
Press Conference - 6 November 2014

The University Hospitals of Geneva to test the Canadian VSV-ZEBOV experimental vaccine against the Ebola virus

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More information, www.vsv-ebola.ch

Geneva, 6 November 2014

The University Hospitals of Geneva to test the Canadian VSV-ZEBOV experimental vaccine against the Ebola virus

In order to counter the Ebola epidemic, the World Health Organization (WHO) has established a programme to fast-track human trials of two vaccine candidates that have proven effective in monkeys. The Canadian Public Health Agency developed one of them, the VSV-ZEBOV vaccine, and donated 800 vials to WHO. The vials are being stored at the University Hospitals of Geneva (HUG), which will now launch one of the four clinical trials coordinated by WHO to test this vaccine candidate. The trial at HUG will include roughly 115 volunteers; trials in Germany, Kenya and Gabon will include 30, 40 and 60 volunteers, respectively. While the HUG study already received approval from the ethics committees of the Canton of Geneva and WHO, it has now received the required approval from Swissmedic to launch this clinical trial in healthy volunteers aged between 18 and 65 years. The first vaccinations are scheduled to take place on 10 November 2014.

The VSV-ZEBOV is a "live" vaccine candidate. It is produced using a virus that is not considered dangerous for humans, the vesicular stomatitis virus (VSV), which has been modified to produce the surface protein found on the Zaire strain of Ebola virus (ZEBOV). This protein should trigger an immune response in vaccinated individuals with no risk of acquiring Ebola virus disease. The vaccine candidate was 100% effective in protecting monkeys from lethal doses of Ebola virus. The researchers involved in this study, led by Professor Claire-Anne Siegrist, head of the Vaccinology Centre at HUG, hope that the findings from non-human primate experiments will be confirmed in humans.

Hope for a lasting immune response

Our body defends itself against aggressors by producing antibodies and specialized white blood cells to destroy viruses and kill infected body cells. The purpose of a vaccine is to alert these immune defences in advance, so that they can react quickly in case of exposure.

This process is more efficient and lasts longer if a modified "live" virus is used for vaccination (as in the case of VSV-ZEBOV or the measles vaccine). In such a case, the modified virus is able to infect

cells and replicate for a few days before being eliminated by the immune system. A vaccine that does not replicate triggers a milder and less lasting stimulation of the immune system, which is why it often requires subsequent booster vaccinations.

Expected side effects

In humans, naturally-occurring VSV only rarely causes infections; it may cause flu-like symptoms for a few days. The VSV used for this vaccine candidate has been "attenuated" to cause even fewer symptoms. The safety profile of VSV-ZEBOV is only beginning to be tested in humans and has not been tested on large numbers of monkeys. In vaccinated animals, the vaccine candidate was very well tolerated and caused no observable side effects, even in monkeys with a severely weakened immune system.

Because the vaccine contains a weakened form of VSV, it is likely to cause either no side effects or a mild inflammatory reaction with "flu-like" symptoms for a few days. As with any medicine, the vaccine can cause an allergic reaction, which is why volunteers will remain under observation for an hour and a half after the injection. Other side effects, even if they have not been observed in animals, cannot be excluded in humans and any long-term effects are unknown. As the VSV-Ebola vaccine contains only the envelope of the Ebola virus, there is no risk of contracting Ebola virus.

Trials in five countries

Five countries are involved in the first clinical trials of the VSV-ZEBOV vaccine in humans. In the USA, the first injections began in mid-October 2014; two US trials will collectively enrol 78 volunteers. The other four trials will be conducted under the auspices of WHO. The vials stored at HUG will be used for the clinical trials involving 115 volunteers in Geneva, 30 volunteers in Germany, 60 in Gabon and 40 in Kenya.

The HUG clinical trial is now recruiting healthy adult volunteers. Priority will be given to those planning to travel to areas affected by the epidemic in West Africa. These volunteers will be randomly selected to receive one of two vaccine doses. Other volunteers with no significant risk of Ebola exposure will randomly receive either one of the two vaccine doses or placebo.

This clinical trial will evaluate the vaccine candidate's safety and the dose required to trigger optimal immune responses. It will take two months to get the first results. The most effective dose of the vaccine will then be used to perform larger scale safety studies, and to vaccinate frontline healthcare workers in epidemic areas, in order to determine whether the VSV-ZEBOV vaccine protects against the Ebola virus in a clinical setting.

