MOLECULAR DEVICES

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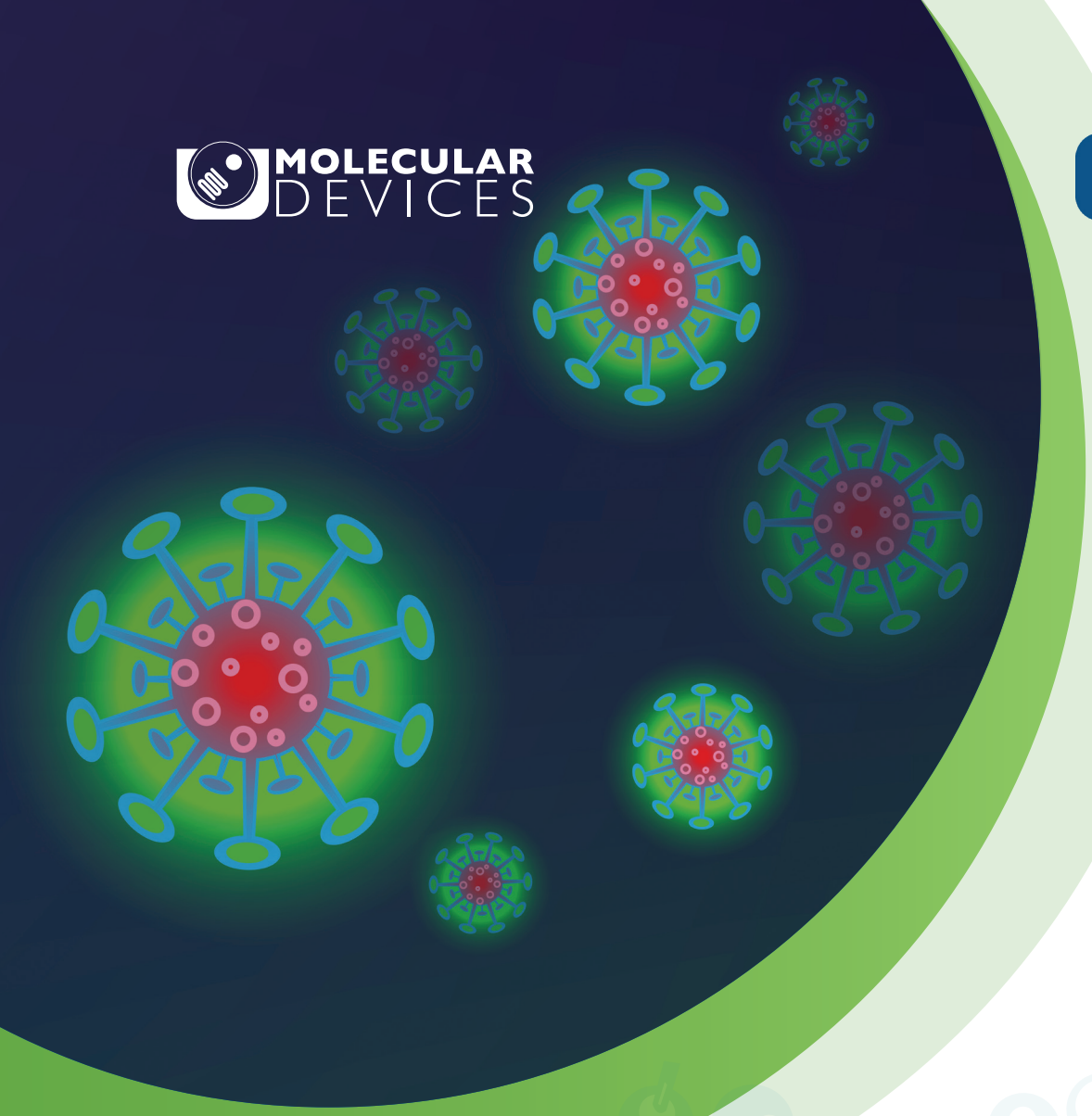
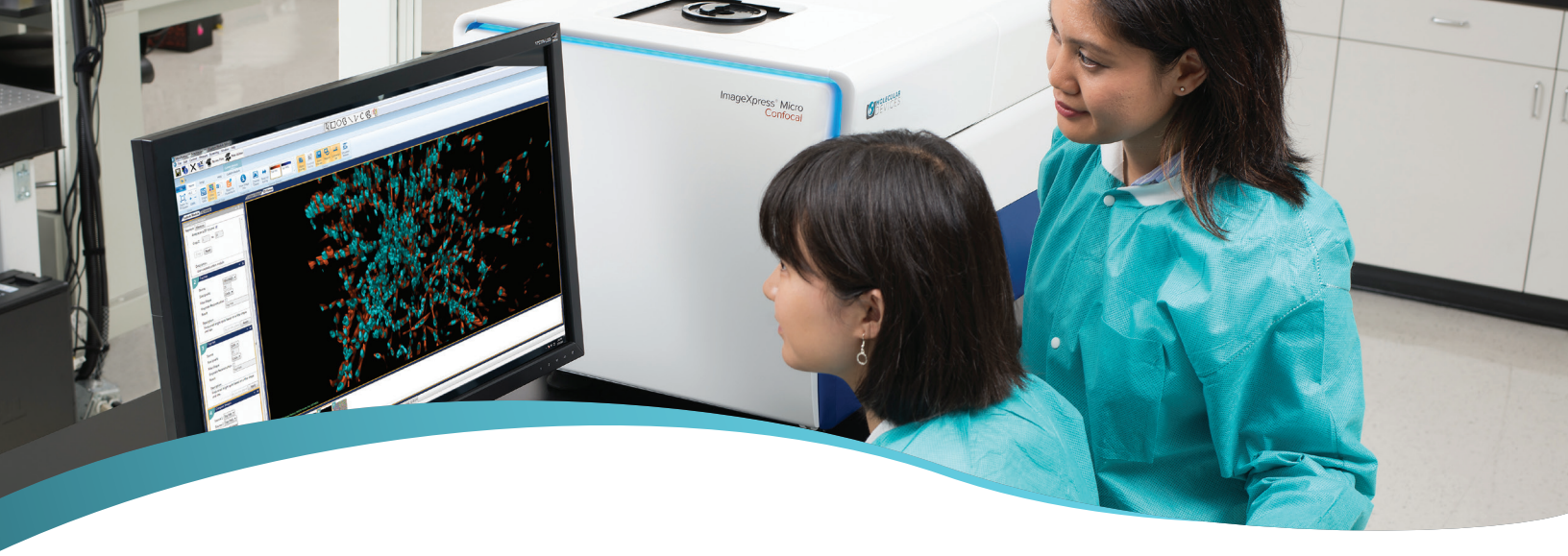


