

The Role of Pathology in Bio-Surveillance and Control of Communicable and Non-Communicable Diseases using One Health Approach



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>One Health Operational definition



*One Health is an **integrated, unifying** approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.*

FAO-WOAH
(OIE)-WHO-
UNEP, 2021

>One Health definition.....

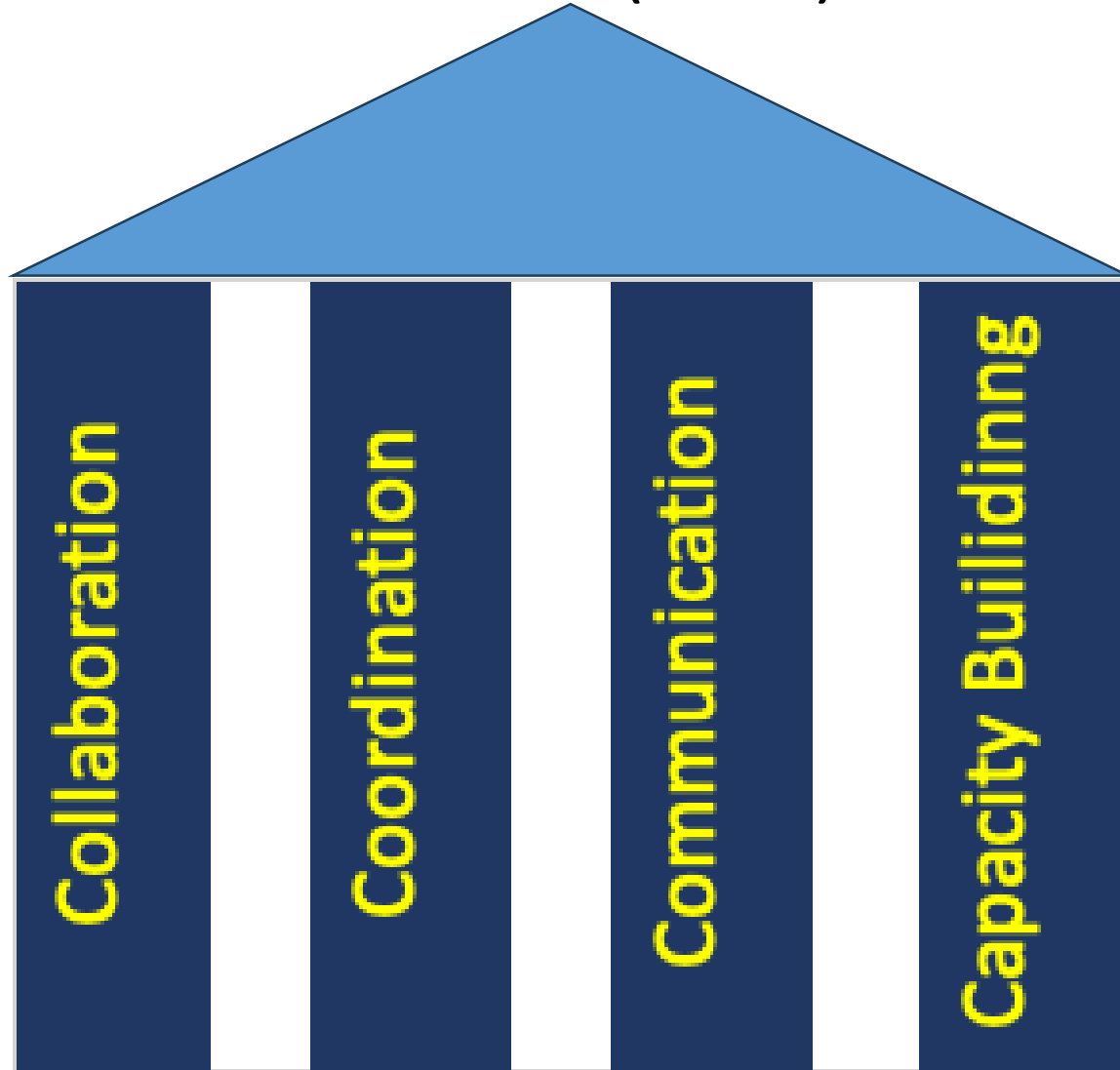
- **Inter-dependency**

- Humans, domestic and Wild animals, Plants, Wider Environment (Ecosystem)
- Their health are closely linked and inter-dependent

- **Working together**

- Working together of Key Sectors (Human, Animal and Environment)
- Different bio-medical disciplines (Medicine, Veterinary, Wildlife, Botany etc.)

>The Four Pillars (4Cs) of One Health



>The History of One Health

- **460-367 B.C.-** Hippocrates “On Airs, Waters and Places”- **Interdependence** of public health and clean environment
- **384-322 B.C.-** Aristotle introduced the concept of ‘comparative medicine’
- **1654–1720-** Giovanni Maria Lancisi (Physician, Veterinarian & Epidemiologist): role played by the Environment to spread diseases to humans and animals
- **1712-1779-** Claude Bourgelat- Established formal education in Animal Health and how it interacts with human health in Europe (1st Vet Faculty in Lyon, France)

