Global collaboration in biosecurity and pandemic preparedness

Session 19 | Great room 3 | 3.00-4.00PM

Debbie Eagles

Director of CSIRO's Australian Centre for Disease Preparedness (ACDP)

Professor Brett Sutton

Director of Health & Biosecurity at CSIRO

Professor David Lye

Director of the Infectious Disease Research and Training Office at the National Centre for Infectious Disease

Professor Thomas Schulthess

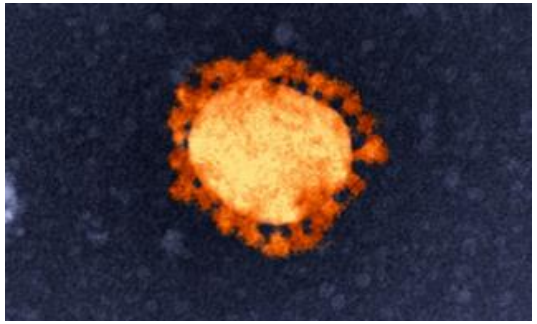
Director of the Swiss National Supercomputing Centre (CSCS) at Manno

Australian Centre for Disease Preparedness

A purpose-built biosecurity facility providing the highest level of biocontainment to protect Australia's livestock and people from the most dangerous emerging infectious diseases

High biocontainment infrastructure with dedicated Biorisk Management Group

Largest PC3 / PC4 lab in the sth. hemisphere & Australia's only PC4 lab for large animals

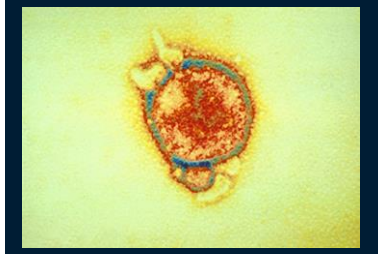


Proven vaccine research capability, including preclinical trial capability

Disease Reference Centre status & selected labs with ISO QA accreditation

Our capability in action

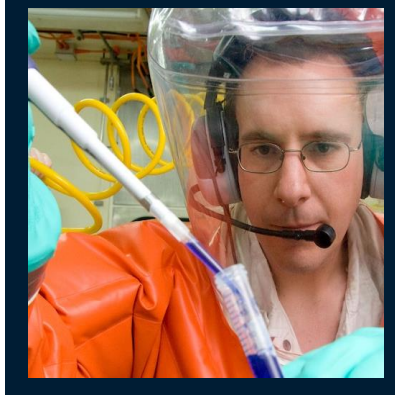
Leader in diagnostic & lab science for high path viruses



Hendra vaccine – Equivac® HeV world 1st 'BSL4' vaccine

Study of SARS-CoV-2's genome and pre-clinical trials

Developing ferret model for COVID-19



ACDP provides independent referral and diagnostic capabilities

Our value to partners

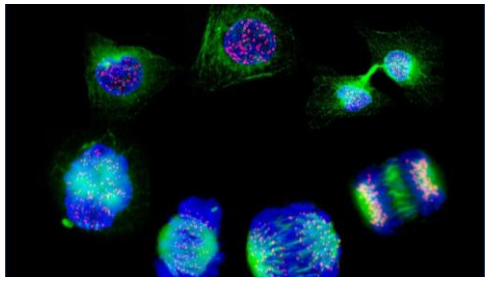
- Proven ability to carry out preclinical testing for vaccines against emerging diseases at high containment
- ACDP status as a world reference laboratory to monitor for Disease X
- Certified management systems in accordance with ISO 9001, ISO 14001, ISO 17025, ISO 17043 as well as the ability to operate in line with OECD GLP principles
- Preclinical testing with appropriate animal models for new vaccine development

Pre-clinical Models

CSIRO's high containment laboratories and experienced scientists enable testing of vaccine and therapeutic efficacy in animal and non-animal models to GLP-like quality standards and principles.

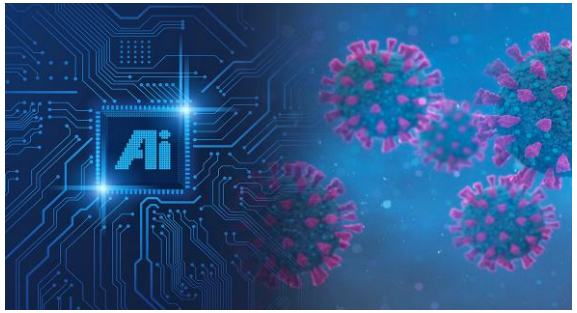
Pre-clinical efficacy testing for vaccines and treatments

