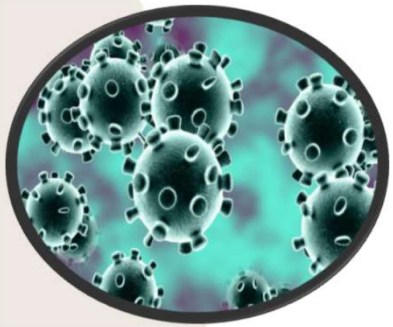

# Developing immunological assays with an eye on potential for generalizability

**WHO Assays WG**


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R&DBlueprint
Powering research to prevent epidemics

## To develop and standardize assays to support vaccine development

**+360** experts from **26** countries and **>130** entities were convened since Jan 2020

Live deliberations on **assay design and performance**

Researchers collaborating on **protocols** and access to reagents and proteins

Researchers collaborating on developing international and secondary **serology standards**

Improved **interpretability** of immune responses and harmonization of results

Enhanced **access** to assay, proteins and reagents for **ALL** developers

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**2020-2022** - focus of the group was on SARS-CoV-2

**2023** - pivoted to other WHO priority pathogens

- Sudan virus
- Marburg virus
- Lassa virus
- Plague
- Microphysiological systems
- Crimean Congo Hemorrhagic Fever virus

# COVID-19 Assays Achievements



- Viruses and other key reagents available
- Sharing of protocols and methods
- Binding assays developed – multiple antigens and formats – ELISA and multiplex
- Neutralization assays available– wtVNA, psVNA, sVNA
- T cell assays established (AIM, ICS, ELISpot) and common peptide pools
- Assess contribution of Fc functional Ab responses
- Practices to ensure integrity of working stocks of SARS-CoV-2 described
- Duration of immunity assessed
- Assays were adapted to assess impact of variants
- Data influenced decisions to boost or reformulate vaccines

# SARS-CoV-2 Antibody Standards

## International Standards: highest order calibrant - established by the WHO Expert Committee on Biological Standardization

- 20/136 – 1st Int. Stan. – Dec. 2020, depleted Aug. 2021
- 21/346 – 2nd Int. Stan. – Oct. 2022
- 21/338 - 1st Int. Stan for VOCs

## Secondary Standards: Regional or national reference material, calibrated to the IS

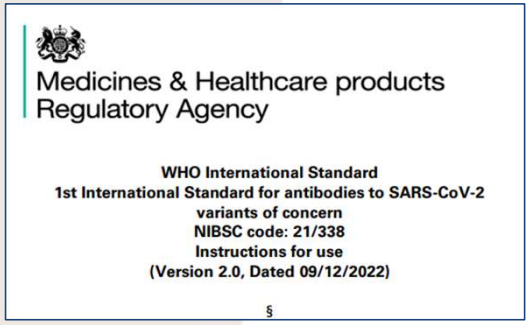
- Instructions for calibration https://cdn.who.int/media/docs/default-source/biologicals/annex-2---who-guidelines-on-secondary-standards-for-antibody-testing---11-may-2022.pdf?sfvrsn=c0d1c8ce_1&download=true
- Webinar conducted by assays WG – 10 Nov 2021 - https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccine-standardization/coronavirus-disease-(covid-19) (webinar link at bottom of page )


Medicines & Healthcare products Regulatory Agency

WHO International Standard
First WHO International Standard for anti-SARS-CoV-2 immunoglobulin (human)
NIBSC code: 20/136
Instructions for use
(Version 2.0, Dated 17/12/2020)


Medicines & Healthcare products Regulatory Agency

WHO International Standard
2nd International Standard for anti-SARS-CoV-2 immunoglobulin
NIBSC code: 21/340
Instructions for use
(Version 1.0, Dated 06/12/2022)


Medicines & Healthcare products Regulatory Agency

WHO International Standard
1st International Standard for antibodies to SARS-CoV-2 variants of concern
NIBSC code: 21/338
Instructions for use
(Version 2.0, Dated 09/12/2022)

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# Lessons Learned



- Unique role of WHO to convene consultations and facilitate connections between laboratories around the world resulted in rapid and open data sharing
- Sharing failure and success to avoid unnecessary replication
- Sharing pre-existing knowledge of coronaviruses allowed rapid progress, as well as sharing vaccine and assay experience from other diseases
- Value of platform technologies for speed and flexibility
- Lack of “gold standard” assays – multiple formats employed, emphasizing importance of antibody standards for comparison of results in IU

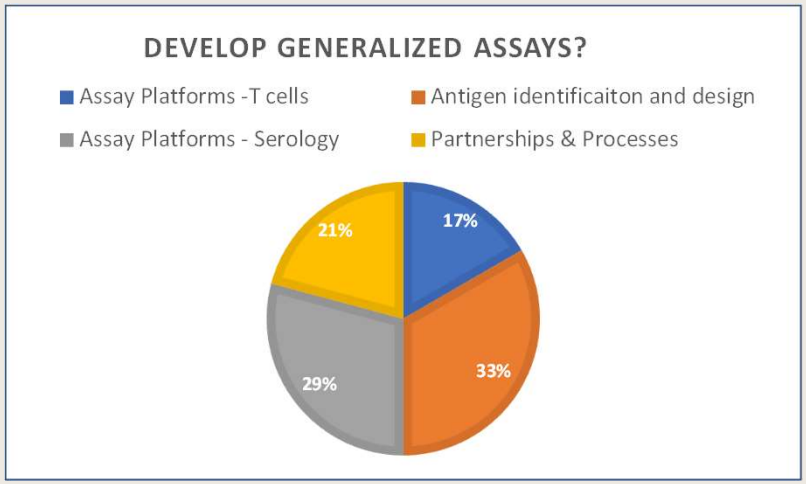
# Assays for Epidemic and Pandemic Preparedness – WG input