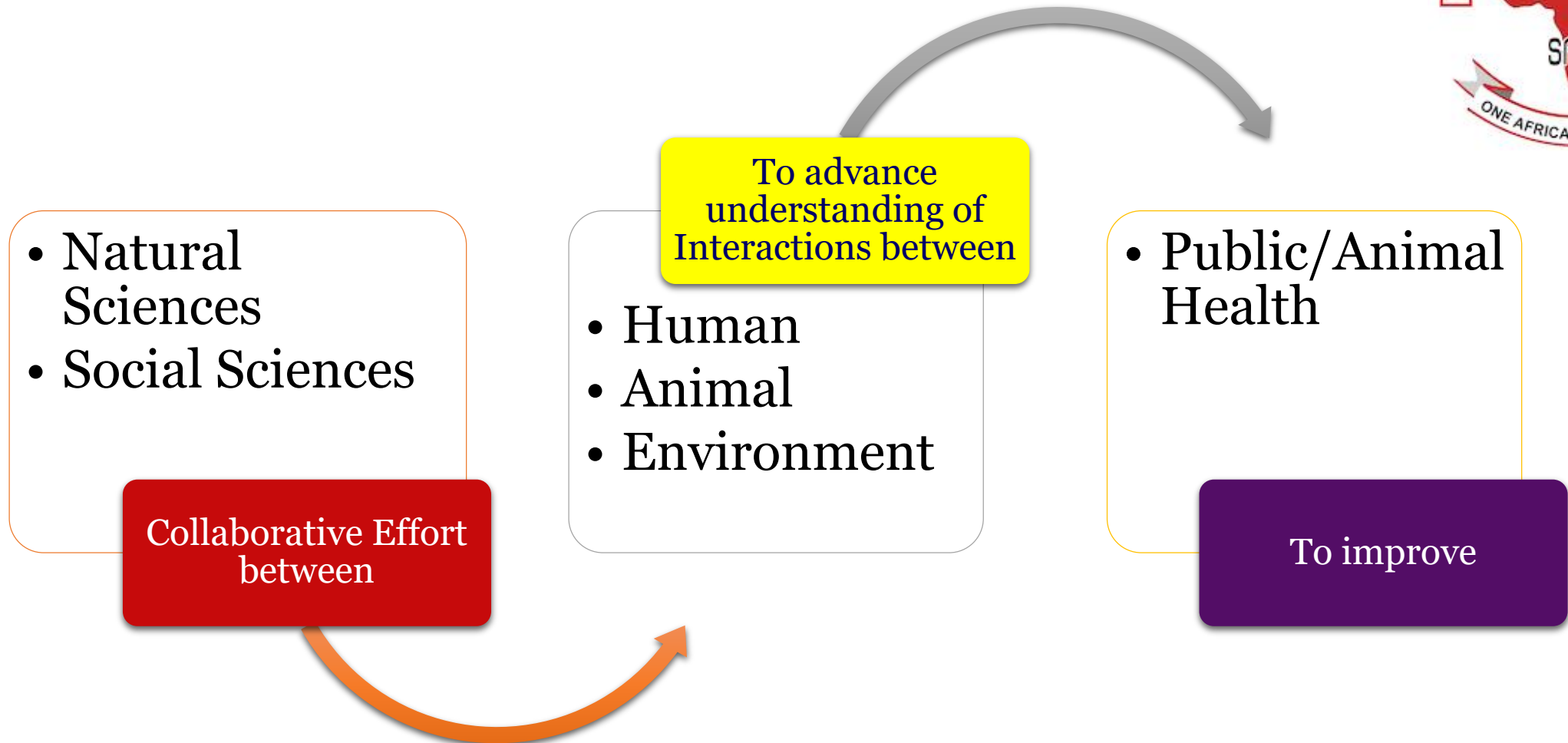
>The History of One Health.....

- **1821-1902.- Rudolf Virchow** (German **Pathologist** and Physician) coined the term '**ZOONOSIS**' "*Between animal and human medicines there are no dividing lines – nor should there be*" - He is recognised as "***Father of Modern Pathology***'
- **1849-1919- Sir William Osler** (1849–1919), promoted the concepts of comparative medicine and comparative biology and the integration of human and animal health (concurrent faculty appointment at Montreal **Veterinary College** and McGill University-**Faculty of Medicine**)-He is recognised as "***Father of Modern Medicine***'

>The History of One Health.....

- **1913-2013- James Steele** and **Calvin Schwabe**, promoted ecological nature of animal and human health (established Vet Public Health Unit- transformed to US CDC, published a textbook on *Veterinary Medicine and Human Health*; introduced the Concept of '**One Medicine**' & '**Veterinary Public Health**'.
- **2008-** FAO, WOAHA (formerly OIE), WHO & UNICEF- "**One World, One Health**" strategic document
- **2010-** FAO, WOAHA, WHO **Tripartite Concept Note** on 'One Health' approach
- **2021-**FAO, WOAHA, WHO, UNEP **Quadripartite** operational definition of 'One Health' approach