Bespoke assay development

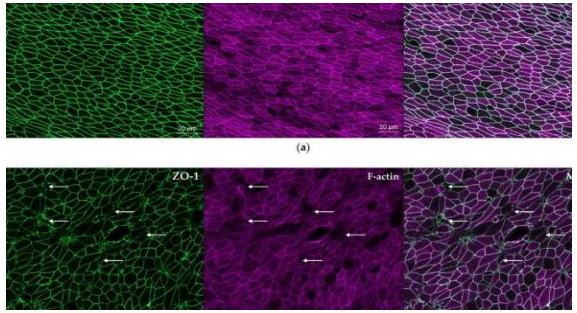


AI and ML Probabilistic Modelling

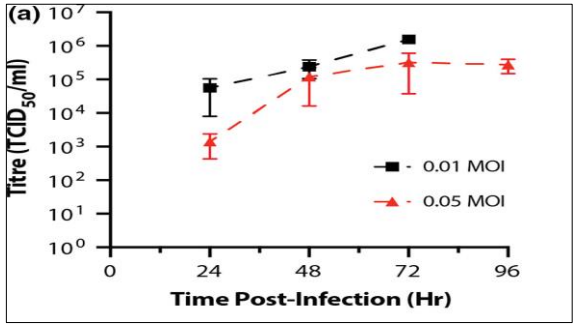
Examples of CSIRO capability



***In silico* optimization of therapeutics payloads & terminology standardisation**



Host-pathogen responses to pandemic Influenza H1N1pdm09



***In vitro* characterisation of SARS-CoV-2 and susceptibility of domestic ferrets**

Bat-borne viruses: Exploring bat-borne viruses to understand immune response

Opportunities

Identification of viral mutations that have functional consequences

Fast-tracked development of vaccines and therapeutics through via *ex vivo* and organoids

Access to specialised infrastructure, facilitating engagement with high-consequence pathogens

Vaccine development & testing

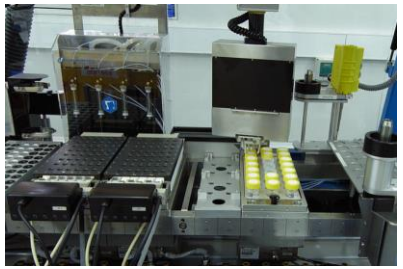
Infrastructure across the whole vaccine value chain:

- laboratories and production facilities
- vaccine pre-clinical testing, systems and techniques to improve efficacy and safety
- expertise in formulation development

Established capability and infrastructure

National Vaccine and Therapeutics Lab

Robotic & automated formulation development

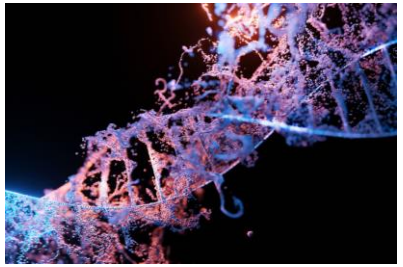


GMP QC Laboratory

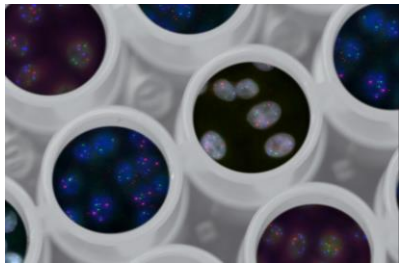
CSIRO BioFoundry Facility

Emerging Research

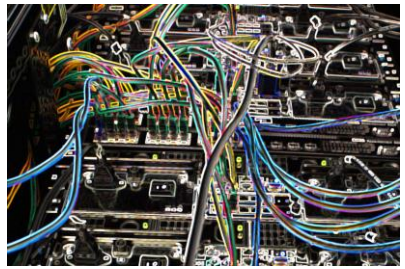
RNA therapeutics



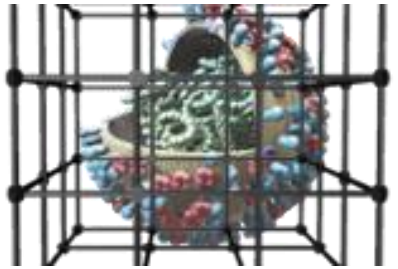
Novel lipids for mRNA LNP production



Bioinformatics tools and techniques



LNP Thermal stability encapsulation



Programme for Research in Epidemic Preparedness and Response (PREPARE)

David Lye MBBS FRACP FAMS FRCP
Director, Infectious Disease Research & Training Office, National Centre for Infectious Diseases
Deputy Executive Director, Programme for Research in Epidemic Preparedness and Response
Senior Consultant, Department of Infectious Diseases, Tan Tock Seng Hospital
Group Head, Research, Interim Communicable Disease Agency
Professor, Yong Loo Lin School of Medicine, National University of Singapore
Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

Governance Framework

For Strategy Development & Funding Accountability

Domain responsible for PREPARE's funding; Ensures alignment with domain strategies

HHP EXCO
Human Health and Potential domain Executive Committee

NMRC as IA & Deskhead

Implementing agency

Oversees pandemic preparedness R&D strategy and accountable for delivery of goals and initiatives under PREPARE

PREPARE Steering Committee (SC)
Chair – Prof Kenneth Mak, Director-General of Health, MOH

PREPARE EXCO
Executive Director – Prof Wang Linfa
PREPARE Deputy ED – Prof David Lye

