

Activity report 2015



Research



Training



Public Health

Activity Report 2015

*« Science knows no country, because knowledge belongs to humanity, and is the torch
which illuminates the world »»*

Louis Pasteur.

Preface

Introduction

Research

Training

Public Health

Scientific productions

Acknowledgements

Message from the Minister of Public Health



Pr. Lalatiana ANDRIAMANARIVO

Minister of Public Health of Madagascar

Since 1961, the Institut Pasteur de Madagascar has been a partner of the Ministry of Public Health in Madagascar, a true ally when we carry out surveys and research in the domain of public health and of economic development in Madagascar.

During 2015, the technical contributions and advice from the IPM accompanied the Ministry of Public Health in the implementation of adequate measures taking into account the priorities of national health such as the plague, malaria or poliomyelitis. As an example, after the suspension of surveillance of the plague in the capital in 2006, it was relaunched in 2015 backed up by the IPM. In collaboration with the Ministry of Public Health, a reinforcement of the sentinel surveillance network of fevers also began with the IPM to develop a system of early detection and prediction of epidemics of malaria in Madagascar. In the end, the implementation of a data collection system, updated daily, allowed real-time national surveillance of epidemics.

This brings up to again express our trust in the IPM as counsellor in the national strategy for public health, but also as a partner in the execution of its activities which benefit the Malagasy population.



Pr. Lalatiana ANDRIAMANARIVO, Minister of Public Health in Madagascar and Mathilde of CALAN, interim director of the Institut Pasteur de Madagascar

We are now over 500 people at the IPM. A beautiful team who by its enthusiasm and commitment contributed to the improvement of the health of the Malagasy population, the economic development, and to its international outreach. Our actions hinge on three pillars: research, training, and health. Our works of research are set up alongside the national priorities, and meet the international health requirements: if the fight against infectious diseases remains one of the main focuses of the IPM, our teams also work to find new means of prevention or treatment of chronic illnesses. In 2015, 30 new projects were initiated.

Our research activities directly relate with actions carried out in the public health sector, in constant partnership with the Ministry of Public Health in Madagascar, which aims to develop surveillance, to ensure quality diagnostics (the IPM hosts 9 laboratories of national or international reference) or also to intervene in epidemic response. Furthermore, the Clinical Biology Centre (CBC), the International Vaccination Centre (CIV) and the Food and Environmental Hygiene Laboratory (LHAE) lead activities which directly help the national population and companies. Lastly, the IPM freely gives vaccines



Mathilde de CALAN

Interim director of the Directrice par intérim de l'Institut Pasteur de Madagascar

and anti-rabies treatment around the country.

Since over one century, the IPM has been committed to train researchers by receiving each year around 250 students and interns. The courses with an international level, the possibility of scholarships or a continuous training contribute to the development of a national expertise with high standards. An expertise regularly shared with our scientific, academic and economic partners in Madagascar.

Our vision is that our competences mirror the needs of development. This is why the IPM has been committed since 2015 to finding new partners, particularly in the

private sector to develop future collaborations. This was expressed through the implementation of the Communication Unit to make our activities and missions known.

Directors' Message

Because of the evolution of activities, it has become essential to the IPM management to implement a structure which will help it to manage its scientific policy to meet national priorities and needs. Hence the creation, in 2015, of the Scientific Management of the IPM. They rely on a scientific committee, whose missions are the strategic focus of the IPM and scientific programming; the scientific evaluation and training of students and researchers; scientific valorisation of accomplished works as well as scientific relationships with foreign partners. When it comes to scientific production, 48 articles were published in international journals of 2015.

Furthermore, 13 poster presentations and 26 oral presentations were done by the researchers of the IPM at international scientific events. One of the highlights of the year 2015 was the organisation of an international class where 16 Malagasy and international students could take part in a training



Dr. Voahangy RASOLOFO RAZANAMPARANY

Scientific Director

on the techniques of immunology. In 2016, the Scientific Management took it upon itself to reframe global vision of the IPM to better redefine its priorities and strategic direction. Its main objectives are to develop big transversal projects of research and public health which will allow

it, on one hand, to reinforce the competences of the IPM, and on the other hand, to better meet the needs of the country, in economics as well as health-wise.

The Financial and Administrative Management not only carries out its activities in the domains of finance and general and cost accounting, but also in audit, human resource management, purchases and supplies, equipment and infrastructure maintenance, as well as the animation of technical and general services. They provide the institution, all the laboratories, and the research and service units with the deliveries and aid needed to complete their respective missions.

To face the increase in activities and human resources, the year 2015 saw the support capabilities strengthened, in particular by the implementation of new management applications such as "Sage Comptabilité", "Sage Gestion Commerciale", "Sage Paie" and "Sage RH". Aiming to consolidate mastery of financial management and to meet new needs of controle, two units were created: Audit Unit and Internal Controle (CACI) and Audit Unit and Project Controle (CACP). Likewise the control of expenses was



Philippe LASNIER

Administrative and Financial Director

structured by the deployment of the application Soft-Budget, enabling a follow-up of budgets and expenses incurred by analytical positions and budget lines and by the creation of the follow-up unit for budget implementation. The full review of financial follow-up procedures of projects and of management

procedures of the imprest fund. To limit collaboration with the informal sector, we have significantly increased tender and contractualisation formalisation with suppliers. Finally, the electricity network was subject to major compliance works to ensure an adequate distribution of electricity according to the new needs.

Since 1898



ITUT PASTEUR DE MADAGASCAR - 1898.



Institut Pasteur de Madagascar

« More than 115 years of excellence, at the service of public health and of companies »

The Institut Pasteur de Madagascar (IPM) is a private Malagasy non-profit scientific institute known for its public utility.

It has been placed under the leadership of the Malagasy Republican Government and covered by the 1961 agreement which connects the Institut Pasteur in Paris and the Minister of Public Health in Madagascar.

The IPM is a member of the International Network of Pasteur Institutes (the RIIP) which regroups 22 institutions spread over the five continents. It supports the Pasteur values and the ethics charter to which the Pasteur Institutes are linked.

One of the missions of the IPM is to contribute to the prevention and treatment of illnesses and to economic development through research, training sessions, and public health activities.

The IPM has its own funds thanks to its diagnostic and vaccination activities. It also receives subsidies from private and public organisations sharing its vision and desiring to have an impact in the domains of research, training and public health.

As a private non-profit organisation, the IPM is entitled to donations and legacies.

1917, thanks to the works of the IPM, Madagascar is the first country in the world to eradicate smallpox

2002, development of the Rapid Plague Diagnostic Test

Since over 115 years, free distribution of the antirabies vaccine all around Madagascar.



The Girard building of the IPM housing five research units

9 research unities

Experimental bacteriology, Medical Entomology, Plague, Epidemiology (including a team of socio-anthropologists and a project realisation unit), Helminthiases, Infectious illness immunology, Mycobacteria, Malaria and Virology

3 economical services

Clinical Biology Center (CBC), International Vaccination Center (CIV), Food and Environment Hygiene Laboratory (LHAE)

3 locations

A campus of 9 hectares in Ambatofotsikely Avaradoha, a sampling center in the Ankorondrano Gallery Zoom and a research site in Moramanga.

More than 500 people

About 400 employees (scientific and administrative personnel), About 10 members from the Ministry of Public Health.

The 3 economical services of the Institut Pasteur de Madagascar

Clinical Biology Centre (CBC)

The CBC has the mission of a public service biological analysis laboratory. They offer a large range of medical analyses carried out in rapid, secure, and quality conditions (regular external quality control and accreditation processes).

International Vaccination Centre (CIV) - Anti-Rabies Treatment Centre (CTAR)

The CIV is a vaccination consultation centre. Open to the public, they ensure all recommended vaccinations in Madagascar and those required for international trips.

The CTAR is the service which takes charge of the people exposed to rabies. There are 31 anti-rabies treatment centres spread out over the island and there is a large enough supply of anti-rabies post-exposure vaccines

Food and Environmental Hygiene Laboratory (LHAE)

The diagnostic activities of the LHAE focused on surveillance of health risks related to food, to water, and to the environment. It is the National Centre of Salmonella, Shigella and Vibrio cholerae References, jointly with the CBC.

The LHAE has been accredited by COFRAC (Accreditations Gate in France) for its activities under the reference N°1 – 1872, according to the NF EN ISO/CEI 17025 standard (available on www.cofrac.fr)

More than 500 people



The team of the Institut Pasteur de Madagascar

The 9 research units

Experimental Bacteriology Unit

The Experimental Bacteriology Unit of the Institut Pasteur de Madagascar, created on September 30 2009, conducts research on bacterial resistance to antibiotics and their mechanisms. They work on diagnostics (by type MALDI-TOF and PCR mass spectrometer) and molecular epidemiology of isolated bacteria in man, animals, and the environment, as well as bacteria responsible for neglected diseases such as melioidosis (pseudoglanders). They implement classical and molecular techniques in microbiology.

Medical Entomology Unit

The Medical Entomology Unit conducts research activities on the identification of potential vectors implicated in the transmission of infections (malaria, Rift Valley Fever and the Plague), transmission risk evaluation and the study of their interaction with different actors (vectors, men, reservoirs and pathogens) in the environment to better understand the epidemiology of vector-borne diseases.

