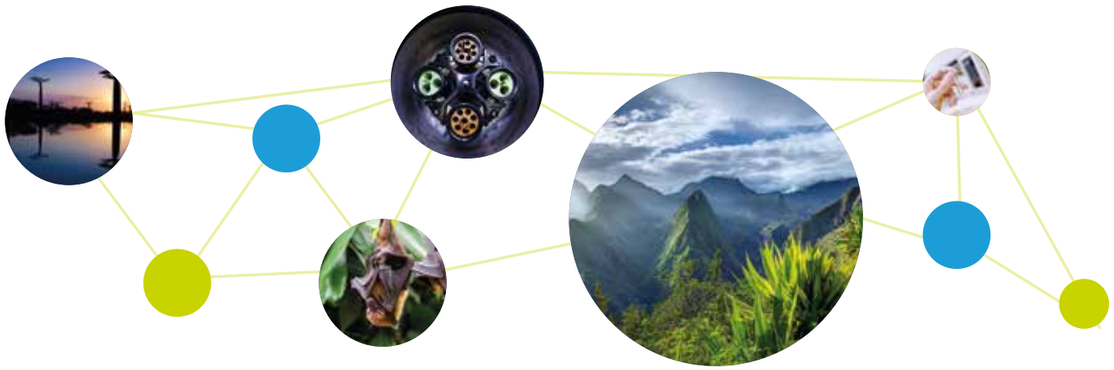
IC - BioHealF 2017

International Conference on Biodiversity Health and Food

14th to 16th December 2017

University of La Reunion
Saint-Denis - La Réunion

Innovons La Réunion
BioST Biosécurité en milieu Tropical
CHU Centre Hospitalier Universitaire La Réunion
CYROI Recherche Santé Bio-innovation
UR Université de La Réunion



IC - BioHealF 2017

International Conference on Biodiversity Health and Food

Bienvenue !

The International conference on Biodiversity Health and food BioHealf 2017 will take place from 14th to 16 December at the University of Reunion Island.

The main objective of the IC-BioHealF 2017 is to bring together students, technicians, engineers, medical practitioners, researchers, and entrepreneurs on the theme of biodiversity – health - food, in order to

› promote research excellence and innovation,

› increase collaborations between research and private actors,

› contribute to the research effort for the benefit of territorial development.

Plenary sessions will illustrate current and future research and innovations by local and international experts. The workshops will review S3 actions and identify future needs of the territory while structuring new partnerships to envisage responses to international calls.

Organisation

Coordination : Patrick MAVINGUI & Maya CESARI

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PROGRAM

Thursday 14 December 2017

9h00-9h45 **Welcome and Opening Speeches**
- Frédéric MIRANVILLE {President of the University of La Réunion}
- Lionel CALENGE, {General director of CHU and President of CYROI},
- Didier ROBERT {President of Region Reunion}
- Amaury de SAINT QUENTIN {Prefect of Region}

9h45-10h00 **Coffee Break - Meeting B2B**

10h00-10h15 Presentation of Smart Specialization Strategy (S3) of Reunion Island {Innovons La Réunion}

10h15-12h55 **PLENARY SESSION** « Metabolic & Chronic diseases »
Chairpersons : Estelle NOBECOURT {CHU, Reunion} & Marie-Paule GONTHIER {DéTROI, Reunion}

10h15-10h35 Karine CLEMENT {UPMC-Paris, France}
« Gut microbiota and derived-metabolites in severe obesity : effect of bariatric surgery »

10h35-10h55 Ramaroson ANDRIANTSITOHAINA {University of Angers, France}
« Extracellular vesicles as biomarkers and biological vectors of atherosclerosis in Metabolic Syndrome »

10h55-11h15 Renaud BEAUWENS {ULB-Bruxelles, Belgique}
« Study of glucose-induced membrane potential oscillations in WT and F508del mouse beta cell: importance of Anoctamin 1 »

11h15-11h35 **Break - Meeting B2B**

11h35-11h55 Stéphane GERMAIN {Collège de France-Paris, INSERM, France}
« Preserving endothelial integrity in ischemic cardiovascular diseases: a new concept.... Really? »

11h55-12h15 Pierre-Olivier COURAUD {INSERM-Paris, France}
« CNS barriers and neuroimmune interactions »

12h15-12h35 Fatiha TABET {UNSW-Sydney, Australie}
« MicroRNAs and cardiovascular disease »

12h35-12h55 Olivier MEILHAC {DéTROI, INSERM, Reunion}
« High-density lipoproteins: biomarkers and therapeutic tool for metabolic complications and beyond »

13h00-14h30 **LUNCH TIME**

14h30-15h30 **University of La Reunion and Younger researchers**
Poster presentations by PhD students, young PhD

