Microbial Consortia Immobilized Bioreactors

This technology offers a 3D printed hydrogel with two different cell populations embedded. This process can enable large scale production with a tunable approach for co-culture bioprocess applications.

What is the Problem?

Microbial production of value-added products ranging from small molecules to complex proteins is becoming increasingly attractive and effective across industry and academia. Recent advances in synthetic biology have further enabled this bioconversion to be modular and distributed across multiple organisms, thus creating synthetic consortia that can reduce metabolic loads and afford more robust cell populations. However, most mono- and co-culture bioprocess applications rely on large-scale suspension fermentation technologies that are not easily portable, reusable, or suitable for on-demand production.

What is the Solution?

The solution is a 3D printed hydrogel, where at least two different populations of cells are embedded in the 3D printed hydrogel. The different populations of cells can produce one or more products. The product can be anything capable of being produced by a cell, such as a protein, peptide, or small molecule. This platform can spatially organize individual microbes via direct-write 3D printing of microbe-laden hydrogel inks. The 3D printed hydrogel can be lyophilized and rehydrated, and the cells can continue to produce the product. This innovation covers methods of producing a product, and methods of producing a 3D printed hydrogel comprising different populations of cells.

What is the Competitive Advantage?

Large-scale suspension fermentation technologies are not easily portable, reusable, or suitable for on-demand production. These limitations are especially relevant when attempting to control the dynamics of a multi-organism consortium. This system eliminates the complexity of large-scale suspension technologies. It allows for a tunable approach, as the system is fit for a hydrogel system with tunable properties that can work with varying cell populations.

Patent Information:

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References

Technology ID

BDP 8693

Category

Materials/Powders

Selection of Available Technologies

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Learn more

1. Trevor G. Johnston, Shuo-Fu Yuan, James M. Wagner, Xiunan Yi, Abhijit Saha, Patrick Smith, Alshakim Nelson(43862) , https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7000784/, Nat Communication