

Study provides documentation that tumor 'stem-like cells' exist in benign tumors

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Cancer stem-like cells have been implicated in the genesis of a variety of malignant cancers. Research scientists at Cedars-Sinai Medical Center's Maxine Dunitz Neurosurgical Institute have isolated stem-like cells in benign (pituitary) tumors and used these "mother" cells to generate new tumors in laboratory mice. Targeting the cells of origin is seen as a possible strategy in the fight against malignant and benign tumors.

Cells generated from the pituitary tumor [cells](#) had the same genetic makeup and characteristics as the original tumors and were capable of generating new tumors, according to an article in the July 2009 issue of the [British Journal of Cancer](#), posted online June 30.

Normal stem cells have the ability to self-renew and the potential to "differentiate" into any of several types of cells. Tumor stem-like cells appear to have the same self-renewing and multipotent properties, but instead of producing healthy cells, they propagate tumor cells. In this study, benign tumor stem-like cells were analyzed for their [genetic makeup](#) and behavior.

Pituitary adenomas have unusual characteristics that provided significant clues about several types of stem cells. The pituitary gland, situated at the base of the brain behind the nose, is stimulated by hormones from the hypothalamus gland to produce a variety of hormones that control other glands throughout the body. About half of all pituitary adenomas - which arise from pituitary gland tissue - also have this hormone-producing capability.

In these studies, the scientists isolated stem-like cells from both hormone-producing and non-producing pituitary adenomas that had been surgically removed from eight patients. Laboratory experiments focused on tumor stem cells from one tumor that produced growth hormone and one tumor that produced no hormones. Both types of stem-like cells were found to be self-renewable and multipotent, meaning they expressed proteins that could enable their offspring to differentiate into several types of cells.

Studies also showed that both hormone-producing and non-producing tumor stem cells can be differentiated into hormone-producing cells, with the specific hormones produced being determined by the characteristics of the original pituitary tumor.

Consistent with the researchers' earlier findings in cancer stem-like cells of malignant brain tumors, the tumor stem cells - but not the "daughter" cells - appeared to be resistant to chemotherapy. This suggests that even if most of a tumor's cells can be killed, stem-like cells may survive and regenerate the tumor.

When tumor stem-like cells were implanted into laboratory mice, they generated new tumors that had the same genetic composition and characteristics as the original tumors. Cells from the new tumors, later transplanted into other mice, maintained the same tumor-specific properties.

"Although previous studies have offered evidence of the existence of stem-like cells in pituitary adenomas, in this study we scrutinized these cells for composition and function, demonstrating that stem-like cells exist in benign tumors," said neurosurgeon John S. Yu, M.D., director of Surgical Neuro-oncology at Cedars-Sinai Medical Center. He is senior author of the journal article.

Although pituitary adenomas are typically noncancerous, they can cause significant injury or illness, either by compressing important structures, such as the optic nerve, or by creating hormone imbalances that can have wide-ranging and serious consequences. Identifying the mechanisms that enable these and other tumors to form may provide unique targets for new, more effective therapies.

"From our work with cancer stem-like cells in malignant brain cancers, it appears that stem cells from different cancers - or possibly even within the same tumor - may use different signaling pathways and have different implications for disease progression and prognosis. Findings from the pituitary tumor study generally support the cancer stem cell hypothesis, suggesting that similar mechanisms may be involved in the generation of both malignant and benign tumors," said Keith L. Black, M.D., chairman of the Department of Neurosurgery at Cedars-Sinai.

"Confirmation of the existence of stem-like cells in benign tumors is intriguing," said Yu, "but many questions remain to be answered, particularly in defining the molecular mechanisms involved. We need to find out if there is any relationship between tumor stem cells and normal pituitary stem cells, and how [stem cells](#) from benign tumors are different from and similar to those of malignant tumors."

More information: *British Journal of Cancer*: "Isolation of tumour stem-like cells from benign tumours." July 2009:
www.nature.com/bjc/journal/v10...n2/abs/6605142a.html

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