>SACIDS One Health Focus, 2008-2023



>The Concepts of Surveillance and Biosurveillance

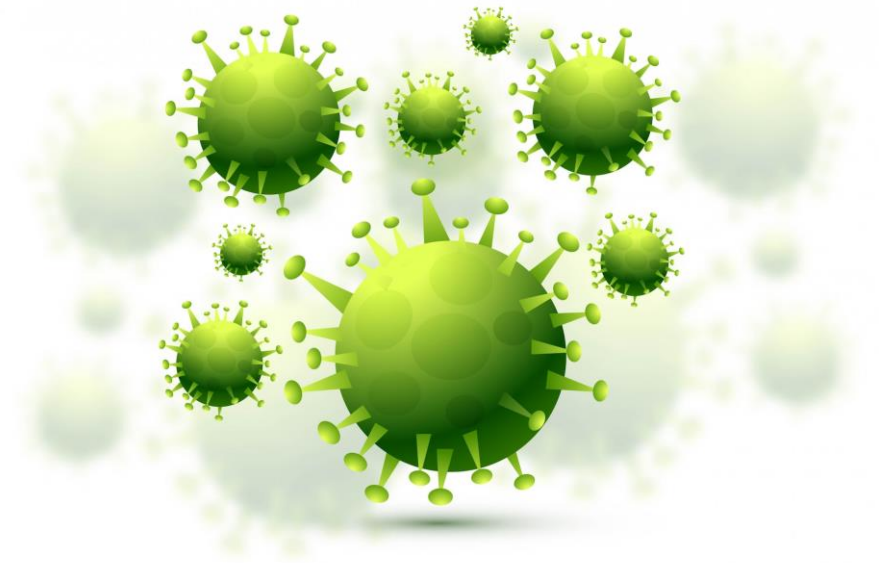
- **Disease Surveillance:** refers to the systematic, continuous collection, collation, analysis, interpretation, and dissemination of **disease-related data** from defined human or animal populations to **inform decision making**.
- **Role of Surveillance in Public Health:**
 - An instrument to **identify events** of public health concern (sub-national, national, regional or global level)
 - **Informs Response** to Public Health threats
 - Supports **planning** and **preparedness** for unwanted events

>The Concepts of Surveillance and Biosurveillance.....

Biosurveillance: Surveillance to detect Biological Threats

“active data-gathering with appropriate analysis and interpretation of biosphere data that might relate to disease activity and threats to human or animal health”

- Focuses on infectious organisms and others
- Include Viruses, Bacteria, fungi, etc.
- Have potential to cause Infections & spread fast
- Public and Global Concerns



>The Role of Pathologists in Biosurveillance

1. Diagnosis of aetiologies (**infectious vs non-infectious** agents in the **biosphere**)
2. Identification of pathological processes
3. Identification of clusters and trend in patient populations
4. Serve as early warning point

>The Concept of Disease Causation by Infectious Agents

Solution (fx): Integrated
& Unifying approach-**One
Health**

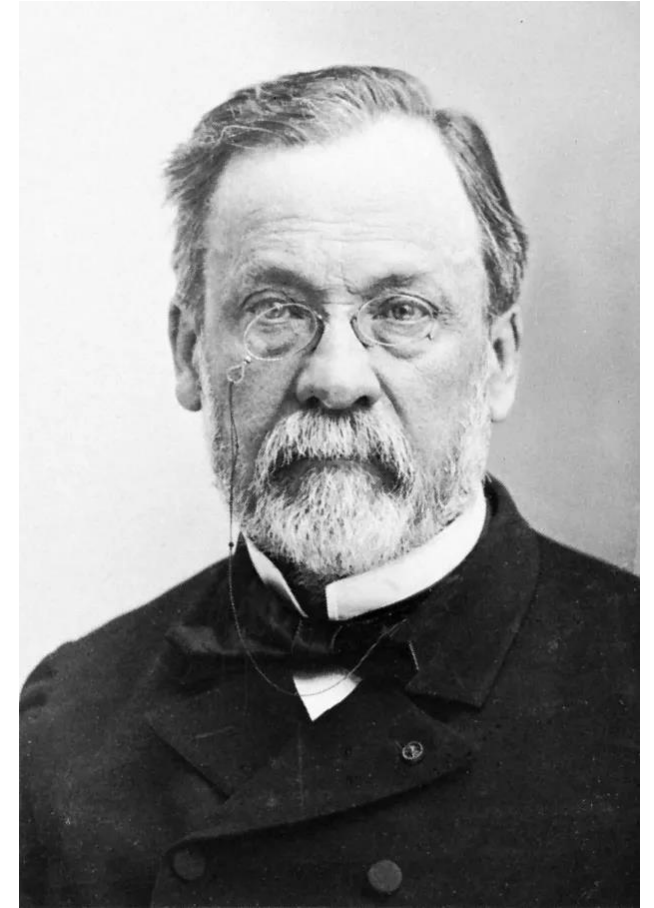
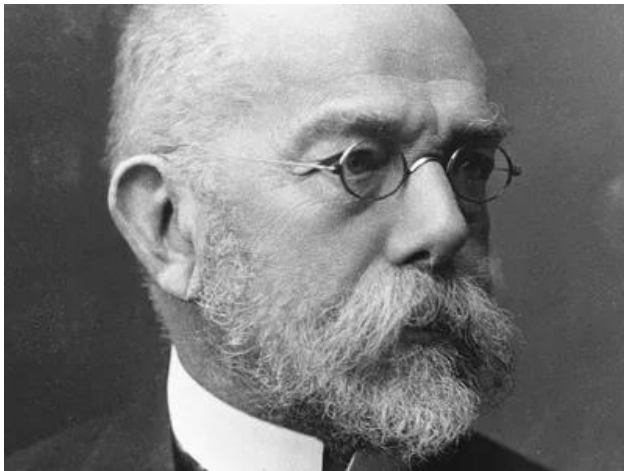
Monocausal

Multicausality

Complex
Epidemiologic
al triad (Host,
Agent,
Environment)

