Rare cancers yield potential source of tumor growth

September 18 2012

(Medical Xpress)—Researchers at the National Institutes of Health have discovered a genetic mutation that appears to increase production of red blood cells in tumors. The discovery, based on analysis of tissue from rare endocrine tumors, may help clarify how some tumors generate a new blood supply to sustain their growth, the researchers explained.

The finding could lead to information on how to hinder the growth of tumors and treat cancers associated with excessive production of red blood cells.

"The finding has provided an important new lead that may yield information useful to understanding and treating a number of different tumor types" said Constantine A. Stratakis, M.D., D.Sc., scientific director of the Division of Intramural Research at the NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD).

Dr. Stratakis was a member of the research team that made the discovery. The team was led by the study's senior author, Dr. Karel Pacak, head of the Section on Medical Neuroendocrinology at NICHD. In addition to researchers at the NICHD, the team also included researchers at National Institute of Neurological Disorders and Stroke, the National Cancer Institute, the University of Utah School of Medicine, in Salt Lake City, and the University of Belgrade, in Serbia.

Their findings appear in the New England Journal of Medicine.

The researchers analyzed tumors from two patients. Both had a rare type of tumor, known as paraganglioma, which forms from chromaffin cells outside the adrenal glands, near blood vessels and nerves. Chromafin cells produce the hormone norepinephrine (adrenaline.) One patient also had a rare tumor of the duodenum known as a somatostatinoma.

Since birth, both patients had polycythemia, a rare disease in which the body produces too many red blood cells.

Analysis of the tumor tissue revealed that it contained an alteration in one of the family of genes called hypoxia-inducible factors (HIFs). HIFs have been implicated in the development of tumors and the progression of cancers. HIFs are made of two subunits, termed alpha and beta, and those subunits have been found to play a role in cancers. In the current study, the researchers found that the altered HIF2A gene generated proteins that were broken down more slowly than the typical form of the gene. In the presence of these proteins, the researchers also documented increased levels of a hormone that stimulates the production of red blood cells.

HIF genes are most active in conditions of low oxygen, such as in tumor tissue. Dr. Pacak explained that previous studies have found that a patient's polycythemia has disappeared after a paraganglioma or pheochromocytoma (chromaffin cell tumors arising in the adrenal gland) was removed.

The researchers concluded that the mutation may have altered gene activity in a way that led to more tumors growing in the bodies of the patients they examined.

Provided by National Institutes of Health