Kidney cancer reveals its weak link

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This is Jens B Nielsen, professor in Systems Biology, Department of Chemical and Biological Engineering, Chalmers University of Technology. Credit: Peter Widing/Chalmers University of Technology

A team of researchers at Chalmers University of Technology has found that kidney cancer cells have a quite different metabolism than other types of malignancies. The findings pave the way for new methods of diagnosing kidney cancer at an early stage, a feat that had eluded researchers earlier, and thereby fresh approaches to treatment.

Cancer is a result of mutations in the genes of healthy cells. The transition to cancer cells involves a fundamental transformation of their metabolism, the way that they use nourishment and energy. The uninhibited growth of cancer cells is based on their particular metabolism.

The Chalmers researchers have explored the metabolism associated with ten types of cancer cells. When analyzing regulation of metabolism by healthy cells after having become malignant, the researchers made an unexpected discovery.

"One type of cancer stood out from all the rest," says Professor Jens Nielsen, who headed up the team. "Cells affected by kidney cancer reprogram their metabolism in a very special way, which is the weak link in the disease. What fascinated us most was that we can potentially measure this vulnerability by taking a simple blood sample."

In order to look more closely at possible methods of using metabolism to diagnose renal cell carcinoma – the most common type of kidney cancer – the Chalmers team has begun collaborating with researchers at a hospital in Padua, Italy.

"To determine whether our predictions are valid," Professor Nielsen says, "the hospital will conduct a clinical trial to analyze blood samples and urine specimens from kidney cancer patients. We anticipate that a simple method of deciding whether someone has kidney cancer will be available within a few years."

Early detection of kidney cancer significantly improves its prognosis. Surgery to prevent the malignancy from metastasizing can still be successful at that point. The study also suggests that a feasible long-term goal is the ability to destroy cancer cells by changing their metabolism.

"Because kidney cancer cells metabolize abnormally, they have to fight for their survival," says Francesco Gatto, who constructed the cell models. "As a result, it should be possible to customize a way of taking advantage of their vulnerabilities so as to kill them without damaging healthy cells."

With that idea in mind, the Chalmers team is also collaborating with British researchers to identify the mechanisms decisive to destroying kidney cancer cells. The objective is to discover and develop drugs that can attack renal cell carcinoma.

The study has been published in the *Proceedings of the National Academy of Sciences*.

More information: Chromosome 3p loss of heterozygosity is associated with a unique metabolic network in clear cell renal carcinoma, www.pnas.org/cgi/doi/10.1073/pnas.1319196111

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