Evaluation of Monoclonal Antibodies

Giulia Piccini, PhD
Senior Project Director
VisMederi
giulia.piccini@vismederi.com
How do monoclonal antibodies work?

**Vaccines** actively teach the body to recognize pathogens, through production of antibodies.

**Virus** enters the body and replicate within epithelial cells.

**Monoclonal antibodies** can be passively administered to patients.

**B cells** produce antibodies.

**T helper cells** are activated.

**Cytotoxic T cells (CTL)** identify and destroy virus-infected cells.

**Antibodies** bind to pathogen.

**Neutralize and block** pathogen from entering cells.

**Tag** pathogens for destruction.

**Benefits of mAbs:**

- Can be a therapeutic treatment -> function rapidly
- Provide protection to exposed and not yet vaccinated (eg. healthcare workers)
- May be required for those that cannot maintain / develop an adequate immune response after vaccination (eg. elderly / immunocompromised)

**Limitations of mAbs:**

- Short-lived protection
- High specificity may rapidly loose efficacy
- More expensive than vaccines
Case study 1: How to identify and develop monoclonal antibodies

Identification of extremely potently neutralizing monoclonal antibodies from Italian Covid-19 convalescent patients


→ Unfortunately mAb was not effective against Omicron
Characterization of monoclonal antibodies – Binding and Neutralization

**Live Virus Neutralization** Assay -> to determine if antibody block and neutralize virus (functional)
*Virus*: Live Virus
*Readout*: Citopatic effect (MN-CPE) or Plaque reduction (PRNT)
*Limits*: BSL3 required for some viruses (such as SARS-CoV-2)

**Pseudovirus Neutralization** Assay -> to determine if antibody block cell entry (surrogate of functional)
*Virus*: VSV-based, LV-based expressing protein of interest and a reporter gene
*Readout*: Luminescence

**ELISA** Assay -> to determine if antibody binds the antigen (not functional)
VisMederi Laboratory assays for monoclonal antibodies evaluation

- Methods fully developed for SARS-CoV-2
- Possibility to use live virus (functional, BSL3) or pseudovirus / antigens (not functional, BSL2)
- Other assays available on request
- Most methods are validated
- Possibility for customization
- Possibility to develop the same/similar assays using other viruses (eg. Influenza, RSV...)

VisMederi Laboratory assays for monoclonal antibodies evaluation
Case study 2: How to predict mutations – Viral Escape Assay (Live)

SARS-CoV-2 escape in vitro from a highly neutralizing COVID-19 convalescent plasma

---

**E484K later emerged in Beta and Gamma → VE assay can predict mutations in real setting!**

---

THANKS FOR YOUR ATTENTION