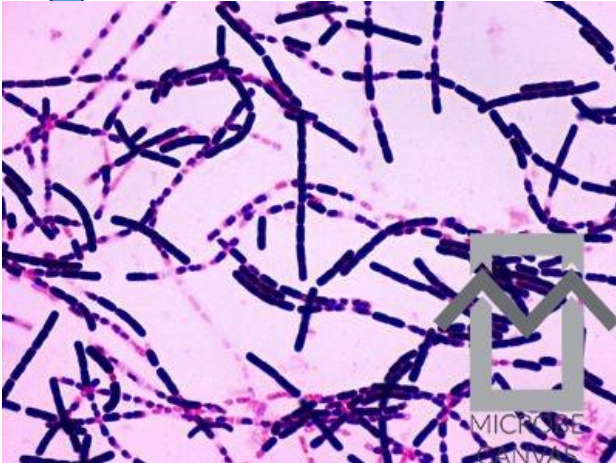
>How do microorganisms cause diseases?

- A microorganism that causes a disease= PATHOGEN
- The '**Germ Theory**' by Louis Pasteur, Joseph Lister & Robert Koch



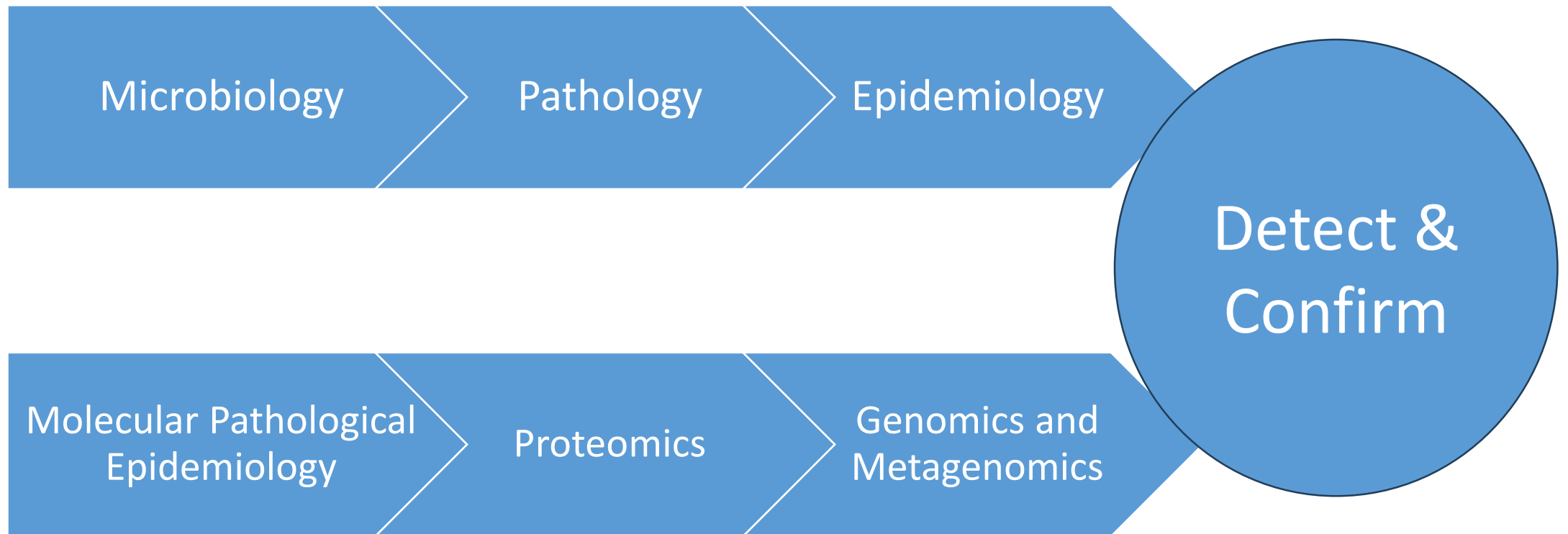
> Koch's Postulates based on animal model

Recovery on
Bacillus anthracis in
COW



>Advances beyond traditional microbiology

From **–OLOGY** to **-OMICS**



>Fundamental Principles of Pathology

Pathology is concerned with the **dynamics** of disease processes and the elucidation of such factors as their **aetiology, pathogenesis, morphology, and biological behaviour.**



>Fundamental Principles of Pathology....

Pathology focuses of
structural, biochemical, and
functional changes in **cells,**
tissues, and organs in
disease



>Disease Process: c.f. human, animal & plant



Aetiology

Pathogenesis

Mol & Morph Changes

Clinical Manifestation

>Pathology has no borders

Medical Pathology

Veterinary Pathology

Plant Pathology

Environmental Pathology



>So what

Need to embrace
the One Health Approach

Studying the ecology of Filoviruses in the Congo Basin (Sharing resources and expertise)



