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CELLS ON SPHERES – A VISUALIZATION OF BIOCOMPATIBILITY

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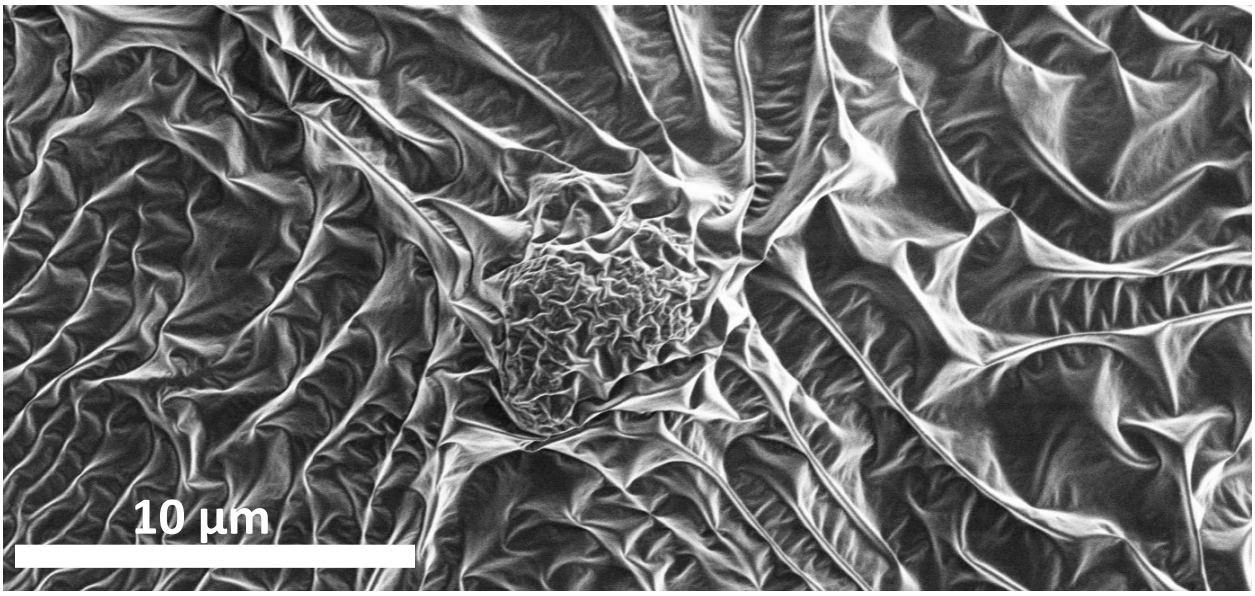

Figure 1. A mouse dental pulp cell clinging to the surface of a calcium-phosphate microsphere, sputter coated with carbon.

Methods

The above image (Fig. 1) was produced as part of a project investigating the use of calcium phosphate microspheres for use as dental bone graft materials. Microspheres were fabricated by passing calcium phosphate powder through a flame, as shown in Figure 2.

To test the biocompatibility of the calcium phosphate microspheres, mouse dental pulp cells were cultured on the spheres before being fixed and dried. The samples were then sputter coated with carbon to reduce charging and volatilization during imaging.

Figure 1 was capture using a Hitachi S4800 scanning electron microscope with an accelerating voltage of 1.0 kV and a working distance of 4.5 mm.

Comments

In the center of the image sits a mouse dental pulp cell, which is attached to the surface of a single microsphere with a diameter of around 150 µm. The ripples seen on the cell and across the entire image are folds in a carbon film, which is a result of the carbon sputter-coating process. A zoomed out view of several cells similarly adhered to a microsphere can be seen in Figure 3.

While these scanning electron micrographs are purely qualitative, they provide the opportunity to visualize how biocompatible materials can interact favorably with cells. The spherical geometry

is important in obtaining such images, as visualization is much more difficult with un-spheroidized powder such as that shown in Figure 4 due to the irregular surfaces.

The rippling created by the carbon coating generates a beautiful effect. Though this image was created using a microscope, it almost resembles an image of desert sand dunes, as taken from above. This image was taken near the beginning of my time as an undergraduate researcher and has reminded me that science and research can be beautiful. This beauty is part of what has inspired me to pursue a career as a researcher.

Additional Images

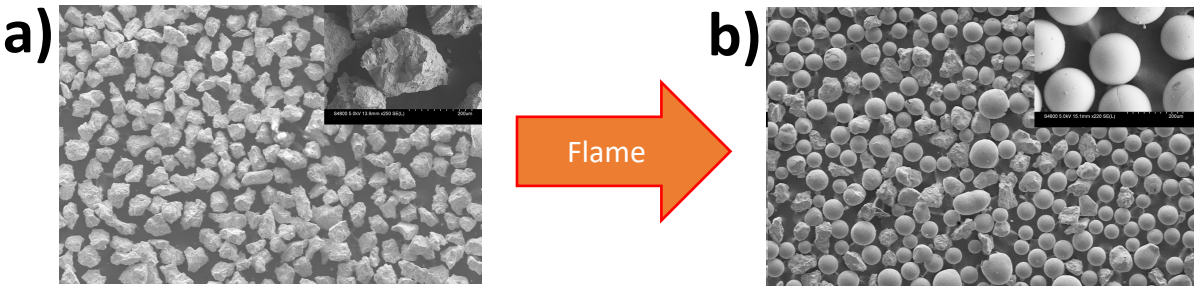

Figure 2. The process of producing microspheres from calcium phosphate powder. a) Calcium phosphate powder. Powder falls into a flame and is carried into a collector. As the powder melts, surface tension naturally forms the particles into spherical shapes. b) calcium phosphate microspheres.

