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Small molecule shows promise as anti-cancer therapy

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Johns Hopkins scientists say a previously known but little studied chemical compound targets and shuts down a common cancer process. In studies of laboratory-grown human tumor cell lines, the drug disrupted tumor cell division and prevented growth of advanced cancer cells.

In a study described in the January 13 issue of *Cancer-Cell*, Marikki Laiho, M.D., Ph.D., and her colleagues say their work focused on the ability of a chemical dubbed BMH-21 to sabotage the transcription pathway RNA Polymerase pathway (POL I), shutting down the ability of mutant cancer genes to communicate with cells and replicate.

Laiho's research linked the pathway to p53 gene activity. P53 is a tumor suppressor gene, a protein that regulates cell growth, and it is the most frequently mutated suppressor gene in cancer.

Transcription pathways are the means by which certain proteins that direct cell division are put into action by cells. Uncontrolled cell division is a hallmark of cancer, and BMH-21 has demonstrated an ability to bind to the DNA of cancer cells and completely shut down this transcription pathway.

"Without this transcription machinery, cancer cells cannot function," says Marikki Laiho, M.D., Ph.D., professor of Radiation Oncology and Molecular Radiation Sciences at Johns Hopkins and senior author on the study.

Laiho said BMH-21 was identified using by screening a library of chemical compounds known to have potential for anticancer activity based on their chemical structure and capabilities. Specifically, they looked for the ability of those compounds to interfere with transcription in human tumor cells obtained through the National Cancer Institute's collection of 60 human tumor cell lines of nine different cancer types, including melanoma and colon cancer.

BMH-21 first jumped out, Laiho said, demonstrating potent action against melanoma and colon cancer cells. In fact, in these studies, the drug functioned better in upsetting these cancer cells' activities than many FDA-approved cancer drugs.

BMH-21 also appears to overcome the tendency of cancer cells to resist chemotherapeutic agents because it finds and targets proteins and shuts down the communication pathways that cells use to continue dividing.

"One of the challenges of current cancer therapies, including new targeted therapies, is a cancer cell's ability to overcome a treatment's anticancer properties. The characteristics of a cancer cell and its circuitry is very complex and results in many changes and mutations that allow the cells to continue to thrive despite cancer treatments," said Laiho.

While the findings with BMH-21 are promising, Laiho cautions much more study of the compound is needed before it would be ready for studies in patients. She and her team are continuing studies of the drug in animal models to further reveal the drug's potential against cancer and possible toxicities, and to determine dosage.

The transcription machinery the compound shuts down is common among all cancer cell types, so the researchers believe it has therapeutic potential across many tumor types.

Laiho is currently collaborating with Kimmel Cancer Center drug development experts as well as multiple myeloma blood cancer, medullary thyroid cancer, and prostate cancer experts to further explore the drug's cancer-fighting abilities. She also is collaborating with investigators at a laboratory in Helsinki, Finland, where she maintains an affiliation.

Provided by Johns Hopkins University School of Medicine