

# Health and Well-Being

## Emergent and neglected diseases

**First InPrint Seminar**

Partnership Building towards  
Stronger Engagement in International Collaboration

UFMG, Belo Horizonte

19-23 November 2018

# Project: “Emergent and Neglected Diseases”

November 20, 2018 - CAD3 – UFMG - 11:00 am a 12:30 pm

## Programming

Moderators: Prof. Frédéric Frézard, Profa. Rosa Maria Esteves Arantes, Profa. Adriana Oliveira Costa

11:00: Prof. **Frédéric Frézard**, **Universidade Federal de Minas Gerais** ([frezardf@gmail.com](mailto:frezardf@gmail.com))

*15-min presentation / 15-min discussion.*

11:30: Prof. **Malcolm Jones**, **The University of Queensland** (AU) ([m.jones@uq.edu.au](mailto:m.jones@uq.edu.au))

*10-min presentation / 10-min discussion.*

11:50: Dr **Richard McCulloch**, **University of Glasgow** (UK) ([Richard.McCulloch@glasgow.ac.uk](mailto:Richard.McCulloch@glasgow.ac.uk))

*10-min presentation/10-min discussion.*

12:10: Prof. **Mauro Perretti**, **Queen Mary University of London** (UK) ([m.perretti@qmul.ac.uk](mailto:m.perretti@qmul.ac.uk))

*10-min presentation/10-min discussion.*

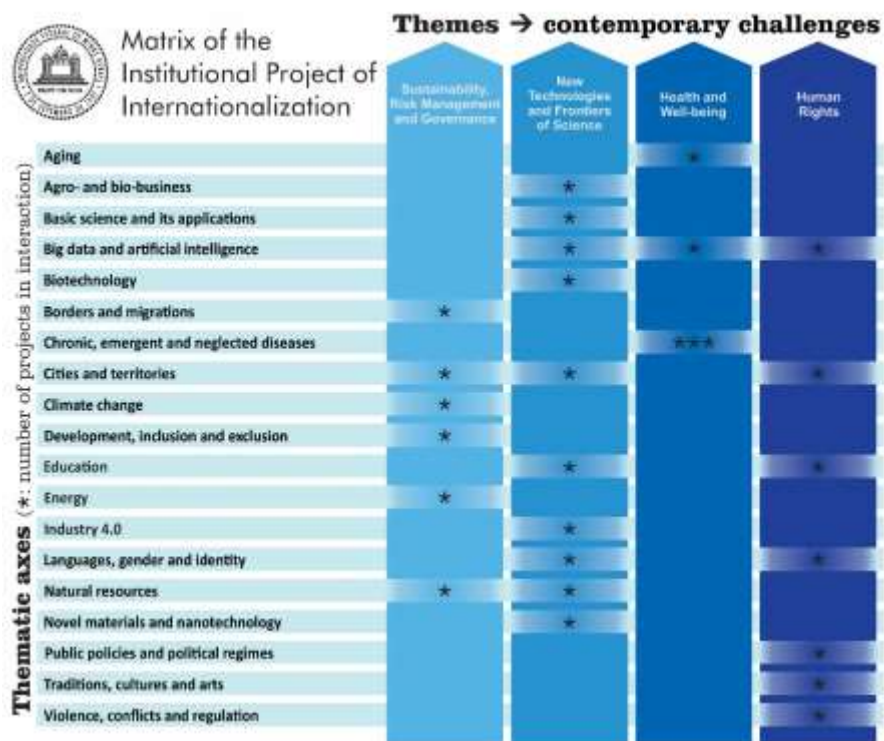
Vincent Sobanski, **Université de Lille** (FR)

David Wilson, **University of Southampton** (UK)

Brian Watkins, **University of Georgia** (USA)

Sharon McLennan, **Massey University** (NZ)

# How PrInt/UFMG changes the ways we collaborate



- Actions building on a matrix of four themes (contemporary challenges) and 28 thematic axes (projects) aligned with the United Nations Sustainable Development Goals
- PhD Programs are expected to work together with partner institutions abroad to develop cross-cutting research aligned with the PrInt/UFMG themes and projects
- Funding will be allocated to outgoing and incoming mobility actions within the four themes by means of internal calls