# Virology and immunology research solutions

Accelerate your research with your innovation partner

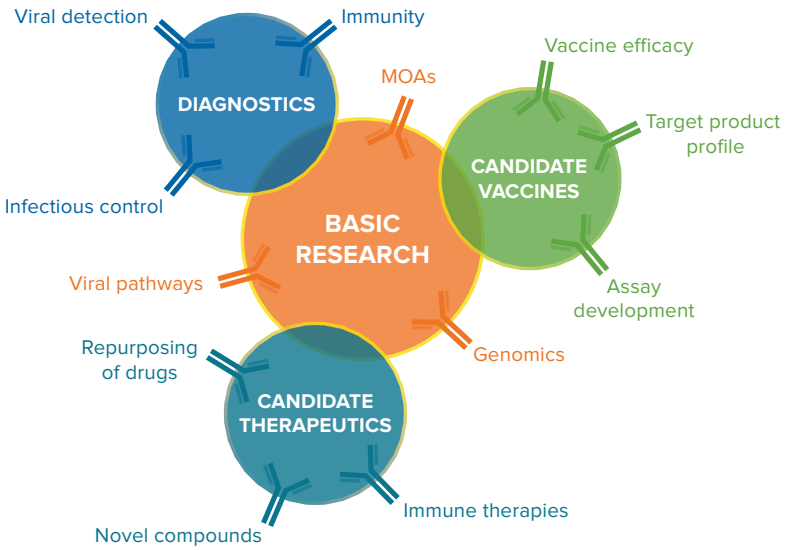



Accelerating research to provide testing and medicines to the market as soon as possible can be very challenging. Molecular Devices is here to support your research needs by offering technology and solutions that you can deploy rapidly. We're committed to supporting scientists that are researching cellular response and vaccine development. We provide validated and compliant laboratory solutions to help accelerate your research—from cell line development systems to cellular imaging, microplate readers, washers, and GxP software and validation services to meet your needs.

