

Rearrangements of multifunctional genes cause cancer in children and young people

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A doctoral thesis presented at the Sahlgrenska Academy, University of Gothenburg, Sweden, shows that three genes that lie behind a number of malignant tumour diseases are normally involved in several fundamental processes in the cell. This may be the reason that the tumours arise early in life and principally affect children and young people.

A family of [genes](#) known as the "FET" genes has been investigated in the work presented in the thesis. This family contains three genes that are found in modified forms in several malignant soft-tissue tumours and several forms of leukaemia. The FET genes are found in these tumours in the form of what are known as "[fusion genes](#)" in which parts of two different genes have merged to form one gene. Fusion genes are translated into abnormal fusion proteins, which can in certain cases transform normal [cells](#) to [cancer cells](#).

The human body consists of many different types of specialised cell types such as nerve cells, fat cells and [intestinal cells](#). These are formed when [stem cells](#) multiply and mature gradually along different developmental pathways. Cancer may arise if something goes wrong in this process. The study has shown that the activities of the genes in the FET family fall as the cells mature, and scientists therefore believe that these genes play a role during the early stages of cell maturation, when the cells are not far from the stem cell stage. The normal maturation pathway of a cell becomes blocked when fusion genes that contain FET genes arise. The result is a cancer cell with properties similar to those of stem cells, and such a cell can multiply in an uncontrolled manner.

"We found that the FET genes are also involved in the response of the cell to external and internal stress, and when cells spread. Alterations of such processes are common in cancer cells", says Mattias Andersson.

It normally requires damage to several different genes before cancer cells develop, and this usually takes a long time. However, since the FET genes are involved in several of the normal cell processes, scientists believe that in their rearranged form they can affect in parallel several of the control systems that prevent a normal cell from becoming a cancer cell. This may give rise to rapid development of cancer, and it may be the reason that tumours with FET fusion genes are often found in children and young people.

"Studying normal FET genes has increased our understanding of what may go wrong in cancer cells having rearrangements of these genes. This may in the long term lead to new methods of treatment for tumour diseases that contain FET fusion genes", says Mattias Andersson.

Source: University of Gothenburg

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