

Evaluating the Effects of Microenvironment Pro-inflammatory Cytokines on Breast Cancer Metastasis

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Breast cancer is one of the most commonly diagnosed forms of cancer in women, yet there is still no cure for stage IV breast cancer. Stage IV breast cancer is characterized by the cancer becoming metastatic and spreading to other parts of the body. With metastatic breast cancer accounting for approximately 90% of all breast cancer deaths, it is imperative to better understand the mechanisms of breast cancer metastasis for approaches towards treatment and prevention. It is understood that the cellular microenvironment plays a vital role in breast cancer metastasis, as research has shown that signaling molecules, such as cytokines, which are secreted into the tumor microenvironment, affect neighboring cells in the microenvironment to stimulate tumor cell metastasis. Specifically, research has shown elevated levels of CCL-2, a pro-inflammatory cytokine associated with tumor migration through the recruitment of immune cells and tumor proliferation, proposing a potential role for CCL-2 regulating breast cell metastasis. This work aims to study the effects of CCL-2 on breast cancer metastasis using physiologically-relevant cytokine levels. Two breast cancer cell lines, MCF-7 and MDA-MB-231, were conditioned in CCL-2 concentrations representative of those found in breast tissue of healthy individuals (500 pg/mL) or those with breast cancer (2500 pg/mL) and then evaluated using a wound healing assay to study the effects of CCL-2 on metastasis, as indicated by cell proliferation to close the wound. Images of the wound closure were captured every 6 hours until closure was observed. Image analysis using ImageJ software (NIH) and statistical analysis using a two-way ANOVA with significance determined by $p < 0.05$ (Graphpad Prism) showed no significant differences in percent closure among different CCL-2 concentrations. These findings confirm that CCL-2 likely contributes a greater role in breast cancer metastasis through immune cell recruitment, as opposed to cancer cell proliferation, as hypothesized here.