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“The overall interest of my laboratory has been the regulation of cell growth, including the action of cancer-causing genes, communication between cells, and the effects of growth factors on the development of breast cancer.”

The growth of cells is tightly controlled, but cancer cells turn a deaf ear to signals that cause normal cells to stop dividing. Eckhart and his team identified and characterized genes in tumor viruses—so-called viral oncogenes—that override normal cell cycle controls. The viral genes he studied stimulate cellular growth signaling pathways, allowing the cells to divide continuously. Identification of growth signaling pathways has led to the development of drugs that inhibit the growth of cancer cells.

Cancer cells also lose the ability to communicate with each other through the exchange of materials through channels called gap junctions. This communication is important for coordinating the activities of cells in tissues, including normal regulation of cell growth. The proteins that form the channels are called connexins. Eckhart found that the addition of a phosphate molecule to a particular site in the connexin protein caused the channel to close. Some cancer-causing genes

stimulate this addition, thereby shutting off communication between adjacent cells and disrupting normal growth. Restoration of communication allows the cells to grow normally again, suggesting that agents that regulate cellular communication might help in reversing cancer. Eckhart also studied the effects of a growth factor, insulin-like growth factor-1 (IGF-1), on human mammary epithelial cells growing in a three-dimensional culture system that mimics the environment of the body. These cells spontaneously develop into hollow structures resembling tiny milk ducts, the most common site where invasive breast cancer arises. Abnormal signaling by IGF-1 changed the clearly defined hollow tubes into a misshapen blob of cells, similar to what happens during early tumor development. Studies like these can help in understanding how changes in genes and growth signaling can lead to breast cancer.

Eckhart recently phased out his laboratory research program. He became professor emeritus in 2010.



Walter Eckhart and Susie Simon