15h30-15h50 **Break - Meeting B2B**

15h50-17h10 **PLENARY SESSION** « Innovations, valorization in life and health sciences »
Chairperson : Claude MARODON {APLAMEDOM, Reunion} & Anne-Laure MOREL {Torskal}

15h50-16h10 Eric NIESOR {Hartis Pharma, Switzerland}
« Role of HDL and its receptor SR-B1 in the transport and delivery of liposoluble antioxidants: potential therapeutic implications »

16h10-16h30 Theesan BAHORUN {CBBR, Mauritius}
« Biomedical Research and Innovation: from bench to shelf »

PROGRAM

IC - BioHealF 2017

16h30-16h50 Fabien BOULLE {Axonova, Ile Maurice}
« Identification and characterization of plant-based modulators of BDNF/TrkB signalling: Application in Neuro-Psychiatry »

16h50-17h10 Anne BIALECKI {LCSNSA, Reunion University}
« Bioactive molecules of marine invertebrates from South-West Indian Ocean »

17h10-17h30 **Coffee break - Meeting B2B**

17h30-19h10 **2 Workshops in parallel**

« The microbiota »

Chairpersons : Fabienne REMIZE {Reunion University} & Olivier MEILHAC {INSERM}

Contributors : Karine CLEMENT {UPMC, France}, Pascale MOSONI {INRA, France}

«Valuation of natural compounds (regulation, testimony, exchange)»

Chairpersons : Maya CESARI {CYROI, Reunion} & Graziella TOSTAIN {Qualitropic, Reunion}

Contributors : Paul HANNEWALD {PharmaD}, Achmet SAID {University of Comoros-Comoros}, Frédéric GAULT {CORALBIOME} Start-ups from La Reunion, Michel HUC {ASPE-CONSEIL}

Friday 15 December 2017

8h00-8h30 **Reception and registration**

8h30-11h20 **PLENARY SESSION « Infectious diseases: One Health & Ecohealth »**
Chairpersons : Catherine CÊTRE-SOSSAH {Cirad, Reunion} & Pablo TORTOSA {Reunion University}

8h30-8h50 Herwig LEIRS {University of Antwerp, Belgium}
« Small mammals and One Health: linking ecology to human society »

8h50-9h10 Eric CARDINAL {ASTRE, CIRAD-Reunion}
« One Health in the Indian Ocean: a concept on the move! »

9h10-9h30 Marie-Lise GOUGEON {Institut Pasteur, France}
« Innate Sensing of Viral Infections: the Janus Face of Dendritic Cells in viral infections »

9h30-9h50 Alain KOHL {University of Glasgow, UK}
« Zika virus- tropism and antiviral responses »

10h00-10h20 **Coffee break - Meeting B2B**

10h20-10h40 Fabrice VAVRE {LBBE - Lyon University, France}
« Extreme (and recurrent?) lifestyle transitions in tick-associated bacteria »

10h40-11h00 Patrick MAVINGUI {PIMIT, CNRS, Reunion}
« Investigations in the research unit Infectious Processes in Tropical Island Environments »

11h00-11h20 Philippe DESPRES {PIMIT, Reunion University}
« The research program on Zika virus exemplifies the PIMIT's capacity to respond to emerging infectious disease threats in Indian ocean »

PROGRAM

11h30-13h00 2 Workshops in parallel

« Cohorts & Biological collections »
Innovative Strategies for Vector Control

Chairpersons : Bénédicte ROQUEBERT {CHU Reunion} & Bernard REYNAUD {PVBMT, Reunion University}

Contributors : Catherine MARIMOUTOU {CIC, CHU Reunion}, Eric NIESOR {Hartis Pharma, Switzerland}, Jean-Hélène DI DONATO {France}

« Innovative Strategies for Vector Control »

Chairpersons : Clément GOUAGNA {MIVEGEC, IRD Reunion} & Jean Sébastien DEHECQ {ARS Indian Ocean}

Contributors : David TCHOUASSI {ICIPE, Nairobi Kenya}, Frédéric SIMARD {IRD, France}, Pablo TORTOSA {Reunion University}, Jokin GARATEA {Cluster GAIA}, Manuel DE LARA {Ocean Living Lab, Pays Basque espagnol}, Romain GIROD {IP Madagascar}, Patrick RABARISON {ARS Mayotte}

13h00-14h30 LUNCH TIME

14h30 -17h10 PLENARY SESSION « Tropical Biodiversity, Food, Health &Society »
Chairpersons : Pascale CHABANET {IRD, Reunion}, Marie THIANBO-MOREL {IRIS, Reunion}

14h30-14h50 Sylvie BERCION {University of Antilles-France}
« Antidiabetic traditional vegetal extracts as potential raw materials for new products »

