Potential novel antibody treatment for breast cancer

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Breast stem cells

Within the breast tissue there are different subsets of cells, such as luminal and myoepithelial cells. These cells have specific function within the tissue. All these cells originate from one small cell population, the breast stem cells (figure A). Breast stem cells are undifferentiated cells that have the ability to divide indefinitely and give rise to undifferentiated cells, with limited lifespan.

Breast cancer stem cells

Breast cancer is abnormal cell division of breast cells. Within a breast tumor, heterogeneity of cell types can be found. The lab of Michael F. Clarke, MD was the first to prospectively identify cancer stem cells (CSC) in breast tumors. These are tumor cells with stem cell like characteristics such as the ability to divide indefinitely and to give rise to differentiated cell types. We currently think that cancer stem cells are the source of breast cancer (figure B).

Therapeutic antibodies

Our body makes antibodies, which identify and neutralize foreign objects like bacteria. Antibodies can also be engineered in such a way that they recognize proteins expressed on tumor cells and induce cell death of these cells. One of the biggest successes of a therapeutic antibody is Rituximab, which recognizes a protein (CD20) specific for a lot of leukemias and lymphomas. Another example is Trastuzumab, specific for breast cancer, which recognizes Human Epithelial growth factor Receptor 2 (Her2/Neu). Both antibodies are currently used in the clinic to treat cancer patients.

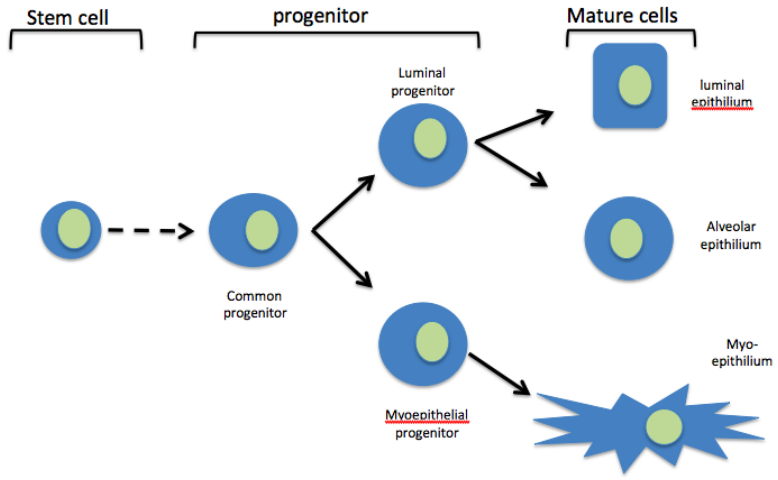
Potential new antibody treatment for cancer stem cells

The identification of heterogeneity within a tumor and the description of cancer stem cells as the "source" of cancer make these cells a good target for therapy. By attacking and killing cancer stem cells, the tumor will not be replenished and will eventually disappear.

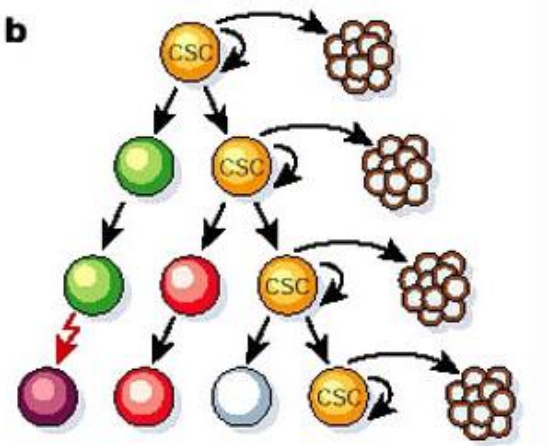
When I joined the Clarke lab at Stanford I set out to study breast cancer stem cells and aimed to develop novel ways to attack and kill these cells. I studied several proteins that are expressed by breast cancer stem cells and showed that blocking antibody kills cancer cells.

The critical next steps in my research will be preclinical testing of the antibody in animal models with human and mouse breast tumors. Furthermore, I plan to characterize the mechanism by which the antibody kills tumor cells. A seed grant of $40,000-$50,000 from My Blue Dots will provide me with the means to perform this research and to take it to the next level of pre-clinical trials. If we can successfully demonstrate in animal models that this antibody is a potential new therapy for breast cancer, the next step would be to test it in clinical trials with patients.

a


Stem cell
progenitor
Mature cells
Luminal progenitor
luminal epithilium
Alveolar epithilium
Common progenitor
Myo-epithilium
Myoepithelial progenitor

b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