Fondation Mérieux :

Building local capacity to improve AMR diagnosis and surveillance in LMICs

Workshop on Novel Diagnostics for Infectious Diseases
March 25 – 26, 2024, London

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des racines pour la vie

FONDATION MÉRIEUX

An independent foundation fighting infectious disease

- **The Mérieux Foundation: created in 1967** by Dr. Charles Mérieux in memory of his father, Marcel Mérieux

- A French non-profit Foundation with **public interest status**

- **Focus on locally-driven work in the field**, side-by-side with onsite teams and partners

OUR MISSION

Fighting infectious diseases affecting the most exposed populations in low- and middle-income countries

Strengthening **local capacities in clinical biology and applied research** to improve **diagnosis and surveillance** of infectious diseases

Encourage **knowledge-sharing and public health initiatives**, leveraging Les Pensières Center for Global Health

Improve conditions for **mothers and children**, taking a global health approach

More than 100 projects
in 25 low- and middle-income countries

160 people in:
- Africa
- Asia
- France
- Indian Ocean
- Middle East

The AMR context of LMICs

- **Limited access to diagnostics*** → Lack of well-equipped microbiology laboratories

    → Lack of well-trained microbiologists

    → Reagent supply issues

    The majority of diagnostic tests are restrained to hospitals and laboratories in urban settings:

    → Only 19% of patients have access to appropriate diagnostics at the primary health care level**

    → Patients paid for the majority of healthcare (diagnosis, treatment, surgery …)

    → Targeted antibiotic therapy is rarely prescribed.

- **Weaknesses in their AMR and AMU epidemiological surveillance network,** to generate robust data on AMR

- **Weak research capacity with poor access to innovation** and in particular to molecular microbiology; poor dissemination of research data

- **Lack of regulation** for antimicrobial use in animals

- **Lack of access to drinking water and sanitation,** precarious hygiene conditions

- **Inadequate infection prevention and** control measures……

*Lancet 2021: Availability of diagnostics by tier and country   ** PATH, 2022, Market failures and opportunities for increasing access to diagnostics in LMICs

A focus on our AMR activities

1. Capacity Building for Diagnostics and Laboratory Systems

2. Strengthening surveillance capacity with the One Health approach

3. Antibiotic stewardship program

4. Knowledge Sharing - AMR course, to support the WHO AMR-Global Action Plan

Introducing Bacteriology diagnostics in Madagascar

Laboratory capacity

- Partnership with Ministry of Public Health (DPLMT / SLab)

- A network of 27 hospital labs

- 13 bacteriology units to date in CHU
  - Culture and antibiotic susceptibility testing
  - Capacity-building for AMR surveillance
    - Data for WHO GLASS
  - At the patient level: better treatment (right antibiotics)
  - At the population level: better visibility of which antibiotics work

- Contribution to national AMR action plan
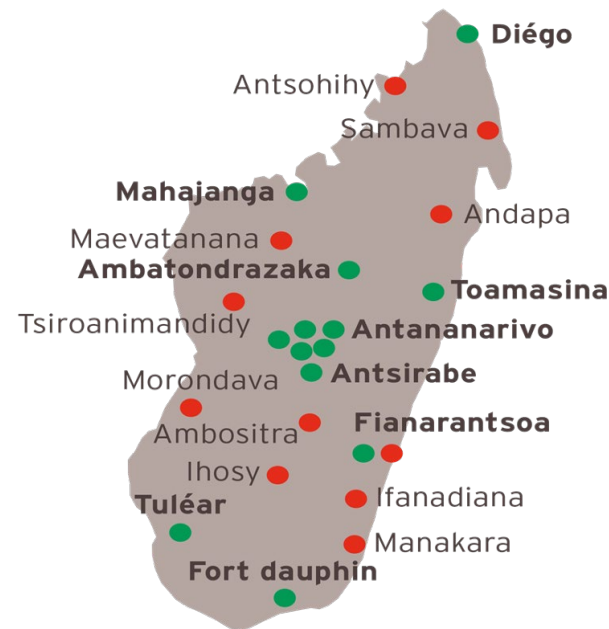
Main AMR activities in applied research & surveillance
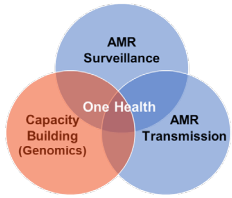
"One Health" surveillance & AMR transmission studies:

- Global surveillance: early information and spread of AMR
- Community level: human, animal and environment interactions
- Data sharing with the health authorities
- Simplified techniques adapted to LMICs
- NGS / bioinformatics for deep characterization of resistant strains

Capacity building:

- Mentoring PhDs and health professionals from LMICs
- NGS / bioinformatics training
- Fleming Fund Fellowship scheme program in Senegal & Laos