The clinical trial is led by Prof. Claire-Anne Siegrist, head of the Vaccinology Centre at the HUG, with the support of Drs Angela Huttner and Julie-Anne Dayer of the Division of Infectious Diseases, and Dr Alain Matthey of the Centre for Clinical Research (all at the HUG). The Vaccinology Centre at the HUG is a WHO collaborating centre, and the Clinical Research Centre and the Faculty of Medicine of the University of Geneva are part of the national network of Clinical Trial Units (CTU).

Vaccine candidate doses will be prepared at the HUG's pharmaceutical unit. Analyses related to the monitoring of the volunteers will be performed at the Virology Laboratory at HUG, which is also the Swiss reference centre for emerging viral infections.

These Phase I clinical trials are funded by the Wellcome Trust (UK), a not-for-profit foundation that supports health programmes worldwide.

The clinical trial in short

The trial will compare 2 different doses of the vaccine candidate to each other and to placebo to determine whether they differ in side effects and immune responses.

- Priority will be given to volunteers planning travel to Ebola-affected countries. These volunteers will not receive placebo; they will receive one of two vaccine doses.
- The trial includes 9 hospital visits (including a pre-enrolment screening) at HUG's Clinical Trials Unit over a period of 24 weeks. The first two visits will last 1.5 – 2 hours, the remaining visits 20-30 minutes each.
- For volunteers likely to travel to Ebola-affected countries, some visits may be conducted remotely, but a minimum 14-day stay in the Geneva area is required after vaccination to allow for monitoring.
- Because the vaccine is made from the VSV virus and contains only the envelope of the Ebola virus, there is no risk of contamination with the Ebola virus.
- Compensation for study participation is 810 Swiss Francs (approximately US\$ 840, EUR 670).
- Participation is anonymous; all data will be handled confidentially.

For further information, please contact: (+41 22) 372 60 07, www.vsv-ebola.ch

FAQs about the context of this clinical trial, with quotes

1. Why did WHO ask the University Hospitals of Geneva to perform this clinical trial?

The proximity of the two institutions makes operations and contacts easier: WHO has asked the University Hospitals of Geneva (HUG) to store the VSV vaccine doses donated by the Public Health Agency of Canada, which will be used for all the phase I clinical trials. In addition, the HUG have internationally recognised scientific and medial expertise in clinical trials, vaccinology and virology. That is why they were selected to be among the four medical centres which will conduct the first trials of VSV-Ebola vaccine on humans.

Dr Marie-Paule Kiény

Assistant Director-General of WHO Health Systems and Innovation

"WHO is working with the University Hospitals of Geneva and Lausanne not only because of their proximity, but also because they have a worldwide reputation in clinical research."

2. Why not test this vaccine in areas affected by the epidemic?

Phase I clinical trials aim primarily at determining vaccine safety as well as the dose necessary to trigger an immune response. These are preliminary tests for which it would be challenging to recruit volunteers who are directly exposed to the Ebola virus. Also, these people live in countries where it would not be easy to collect accurate data on vaccine safety.

Dr Marie-Paule Kiény

Assistant Director-General of WHO Health Systems and Innovation

"Such trials are impossible to implement in the countries of West Africa affected by the Ebola virus, because their health systems are currently very much disturbed by the epidemic."

3. Will the future vaccines be given for free or will they be sold?

WHO and GAVI (Global Alliance for Vaccines and Immunization) could distribute them for no charge, conditional on the availability of external funding (e.g. from the Wellcome Trust, the Bill & Melinda Gates Foundation, the Aga Khan Foundation or the World Bank). It is also likely that armies in different countries will secure a certain amount of vaccine doses to counter any potential bioterrorist threat.

Dr Marie-Paule Kiény

Assistant Director-General of WHO Health Systems and Innovation

"Vaccine producers will of course be financially compensated. Discussions are underway to set up a partnership which is likely to include GAVI – the Global Alliance for Vaccines and Immunization – and donor countries."