Epidemiology Unit

In collaboration with the other units of the Institut Pasteur de Madagascar, the Epidemiology Unit has a network to monitor fevers which enables them to follow morbidity and mortality trends attributed to pathogens such as malaria, the flu, cholera, polio and arboviruses.

Helminthiasis Unit

The Helminthiasis Unit combines the research Unit and the Central Laboratory of Bilharzia of the Ministry of Public Health (MSanP), hosted by the IPM since the 60s.

The Helminthiasis Unit primarily brings its biological and technical help to national programmes against schistosomiasis and geo-helminthiasis of the MSanP as part of the international initiative on the integrated approach to the fight against neglected tropical diseases in Madagascar.

Infectious Diseases Immunology Unit

The research projects conducted in the Infectious Diseases Immunology Unit enables the detailed study of defence mechanisms (cellular immunity responses and antibodies) developed by man to fight against infectious diseases. Specific infectious pathologies targeted in the Unit are malaria, cysticercosis/neurocysticercosis and leptospirosis, which have a strong impact on the health of the Malagasy, African and Indian Ocean populations.

of the Institut Pasteur de Madagascar

Mycobacteria Unit

The Mycobacteria Unit combines the tuberculosis diagnostic laboratory, which is part of the National Mycobacteria Reference Centre for the National Anti-Tuberculosis Programme (PNLT, MSanP) and the research Unit.

The Mycobacteria Unit does tuberculosis diagnostics for the IPM's Clinical Biology Centre and the PNL. They conduct research activities as well as activities of antitubercular resistance surveillance.

Malaria Research Unit

The Malaria Research Unit (URP) develops research projects to build up their choices of intervention strategies according to evidence.

The URP is actively implicated in activities of training, operational interventional research based on the parasitological and epidemiological aspect of malaria to be able to generate useful and usable data, especially for the ministries of health in the south-west region of the Indian Ocean (Madagascar, Mayotte, Union of the Comoros).

Plague Unit

The Plague unit combines the research unit, the Central Plague Laboratory (LCP) of the Ministry of Public Health and the rapid plague diagnostics test production unit. Being a collaborating centre to the World Health Organisation in the fight against and research on the plague, the LCP is also a national reference laboratory for the biological diagnostic of the plague in Madagascar and Africa.

Virology Unit

The virology unit has integrated multiple laboratories implicated in surveillance, research and training activities. The laboratories are mostly the only ones in Africa and the Indian Ocean capable of carrying out a diagnosis of certain viral infection affecting man/animal-kind.

The Unit has a type 3 Security Level Biology laboratory which enables it to meet international requirements in terms of security for man and for the environment during the use of highly pathogenic agents such as the bird flu and Ebola.

Research







Directly applied to **priorities of national health**, especially in microbiology and epidemiology of infectious diseases, but also on non-communicable diseases such as malnutrition and arterial hypertension.

More than 125 research projects carried out between 2011 and 2015.

More than 30 times researchers from the IPM attended national, regional, and international conferences as organisers and/or attendees in 2014 and 2015

Research projects to serve the Malagasy population

An innovative surveillance network

Since 2007, the Institut Pasteur de Madagascar, in collaboration with the Ministry of Public Health has implemented a sentinel surveillance network for potentially national epidemic diseases. This network enables a quick response, and near real time regular data updates, in the fight against diseases, of which malaria, the flu, cholera, acute flaccid paralysis, arboviruses ... It also enables us to deduct the impacts of fights carried out around the country and to detect epidemic threats in time for the health authorities to take necessary steps to be able to act as quickly as possible. In 2015, the sentinel surveillance was based in 18 hospital centres and 54 Basic Health Centres (CSB) spread out over all the bioclimatic zones in Madagascar. At the centre of this network, 20 sites were subject to fever surveillance. In November 2015 the South Ambalavao site was added to the fever surveillance zones following a recent malaria epidemic in the area in January 2015.

To optimise the quality of collected data in the network, the communal agents (AC) and the CSB chiefs were given an Android smartphone including an application enabling them to collect data through a questionnaire in Malagasy. Those responsible of the sentinel centres and the ACs of the network were trained in July 2015 on how to use an Android smartphone which allows them to collect data as well as to receive retro-information. Another web application was developed to receive SMS and automatically generate daily retro-information from the data in the form of text, charts and maps. Thanks to these technologies, the ACs and CSB chiefs can observe the evolution of indicators for each pathology within the surveillance network.



The mobile application in Malagasy developed by the IPM



Training of the communal agents on the use of Android and the mobile application

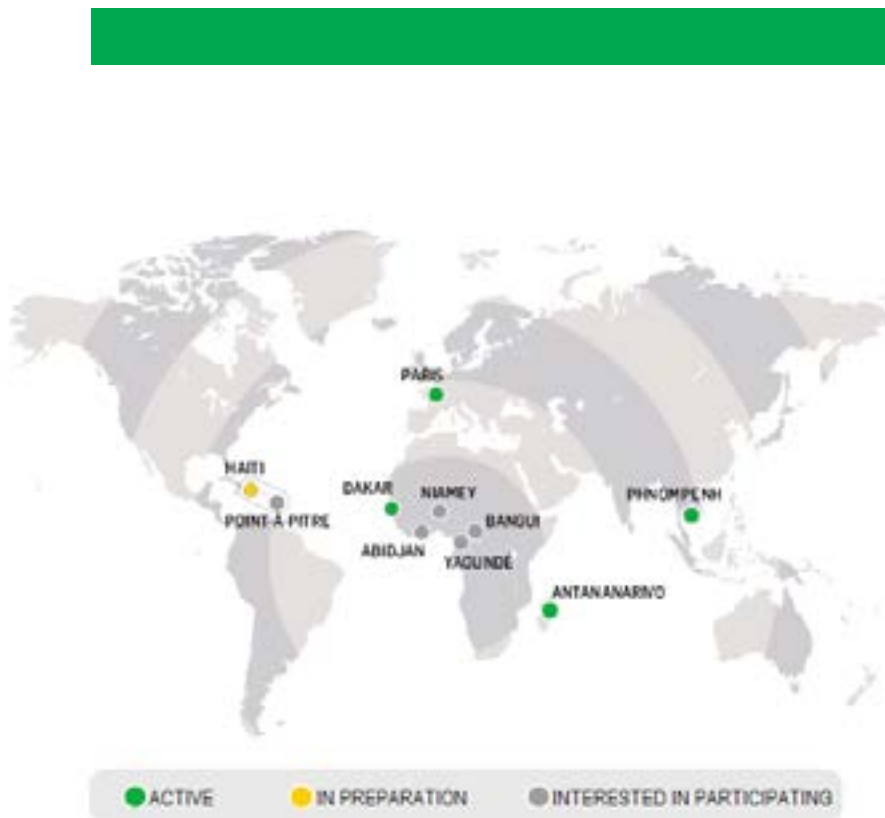
Participation to the international project BIRDY on the resistance to antibiotics

The pilot phase of the project BIRDY started in September 2012 and the project in March 2014. The project consisted in estimating the impact of bacterial infections resistant to antibiotics in newborns, toddlers and children up to 18 months to be able to detect the impact of these infections and their resistance to antibiotics on the health of the child. This project is gaining relevance because Madagascar presents all the risk factors which are self-treatment and the ability to procure medicine without a prescription. To this we can add the fact that the Malagasy population has a limited buying power for medicine and that hygienic and environmental conditions favour infections.

Since November 2013, the BIRDY programme has entered a partnership with the health organisation AFAFI (Aro ho an'ny FAhasalaman'ny Flanakaviana) to be able to offer health coverage to a community recruited in the pilot study (about 500 families). The partnership's aim is to extend the coverage of healthcare to BIRDY mothers, as well as to members of the families of BIRDY babies. This study has also helped to strengthen local capacities, whether it be for scientists associated with the study, the caregivers on the clinical pictures and the sampling

mode in correct asepsis to provide a good diagnostic. The epidemiological and microbiological data acquired until the end of the project will help to locally outline the incidence rate of different bacterial aetiologies at the root of severe infections in infants and children, as well as in resistance profiles and associated risk factors. This work will also help to guide the choice of empirical treatments on time to generally help improve the care that these infection need by elaborating guidelines better adapted to local specifications. Furthermore,

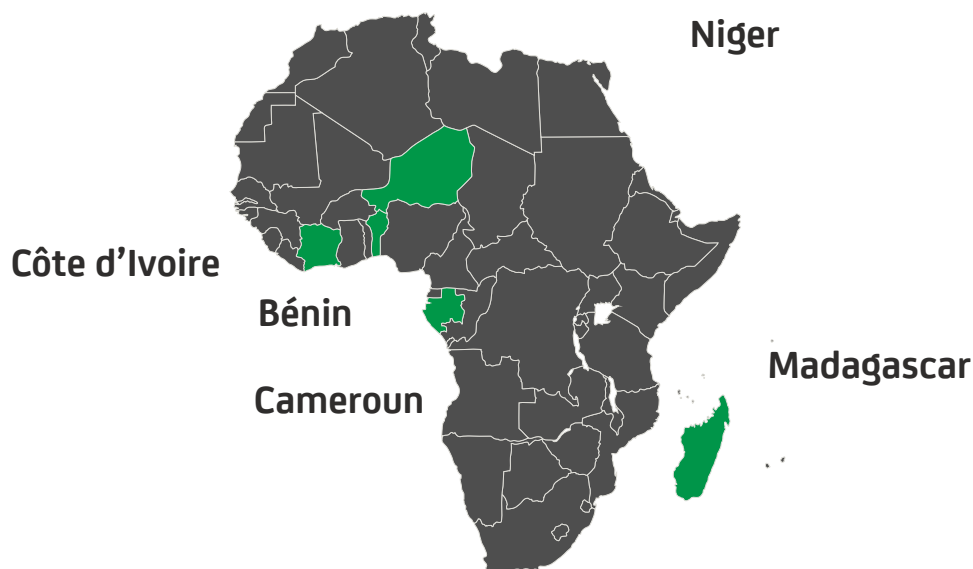
the implementation of a cohort of young children could help construct an applied research platform allowing the evaluation of vaccines, and tools of rapid diagnostics. The project is carried out with help from the Pasteur Institute in Paris and is financed by the principality of Monaco.



