Pasteur Institute of Guyana

The Pasteur Institute of Guyana headed since September 2014 by Dr. Mirdad Kazanji.

Created Dec 7th, 1940, Pasteur Institute of French Guyana and Inini, took name of Pasteur Institute of Guyana in 1946.

Missions: Prevention and treatment of diseases, infectiousness- priority is structured around four components:

1. Search
2. Support for public health
3. Education and training
4. Services

Research

Our strategic research areas: in recent years, this situation has resulted in particular:

- the re-emergence in humans of rabies (2008)
- the emergence of hantavirus causing several deaths (2008-2009),
- a profound change in the epidemiology of malaria,
- hyper-endemic dengue since the early 2000s with more frequent outbreaks,
- The recent arrival of chikungunya in the region, associated with a high risk of spread of the virus.

1-The Medical Entomology Unit - Head: Romain GIROD, Research Engineer, PhD

Unit interested in insect vectors (Culicidae and Sandflies), transmission of vector-borne diseases and factors for the improvement of control methods and prevention.

- **Anopheles** species of malaria vectors, and ***Aedes aegypti***, the vector of dengue and chikungunya.
    - Focusing on taxonomy, bio-ecology, behavior, the vector potential and adaptation to insecticides and the search for new insecticides and the development of methods surveillance.

Research programs

- Research program **on malaria *P. vivax*** in Guyana: characterize the Anopheles vectors of malaria, their role in disease transmission and resistance to insecticides.
- "Development of an **early detection method for the transmission of dengue** virus and **chikungunya** by the populations *of Aedes aegypti"*
- Program "SPREAD" - 2013-2015: study the dynamics of pyrethroid resistance in populations *of* Aedes *aegypti* in the border region between Guyana and the state of Amapá (Brazil).
- Program "REACT" 2014-2017: evaluate new insecticides candidates for the fight against *Aedes aegypti* and study the reversion phenomena of resistance to pyrethroids.
- Program "RICOCHET" 2014-2015: study **insecticide resistance** *in* Aedes *egypti* and its importance in vector competence for the Chikungunya virus and its impact on viral genetic evolution in the mosquito.

2- The Epidemiology Unit - Head: Claude Flamand, biostatistician, epidemiologist, MSc, FETP

The main research themes better understanding the methods of transmitting arboviruses such as dengue and Chikungunya.

- Study climate and environmental determinants, human factors and / or socio-behavioral associated with the transmission with a view to modeling the transmission dynamics.
- The work is based on multidisciplinary research approaches such as tele-epidemiology, methods of "data mining" or mathematical modeling.

Research programs

- Detect: Study of climatic and environmental determinants of dengue. Collaboration Aerology Laboratory of Toulouse, Météo-France, InVS Unit in Region West Indies and Guiana, UMR TETIS
- CAPE CHIK: Study of knowledge, attitudes and practices of the Guyanese population vis-à-vis the vector-borne diseases
- Spatio-temporal modeling of the dynamics of dengue in Guyana: Dynamics study of predictive referred to epidemics in the different municipalities of Guyana.
- Study of factors associated with severity of dengue: Analysis of data from a hospitalized patient cohort implemented in different hospitals of Guyana.

3- The Laboratory of Immunology of Leishmaniosis – Head: Eliane Executioner, PhD

The activity is the study of the immune response to Leishmania infection guyanensis.

- Understand and control an effective immune system of regulation under cutaneous Leishmania guyanensis.
- Studying different candidate vaccines against malaria in the animal model (saimiri) before devoting himself to the study of the immune response in patients who develop cutaneous leishmaniosis.

Research Program

- Studying the specific immune response of Leishmania RNA virus and cell populations involved in this response.

4- The Laboratory of Parasitology – Head: Lise Musset, PharmD, PhD

All its activities to the study of malaria parasites.

- The National Reference Centre (CNR) Malaria,
- The WHO Collaborating Centre for monitoring antimalarial drug resistance.

Research programs

- Study of resistance to antimalarial drugs: origin, mechanism and evolution:
    1. **Study the sensitivity to chloroquine *P. falciparum*.**
        - Collaborations: Broad Institute of MIT and Harvard, Cambridge; Columbia University; Centro de investigation cientifica caucaseco, Cali, Colombia; US Naval Medical research unit 6 , Callao, Peru; Faculty of Medical Sciences, Paramaribo, Suriname; National Malaria Control, Georgetown, Guyana; University of São Paulo, Brazil; Fundacao de Medicina Tropical Manaus, Brazil; Mahidol Oxford Research Unit, Bangkok, Thailand.
    2. Antimalarial Resistance to currently recommended in the Amazon
        - Level of resistance of P. *falciparum to* **artemisinin** derivatives (Coartem ® / Coartem ®) *and* P. *vivax* to **chloroquine** (Nivaquine ®).
        - Collaborations: Fundação de Medicina Tropical Dr. Heitor Vieira Dourado, Manaus, Brazil Evolution and diversity of parasites
    3. AMAZOMICS: Adaptation Genomics in the Amazon ecosystem: study adaptation in Amazonian ecosystems from the study of the adaptation of certain species of bats project plants, d shaft, primates, and parasites *(Plasmodium).*
        - I) Adaptation of P. *falciparum* over time and drug pressures
        - ii) Adapting *P. vivax* vis-a-vis pressure of the drug chloroquine.
            - Collaborations: D. Neafsey, Broad Institute, Cambridge, USA
    4. Genetic diversity of populations of *P. vivax* in Guyana

- Operational Research:
    1. Evaluation of diagnostic methods
        - Rapid diagnostic test to detect presence of pests and distinguish the species *Plasmodium falciparum vivax*.
        - TDR for assessing whether a patient has a G6PD enzyme.
    2. ORPAL: portage parasite prevalence among people working on panning for gold in Guyana

5- The laboratory of Virology – Head: Dominique ROUSSET, MD, PhD

Evaluation and development of new diagnostic tools for arboviruses, respiratory viruses or Hantaviruses and potentially emerging agents.

