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UNDERSTANDING THE BIOLOGY OF BREAST CANCER

By Dr. Linda Vahdat

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Things keep on moving forward in the world of breast cancer. Since the sequencing of the human genome project, there has been an explosion of new treatments for breast cancer and this reflects our exponentially improved understanding of how breast cancer grows.

The biggest advance in the understanding of breast cancer is the realization that they are divided into new categories called molecular subtypes based on their genetic makeup. These subtypes are labeled Luminal A and B, HER 2 neu-enriched/Luminal Her 2 and basaloid (a.k.a. triple negative breast cancer). What has become apparent is that these subtypes behave in a similar fashion regardless of size and number of involved lymph nodes which is a totally new concept. By separating out these tumors by molecular subtype, we have been able to "divide and conquer" in our approach to treatment of all kinds of breast cancer. The HER 2 neu-enriched/Luminal Her 2 subtype is treated with HER 2 neu directed therapy such as trastuzumab (Herceptin) and lapatinib (tykerb). Because it seems to be such a great target there is a long list of agents that are in clinical trials and each one looks better than the next. At Cornell, we are conducting clinical trials with neratinib, T-DM1 and pertuzumab which look especially great at treating HER 2 neu + breast cancer that has spread. More importantly, it is critical to be able to offer our patients access to these new drugs that are not widely available yet especially when they look very promising.

Another new category is the basaloid or triple negative breast cancers. These cancers tend to be a challenge to treat mostly because they seem to grow in a way that is different from the other breast cancers. The Poly (ADP-Ribosyl) polymerase (PARP) inhibitors made a big splash at our annual meeting of the American Society of Clinical Oncology in June 2009 in that when a PARP inhibitor was combined with chemotherapy it made the chemotherapy work much better. The idea was that the PARP inhibitor exploited and suppressed the ability of cancer cells to repair themselves from the damaging effects of chemotherapy. There are a number of PARP inhibitors in clinical trials and at Cornell we have 2 clinical trials of PARP inhibitors that are currently accruing patients. We are very excited to be participating in these clinical trials, as they seem to be quite effective with a good side effect profile.

Trying to understand why some tumors remain dormant and occult also impacts our understanding of how cancers spread and others don't. Research conducted by our Group has begun to unravel this process and it appears that for certain tumors, a copper deficiency induced state might be able to keep cancer cells from spreading and we think it might be because we deplete the ability of cancer cells to form blood vessels and some of the valuable tools it needs to spread elsewhere. We are hoping to be able to have more information on this research avenue within the coming year.

As you can see, this is a just a small example of the trajectory which we are on towards understanding this process called breast cancer. I am confident that the next few years will bring an entire new level of understanding to all the processes surrounding the disease and that more effective treatments will be reflected in this new and improved understanding of the breast cancer process ultimately resulting in less breast cancer and less breast cancer deaths.