In Breast Cancer a Calcium Pump Works both Ways

By HospiMedica International staff writers
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Cancer researchers have identified a protein overexpressed in breast cancer cells that functions both as a calcium pump and as a component of a signaling system, which triggers a massive cellular influx of calcium.

The protein, Secretory Pathway Ca2+-ATPase (SPCA2), was thought to be a supplemental protein pump – one of several able to force calcium ions out of the cell. However, a study published in the October 1, 2010, issue of the journal Cell revealed that SPCA2 primarily acted in an opposite fashion.

Investigators at Johns Hopkins University (Baltimore, MD, USA) showed that in breast cancer cells SPCA2 moved from its normal location in the cytoplasm to the cell surface, where it interacted with calcium channels. SPCA2 activated the channels, admitting large quantities of calcium into the cells.

The action of SPCA2 in breast cancer cells was thought to have derived from a possible role in lactation, a function of normal breast tissue. “Human milk is extremely high in calcium, and all that calcium gets there because SPCA2, along with an elaborate network of other proteins, is turned on during lactation,” explained senior author Dr. Rajini Rao, professor of physiology at Johns Hopkins University. “SPCA2’s normal purpose, we think, is to signal calcium channels to open so lots and lots of calcium come into the cells of mammary tissue, where it is packaged and pumped out to the milk.”

The SPCA2 gene is down regulated in normal breast tissue except during lactation. However, it is highly up regulated in breast cancer cells. “When regulation of SPCA2 goes wrong, that is when you have breast cancer,” said Dr. Rao, “probably because in breast tumor cells, the lack of regulation of the pump/signaling mechanism lets vast amounts of calcium into the cells, which stimulates the cell cycle, and triggers high levels of proliferation.”

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