14h50-15h10 Phila BIANCHINI RAHARIVELOMANANA {University of French Polynesia Française-France}
« Phytochemical assessment of Rauvolfia nukuhivensis : from uses to biological activities and chemodiversity »

15h10-15h30 Pascale MOSONI {INRA, France}
« Deciphering the dietary fibre-degrading enzyme system of the human gut bacterium Bacteroides xylanisolvens using transcriptomic, proteomic and mutagenesis approaches »

15h30-15h50 Break - Meeting B2B

15h50-16h10 Jocelyn RAUDE {EPV, PIMIT, IRD Reunion}
« The role of interaction between Human behaviors and environments in the dynamic of mosquito-borne diseases »

16h10-16h30 Mathieu WEIL {QUALISUD, Réunion}
« Piper borbonense, a wild pepper from Réunion Island : Characterization, impact of processes on quality and valorization »

16h30-16h50 Frédéric SANDRON {CEPED, IRD France}
« 5P: a research program for studying aging in La Reunion Island »

16h50-17h10 Coffee Break - Meeting B2B

17h10-18h30 Conference closing
- Return of workshops
- Students awards
- Closing speeches : {INSERM}, Martine HOSSAERT {CNRS}, Yves MARTIN-PREVEL {IRD}

18h30-19h30 Conference General Public
Gilles BOETSCH {CNRS} « Ecologie de la santé et transition épidémiologique »

Gut microbiota and derived-metabolites in severe obesity : effect of bariatric surgery

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If you transfer the gut microbiota from an obese mouse in[to] a germ-free lean mouse this animal will gain weight and develop metabolic complications, among others. However, if you make the same experiment starting [with] the transfer of gut microbiota from a lean animal to a germ-free lean mouse, the animal will remain lean. These experiments in rodents suggest the contribution of the gut microbiota [to] the development of obesity and metabolic disorders. In human[s], it is more difficult to examine causality. Observational studies [have] examined the gut microbiota from an obese person to a non obese person. Differences in the gut microbiota composition are observed, with some obese persons having a decreased gut microbiota richness associated with the enrichment or with the loss of some bacterial groups when compared to a non obese person. These changes can be (partially rescued) by dietary modification. We will here present new unpublished data regarding the gut microbiota in severely obese patients and examine whether or not bariatic surgery dedicated to these complex and severe conditions can rescue gut microbial changes.

Keywords: gut microbiota, nutrition, metabolic health, obesity, diabetes, cardiovascular diseases, inflammation

Extracellular vesicles as biomarkers and biological vectors of atherosclerosis in Metabolic Syndrome

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Metabolic Syndrome (MetS) defines a cluster of interrelated risk factors for cardiovascular disease and diabetes. In this context, extracellular vesicles (EVs) may represent novel effectors that might help to elucidate disease-specific pathways in metabolic diseases. EVs (a terminology that encompasses microparticles, exosomes and apoptotic bodies) are emerging as a novel mean of cell-to-cell communication, as they represent a new way to convey fundamental information between cells. EVs carry specific markers of the cell of origin that makes possible monitoring their fluctuations in the circulation and they can be valid biomarkers inasmuch their circulating levels are increased in MetS patients. Importantly, EVs can be bio-effectors of messages leading to atherosclerosis the occurrence of which increase in MetS. Indeed, EVs induce endothelial dysfunction, smooth muscle proliferation and migration and all the processes leading to atherosclerosis.

Study of glucose-induced membrane potential oscillations in WT and F508del mouse β cell: importance of Anoctamin 1.

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In basal conditions, β cell membrane potential is extremely stable around -70 mV. An increase in extracellular glucose concentration above some threshold induces cyclic fluctuations of the membrane potential. Glucose metabolism increases cell ATP leading to an initial depolarization by closure of KATP channels; then successive further depolarization and repolarization occurred. We suggested that the gating of Ano1 channel (allowing chloride exit) is responsible for these slow waves on which bursts of action potentials (AP) occur during the active depolarized phases, allowing the opening of L-type Ca++ channels, Ca++ entry and insulin release. We compared these fluctuations in β cells from WT and F508del mice and report that in the latter mice 1) the resting potential is hyperpolarized by at least 7 mV; 2) the electrical activity corresponding to the second phase of secretion is delayed by nearly 6 min; 3) the AP frequency (during the first 30 min) is drastically reduced (by about 50%); 4) the AP peak is hyperpolarized by about 8 mV.

We conclude that F508del mouse β cells exhibit a defective electrical activity.

Preserving endothelial integrity in ischemic cardiovascular diseases: a new concept.... Really?

Stéphane GERMAIN
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Our team has developed in the last 10 years an expertise in the field of pa mechanisms of angiogenesis. Our goals are to understand the molecular mechanisms involved in hypoxic regulation of vascular development in 3D and its homeostasis. We aim to decipher the chemical and mechanical signals involved in guiding vascular morphogenesis and determine the key actors that control the regulation of vascular permeability of blood vessels in ischemic cardiovascular and tumor diseases. We are interested in understanding how angiogenesis and vascular integrity are regulated in hypoxic conditions.

