Simple, naked-eye pathogen detection using bioengineered baker's yeast

Published date: July 20, 2016

Technology description

Summary

There is a pressing need for simple, rapid diagnostic tests for bacteria and other pathogens. Current technologies to detect pathogenic agents like bacteria require specialized equipment and laboratories. This poses an almost prohibitive challenge to pathogenic testing in remote areas and in developing countries. This technology is a method for detecting human, animal, and agricultural pathogens using bioengineered baker’ s yeast. The yeast are engineered to produce lycopene, the compound responsible for the red color in tomatoes, in the presence of bacteria and other pathogens. The color change allows for a simple naked-eye test that can be used in the field by non-experts. This technology has the potential to be a transformative biological testing platform, akin to antibody dip-sticks.
Yeast are engineered to detect quorum sensing and produce lycopene, a red molecule
Baker’ s yeast (s. cerevisiae) can be freeze-dried and stored for prolonged periods of time, making it an ideal biosensing organism for remote areas. The yeast are engineered with G protein-coupled receptors (GPCR) that can detect biomolecules produced by different pathogens during quorum sensing. When a biomolecule binds to the GPCR, this sets off a signaling cascade that will activate the gene responsible for lycopene production. As lycopene is produced, the yeast culture turns red, indicating the presence of bacteria. Lycopene production in response to initial pathogen exposure can occur in as little as two hours, and visible color change generally takes place in under six hours.
This technology has been demonstrated using yeast engineered to produce lycopene in the presence of the natural s.cerevisiae pheromone, α-Factor, as well as in the presence of several fungal pathogens. Yeast have also successfully been engineered with GPCR’ s that can bind cholera toxin.

Lead Inventors:
[Virginia Cornish, Ph.D.](/)

Publications

* [Ostrov N, Wingler LM, Cornish VW. "Gene assembly and combinatorial libraries in S. cerevisiae via reiterative recombination." Methods Mol Biol. 2013;978:187-203.]( )

Application area

* Rapid detection of bacterial pathogens
* Rapid detection of fungal pathogens
* Rapid detection of biological warfare agents
* Food and water safety testing
* Healthcare diagnostics
* Agricultural disease diagnostics

Advantages

* Can be employed by non-experts
* Can be employed without the need for a laboratory or specialized equipment
* Can be employed in remote areas
* Test can be performed in as little as two hours.
* Baker’ s yeast can be stored for prolonged periods of time

Patent Information:

Patent Pending ([WO/2016/081619](https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016081619))
Tech Ventures Reference: IR CU15305

Institution

Columbia University

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com