

# What do rotten eggs and colon cancer have in common? Hydrogen sulfide

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University of Texas Medical Branch at Galveston researchers have discovered that hydrogen sulfide—the pungent-smelling gas produced by rotten eggs—is a key player in colon cancer metabolism, and a potential target for therapies for the disease.

In a paper now online in the *Proceedings of the National Academy of Sciences*, the UTMB scientists describe cell-culture and mouse experiments demonstrating that colon cancer cells produce large amounts of hydrogen sulfide, and depend on the compound for survival and growth.

"They love it and they need it," said UTMB professor Csaba Szabo, an author on the paper. "Colon cancer cells thrive on this stuff—our data show that they use it to make energy, to divide, to grow and to invade the host."

The researchers connected the bulk of colon-cancer hydrogen sulfide production to a protein called CBS, which is produced at much higher levels in [colon cancer cells](#) than in non-cancerous tissue. Experiments revealed that colon [cancer cell growth](#) was curtailed when the activity of CBS was chemically blocked, while normal cell growth was unaffected.

"Our work identifies CBS as a new anti-cancer target," said UTMB professor and paper author Mark Hellmich. "By blocking CBS, we can fight colon cancer."

The anti-colon cancer effects of blocking CBS were also seen when the scientists studied "nude" mice onto which patient-derived [colon cancer tumor cells](#) had been implanted. Without hydrogen sulfide, the tumors grew much more slowly. They also showed a pronounced decrease in angiogenesis—the process by which a tumor stimulates the growth of a host's blood vessels around itself to "hijack" oxygen and nutrients for its own use.

The discovery surprised Szabo and Hellmich, but in retrospect, Szabo said, it makes sense. "Billions of years ago, before there was oxygen on Earth, hydrogen sulfide biochemistry was one of the main mechanisms that supported life," Szabo said. "By producing hydrogen sulfide, cancer cells are recreating an ancient mechanism."

That mechanism, Hellmich said, offers the scientists a chance to translate a basic science discovery into new therapies for cancer patients. "This is a chance to do research that really matters," Hellmich said. "We're very excited to have that opportunity."

**More information:** Tumor-derived hydrogen sulfide, produced by cystathionine- $\gamma$ -synthase, stimulates bioenergetics, cell proliferation, and angiogenesis in colon cancer, [www.pnas.org/cgi/doi/10.1073/pnas.1306241110](http://www.pnas.org/cgi/doi/10.1073/pnas.1306241110)

Provided by University of Texas Medical Branch at Galveston

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