4. If WHO decides on a large scale vaccination campaign, how will priorities be set?

The vaccine will primarily be used to protect frontline medical workers who are in contact with people affected by Ebola virus disease, and staff in charge of cleaning infected premises and people who have died of the

disease. In the areas where the outbreak is out of control, massive vaccination of the population must be envisaged.

Dr Marie-Paule Kieny

Assistant Director-General of WHO Health Systems and Innovation

"If the vaccine candidates prove effective, priorities for vaccination will be set by representatives of the three countries most affected by Ebola virus disease and by experts who are modeling the spread of the epidemic. Priority will be given to those most exposed to the virus: medical staff, and those in charge of cleaning medical premises and burying the victims."

Dr Vasee Moorthy

vaccine expert at WHO

"It is difficult to predict when vaccines will be available. If clinical experiments are successful, we are told that a few thousand doses of vaccine will be available in the first months of 2015. If we further expand the number of laboratories able to produce vaccines, a high number of doses may be available by the end of 2015."

5. Why was this vaccine not been made available earlier to WHO?

Between its discovery in 1976 and 2013, the Ebola virus caused between 10 and 100 deaths per year. Before the current outbreak, Ebola was therefore considered an "orphan disease" for which it was difficult to justify the launch of clinical trials costing tens to hundreds of millions of dollars. Experts also thought that the Ebola virus would always be kept in check through infection prevention control. The magnitude of the current epidemic has altered these views.

Dr Marie-Paule Kieny

Assistant Director-General of WHO Health Systems and Innovation

"The vaccines were made available to WHO in August 2014. I would like to thank the University Hospitals of Geneva for having been so prompt to set up the clinical trial to test this vaccine on humans for the first time."

6. Who is funding the clinical trial at the University Hospitals of Geneva?

Costs related to the Phase I clinical trials to take place at the University Hospitals of Geneva (115 volunteers), Hamburg (40), Kenya (40) and Gabon (60) will be supported by the Wellcome Trust (UK), a charitable foundation supporting advances in global health.

7. Who funded the production of vaccines to be used at the University Hospitals of Geneva?

The Canadian government. In August 2014, it declared that it would donate 800 doses of its experimental vaccine to WHO, as a contribution to the fight against the epidemic.

8. What other vaccines are being considered by WHO?

Only 2 vaccines are sufficiently advanced to be tested now on humans. One is the VSV-ZEBOV vaccine to be tested at the HUG, in Hamburg, Kenya and Gabon (and by the US Army).

The other is the chimpanzee adenovirus vaccine-chAd3. It will be tested at the CHUV (Centre Hospitalier Universitaire Vaudois) in Lausanne, in Mali, in Gambia and the USA. The first tests in humans started in September 2014 in the United States and the United Kingdom. For updates, please visit the website of the CHUV: <http://www.chuv.ch>

Dr Marie-Paule Kieny

Assistant Director-General of WHO Health Systems and Innovation

"There are currently two vaccine candidates which may counter the Ebola virus; one based on a chimpanzee adenovirus and the other on the vesicular stomatitis virus. We are at an early stage of the evaluation. The first objective is to investigate how safe they are, what side effects they cause, and how good they are at generating an immune response."

Dr Vasee Moorthy

vaccine expert at WHO

"There are several vaccines at pre-clinical research stages. Both vaccines whose clinical trials are supported by WHO offer several guarantees: they are produced using high quality laboratory processes and have been successfully tested on the best animal models – macaque monkeys. All monkeys vaccinated with these vaccines have been protected against Ebola virus."

9. How can these vaccines contribute to stopping the current epidemic?

Dr Vasee Moorthy

vaccine expert at WHO

"Currently, those involved in the struggle against the epidemic should not rely only on the vaccines. Controlling the spread of the infection, tracing the contacts of infected persons and applying standard measures to control the epidemic are top priorities. We have high hopes for these vaccines, but they have yet to show their usefulness in protecting humans. Even if everything works according to plan, we do not expect to have sufficient amounts of vaccine before the end of 2015."

10. When and where will the other phase I clinical trials on the VSV vaccine take place?

Vaccination of volunteers by the US Army started in mid-October. In Gabon, Kenya and Germany, clinical trials are expected to start in November 2014. The first results will be available in December 2014.

