NTU Singapore scientists fight cancer with upcycled ABS

The researchers used ABS from discarded keyboards to generate a 3D synthetic matrix as an anti-cancer drug screening tool

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The matrix made from upcycled ABS

Scientists at the Nanyang Technological University (NTU) Singapore have found a way to upcycle Acrylonitrile Butadiene Styrene (ABS) used in consumer electronics that advances cancer research.

The team used ABS from keyboards to create a synthetic 3D structure where cancer cells can grow to then be targeted in drug trials.

ABS is one of the most used plastics in electronical and electric products, a rapidly growing source of waste. These products currently have limited end-of-life options, as the presence of contaminants, mixed materials, and lack of cost-effective separation technology hinders recycling.

With their research, the NTU team has created a new end-of-life option for ABS e-waste and found an alternative to using new plastics in biomedical research.

“Our innovation not only offers a practical means to reuse e-waste plastics but could also reduce the use of new plastics in the biomedical industry,” lead researcher Associate Prof. Dalton Tay told Sustainable Plastics.

His team procured around 5kg of post-consumer keyboards in black and white from Virogreen, a recycling service for electronic waste in Singapore. They cut the samples into small pieces, washed them thoroughly with double distilled water, and air-dried them before dissolving the scraps in acetone. After adding sodium chloride crystals and pouring the mixture into a mould, the team obtained a highly porous and interconnected structure they called ABSponge.

The 3D synthetic matrix functions as a support structure, providing a framework for cells to attach and grow. The scientists obtained breast, colorectal, and bone cancer cell cultures and seeding and introduced them in the ABSponge. The cultures grew into spherical clusters of cells, called cancer spheroids, that resemble actual tumours and can be targeted in drug trials.

The 3D ABS structure showed better results than the conventional 2D plastic structures.

“The 3D organisation of the cancer spheroids can establish a non-uniform metabolic and signal gradient, which may profoundly affect the gene and protein expression patterns, exhibiting fundamental differences as compared to traditional 2D cultures,” the researchers explained. “These alterations arise due to the changes in cell-cell interaction, communications, as well as coordinate-dependent pericellular stresses,” they added.

The team shared their findings in ‘Transforming electronic plastics into bioadaptive 3D porous construct for advanced cell culture applications’, recently published in *Resources, Conservation and Recycling*.

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