- To foster and enhance collaboration with partner universities worldwide by means of joint innovative research and capacity building of human resources
- To consolidate the training and experience abroad of UFMG faculty members with both a junior and a senior profile as visiting professors at partner universities
- To train PhD students abroad through internships at partner universities with a strong focus on cotutelle (double PhD degrees)
- To recruit postdoctoral fellows and early-career researchers with experience abroad to work at UFMG within the PrInt themes and projects
- To attract internationally renowned visiting professors with highly recognised experience for short stays (15 days) at UFMG

## OUTGOING

- PhD mobility grants for internships abroad (six to twelve months)
- Junior Professor grants for visiting professorships abroad (six months)
- Senior Professor grants for visiting professorships abroad (six months)

## INCOMING

- Postdoctoral grants for activities at UFMG (12 months, renewable)
- Early-career researcher grants for activities at UFMG (12 months, renewable)
- Senior Professor grants for international visitors at UFMG (15 days)

# UFMG Graduate programs taking part in the project

## on EMERGENT AND NEGLECTED DISEASES

- GP in Biochemistry and Immunology – ICB
- GP in Bioinformatics – ICB
- GP in Genetics – ICB
- GP in Parasitology – ICB
- GP in Microbiology – ICB
- GP in Cellular Biology – ICB
- GP in Pathology – ICB
- GP in Physiology and Pharmacology – ICB
- GP in Technological and Biopharmaceutical Innovation – ICB
- GP in Clinical and Toxicological Analysis - Faculty of Pharmacy
- GP in Medications and Pharmaceutical Assistance – Faculty of Pharmacy
- GP in Food Science – Nursing School
- GP in Adult Health – Faculty of Medicine

