Fast vaccine offers hope in battle with Ebola

Tom Clarke and Jonathan Knight

High-speed vaccines could help to contain unexpected outbreaks of disease, say US researchers who have developed a fast-acting vaccine against the deadly Ebola virus.

The new vaccine, reported in this issue of *Nature* (see page 681), gives macaque monkeys protection from Ebola infection only four weeks after a single jab. Previous Ebola vaccines took six months and multiple boosters to confer immunity.

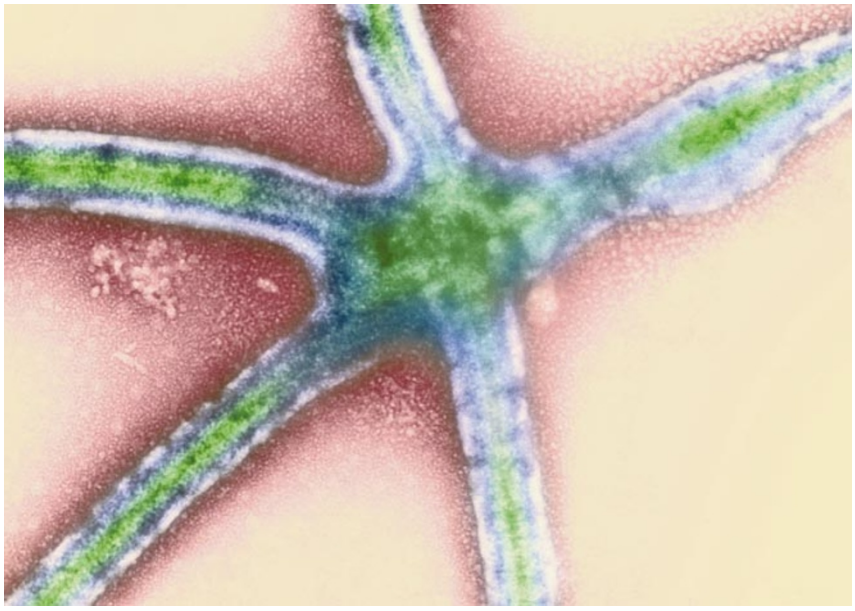
Should the vaccine prove safe and effective in humans, this would be fast enough to stop Ebola outbreaks, says lead author Gary Nabel, head of the Vaccine Research Center at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland. It could also form a template for developing emergency vaccines against unexpected outbreaks of disease, Nabel says.

Most vaccines serve only as a preventive measure, because they take too long to produce immunity to be useful once an outbreak has begun. A notable exception is smallpox vaccine, which acts so quickly that it can sometimes stop the disease even after a person has been infected with the virus.

Fast vaccines permit a strategy called ring vaccination, which aims to contain an outbreak by inoculating all possible contacts of the first detected cases — and contacts of contacts as well. Ring vaccination is considered one viable option for dealing with a bioterror attack using smallpox.

Nabel believes that it would also be effective against Ebola outbreaks, which occur every few years in parts of Africa. Ebola virus causes a severe and untreatable haemorrhagic fever that kills up to 90% of its victims by liquefying their organs.

To make the new vaccine, Nabel's team stitched a portion of the Ebola virus genome into a modified adenovirus, a cause of the common cold. Adenovirus generates a very aggressive immune response in the host, and so teaches the immune system to recognize the protein encoded by the inserted gene.



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In the pink: researchers hope their new vaccine against Ebola (pictured) will help to contain outbreaks.

Macaques injected with the vaccine became immune to Ebola within 28 days. Infectious-disease experts expressed surprise over news of the vaccine's speed. "My reaction is 'wow'," says Steve Wolinsky, who heads the infectious-disease division at Northwestern University in Chicago, Illinois. If this could be reproduced with other pathogens, it would dramatically help the control of viral disease, he says.

One trade-off in producing a fast interventionist vaccine is that the one-shot approach gives a weaker immune response than conventional vaccination with multiple jabs. But this may not matter, as the response was sufficient to prevent disease. "During an Ebola outbreak that's all you need," says virologist Yoshihiro Kawaoka at the University of Tokyo.

What remains to be determined is how long immunity lasts. Ebola outbreaks can last up to a year and the vaccine would need to confer protection for that long, Kawaoka warns.

There are other hurdles too. About 45% of the US population carries protective antibodies against adenovirus and might be resistant to the vaccine. Nabel's group is working on ways to coat the adenovirus particles chemically to shield them from rejection by the immune system.

The possibility of fast-acting vaccines should nevertheless prompt a rethink of vaccination strategy at times when rapid responses are needed to viral bioweapons or novel viruses such as that which causes severe acute respiratory syndrome (SARS), says Nabel. "This could change our thinking about how we use vaccines," he says.

Nabel's team is collaborating with the biotechnology company GenVec in Gaithersburg, Maryland, to produce a SARS vaccine using the adenovirus technology. ■

Czech stem-cell work heightens calls for EU ruling

Alison Abbott

Czech scientists say they have derived three human embryonic stem-cell lines from spare embryos stored at an *in vitro* fertilization clinic in Brno.

This makes the Czech Republic the first of the eastern European countries poised to join the European Union (EU) to move into this controversial research area.

It also adds to pressure on the EU to decide whether to fund research on newly derived stem-cell lines. This research is allowed under strict ethical supervision in some EU countries, such as Britain and Sweden, but is banned in others, including Germany and Italy. Last week the Spanish government changed sides and approved a proposed law to allow the production of cell lines from spare embryos for research.

The Czech Republic has no law controlling human embryonic stem-cell research. But Eva Syková, head of the Centre for Cell Therapy and Tissue Repair at Charles University in Prague, who developed the three cell lines together with colleagues at the Mendel University of Agriculture and Forestry in Brno, says they are working to high ethical standards. They received informed consent from donor couples undergoing *in vitro* fertilization, she points out.

The scientists are now characterizing the lines, and plan to study the cells' potential to develop into differentiated cells such as neurons, which they believe could have therapeutic potential. They presented their results at a meeting in Prague last month. ■