Collecting samples from
bats at Luebo DRC



Within the BSL-4 Lab of the NICD
Johannesburg



Sample preparation in a
field laboratory in Luebo

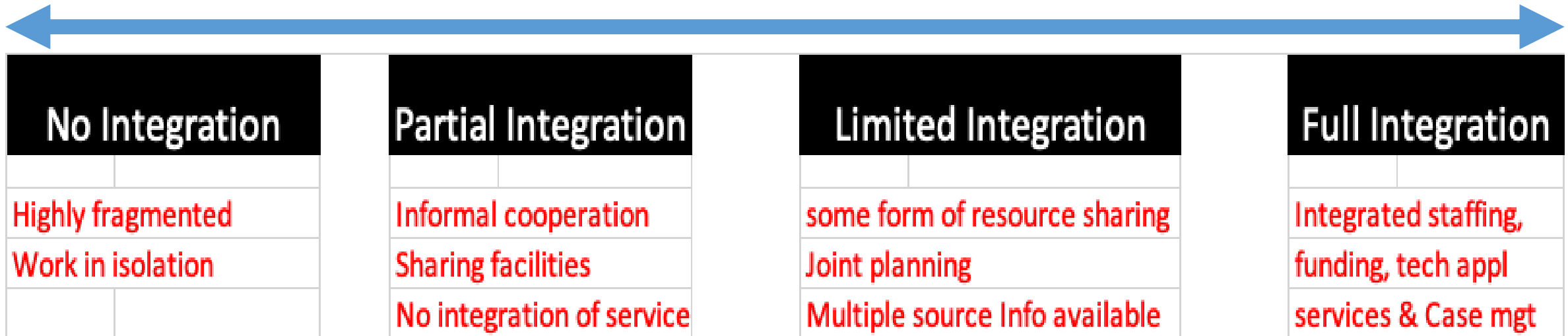
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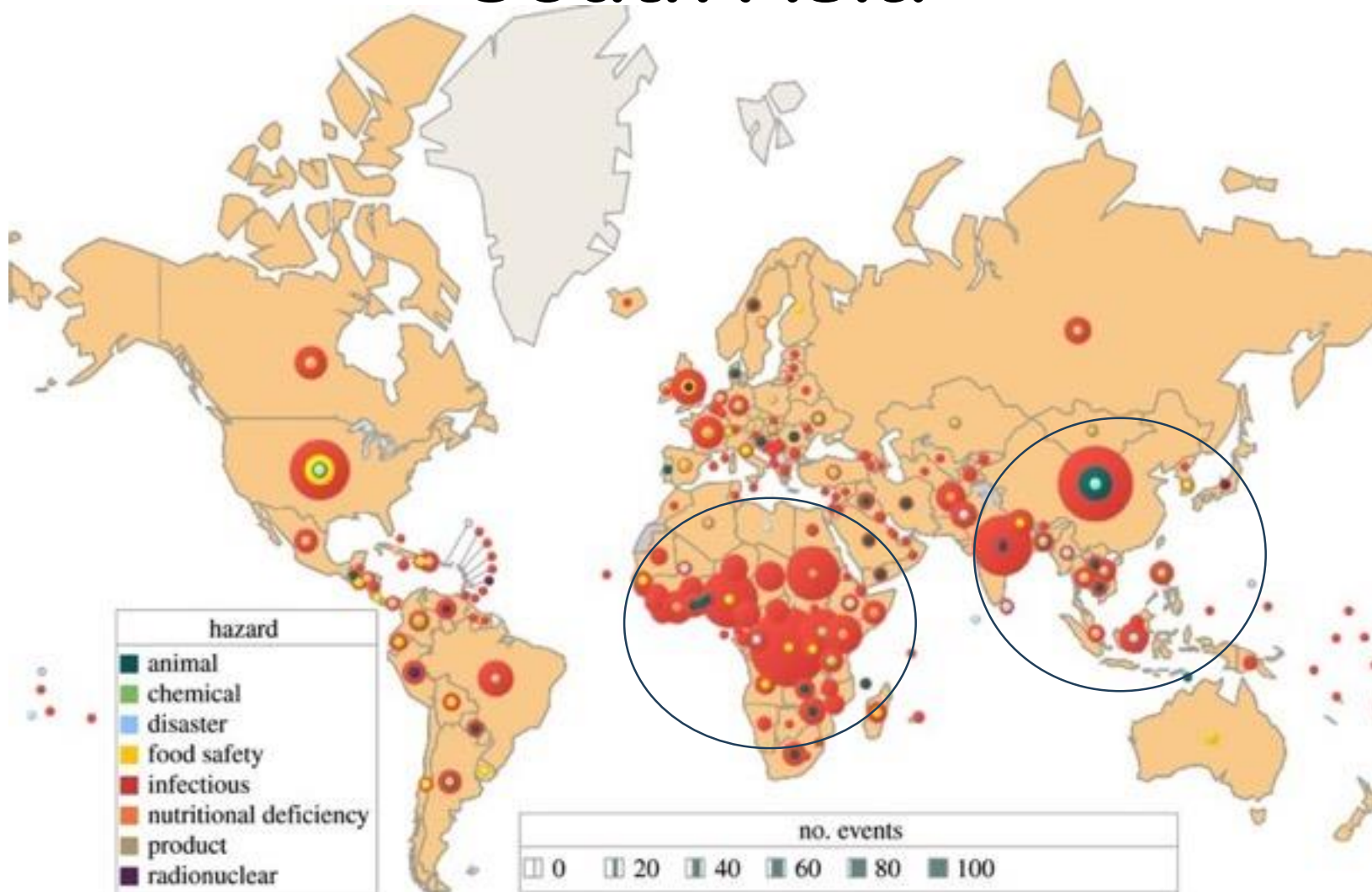
FAO-OIE-WHO-
UNEP, 2021