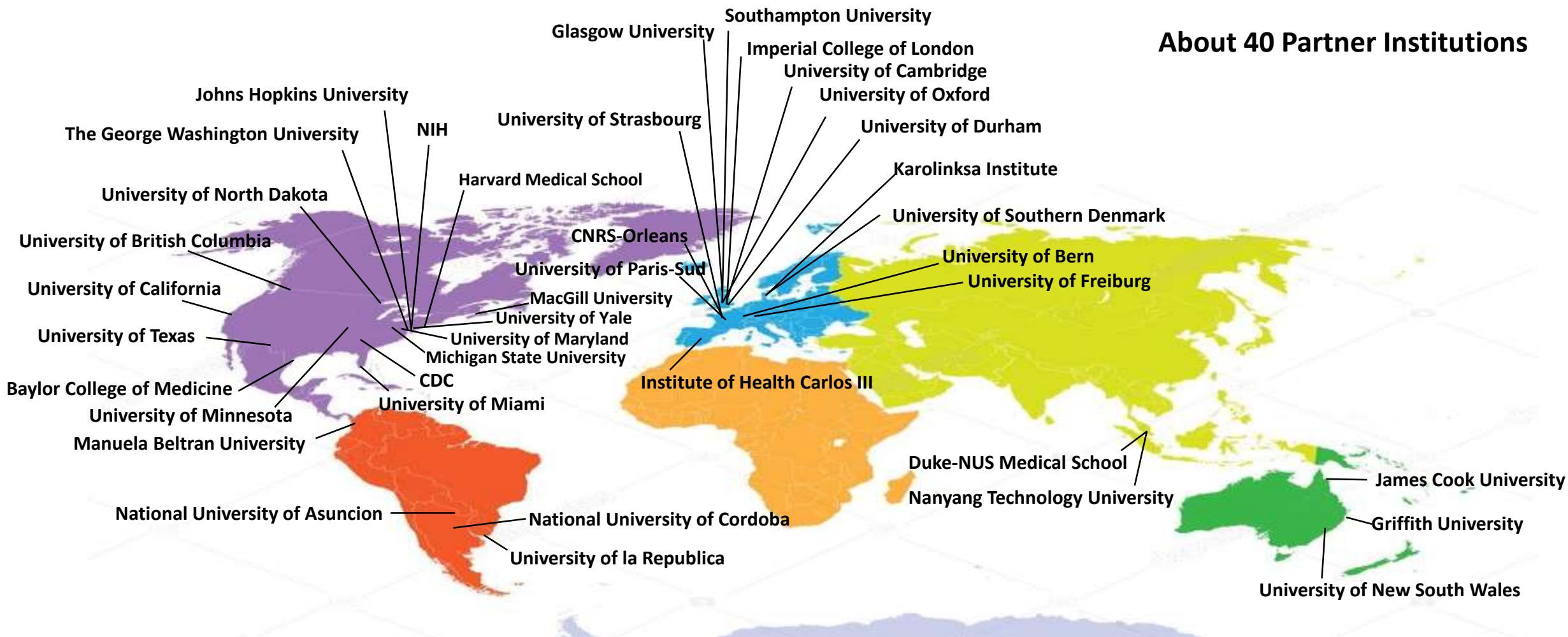


**13 Graduate Programs**  
**57 professor-researchers**



# Partner Institutions with Ongoing Collaborations with UFMG

About 40 Partner Institutions





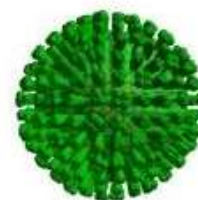
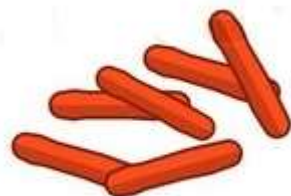
# What do we mean with EMERGENT AND NEGLECTED DISEASES?

## DISEASES CAUSED BY THE FOLLOWING AGENTS:

*Brucella*

*Mycobacterium*

Foodborne bacteria (*Listeria*,  
*Bacillus cereus*, *Salmonella*,  
*Clostridium perfringens* and others)



Dengue virus  
Zika virus  
Yellow fever virus  
Chikungunya virus  
HIV  
HTLV

... and  
vectors



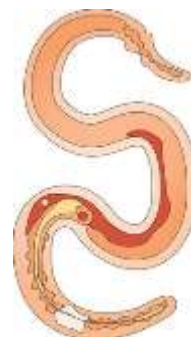
*Triatominae*  
*Aedes*  
*Anopheles*  
*Phlebotomines*

### Fungi and fungi-like

*Cryptococcus*  
*Sporotrix*



*Rhinosporidium*  
*Lacazia loboi*  
*Pithium insidiosum*  
*Lagenidium*



### Helminths

*Schistosoma mansoni*  
*Fasciola hepatica*  
*Strongyloides stercoralis*

### Protozoans

*Trypanosoma cruzi*  
*Leishmania*  
*Entamoeba histolytica*  
*Giardia duodenalis*  
*Acanthamoeba*  
*Toxoplasma*  
*Plasmodium*





# What do we mean by “EMERGENT AND NEGLECTED DISEASES”?

- Leishmaniasis, Chagas disease
- Arboviral infections (Dengue, Chikungunya, Zika, Yellow Fever), AIDS, HTLV infect., toxoplasmosis, acantamebiasis, intestinal helminthiasis, tuberculosis, oportunistics fungal infections

## Challenges

### Neglected diseases

- Poverty
- No effective drug or few old & toxic drugs
- Lack of field-based accurate, sensitive, and cost-effective rapid diagnostic tools
- Complexity of host-pathogen interactions

### Emerging diseases

- Newly appeared in a population
- Known for some time but rapidly increasing in incidence or geographic range
- No effective vaccines or drugs
- Lack of suitable animal models
- Control of the vectors

# Research on EMERGENT AND NEGLECTED DISEASES at UFMG

## Research Topics

- Biology of the infectious agents and vectors
- Host-pathogen interactions: pathogenesis and immunity
- Strategies of control: vaccines and vectors
- Strategies of control: diagnosis and therapeutics
- Population studies and clinical trial

## Medium & Long-term Goals

- To build international cluster of excellence to impact the quality of knowledge production and education and the visibility and recognition of UFMG
- To accelerate science-driven development of effective control strategies
- To reduce morbidity and mortality and improve the health condition of affected populations