FAQs about the clinical trial, with quotes

11. How will the volunteers be selected?

Dr. Alain Matthey

Physician at the Clinical Research Centre at HUG& Faculty of Medicine

"Given the urgency, we will screen candidate volunteers by order of arrival. Of course, they will have to meet the requirements of the research protocol: they must be at least 18 years old, in good health, etc. Each week, priority will be given to people who are planning to travel to areas currently affected by the epidemic."

Prof. Bernard Hirschel

President of the Cantonal Commission of Research Ethics (Geneva)

"In the volunteer selection process, it is important that the first people to be potentially protected against Ebola virus should be those who will be travelling to West Africa to fight the epidemic."

Prof. Claire-Anne Siegrist

Principal Investigator and Head of the Vaccinology Centre at HUG

"The Phase I clinical trial will involve over one hundred volunteers, who will each come to the hospital ten times: this represents one thousand medical appointments! For Phase II, i.e. the deployment and testing of the vaccine in the field, other scientific teams will take over. Of course, we will provide them with all our clinical data."

12. How often will the vaccinations take place?

Provided we get enough volunteers, 15 people can be vaccinated every week. The vaccination period would therefore last about 7 weeks.

13. When (and how) will we know if the VSV-ZEBOV vaccine works?

To be really sure that the vaccine protects against the Ebola virus, it will be necessary to examine to what extent people who are both vaccinated and exposed to the virus resist infection.

In the meantime, this clinical trial aims at establishing two important things:

- 1) the side effects caused by the vaccination: the vaccine is not expected to cause major side effects that would put people at risk, but it is important to know how many vaccinated volunteers will have some fever or flu-like symptoms, and for how long after vaccination. This information will be very useful to distinguish between what is induced by the vaccine and what is not.
- 2) the extent and duration of the volunteers' immune response: the vaccine should trigger the production of antibodies against the Ebola virus. And hopefully, these antibodies will prove protective when they are exposed to the virus.

Today, we do not know what the best dose is. Which has the best tolerance profile? Which is the most effective? Determining the best dose is the overarching goal of this study.

14. If the results are conclusive, will we need further clinical studies before implementing large-scale vaccination?

It will be necessary to proceed step by step. Phase I clinical trials with the VSV-Ebola vaccine will take place at HUG, but also in the United States, Germany, Gabon and Kenya, totaling about 250 volunteers. The clinical trial at HUG will be the one involving the largest set of volunteers (115). WHO is already planning phase II and III clinical trials, partly in areas affected by the epidemic, to collect data on vaccine safety on thousands of individuals, and also - hopefully - to protect frontline medical workers who are the most exposed to the epidemic.

For more information: <http://www.who.int/mediacentre/news/ebola/01-october-2014/en/index4.html>

15. How much shorter is this process compared to the study of a conventional vaccine?

The ambition is to accomplish in a few months what normally takes between 2 and 4 years, while respecting international standards of quality and safety.

Prof. Claire-Anne Siegrist

Principal Investigator and Head of Vaccinology Centre of HUG

"Our vaccination protocol has 250 pages and is fully up to standard. Normally, it would have taken a year to prepare it. In this case, it has taken one month, for a team of ten people working day and night."

Prof. Bernard Hirschel

President of the Cantonal Commission of Research Ethics (Geneva) and HIV specialist

"Upon receipt of the research protocol by the Ethics Commission, legislation gives us 30 days to render our decision on a clinical trial of this nature. Given the urgency of the situation, a special session was scheduled and the decision was made in only three days."

16. How many volunteers will receive a placebo?

This number will vary depending on the profile of the volunteers: placebos will not be given to people who already know that they will visit areas affected by the epidemic.

Prof. Claire-Anne Siegrist

Principal Investigator and Head of Vaccinology Centre of HUG

"Several very close colleagues have volunteered for this vaccination trial. There is a very strong sense of being able to do something for our colleagues who are on the front line of the epidemic, and who are facing very difficult situations."

17. Has anyone already received this vaccine?

In 2009, a person working in the lab was accidentally injured with a needle containing the Ebola virus, and was injected with a preliminary version of the VSV-Ebola vaccine to counter a possible infection. She did not develop the disease, but we do not know whether this was because of the vaccine or because the virus dose was too low.

