Knowledge Transfer Office
香港城市大學
City University of Hong Kong

System and Method for Detecting a Target Enzyme

Health & Wellness

Biomedical and Genetic Engineering

Sensors

Opportunity

Enzyme detection is frequently used in disease diagnosis and food testing. For example, extracellular proteases are enzymes that are sometimes linked with cancer proliferation and the presence of common pathogens, such as E. coli and Salmonella, in food. Additionally, lipases, nucleases, glycoside hydrolases, and amidases are other potential enzyme targets of food- or medicine-related biosensing technologies. However, these diagnostically important enzymes are usually difficult to detect precisely with conventional techniques because they are only present at trace levels. Existing self-amplification methods for increasing the detectability of enzymes are time-consuming and laborious. The current state-of-the-art enzyme detection technologies for diagnosing tumours and microorganism-caused diseases and for identifying foodborne pathogens still have a lot of rooms for improvement.. A simple, rapid, and versatile technology is needed.

Technology

The invention is a system for detecting an enzyme in a sample such as food or human tissue. One embodiment is designed to detect the enzyme collagenase, an extracellular protease found in most bacterial cultures. The system uses autocatalysis to amplify the target enzyme signal. The technological principle is a substrate on which two or more enzymes are immobilised, one of which, such as the second, is substantially identical to the target. The enzymes are connected to the substrate via linkers, which consist of (bio)polymers. In one embodiment, the first linker is cleaved in the presence of the target enzyme. This releases the first enzyme, which then cleaves the second linker and releases the second enzyme, which can, in turn, cleave more of the first linker resulting in the release of more of the first enzyme. In this manner, a positive feedback loop is created with the release of much more enzymes (producing much bigger signal intensity) even with only small amount of the target enzyme. Signal transduction, e.g. colorimetric signals, can be realized by the incorporation of an optional third enzyme that can be released from the substrate during this positive feedback looping action. By quantifying the target enzyme, the system can assist disease diagnosis and the detection of foodborne pathogens.

Advantages

- Detects trace extracellular proteases more precisely than existing methods

IP Status
Patent filed

Technology Readiness Level (TRL) 4

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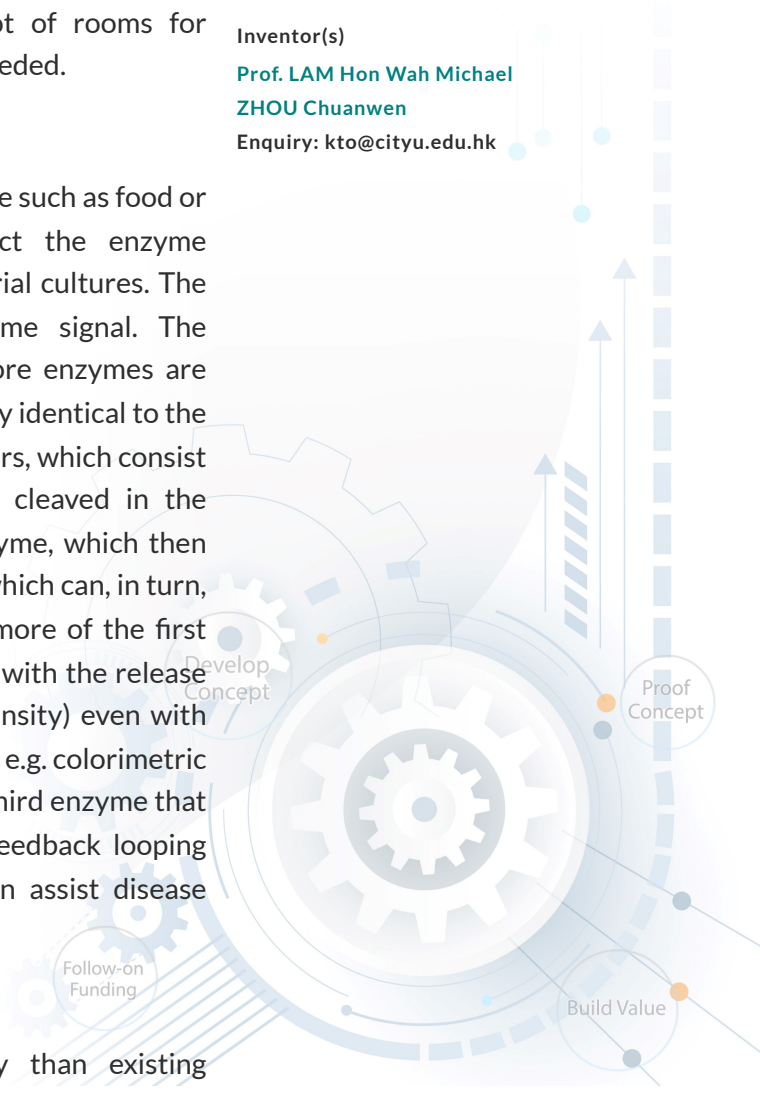

- Rapid and simple
- Does not require the design of cascaded biochemical pathways

Applications

- Clinical diagnosis of diseases caused by microorganisms
- Clinical diagnosis of cancers
- Food safety surveillance
- Fundamental research