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Zinc control could be path to breast cancer treatment

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The body's control mechanisms for delivering zinc to cells could be key to improving treatment for some types of aggressive breast cancer.

New research by Cardiff University and King's College London has identified the switch which releases zinc into cells, with important implications for a number of diseases.

Zinc has long been known to play a vital part in human health. Too much zinc, or too little, can cause cell death. A growing body of evidence links zinc to disease states including neurodegeneration, inflammation, diabetes and cancer.

Zinc levels in cells are controlled by protein molecules called zinc transporters. These move zinc in and out of the cell to ensure correct levels are maintained. Until now, scientists have not understood how the transporters release the zinc. The Cardiff and King's research team have identified a switch, known as CK2, a protein which opens one transporter, called ZIP7, and allows the zinc to flow.

Earlier research by the team has already linked zinc delivery to types of breast cancer. Higher levels of intracellular zinc and the ZIP7 transporter were found in tamoxifen-resistant breast cancers. CK2 was also known to be more common in cancers which encourage cell growth. The discovery that CK2 opens ZIP7 suggests that drugs which block this release of zinc could also block cancer development. Early results from clinical trials of CK2 inhibitors suggest they are performing well.

Dr Kathryn Taylor, of Cardiff University's School of Pharmacy and Pharmaceutical Sciences, said: "We know that zinc, in the right quantities, is vital for development, our immune systems and many other aspects of human health. But when something goes wrong with the body's zinc delivery system, it looks as though disease can result. In particular, our research has shown a link to highly aggressive forms of breast cancer. Our better understanding of how exactly zinc is delivered suggests if we can block malfunctioning transporter channels, we can potentially halt the growth of these forms of cancer. We believe this makes zinc, and zinc delivery, a high priority for future cancer research."

Professor Christer Hogstrand from the Diabetes and Nutritional Sciences Division at King's College London, said: "Our discovery provides a mechanistic explanation for how the cell uses zinc to regulate different functions. The evidence that zinc is released on command in the cell and then regulates cellular processes seems to set it apart from other transition metals, such as copper and iron, in the way that it is used by the body. These findings should open the door for new research into the roles of zinc in health and disease."

The research, funded by a Wellcome Trust University Research Award to Dr Taylor, is published tomorrow (February 7) in the leading journal *Science Signaling*.

Provided by Cardiff University