# Biology of infectious agents

Phylogenetics, gene expression, virulence factors of opportunistic eukaryotic pathogens (protozoan, fungi and fungi-like organisms)

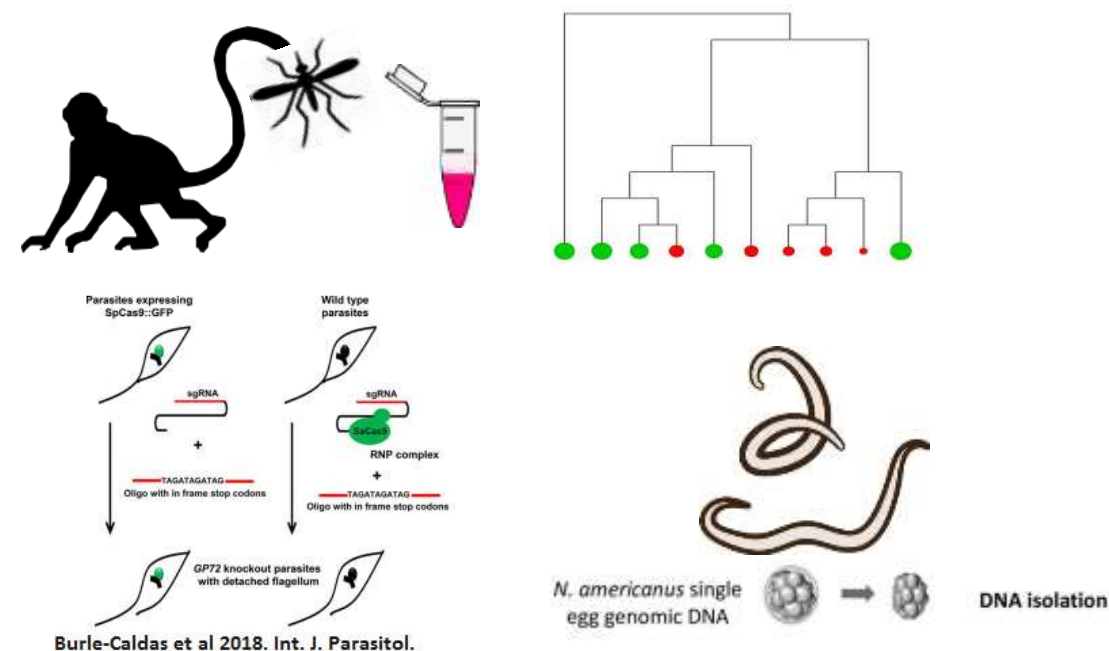
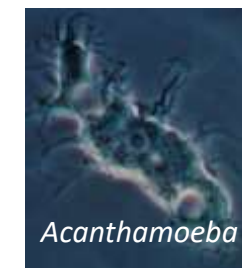
Biological and molecular characterization of viruses. Investigation of hosts: evolution, ecology, phylodynamics

Genomics in helminthic and protozoan parasites

**UFMG Graduate programs involved:**

- Clinical and Toxicological Analysis
- Microbiology
- Biochemistry and Immunology
- Bioinformatics
- Parasitology

