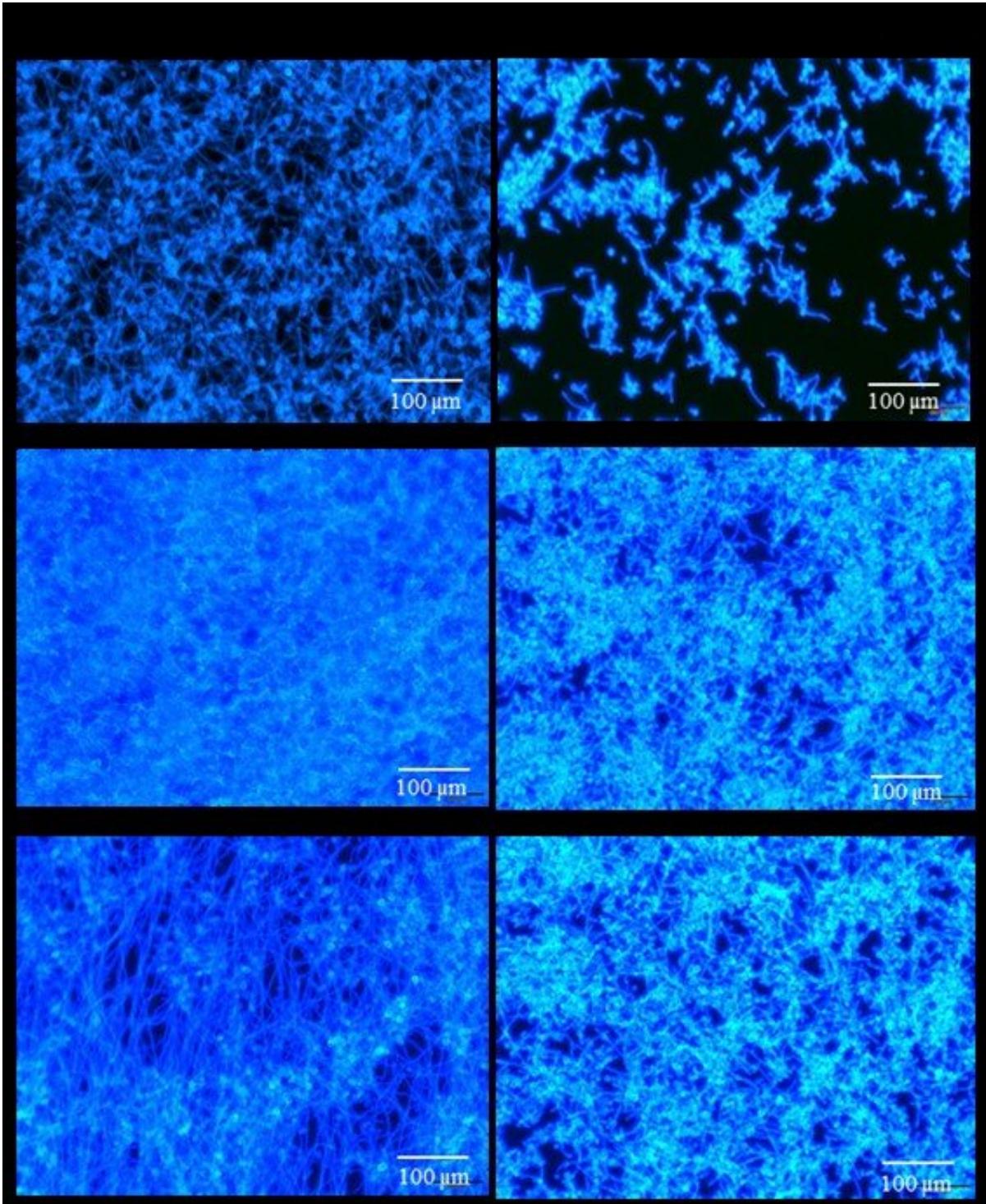


Fighting fungal infections: Giant leaps for smart nanotech

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Credit: University of South Australia

They're roughly the same size as a coronavirus particle, and 1000 times smaller than a human hair, yet newly engineered nanoparticles developed by scientists at the University of South Australia, are punching well above their weight when it comes to treating drug-resistant fungal infections.

Created in partnership with Monash University, the new nanobiotechnology (called "micelles") has a remarkable ability to battle one of the most invasive and notoriously resistant fungal infections—*Candida albicans*. Micelles are made of lipid molecules that arrange themselves in a spherical form in aqueous solutions. They both attract and repel liquids, making them particularly well suited for drug delivery.

It's a timely finding, especially given the significant rise of dangerous fungal infections in hospitals with countries overrun by COVID-19.

Candida albicans is an opportunistic pathogenic yeast that is extremely dangerous to people with compromised immune systems, particularly those in a hospital setting. Found on many surfaces, *Candida albicans* is notorious for its resilience to anti-fungal medicines. It is the most prevalent cause of fungal infections worldwide and can cause serious infections that can affect the blood, heart, brain, eyes, bones, and other parts of the body.

Senior investigator, UniSA's Professor Clive Prestidge says the new polymer-based micelles could revolutionize current anti-fungal medicines.

"Managing and treating invasive fungal infections is particularly challenging because so many fungal biofilms are resistant to contemporary antifungal drugs," Prof. Prestidge says.

"Fungal biofilms are surface-loving microbials that thrive on implanted devices such as catheters, prostheses and heart valves, making the presence of these devices a major risk factor for infection.

"In places like India—which has nearly 40,000 new COVID-19 infections every day—hospital resources are severely stretched, leaving healthcare workers are not only battling COVID-19, but also dealing with complacency and fatigue.

"The unfortunate result is that infection control practices have deteriorated, putting patients on [mechanical ventilation](#) at greater risk of developing bacterial or fungal infections.

"As fungal biofilms tend to seed recurrent infections, finding ways to break and beat the infection cycle is critical, especially now.

"Our research has identified and developed smart micelles that have the ability to break down single and multi-species biofilms to significantly inhibit the growth of *Candida albicans*, one of the most virulent fungal species.

"We estimate that the new micelles could improve the efficacy of anti-fungal medicines by 100-fold, potentially saving the lives of millions of people worldwide."

Dr. Nicky Thomas, co-investigator, says the new micelles present a breakthrough for treating invasive fungal infections.

"These micelles have a unique ability to solubilize and entrap a range of important antifungal drugs to significantly improve their performance and efficacy."

"This is the first time that polymer-based micelles have been created

with intrinsic capabilities to prevent fungal [biofilm](#) formation.

"As our results already show that the new micelles will remove up to 70 percent of [infection](#), this could be a real game changer for treating fungal diseases."

More information: Yassamin N. Albayaty et al, Polymeric micelles with anti-virulence activity against *Candida albicans* in a single- and dual-species biofilm, *Drug Delivery and Translational Research* (2021). [DOI: 10.1007/s13346-021-00943-4](#)

Yassamin N. Albayaty et al, pH-Responsive copolymer micelles to enhance itraconazole efficacy against *Candida albicans* biofilms, *Journal of Materials Chemistry B* (2020). [DOI: 10.1039/C9TB02586C](#)

Provided by University of South Australia

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