Scientists engineer human tissue with electricity

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Scientists at The University of Manchester have developed a new technique which uses electricity to engineer human tissue. They now believe it may have the potential to engineer bespoke bone marrow.

The technique, which uses electric fields to build up layers of cells to form a tissue, is being used to create Hematons – aggregates of blood producing cells essential in the function of healthy bone marrow.

Dr Gerard Markx, of the School of Chemical Engineering and Analytical Science, has developed the technique based on a phenomenon called dielectrophoresis.

Dr Markx said: “We have proven this technique works, and have created some very simple Hematon structures in the lab. If we can perfect this technique then it may one day be possible to create artificial bone marrow outside the body and produce any given blood type.”

Dr Markx and his research team, which includes scientists in the University’s Faculty of Life Sciences, have so far created tissue 200 microns thick using the technique.

The function of bone marrow in the body is the production of blood. The most productive part of the bone marrow is formed by the hematon. Hematons are thought to be dysfunctional in patients suffering from bone marrow diseases like leukaemia.

Tissue is made using a series of glass slides with micro-electrodes etched on top of them. A solution containing cells is introduced to the slides. Electric fields are then created between the electrodes by running a small AC current through them.

In a similar way to which iron filings are attracted to the poles of magnets, the cells are attracted to the regions between the electrodes. As the cells collect together layers of cells build up, forming tissue.

Dr Markx said: “The use of electricity enables greater control over the position of the cells than conventional techniques. By varying the voltage and using different electrode shapes, cells can be positioned and stacked on top of each other in any pattern. Different electric fields can also be used to attract different types of cells. Most importantly, cells can be kept alive and active.”

The micro-electrodes used measure between 50-250 microns in size and can be positioned in any formation.

Source: The University of Manchester