Co-operative Leads

Prof Kelvin Bryan Tan (MOH)	*Dr Kang Chang Wei (A*STAR) & Dr Judith Wong (Dy Lead)*	*Dr Weng Ruifen (A*STAR)*
Analytics, Disease & Behaviour Modelling	Environmental Transmission & Mitigation	Diagnostics
A/Prof Sylvie Alonso (NUS)	*A/Prof Yeo Tsin Wen (NTU)*	
Vaccines & Therapeutics	Regional Networks	

Core Leads

A/Prof Barnaby Young (NCID)	Databases
Dr Shawn Vasoo (NCID)	Biorepository

For Pandemic Preparedness Policy Alignment

MOH Mgmt and MOH Public Health Group

Ensures alignment with overall public health pandemic preparedness strategy

For Programme Administrative Support

PREPARE Programme Office
Administratively hosted in National Centre for Infectious Diseases

Objectives of PREPARE

Overarching objective:

- **To support and strengthen essential research *capabilities, translational platforms,* and *expertise* to develop tools, methods and products that can be tapped on to detect, respond to, and contain future infectious disease threats.**

To deliver this objective, PREPARE has a governance framework under the oversight of the Ministry of Health that will:

i. Draw up a national R&D plan that sets out the key R&D goals and strategies that support epidemic preparedness and response, based on the desired outcomes;

ii. Develop strong and synergistic partnerships between teams in different disciplines, across sectors, and in close collaboration with MOH;

iii. Make the necessary preparations during periods of normalcy that will enable R&D to proceed rapidly during an epidemic;

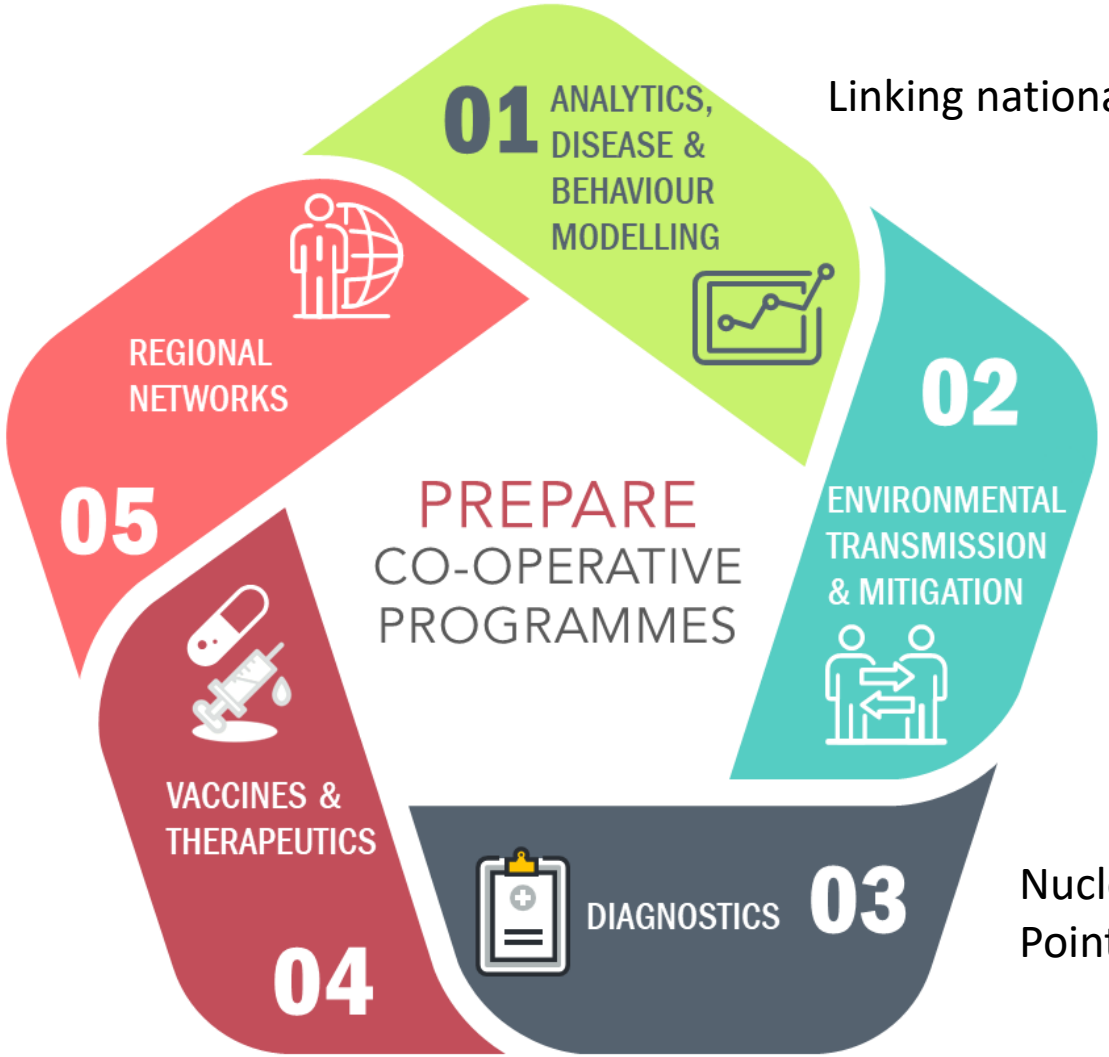
iv. Actively facilitate and expedite the process by which research discoveries can be developed into deployable products and solutions, e.g. approved diagnostic kits and therapeutic agents, and manufactured at scale.

