhibitors that target essential chromatin factors of malaria parasites; discovery of parasite resistance molecular markers to artemisinins and to piperazine; evaluation of alternatives to intermittent preventive treatment of pregnancy-associated malaria and development of a vaccine to prevent it.

Great efforts have been devoted to the development of new tools: high throughput techniques, new animal models in immunosuppressed mice, mutant parasites, in vitro *P. vivax* culture systems, imaging approaches. All these innovations will pave the way for new discoveries with potent applications in vaccine and drug development, through interdisciplinary and collaborative research programs.



64518: Mesurer l'efficacité des moustiquaires, Bénin - Remplissage de questionnaire sur l'utilisation de la moustiquaire Lifenet. Caroline ABALLO et Achille AWALLE, enquêteurs entourés des enfants de Tori Bossito. Les scientifiques s'intéressent à l'intégrité physique de la moustiquaire (solidité, résistance) et à ses conditions d'usage par les habitants. L'objectif de l'enquête est de comparer l'efficacité de la moustiquaire Lifenet et de la moustiquaire Permanent. © IRD - Rita Saudegbe