

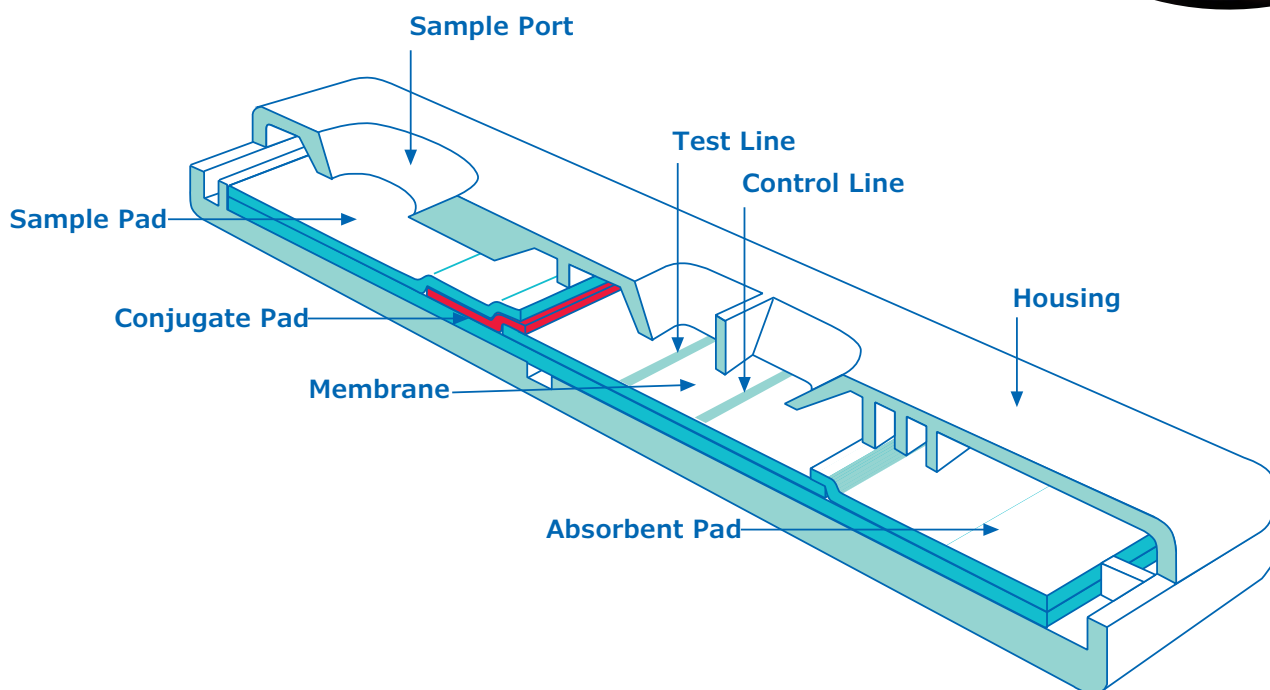


Optimizing Lateral Flow Tests

Membrane Selection and Performance Insights

What are Lateral Flow Tests?

Lateral flow tests (LFTs) are simple devices used to detect the presence of a target substance in a liquid sample without the need for specialized and costly equipment.



Schematic view of the main components of a LFT. Each component plays a crucial role in the test's functionality.

The sample is applied to the sample pad, which evenly distributes it through capillary action and may condition it with buffer salts for optimal flow. As the sample moves to the conjugate pad, it encounters detector particles coated with antibodies that bind to the target analyte. The mixture then migrates through the membrane, where immobilized capture antibodies at the test line trap the analyte-detector complex if present, forming a visible line to indicate a positive result. A control line also captures excess detector particles to confirm the test's validity. Finally, the absorbent pad at the end of the strip absorbs excess sample, ensuring continuous flow and proper function of the test.

The COVID-19 pandemic significantly amplified the use and development of LFTs, as they became a crucial tool for rapid, widespread testing of SARS-CoV-2 antigens.

Sample types

Serum



Serum-based LFTs detect blood analytes like hormones and antibodies, aiding in disease diagnosis and monitoring. They require efficient separation of blood cells to ensure smooth flow, often using blood filter matrices. These tests are crucial for rapid, minimally invasive diagnostics in clinical settings.

Saliva



Saliva-based LFTs offer a non-invasive way to detect disease biomarkers, benefiting from easy collection, especially for children. Despite lower analyte concentrations than serum, advances in assay design have enhanced their sensitivity and specificity. Widely used during the COVID-19 pandemic, these tests facilitate mass screening and self-monitoring.

Urine



Urine-based LFTs detect pregnancy, drug use, and infections, leveraging urine's easy collection for repeated testing. Variations in urine composition require sample pads with buffer salts for stability. These tests provide valuable health insights in both clinical and home settings.