## Research issues:



## Biology of vectors

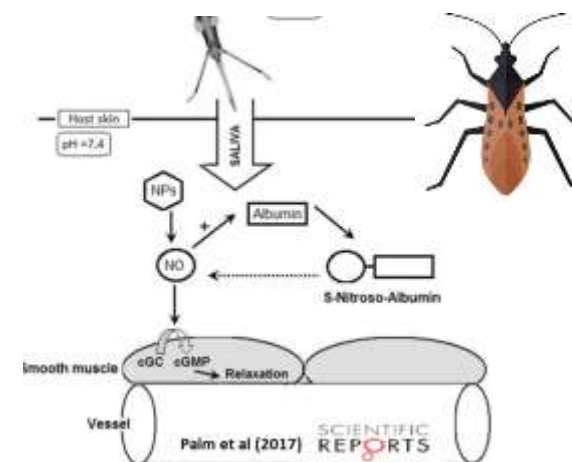
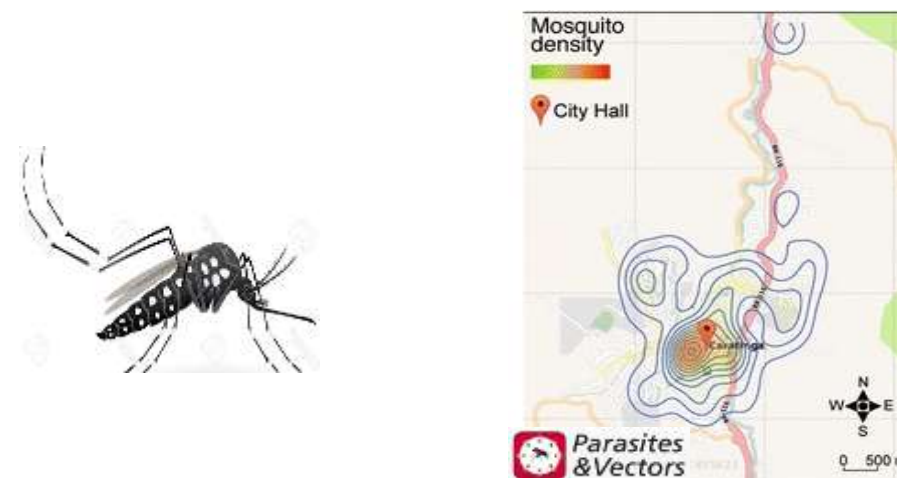
Innate immunity in invertebrates carrying dengue or Zika virus

Ecology of vectors

Physiology of hematophagous arthropods

### UFMG Graduate programs involved:

- Cellular Biology
- Parasitology
- Biochemistry and Immunology



# Host-pathogen interactions: pathogenesis and immunity

Immunology of protozoans (leishmaniasis, Chagas disease, toxoplasmosis, amoebiasis, giardiasis) and helminths (schistosomiasis, strongyloidiasis, toxocariasis)

Immunology of *Mycobacterium* and *Brucella*

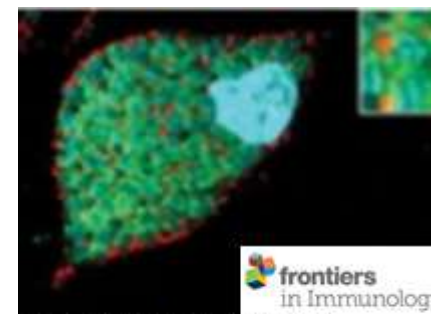
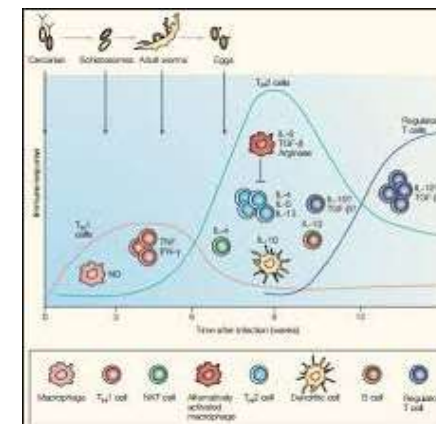
Immunopathogenesis of viral infections

Experimental animal models and pathology of infectious diseases

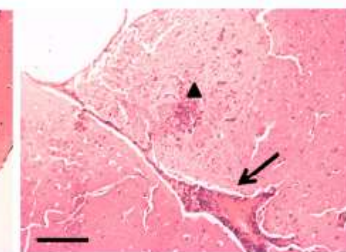
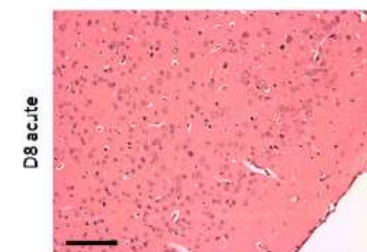
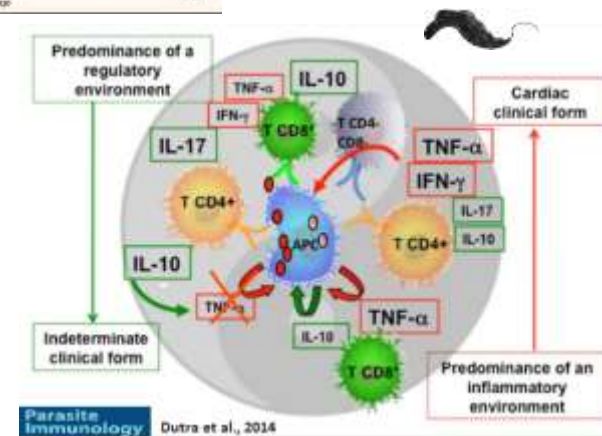
UFMG Graduate programs involved:

