Quantitative analysis of cell-cell interactions and contact-inhibition of movement of cancer cells

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Metastasis accounts for 90 percent of all cancer related deaths. This process, driven by cell migration, involves cancer cells escaping from the primary tumor, invading the local tissue and forming secondary tumors in foreign areas of the body. Normal cells do not exhibit this ability because their locomotion is inhibited by contact with another cell. Contact inhibition of locomotion (CIL) is suppressed in cancer cells, allowing them to become metastatic. To date there is limited quantitative understanding of contact inhibition at the single cell level. Micropatterns provide a unique environment to study single cell contact inhibition. Micropatterns can be used to force pairwise interactions between single cells. Additionally, micropattern stripes confine cell movement along one dimension and mimic aspects of *in vivo* cell migration on extracellular matrix protein fibers. We are developing a quantitative approach that combines micropatterned materials, time lapse microscopy and fluorescence imaging to analyze cell-cell interactions and contact-inhibition in normal and cancer cell systems. Furthermore, this technique will be applied to elucidate the roles of two important biological signaling pathways in metastatic cancer: Ephrins and Par3. By analyzing cell-cell interaction in this context, quantitative differences between measured characteristics and expression levels can be used to identify critical expression levels of signaling molecules that regulate metastasis. Such insights can help to guide drug discovery and to develop therapeutic strategies.