### Our customers are developing potential therapies for viruses, including:

- Vaccines
- Recombinant proteins, including monoclonal antibodies
- Repurposing of drug molecules already approved, or in clinical trials, for other viruses
- Developing diagnostic and research tools using antibodies

Vaccine development workflows vary depending upon the platform (e.g. inactivated virus vs. DNA vaccine) chosen, each having its own advantages. In order to increase the likelihood of success against the infectious agent, CEPI (Coalition for Epidemic Preparedness Innovations), and many other organizations promote diverse approaches during a pandemic.




## Key applications

- Cell count/cell viability
- Cell line development
- Protein/antigen binding affinity
- Protein/nucleic acid quantification (non-specific)
- Protein/nucleic acid quantification (specific)
- Viral neutralization
- Viral pathogenesis (viral pathways)
- Viral titer

# Streamline your compliance journey in GMP/GLP labs

## Ensure data integrity, compliance, and audit readiness—in line with the latest FDA guidance

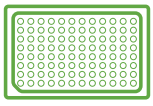
Molecular Devices is a leader in comprehensive compliance solutions with microplate detection systems and software. Combined with validation services and support, our solutions assure data integrity. Our expert team will partner with you to support your GMP/GLP regulated work.


### READERS & WASHERS

Best-in-class microplate readers and washers for all your assay needs.


### SOFTMAX PRO GxP SOFTWARE

Our most secure software to achieve full FDA 21 CFR Part 11 compliance.



### VALIDATION PLATES

Validation plates test the performance of your microplate reader using traceable materials for reliable results.


### IQ/OQ & PM/OQ SERVICES

Comprehensive OEM operational qualification and repair coverage for microplate readers and washers.

### INSTALLATION SERVICES

Software installation services verify and document that required components are installed to operational specifications.

### VALIDATION SERVICE

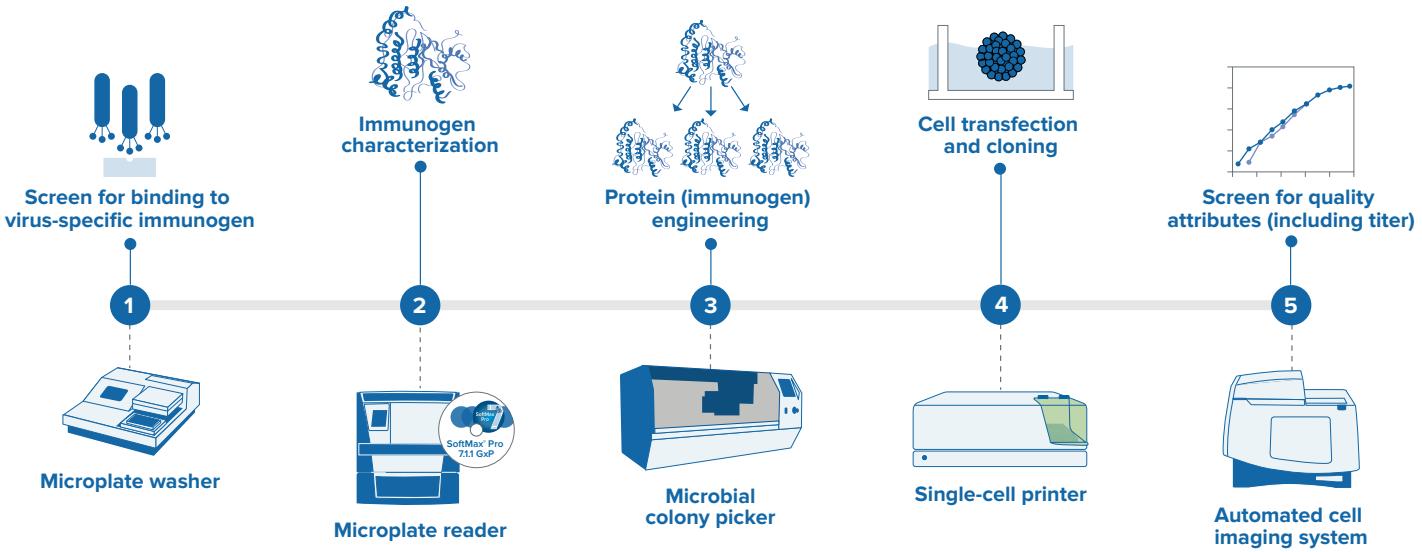
On-site software validation service is conducted by our certified Field Service Engineer.

