Unlocking the Secrets to True Biocompatibility

Regardless of the reason for the placement of a medical device inside the body, it is still treated as a foreign invader. Cells attack the device, creating an inflammatory response. As a result, implanted medical devices are unable to perform at their optimum level.

In the hopes of solving this dilemma, researchers from the Georgia Institute of Technology have discovered how cells “sense” differences in biomaterial surface chemistry. According to findings published in the Proceedings of the National Academy of Sciences (PNAS), the cell behavior changes based on the differences in communication between the cell and the biomaterial. Further, the findings could lead to the development of materials that could be used to manipulate cells, such as controlling the differentiation of stem cells into mature, functional cell types.
“From a molecular perspective, we now have a better idea of how cells interact with materials and how materials can direct cell responses,” stated Andrés García, lead researcher on this project and an associate professor in the Woodruff School of Mechanical Engineering and the Petit Institute for Bioengineering and Bioscience at Georgia Tech. “And now that we understand that, it may be possible to engineer novel, rationally-designed biomaterials that can control those interactions.”
In a release issued by the institute, it was explained that “cells interact with biomaterials using specialized adhesion proteins. These adhesion proteins on the cell bind to target proteins adsorbed on the biomaterial surface. In addition to anchoring cells, these adhesion proteins trigger signals that control many cell functions, including growth and protein production. An important feature of these adhesion proteins is that they only recognize a small number of target proteins. García and his group showed that the biomaterial surface chemistry altered the types of adhesion proteins that cells used to adhere to the biomaterial. As the surface chemistry of the material changed, so did the types of adhesion receptors that the cells used for binding. These differences in the binding of adhesion proteins changed the signals in the cell and resulted in very different cellular responses.”
“The idea is that different adhesion proteins do different things by triggering different signals,” said García. “By controlling which adhesion proteins the cell is using to bind to a material, we can control what the cell does and the quality of its interaction with the material.”
Information: www.gatech.edu.

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