Research paves path for hybrid nano-materials that could replace human tissue or today's pills

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A team of researchers has uncovered critical information that could help scientists understand how protein polymers interact with other self-assembling biopolymers. The research helps explain naturally occurring nano-material within cells and could one day lead to engineered bio-composites for drug delivery, artificial tissue, bio-sensing, or cancer diagnosis.

Results of this study, "Bionanocomposites: Differential Effects of Cellulose Nanocrystals on Protein Diblock Copolymers," were recently published in the American Chemical Society's *BioMacromolecules*. The findings were the result of a collaborative research project from the Polytechnic Institute of New York University (NYU-Poly) Montclare Lab for Protein Engineering and Molecular Design under the direction of Associate Professor of Chemical and Biomolecular Engineering Jin K. Montclare.

Bionanocomposites provide a singular area of research that incorporates biology, chemistry, materials science, engineering, and nanotechnology. Medical researchers believe they hold particular promise because—unlike the materials that build today's medical implants, for example—they are biodegradable and biocompatible, not subject to rejection by the body's immune defenses. As biocomposites rarely exist isolated from other substances in nature, scientists do not yet understand how they interact with other materials such as lipids, nucleic acids, or

other organic materials and on a molecular level. This study, which explored the ways in which protein polymers interact with another biopolymer, cellulose, provides the key to better understanding how biocomposite materials would interact with the human body for medical applications.

The materials analyzed were composed of bioengineered protein polymers and cellulose nanocrystals and hold promise for medical applications including non-toxic, targeted drug delivery systems. Such bionanocomposites could also be used as scaffolding for tissue growth, synthetic biomaterials, or an environmentally friendly replacement for petroleum-derived polymers currently in use.

More information: pubs.acs.org/doi/abs/10.1021/bm401304w

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