Two clinical phase I trials each involving 39 volunteers began in mid-October 2014 at the Walter Reed Army Institute of Research Military Hospital (USA) and at the National Institute of Allergy and Infectious Diseases NIAID (USA) (the Government of Canada also provided free vaccine doses for these trials). To date, no major side-effects have been observed.

18. What do we know already about the VSV-Ebola vaccine?

Prof. Jules Desmeules

Head of the Clinical Investigation Unit, Clinical Research Centre of HUG & Faculty of Medicine

"The vaccine manufacturer has provided us with all the information available on the preclinical data related to the toxicology of this vaccine. No toxicity has been observed in the organs of animals that received the vaccine. The potential side effects of the VSV vaccine are minor. In some cases, it is expected that volunteers will have a mild fever for up to 2 days. But I would almost say that this is "expected", because in vaccinating, we are trying to stimulate the immune system: and a slight fever can be a good indicator of such a stimulation. In addition, this vaccine does not contain any additives: the risk of allergic reaction is therefore very low. Nevertheless, the Clinical Research Centre is equipped for reanimation and manages all its Phase I clinical trials in coordination with the Intensive Care Unit headed by Prof. Jérôme Pugin."

Prof. Claire-Anne Siegrist

Principal Investigator and Head of Vaccinology Centre of HUG

"There would be no reason to engage in such a clinical trial if we were not fully convinced that the vaccine may be effective and safe."

Prof. Bernard Hirschel

President of the Cantonal Commission of Research Ethics (Geneva) and HIV specialist

"The ethical requirements for clinical studies on vaccines are very high, because we are vaccinating people who are in good health. And we cannot accept a study that would put in danger a person who is in good health."

19. Are the HUG in contact with the other teams that are testing this vaccine?

Yes. Testing of the VSV-ZEBOV vaccine is coordinated by WHO. A consortium bringing together the principal investigators of the 4 clinical centres (Geneva, Hamburg, Lambaréné, Kilifi) has been created. These investigators have pooled their research protocols and will exchange data and information throughout the study.

Prof. Jules Desmeules

Head of the Clinical Investigation Unit, Clinical Research Centre of HUG & Faculty of Medicine

"The results of the first clinical trials, that are already taking place on 60 volunteers in the USA, will be sent to all teams conducting trials with the same vaccine. There is an international convention (Good Clinical Practice) which states that the sponsor of a clinical trial must be informed within 24 hours in case of serious adverse effects. Information channels and timely communication protocols are strictly defined."

Prof. Claire-Anne Siegrist

Principal Investigator and Head of Vaccinology Centre of HUG

"Many people involved in these clinical trials are keen to gather enough scientific data to be able to roll out a vaccine at the beginning of 2015. One positive aspect in this race against Ebola is the mobilization of people who are doing far more than what they have to and who are willing to share information rather than keeping it for themselves."

20. Will it be possible to modify the research protocol during the course of the clinical trial?

Yes. For example, it will be possible to modify the doses used if we find out at an early stage that a dose is too low or, on the contrary, if it causes too many adverse effects - such as a high fever. Each research protocol includes specific rules and allows suspension of the trial in order to analyze what is happening and then decide whether to continue, modify or stop the process.

Prof. Jules Desmeules

Head of the Clinical Investigation Unit, Clinical Research Centre of HUG& Faculty of Medicine

"Yes, absolutely. Each year, Swissmedic manages thousands of modifications on authorized protocols. It makes sense to be able to adapt a protocol to ensure the safety of the people involved in the clinical trial."

21. Have the HUG already performed this type of clinical trial?

Prof. Jules Desmeules

Head of the Clinical Investigation Unit, Clinical Research Centre of HUG& Faculty of Medicine

"Yes, of course. This study will be the third phase I clinical trial that we are operate in 2014. In 2013, the Clinical Research Centre was involved in over 70 clinical trials (phase I-II-III). This one will have a strong support of several professional teams and will take place under optimal conditions, with all the necessary measures to ensure volunteers' safety."

FAQs on the VSV-ZEBOV vaccine against Ebola virus, with a quote

22. How and by whom is this vaccine manufactured?

The VSV-ZEBOV vaccine was developed by Canadian scientists and produced by IDT Biologika, a German company, under a licensing agreement with NewLink Genetics (USA) which owns the production and marketing rights on this vaccine. Its manufacturing process has met the highest standards for pharmaceuticals (GMP).

