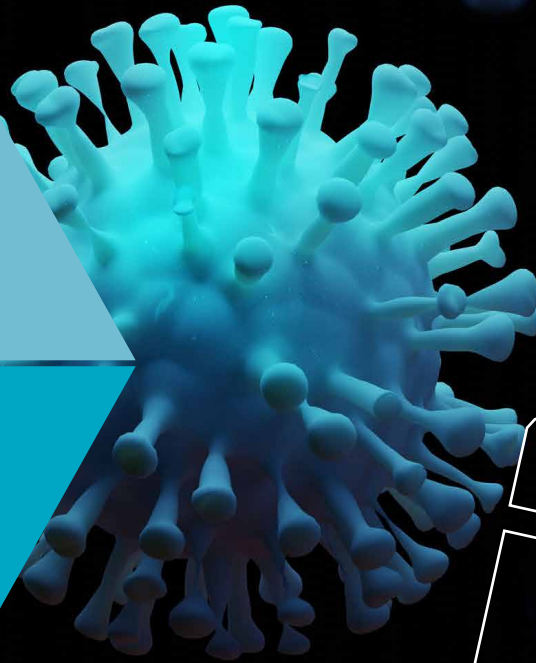


SILVER AMPLIFICATION TECHNOLOGY FOR EARLY COVID19 DETECTION

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In Vitro Diagnostics

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Rapid and sensitive detection of respiratory infections caused by viruses including SARS CoV2 infection are essential for treatment and isolation of patients. Early diagnosis is critical in medical practice.

For the detection, rapid diagnostic kits based on immunochromatography are widely used.

To help avoid false negative rates with patients who have been just infected and carry a small amount of virus only, we have developed a highly sensitive immunochromatographic rapid detection system using silver amplification, applying our accumulated photo technology to rapid diagnosis. The detection system consists of “FUJI DRI-CHEM IMMUNO AG cartridge” which integrates the silver amplification reagents.

For SARS CoV2 we have developed a cartridge for easy manual use which can be used on a standalone basis, whereas other respiratory viruses, like Influenza and RSV will be used with a reading device “FUJI DRI-CHEM IMMUNO AG2” that automatically determines whether the result is positive or negative.

How does an immunochromatographic works

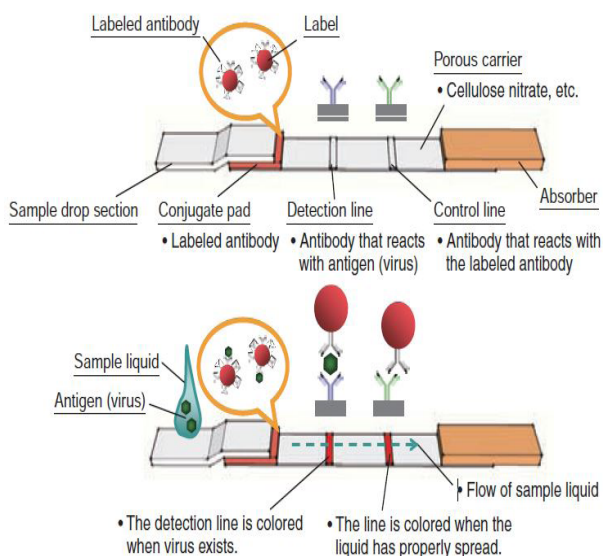
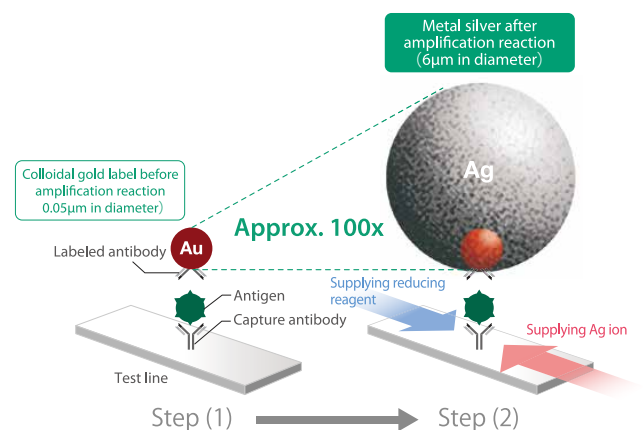


Fig. 1 principle of immunochromatographic detection kit

When a sample liquid containing an antigen (virus) is dropped onto the sample drop section, the labelled antibody in the conjugate pad is specifically bound to the antigen. The sample liquid is spread horizontally (to the left in Fig. 1) by the capillary force of the porous carrier and absorbed by the absorber. The detection line on the porous carrier is coated with an antibody that reacts specifically with a virus. The label is fixed to the detection line with the virus sandwiched between the antibody and the labeled antibody. That colors the detection line and indicates that the result is positive. Common substances used as the label include gold particles and dyed latex particles. Gold particles are widely used because it is easy to modify an antibody with them as they are 10 to 100 nm in particle size and vivid red due to the surface plasmon.

Increasing sensitivity by photographic technology

There are many methods of the amplification technology, for example, the instant photographic technology and the dry silver photographic technology employed for x-ray film. We have examined those methods in various aspects, and as a result, found that physical development is the most suitable for immunochromatography.



Physical development is to supply silver ions and a reducing agent to the photographic film from the outside and increase the size of silver particles using the small silver particles in the film as a catalyst. We studied this technology in depth from the late 1970s to the early 1980s when we put our effort to save silver in silver halide photography as silver price soared.

Based on this technology, we designed formulation for producing large silver particles quickly, and we have succeeded in formulating an amplification liquid that multiplies visibility more than 100 times. Silver is attached to the virus label, and then amplified, making the detection easier.

Silver Amplified Immunochromatography Packed in a Cartridge

Many conventional immunochromatographic tests are very simple. All you have to do is to drop a sample liquid onto the kit and see whether the detection line is colored. Our silver-amplified technology would normally require an additional washing process and amplification process. That would make the operation much complicated than those of the conventional methods.

However, we have found a way of avoiding complex extra steps. Just by pressing an additional button on the cartridge, the silver amplification step is initiated and the high sensitivity result is visible after a few minutes.

In response to Covid-19 pandemic, Fujifilm has commenced the development of a cartridge to detect the virus. Fujifilm uses its proprietary silver amplification immunochromatography method described above to provide a fast and highly-sensitive SARS-CoV-2 antigen test kit. The development uses antibodies that can detect SARS-CoV-2 antigens, to be supplied by the Public-University Corporation Yokohama City University (Kanagawa, Japan).

Rapid Antigen Test for COVID-19



How to use