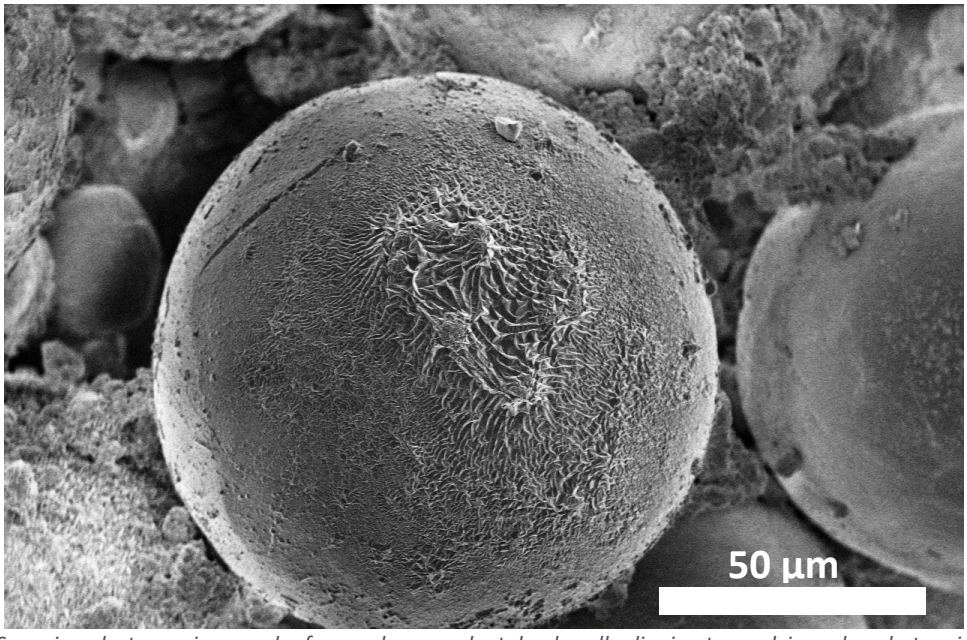

Figure 3. Scanning electron micrograph of several mouse dental pulp cells clinging to a calcium phosphate microsphere.

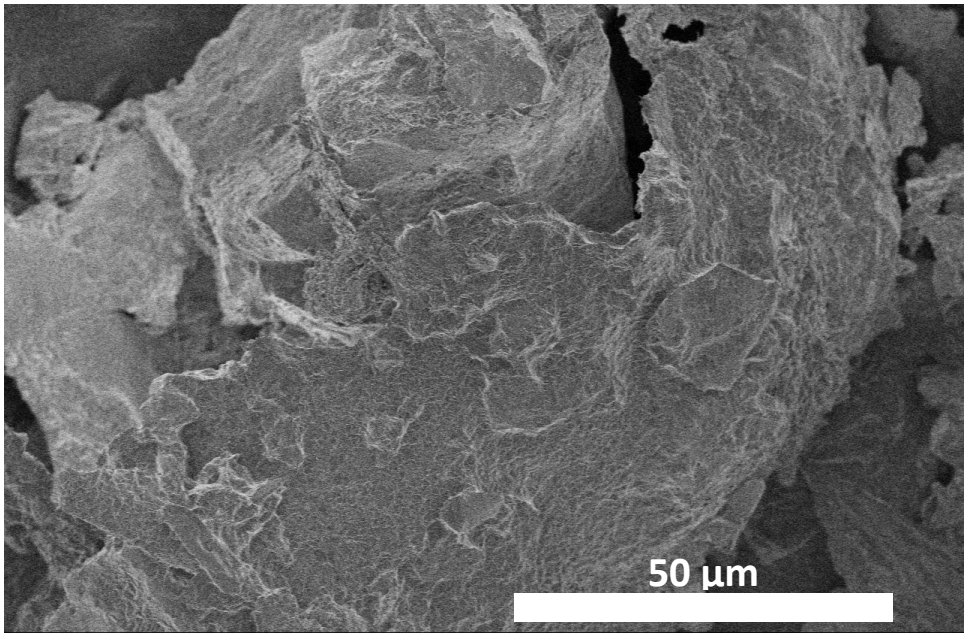

Figure 4. Scanning electron micrograph of a particle of calcium phosphate powder. While it was cultured with cells similar to figures 1 and 3, it is much harder to distinguish shapes due to the irregular surface.