Also see diagram: "VSV-ZEBOV vaccine against Ebola"

23. If the vaccine is "live", why is it not dangerous?

The VSV-ZEBOV vaccine is produced using a virus which is not considered dangerous for humans - the vesicular stomatitis virus (VSV) - which has been modified to display the surface protein found on the Ebola virus. These proteins should trigger an immune response in vaccinated individuals with no risk of acquiring Ebola virus disease.

The VSV virus is easily eliminated by the human body and causes, in the worst case, symptoms comparable to a mild flu lasting 2 to 4 days. In addition, the VSV has been attenuated to further reduce these symptoms. "Live" but attenuated vaccines are usually more effective than vaccines solely based on viral proteins. They are already widely used, for example against mumps and measles. Their main advantage is to trigger a stronger immune response: they generally do not require a subsequent booster vaccination.

The use of the VSV for immunization has other advantages:

- Being an RNA virus, its genetic material can not insert itself into human DNA.
- As the VSV does not usually infect humans, there is no risk of the virus contained in the vaccine recombining with human strains of the same virus.
- Very few people have been exposed to this virus: therefore, basic immunity in the human population against VSV is very low, which should make it more effective for vaccination.

24. Has the VSV already been used for other vaccines or therapeutic treatments?

The VSV has also been used to develop experimental vaccines against HIV. Tests on mice using modified VSVs have given excellent results for treating melanomas, lung cancer, colorectal cancer, and brain tumors.

25. Is this vaccine protected by any "Intellectual Property Rights" which prevent other laboratories from producing it?

The Canadian government owns the intellectual property rights associated with the VSV-ZEBOV vaccine. However, in 2010, it licensed the production and marketing to the company NewLink Genetics (USA).

26. What are the odds for this vaccine being effective?

For the vaccine to be effective, it must stimulate the body to produce antibodies that neutralize the Ebola virus. VSV-ZEBOV vaccine should induce a good antibody response, because it multiplies for 1-2 days in the

body before being eliminated. If it triggers an immune response against the Ebola virus as good as what has been observed in monkeys, a single injection could provide a very high and lasting protection.

Prof. Bernard Hirschel

President of the Cantonal Commission of Research Ethics (Geneva) and HIV specialist

"Between HIV and the Ebola virus, there is a big difference. The HIV-infected person develops an immune response with antibody production, but cannot vanquish the disease. With Ebola, the person who survives the disease becomes immunized against the virus. So there is a great hope that vaccines will be effective."

27. Could the Ebola virus mutate - like the flu virus - and therefore make the vaccine ineffective?

That can not be excluded, but the Ebola virus does not mutate as quickly as the flu virus or HIV. Therefore, major changes in the Ebola-Zaire virus (the strain causing the current epidemic) which would render the vaccine ineffective are unlikely - even if we can not totally exclude this eventuality. The mode of transmission and mortality rates observed for the current virus are in fact very similar to those of the first Ebola virus identified in 1976 in Zaire (now Democratic Republic of Congo).

28. How long after vaccination would the protection become effective?

If the VSV-ZEBOV vaccine works as well in humans as it does in monkeys, partial protection should be achieved after 2 weeks, and a good level of protection after 4 weeks. But to date, we still do not know whether the vaccine will enable the production of antibodies, and whether these antibodies can neutralize the envelope of the Ebola virus which causes the disease.

29. How long is the vaccine's protective effect likely to last?

If the VSV-ZEBOV vaccine works as well on humans as it does on monkeys, it will achieve a long-lasting protection. As in other "live" vaccines, such as measles and polio, it may be possible that a single injection - of a suitable dose to be determined - would be sufficient to ensure sustained protection for life.

30. Will it be possible to vaccinate children? And what about animals, including those that could potentially transmit the virus to humans?

The question of children, pregnant women and older people is crucial, because they pay a heavy toll due to the Ebola virus disease. But the first vaccination trials with VSV-ZEBOV will be limited to people aged between 18 and 65. Future studies will determine whether this vaccine may also be safe and effective for children, older people, etc.

