WHO, Scientific strategies from recent outbreaks to help us prepare for *Pathogen X*, 2022

**Developing therapeutic antibodies for pandemics**

Dr. Anne Ljungars

Technical University of Denmark
Personal background

• Phage display antibody discovery
• Screening and assay development
• Project management

PhD in Immunotechnology (2020)
What are antibodies?

How can they be discovered?

What are some of the challenges with developing antibodies for infectious diseases?
Antibody discovery: antibodies isolated from animal/human plasma

Immunize animal with antigen

Collect plasma

Purify antibodies

Undefined polyclonal mixture of antibodies

Laustsen et al. Trends biotechnol 2021
Antibody discovery: monoclonal antibodies through hybridoma technology

1. Immunize animal with antigen
2. Harvest splenocytes to generate hybridoma cell lines
3. Purify antibodies
4. Mouse monoclonal antibody
Antibody discovery: monoclonal antibodies though hybridoma technology

1. Immunize transgenic animal with antigen
2. Purify antibodies
3. Harvest splenocytes to generate hybridoma cell lines
4. Hybridoma cell
5. Human monoclonal antibody

Laustsen et al. Trends Biotechnol 2021
Antibody discovery: display technologies

Linking genotype and phenotype

- Phage display
- Ribosome display
- Yeast display
- Mammalian display
Antibody discovery: display technologies

1) Antigen presentation

2) Binding

3) Washing

4) Elution

5) Phage amplification

Antibody discovery: combining *in vivo* and *in vitro* technologies

1) Antigen presentation
2) Binding
3) Washing
4) Elution
5) Phage amplification

Antibody discovery: machine learning and AI
Pathogens change quickly - escape mutants and AMR

Pathogens change their antigens when put under pressure
Pathogens change quickly - escape mutants and AMR

Antibodies are typically very specific
Pathogens change quickly - escape mutants and AMR

Broadly neutralizing antibodies needed
Broadly-neutralizing antibodies can be achieved through technical advancements

Design and use of consensus antigens
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Antigen design and its usage important.
Access to antigen and predictive assays important

Safe handling of antigens

Predictive *in vitro* and *in vivo* models needed
Parallel versus sequential activities, risk, recourses, and price affect the timeline

Antibody discovery → In vitro and in vivo testing → Cell line development → Clinical testing
Scale up and distribution is a challenge

Protein → mRNA
Regulatory challenges
Thank you for your attention!

aellj@dtu.dk