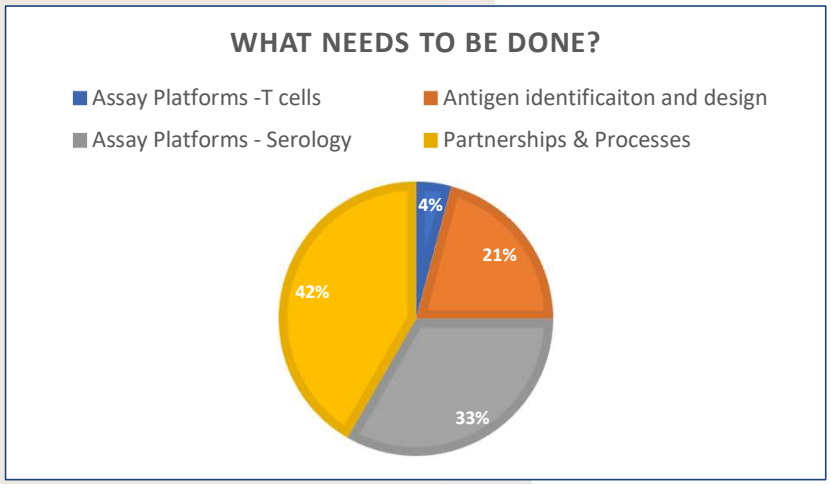


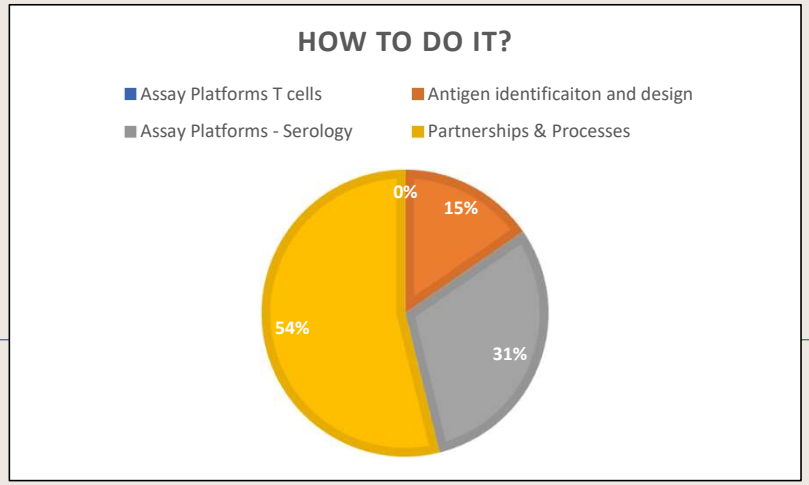
Questions sent to group 20 December 2023

## How can we develop immunological assays with an eye on potential for generalizability (developing for pathogen X)?
## What needs to be done?
## How to do it?

# Survey Results Summary



# Antigen identification and design



- For each viral family, Identify highly conserved proteins and proteins that will be the basis of vaccines
- Utilize multiplex and other high throughout assays to identify epitopes bound by antibodies
- Identify viral receptors on human cells
- Develop optimized antigen designs for multiple members of each viral family
- Establish whether  the same regions immunogenic in humans are recognized in animal models to determine the utility of these models for immunogenicity or efficacy assessment.

# Assay platforms



- Develop assay platforms that allow rapidly swapping in pathogen X-specific components when identified
- Use multiplex assays to assess multiple antigens simultaneously (including across viral genus/ family)
- Assess T cell responses with existing assays based on AIM, ICS and ELISPOT platforms; establish and distribute high quality peptides
- Compile summaries for assay platforms including performances metrics for known pathogens, scalability, throughout, and cost per sample.
- Generate positive control sera from animals (including humanized animals) if human convalescent sera are not available

# Partnerships and processes



- Continuously update and disseminate lists of candidates for pathogen X
- Create partnerships or establish international core facilities to produce and distribute antigens, peptide and antibody reagents
- Create partnerships to share viruses, sequences and samples and create secondary and working standards
- Transfer to facilities/labs in LMIC so that they can also produce materials and develop assays locally.
- Pre-arrange processes for sample sharing, procurement of common reagents, rapid sharing of results and data and fast access to standards for comparing / verifying assays.
- Establish partnerships and processes to evaluate commercial tests

# Summary



- The WHO Assays working group was established to coordinate the development and standardization of immune assays to support vaccine development for COVID-19 , and then later for other WHO priority pathogens
- Continued sharing of protocols, methods and results will help to advance the development of immunoassays for Disease X vaccines
- Research done in advance of an epidemic or pandemic, as well as pre-established partnerships and processes, will shorten the time needed for implementation
- Use of novel, high throughput platform technologies applied to viral or bacterial families will allow rapid adaptation to newly emergent pathogens

# Thank you

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