

Introduction

In 2012 more than 226,870 new cases of invasive breast cancer will be diagnosed (1). In the 1970s the connection was first made between cancer and virus infection. One particular virus that has been associated with breast cancer is human cytomegalovirus (HCMV). This virus is endemic in the human population and establishes lifetime latency in the host.

HCMV infected cells produce cmvIL-10 protein, a viral homolog of the human interleukin-10 protein (hIL-10), which activates the JAK-STAT signaling pathway (2). Like hIL-10, cmvIL-10 has also been shown to bind to the IL-10 receptor and activate the JAK-STAT pathway as well (3).

Here, we show that cmvIL-10 activates Stat3 in human breast cancer cells through phosphorylation (pStat3). Stat3 has been identified as a key factor in tumor progression and evasion of programmed cell death (4). These results suggest that the cmvIL-10 protein may cause breast cancer cells to become more invasive or metastatic.

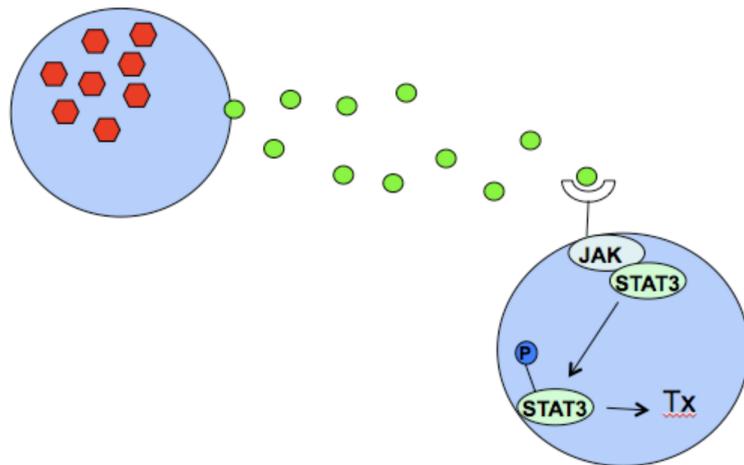


Figure 1. Paracrine effects of cmvIL-10 protein. Virus infected cells release cmvIL-10 protein which acts on nearby cells that have the IL-10 receptor.

Results

cmvIL-10 upregulates the hIL-10 receptor

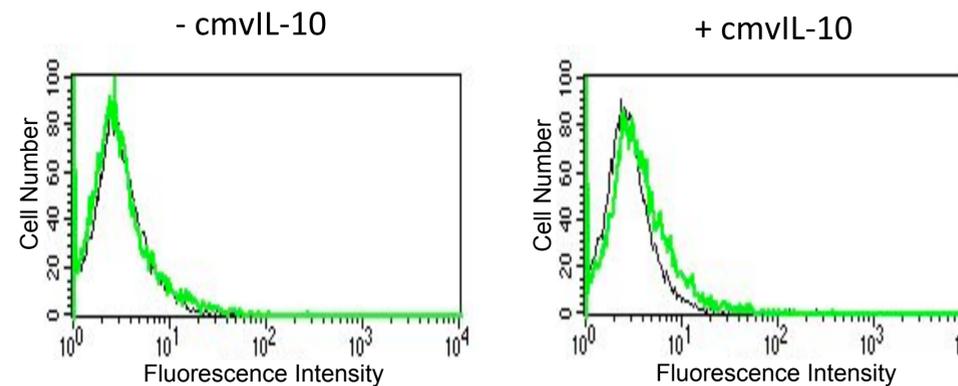


Figure 2. IL-10 receptor levels examined by flow cytometry. MDA-MB-231 human breast cancer cells were serum starved for 24 hours and treated with 100ng/mL of purified recombinant cmvIL-10 protein for 15 min. The green represents the IL-10 receptor labeled with the anti-IL-10 receptor antibody. The black represents the control antibody.

cmvIL-10 triggers Stat3 phosphorylation

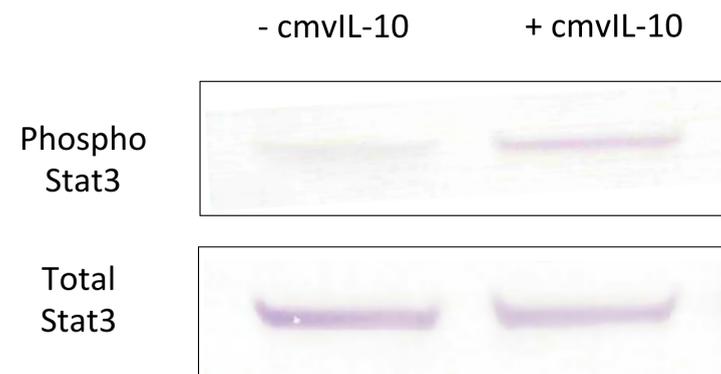


Figure 3. Western blot showing Stat3 activation by cmv IL-10. MDA-MB-231 cells were treated with cmvIL-10. The cells were lysed, lysates clarified and the proteins separated on SDS-PAGE gel. The proteins were then transferred to a membrane and probed with anti-Stat3 and pStat3 antibodies.

Conclusion

MDA breast cancer cells treated with cmvIL-10 exhibit upregulation of the IL-10 receptor on the cell surface as compared to untreated cells. Furthermore, MDA cells express Stat3 protein which becomes phosphorylated and activated by the binding of cmvIL-10 to the IL-10 receptor.

To further examine the role of cmvIL-10 in the progression of breast cancer, PCR arrays will be used to evaluate resulting changes in gene expression. Genes encoding adhesion factors and extracellular enzymes are of particular interest, as they play a crucial role in dissemination of cancer cells and the establishment of secondary tumors. Additional follow up experiments will include ELISAs to monitor enzymes levels and migration assays to evaluate invasive potential.

If cmvIL-10 does effect these cellular changes, this might suggest that HCMV positive cancer patients would benefit from anti-viral therapy combined with traditional chemotherapy. Our results are expected to clarify the role of HCMV in breast cancer and could have significant implications for patient treatment strategy.

Works Cited

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4. Behera, R, Kumar, V., Lohite, K., Karnit, S. and G. Kundu. 2010. Activation of JAK2/STAT3 signaling by osteopontin promotes tumor growth in human breast cancer cells. *Carcinogenesis* 31 (2): 192-200.

Acknowledgements

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