Living Bioreactor for Stoichiometric Protein Production

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BACKGROUND

Living bioreactors are powerful systems for producing a variety of valuable compounds. The versatility of such bioreactors is one of the more useful aspects of the system. Large quantities of compounds or cellular components can be produced efficiently, with minimal cost. Alternately, these systems can be used to produce pathway components that are necessary in the production of secondary products. A common problem with such systems is that they are limited by non-uniform production of pathway components, or require an isolation process to ensure the components are in the appropriate quantity and sequence in the process. Inventors at Texas A&M and UC San Francisco have developed a novel technique to address these issues. The technology effectively results in a stoichiometric production of protein components that are produced in an array, ready for secondary production.

TECHNOLOGY DESCRIPTION

The living bioreactor produces a nanofabrication of polymers of the same or varied lengths which are produced as liposomes. The enzymes in the liposomes are produced in stoichiometric fashion, in a linear array which is precisely defined. The liposomes resist harsh conditions, and if necessary can be isolated easily. The system is especially practical for performing multi- enzymatic pathway processes that allow for efficient localization of intermediates to the next enzyme in the pathway. While the production of proteins as enzymes is a prominent aspect of the invention, the bioreactor would also be useful for preparing peptides, bioactive enzymes, protease-sensitive proteins, vaccines, antibodies and other compounds.

ADVANTAGES

· Nanofabrication of enzymes to prepare linear arrays for biosynthetic pathways

· Production of protease-sensitive proteins

· Production of two or more proteins in precise stoichiometry

· Renewable, low-cost production process

APPLICATION

· Biosynthetic pathway production for a variety of compounds

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OTHER INFORMATION

KEYWORDS

Protein Production, Living Bioreactor, Nanofabrication, Drug and Vaccine Development

CATEGORIZED AS

- **Biotechnology**
  - Proteomics
- **Medical**
  - Vaccines
- **Research Tools**
  - Protein Synthesis

RELATED CASES

2017-165-0

· Applications in drug and vaccine development, protein production

STAGE OF DEVELOPMENT

· Demonstrated production of linear protein polymer

· Renewable production of protein proof of concept completed

RELATED MATERIALS

▶ Ishikawa, H., Ide, T., Yagi, T., Jiang, X., Hirono, M., Sasaki, H., … Marshall, W. F. (2014). TTC26/DYF13 is an intraflagellar transport protein required for transport of motility-related proteins into flagella. eLife, 3, e01566. http://doi.org/10.7554/eLife.01566

▶ Yanagisawa, H., Mathis, G., Oda, T., Hirono, M., Richey, E. A., Ishikawa, H., … Qin, H. (2014). FAP20 is an inner junction protein of doublet microtubules essential for both the planar asymmetrical waveform and stability of flagella in Chlamydomonas. Molecular Biology of the Cell, 25(9), 1472–1483. http://doi.org/10.1091/mbc.E13-08-0464

PATENT STATUS

Patent Pending

INVENTOR INFORMATION

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Research Interests

· Pattern Formation and Regeneration in a Single Cell

· Cellular spatial awareness and organization

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Research Interests

· Ciliogenesis and ciliopathies

· Algae synthetic biotechnology

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