Desired outcomes of PREPARE

PREPARE

1	**Enhance research capabilities for early detection and sense-making to prepare Singapore against future threats**	• Deepen disease surveillance research capabilities and make better risk assessment of potential threats
2	**Develop or strengthen key enablers in data infrastructure, analytics and behavioral science research**	• Create a step-change improvement in our capacity to harness data and research more effectively to respond to public health crisis
3	**Strengthen research capabilities for accelerated development of diagnostics, therapeutics and vaccines**	• Develop localised selected capabilities to enhance national resilience in diagnostics, vaccines and therapeutics development
4	**Develop a strong regional infectious diseases research collaboration network**	• Enhance co-operative action across countries in our region to prevent and respond to epidemics, and facilitate multicentre clinical trials.

PREPARE



Linking national MOH with hospital patient data

Computational fluid dynamics modelling, wastewater and environmental detection, G2 study

Nucleic acid and lateral flow
Point of care and high throughput

Pathogen agnostic
Support and sustain scientific talent and manpower

mRNA and protein subunits
Mucosal immunity, longevity and breadth of protection
Broad-spectrum small molecules
Broadly neutralising antibodies

PREPARE Regional Strategy

- Regional collaborations to **enhance Singapore's preparedness and response**, by:
  - Increasing clinical trial capacity
  - Providing early insights through enhanced aetiological investigation
  - Enhancing early surveillance research
  - Increasing clinical and genomic data and samples collected
- **PREPARE regional strategy focuses on:**
  - Augmenting existing funding streams by supporting expansion of local efforts to the region
  - Leveraging partnerships with international networks (e.g. ADVANCE-ID)
  - Nurturing relationships with regional investigators

Timeline summary

Q3 2022
- IAP 2022

Q4 2022
- 1st Collaborators meeting for regional **RESPIRO**
- 1st meeting with NUH for **REMAP-CAP**

Q1 2023
- Agreements & IRB submission initiated for both regional **RESPIRO** and **REMAP-CAP**

Q2 2023
- Agreements and IRB under review

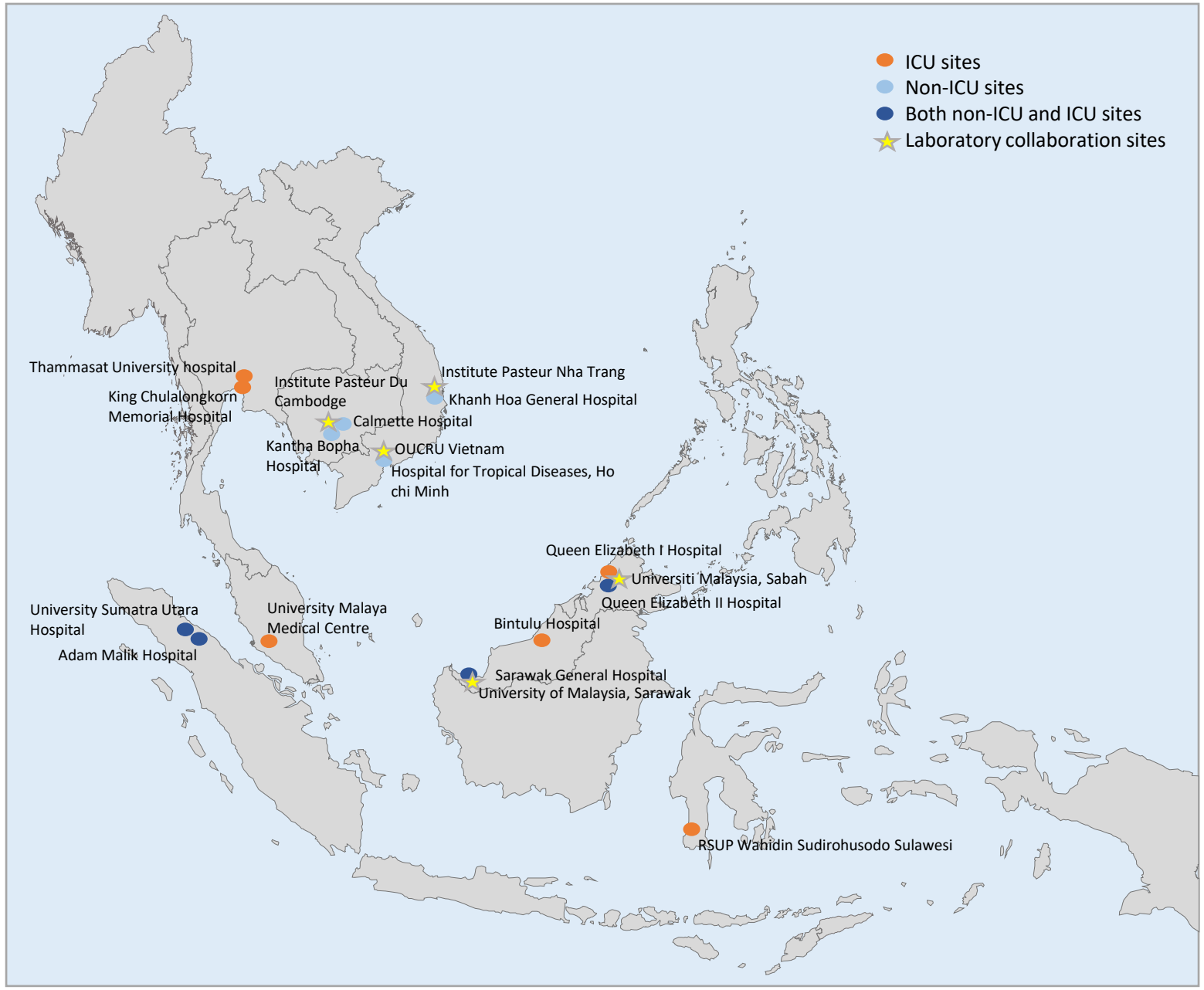
Q4 2023
- 1st Patient recruitment (HTD Vietnam)

