

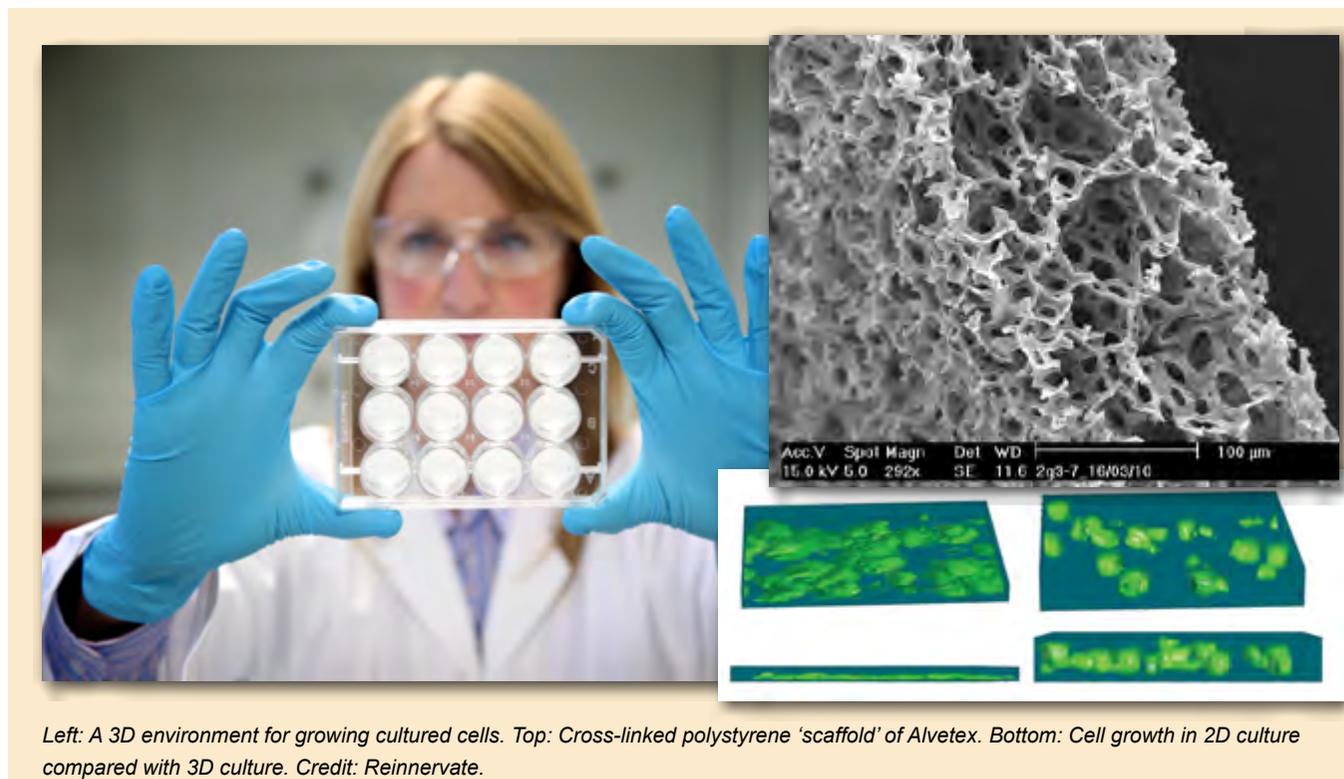
A novel 3D cell culture system from spinout company Reinnervate

Reinnervate, a spinout biotechnology company, has developed an innovative way to manage the growth and function of cultured cells¹. One of Reinnervate's products is enabling scientists to grow cell tissue in three dimensions, overcoming the limitations of conventional two-dimensional (2D) culture methods. The company, which has 1,500 customers worldwide, originates from BBSRC-funded research carried out at Durham University.

Reinnervate has developed Alvetex, a cross-linked polystyrene material in the form of a highly porous 'scaffold' that has been engineered into a membrane 200 microns across². Cells can move freely into the scaffold and form complex three-dimensional (3D) tissue-like structures.

Cell-culture models have been used in cell biology for many years, often relying on conventional 2D cell-culture systems in Petri dishes. However, the 2D culture systems used by many researchers can distort and flatten cells growing on the base of the culture vessel, and limit interaction with other cells.

More realistic models can be created by growing cells in 3D, enabling them to resemble their counterparts in living organisms³. Alvetex can produce more lifelike cell structures, cell-to-cell interactions and organisation of more physiologically-relevant tissue models⁴. According to Professor Stefan Przyborski, who works at Durham University and who founded Reinnervate in 2002⁵, cells are sensitive to their growth environment and will react



Left: A 3D environment for growing cultured cells. Top: Cross-linked polystyrene 'scaffold' of Alvetex. Bottom: Cell growth in 2D culture compared with 3D culture. Credit: Reinnervate.

and display behaviours relating to their surroundings. "Preventing cells from adopting abnormal, flattened structures and enabling preservation of their native 3D form is an important step in creating more physiologically relevant models and cell-based assays for use in research and discovery," he says.

An independent assessment by ThermoFisher Scien-

tific (supplier of cell culture plastic ware) in 2009 found the market for Alvetex to be \$35-\$40 million per year⁶. ThermoFisher Scientific are now a global distributor of the Alvetex technology.

Reinnervate now has more than 1,500 customers around the world, including cell biologists and other researchers in academic institutions, government labs,

hospitals and the biotech and pharmaceutical industries, making it a leading company in the 3D cell-culture market. The company's technologies have several applications in life sciences, including stem cell research and tissue engineering in vitro, cancer cell biology, liver toxicology, models of human skin, as well as drug discovery and product development in the academic, biotechnology and pharmaceutical sectors.

“Alvetex has been developed as an accessible technology that's simple to use, it's cost effective and is readily transferrable. No special equipment is required and any cell biologist growing cells in 2D cultures can now easily practice 3D culture to advance their research,” Professor Przyborski explains. “Alvetex is especially useful for creating complex co-culture models to study the interactions between cells – as would be experienced in real tissues. Such advances will improve the quality of cell-based assays which in turn will enhance the efficiency of in vitro tests, decrease costs and reduce the number of animals used in research,” he adds.

In addition to Alvetex, Reinnervate is developing other innovative products to manage the growth and function of cultured cells, including small molecules that control the formation of neural derivatives from human stem cells.

Reinnervate's products are manufactured and distributed worldwide from the company's development and production facilities in Sedgefield in the North East of

England. The company employs 17 people, six of whom hold PhDs and have many years combined experience in cell biology. Through a formal commercial research collaboration agreement, Reinnervate maintains a close relationship with Durham University and it continues to research new enabling technologies for application in cell culture in the university's modern research facilities.

Notes and references

1. <http://www.reinnervate.com>
2. <http://www.reinnervate.com/alvetex/videos/9>
3. <http://www.amsbio.com/alvetex.aspx>
4. Bokhari M, Carnachan RJ, Cameron NR, Przyborski SA. (2007) Novel cell culture device enabling three-dimensional cell growth and improved cell function. *Biochem Biophys Res Commun.* 354(4):1095-100. Available online at: <http://www.ncbi.nlm.nih.gov/pubmed/17276400>
5. <http://www.dur.ac.uk/biosciences/research/staffprofiles/?id=1016>
6. This is taken from an internal assessment made by ThermoFisher Scientific. The figures are based on an internal assessment of sales and current market research/intelligence.