GABRIEL network members

GABRIEL network coordination

LEBANON
Rodolphe Mérieux Laboratory of Beirut, St Joseph University

Microbiology, Health and Environment Laboratory

MALI
Charles Mérieux Centre of Infectiology

GEORGIA
National Center for Tuberculosis and Lung Diseases

BURKINA FASO
Emerging and Re-Emerging Pathogens Laboratory

BANGLADESH
Bangladesh Institute of Tropical & Infectious Diseases

Institute for Developing Science & Health Initiatives

International Center for Diarrheal Disease Research Bangladesh

FRANCE

HAITI
GHESKIO center,
Rodolphe Mérieux Laboratory

CHINA
Christophe Mérieux Laboratory, Institute of Pathogen Biology, Chinese Academys of Health Sciences

BRAZIL
Laboratory of Respiratory Viruses and Measles - Fundação Oswaldo Cruz

National Laboratory for Scientific Computing

Institute of Tropical Medicine (IMT-SP) of the University of Sao Paulo

Charles Mérieux Center for Infectious Disease of Fundhacre hospital, Rio Branco

LAOS
Laotian Ministry of Health, Rodolphe Mérieux Laboratory

CAMBODIA
Rodolphe Mérieux Laboratory of the University of Health Sciences

CAMEROON
Centre Pasteur of Cameroon

INDIA
King Georges Medical University

REPUBLIC OF THE CONGO
Congolese Foundation for Medical Research

MADAGASCAR
Charles Mérieux Center for Infectious Disease

PARAGUAY
National University of Asuncion, Instituto de Investigaciones en Ciencias de la Salud

DEMOCRATIC REPUBLIC OF THE CONGO
Rodolphe Mérieux Laboratory, National Biomedical Research Institute

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Active surveillance of AMR with "One Health approach"

WHO Tricycle protocol / JPI AMR-TRIuMPH

Rationale and unmet need
Lack of AMR surveillance system in LMICs with "One Health approach"
Lack of data on prevalence of resistant bacteria in the different sectors

Objective
To assess AMR prevalence in humans, animals & environment through analysis of a single indicator **ESBL *E. coli***

Study design
- Simplified AMR surveillance across the three main sectors:
  - Human, food chain and the environment

- Measured yearly in identical and controlled conditions
  - to assess the impact of future AMR interventions
  - to inform National Action Plan and Ministry of Public Health

Active surveillance of AMR with "One Health approach"

Upstream, downstream,
waste water, slaughterhouse

Chicken from
traditional farms

Pregnant women :
representative of the
community

Tricycle in Madagascar : the main results of one-year study
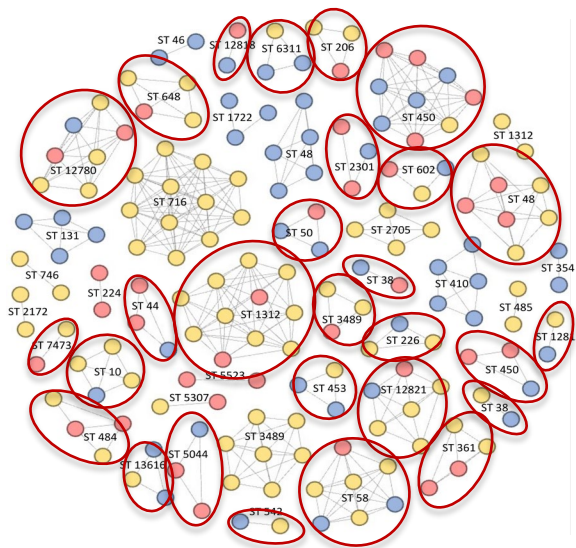*Lancet microbe, 2024, in Press*

ESBL *E. coli* carriage

Genetic relatedness of isolates based on single nucleotide polymorphism analysis

n=492

34%

⬤ Human

n=246

57%

⬤ Animal

n=28

100%

⬤ Environment

Force-directed Fruchterman-Reingold layout representing intra and intersectoral dissemination of isolates differing by less than 40 SNPs and harbouring the same ESBL enzyme.