Q1 2024
- Workshop on Clinical research Networks in the region (Feb 2024)

Q3 2024
- Patient recruitment in IP Nha Trang, Vietnam and USU, Indonesia
- Agreements and IRBs for RESPIRO done (14 sites)

Q4 2024
- Target timeline for patient recruitment in all (14) regional sites for RESPIRO study

Study sites summary

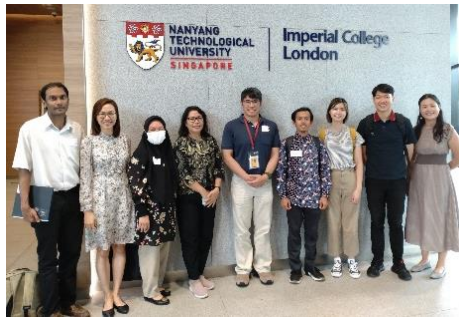


Current: 14 sites (All in RESPIRO study; 7 in REMAP-CAP)

Regional RESPIRO (target ~ 2,624 subjects – adults & paeds)

REMAP-CAP(estimated 30-40 patients/year)

Regional & international engagements



Regional

- **13-18 Oct 2022:** LKC Modelling Workshop *(top-left)*
- **15-19 May 2023:** PREPARE-Temasek Foundation (TF) READI workshop on diagnostics *(top-right)*
- **26 Feb - 1 Mar 2024:** PREPARE-TF READI workshop on regional trials *(bottom-left)*
- **24 Jun – 28 Jun 2024:** PREPARE-TF READI workshop on wastewater and environmental surveillance and research *(bottom-right)*

International

- **21-22 Sep 2022:** 1st PREPARE International Advisory Panel Meeting
- **29 Nov 2022:** NCID visit by Prof Deborah Williamson, Australia
- **16 May 2023:** Visit by Guangzhou Laboratory, China
- **11-13 Sep 2023:** 2nd PREPARE International Advisory Panel Meeting
- **20-21 Sep 2023:** 1st CN-SG Experts' Workshop on Pandemic Sciences *(bottom)*
- **22 Sep 2023:** NCID visit by Prof Zhong Nanshan; Guangzhou Laboratory, China

PREPARE-TF READI workshops to date

- **1st PREPARE-TF READI workshop, 15-19 May 2023, Singapore**
  - Workshop theme: "Peacetime research in biological and physical detection technologies for surveillance and diagnostics"
  - Co-organised with DxD Hub, A*STAR's IHPC and ASEAN Dx Initiative.
  - Attended by 35 regional participants from ASEAN nations and 74 participants from Singapore.
- **2nd PREPARE-TF READI workshop, 26 Feb – 1 Mar 2024, Singapore**
  - Workshop theme: "Regional Trials for Epidemic Preparedness & Response"
  - Co-organised with ADVANCE-ID.
  - Attended by ~50 regional participants from ASEAN nations and another ~50 participants from Singapore.
- **3rd PREPARE-TF READI workshop, 24 – 28 Jun 2024, Singapore**
  - Workshop theme: ""Developing a regional agenda for wastewater & environmental surveillance and research for epidemics and pandemics"
  - Co-organised with NEA, Asia PGI, Bill & Melinda Gates Foundation (BMGF), EU Health and Emergency Preparedness and Response (HERA).
  - Attended by ~300 participants from 40+ countries, including 43 regional participants from ASEAN nations.

