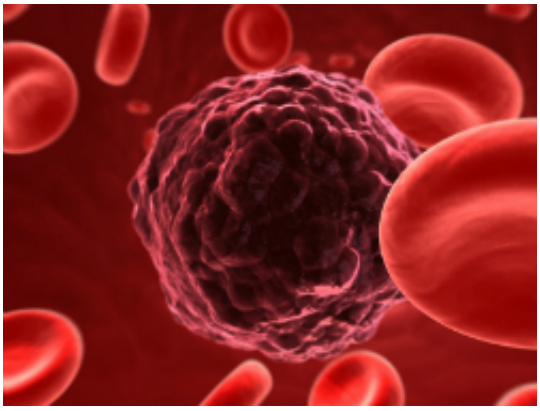
Malaria vaccine provides hope for a general cure for cancer

October 13 2015



The hunt for a vaccine against malaria in pregnant women has provided an unexpected side benefit for Danish researchers, namely what appears to be an effective weapon against cancer. The scientists behind the vaccine aim for tests on humans within four years.

Danish scientists from the University of Copenhagen and the University of British Columbia (UBC) face a possible breakthrough in the fight against cancer, which may result in a genuine medical treatment for the dreaded disease.

The hunt for a weapon to fight malaria in pregnant women has revealed that, expressed in popular terms, armed malaria proteins can kill cancer. The researchers behind the discovery hope to be able to conduct tests on

humans within four years.

In collaboration with cancer researcher Mads Daugaard from the University of British Columbia in Canada, malaria researcher Professor Ali Salanti from the Faculty of Medical Health and Sciences, UCPH, has revealed that the carbohydrate that the malaria parasite attaches itself to in the placenta in pregnant women is identical to a carbohydrate found in cancer cells.

In the laboratory, scientists have created the protein that the malaria parasite uses to adhere to the placenta and added a toxin. This combination of malaria protein and toxin seeks out the cancer cells, is absorbed, the toxin released inside, and then the cancer cells die. This process has been witnessed in cell cultures and in mice with cancer. The discovery has only just been described in an article in the renowned scientific journal *Cancer Cell*.

"For decades, scientists have been searching for similarities between the growth of a placenta and a tumor. The placenta is an organ, which within a few months grows from only few cells into an organ weighing approx. two pounds, and it provides the embryo with oxygen and nourishment in a relatively foreign environment. In a manner of speaking, tumors do much the same, they grow aggressively in a relatively foreign environment," says Ali Salanti from the Department of Immunology and Microbiology at the University of Copenhagen.

Ali Salanti's team is currently testing a vaccine against malaria on humans, and it was in connection with the development of this drug that he discovered that the carbohydrate in the placenta was also present in cancer tumors. Ali Salanti immediately contacted his former fellow student and now cancer researcher, Mads Daugaard, who is head of the Laboratory of Molecular Pathology at the Vancouver Prostate Center at UBC in Canada. In collaboration, the two groups have generated results,

which they hope will provide the basis for a drug against cancer.

"We examined the carbohydrate's function. In the placenta, it helps ensure fast growth. Our experiments showed that it was the same in cancer tumors. We combined the malaria parasite with cancer cells and the parasite reacted to the cancer cells as if they were a placenta and attached itself," Ali Salanti explains.

Kills cancer cells

In collaboration, the two university research groups have tested thousands of samples from brain tumors to leukemias and a general picture emerges to indicate that the malaria protein is able attack more than 90% of all types of tumors. The drug has been tested on mice that were implanted with three types of human tumours. With non-Hodgkin's lymphoma, the treated mice's tumours were about a quarter the size of the tumours in the control group. With prostate cancer, the tumours disappeared in two of the six treated mice a month after receiving the first dose. With metastatic bone cancer, five out of six of the treated mice were alive after almost eight weeks, compared to none of the mice in a control group.

"We have separated the malaria protein, which attaches itself to the carbohydrate and then added a toxin. By conducting tests on mice, we have been able to show that the combination of protein and toxin kill the cancer cells," Mads Daugaard explains.

"It appears that the malaria protein attaches itself to the tumor without any significant attachment to other tissue. And the mice that were given doses of protein and toxin showed far higher survival rates than the untreated mice. We have seen that three doses can arrest growth in a tumor and even make it shrink," PhD student Thomas Mandel Clausen elaborates. He has been part of the research project for the last two

years.

It would appear that the only snag is the fact that the treatment would not be available for pregnant women.

"Expressed in popular terms, the toxin will believe that the placenta is a tumor and kill it, in exactly the same way it will believe that a tumor is a placenta," Ali Salanti states.

In collaboration with the scientists behind the discovery, the University of Copenhagen has created the biotech company, VAR2pharmaceuticals, which will drive the clinical development forward. The research teams working with Ali Salanti and Mads Daugaard are now working purposefully towards being able to conduct tests on humans.

"The earliest possible test scenario is in four years time. The biggest questions are whether it'll work in the human body, and if the human body can tolerate the doses needed without developing side effects. But we're optimistic because the protein appears to only attach itself to a carbohydrate that is only found in the placenta and in cancer tumors in humans," Ali Salanti concludes.

More information: Ali Salanti et al. "Targeting Human Cancer by a Glycosaminoglycan Binding Malaria Protein," *Cancer Cell* (2015). DOI: 10.1016/j.ccell.2015.09.003

Provided by University of Copenhagen