Concept of Integration Continuum



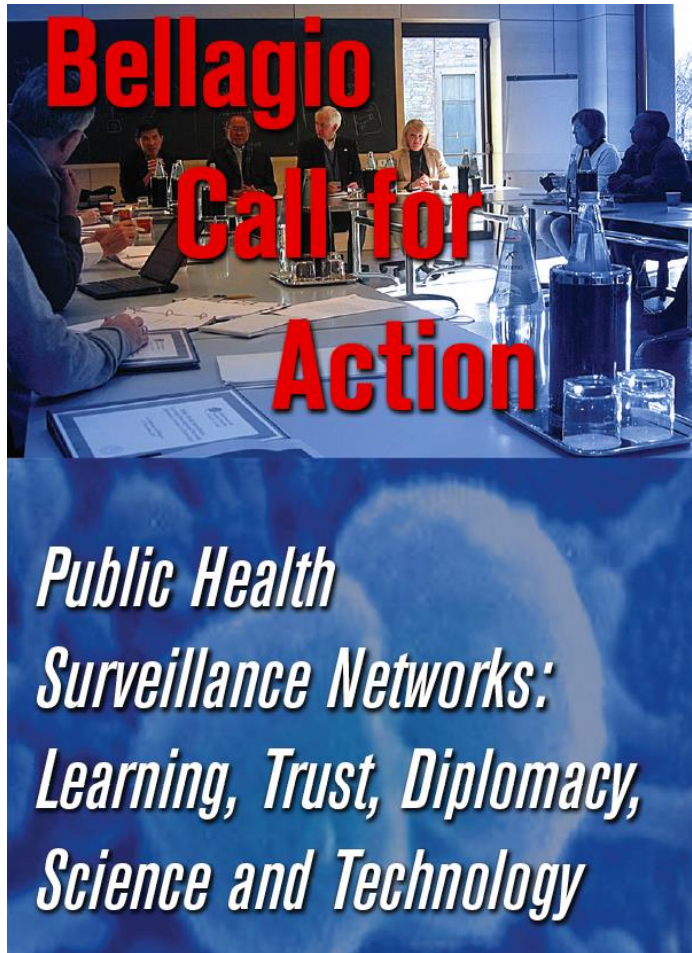
Source: **KPMG, 2013**

Global Infectious Disease Burden: **Africa** & South Asia



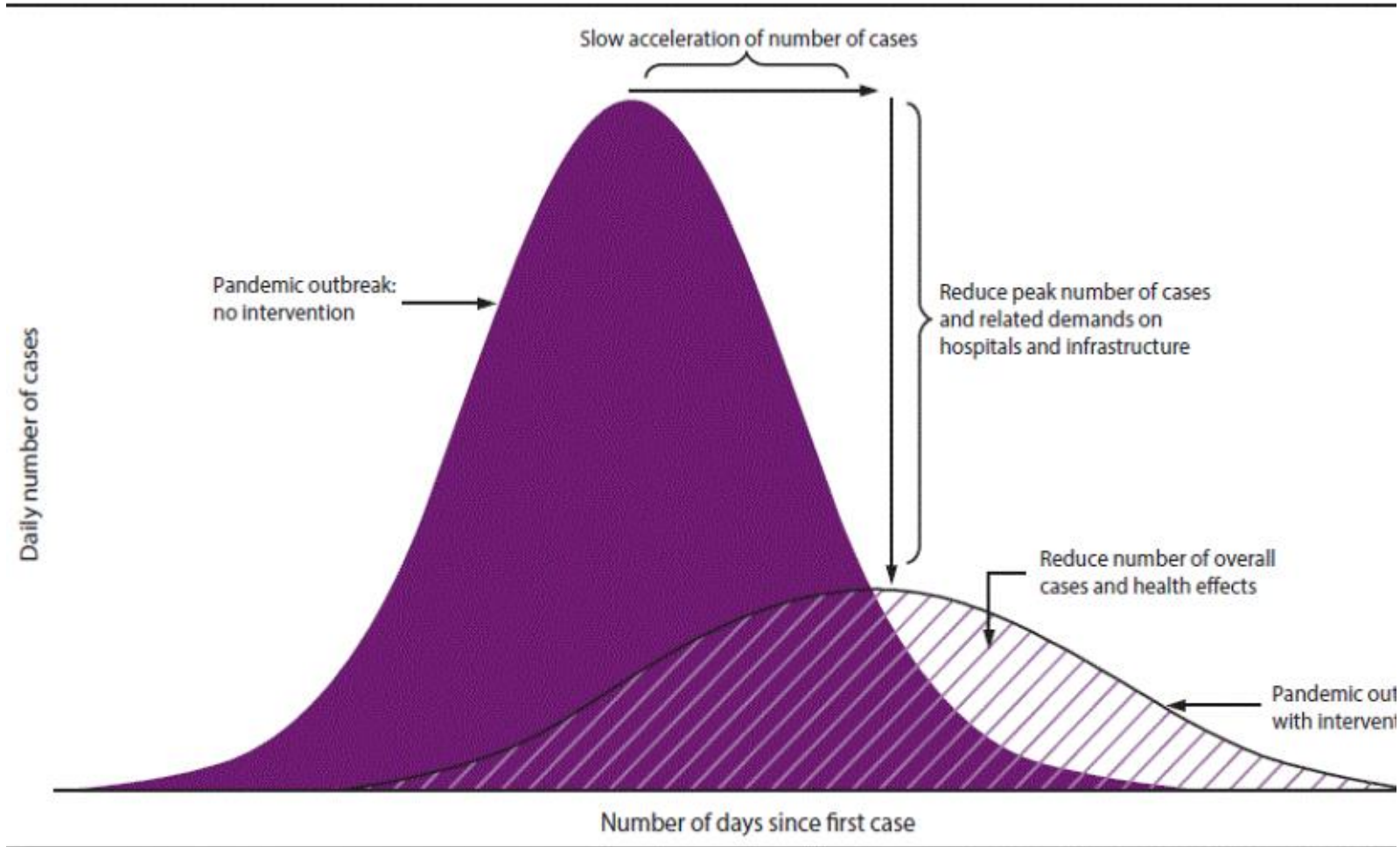
Christopher Dye, After 2015: infectious diseases in a new era of health and development, Phil. Trans. R. Soc. B 2014; 369:20130426

@Bellagio: November 2007!!