Buffer



Buffer-based LFTs are used in labs for research and development, providing a stable environment for reagents. They ensure consistent test conditions, aiding in calibration and performance validation. Buffers allow researchers to fine-tune test components for optimal sensitivity and specificity.

Water



Water-based LFTs detect contaminants like pathogens and pollutants, crucial for environmental monitoring and water safety. They require high sensitivity due to low contaminant concentrations and must handle varying water conditions. These tests offer rapid, on-site solutions for timely health risk interventions.

Applications



Infectious Disease Detection

LFTs are widely used for rapid detection of infectious diseases, such as COVID-19, influenza, and HIV. These tests provide quick results, enabling timely diagnosis and treatment, and are crucial for controlling outbreaks.



Pregnancy Testing

One of the most common applications, pregnancy LFTs detect the hormone hCG in urine, offering a simple and reliable method for confirming pregnancy at home.



Drug Testing

LFTs are employed for detecting drugs of abuse in urine or saliva. They provide a convenient, non-invasive way to screen for substances like opioids, cannabis, and amphetamines, commonly used in workplace testing and rehabilitation programs.



Food Safety

LFTs are used to detect contaminants and allergens in food products, ensuring safety and compliance with regulations. They provide rapid results, helping manufacturers prevent foodborne illnesses and allergenic reactions.



Veterinary Diagnostics

LFTs are used in veterinary medicine to diagnose diseases in animals, such as canine parvovirus or feline leukemia. They offer quick, on-site testing, aiding in the prompt treatment of pets and livestock.



Environmental Monitoring

LFTs are utilized for detecting pollutants and pathogens in water and soil. They provide on-site, rapid testing solutions, essential for environmental protection and public health safety.



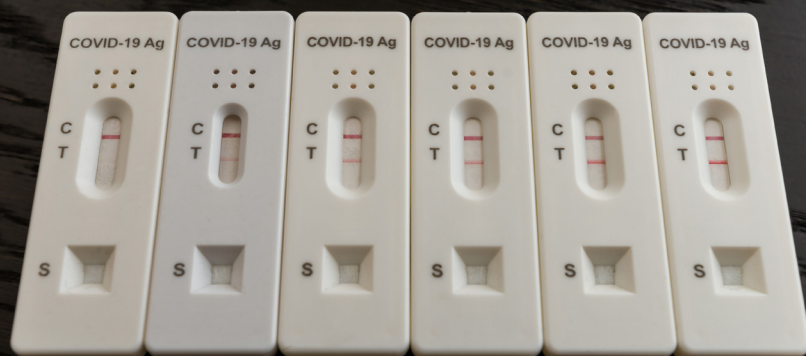
Biomarker Detection

LFTs detect specific biomarkers in biological samples, aiding in disease diagnosis and monitoring. They are used in clinical settings to assess conditions like cardiac events or cancer.



Hormone Monitoring

LFTs measure hormone levels in various samples, such as saliva or blood, to monitor conditions like fertility or thyroid function. They offer a non-invasive and convenient method for regular monitoring.



Membrane Selection

Selecting the appropriate membrane is critical for assay performance. Hi-Flow™ Plus membranes vary in flow rate and sensitivity, catering to different sample types and testing needs. Key factors to consider when choosing a membrane include:

1 Sample Type Compatibility

Different membranes are optimized for various sample types. For instance, HF180 is ideal for low viscosity samples, while HF090 is better suited for high viscosity samples like saliva or food testing.

2 Capillary Flow Rate

The speed at which the sample moves along the test strip. Membranes with slower flow rates (e.g., HF180) allow more time for interactions between the target molecule and the capture reagents, increasing sensitivity. Faster flow rate membranes (e.g., HF075) are suitable for applications where speed is critical.