The Pasteur Institutes taking part in the BIRDY project in the world.

Implication in the international PALEVALUT project in the fight against malaria

To rationalise the use of means dedicated to the fight against malaria, it is of utmost importance to be able to evaluate the impact, real-world effectiveness and the cost/ effectiveness ratio of adopted measures, and to identify factors which condition this effectiveness, be they economic, social, organisational, behavioural, biological, entomological, or other. The aim of the PALEVALUT project is to measure the impact of the Global Fund's interventions and to measure factors that interfere with the effectiveness of these interventions, to capitalise obtained results and/or to transpose these results. It is a question of creating a "toolkit" to evaluate the integrated fight against malaria with a variable geometry, and deployed according to the needs of the evaluation and the countries involved. The contents of this "toolkit" could be used together or individually, for a country, a region, of a district. The PALEVALUT project and the use of this guide will help to improve the effectiveness and the quality of interventions and services by strengthening national strategies. It will also help to better adapt to social and cultural needs and backgrounds. Concerning Madagascar, qualitative surveys were conducted on four sites which had various epidemiological contexts: Moramanga, Antsohihy, Fianarantsoa, Mananjary. The surveys explored three subjects:



Les pays impliqués dans le projet PALEVALUT.

usual perceptions and practices in case of fever (adult or child); the practices to prevent malaria; the knowledge and access to treatment. Vague perceptions of malaria were noticed during these surveys of which the confusion between malaria (tazomoka) and fevers (tazo). The survey also revealed other factors such as the low appeal of the health training, late treatment, women's lack of knowledge of the disease and the unavailability of medicine for Preventive Malaria Treatment (IPT) for pregnant women. In regards to Insecticide-Treated Mosquito Nets (ITN), it has been found that the use of mosquito nets is justified firstly by the disturbance caused by mosquitos, and secondly by the protection against malaria in Mananjary alone. The Indoor Home Spray Campaign of insecticide (CAID) is also seen as

a way to fight against small insects (mainly fleas and cockroaches), but not necessarily against mosquitos. On the other hand, many inconveniences due to sprays have been reported: bad smells, headaches, wall deterioration, chickens dying ... Either way the spray products are often seen as rarely efficient (or even entirely inefficient), or efficient but only for a certain time.

Training







More than 250 students / trainees trained every year, (medical personnel scientists and technicians, national and international)

More than forty thesis scholarships, whether MAS or Masters offered per year, amongst which the Girard scholarship

International courses mainly given in collaboration with the International Network of Pasteur (RIIP). More than 10 national, regional, and international courses and training sessions given at the IPM in 2014 and 2015

Expertise regularly given to actors in academic, scientific and economic sectors in Madagascar and overseas

The year 2015 at the Pasteur Institute of Madagascar was not only marked by training courses and international courses, but also by the reception of students, trainees and scientists.

Retrospectives on the training courses and international courses of the IPM in 2015

The scientific transmission and knowledge enhancement represent one of the three Pasteurian pillars. Thus in the completion of its mission, the Pasteur Institute of Madagascar has not only given training and international courses, but some representatives of its scientists were also locally or internationally trained, or took part in scientific animations. In 2015 about 30 training courses were given and received by the scientific team of the IPM. The first edition of the international course on “The Techniques of Immunology”, organised by the IPM in October 2015, marked the life of the Institute. The objective of this training was to locally give free immunology lessons, focusing on B-cells. It was mostly practice but also had some theory. It consisted in presenting a group as complete as possible on modern technologies on contemporary immunology, and to boost their mastery. For this first edition, 16 learners (students, technicians, engineers and researchers) from the IPM, the University of Antananarivo, the Pasteur Institute of Dakar and the Pasteur Institute of Bangui were chosen.

Two QGIS training sessions, Wien Version 2.8.1 (software used in a geographical information system) were also organised by the IPM. They mainly targeted: researchers of the IPM, PhD / masters students (national or international) of the IPM as well as personnel at the Ministry of Health who were brought into a collaboration with the different units of the IPM. About thirty people benefited from these training sessions.

Scientists from the IPM received training at the IPM on science writing and on how to use bibliography software (Mendeley). Some were even able to do training and participate in scientific animations overseas (France, Italy, Senegal, South Africa...) such as training sessions on scientific communication, geographical information systems in epidemiology, the plague, etc.

The IPM is strong from its hundreds of years of experience in the domains of

Training

research, training and public health and is often called to share its expertise in these domains to the population of the Big Island and even beyond the frontiers.

The Institute belongs to / participates in groups and committees of national experts.

In 2015 the Food and Environmental Hygiene Laboratory (LHAE) of the IPM participated in meetings of the Codex Alimentarius of Madagascar on the creation of the Malagasy food law and the elaboration of regulatory text projects which govern Malagasy food products. Furthermore, the LHAE is belongs to the global foodborne infections network of the OMS (GFN), involved in world surveillance of infections of origin, and also is a member of the National Committee of Health and PhytoSanitary measures (CNSPS).

Furthermore, the microbacteria unit of the IPM intervenes at the National Anti-Tuberculosis Programme (PNLT) of the Ministry of Public Health in Madagascar.

What is more, the plague unit of the IPM not only participates in the Cross-sectoral Support Group in the Fight against the Plague (GIALP) in Madagascar, but the person in charge of this unit is also a member of the Rapid Response team-WHO African Region. They are also the



Entomology training provided by the CDC to IPM

reference in plague diagnostics in the African Region. Moreover, the epidemiology and virology units of the IPM are mainly involved in activities of national and international institutions. The IPM is also a member of the Akademia Malagasy and of the Initiative against Diarrheal and Enteric diseases in Africa. The Institute also directly collaborates with the Roll Back Malaria (RBM) committee, the Centre for Disease Control and prevention (CDC), the World Health Organisation (WHO) and the United Nations Children's Emergency Fund (UNICEF). The virology unit of the Institute is a member of the Executive Committee of the International Society for

Influenza and other Respiratory Virus Diseases (ISIRV) and that of the African Network for Influenza Surveillance and Epidemiology (ANISE). The IP is also a Technical Expert of the WHO Technical Working Group on Influenza Severity Assessment through their virology unit. The latter also represents the Institute at the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC).

The IPM : an establishment that welcomes students, trainees, and scientists

More than 80 people from Madagascar or overseas, coming from local or international establishments were welcomed at the IPM to train or to be trained. About twenty PhD students in science and about twenty masters, higher masters, MAS (or equivalent) students worked on subjects related to bacteriology, entomology, epidemiology, virology or immunology. About ten trainees also came to develop their knowledge about biobanks, epidemiology, or to observe how a business or a scientific research unit operates, or again to discover what it's like backstage for laboratory or research work.

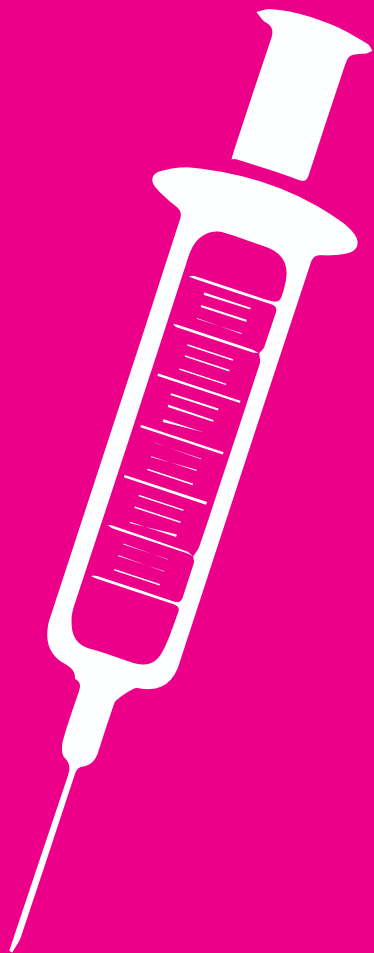
Two international volunteers, from the Association France Volontaire and the Peace Corps, helped the epidemiology unit team of the IPM in its activities. Furthermore, this unit had the opportunity to collaborate with three missionaries: one coming from the Pasteur Institute of France and two from the French Agricultural Research Centre for International Development (CIRAD). These collaborations dealt mostly with subjects such as the Plague, data management, animal or zoonotic vector-borne diseases and rabies.

An excellent scientist develops himself every day at the Pasteur Institute of Madagascar...



Dr. Rindra RANDREMENANA, Deputy of the epidemiology unit presenting research results on nutrition

Public Health







Sentinelle Surveillance of Diseases : The IPM actively participates in the surveillance of the infectious diseases by working closely with national and international health authorities, such as the World Health Organisation (WHO)

For the epidemic control Intervention (plague, poliomyelitis, malaria, flu, arboviruses, diarrhea, ...)