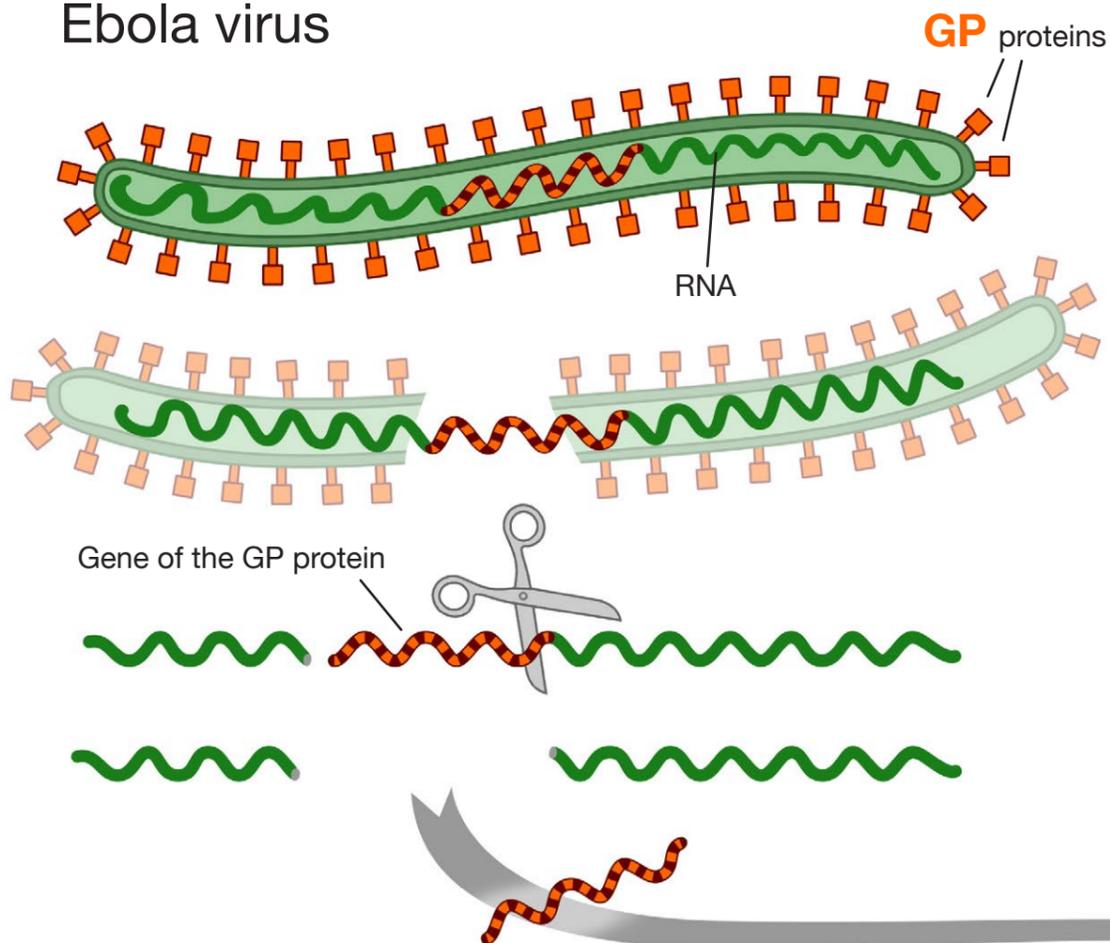
For pregnant women, caution is the rule when it comes to live vaccines which are able to multiply, such as VSV-ZEBOV. Other vaccine candidates which do not replicate, such as the one currently tested at the CHUV in Lausanne, might be better candidates for them.

The vaccination of animals in order to prevent transmission to humans is highly unlikely, because free-living bats are probably the primary reservoir of the virus.

