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AUG 30, 2021 9:00 AM PDT

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Using Sunflower Pollen to Create Ink For 3D Biomedical Printing

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Most methods for manufacturing 3D printer ink involve the addition of various materials to provide strength and structure to the ink. According to new research from Nanyang Technological University, Singapore (NTUS), sunflower pollen helps create stronger and more flexible inks produced in a more environmentally-conscious way.

According to research published in *Advanced Functional Materials (https://onlinelibrary.wiley.com/doi/10.1002/adfm.202106276),* pollen-based ink may address a key limitation of current 3D inks: their structural resilience. Many of the materials used to create current printing inks can be too soft, which can affect the structural integrity of the final printed product. Many common approaches, such as extrusion-based bioprinting, also require exoskeletons to help ensure that the final product achieves the desired structure. However, these exoskeletons are essentially useless after printing, resulting in a significant amount of waste. Pollen-based ink may offer a new solution.

The process for making the pollen ink is also environmentally friendly. To make the ink, researchers soaked pollen particles alkaline, a process akin to soap-making, which itself is environmentally friendly due to the materials used and the limited amount of waste. This product is then mixed with hydrogels, such as those produced from brown seaweed or naturally occurring material from the human body. The product is an ink with more flexibility and structural integrity than existing inks and developed in a way that reduces waste and negative impacts on the environment.

The research team noted that their pollen-based ink could have important applications for biomedical printing, adding to previous research (https://pubs.rsc.org/en/content/articlehtml/2020/tb/d0tb00034e) noting the benefits of 3D printing for a range of biomedical needs, including the development of complex-shaped printed structures. Co-author Assistant Professor Song Juha, stated that "using our pollen-based 3D printing ink, which is biocompatible, flexible, and low in cost, we can fabricate membranes that are tailored to the contours of the human skin and are capable of bending without breaking."

As part of their research into the ink's biomedical applications, the team tested their ink in a proof-of-concept study, creating a five-layer tissue sample that could be used to culture cells. The team noted that "Pollen microgel particles have a hollow shell structure, which means they could potentially be used to carry drugs, cells, or biomolecules in drug delivery platforms with customised 3D structures."

The next step is to continue studies of their ink and find sponsors in the private sector to help advance their work.

Sources: Eureka Alert! (https://www.eurekalert.org/news-releases/926393); Advanced Structural Materials (https://onlinelibrary.wiley.com/doi/10.1002/adfm.202106276); Journal of Materials Chemistry B. (https://pubs.rsc.org/en/content/articlehtml/2020/tb/d0tb00034e)

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