Free Antirabies Treatment at the Antirabies Treatment Centre (CTAR) of the IPM and free antirabies vaccin kits for the whole of Madagascar

Diagnostics : Clinical Biology Centre (CBC), and The Food and Environmental Hygiene Laboratory (LHAE)

The Pasteur Institute of Madagascar (IPM) has been contributing to the improvement of the public health in Madagascar for more than 115 years. Some significant facts in terms of health services and fight against diseases were at stake in 2015 at the IPM.

The Food and Environmental Hygiene Laboratory: an active actor in the economy development of Madagascar as well as in the African region and the Indian Ocean

The Food and Environmental Hygiene Laboratory (LHAE) of the IPM has carried out an extension audit of its credential from the accreditation French committee (COFRAC – available on www.cofrac.fr), in LABGTA 59 related to food microbiology. That has confronted the analysis quality of this laboratory and supported the economic operators of the Island.

Moreover, the LHAE is part of the shortlisted laboratories for the implementation of the pesticides dosage, aflatoxins (mushrooms toxins), and iron in the food products thus allowing high valued added tax to support the agro-food department in Madagascar. This laboratory welcomed EDES – COLEACP audit mission in the context of this shortlisting

Besides, it is eligible to get fundings for the strengthening of the analytical capabilities of the territory through the PROCOM, Regional Integration and Employment Support Program funded by the European Development Funds (FED) for the ACP countries. This allowed the laboratory activities to develop for the sake of the Malagasy private sector and the Indian Ocean subregion.

The reorganisation of the Epidemio-surveillance and the Animal Health platform (PES) within the LHAE was undertaken during the year 2015 to better meet the needs of the economic operators and the local market. This, in order to match the service offers and the provisions of the laboratory to its needs.

The LHAE has made its expertise known in the area of hygiene regulations with regard to water, to food protection during national and regional economic conferences. In 2015, it then took part in workshops such as. (i) the « Seafood quality Workshop » (SmartFish (a programme aiming at improving the capabilities of the sustainable exploitation of fishing resources) and the Indian Ocean Commission), in the Seychelles; (ii) the inaugural workshop of the National Committee on

the Hygiene Regulations and Plant Health (CNSPS) and directives for its streamlining operations across all the African Union countries in Antananarivo, (iii) the workshop on water capacity analysis networking in the Indian Ocean (Mayotte, the Réunion, the Comores, Madagascar), in Antananarivo

Besides, the IPM, through its LHAE, had the opportunity to participate on one hand in the launching of the project “Strengthening controls of food safety threats, plant and animal pests and diseases for agricultural productivity and trade in Southern Africa”, aiming at controlling the problems related to food safety and to plants and animal diseases to reinforce food safety and trades in the region (Africa Solidarity Trust Fund, FAO), in Antananarivo; and on the other hand, in the regional training on the designing of the development plans for laboratories, considering the role played by the laboratories in the national system of food safety (EDES-COLEACP), in Senegal. It is a support programme for the implementation and the reinforcement of health and food safety system in the ACP countries (Africa-Caribbean-Pacific).



LHAE of IPM, still within its activities framework managed to carry out the 2nd stage of the on –site analysis campaign, the quality of the well water, a programme of Santé Mahefa, of the USAID.

The LHAE participated in the 10th exhibition of the FIM (Foire Internationale de Madagascar), which is a multisectoral economic event and representing 300 exhibitors highlighting specially the food sector Tanjombato (Antananarivo). It was

its 2nd time to participate in such an event during which the laboratory presented to the economic operators and the wide public who came to visit the IPM stand the new service offers of water and food analysis.

The FIM permitted equally the Institute to launch its development actions of partnership targeting the private sector. Targeted meetings between the economic operators, the LHAE Head and managers were planned during that fair.

The Daily Quality Services delivered to the Malagasy people by the Clinical Biology Centre

The year 2015 was characterised by the opening 7/7 Clinic Biology Centre (CBC) of the IPM in order to better serve every day the Malagasy population. Since then, patients wanting biological screening can make recourse to the quality policy services CBC, even at weekends or during bank holidays. This year the laboratory has treated more than 112 000 files.



Pictures of blood sampling carried out in the CBC



A baby being treated against rabies

Treatments and anti-rabies vaccines supplied freely by the IPM to the country

According to the convention in 1961, between the Malagasy State and the Pasteur Institute in Paris, the antirabies treatment of IPM will treat freely the people who are exposed to rabies and supply with antirabies vaccines, at their own expense the 30 antirabies treatment centres (CTAR) of Madagascar.

The celebration of the world day against rabies took place in 6 different areas in 2015 : in the Town Hall in Analakely on 28th September, in Imerintsiasika on 30th September, in Anjozorobe on 1st October, in Behenjy on 9th October and in Mahitsy on 15 October. The Secondary School (CEG) of Antanimena benefited from the sensitization on rabies of the whole school on 22nd October.

The IPM : mobilized in the fight against outbreaks in Madagascar

Support during the pulmonary plague in Moramanga

Being characterised by its strong contagiousness, the confirmed pulmonary plague in Moramanga in August, stirred the district Public Health Services (SDSP) to ask for the intervention of IPM to lead an investigation work in order to identify the origin of the infection and thus aiming at establishing the adequate urgent response and preventing new outbreaks periods.

In the context of the environmental investigation of this alert and to check if the *Y.pestis* bacterium circulates among the rodent population, the Plague Unit proceeded a series of captures under the IPM Plague Unit standard. Some recommendations were made about this inquiry, to improve responses, strengthen the fight against rats and the outreach activities - Education - Communication (IEC) and to promote the control of the murin population by involving the communal agents.



Two members of the Plague Unit team carrying out the rat during the on field mission to find out if it was infected by the plague bacillus

Interventions during the outbreak of the bubonic plague in Bemahatazana

The Rural Commune of Bemahatazana of Tsiroanomandidy District (in the middle West) experienced an outbreak of bubonic plague in September 2015. The bubonic plague was the result of an infection, consequence of an infected rat flea bite. The success of the antibiotic therapy treatment is 100% if administered on time. The response measure aiming mainly at the rat fleas is important to best

control the epidemics.

Confronting the epidemic situation as well as the request for support from the local authorities, the IPM team intervened and carried out a series of disinsectisation, rats capture and fleas collect. About the disinsectisation the use of Kartman boxes was the adopted method.

Virus Surveillance in Madagascar

Between 2014 and 2015, Madagascar experienced a diffused polio outbreak. As part of its activities to control polio, the IPM virology, through its national laboratory of the World Health Organisation (WHO) on polio, has supported many times the Ministry of Public Health with diagnostics and on fields investigations. This laboratory set up too the environmental control of polio as recommended by WHO. As part of eventual outbreak of Ebola virus in Madagascar or in Comoros, the IPM virology unit signed an agreement with the Indian Ocean Commission (COI) to set up a mobile laboratory team composed of mobile virologists and epidemiologists who are available

within 48H to go anywhere on the Malagasy or Comorian territories.

Concerning the flu control, the virology unit has taken the charge to look after the population through many projects financed by the CDC and the WHO.

Since 1978, the IPM flu laboratory has been recognised by WHO and the Ministry of Public Health of Madagascar as the National Reference for the Flu (CNRG).

In 2015, the sentinel surveillance system of the flu has been composed of 34 Basic Health Centres (CSB) that are involved in the treatment of the infection influenza-like illnesses (ILI), and of 17 hospitals insuring the

control of serious and acute breathing infections (SARI).

The IPM virology unit equally insures the control of rabies in Madagascar through the screening of some samples of animals that are sent to the unit.



Manipulations undertaken in the laboratory of security level 3

Epidemiological Inquiries

In order to best conduct the interventions in the public health, the IPM Helminthiasis unit team has technically supported by establishing the schistosomiasis and geohelminthiasis mapping in Madagascar. Parasitological investigations have been conducted in collaboration with the Bilharzia Division of the Fight against Epidemic and Neglected Diseases Services (SLMEN), with the financial support of Schistosomiasis Control Initiative (SCI) of these districts: Miarinarivo, Soavinandriana, Tsiroanomandidy, Morombe, Sakaraha, Kandrehô et Anjozorobe. The new sentinel sites such as the districts of Belo Tsihibihina, Morombe, Toliara II, Sakaraha, Beroroha, Mandritsara, Befandriana, Port Bergé and Mampikony – have been equally subjects to parasitological inquiries on schistosomiasis et les geohelminthiasis.

The same team carried out parasitological inquiries on taeniosis in 12 fokontany among the 20 targeted ones thanks to the “Pilot project of mass treatment with anti-taeniosis medecins in the district of Antanifotsy”. This has set up a close collaboration with the Cysticercosis Division of SILMEN and the Immunology laboratory of the Hospital Joseph Ravoahangy Andrianavalona (HJRA) d’Antananarivo.

