

Nicotine binding to receptor linked to breast cancer cell growth

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When nicotine binds to the nicotinic acetylcholine receptor (nAChR), it is known to promote smoking addiction and may also directly promote the development of breast cancer, according to a study published online August 23 in *The Journal of the National Cancer Institute*.

While smoking is a well-known risk factor for a broad range of cancer types, non-nicotine components of tobacco have generally been thought to be the carcinogens, so little is known about how nicotine acts on cells to promote cancer cell growth. For breast cancer in particular, some large epidemiological studies have suggested that smoking is related to increased breast cancer risk, but they have not been accompanied by molecular biology studies on how that actually works.

To determine whether nicotine works on the cellular level to promote breast cancer growth, Yuan-Soon Ho, Ph.D., of the Taipei Medical University, and colleagues, looked at 276 [breast tumor](#) samples from anonymous donors to the Taipei Medical University Hospital, to see whether subunits of the [nicotinic acetylcholine receptor](#) were overexpressed in breast cancer cells compared with surrounding normal cells.

The researchers found that human [breast cancer cells](#) consistently overexpressed the alpha 9 subunit of the nAChR ($\alpha 9$ -nAChR), and that expression was higher in advanced-stage breast cancer compared with early-stage cancer. They also found that reducing the levels of $\alpha 9$ -nAChRs inhibited tumor growth in laboratory experiments, whereas

increasing the levels of $\alpha 9$ -nAChRs or treating more normal breast cells with nicotine promoted the development of cancer characteristics.

The authors write: "These results imply that receptor-mediated carcinogenic signals play a decisive role in biological functions related to human breast cancer development."

The authors say their study was limited by its small sample size, and the fact that it included only Asian patients. [Breast cancer](#) in Taiwan is characterized by its low incidence rate and early stage of tumor onset.

In an accompanying editorial, Ilona Linnoila, M.D., of the Center for Cancer Research at the National Cancer Institute, writes that the study "suggests not only that smoking could be causally related to breast carcinogenesis but also that [nicotine](#) could directly contribute to the molecular mechanism of carcinogenesis in addition to indirectly contributing by promoting addiction to smoking."

Furthermore, Linnoila writes, "Better understanding of the molecular mechanisms of the cholinergic pathways will lead to more opportunities for intervention and prevention of tobacco toxicity."

More information: jnci.oxfordjournals.org/

Provided by Journal of the National Cancer Institute

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