We recently reported that ANGPTL4 (angiopoietin-like 4) inhibits vascular permeability. Myocardial infarct size is increased in ANGPTL4 KO mice. Intravenous administration of human recombinant ANGPTL4 induces subsequent protection from vascular permeability and finally reduced infarct size and the no-reflow phenomenon. This paper received Circulation's Best Paper Award in the category of Basic Science from the American Heart Association Conference in Dallas in November 2013. On January 06th, 2016, International patent application N° PCT/EP2016/050108 was filed « METHODS AND PHARMACEUTICAL COMPOSITIONS FOR THE TREATMENT OF ISCHEMIC CONDITIONS» PCT/EP2016/050108. In stroke, we also showed that ANGPTL4 modulates EC permeability following ischaemia/reperfusion and thus represents a potential new therapeutical target. We further showed for the first time that ANGPTL4 serum levels predict MRI-detected no-reflow after successful PPCI in STEMI patients. Given the recently demonstrated therapeutic role of ANGPTL4 (our 2 patents) in diminishing no-reflow and therefore infarct size in pre-clinical animal models, these findings in humans may open new fields of research.

CNS barriers and neuroimmune interactions

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The endothelial cells lining the brain microvessels separate the blood from the brain parenchyma. They constitute the blood-brain barrier (BBB) which serves as a crucial interface for exchange of nutrients, gases and metabolites between blood and brain and as a dynamic barrier for neurotoxic components of plasma and xenobiotics. Both pericytes and astrocytes regulate the phenotype of the BBB, through mechanisms not yet fully understood but involving cell-cell communication via soluble factors and possibly also direct contact interactions. Activated cells of the immune system can cross the BBB, although to a lesser extent than peripheral vascular endothelia, patrol the CNS and induce or contribute, together with resident microglia, to local immune responses.

Cell culture models, often based on co-cultures of brain endothelial and glial cells, have been developed, in order to facilitate in vitro studies of drug transport to the brain and studies of brain endothelial cell biology and pathophysiology in the context of neuroinflammation, neuroinfection or neurodegenerative diseases: among them, the hCMEC/D3 human brain endothelial cell line we produced has now been extensively validated as a model of the human BBB.

This presentation will constitute a brief overview of the structural characteristics of the BBB and its functional involvement in brain homeostasis and cross-talks between the nervous and immune systems.

MicroRNAs and cardiovascular disease

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MicroRNAs (miRNAs) are transported on lipoproteins including high-density lipoproteins (HDLs). Our recent studies showed that HDL-associated miRNAs are involved in intercellular communication in cardiovascular disease. Indeed, we demonstrated that there is a concentration gradient across the coronary circulation for HDL-associated miRNAs miR-16, miR-20a, miR-92a, miR-126, miR-222 and miR-223 and that in patients with acute coronary syndrome, there was a significant inverse transcoronary gradient for HDL-associated miR-16, miR-92a and miR-223 compared to patients with stable coronary artery disease. Furthermore, we recently demonstrated that miRNAs are involved in the regulation of lipoprotein (a) (Lp(a)). Indeed, miR-1271-5p and miR-520a-3p inhibited Lp(a) gene (LPA) expression in hepatocytes and that miRNAs may be potential candidates as Lp(a) lowering agents.

High-density lipoproteins: biomarkers and therapeutic tool for metabolic complications and beyond

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Beside their well-documented function of reverse transport of cholesterol, high density lipoproteins (HDLs) display pleiotropic effects including antioxidant, anti-thrombotic, anti-inflammatory and anti-apoptotic properties that may play a major protective role in different pathological situations, including sepsis, abdominal aortic aneurysm (AAA), or acute stroke. In ischemic stroke, HDL may limit the deleterious effect of oxygen-glucose deprivation on the blood brain barrier (BBB) and on the parenchymal cerebral compartment. HDLs may also modulate leukocyte and platelet activation, which should also represent an important target that would justify the use of HDL injections in inflammatory situations. HDL-based therapies will be presented in stroke, AAA and sepsis using preclinical models with the perspective of potential clinical applications in humans.

Role of HDL and its receptor SR-B1 in the transport and delivery of liposoluble antioxidants: potential therapeutic implications.

