Researchers find fungus has cancer-fighting power

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Arthrobotrys oligospora doesn't live a charmed life; it survives on a diet of roundworm. But a discovery by a team led by Mingjun Zhang, an associate professor of biomedical engineering at the University of Tennessee, Knoxville, could give the fungus's life more purpose—as a cancer fighter.

Zhang and his team have discovered that nanoparticles produced by *A. oligospora* hold promise for stimulating the immune system and killing tumors. The findings are published in this month's edition of Advanced Functional Materials.

Zhang commonly looks to nature for solutions to the world's challenges. He and research associate Yongzhong Wang were examining *A. oligospora*'s trapping mechanism for roundworms when they discovered the fungus secretes nanocomposites consisting of highly uniform nanoparticles. Nanoparticles are tiny particles that have been shown to be important in cancer therapies.

"Naturally occuring nanoparticles have drawn increasing interest from scientific communities for their biocompatibility," said Zhang. "Due to their high surface-to-volume ratio, nanoparticles have demonstrated unique optical, thermal and electronic properties. In addition, their small size allows them to easily cross cell membranes, an essential requirement for cancer therapy."

The researchers investigated the fungal nanoparticles' potential as a

stimulant for the immune system, and found through an in vitro study that the nanoparticles activate secretion of an immune-system stimulant within a white blood cell line.

They also investigated the nanoparticles' potential as an antitumor agent by testing in vitro the toxicity to cells using two tumor cell lines, and discovered nanoparticles do kill cancer cells.

According to Zhang, nature faces many diseases, and offers rich mechanisms for curing them as a result of evolution. Nature-based nanostructures possess near endless diversity, which may offer novel solutions for therapeutic applications.

"This study could be the entrance into a gold mine of new materials to treat cancers," said Zhang. "Understanding how these nanostructures are formed in the natural systems will also provide templates for the synthesis of a future generation of engineered nanostructures for biomedical applications."

The researchers' approach promises to open up a new avenue for controlling the synthesis of organic nanoparticles using synthetic biology.

"This exciting discovery is the first step forward in the development of natural nanoparticle-based therapeutics for cancer treatment and demonstrates the importance of looking to nature for innovation in disease treatment," said Zhang.

Provided by University of Tennessee at Knoxville