3 Surface Quality

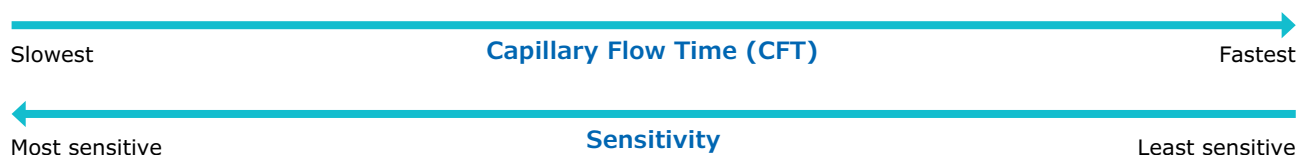
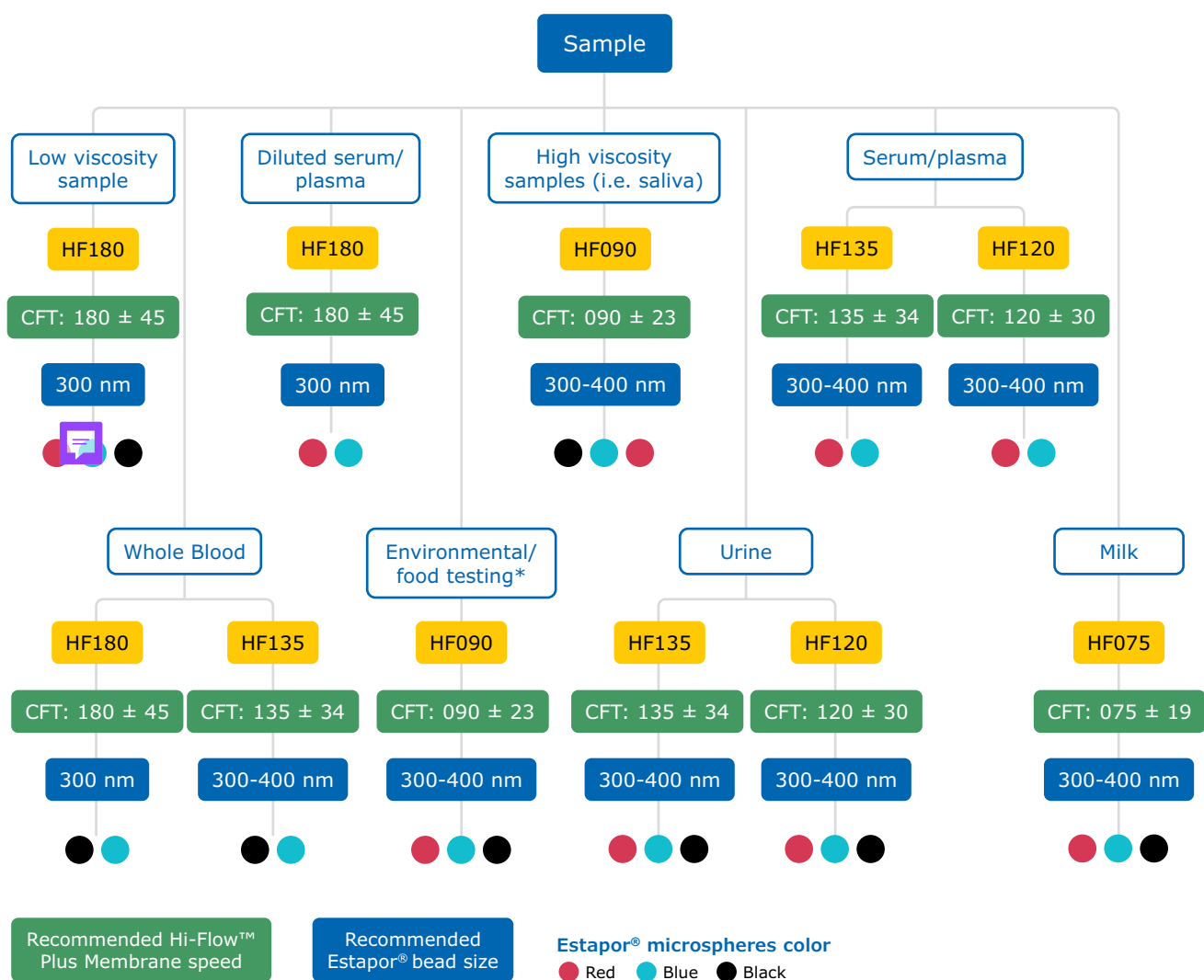
A smooth, defect-free membrane surface enhances the sharpness of test and control lines, thereby improving the clarity of results. A clear white membrane background offers excellent contrast for colored or fluorescent signals, making result interpretation easier.

4 Membrane Material

The polymer composition of the membrane affects its binding properties, with nitrocellulose being the most common material due to its high protein-binding capacity, which allows it to immobilize capture reagents for the test and control lines.

5 Reagent Consumption

The amount of reagents required for the test. Slower flow rate membranes generally consume fewer reagents, making them more cost-effective for certain applications.



Matching sample types with suitable Hi-Flow™ Plus membranes. Simply choose your sample type (white boxes) to obtain the corresponding membrane type (yellow boxes) and Estapor® bead size (colored squares) for your research. Estapor® beads are polymer microspheres that facilitate signal generation and antibody-antigen interactions. The choice of microsphere size, composition, and surface functionality can be optimized to enhance the overall performance of the lateral flow test. CFT (Capillary Flow Time) is the time required for a liquid to move along and fill a strip of defined length. This value is typically expressed as sec/cm and is inversely related to the flow rate.

*Dependent on food color

Further Resources

Application note

[Rapid Lateral Flow Tests: Considerations for Product Development](#)

For more information on lateral flow tests, [visit our website](#).