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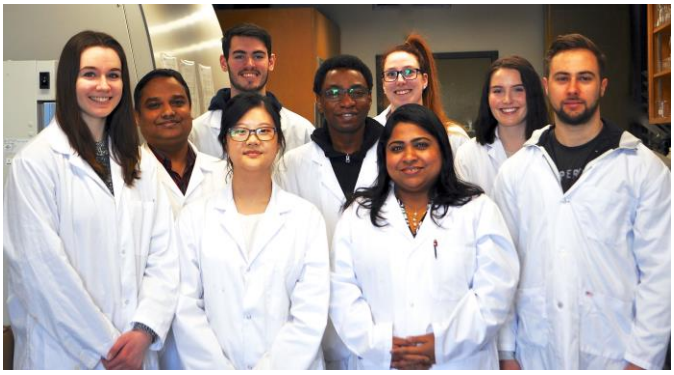
RESEARCH CONNECTION

Could a simple blood test be able to detect breast cancer?

By Dr. Mousumi Majumder and her team



What you need to know

One in eight women in Manitoba will be diagnosed with breast cancer in their lifetime. The death rate of metastatic breast cancer is increasing. However, early detection can save 98% of patients with breast cancer. We have identified some small molecules known as micro RNA (miRNA) in the blood of breast cancer patients, which can detect a tumor at a very early stage.

Why this research is important

One in nine women in Canada and one in eight women in Manitoba will be diagnosed with breast cancer in their lifetime. An increase in the number of newly diagnosed breast cancer cases is due to a delay in diagnosis and limited therapeutic options for various kinds of cancers (hormone positive, negative). The currently available test for breast cancer is very painful and invasive, and routine mammograms (x-ray of the breast) do not start until women reach 50 years of age. Recent statistics show that an early detection of the disease decreases the breast cancer death rate, but the current challenge is the 'early detection of the disease.' We need a blood biomarker for breast cancer, which can detect cancer at a very early stage and is as efficient as tumor biopsy. Micro RNAs (miRNA)s are small RNAs produced by our cells to regulate our growth and development. Some miRNAs found in the tumor play an opposite role, they help the tumor to grow and become metastatic. We identified two such miRNAs: miR526b and miR655 in aggressive breast tumor cell lines. Cell lines are immortalized cells collected from human tissue (like tumors), which can grow and divide unlimitedly in laboratory condition. These cell lines help us understand more complex molecular functions vastly used in medical research. We have validated these miRNAs as tumor-promoting miRNAs and are currently measuring these miRNAs in breast cancer patient blood.

How the research was conducted

First, we identified and validated miR526b and miR655 in aggressive breast tumor cells and established that these miRNAs are tumor causing. Second, we collected blood

samples from breast cancer patients and healthy participants at the London Regional Cancer Program (LRCP) in Ontario. The plasma from blood samples were then separated and an aliquot of plasma was kept at the tumor repository at the University of Western Ontario. All plasma samples were shipped to Brandon University. At Brandon University, we extracted the RNA from plasma samples and compared the miRNA expression between healthy and breast cancer patients' samples. Successfully, we identified that the miRNA expression was significantly different in normal and breast cancer patients and that the tumor can be detected as early as stage I (early stage). Now we are collecting more samples to validate the observation in large sample set.

What the researchers found

The most exciting outcome of this research is the identification of two miRNAs, which can be used as a biomarker for breast cancer. Further, we are trying to identify a protein biomarker (more stable in plasma than miRNA) using Mass-Spectrometry (MS) comparing plasma proteins of healthy and cancer samples.

How this research can be used

Our goal is to use miRNA as a blood biomarker and to use miRNA as a new diagnostic tool for cancer detection. We can detect tumors at a very early stage. By measuring miRNA in various tumor stages we can see a correlation of miRNA expressions with disease progression. Wouldn't it be great if a simple blood test could be as good as a tumor biopsy for cancer detection? It is less invasive and will encourage the younger population to participate in cancer screening. If we can detect early, we can save many lives.

About the researchers

Dr. Majumder is an Assistant Professor in the Department of Biology at Brandon University. She has been working on epithelial cancers (oral and breast) and is investigating gene-environment interactions to understand cancer pathology for the last 15 years. She joined Brandon University in 2016. Dr. Majumder's lab research programs can be found at https://people.brandonu.ca/majumderm/ The team: Dr. Mousumi Majumder (PI); Kingsley C. Ugwuagbo (MSc Student); Stephanie Hunter (Honours Student); Topics in Research Students are Braydon Nault, Emma Gervin, Danielle Larocque, Bonita Shin and Riley James Feser; Sujit Maiti (Bioinformatics Fellow).

Keywords

Breast cancer; biomarker; micro RNA (miRNA)

Publications based on this research

The complete list of publications can be found at https://people.brandonu.ca/majumderm/peer-reviewed-publications/

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Editor: Christiane Ramsey Ramseyc@brandonu.ca

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