

Tissue Engineering: Scientists Grow Mouse Teeth

Sarah Schlatter-Biomedical Engineering-University of Rhode Island

Tissue engineering is the use of a combination of cells, engineering and materials methods, and suitable biochemical and physiochemical factors to improve or replace biological functions. It includes applications that repair or replace portions of or whole tissues (ie; bone, cartilage, blood vessels, bladder, etc.). It is a very broad and new field where there is still so much to discover and develop.

I wanted to research a specific area of tissue engineering, something I hadn't heard of before, and so I chose an aspect of dental regenerative therapy. Scientists at the Tokyo University of Science were able to create a structurally correct tooth structure from cultured single-cell specimens as a replacement for natural mice teeth. They took cultured cells from mesenchymal and epithelial (both which form teeth) tissues of eight-week old mice and injected these cells into collagen to form a bioengineered tooth germ. Using two methods, in vitro and in vivo, this tooth germ was developed over two weeks. The in vitro simply means it was grown outside of the living organism in an organ culture, and the in vivo means it was transplanted inside the living tissue of the mouse, more specifically into the subrenal capsules of another mouse's kidney. Using either method, the tooth germ grew into a tiny tooth about 1.3 millimetres long developed with correctly placed mineralized tissue and cell types.

Furthermore, the researchers studied if the tooth germ or developing tooth could be transplanted into the tooth cavity left behind after they'd purposefully extracted an incisor from an adult mouse. Two weeks after engrafting the bioengineered tooth germ into the exposed cavity, they formed a correct tooth structure including enamel, dentin, root, pulp and blood vessels.

The researchers claim that their study "provides the first evidence of a successful reconstitution of an entire organ via the transplantation of bioengineered material." Their study proves that there is hope in the evolving body of research on tissue bioengineering applications and mechanisms for regenerating dental structures and other organs. These

developing dental regenerative therapies can be used instead of inlays or synthetic implants in the mouth, hopefully someday in a human. This method could be applied to re-growing other organs such as a kidney or liver. Similar methods were used in re-growing a mouse hair follicle which eventually formed a whisker.

However, as in any study, there are limitations. So far, researchers are having trouble forming specific types of teeth with predetermined sizes and shapes. Also, in this study, preliminary root structures were developed but they are not necessarily the functional roots that are required for a functional tooth to stay in place.



References:

- http://www.tissue-engineering.net/index.php?seite=News_detail&action=show&nr=179
- http://www.ada.org/prof/resources/topics/science_bioengineered_teeth.asp
- <http://www.healthday.com/Article.asp?AID=601946>
- <http://www.abc.net.au/science/news/stories/2007/1851011.htm>