- Parasitology
- Biochemistry and Immunology
- Cellular Biology
- Pathology
- Adult Health

## Research issues:



Dendritic cells activated by *Brucella abortus* promotes TLR7 colocalization



Costa et al., 2018 Exp. Parasitol



## Strategies of control: vaccines and vectors

### Historical contribution at UFMG

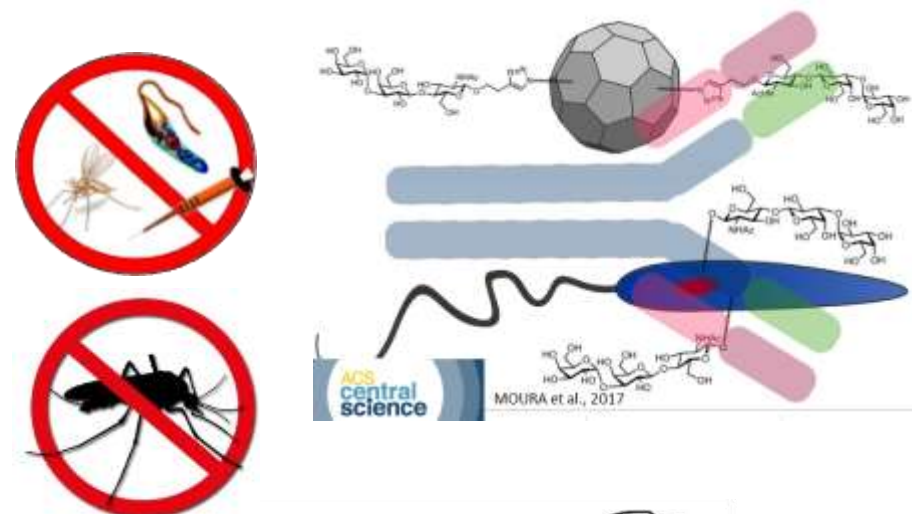
Pioneer work of Mayrink's group in 70-80's with development and clinical trials of first-generation vaccine against leishmaniasis

Vaccines development for vector-borne diseases: leishmaniasis (*Leishmania* or sand fly antigens) and arboviral infections

Traps development for vectors and risk monitoring to control virus and parasite transmission

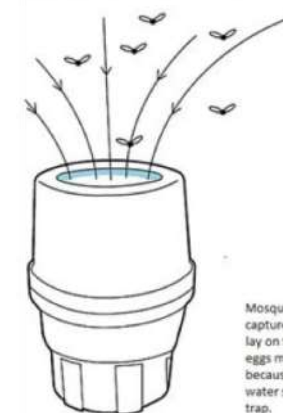
### UFMG Graduate programs involved:

- Cellular Biology
- Parasitology
- Biochemistry and Immunology



### MOSQUITRAP

The females of the *Aedes aegypti* mosquito are attracted by a synthetic chemical substance.



Mosquitoes are captured when they lay on the tape. The eggs may not eclose because there is no water stored in the trap.