### RECERTIFICATION SERVICES

Validation plates are cleaned, calibrated, and recertified according to ISO 17025, and returned to you with a new certificate of calibration.

# Immunogen discovery workflow

This is a general workflow for vaccine development using recombinant proteins as the immunogen, referencing a few of the systems we have available that you may use to aid your research.




**1 Screen for binding to virus-specific immunogen**

Screen virus-specific immunogens through binding using phage display

**2 Immunogen characterization**

Characterize lead immunogen candidates

**3 Protein (immunogen) engineering**

Optimize lead immunogen sequence and structure to enhance anti-viral function

**4 Cell transfection and cloning**

Introduce lead immunogen sequence into cells for protein expression

**5 Screen for quality attributes, including titer**

Screen transfected cells to identify clones with high protein yield and desired quality attributes

## Customer breakthrough

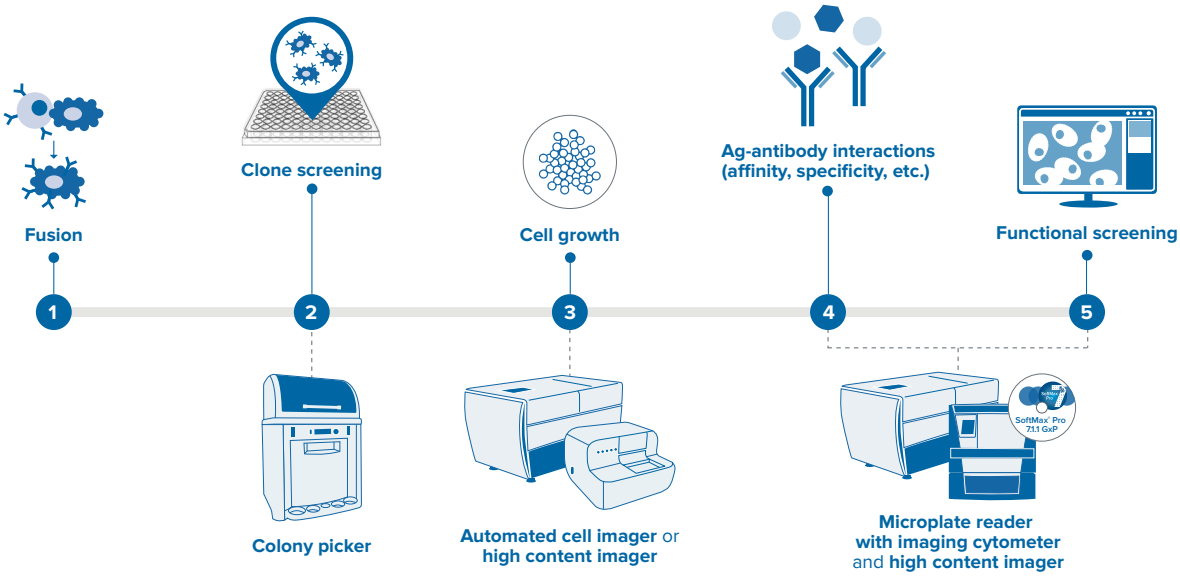
University of Zurich uses the ImageXpress Widefield System to investigate host pathogen interactions.

*"We needed to be able to image and rapidly quantify fluorescent viral plaque formations accompanied by numerous other markers of choice in an automated and screening-compatible fashion."*

—Vardan Andryasian

# Workflow for hybridoma generation and screening of large antibody libraries

Hybridoma technology is a method for mass-producing antibodies in a hybrid cell line generated from the fusion of antibody-producing B-cells with an immortalized myeloma cell line, now called a hybridoma cell. Because every B-cell produces a unique antibody, single-cell cloning of hybridomas can be used to generate a diverse library of unique monoclonal antibodies at a large scale, which are very frequently used in the prevention, diagnosis, and treatment of disease.




## 1 Fusion

The process of fusing B cells, expressing unique antibodies, with myeloma cells creating a hybrid cell line is called a hybridoma.

## 2 Clone screening

The identification of clonally-derived hybridoma cell lines which are producing high amounts of monoclonal antibodies.

Accelerate hybridoma and antibody discovery—Screen 10X more clones than antibody dilution and increase the probability of identifying high value clones with **ClonePix™ 2 Mammalian Colony Picker.**

## 3 Cell growth

Cell growth is determined by monitoring cell divisions over a given period of time using label-free imaging.