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HDL has been considered as a transporter of cholesterol removed from loaded cells for its delivery to the liver for elimination. This hypothesis has been challenged by the failure of all attempts to raise HDL-cholesterol to decrease cardiovascular events in patients. Recent mechanistic and genetic studies suggest a role of HDL particles and its receptor SR-BI in the selective uptake, transport and delivery of liposoluble antioxidant of dietary origin to tissues. Since almost all lipophilic antioxidants are obtained from plants and present in all plants and since they have been used and modified by several animal species their biochemical diversity is unlimited. More importantly their potential therapeutic use is yet unexplored. In addition the recent better understanding of their mechanism of uptake, transport and delivery offers the possibility of selective delivery to tissues. The therapeutic implications of these observations for the prevention or treatment of diseases with unmet medical need will be discussed.

Biomedical Research and Innovation: from bench to shelf

Theeshan BAHORUN
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This presentation will highlight main findings emanating from research and innovation initiatives from the Biopharmaceutical group of CBBR to address health and disease management in Mauritius and provide a firm basis for the development of natural pharmaceuticals with commercial potential. The focus will be on the scientific rationale of considering locally derived functional foods and nutraceuticals, endemic plants, marine flora and fauna as alternate practical sources of prophylaxis against cardiovascular ailments, diabetes, infectious diseases and cancer. Using selected examples, biochemical, cellular, molecular, animal and clinical evidences will be interactively discussed to showcase the importance of research innovation in the pathway from bench to shelf with the perspective of affirming novel formulations in a growing market given the presence of an expanding clientele seeking alternative methods to alleviate disease burden.

Identification and characterization of plant-based modulators of BDNF/TrkB signalling: Application in Neuro-Psychiatry

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TrkB is a tyrosine kinase receptor abundantly expressed in the brain. The activation of TrkB via its endogenous ligand BDNF is responsible for proliferation and survival of neuronal cells and facilitation of synapse formation and neuronal transmission. TrkB is considered as a very promising therapeutic target for brain diseases, and many research works showed that different classes of phytochemicals such as flavonoids and terpenes could specifically bind to TrkB receptor. Therefore, the development of botanicals and plant-derived drugs that can specifically activate the BDNF-TrkB signalling may represent promising therapeutic avenue for the treatment of central nervous system (CNS) disorders. In this context, Mauritius is endowed with a unique flora representing an enormous wealth of medicinal remedies. Axonova aims to valorise regional knowledge and research on indigenous medicinal plants in order to identify plant extracts and phytochemicals with BDNF-TrkB modulatory properties and high neuroprotective value. Such assets shall open doors for development of novel nutraceutical and pharmaceutical products.

Bioactive molecules of marine invertebrates from South-West Indian Ocean.

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Marine invertebrates produce a large number of unique and structurally diversified natural products which represent a major source of bioactive molecules particularly for pharmaceuticals leads. This great potential has elicited worldwide scientific and economic interests in searching novel drugs from marine invertebrates since de pioneering work of Bergmann on sponge nucleosides in 1950[1,2]. These efforts have resulted in several thousands of novel marine natural products exhibiting a wide range of bioactivities such as anticancer, antiviral, antifungal and antibacterial properties.

Since the early 1990s, the Chemistry Laboratory of Natural Substances and Food Sciences (LCSNSA, University of La Reunion) has been trying to gain a foothold in this field of research. The laboratory, located at Reunion Island, occupies a strategic location. Indeed, with a series of islands scattered in the western Indian Ocean along the southeast coast of Africa (Madagascar, Seychelles, the Comoros, Mayotte, Mauritius, Eparses islands), Reunion Island belongs to a global biodiversity hotspot. And despite the intense global interest in marine natural products, the chemistry of marine fauna of this part of the World remained largely ignored.

This communication will therefore provide an overview of the contribution made by the LCSNSA to marine natural products research in the west part of Indian Ocean. Our research programs were more precisely concentrated on marine invertebrates from Reunion Island, Rodrigues, Mayotte and Madagascar. Among the numerous marine invertebrates encountered in these areas, sponges, ascidians and soft corals have predominated in all our collection expeditions and have therefore received special attention from our research group. More than one hundred new compounds showing relevant bioactivity, were isolated.

Small mammals and One Health: linking ecology to human society.

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Disease ecologists have long recognized the importance of the environment in general and fauna diversity in particular as major factors underlying the origin, spreading and distribution of infectious diseases. In this talk I present several examples, mostly of our own research, on the fascinating ecological complexities linking infections in wild animals to disease in humans and then onward the transmission within human populations. Spatio-temporal variation in Puumala hantavirus-disease in Western Europa is explained by landscape and climate-induced effects on the bank voles that are the reservoir for this virus. Yersinia pestis plague in Central-Asia is carried by great gerbils; changes in the production of green vegetation cause gerbil population growth and consequently changes in flea abundance, resulting in increased transmission of plague; climate changes in the past can be linked to historical plague outbreaks but as illustrated by the 2017 Madagascar plague epidemic, the human social environment plays a major role for the human-to-human transmission. Ebola fever is a prime example of a One Health system with (rare) transmission events to humans that can have dramatic consequences, but its natural source remains enigmatic. Monkeypox virus seems to occur in a wide variety of small mammals in Central Africa but is of growing concern as transmission to (and among) humans becomes more frequent. The diversity of arenaviruses in African rodents makes one wonder why Lassa fever remains limited to a relatively small area in West-Africa. During the past decade, One Health and EcoHealth have been developed as a new transdisciplinary paradigm for health research. Basic ecological research remains necessary as a foundation for these approaches.