Scientific Productions



est un
ations.
ations
exigées pour



Institut Pasteur
de Madagascar



permet de contrôler
des eaux pour assurer
des consommateurs
de
de l'eau



In 2015, the IPM did : **48 publications** in scientific journals, **13 posted communications** and **26 oral communications**

Publications

1. Abdelkader AS, Farbos AG, Hamidou AA, Vonaesch P, Jusot JF, Koeck JL, Collard JM. MLVA typing on *Streptococcus pneumoniae* serotype 1 isolated from meningitis cases in Niger before the introduction of PCV - 13 revealed a low genetic diversity. *Trans R Soc Trop Med Hyg.* 2015 ; 109(7) : 477-80. 5-year **Impact Factor : 2.443**

2. Alonso WJ, Guillebaud J, Viboud C, Razanajatovo NH, Orelle A, Zhou SZ, Randrianasolo L, Heraud JM. Influenza seasonality in Madagascar : the mysterious African free-runner. *Influenza Other Respir Viruses.* 2015 May ; 9(3) : 101-9. **Impact factor: 2.20**

3. Andriamandimby SF, Viarouge C, Ravalohery JP, Reynes JM, Sailleau C, Tantely ML, Elissa N, Cardinale E, Sall AA, Zientara S, Heraud JM. Detection in and circulation of Bluetongue virus among domestic ruminants in Madagascar. *Veterinary Microbiology* 2015. 176 : 268-273. **Impact factor: 2.72**

4. Baltazar M, Ngandjio A, Holt KE, Le Pillat E, de la Gandara MP, Collard JM, Bercion R, Nzouankeu A, Le Hello S, Dougan G, Fonkua MC, Weill FX. Multidrug-resistant *Salmonella enterica* serotype Typhi lineages in the Gulf of Guinea. *Emerg Infect Dis.* 2015 ; 21(4) : 655-9. **Impact Factor : 6.17**

5. Boukraa S., De la Grandière M. A., Bawin T., Raharimalala F. N., Zimmer J.-Y., Haubruge E., Thiry E., Francis, F. Diversity and ecology survey of mosquitoes potential vectors in Belgian equestrian farms: a threat prevention of mosquito-borne equine arboviruses. *Preventive Veterinary Medicine.* 2015. 124 : 58-68. **Impact Factor : 2,182**

6. Caini S, Huang QS, Ciblak MA, Kuszniarz G, Owen R, Wangchuk S, et al. Epidemiological and virological characteristics of influenza B : results of the Global Influenza B Study. *Influenza Other Respir Viruses.* 2015 ; 9 Suppl 1 : 3-12. **Impact factor: 2.20**

7. Chereau F, Herindrainy P, Garin B, Huynh BT, Randrianirina F, Padget M, Piola P, Guillemot D, Delarocque-Astagneau E. Colonization of extended-spectrum-lactamase- and NDM-1-producing Enterobacteriaceae among pregnant women in the community in a low-income country : a potential reservoir for transmission of multiresistant Enterobacteriaceae to neonates. *Antimicrob Agents Chemother.* 2015;59(6):3652-5. **Impact Factor : 4.476**

8. Cornick JE, Chaguza C, Harris SR, Yalcin F, Senghore M, Kiran AM, Govindpershad S, Ousame S, Du Plessis M, Pluschke G, Collard JM, Antonio M, von Gottberg A, French N, Klugman KP, Heyderman RS, Bentley SD, Everett DB for the PAGE Consortium. Region-specific diversification of the highly virulent serotype 1 *Streptococcus pneumoniae*. *Microbial Genomics* 2015, 1(2) doi : 10.1099/mgen.0.000027.

9. Depaquit J, Léger N, Randrianambinintsoa FJ. Paraphyly of the subgenus *Anophelebotomus* and creation of *Madaphlebotomus* subg. nov. *Medical and Veterinary Entomology* 2015. 29(2) : 159-170. **Impact factor: 2.86**
10. Diomandé FV, Djingarey MH, Daugla DM, Novak RT, Kristiansen PA, Collard JM, Gamougam K, Kandolo D, Mbakuliyemo N, Mayer L, Stuart J, Clark T, Tevi-Benissan C, Perea WA, Preziosi MP, Marc LaForce F, Caugant D, Messonnier N, Walker O, Greenwood B. Public Health Impact After the Introduction of PsA-TT : The First 4 Years. *Clin Infect Dis*. 2015 Nov 15;61 Suppl 5 : S467-72. **Impact Factor : 8.886 5-Yr IF 9.206**
11. Gouagna LC, Dehecq JS, Fontenille D, Dumont Y, Boyer S. Seasonal variation in size estimates of *Aedes albopictus* population based on standard mark–release–recapture experiments in an urban area on Reunion Island. *Acta tropica* 2015. 143 : 89-96. **Impact factor: 2.51**
12. Gray GC, Anderson BD, LaBeaud AD, Heraud JM, Fevre EM, Andriamandimby SF, et al. Seroepidemiological Study of Interepidemic Rift Valley Fever Virus Infection Among Persons with Intense Ruminant Exposure in Madagascar and Kenya. *Am J Trop Med Hyg*. 2015 ; 93(6) : 1364-70. **Impact factor: 2.73**
13. Guyant P, Corbel V, Guérin PJ, Lautissier A, Nosten F, Boyer S, Coosemans M, Dondorp AM, Sinou V, Yeung S, White N. Past and new challenges for malaria control and elimination : the role of operational research for innovation in designing interventions. *Malaria Journal* 2015. 14 : 279. **Impact factor: 3,079**
14. Hämäläinen A, Raharivololona B, Ravoniarimbina P, Kraus C. Host sex and age influence endoparasite burdens in the gray mouse lemur. *Frontiers in Zoology*, 2015 ; 12 : 25. **Impact factor: 3.05**
15. Huynh BT, Padget M, Garin B, Herindrainy P, Kermorvant-Duchemin E, Watier L, Guillemot D, Delarocque-Astagneau E. Burden of bacterial resistance among neonatal infections in low income countries : how convincing is the epidemiological evidence? *BMC infectious diseases*. 2015 ; 15(1) : 127. **Impact factor: 2.61**
16. Jacquet M, Tilquin M, Ravanel P, Boyer S. Increase in tolerance of *Aedes aegypti* larvae (Diptera : Culicidae) to the insecticide temephos after exposure to atrazine. *African Entomology* 2015. 23(1) : 110-119. **Impact factor: 0.36**
17. Kamau E, Campino S, Amenga-Etego L, Drury E, Ishengoma D, Johnson K, Mumba D, Kekre M, Yavo W, Mead D, Bouyou-Akotet M, Apinjoh T, Golassa L, Randrianarivelojosa M, Andagalu B, Maiga-Ascofare O, Amambua-Ngwa A, Tindana P, Ghansah A, MacInnis B, Kwiatkowski D, Djimde AA. K13-propeller polymorphisms in *Plasmodium falciparum* parasites from sub-Saharan Africa. *J Infect Dis*. 2015 Apr 15 ; 211(8) : 1352-5. **Impact Factor: 5.99**
18. Kerkhof K, Canier L, Kim S, Heng S, Sochantha T, Sovannaroth S, Vigan-Womas I, Coosemans M, Sluydts V, Ménard D, Durnez L. Implementation and application of a multiplex assay to detect malaria-specific antibodies : a promising tool for assessing malaria transmission in Southeast Asian pre-elimination areas. *Malar J*. 2015 Sep 4 ; 14(1):338. PubMed PMID : 26337785. **Impact factor: 3.10**

19. Koffi D, Touré AO, Varela ML, Vigan-Womas I, Béourou S, Brou S, Ehouman MF, Gnamien L, Richard V, Djaman JA, Perraut R. Analysis of antibody profiles in symptomatic malaria in three sentinel sites of Ivory Coast by using multiplex, fluorescent, magnetic, bead-based serological assay (MAGPIX™). *Malar J.* 2015 Dec 21;14:509. PubMed PMID : 26692284.

Impact Factor : 3.10

20. Lastrucci C, Bénard A, Balboa L, Pingris K, Souriant S, Poincloux R, Al Saati T, Rasolofo V, González-Montaner P, Inwentarz S, Moraña EJ, Kondova I, Verreck FA, Sasiain Mdel C, Neyrolles O, Maridonneau-Parini I, Lugo-Villarino G, Cougoule C. Tuberculosis is associated with expansion of a motile, permissive and immunomodulatory CD16(+) monocyte population via the IL-10/STAT3 axis. *Cell Res.* 2015 Dec;25(12) : 1333-51. **Impact Factor : 12.41**

21. Mattheus W, Hanquet G, Collard J-M, Vanhoof R, Bertrand S. Changes in meningococcal strains in the era of a serogroup C vaccination campaign : Trends and evolution in Belgium during the period 1997-2012 ; *PLoS One*, 2015 ; 10(10) : e0139615. **Impact Factor : 4.41**

22. McMorrow ML, Wemakoy EO, Tshilobo JK, Emukule GO, Mott JA, Njuguna H, et al. Severe Acute Respiratory Illness Deaths in Sub-Saharan Africa and the Role of Influenza : A Case Series From 8 Countries. *J Infect Dis.* 2015 ; 212(6) : 853-60. **Impact Factor : 5.99**

23. MenAfriCar consortium. The diversity of meningococcal carriage across the African meningitis belt and the impact of vaccination with a group A meningococcal conjugate vaccine. *J Infect Dis.* 2015 Apr 9. pii : jiv211. **Impact Factor : 5.778**
5-year Impact Factor : 6.020

24. Michel R, Berger F, Ravelonarivo J, Dussart P, Dia M, Nacher M, Rogier S, Moua D, Sarr FD, Diop OM, Sall AA, Baril L. Observational study on immune response to yellow fever and measles vaccines in 9 to 15-month old children. Is it necessary to wait 4 weeks between two live attenuated vaccines? *Vaccine.* 2015 May 11 ; 33(20) : 2301-6. **Impact Factor : 3.48**

25. Nepomichene TNJJ, Elissa N, Cardinale E, Boyer S. Species diversity, abundance and host preferences of mosquitoes (Diptera : Culicidae) in two different ecotypes of Madagascar with recent RVFV transmission. *Journal of Medical Entomology* 2015. 52(2) : 962-969. **Impact Factor : 1.95**

26. Nepomichene TNJJ, Tata E, Boyer S. Malaria case in Madagascar, probable implication of a new vector, *Anopheles coustani*. *Malaria journal* 2015. 14 : 475. **Impact Factor : 3,079**

27. Perraut R, Varela ML, Mbengue B, Guillotte M, Mercereau-Puijalon O, Vigan-Womas I. Standardization and validation of a multiplex magnetic bead-based for simultaneous detection of IgG to Plasmodium antigens. *J Immunol Tech Infect Dis.* 2015. <http://dx.doi.org/10.4172/2329-9541.1000134>.

