Scientists discover new method of diagnosing cancer with malaria protein

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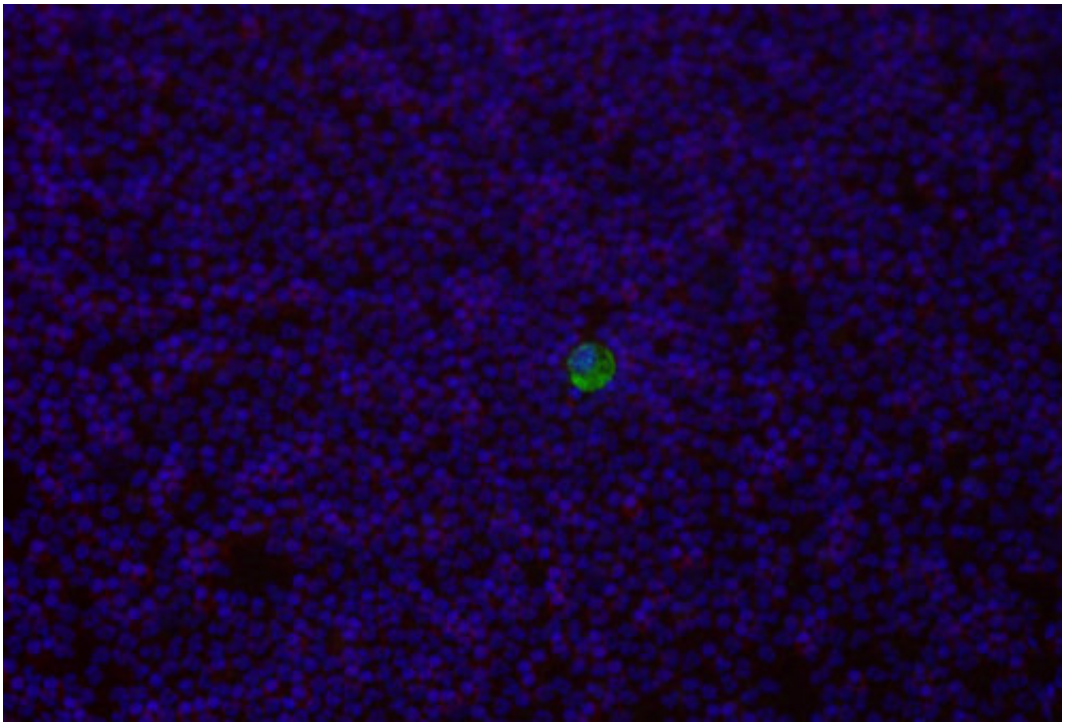

A cancer cell colored with rVAR2 (green) in a background of normal, white blood cells (red). Credit: University of Copenhagen

In a spectacular new study, researchers from the University of Copenhagen have discovered a method of diagnosing a broad range of cancers at their early stages by utilising a particular malaria protein that sticks to cancer cells in blood samples. The researchers hope that this method can be used in cancer screenings in the near future.

Each year, cancer kills approximately 9 million people worldwide, and early diagnosis is crucial to efficient treatment and survival. Now, researchers from the Faculty of Health and Medical Sciences at the University of Copenhagen have come up with a new method of diagnosing cancer in its early stages in humans by way of a malaria protein called VAR2CSA, which sticks to cancer cells. All the scientists need to determine whether or not a person has cancer is a blood sample.

"We have developed a method in which we take a blood sample, and with great sensitivity and specificity, we're able to retrieve the individual cancer cells from the blood. We catch the cancer cells in greater numbers than existing methods, which offers the opportunity to detect cancer earlier and thus improve outcome. You can use this method to diagnose broadly, as it's not dependent on cancer type. We have already detected various types of cancer cells in blood samples. And if there is a cancer cell in your blood, you have a tumour somewhere in your body," says Professor Ali Salanti from the Department of Immunology and Microbiology and joint author of the study, which has just been published in the scientific journal, *Nature Communications*.

Today, there are several ways of detecting cancer cells in blood. Most of them are based on a particular marker, which is found on the surface of tumour cells. However, not all tumour cells display this marker, which renders these methods unable to detect tumour cells spread to other organs such the liver, lung and bones, as opposed to the method based on the malaria protein.

A few years ago, Ali Salanti and his fellow researchers discovered a new method of treating cancer with the protein VAR2CSA, which is produced by malaria parasites. And these discoveries have formed the basis of the research group's new method of diagnosis. Among other things, they have shown that the malaria protein sticks to a specific sugar molecule, which is found in more than 95 percent of all types of cancer

cells. In other words, this new method of diagnosis can be used to detect practically all types of cancer.

Circulating tumour cells

A cancerous tumour consists of several different cancer cell types, some of which spread by wandering through the tissue and into the blood. These cancer cells in the blood are called circulating tumour cells, and they can develop into metastases, which cause up to 90 percent of all cancer-related deaths. If cancer originating in the lungs spreads to the brain, it is called brain metastasis.

The new method detects the circulating tumour cells in a blood sample by using the malaria protein. During the development of this new method, the researchers took 10 cancer cells and added them to five millilitres of blood, and were subsequently able to retrieve nine out of 10 cancer cells from the blood sample.

"We count the number of cancer cells, and based on that, we're able to make a prognosis. You can, for example, decide to change a given treatment if the number of circulating tumour cells does not change during the treatment the patient is currently undergoing. This method also enables us to retrieve live cancer cells, which we can then grow and use for testing treatments in order to determine which type of treatment the patient responds to," says Postdoc Mette Ørskov Agerbæk, Department of Immunology and Microbiology and joint author of the study.

Future screening programme

The researchers are following up on their results in a large clinical study in which many more patients with pancreatic cancer have been tested

using this method. "We found strikingly high numbers of circulating tumour cells in every single patient with pancreatic cancer, but none in the control group," says Professor Christopher Heeschen, School of Medical Sciences, UNSW, Sydney, Australia, and joint author of the study.

The researchers envision using the method to screen people at high risk of developing cancer in the future. However, they also expect that this method can be used as a biomarker indicating whether a patient with mostly vague symptoms actually has cancer or not. This will enable doctors to determine the stage of the disease.

"Today, it's difficult to determine which stage cancer is at. Our method has enabled us to detect cancer at stages one, two, three and four. Based on the number of circulating tumour cells we find in someone's blood, we'll be able to determine whether it's a relatively aggressive cancer or not so then to adjust the treatment accordingly," explains Professor Ali Salanti who adds that a much larger clinical study is needed before firm correlations to tumour staging can be made.

More information: Mette Ø. Agerbæk et al, The VAR2CSA malaria protein efficiently retrieves circulating tumor cells in an EpCAM-independent manner, *Nature Communications* (2018). DOI: 10.1038/s41467-018-05793-2

Provided by University of Copenhagen

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