One Health in the Indian Ocean: a concept on the move!

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In 2005, a Chikungunya epidemics affected thousands of people in the Indian ocean region. This event confirmed that sharing health information in the countries of the Indian Ocean Commission (Comoros, Madagascar, Mauritius, France / Reunion and Seychelles) was essential. At the same time, zoonoses such as Rift Valley fever and other high-impact animal diseases such as peste des petits ruminants have burst out endangering food security in the region. To address these threats, a «One Health» approach was developed with the implementation of the SEGA One Health network, in charge of the surveillance of human and animal infectious diseases and the One Health Indian Ocean platform in partnership, its alter ego for research activities on zoonotic and animal diseases.

Innate Sensing of Viral Infections: the Janus Face of Dendritic Cells in viral infections

Marie-Lise GOUGEON
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Director, Innate Immunity and Viruses Unit
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The dual role of the innate immune system in early viral control and in contributing to disease pathology has been highlighted in the context of persistent viral infections, such as HIV infection. Dendritic cells (DCs) are crucial for activating and conditioning virus-specific T cells, a process that is largely influenced by the preceding innate immune response. However, HIV has evolved ways to exploit DCs, thereby facilitating viral dissemination and persistence in target cells. Our recent studies revealed that viral persistence in DCs is driven by their cognate interaction with NK cells. Indeed, HIV hijacks the physiological editing process that allows NK cells to keep in check the quality of immature iDCs by upregulating two key anti-apoptotic molecules in infected DCs (DCHIV), resulting in their resistance to TRAIL-mediated NK killing, thus contributing to the constitution of viral reservoirs in DCs.

We also studied the impact of HIV on another DC subset, plasmacytoid DCs (pDCs). They are efficient sensors of viruses through TLR7 and 9, which stimulate IFN genes and inflammatory cytokines. pDCs are the major source of IFN alpha and the strength of their response is correlated to HIV disease resistance. However, IIFN alpha was shown to be detrimental through its ability to up-regulate the death molecule TRAIL, thus turning pDCs into Interferon-producing Killer pDCs (IKpDCs). IKpDCs are then able to kill both infected and uninfected CD4+ T cells through the TRAIL/DR5 pathway, thus contributing to the collapse of the immune system. Their dialogue with NK cells involves an alarmin, HMGB1, which plays a pivotal role in innate immunity, but can induce damages in infection-induced threat. In conclusion, the good and the bad of DCs in HIV infection and the consequences on viral control will be discussed.

Zika virus- tropism and antiviral responses

Alain KOHL
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The emergence of Zika virus in the Americas has brought this mosquito-borne virus firmly into the spotlight, given the scale of the outbreak and the clinical symptoms associated with infection. These include Guillain-Barré syndrome (GBS) and a complex of manifestations now called Zika Congenital Syndrome (including microcephaly). This emergence has triggered research efforts in various domains.

During this meeting, I will discuss our studies on detection of Zika virus by the innate immune system and viral counteraction of host responses, as well as work using a mouse embryo derived cell culture model that allows *in vitro* studies of central nervous system and peripheral nervous system infections. We have quantified viral tropism in neural tissues and our data suggest that direct infection is unlikely the trigger for GBS, but tropism for myelinating cells of the CNS might explain infections in later stages of pregnancy which are now increasingly recognized as a further cause of disease.

Extreme (and recurrent?) lifestyle transitions in tick-associated bacteria

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Arthropods are hosts to a wealth of microorganisms that play a determinant role in their biology, but also in their ability to interact and transmit pathogens. These microorganisms are currently used to develop new strategies in order to fight infectious diseases, either to reduce arthropod populations or to limit their ability to transmit pathogens. Interestingly, many bacteria commonly found in Arthropods have close relatives known as vertebrate pathogens. This is notably the case in ticks where bacteria from the genera Rickettsia, *Coxiella or Francisella* are frequently found and whose effects are not totally understood. Using different approaches combining large screening efforts, phylogeny and genomics on various tick and bacterial species, I will illustrate the evolutionary trajectory of these interactions. The results obtained so far raise the possibility that multipartite interactions between hematophagous insects, their vertebrate hosts and bacteria may promote rapid transitions in the way of life of the latters. Identifying the forces directing them towards pathogeny or mutualism remains an important challenge for understanding the evolution of these interactions and potentially the emergence of pathogeny.