- 28.** Rabodoarivelo MS, Imperiale B, Andrianavomikotroka R, Brandao A, Kumar P, Singh S, Ferrazoli L, Morcillo N, Rasolofo V, Palomino JC, Vandamme P, Martin A. Performance of Four Transport and Storage Systems for Molecular Detection of Multidrug-Resistant Tuberculosis. *PLoS One*. 2015 Oct 2 ; 10(10) : e0139382. **Impact Factor : 3.23**
- 29.** Raharimalala FN, Boukraa S, Bawin T, Boyer S, Francis F. Molecular detection of six (endo-) symbiotic bacteria in Belgian mosquitoes : first step towards the selection of appropriate paratransgenesis candidates. *Parasitology research* 2015. 1-9. **Impact Factor : 2.32**
- 30.** Rakotosamimanana N, Richard V, Raharimanga V, Gicquel B, Doherty TM, Zumla A, Rasolofo Razanamparany V. Biomarkers for risk of developing active tuberculosis in contacts of TB patients : a prospective cohort study. *Eur Respir J*. 2015 Oct ; 46(4) : 1095-103. **Impact Factor : 8,332**
- 31.** Rakotosamimanana N, Richard V, Raharimanga V, Gicquel B, Doherty TM, Zumla A, Rasolofo Razanamparany V. Early markers for risk of developing active tuberculosis in contacts of TB patients : a prospective cohort study. *Tropical Medicine & International Health. Special Issue : Abstracts of the 9th European Congress on Tropical Medicine and International Health, 6-10 September 2015, Basel, Switzerland. Volume 20, Issue Supplement S1.*
- 32.** Rakotosamimanana N, Richard V, Raharimanga V, Gicquel B, Mark Doherty T, Zumla A, Rasolofo Razanamparany V. Biomarkers for risk of developing active tuberculosis in contacts of TB patients : a prospective cohort study. *Eur Respir J*. 2015; 64(4):1095-103. **Impact Factor : 8,332**
- 33.** Ranaivomanana P, Raharimanga V, Dubois PM, Richard V, Rasolofo Razanamparany V. Study of the BCG Vaccine-Induced Cellular Immune Response in Schoolchildren in Antananarivo, Madagascar. *PLoS ONE* 2015; 10(7) : e0127590. **Impact Factor : 3.23**
- 34.** Randriamaherijsaona S, Rogier C, Boyer S, Bouraima A, N'Guessan R, Briët O, Corbel V. Do holes in long lasting insecticidal nets compromise their efficacy against pyrethroid resistant *Anopheles gambiae* and *Culex quinquefasciatus*? Results from a study releasing mosquitoes in experimental huts. *Malaria Journal* 2015. 14 : 332. **Impact Factor : 3,079**
- 35.** Randrianasolo BS, Jourdan PM, Ravoniarimbinina P, Ramarokoto CE, Rakotomanana F, Ravaoalimalala VE, Gundersen SG, Feldmeier H, Vennervald BJ, van Lieshout L, Roald B, Leutscher P, Kjetland EF. Gynecological manifestations, histopathological findings, and schistosoma-specific polymerase chain reaction results among women with *Schistosoma haematobium* infection : a cross-sectional study in Madagascar. *J Infect Dis*. 2015 Jul 15 ; 212(2) : 275-84. Epub 2015 Feb 28. <http://www.ncbi.nlm.nih.gov/pubmed/25725656> **Impact Factor : 5.99**
- 36.** Ratovoson R, Rasetarinera OR, Andrianantenaina I, Rogier C, Piola P, Pacaud P (2015). Hypertension, a neglected Disease in Rural and Urban Areas in Moramanga, Madagascar. *PLoS ONE* 10(9) : e0137408. **Impact Factor : 3.23**

37. Ratsitorahina M, Rahelinirina S, Michault A, Rajerison M, Rajatonirina S, Richard V. Has Madagascar Lost Its Exceptional Leptospirosis Free-Like Status? PLoS ONE 2015 ; 10(4) : e0122683. **Impact Factor : 3.23**

38. Razanajatovo NH, Nomenjanahary L, Wilkinson D, Razafimanahaka J, Goodman S, Jenkins R, Jones J, Heraud J. Detection of new genetic variants of Betacoronaviruses in Endemic Frugivorous Bats of Madagascar. Virology Journal. 2015; 12:42. **Impact Factor : 3.27**

39. Richard V, Riehm JM, Herindrainy P, Soanandrasana R, Ratsitoharina M, Rakotomanana F, Andrianalimanana S, Scholz H, C. Rajerison M. Pneumonic plague outbreak, Northern Madagascar, 2011. Emerg Infect Dis. 2015 Jan ; 21(1) : 8-15. **Impact Factor : 6.75**

40. Riehm JM, Projahn M, Vogler AJ, Rajerison M, Andersen G, Hall CM, Zimmermann T, Rahelinirina S, Andrianaivoarimanana V, Straubinger RK, Nottingham R, Keim P, Wagner DM, Scholz HC. Diverse Genotypes of Yersinia pestis Caused Plague in Madagascar in 2007. PLoS Negl Trop Dis. 2015 ; 9(6) : e0003844. **Impact Factor : 4.44**

41. Rist CL, Ngonghala CN, Garchitorena A, Brook CE, Ramananjato R, Miller AC, Randrianarivelojosia M, Wright PC, Gillespie TR, Bonds MH. Modeling the burden of poultry disease on the rural poor in Madagascar One Health 2015 : 60–65.

42. Salim Abdulla, Adam. I, Adjei. GO, Randrianarivelojosia. M, Adjuik. MA, Alemayehu. B, Allan. R, Arinaitwe. E, Ashley. EA, Ba. MS, Barennes. H, Barnes. KI, Bassat. Q, Baudin. E, Berens-Riha. N, Björkman. A, Bompert. F, Bonnet. M, Borrmann. S, Bousema. T, Brasseur. P, Bukirwa. H, Checchi. F, Dahal. P, D'Alessandro. U, Desai. M, Dicko. A, Djimdé. AA, Dorsey. G, Doumbo. OK, Drakeley. CJ, Duparc. S, Eshetu. T, Espié. E, Etard. J-F, Faiz. AM, Falade. CO, Fanello. CI, Faucher. JF, Faye. B, Faye. O, Filler. S, Flegg. JA, Fofana. B, Fogg. C, Gadalla. NB, Gaye. O, Genton. B, Gething. PW, Gil. JP, González. R, Grandesso. F, Greenhouse. B, Greenwood. B, Grivoyannis. A, Guerin. PJ, Guthmann. J-P, Hamed. K, Hamour. S, Hay. SI, Hodel. E, Humphreys. GS, Hwang. J, Ibrahim. ML, Jima. D, Jones. JJ, Jullien. V, Juma. E, Kachur. PS, Kager. PA, Kamugisha. E, Kamya. MR, Karema. C, Kayentao. K, Kiechel. J-R, Kironde. F, Kofoed. P-E, Kremsner. PG, Krishna. S, Lameyre. V, Lell. B, Lima. A, Makanga. M, Malik. EM, Marsh. K, Mårtensson. A, Massougbdji. A, Menan. H, Menard. D, Menéndez. C, Mens. PF, Meremikwu. M, Moreira. C, Nabasumba. C, Nambozi. M, Ndiaye. J-L, Ngasala. BE, Nikiema. F, Nsanzabana. C, Ntoumi. F, Oguike. M, Ogutu. BR, Olliaro. P, Omar. SA, Ouédraogo. J-B, Owusu-Agyei. S, Penali. LK, Pene. M, Peshu. J, Piola. P, Plowe. CV, Premji. Z, Price. RN, Rombo. L, Roper. C, Rosenthal. PJ, Sagara. I, Same-Ekobo. A, Sawa. P, Schallig. HD, Schramm. B, Seck. A, Shekalaghe. SA, Sibley. CH, Sinou. V, Sirima. SB, Somé. FA, Sow. D, Staedke. SG, Stepniewska. K, Sutherland. CJ, Swarthout. TD, Sylla. K, Talisuna. AO, Taylor. WR, Temu. EA, Thwing. JI, Tine. RC, Tinto. H, Tommasini. S, Touré. OA, Ursing. J, Vaillant. MT, Valentini. G, Broek. IVD, Vugt. MV, Ward. SA, Winstanley. PA, Yavo. W, Yeka. A, Zongo. YMZal. Clinical determinants of early parasitological response to ACTs in African patients with uncomplicated falciparum malaria: a literature review and meta-analysis of individual patient data. BMC Med. 2015; 13(7):212. **Impact Factor : 8,005**

