HIV's sugar coating offers new vaccine approach

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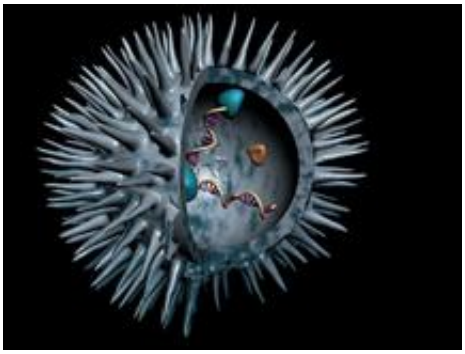

(PhysOrg.com) -- Oxford research suggests the chains of sugar molecules, or carbohydrates, that cover the outside of the highly variable HIV virus remain constant, are different from those found on human cells, and could form the basis of a promising new approach to an AIDS vaccine.

The chains of sugar molecules, or carbohydrates, that cover the outside of the highly variable HIV virus remain constant, are different from those found on human cells, and could form the basis of a promising new approach to an AIDS vaccine, according to research led by the University of Oxford.

The researchers suggest that a vaccine based on synthetic versions of the

HIV carbohydrate coat, because it is so unchanging, could prime the body's immune system to recognise the otherwise rapidly changing HIV virus and fight off any infection.

'We're used to flu vaccines being reformulated every year because new strains come along,' said Dr Chris Scanlan of the Department of Biochemistry at the University of Oxford, who led the research. 'Yet you will see more viral diversity develop in a single HIV patient in a single day than you will in the whole flu season this year across the whole of the UK. That is some challenge for developing a vaccine against HIV.

'We're cautiously optimistic that this research could lead to a promising new approach for a vaccine against HIV/AIDS,' said Dr Scanlan. 'We've found something that doesn't change across all classes of HIV - from viruses found in the USA to those in Uganda - and it's something that can be made and manufactured.'

The team from Oxford University, The Scripps Research Institute in La Jolla, California, and the Ragon Institute in Boston, Massachusetts report their findings in the journal Proceedings of the National Academy of Sciences (*PNAS*).

The researchers were able to isolate the carbohydrate coating from different samples of live HIV-1 virus, representing typical viruses found in different parts of the world, and analyse their chemical structures for the first time. They found that the carbohydrates are unique and are found across all classes or 'clades' of HIV-1. Importantly, these carbohydrates are completely different to the patterns of sugars found on human cells.

The researchers also showed that existing vaccines being developed against HIV will not have the same carbohydrate structures within their formulations as the native HIV virus and so may not mimic this element

of the virus adequately.

'The dense cloud of carbohydrates covering the virus has been called its 'carbohydrate camouflage' because the carbohydrate chains look like those on the outside of the body's own cells, and so they aren't normally recognised by the immune system,' explained Dr Scanlan.

'We've shown that HIV's camouflage may be flawed. The carbohydrates on an HIV virus are different to the body's own cells, and that might give us an opportunity to attack.

'It is possible to educate the immune system to these differences. You can include danger signals in your vaccine formulation to force the immune system to take notice of particular carbohydrate structures. Some cancer vaccines in development use this approach, for example,' he added.

The team now aim to come up with ways of making synthetic versions in the lab of the particular carbohydrates found on the outside of HIV. These could then be combined with an adjuvant - a factor that enhances the body's immune response - to give a completely new vaccine candidate for evaluation.

The researchers have already shown in their *PNAS* paper that it is possible to modify a human cell line to produce the gp120 HIV protein with the correct carbohydrates attached. This is one way that the carbohydrates for any future vaccine could be produced.

Provided by Oxford University