IC - BioHealF 2017

Investigations in the unit Infectious Processes in Tropical Island Environments

Patrick MAVINGUI
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The research unit PIMIT (for Infectious Processes in Tropical Island Environments) is specialized in the investigation of infectious diseases, particularly those with epidemic potential and vector transmission in the South-Western region of Indian Ocean. Researches aim at understanding the epidemic emergence and endemization phenomenon of pathogens to humans as well as in animal reservoirs by one health ecosystemic approach. Research actions on infectious processes at molecular, cellular, bioclinical and animal model levels intend to identify the mechanisms of variability (susceptibility and resistance) during host-pathogen interactions in order to develop innovative diagnostic and preventive tools and strategies. I will present an overview of PIMIT research themes and illustrate with some recent discoveries.

The research program on Zika virus exemplifies the PIMIT's capacity to respond to emerging infectious disease threats in Indian ocean

Philippe DESPRES
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Since the creation of UM 134 PIMIT, the I2T (*for* Immunopathology of Infectious Diseases in Tropics) team has setting up research programs that are mainly dedicated to mosquito-borne RNA viruses (arboviruses). They have ambition for improving the knowledge on viral and host factors that contribute to the pathogenicity of medically important arboviruses. The I2T investigators have basic research interests on molecular mechanisms of virus virulence, host cell responses to virus infection, and strategies by which arboviruses manipulate the host factors to their own advantage. They apply the knowledge gained from their work to propose more sensitive and specific molecular tools in arbovirus detection as well as candidate vaccines and antiviral molecules to prevent and combat virus infection. Successful collaborations have been established with research groups within France, Europe, Brazil and USA and their themes are supported by European H2020 (ZIKAlliance) and FEDER Région Réunion 2015-20 (ZIKAlert) programs as well as R&D partnerships with SMEs.

Zika fever provides one of the more remarkable example of emerging arbovirosis of medical interest worldwide. Mosquito-borne Zika virus (ZIKV) has recently emerged in South Pacific islands, Americas, and Caribbean islands where large epidemics were documented. in humans, ZIKV infection is implicated in causing neurological abnormalities and congenital malformations. Since 2015, the I2T research program is mainly geared towards the study of ZIKV in anticipation of its possible arrival in Indian ocean thus contributing to international effort against Zika fever. The different research themes developed on ZIKV and the notable achievements will be presented here.

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Antidiabetic traditional vegetal extracts as potential raw materials for new products.

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Diabetes which affects an estimated 422 million adults is well recognized as a major global health problem. In 2012, three million people were treated for this pathology in France. Particularly in French West Indies, the prevalence of this pathology was evaluated for the more then 16 years old people, in 2013 at 11% in Guadeloupe and at 10% in Martinique. Previously, in all overseas French territories, the occurrence of type 2 pathology was evaluated at 96%.

Diabetes and its complications can be prevented using phytomedicines. It has been recently recalled the growing value of international trade in herbal medicine (estimated to US$83 billion in 2012) and the need for the development of research evaluating the medicinal properties of some of these plants as well as their potential as new drugs.

This paper makes a review of scientific studies which supports the use of a dozen of plants used in French West Indies for their anti-diabetic properties. An analysis of the data is performed to pointed out, when sufficient research is available, the metabolites which have to be quantified in quality control, in the perspective of the use of these plants in functional foods or traditional medicines in respect to actual reglementation.

Phytochemical assessment of Rauvolfia nukuhivensis : from uses to biological activities and chemodiversity

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Rauvolfia genus (Apocynaceae), biogeographically widespread in tropical areas, includes many species used in traditional medicine. Rauvolfia nukuhivensis, an endemic species grown in Marquesas archipelago (French Polynesia), locally called "tu'eiao", is currently used as traditional medicinal plant for women intimate care. The chemodiversity of the alkaloids from the bark of this plant was assessed by integrated approaches mainly: structural elucidation, biological activity, phylogenetic analysis and a putative biosynthesis hypothesis statement. Structural elucidation network led to the identification of 13 major constituents belonging to four distinct indole alkaloid skeletons (ajamalane, sarpagane, macroline and β-carboline) within six new natural compounds. As previous studies reported the activity of ajmaline derivative on ion channels inhibition related to important human pathologies, we decided to assess the potential of the isolated alkaloids on these biological targets. The cytoxicity of the isolated compounds as well as their inhibiting effects on hERG channel were so investigated. Norsandwicine, 10-methoxypanarine, tueiaoine, and more importantly nukuhivensiums, were shown to significantly induce a reduction of IKr amplitude (hERG current). According to these biological activities, a computational study through docking was performed in order to illustrate these results.