## Strategies of control: diagnosis and therapeutics

Nanobiotechnology for diagnosis of arboviral infections:  
SPR-based sensors for dengue

Diagnostic tests by recombinant technology for Human T-lymphotropic virus (HTLV-1 and HTLV-2)

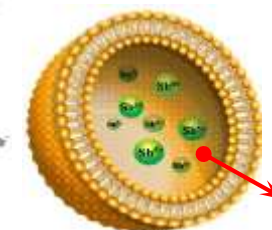
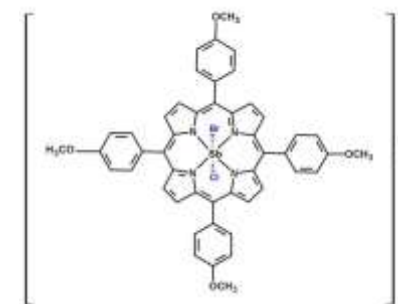
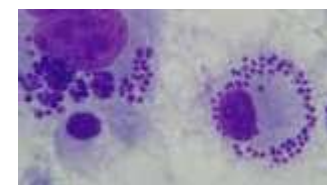
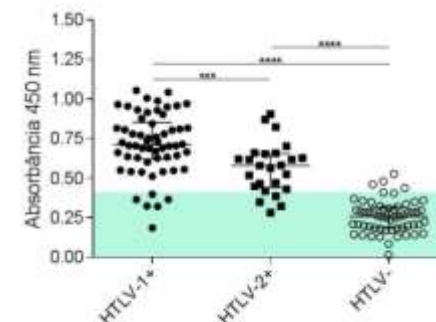
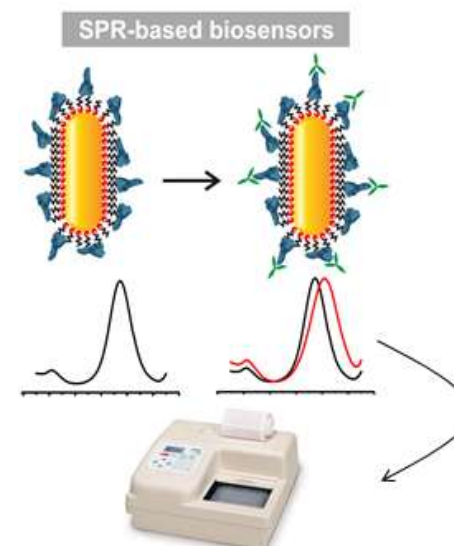
Therapeutic vaccines for immunotherapy of leishmaniasis and Chagas disease

New drugs against arboviral infections

New drugs for leishmaniasis; lipid nanocarriers for drug and vaccine delivery

UFMG Graduate programs involved:

- Microbiology
- Technological and Biopharmaceutical Innovation
- Physiology and Pharmacology
- Parasitology
- Cellular Biology
- Biochemistry and Immunology





## Population studies and clinical trials

Effectiveness and safety of antiretroviral therapy in people living with HIV and co-infections (HIV / TB, HIV / leishmaniasis, HIV / Hansen's disease) in Brazil

Drug repositioning for treatment of cryptococcal meningitis

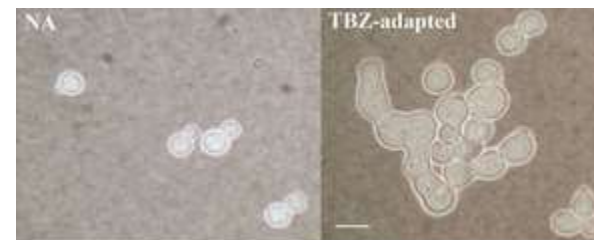
Methotrexate in the treatment of Chikungunya

Transgenic mosquitos for dengue control

### UFMG Graduate programs involved:

- Microbiology
- Biochemistry and Immunology
- Clinical and Toxicological Analysis

## Research issues:



## Concluding remarks for the project on EMERGENT AND NEGLECTED DISEASES

- History of previous successful collaborations with several international partner institutions
- Strong established competencies and expertise for basic and applied research at UFMG
- Successful cases of applied research: one vaccine currently on the market for canine leishmaniasis and commercialized traps for vectors
- However, the context of Emergent and Neglected Diseases requires more: consolidated, multidisciplinary and integrated research network capable of responding to the urgent and complex demands of emergent diseases and overcoming the complex challenges of neglected diseases
- The consolidation of such a research network as a cluster of excellence is expected from interdisciplinary research integration and strategic and long-term international collaborations
- Interest in planning and building strategies for long-term collaborations with international institutions in the framework of strong scientific projects
- Invitation to initiate the construction of projects of mutual interest! ...

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