## 4 Specificity and cross reactivity

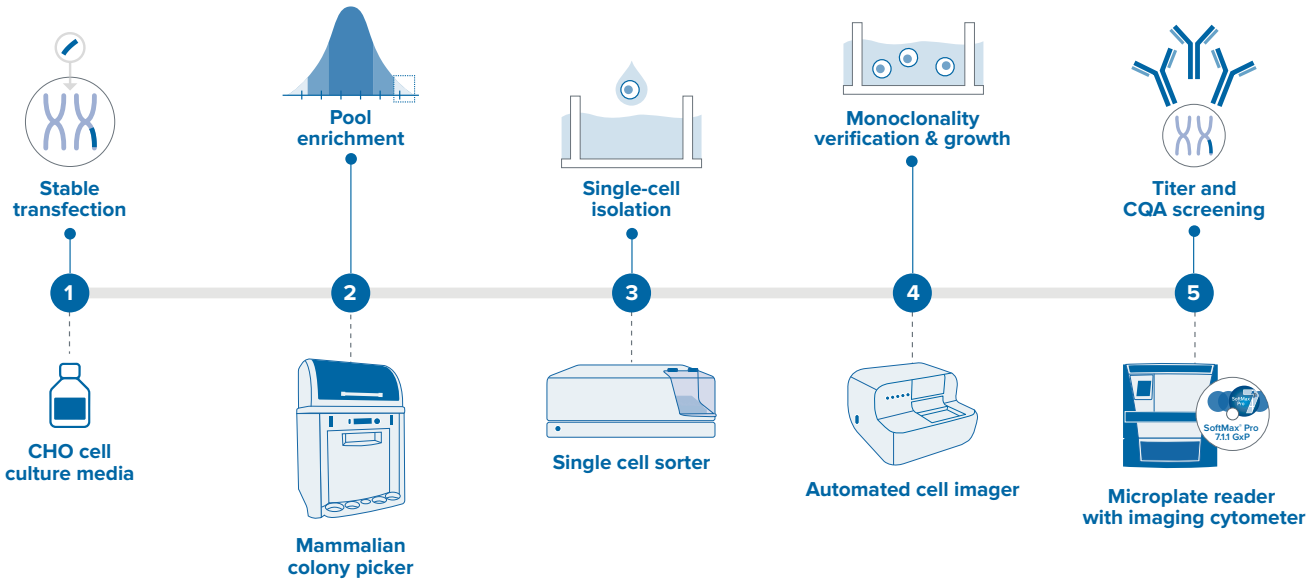
The process of analyzing the ability of an antibody to bind to only one target antigen.

## 5 Binding affinity and internalization

Binding affinity is the strength of the binding interaction between a single biomolecule (e.g. protein or DNA) to its ligand/binding partner (e.g. drug or inhibitor). Internalization is the process of monitoring the ability of a given particle to enter into the cell.

# Typical cell line development workflow

Cell line development is the process of establishing a clonally-derived cell population which, has been genetically engineered to express a desirable phenotype (such as producing large amounts of recombinant protein) for a stable period of time. Single cells proliferate to form colonies that can then be assessed for the desirable characteristic.




## 1 Stable transfection

The process of cell line development begins with the introduction of foreign DNA (encoding the recombinant protein of interest) into a host cell, a process known as transfection. Upon transfection, cells begin expressing protein for a transient period of time (usually less than a week) before completely halting production. However, a small subpopulation maintain their ability to express recombinant protein for long periods of time due to integration of the foreign DNA into their genome. They are referred to as stably transfected cells and are selected to move forward in the next step.

## 2 Pool enrichment

Foreign DNA encoding the protein of interest often includes an additional selectable marker that can be used to separate stably transfected cells from nontransfected cells. For example, green fluorescent protein (GFP) is often added to the foreign DNA so that transfected cells exhibit fluorescence and can be differentiated from non-transfected cells that do not fluoresce. There is a strong correlation between the expression levels of the recombinant protein and the GFP marker included in the foreign DNA, allowing researchers to use GFP fluorescence intensity to identify and enrich their cell pools for high protein expression.

## 3 Single cell isolation

The process of stable transfection, whether targeted or random, will generate a cell population with heterogenous protein expression. Therefore, single cells must be isolated and cloned in order to ensure that the cell population is genetically identical, significantly reducing the heterogeneity of expression. Single-cell isolation is the process of separating individual living cells from a solid block of tissue or cell suspension for further analysis.