43. Tantely ML, Boyer S, Fontenille D. A review of mosquitoes associated with Rift Valley fever virus in Madagascar. American Journal of Tropical Medicine and Hygiene 2015. 92(4) : 722-729. **Impact Factor : 2.73**

- 44.** Troegeler A, Lugo-Villarino G, Hansen S, Rasolofo V, Henriksen ML, Mori K, Ohtani K, Duval C, Mercier I, Bénard A, Nigou J, Hudrisier D, Wakamiya N, Neyrolles O. Collecting CL-LK as a Novel Soluble Pattern Recognition Receptor for Mycobacterium tuberculosis. PLoS One. 2015 Jul 14 ; 10(7) : e0132692. **Impact Factor : 3.23**
- 45.** Wotodjo AN, Trape JF, Richard V, Doucoure S, Diagne N, A. Tall, O. Ndiath, N. Faye, J. Gaudart, C. Rogier, and C. Sokhna. No difference in the incidence of malaria in human-landing mosquito catch collectors and non-collectors in a Senegalese village with endemic malaria. PLoS One 10: e0126187. **Impact Factor : 3.23**
- 46.** WWARN Artemisinin based Combination Therapy (ACT) Africa Baseline Study Group. Clinical determinants of early parasitological response to ACTs in African patients with uncomplicated falciparum malaria : a literature review and meta-analysis of individual patient data. BMC Med. 2015 Sep 7 ; 13 : 212. **Impact Factor : 8,005**
- 47.** Zumla A, Maeurer M; Host-Directed Therapies Network (HDT-NET) Consortium. Host-Directed Therapies for Tackling Multi-Drug Resistant Tuberculosis : Learning From the Pasteur-Bechamp Debates. Clin Infect Dis. 2015 Nov 1 ; 61(9) : 1432-8. **Impact Factor : 8.88**
- 48.** Zumla A, Maeurer M, Host-Directed Therapies Network, Chakaya J, Hoelscher M, Ntoumi F, Rustomjee R, Vilaplana C, Yeboah-Manu D, Rasolofo V, Munderi P, Singh N, Aklillu E, Padayatchi N, Macete E, Kapata N, Mulenga M, Kibiki G, Mfinanga S, Nyirenda T, Maboko L, Garcia-Basteiro A, Rakotosamimanana N, Bates M, Mwaba P, Reither K, Gagneux S, Edwards S, Mfinanga E, Abdulla S, Cardona PJ, Russell JB, Gant V, Noursadeghi M, Elkington P, Bonnet M, Menendez C, Dieye TN, Diarra B, Maiga A, Aseffa A, Parida S, Wejse C, Petersen E, Kaleebu P, Oliver M, Craig G, Corrah T, Tientcheu L, Antonio M, Rao M, McHugh TD, Sheikh A, Ippolito G, Ramjee G, Kaufmann SH, Churchyard G, Steyn A, Grobusch M, Sanne I, Martinson N, Madansein R, Wilkinson RJ, Mayosi B, Schito M, Wallis RS. Towards host-directed therapies for tuberculosis. Nat Rev Drug Discov. 2015 Aug ; 14(8) : 511-2. **Impact Factor : 41.90**

Posted Communications

1. A complicated pneumonic plague case with MDR-bacterial co-infection in Madagascar. V. Andrianaivoarimanana, M. Rajerison, R. Rajaonarison, T. G. Rakotondramaro, E. Bertherat, C. Rogier. Troisième édition des Journées de la Veille sanitaire dans l'Océan Indien, Ile Maurice, 26-27 octobre 2015.

2. Epidemiological features of pneumonic plague in Madagascar with special emphasis on Ambilobe and Faratsiho events. M. Rajerison, H. Razafimandimby, S. Andrianalimanana, C. Rogier, M. Ratsitorahina, P. Herindrainy and V. Richard. Troisième édition des Journées de la Veille Sanitaire dans l'Océan Indien 26-27 octobre 2015, Ile Maurice.

3. Hedje J, Randriamaherijaona S, Sebastien Boyer, Annett Cotte, Sixte Zigirumugabe, Mike Green, Ray Beach. Quantifying LLIN bioefficacy : Can colorimetric fast test (CFT) results serve as a proxy for the WHO cone bioassay? 64th Annual Meeting, Philadelphia, Pennsylvania, USA, 25 – 29 octobre 2015.

4. Kesteman T, Randriamaherijaona S, Rogier C, Boyer S. Save mosquitoes, save money! A resampling analysis to determine how many mosquitoes are needed to test a LLIN. 64th Annual Meeting, Philadelphia, Pennsylvania, USA, 25 – 29 octobre 2015.

5. L Randriamampionona, L Randrianasolo, T Ramarokoto, CE Ramarokoto, A Randriamanantena, P Piola. Etude de la sensibilité du système de surveillance sentinelle des fièvres à Madagascar. 3ème Journée de la Veille Sanitaire dans l'Océan Indien, Ile Maurice, Octobre 2015.

6. M. Harimalala, H. Delatte, S. Telfer, A. Miarinjara, T. Ramihangihajason and S. Boyer. Genetic structure of *Xenopsylla cheopis*, the flea vector of plague in Madagascar. International Scientific Symposium of the Institut Pasteur International Network, Paris, October 14th-16th, 2015.

7. MS Rabodoarivelo, B Imperiale, R andrianiavomikotroka, A Brandao, P Kumar, S Singh, L Ferrazoli, N Morcillo, V Rasolofo, JC Palomino, P Vandamme, A Martin. Feasibility of four transport and storage supports for molecular detection of multidrug resistant tuberculosis. Scientific Symposium of the Institut Pasteur International Network, 14/10/2015 au 16/10/2015 à l'Institut Pasteur à Paris.

8. MS Rabodoarivelo, B Imperiale, R andrianiavomikotroka, A Brandao, P Kumar, S Singh, L Ferrazoli, N Morcillo, V Rasolofo, JC Palomino, P Vandamme. Performance of four transport and storage systems for molecular detection of multidrug-resistance tuberculosis". 36ème congrès de l' « European Society of Mycobacteriology (ESM) » à Riga, Latvia, 28 juin-01 juillet 2015.

9. N. Rakotosamimanana, Raharimanga V, Ratovoson R, Richard V, Zumla A, Doherty MT, Gicquel B, Rasolofo VR. Assessing human immune response against different *Mycobacterium tuberculosis* antigens by IGRA in active pulmonary TB and their household contacts. Keystone, janvier 2015.

10. N Rakotosamimanana, Richard V, Raharimanga V, Doherty MT, Gicquel B, Zumla A, Rasolofo VR. Biomarkers for Risk of Developing Active Tuberculosis in contacts of TB patients obtained from a prospective cohort study. Scientific Symposium of the Institut Pasteur International Network. Institut Pasteur, Paris, France, October 2015.

11. Ramandanirainy P, Rahantamalala A, Nativel P, Randriantsoa D, Rakotondrazaka M, Randrianasolo N, Ramiandrisoa S, Rabeniary A, Vincent Porphyre, Harena Rasamoelina-Andriamanivo, Ronan Jambou, Inès Vigan-Womas. Development of serological tools for the “point-of-care” diagnostic and control of cysticercosis in Madagascar.

- 3ème journée du Réseau SEGA One Health, sur la veille sanitaire dans l’Océan Indien, 26-27 Octobre 2015.
- Scientific Symposium of the Institut Pasteur International Network 2015, Institut Pasteur, Paris, 14 -16 Octobre 2015.

12. Rivo Andry Rakotoarivelo, Voahangy Rasolofo Razanamparany, Jocelyn Rakotomizao and David W. Denning. The burden of serious fungal diseases in Madagascar. 7th Trends in Medical Mycology (TIMM-7). Lisbon, Portugal, 9-12 October 2015.

13. Steinhardt L, Ravaoarisoa E, Wiegand R, Harimanana A, Hedje J, Cotte A, Zigirumugabe S, Kesteman T, Rasoloharimanana TL, Rakotomalala R, Rakotondramanga JM, Butts J, Rogier C, Piola P, Randrianarivehojosia M, Vigan-Womas I. A school-based serology study to validate use of routine data for targeting malaria interventions in the Central Highlands of Madagascar - May-July 2014. American Society of Tropical Medicine and Hygiene (ASTMH) 64th annual meeting. Philadelphia, USA. October 25-29, 2015.

Oral Communications

1. Alain Rakotoarisoa, Laurence Randrianasolo, Julia Guillebaud, Norosoa Razanajatovo, Lea Randriamampionona, Stefano Tempia, Patrice Piola, Ariane Halm, Jean-Michel Heraud. Evaluation du système de surveillance de la grippe à Madagascar, 2009–2014. 2^{ème} Journées Scientifiques du Réseau SEGA “One Health” Mauritius, 21 - 22 Septembre 2015.