Active surveillance of AMR with "One Health approach

Data Science Center for AMR (BMGF)
Grand Challenges 2022
Partners: Madagascar, Burkina Faso

Rationale and unmet need

AMR data collected through research or active surveillance projects are often:
- of low quality and difficult to transcribe into electronic format
- not shared with decision-makers, stakeholders or scientists

This leads to delays in data analysis and in the definition of relevant strategic indicators for monitoring the impact of public health measures and to a lack of decision-making by governance stakeholders

Objective
- Build an AMR data center with robust tools for collecting, analyzing, sharing, and disseminating data from active surveillance in Madagascar and Burkina Faso
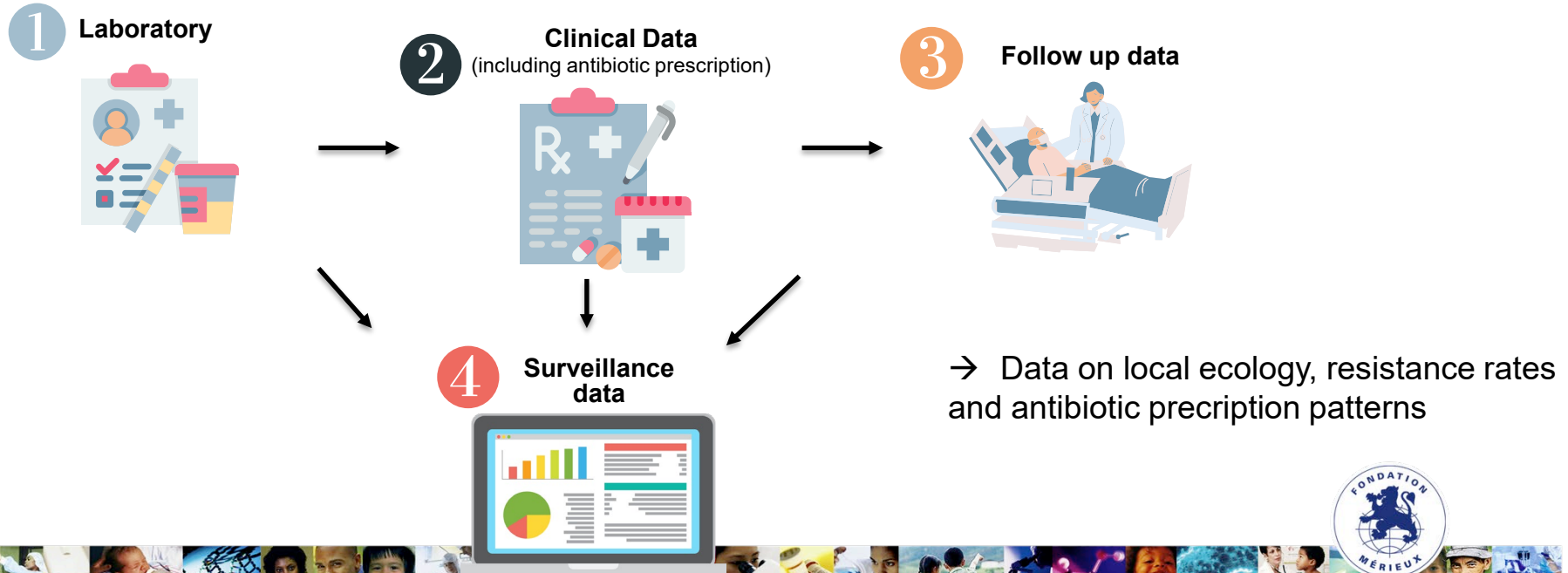
Study design
- Ministries of Health, Livestock and Environment involved in AMR data center specifications
  - Especially intellectual property, data sharing and data governance
- Creation of a single platform interoperable with DHIS2 (or an equivalent, ENDOS) to centralize AMR data from active and passive surveillance in Madagascar and Burkina Faso

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TSARA: An antibiotic resistance surveillance program*
Technique de Surveillance Actualisée de la Résistance aux Antibiotiques

Antibiotic Stewardship

A standardized data collection tool for monitoring **microbiological**, **clinical** and **epidemiological** data.

Objective: Combining patient data with laboratory and epidemiological surveillance data to provide a better understanding of the scope of AMR and improve antibiotic prescribing practices.

1 **Laboratory**

2 **Clinical Data** (including antibiotic prescription)

3 **Follow up data**

4 **Surveillance data**

→ Data on local ecology, resistance rates and antibiotic precription patterns

TSARA: the main results

- Study implemented in 10 hospitals at Madagascar

- Hospitalized patients (N=2311) with a sample sent to the microbiology labs

Laboratory data

- **31.8 % positive cultures**

  → **56.8%** Enterobacteriaceae isolates
  - 60.0% C3G resistant Enterobactericeae
  - 12.9% Carbapenemase resistant Enterobactericeae

  →**12.1%** *Staphylococcus aureus*
  - 17.9% Methicillin-resistant

Clinical data

- **57.8% with empiric antibiotic therapy prescription**
  - Ceftriaxone : the most commonly prescribed molecule as monotherapy (18,3 %)
  - Bitherapy with Ceftriaxone + Gentamicin (13,9%)

- **29.3% documented antibiotic therapy (after reception of the lab results)**
  - 48.6% documented antibiotic prescriptions despite **the reception of a negative bacterial culture**

Thank you for your attention