- To develop and encourage collaboration between the human, animal and agricultural sectors to achieve a holistic approach to infectious disease surveillance; and
- To promote the development of national capacities and new regional networks, particularly in Africa and South Asia.

Importance of “Flattening Epidemic Curve”



History of One Health coordination in Tanzania

OH Collaboration between the MoH & MLF:
Focus: Zoonotic disease-specific TFs e.g Avian Influenza

OHCD established under PMO:
Aim: Facilitate coordination & communication amongst sectors

Upgrade of OHCD to One Health Section and Revised OHSP 2021/2016

2007

2013

2015

2018

2022

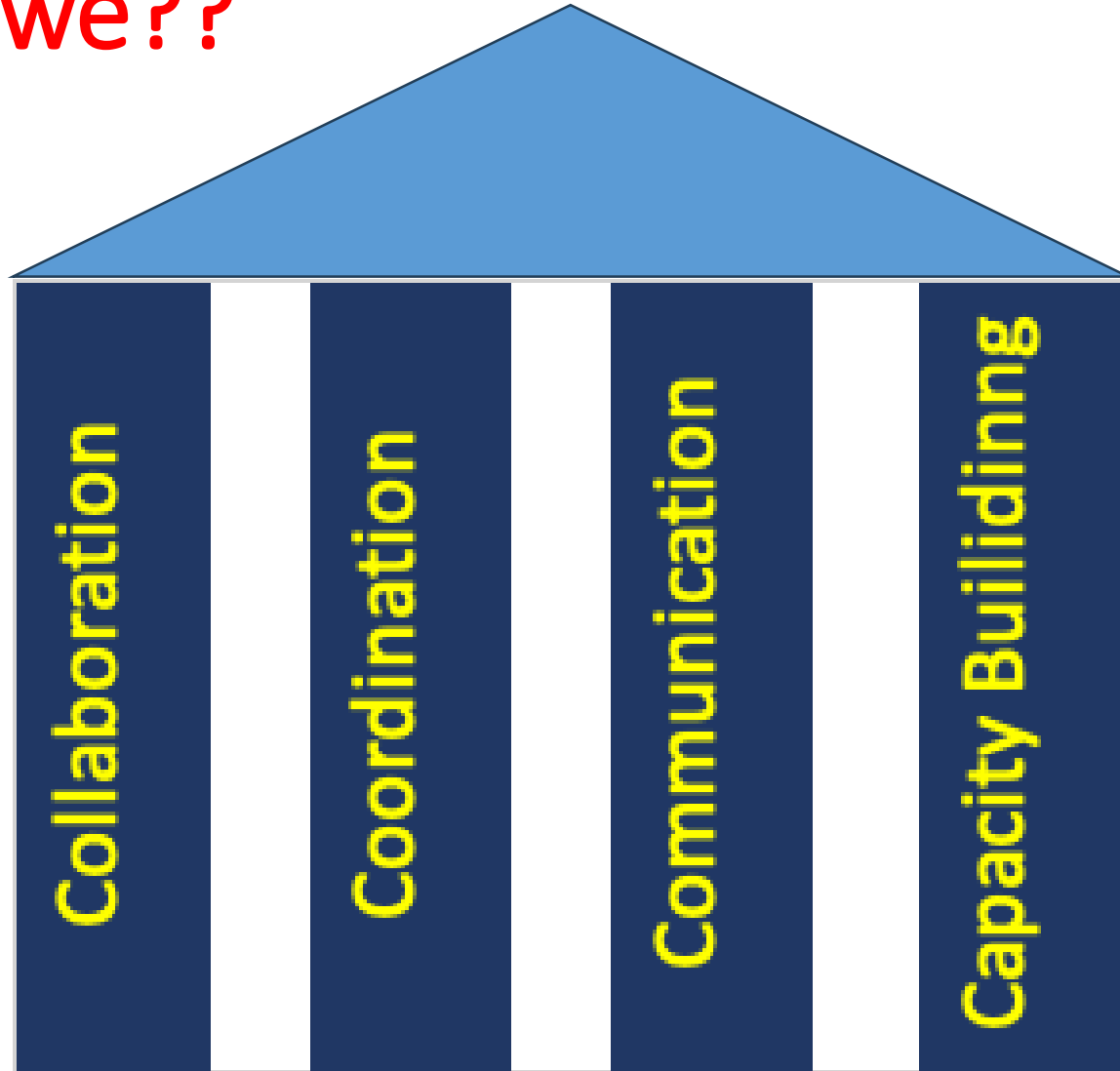
National OH Agenda launched, led by OH networks e.g. OHCEA, SACIDS Foundation for OH, Afrique One

Official launching of OHCD and 5-year OHSP (2015-2020).