## 4 Monoclonality verification and cell growth

Single-cell cloning is an extremely critical stage of the cell line development process. It is important to verify that single cells are properly isolated from one another within a microplate, and is often documented using a cell imager. Cells are typically monitored for growth following the cloning stage to ensure that their growth properties have not changed dramatically. This includes the process of tracking the progress of a single cell into a colony of cells.

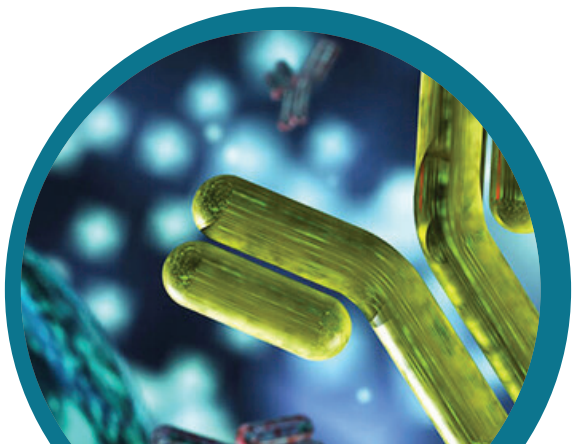
Verify monoclonality with a label-free workflow including a **CloneSlect™ Imager**.

Key benefits:

- Image-based evidence of clonality
- Increased viability and clone throughput
- Automated export of clonality data for regulatory submission

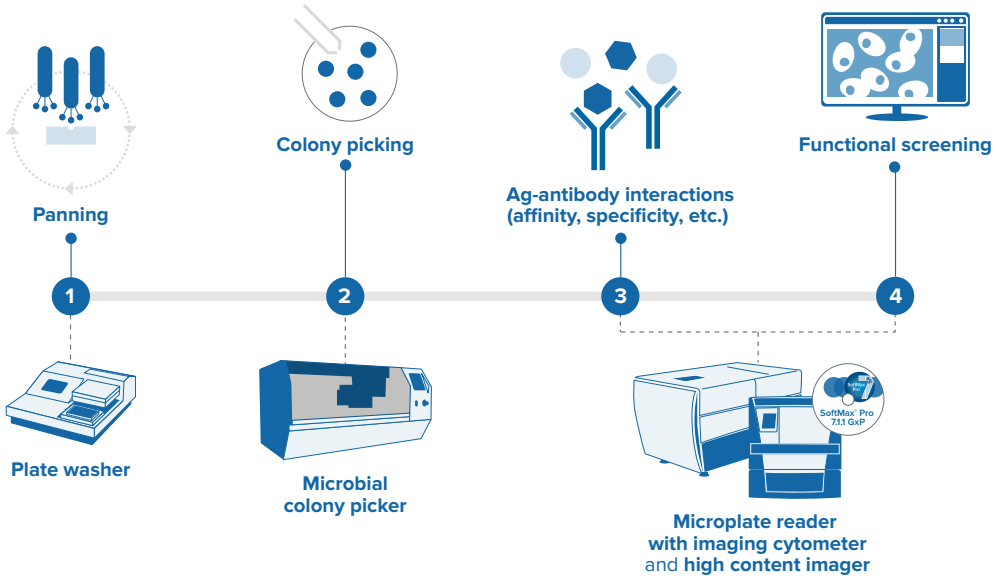
## 5 Titer and CQA screening

This is a test that detects the amount of recombinant protein or antibodies produced from the clonally-derived cell line.



# Phage display workflow

Phage Display is a technique used to study the interaction of proteins displayed on the surface of a bacteriophage with other molecules such peptides, DNA, and other proteins. Phage display is commonly used to find high affinity interactions between antibodies and antigens, which play a critical role in viral pathogenesis, vaccines, and other treatments.

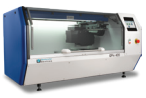



## 1 Panning

Panning is an iterative process for enriching phage within a population that possess high affinity binding to a target of interest compared to others.

## 2 Colony picking

Bacteriophage selected from the previous step are then cloned and picked in order to isolate each unique protein binder.



Pick and screen 30,000 colonies and save up to eight hours per day with the automated **QPix™ 400 Series Microbial Colony Picker**.

## 3 Ag-antibody interactions

During panning, phages displaying proteins with higher binding affinity are selected in relation to phages displaying lower affinity proteins. This qualitative selection process requires validation using more quantitative immunoassays to assess antibody-antigen interactions such as ELISA, immunofluorescence, HTRF, complement fixation, agglutination, and/or precipitation.