- The lab hosts three National Reference Centers (NRC) respectively for the Arbovirus the Influenza virus and Hantavirus for 2012-2016 term.

Research programs

- CMF Dengue:

  Prospective descriptive study to study the consequences of maternal-fetal infection with dengue virus in pregnant women in Guyana by comparing three groups of patients.
- Dengue-OMIC:

Study the diversity of viral quasispecies observed during infection by dengue virus in patients with varying severity of infections during the epidemic of Dengue 2 occurred in Guyana in 2013.

- PTR 489:

  In collaboration with teams from various institutes of the International Network of Pasteur Institutes, characterize the genetic evolution of the virus chikungunya both in humans during the 2014 epidemic in the Americas and during experimental infections alternating passages between mammals and mosquitoes.

- EMERGUY:

  Collaboration with the ICU of CHAR aims to identify emerging or potentially emerging viruses causing severe clinical syndromes and unlabeled observed in hospitalized patients.

6- The Laboratory of Virus-Host Interactions – Head: Vincent Lacoste, researcher, PhD, HDR

Research programs

- Neglected Infectious Diseases
  - Carolia (ERDF 2012-2015): Better understand the modalities of circulation and dispersion of the rabies virus in different species of bats and characterize the immune response vis-à-vis the infection.
  - GENEVIL (Labex CEBA): Identification of the genetic diversity of the virus Leishmania (Leishmania RNA virus LRV) infecting parasite Leishmania.
- Emerging and vector-borne diseases
  - Virome (Labex CEBA): Study of viral diversity in three species of bats
  - BIOVIRO (Labex CEBA): Characterization of viral diversity in Guyana rodents.
- Other
  - AMAZOMICS (Labex CEBA): Adaptation Genomics two species of bats facing the selective pressure induced by pathogens.
  - GESTURE (Labex CEBA): Study the genomics of adaptation of two species of rodents in contrasting environments Guyana.
  - Identification of mechanisms of innate immunity in bats of the New World in response to viral infection
  - Biodiversity and zoogeography of small mammals of the Guyana Shield (GUYAMAZON)
- Major causes of illness / morbidity
  - EHPAVI (ERDF 2010-2015): Epidemiology of human papillomavirus infection in women.
- Antimicrobial resistance
  - HIV ARV: As part of the diagnostic work conducted by the LIVH on the analysis of mutations in HIV-1 resistance to antiretroviral drugs.

Two partner teams are also hosted on the campus:

1- Research Team Health Service of the Armed Infectious and Tropical Diseases

For increase knowledge of infection and tropical diseases to improve prevention and treatment in favor of civilian and military populations in Guyana.

Research programs

- The research are centered **mainly on malaria** through a research program based multidisciplinary approaches with parasitological, entomological, epidemiological, remote sensing, clinical and genetic parasite and vector populations.
- Other infectious and / or tropical diseases are also discussed such as Q fever, cutaneous leishmaniasis, toxoplasmosis the Amazon, arbovirus infections or intestinal parasites.

2- Team Chemistry UMR EcoFoG

Focuses on interdisciplinary themes at the interface between chemistry, biology and ecology.

- The chemodiversity of living is the variety of chemical compounds found in living organisms.
- Amazon chemodiversity describe, understand the nature of interactions it materializes, and initiate the development of bio-inspired application

Support to Public Health

National reference centers have the task of contributing to epidemiological surveillance and to provide expertise and advice to health authorities for the Antilles-Guyana region.

1. Arbovirus CNR, Influenza virus and Hantavirus

- For the 2012-2016 term, the virology laboratory hosts three National Reference Centers (NRC) respectively for the Arbovirus the Influenza virus and Hantavirus.

Missions

- Ensure virological surveillance with characterization of circulating viruses
- Contribute to the epidemiological surveillance
- provide expertise and advice to health authorities

2. Malaria CNR, laboratory associated to the Antilles-Guyana region

Missions

The CNR malaria comprises 4 laboratories: 3 in France and 1 in Guyana.

- Our mission for the West Indies and Guyana: parasite resistance to antimalarial level used therapeutically.
- This monitoring is possible with the active participation of local actors of malaria diagnosis.
- Evaluate new diagnostic methods
- Offer expertise in local or national health authorities.

WHO Collaborating Centre for Surveillance of Antimalarial Drug Resistance

- characterization of parasite resistance level (genotyping and phenotyping)
- development and use of characterization techniques,
- investigation of epidemics and diagnosis,

3. The laboratory Mycobacteria

Education and Training

Researchers at the Pasteur Institute of Guyana involved in regional education (University of Guyana University of the West Indies) and international (Virology courses supported by the AmSud Shepherd program in Brazil organized by the Pasteur Institute in Hong Kong).

Our laboratories also host students and trainees each year from around the world to PhD and post-doctoral level.

The Pasteur Institute of French Guiana also regularly organizes scientific seminars that allow researchers to share their work and interact with regional and international scientific community.