OH coordination structure aligns to the disaster risk management framework

Source: **Sanga, V. (2022)**

>The Four Pillars (4Cs) of One Health: **Where are we??**





Towards Community Level Syndromic & Genomic Surveillance

AfyaData



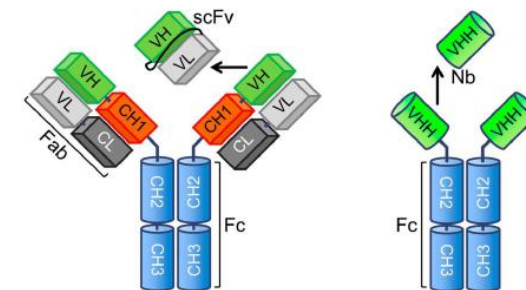
Mobile Genomics Laboratory



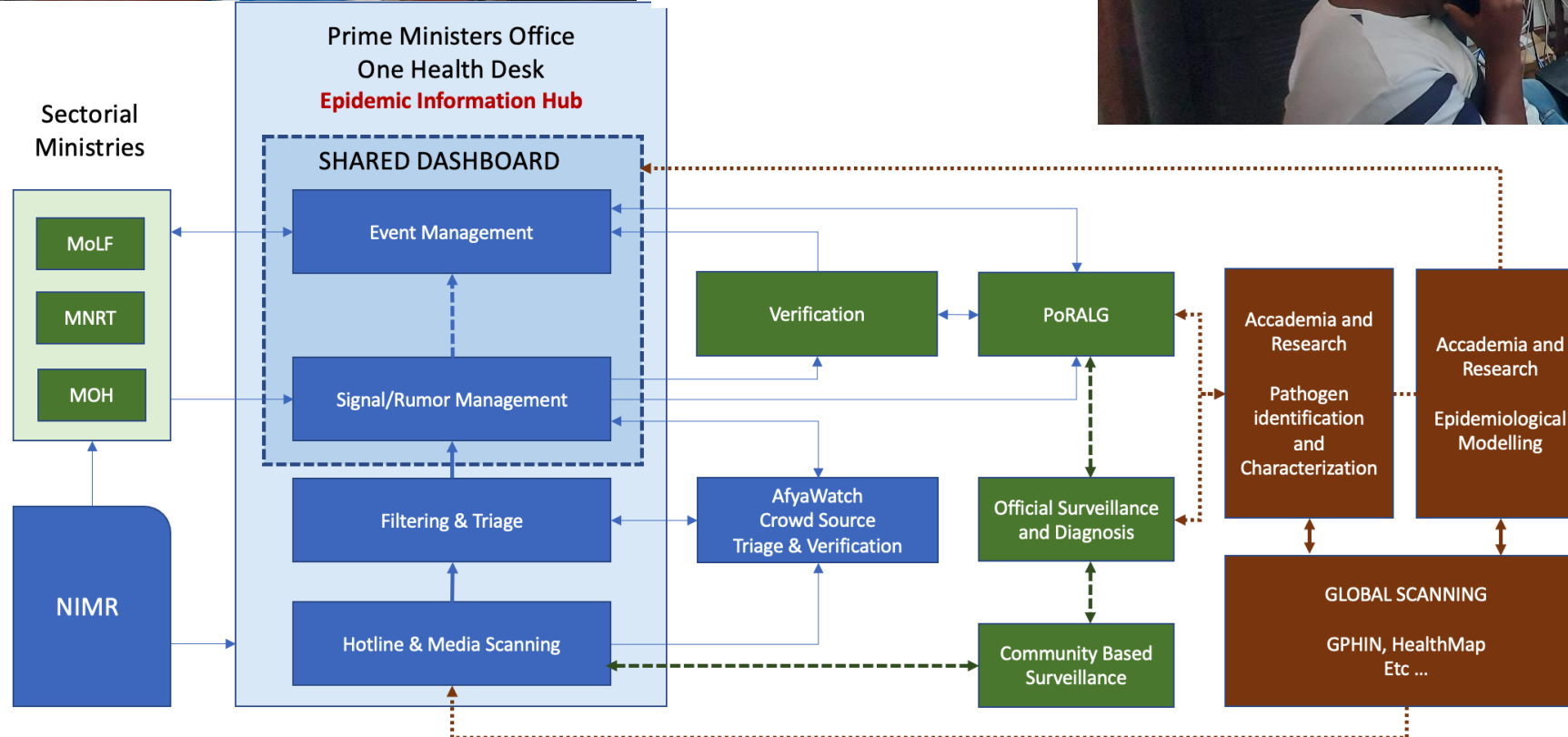
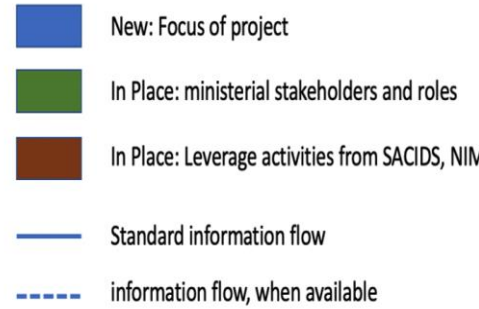
Mobile PCR



Nanobodies



Early Warning System- Digital Platform under PMO coordination



- Strengthen EBS for Sectorial Ministries
- Hotline and Media scanning
- Link National OH Section with Sector Ministries (shared digital dashboard)



Thank You very
much