Grants/Projects funded by PREPARE

As of 30 Sep 2024

PREPARE

42

Awards

S$41.5m

Funding Support

18

Institutions (Primary)

7

Countries

PREPARE

Thank You

David_lye@ncid.sg
Prepare@ncid.sg

www.prepare.gov.sg

ETH zürich

Alps-RI for pandemic preparedness

Thomas C. Schulthess

CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

OUR MISSION (since 2015)

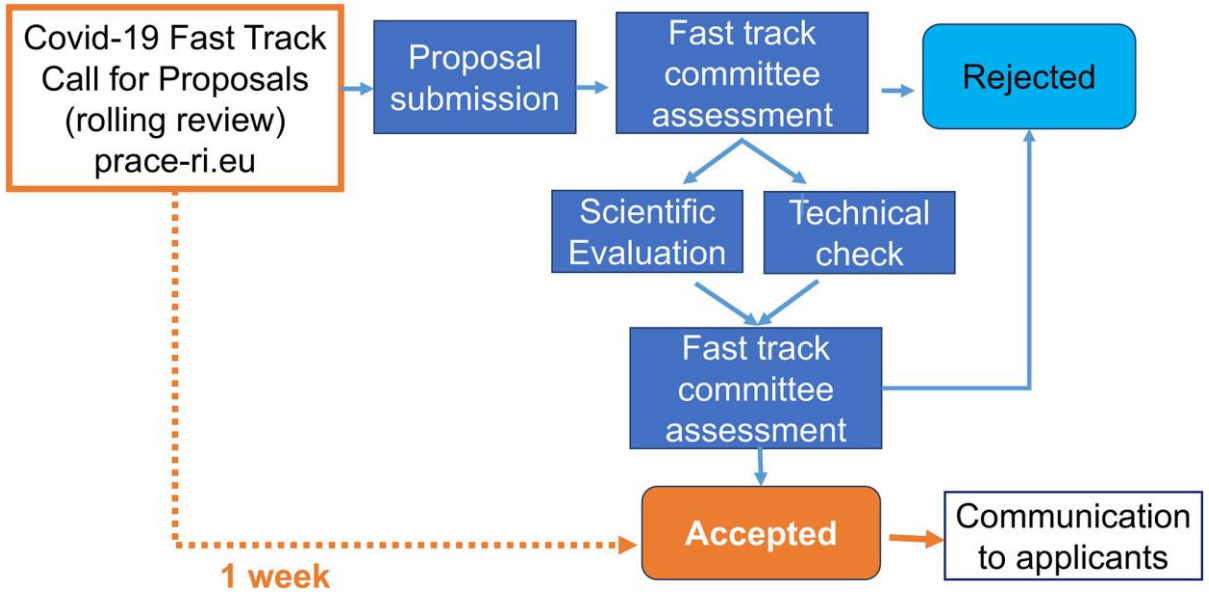
"We develop and operate a high-performance computing and data research infrastructure that supports world-class science in Switzerland."

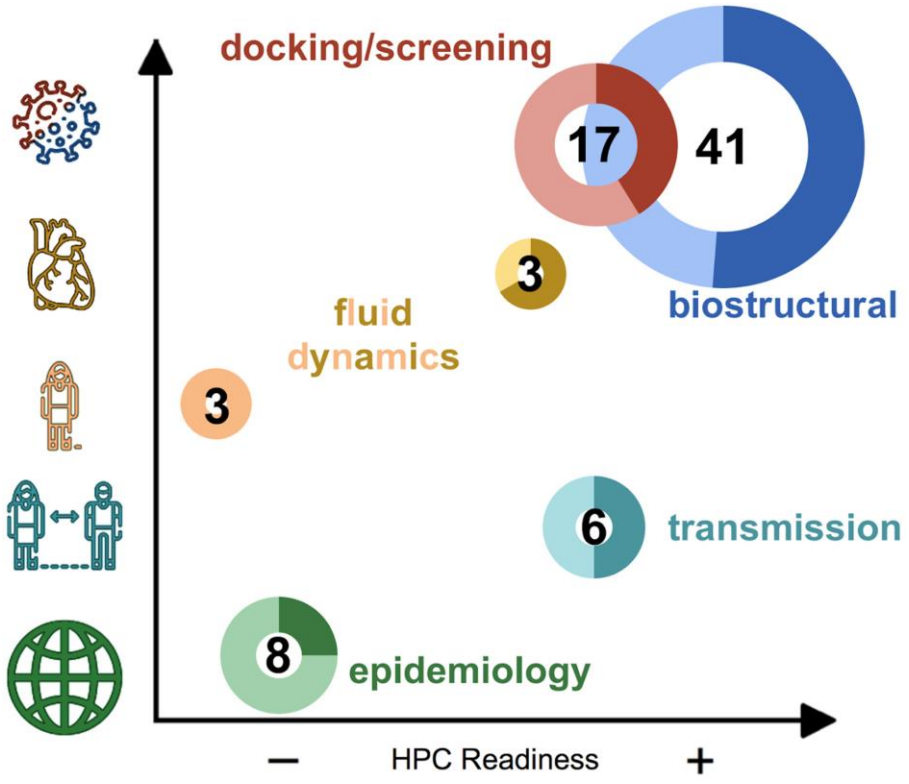
The research infrastructure is open to scientists worldwide

Urgent computing during COVID-19 pandemic

2020: five European supercomputing centres provided urgent access to COVID-19 related research

Partnership for Advanced Computing in Europe (PRACE) provided existing organisational framework



