New antibody technology for monitoring multiple sclerosis patients may have potential in COVID-19 testing

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A new study led by Queen Mary University of London has demonstrated the effectiveness of using a novel light technology to monitor the presence of anti-drug antibodies in the treatment of multiple sclerosis (MS), which can lead to drug resistance and treatment failure.

The researchers say that they have also applied the technology to COVID-19 for potential use in antibody testing to determine whether someone has previously been infected with the virus.

Antibodies are proteins that are made by the immune system to fight infection. They can also be used as drugs to fight disease. Alemtuzumab is an antibody designed to kill T and B cells—the major cellular components of the adaptive immune response—and was first used in white blood cell cancers and more recently in MS. However, this can sometimes result in the production of anti-drug antibodies, which prevent Alemtuzumab from working as effectively and lead to patients not responding to treatment.

The GloBody platform is a new tool which uses a light-producing enzyme, called nanoluciferase, to detect if anti-drug antibodies are present in a patient sample, which can cause allergies and stop the treatment from working. This is used to show which people are likely to respond to treatment and can predict which people are likely to fail treatment before it occurs, so that they can be switched to a different drug. This can prevent people from accumulating disability due to treatment failure.

This study, published in the journal *Neurology: Neuroimmunology & Neuroinflammation* and carried out in collaboration with Cardiff

University, demonstrated the high reliability of using the GloBody platform to detect the anti-drug antibodies and predict which patients were subsequently likely to fail treatment.

The results from the study can be used to improve the safety of drug treatments for MS, and testing has already been moved into the researchers' and others' clinical practices. The researchers hope that their work will help more people to recognise the importance of anti-drug antibodies and use a simple method to monitor these in patients and avoid the issues that they cause.

Lead researcher Dr. Angray Kang from Queen Mary University of London said: "Although we only looked at anti-drug antibody responses in multiple sclerosis, this approach can be applied to any therapeutic antibody in any clinical condition. The technology can also be used in pre-clinical animal models, saving time and effort before moving to clinical trials in humans.

"If you can predict that a drug will not work in a patient, then you prevent them from receiving futile and often expensive treatments. Some of these treatments cost the NHS close to half a million pounds per person a year, so being able to tell if a treatment is not working is important so you can quickly switch to something else."

The researchers say that the technology has also been developed to detect immune responses against infections and monitor disease outbreaks, including COVID-19.

Dr. Kang added: "With COVID-19, we know there has been a lot of attention on the potential of antibody testing to see if someone has previously been infected. The GloBody tests have potential to be applied to COVID-19 in this way. Some antibody tests will only give you a 'yes' or 'no' answer, however GloBody technology could tell you how much

antibody is present and if the antibodies can block re-infection. This will be needed when assessing the effectiveness of a vaccine.

"Within a few days, we have already been able to produce sufficient amounts of the COVID-19 GloBody reagent to potentially test 1.6 million people for COVID-19. That's enough to test all of the NHS staff in the UK. And if the virus mutates, a new test could be made just as quickly."

The researchers caution that any GloBody COVID-19 antibody test would first need to be validated as an accurate test before being put into widespread use. The validation process has started within Barts Health NHS Trust and Queen Mary University of London.

More information: 'Detecting and predicting neutralization of alemtuzumab responses in multiple sclerosis' Gauri Saxena, James M. Moore, Meleri Jones, Gareth Pryce, Liaqat Ali, , Georgia R. Leisegang, Vivek Vijay, Samantha Loveless, Neil P. Robertson, Klaus Schmierer, Gavin Giovannoni, Sharmilee Gnananpavan, David Baker, Emma C. Tallantyre, Angray S. Kang. *Neurology: Neuroimmunology & Neuroinflammation*. DOI: 10.1212/NXI.0000000000000767

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