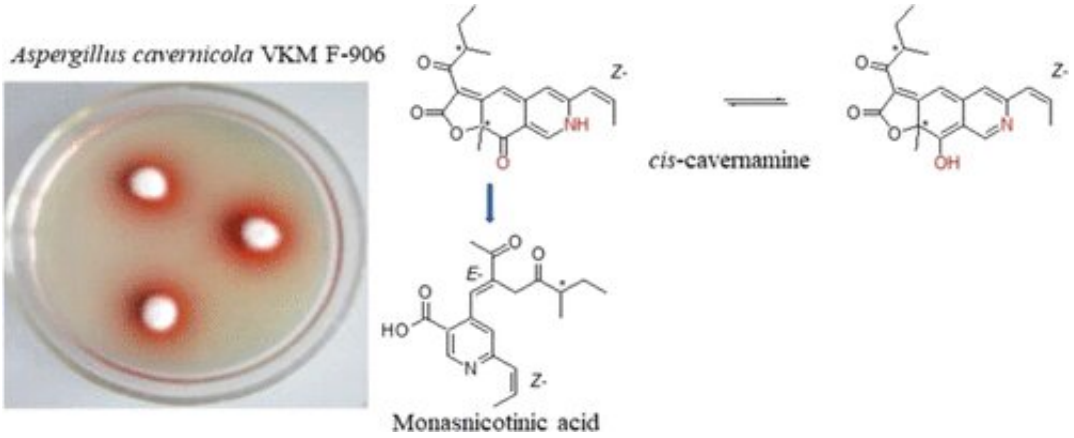
Substance with anti-tumor properties found in the extract of a fungus

October 7 2022



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Skoltech researchers and their colleagues from the Pushchino Scientific Center for Biological Research of RAS and Lomonosov Moscow State University discovered a never-before-seen substance with anti-tumor properties in the extract of the fungus Aspergillus cavernicola. The study was published in the *Journal of Agricultural and Food Chemistry*.

Cis-cavernamine, a pigment present in the A. cavernicola extract, was found to turn into another compound that the researchers dubbed monasnicotinic acid (MNA). They used human prostate and bladder cancer cells to check whether MNA has anti-tumor activity and discovered that it hinders the growth and migration of cancer cells by

blocking the AKT/mTOR signaling pathways.

"MNA's anti-tumor effect is promising, although not strong enough yet. We plan to enhance this capability by tweaking the molecule's structure and have already applied for an RSF grant to continue this research. While modified versions of MNA stand a good chance of evolving into effective cancer drugs, cis-cavernamine can be used by the food industry right away," said Tatiana Antipova, lead author and senior research scientist at the Skryabin Institute of Biochemistry and Physiology of Microorganisms of RAS in Pushchino.

A dark crimson dye, cis-cavernamine, is an azophyllon compound similar to the pigments found in the fungus Monascus.

"In China, Monascus has been used for over 2,000 years, both in medicine and the production of red yeast rice. In contrast to Monascus, which is banned in the United States as a source of citrinin mycotoxin, A. cavernicola can be a safer source of natural dyes," Antipova noted.

Cis-cavernamine can replace synthetic azo-compound-based food colorants that increase the risk of allergic reactions and cancer. A. cavernicola can be grown in bioreactors using agricultural waste in order to obtain the food dye. How soon the mushroom and the dye will come into use depends on the industries rather than scientists, Antipova added.

"This study used advanced structural analysis methods, including ultrahigh resolution mass spectrometry. After a thorough analysis, we identified the structures of both the dye and MNA. It turned out that MNA is released spontaneously from the dye and does not form as a result of fungal metabolism. The mechanism that we assume lies behind this chemical transformation suggests that the dye will have a long-term antifungal effect, among other things, which is important for food preservation and storage," Alexander Zherebker, senior research scientist

at the Skoltech Laboratory of Mass Spectrometry, said.

More information: Tatiana V. Antipova et al, Formation of Azaphilone Pigments and Monasnicotinic Acid by the Fungus Aspergillus cavernicola, *Journal of Agricultural and Food Chemistry* (2022). DOI: 10.1021/acs.jafc.2c01952

Provided by Skolkovo Institute of Science and Technology