Hybrid Materials with Living Cells and Tough Hydrogels
Technology #18548

Applications

This technology combines functional engineered cells into a tough hydrogel for the purpose of containment and protection of the cells. The technology has a wide range of potential applications in health and environmental sensing.

Problem Addressed

Genetic engineering has led to incredible advances in the functional capabilities of cells. For example, engineered bacteria can function like a microscopic computer to sense environmental signals and respond with a variety of outputs including physical readouts, functional secreted compounds, or the generation of long-term memory of inducible events. A significant roadblock to the utilization of engineered cells remains containment of genetically modified cells while retaining their functional capabilities. These inventors have provided a solution to this problem by embedding engineered cells in hydrogels.

Technology

This technology combines genetically engineered cells with a tough hydrogel material. The hydrogel is composed of 70-90% water with a biocompatible structural matrix, and the resulting hydrogel has a strength and elasticity similar to natural rubber. The hydrogel additionally contains the nutrients required by the cells for survival and allows transfer of chemical signals through the matrix. This technology provides both physical containment through motility restriction and chemical biocontainment by auxotrophy to prevent distribution of genetically engineered cells. The hydrogel has the capacity to be tailored to bacterial, yeast, or mammalian cells. Potential applications include (1) wearable, implantable, or ingestible health biosensors to detect inflammation, bleeding, or disease biomarkers, (2) environmental detection of toxins, and (3) controlled distribution of environmentally functional cells, for example, nitrogen fixing bacteria.

Advantages

- Biocontainment of genetically engineered cells and bacteria
- Protection of cells from environmental stress
- Easy retrieval of genetically modified cells

Categories For This Invention:

Materials
Polymers (Materials)
Biomaterials
Biotechnology
Diagnostics
Synthetic Biology
Therapeutics

**Intellectual Property:**
Materials and devices containing hydrogel-encapsulated cells
PCT
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**Publications:**
Stretchable living materials and devices with hydrogel-elastomer hybrids hosting programmed cells
Proceedings of the National Academy of Sciences
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