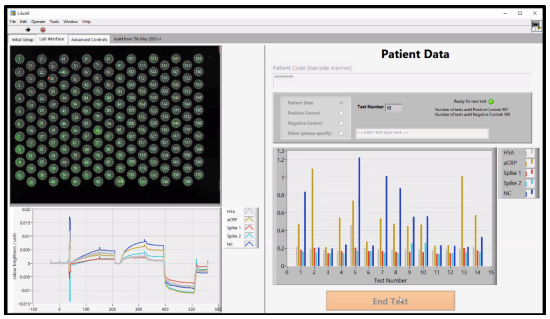
# The Next Generation Triple Antibody Test

**Introduction:** Testing for COVID-19 infection currently relies on taking a swab sample from the patient's throat or nose. Recent research suggests that this detection method fails in 30% of patients. In contrast, blood tests work by measuring the patient's immune response - the level of antibodies in a sample of blood. Antibodies are produced as part of the body's mechanism to fight disease, and their concentration gives an indication of disease progression, degree of recovery and subsequent protection from re-infection.

**Attomarker Technology** consists of an array of 170 spots each containing gold nanoparticles which, when illuminated from below, scatter light into a video camera. In order to detect biomarkers in the blood, the gold nanoparticles are functionalised, meaning their surfaces are coated with a biomolecule, for example an antibody intended to capture the target disease biomarker.




When the captured biomolecule binds the target biomarker, this causes a change in the arrangement of the gold nanoparticles in the spots, which in turn affects how they scatter the light being shone upon them, which changes the brightness of the spots. The change in brightness can be measured during the detection step.

Key advantages of the technology include:

**Flexible Multiplex Testing Capability:** Attomarker COVID-19 tests for three virus antigens and three classes of antibodies, not just the nucleocapsid (NC). Other recently announced tests are NC only, yet results from real-world clinical trials suggest that 2-4% of patients do not show an NC response. Ahead of the 'flu season, the influenza vaccine can be added to the coronavirus chip to give differential diagnosis.

**Simplicity & Connectivity:** Attomarker tests require a pinprick of blood and are designed to be used by non-healthcare professionals, enabling deployment in homes, clinics, pharmacies, universities, airports, cruise ships, border agencies and the military. Anonymised results are uploaded to the Cloud, enabling central identification of hotspots and infection progression. CE-marking is imminent and FDA approval not far behind

**High-Volume/Fast Results:** The benchtop Liscar device delivers results within ten minutes. Each device can carry out 50-60 tests per shift. Our handheld device will deliver results in five minutes, so a 1,500-outlet pharmacy chain would be able to carry out **120,000 tests per day**.

**Fast Response to the Next Pandemic:** Bespoke Attomarker chips can be ready in as little as 10 days, enabling a rapid response to emerging pandemics.

**Rapid Scale-Up & Roll-Out:** Partnership with a large-scale manufacturer such as Smiths Group, will enable production volume of 1,000 devices monthly. We anticipate that demand from the public, care homes, universities, the hospitality industry, clinics and surgeries will require capacity in the tens of thousands.

**Portable Testing Capability:** Attomarker Liscar is a benchtop instrument designed for rapid processing of 50-60 samples per eight-hour shift. It is also suitable for a mobile laboratory, or field hospital, such as might be employed in outbreak management, particularly in testing rural communities.

Attomarker Liscar

Attomarker M3

The next generation M3 is designed as a hand-held instrument enabling point-of-care testing of a finger-stick blood sample to be performed by a non-expert user in almost any setting - from in-home and care home, to company occupational health department, to public transport and border control; from a bustling urban shopping district to remote settlements in the developing world. With results in just 5 minutes, patients can be given their results on the spot. Volume production of M3 will begin December 2020.

**Cloud Connectivity - implications for surveillance and easing of lockdown:** Attomarker analysis platforms are designed to be cloud-connected - test results can be captured and stored on the Cloud. This enables tracking of the spread of epidemics locally, regionally, nationally or even internationally.

Connecting patient location with their test results provides the opportunity to identify infectivity hot spots, whilst also demonstrating to recovered patients how safe it might be, for example, to return to work, or to re-open a business. If this approach was used to establish surveillance of a population during a pandemic, it would make track and trace of viral infections more effective by, for example, identifying changes in a person's Covid-19 antibody and CRP level (versus a baseline measurement) the instant they are tested, and therefore more quickly reaching their contacts, as the data is available from the Cloud in real-time.

**Applications - Attomarker as a future companion diagnostic**

- **Testing vaccine efficacy:** measuring the host response and its persistence in the blood
- **Drugs trials:** monitoring the recovery profile to assess intervention and its success
- **Convalescent serum:** assessing ideal donor and recipient patients and measuring the effects of treatment
- **Re-starting elective surgery:** antibody surveillance of staff and patients as routine surgery starts
- **Second wave testing:** Preparedness for the possibility of the next wave of COVID-19
- **Engaging with emerging threats:** Ready for testing the next epidemic within two weeks

**Actions**

- First academic paper from the trial at St. Thomas' Hospital, UK published in Analyst, the journal of the Royal Society of Chemistry July 2020
- Regulatory approval given by the MHRA, July 2020
- Move into volume production of Liscar, starting August 2020.
- Bring Attomarker M3 to market late Q1 2021.

Attomarker

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