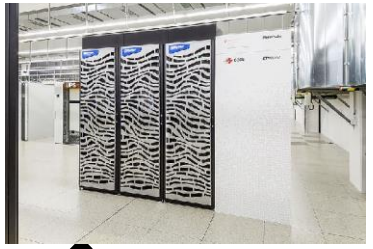


Adapte an existing process

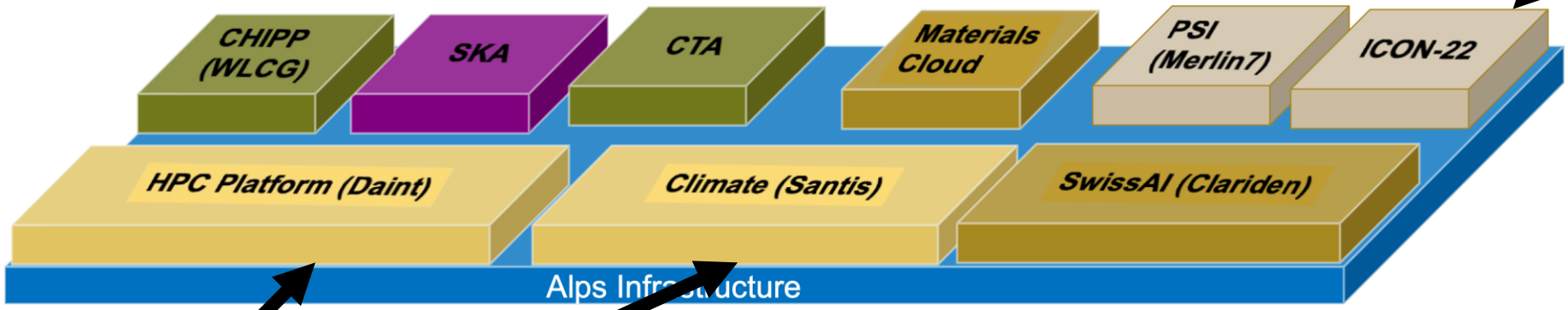
N. López et al., PNAS 118(46)e2024891118 (https://doi.org/10.1073/pnas.2024891118)

ETH zürich

Alps Infra.: beyond traditional supercomputing



NWP
MeteoSwiss



User Program (HPCN)

