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Monica Burdick, Ph.D., assistant professor of chemical and biomolecular engineering and member of the biomedical engineering faculty, was recently awarded a \$50,000 grant from Ohio Cancer Research Associates.

The grant will support Burdick's research project "Identification of E-selectin Ligands on Breast Cancer Cells."

"Hopefully, this will lay the groundwork for bigger and better things," said Burdick, who recently completed her first year as a researcher at Ohio University.

The grant is Burdick's first as an independent investigator. "These institutions have faith in the research plan that I'm proposing," she said. "That feels pretty good."

Burdick's research team will be looking for molecules that could be used by breast cancer cells when metastasizing to the lung or bone marrow.

"If we find these molecules, then we potentially have targets for diagnostic developments, as well as therapeutics," Burdick said.

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Identification of E-selectin Ligands on Breast Cancer Cells

The breast cancer five-year relative survival rate is 100% if detected in the primary tumor stage, largely due to improvements in early detection techniques and the success of modern surgical and chemotherapeutic strategies. However, treatment methods have been much less effective in combating those tumors that have spread to other organs, or metastasized.

Once the cancer has colonized distant sites such as the lungs or bones, the five-year survival rate drops precipitously to 20%. The difficulty in curing late-stage disease is hindered by the complexity of the metastatic process. Breast cancer spread occurs in a multi-step cascade that begins with malignant cells freeing themselves from the original breast tumor, traveling through the bloodstream, and concluding with the cancer cells attaching to cells lining the blood vessels, or vascular endothelium, of a secondary organ.

The vascular endothelium expresses a variety of *adhesion molecules* that can promote the attachment of metastasizing tumor cells in the bloodstream. The proper counter-receptors are called *endothelial adhesion molecules*. One of these endothelial molecules, E-selectin, is continuously expressed by the endothelium of bone, a frequent site of breast cancer metastasis. Study of the E-selectin adhesion pathway in promoting breast cancer metastasis has been largely overlooked, despite clinical studies correlating this molecule and its counter-receptors with disease progression. (This is true not only in breast cancer, but colon, prostate, and pancreatic cancers as well.) In addition, recent studies have indicated that the main type of breast cancer cell found in metastases of bone are "cancer stem cells." These stem cells are particularly aggressive part of the whole tumor with the enhanced capability to form metastatic cancers. It is therefore hypothesized that breast cancer cells, particularly the cancer stem cells, express adhesion counter-receptors that bind E-selectin on bone endothelium. It is hoped that the identification of the molecules on tumor cells that bind to E-selectin will lead to new ways to diagnose and treat late-stage disease, ultimately leading to a cure for breast cancer.