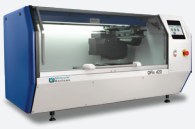
## 4 Functional screening

Following the characterization of antibody-antigen interactions, candidate molecules are then screened for functional activity (e.g. viral neutralization or vaccine efficacy), often using cell-based assays.

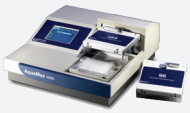
## Virology and immunology research—Molecular Devices solutions

CloneSelect™ Imager

ClonePix™ 2 Mammalian Colony Picker



Qpix™ Microbial Colony Picker



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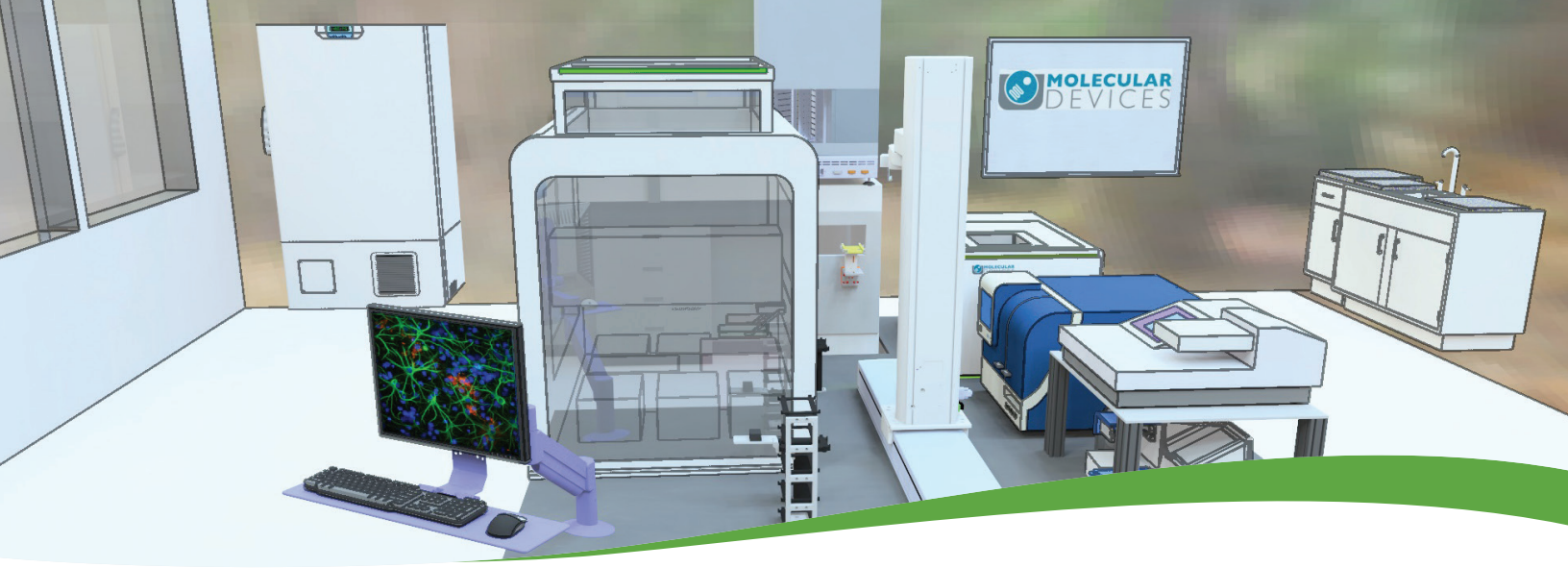


# Streamline lab automation workflows with robotics and software tailored to your meet your application, assay, method, or protocol

We offer services from consultation to implementation, including throughput analysis, software and hardware customization, factory acceptance, site acceptance, and validation testing. We take a consultative approach to understand your application requirements and recommend labware, lab robotics, and software solutions that best match the unique needs of your application.

## Key benefits of automating an infectious agents workflow

- Automated instruments offer standardized processing technology for specimen extraction, specimen amplification, and detection of molecular targets
- Minimal operator interaction is required, improving workflow, test throughput, and overall efficiency of laboratory operations
- Reduce exposure to viral agents, bacterial agents, parasitic agents and more
- Automated molecular testing has become routine in clinical laboratory practice, ensuring diagnostic accuracy and improved result turnaround time

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