Cancer cells brought under control by scientists

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Scientists at The University of Nottingham have brought cancer cells back under normal control -- by reactivating their cancer suppressor genes. The discovery could form a powerful new technology platform for the treatment of cancer of the breast and other cancers.

Breast cancer is diagnosed in about 1.4 million women throughout the world every year, with half a million dying from the disease. A common cause of cancer is when cells are altered or mutated and the body's tumour suppressor genes are switched off.

Research, published today in the *Journal Molecular Cancer*, reveals how Dr. Cinzia Allegrucci from the School of Veterinary Science and Medicine and Dr. Andrew Johnson in the Centre for Genetics and Genomics reactivated tumour suppressor genes and stopped the cancer from growing by treating them with Axolotl oocyte extract. After 60 days there was still no evidence of cancerous growth.

Cancers occur when the mechanisms that control normal cell division are mutated. The process of cell division is controlled by specific genes and these are turned “on” or “off” depending on their function. Among the most important of these genes are tumour suppressor genes. These genes repress the development of cancers and normally act as a control point in the cell division cycle. Therefore, the switching off of tumour suppressor genes is a common cause of cancers, including breast cancer.

Dr. Allegrucci, a lecturer in molecular genetics and cell biology, said: “The on/off switch in genes is controlled by the modification of proteins that are bound to the DNA in a cell — so called epigenetic modifications. Tumour suppressor genes in many breast cancers are switched off by epigenetic marks, which is the underlying cause of tumours. We sought to reverse this process, activating the tumour suppressor genes, in hope of stopping cancerous cell divisions.”

Dr. Johnson said: “To do this we used novel technology that makes use of the eggs of the axolotl salamander. Over the years Dr. Johnson’s lab has shown that humans evolved from animals that closely resemble axolotls, and because of this the proteins in axolotls are very similar to those in humans. Axolotl oocytes — which are the eggs prior to ovulation — are packed with molecules that have very powerful epigenetic modifying activity. Previously Johnson’s lab showed that extracts prepared from these oocytes have powerful capacity to change epigenetic marks on the DNA of human cells.

And, in a breakthrough, they showed it is important to use oocytes from the ovary, because if the oocytes are ovulated these activities are lost. We thought that by treating cancer cells with extracts made from axolotl oocytes we could reverse the epigenetic marks on tumour suppressor genes, causing these genes to reactivate, and thereby stopping the cancerous cell growth.”

The identification of the proteins responsible for this tumour reversing activity in axolotl oocytes is a major goal of future research which could form a powerful new technology platform for the treatment of cancers from the breast, and other tissues.

The University of Nottingham has a broad research portfolio but has also identified and badged 13 research priority groups, in which a concentration of expertise, collaboration and resources create significant critical mass. Key research areas at Nottingham include energy, drug discovery, global food security, biomedical imaging, advanced manufacturing, integrating global society, operations in a digital world, and science, technology & society.

Through these groups, Nottingham researchers will continue to make a major impact on global challenges.

Provided by University of Nottingham