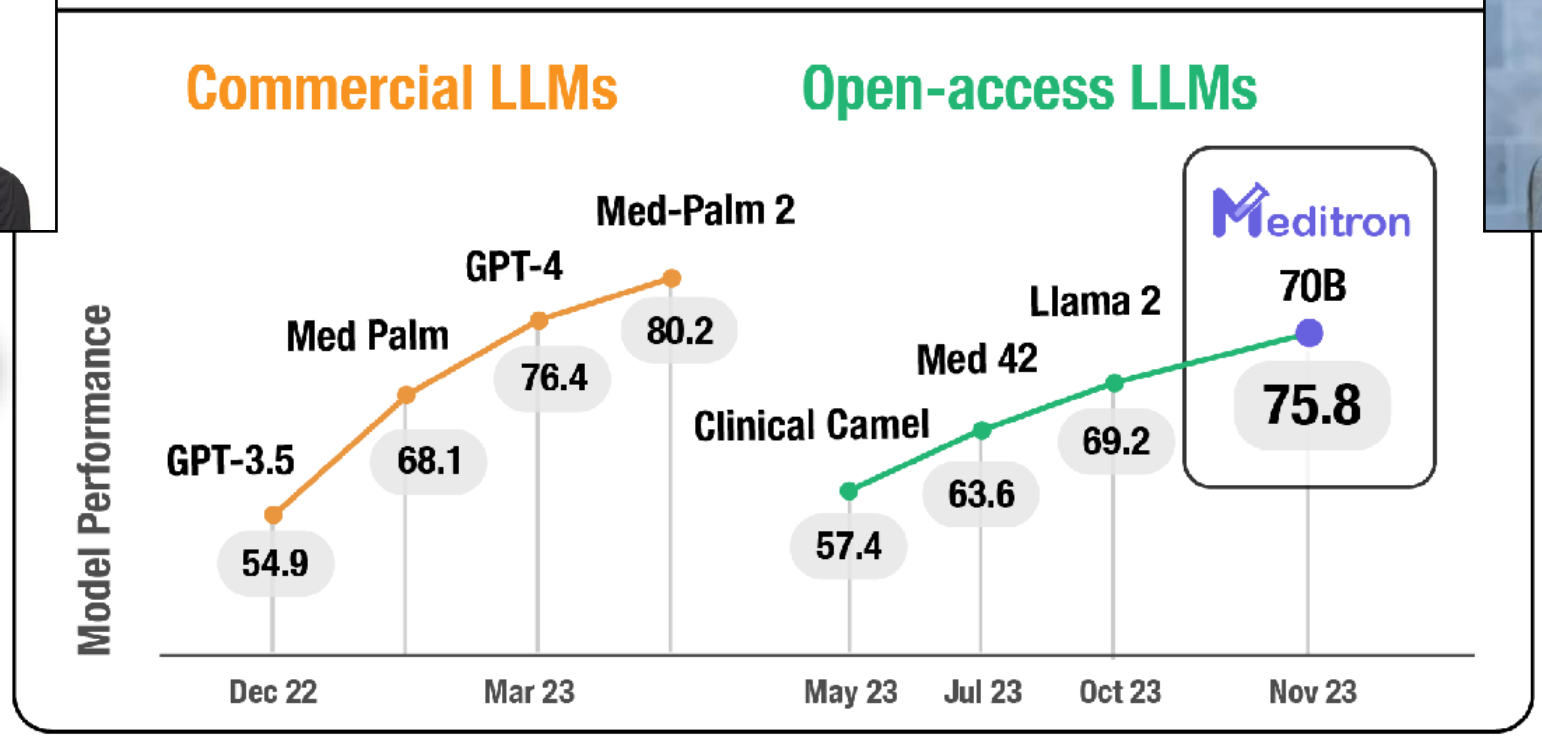
XCLAIM

C2SM
Center for Climate Systems Modeling

EPFL AI Center

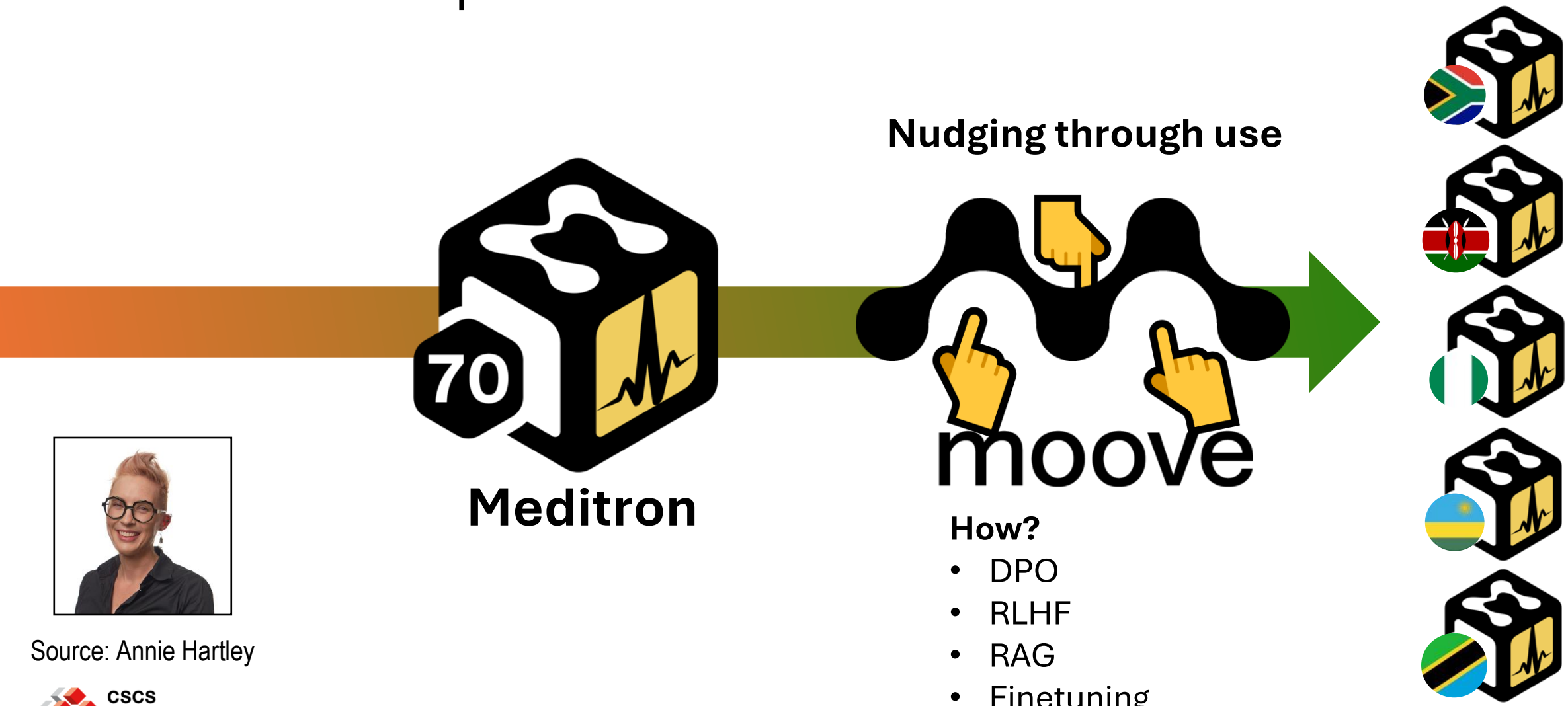
ETH AI CENTER

Meditron: LLM for clinical applications



As we speak: Swiss AI Initiative is training 70B parameter LLM base on fully open data

Nudging imperfect foundation with (moove)
Massive Open Online Validation and Evaluation



Source: Annie Hartley

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Swiss National Supercomputing Centre

Data Science Africa

Grassroots capability building organisation

- By Africa
- Student focus
- About solutions
- Sustainable and inclusive
- Agility

June 2024, Nyeri Kenya