Deciphering the dietary fibre-degrading enzyme system of the human gut bacterium *Bacteroides xylanisolvens* using transcriptomic, proteomic and mutagenesis approaches

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In humans, the degradation of dietary fibers is a metabolic function undertaken by the intestinal microbiota. This metabolic function favors the homeostasis of the digestive ecosystem and participates in the prevention of several chronic disorders like metabolic diseases. The bacteria able to initiate this process possess complex enzymatic systems that deconstruct polysaccharides into compounds (oligosaccharides, sugars) that serve as energetic substrates to the whole microbial community. *Bactereoides xylanisolvens* is a prevalent bacterial species in the human gut that has the particularity to degrade both pectins (soluble fibers found in fruits) and xylans (insoluble fibers found in cereals). The type strain XB1A was isolated in our laboratory and was shown to harbor more than 300 genes encoding carbohydrate active enzymes (CAZymes) that are distributed in 74 genomic loci called Polysaccharide Utilization Loci (PUL). Considering the complexity of B. xylanisolvens enzyme system, the pectinolytic and xylanolytic function was studied using transcriptomics (RNAseq), proteomics and directed mutagenesis. The results highlighted the existence of 6 and 2 PULs involved in pectin and xylan degradation, respectively. Our findings highlight the metabolic plasticity of B. *xylanisolvens* towards non-starch dietary polysaccharides which contributes to its competitive fitness within the human gut ecosystem.

The role of interaction between Human behaviors and environments in the dynamic of mosquito-borne diseases

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During the last decades, epidemiological and bio-mathematical modelling has been increasingly used to better understand and predict the course of epidemics in the aim to mitigate the effects of such events, which can severely impact human health. However, fundamental limitations remain in epidemiological modelling about some key parameters related to diseases' transmission. Indeed, most models have largely ignored how epidemics change individual behavior, and reciprocally how behavioral change may impact the course of epidemics. In this presentation, we will focus on the dynamics of infectious diseases transmission through a holistic approach that integrate the interaction between individual behaviors and the epidemiological environment. Notably, we will present what are the various patterns of human behaviors in response to emerging health threats which have been observed in recent outbreaks of mosquito-borne diseases in French tropical regions.

Piper borbonense, a wild pepper from Reunion Island : Characterization, impact of processes on quality and valorization

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The objective of this research project was to acquire new knowledge on the characteristics of Malagasy and Reunion wild peppers and to study the impact of transformation processes on their quality, evaluated through pungency, aroma and color. The challenge was to be able to propose, thanks to the results obtained, one or more revisited transformation processes to valorize the quality of these peppers. Two distinct transformation processes were identified in Madagascar: a «dry process» consisting of simple drying and a «wet process» including blanching and steaming before drying. Piper borbonense of Réunion Island can be distinguished from Piper nigrum according to its very low content of piperine (0.2% bs), its high content of essential oil (9.8% bs), the presence of a pedicel and an ovoid shape. Piper borbonense can also be differentiated from Malagasy wild peppers as its piperine content is twice lower. Blanching, sweating and drying have little impact on the pungency and aroma but significantly degrade the red color of the pepper. Rather than a single universal process, a «dry way» (direct drying) and a «wet way» (integrating blanching and drying) are proposed to transform and valorize the quality of these peppers.

5P: a research program for studying aging in La Reunion Island

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The French overseas department of Reunion Island faces a very rapid aging of its population because of a very rapid demographic transition.

Between 2010 and 2030, the proportion of people aged 60 and over will double from 12% to 23%.

In this context, like in many other places in the world, to get old in good physical conditions and healthy is fundamental for people and public services.

The "5P" research program is about the detection and measurement of frailty of elderly people.

An interdisciplinary team of researchers and practitioners work together for a better understanding of impacts of seniors participation in prevention workshops "Atout Age" in Reunion Island on their health, well-being and mobility.

The research approach of this project will be presented.

Écologie de la santé et transition dynamique : le cas de la Grande Muraille Verte au Sénégal

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L'écologie de la santé s'insère dans les recherches sur l'écologie globale et la transition écologique. Un programme de reboisement intitulé « Grande Muraille Verte » a été mis en place dans les 11 pays du Sahel africain, pays affectés par le dérèglement climatique et la pression anthropique exercée par le surpâturage.

Ce programme devrait aboutir à un espace replanté de 7 600 km de long sur une largeur de 15 km. À partir de ce dispositif de régénération forestière, et d'après des études scientifiques menées dans le Ferlo sénégalais, nous présentons les impacts sur l'écosystème et les sociétés locales en termes d'activités économiques, d'alimentation et de santé.

Ce type d'approche scientifique, éminemment interdisciplinaire, repose sur un dispositif quasi expérimental – une action anthropique - permettant de mieux comprendre l'interaction des facteurs dans le modèle « écologie de la santé ».

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