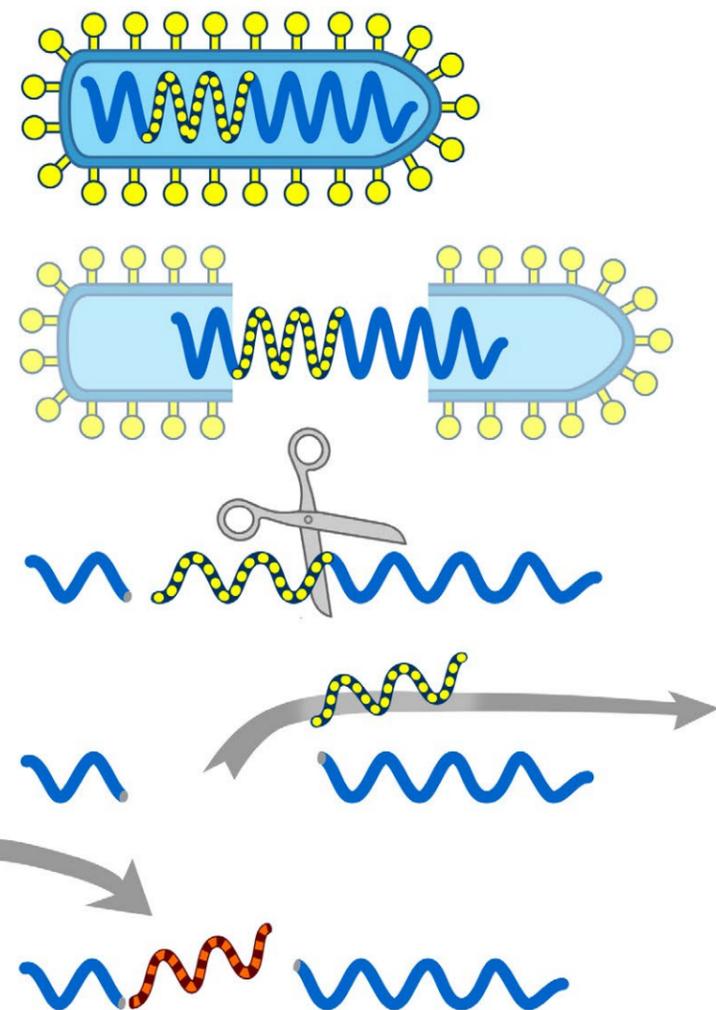
31. If the vaccine works well, is there any hope that we will be able to use it on people who have already been contracted Ebola virus disease?

Maybe. Preliminary post-exposure testing in monkeys showed possible efficacy, but only if the vaccine is administered a few hours after the infection. Further studies will be needed before any strong conclusions can be drawn about post-exposure prophylaxis.

Ebola virus



Vesicular stomatitis virus (VSV)



VSV-Ebola vaccine (VSV-ZEBOV) against Ebola virus

The current Ebola outbreak is caused by the “Zaire” type of the virus. Ebola virus attacks human cells by attaching to them with an anchor protein (GP) covering the surface of the virus. It then enters the cells and forces them to produce new viruses. The GP protein is then massively produced by infected cells and enters the bloodstream, where it is toxic to the blood vessels’ walls, causing the bleeding and hemorrhages which are the hallmark of the disease.

To be protected against the Ebola virus, a person must produce antibodies that neutralize the GP protein. This requires the body to come into contact with GP protein, but without the risk of developing the disease. This is precisely the role of the VSV-Ebola vaccine. The idea is to bring the GP protein into the bloodstream, but carried by another virus – the vesicular stomatitis virus (VSV) – selected for its ability to stimulate the immune system of a person, without becoming life-threatening. Known for infecting cattle, in humans the VSV virus causes symptoms no worse than those of a flu.

To make the vaccine, Canadian researchers took the gene of the GP protein from the Ebola virus and transferred it into the VSV virus (thus replacing the VSV surface protein gene). They also weakened the VSV virus to make it even safer for humans.

The VSV-Ebola vaccine therefore contains the vesicular stomatitis virus, whose envelope protein has been replaced by the GP protein belonging to the Ebola virus (Zaire type). The vaccine does not contain any other molecules belonging to the Ebola virus: thus, there is no risk of catching Ebola disease through vaccination.

The laboratory experiments on monkeys showed that a single injection of the VSV-Ebola vaccine is sufficient to trigger the production of large quantities of anti-GP antibodies, and to protect them against lethal doses of Ebola virus. If everything works out as expected, vaccinated individuals will also produce GP antibodies that will protect them in the event of an exposure to Ebola virus.

Antibodies against the GP proteins from the Ebola virus

