New all-in-one vaccine may prove effective against all coronaviruses

The study by the Universities of Oxford and Cambridge in the UK and Caltech in the US says the vaccine works by training the body's immune system to recognise specific regions of eight different coronaviruses, including SARS-CoV-2 which caused the COVID-19 outbreak and several that are currently circulating in bats and have potential to jump to humans and cause a pandemic.

London: A team of scientists from the world's leading universities have developed a new all-in-one vaccine that they hope can protect humans against a broad range of coronaviruses, including ones that are yet to emerge. The research published in 'Nature Nanotechnology' on Monday is based on a new approach to vaccine development called "proactive vaccinology", where scientists build a vaccine before the disease-causing pathogen even emerges, which has shown promising results in mice.

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"Our focus is to create a vaccine that will protect us against the next coronavirus pandemic, and have it ready before the pandemic has even started," said Rory Hills, a graduate researcher in the University of Cambridge's Department of Pharmacology and first author of the report.

For example, the new vaccine does not include the SARS-CoV-1 coronavirus, which caused the 2003 SARS outbreak, yet it still induces an immune response to that virus.

"We've created a vaccine that provides protection against a broad range of different coronaviruses - including ones we don't even know about yet," said Hills.

Key to its effectiveness is that the specific virus regions the vaccine targets also appear in many related coronaviruses. By training the immune system to attack these regions, it gives protection against other coronaviruses not represented in the vaccine, including ones that haven't even been identified yet.

"We don't have to wait for new coronaviruses to emerge. We know enough about coronaviruses, and different immune responses to them, that we can get going with building protective vaccines against unknown coronaviruses now," said Professor Mark Howarth in the University of Cambridge's Department of Pharmacology, senior author of the report.

"Scientists did a great job in quickly producing an extremely effective COVID vaccine during the last pandemic, but the world still had a massive crisis with a huge number of deaths. We need to work out how we can do even better than that in the future, and a powerful component of that is starting to build the vaccines in advance," he said.

The new 'Quartet Nanocage' vaccine is based on a structure called a nanoparticle - a ball of proteins held together by incredibly strong interactions. Chains of different viral antigens are attached to this nanoparticle using a novel "protein superglue". Multiple antigens are included in these chains, which trains the immune system to target specific regions shared across a broad range of coronaviruses.

The latest study demonstrated that the new vaccine raises a broad immune response, even in mice that were pre-immunised with SARS-CoV-2.

The new vaccine is much simpler in design than other broadly protective vaccines currently in development, which the researchers believe should accelerate its route into clinical trials.

The underlying technology that the scientific collaboration has developed also has potential for use in vaccine development to protect against many other health challenges. It is said to improve on previous work, by the Oxford and Caltech groups, to develop a novel all-in-one vaccine against coronavirus threats.

According to experts, conventional vaccines include a single antigen to train the immune system to target a single specific virus, which may not protect against a diverse range of existing coronaviruses or against pathogens that are newly emerging.

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