2. Bodo S. Randrianasolo, Peter M. Jourdan, Pascaline Ravoniarimbina, Charles E. Ramarokoto, Fanjasoa Rakotomanana, Vololomboahangy E. Ravaoalimalala, Svein G. Gundersen, Hermann Feldmeier, Birgitte J. Vennervald, Lisette van Lieshout, Borghild Roald, Peter Leutscher, Alan Fenwick, Eyrun F, Kjetland. Targeting the burden of schistosomiasis in Madagascar : Gynaecological manifestations of schistosomiasis in an area scaling up mass drug administration of praziquantel. 64^è meeting Annual ASTMH. 2015. Philadelphie. Pennsylvanie. Etats Unis d’Amérique. Octobre 2015.

3. Claudia Filippone. Laboratory Diagnostic of dengue and chikungunya. Workshop Dengue / Chikungunya, Kampala, Uganda, 23 – 26 June 2015

4. Endémie de peste à Madagascar : sensibilité actuelle de la puce *Xenopsylla cheopis* (Siphonaptera, Pulicidae) aux insecticides. A. Miarinjara, E. Tata, M. Rajaonarimanana, T. Ramihangihajason, S. Boyer. Journées de la Veille sanitaire dans l’océan Indien. Maurice, 26-27 octobre 2015.

5. Girond F. Development of a web based Malaria Early Warning System using mobile health”. Atelier “Malaria and Space”, Pretoria, Afrique du Sud, 29-30 juin 2015.

6. Ihantamalala FA, Ratvoson R, Mangahasimbola R, Rakotomanana F. Modélisation de l’accessibilité aux soins des Centres de Santé de Base publique, Moramanga, Madagascar. XIII^{ème} Journées scientifiques du Réseau de télédétection, Dakar, 17 au 19 février 2015.

7. Ihantamalala Felana Angela. Modélisation des zones vulnérables à la propagation du paludisme en rapport avec la mobilité de la population. Journée des doctorants du Collège Doctoral RAMI, Tuléar, 27 avril au 2 mai 2015.

8. Jean-Michel Heraud, Aina Harimanana, Julia Guillebaud, Laurence Randrianasolo, Patrice Piola, Mahery Ratsitoarina. Influenza Disease Burden estimates in Madagascar. Consultation on the tool to estimate the economic burden of influenza and the WHO Technical consultation on the Burden of Influenza Disease 8 to 10 December 2015. Geneva, Switzerland 7 – 10 December 2015

9. Jean-Michel Heraud. Needs, priorities, challenges faced by Madagascar for the introduction of seasonal influenza vaccine into the national programme. Second WHO Meeting on Seasonal Influenza Vaccine Composition for the Tropics and Subtropics. Pune, India, 8 – 10 July 2015.

10. Jean-Michel Heraud. Overview of virological studies conducted at the Institut Pasteur de Madagascar. DUKE-NUS, Singapore, September 7, 2015

- 11.** Jean-Michel Heraud. Pandemic influenza severity assessment in Madagascar, Technical Working Group Meeting on Influenza Severity Assessment WHO Headquarters, Geneva, Switzerland, 1-2 June 2015
- 12.** Keitly Mensah, Jessica Metcalf, Cara Brook, Andriamasina Randriamanantena, Richter Razafindratsimandresy, Jean-Michel Heraud. Incidence of Rubella Infections in Madagascar, 2004-2014. 2ème Journées Scientifiques du Réseau SEGA "One Health" Mauritius, 21 - 22 Septembre 2015.
- 13.** L Randrianasolo. Unité d'Epidémiologie, Institut Pasteur de Madagascar Assurance qualité du Test de Diagnostic Rapide du paludisme utilisé dans les centres de surveillance sentinelle des fièvres à Madagascar. 3ème Journées de la Veille Sanitaire dans l'Océan Indien, Ile Maurice, Octobre 2015.
- 14.** Marilyns Razakamanana. « Présentation des résultats intermédiaires de l'évaluation économique du projet d'intégration du diagnostic et du traitement de la pneumonie dans la prise en charge communautaire du paludisme », DRSP SAVA Sambava, Août 2015.
- 15.** Olive MM, Heraud JM, Grosbois V, Andriamandimby SF, Tran A, Rakotomanana F, Rogier C, Chevalier V (2015). Joint analysis of human and bovine serological data : new insight on the risk and mechanisms of transmission of Rift Valley fever in Madagascar. The 14th International Society for Veterinary Epidemiology and Economics (ISVEE) Congress. Merida, Mexico, November 3-7, 2015.
- 16.** Olive MM, Heraud JM, Tran A, Andriamandimby SF, Rakotomanana F, Rogier C, Grosbois V, Chevalier V. Environmental and behavioural risk factors of Rift Valley fever (RVF) virus transmission in human and cattle in Madagascar. Amsterdam, Netherlands. The 3rd International One Health Congress. March 15-18, 2015.
- 17.** Rahelinirina S, Bourhy P, Rajerison M. Vulnérabilité sanitaire et environnementale dans les bas quartiers d'Antananarivo : cas de la leptospirose et de la peste. Journées de la Veille Sanitaire dans l'Océan Indien. Ile Maurice, 26 au 27 octobre 2015.
- 18.** Rahelinirina S, Duplantier J-M, Goodman S, Rahalison L, Chanteau S, Telfer S, Rajerison M. Seroprevalence of plague infection in small mammals in Madagascar from 1998 to 2014. The 12th African Small Mammal Symposium. Mantasoa, Madagascar. 13 au 17 avril 2015.
- 19.** Rakotoarison HA, Piola P, Rakotomanana F. La Télédétection et le Système d'Information Géographique, un outil d'aide à la décision dans la lutte contre le paludisme à Madagascar. XIIIème Journées scientifiques du Réseau de télédétection, Dakar, 17 au 19 février 2015.
- 20.** Rakotomanana F, Rakotoarison H A, Ihantamalala F A, Rasolofo V, Randremanana R V, Piola P. Case studies of GIS in public Health in Madagascar : benefits and limits. GEOMED, Florence, Italy, 10 au 12 septembre 2015.

- 21.** Rakotomanana F. Panorama of activities linked to vector-borne diseases. Atelier “Malaria and Space”, Pretoria, Afrique du Sud, 29-30 juin 2015.
- 22.** Rakotosamimanana N, Richard V, Raharimanga V, Gicquel B, Doherty TM, Zumla A, Razanamparany VR. Early biomarkers associated with progression of Latent Tuberculosis Infection to clinically active disease – a longitudinal cohort study. 46th International Conference of the Union. CapeTown, South Africa Decemder 2015.
- 23.** Randremanana RV, Rogier C. Expérience sur la formation à la statistique dans un institut de recherche à Madagascar. IVè Colloque International sur l’Enseignement de la Statistique, Bordeaux, France, 21-23 janvier 2015.
- 24.** Rasolofo Razanamparany V. Acquisition de la résistance aux antituberculeux. Congrès International de Pneumologie (organisé par la Société de Pneumologie de Madagascar et la Société de Pneumologie de l’Océan Indien). Antananarivo, 9-11 décembre 2015
- 25.** V Rasolofo, MS Rabodoarivelo, NI Ratovonirina, S Razafimahatratra, JC Palomino, C Sola, F Rakotomanana, A Martin. Challenges in setting-up molecular diagnostic tools for tuberculosis drug resistance detection and epidemiology studies in low-income countries. 36th Annual Congress of the European Society of Mycobacteriology, Riga, Latvia. 28 juin – 01 juillet 2015
- 26.** Vigan-Womas I. Address the new challenges for malaria control in Madagascar. Symposium Fiocruz-Institut Pasteur, 8-9 June 2015 – Oswaldo Cruz Foundation, Brazil. Conférencier Invité.

Acknowledgements

The IPM addresses its sincere thanks to all its technical and financial partners

Agence Française de Développement (AFD) via Commission de l’Océan Indien (COI)

Agence de Santé Océan Indien

Ambassade de France

Agence Universitaire de la Francophonie (AUF)

Banque Africaine de Développement (BAD)

Banque Mondiale

BASF SE

Centers for Disease Control and Prevention (CDC)

Centre National d’Etudes Spatiales (CNES)

FAD/Ministère de l’Agriculture

Fédération Equestre Internationale (FEI)

Fonds Africain de Développement

Fondation Damien

Fondation de Lille

Fondation TOTAL

Fonds Mondial

Institut Pasteur à Paris

Institut Régional de Coopération Développement (IRCOD)

Gouvernement français

Ministre de l’Agriculture

Ministère de la Santé Publique

Organisation Mondiale de la Santé (OMS)

ONG PIVOT

Population Services International (PSI)

President’s Malaria Initiative

Principauté de Monaco

QualiREG - Océan Indien

RIIP (Réseau International des Instituts Pasteurs)

SANOFI-AVENTIS GROUPE

Service de Coopération et d’Action Culturelle – Ambassade de France (SCAC)

Schistosomiasis Control Initiative (SCI)

United Nations International Children’s Emergency Fund (UNICEF)

Université d’Aberdeem

United States Department of Health and Human Services (US DHHS)

United States Agency for International Development (USAID)

VESTERGAARD FRANDSEN SA

Wellcome Trust

◀◀ More than 115 years of excellence, at the service of public health and of companies ▶▶

Institut Pasteur de Madagascar

PO Box. 1274, Ambatofotsikely Avaradoha

101 Antananarivo, Madagascar

Phone : (+261 20) 22 412 72

Email : ipm@pasteur.mg

Website : www.pasteur.mg

