Equipment-Free Quantification in Point-of-Care Diagnostic Assays

An approach to biomarker quantification that extends the benefits of point-of-care diagnostics by increasing their accuracy.

Inventors at Georgia Tech have devised an approach to biomarker quantification that extends the benefits of cell-free diagnostics, and point-of-care diagnostics in general, by increasing their accuracy and robustness. It uses a novel parallelized calibration scheme that enables the actual patient sample to be used in the calibration for each test, minimizing the impacts of variations of non-biomarker sample constituents across patients, as well as variations in test conditions (temperature, time, etc.). The result is accurate, equipment-free, measurement of biomarker levels, which can be implemented in semi-quantitative tests using visible readouts and no equipment, or quantitative tests using minimal, field-deployable equipment. This approach expands the reach of cell-free and other point-of-care diagnostics to entirely new classes of biomarker targets. The approach has been demonstrated with a biomedically relevant zinc biosensor as proof-of-principle, with other examples to demonstrate the generalizability of the approach.

Summary Bullets

- **Field-deployable robustness:** uses reference reactions to accurately measure biomarker levels without expensive or cumbersome equipment
- **Lower cost:** quantification does not require expensive technology

Solution Advantages

- **Field-deployable robustness:** uses reference reactions to accurately measure biomarker levels without expensive or cumbersome equipment
- **Lower cost:** quantification does not require expensive technology

Potential Commercial Applications

- Point-of-care diagnostics
- Artificial cell engineering
- Cell programming
- Genetic testing

Background and More Information

Cell-free synthetic biology is an emerging technology that uses biological parts and systems without the living cells that they come from, with many potential biotechnological applications. This approach has previously enabled the development of low-cost, equipment-free diagnostic tools that are currently being commercialized, but current technologies are limited to detection of pathogens (biological entities that cause infectious disease) and genetic diseases by testing for the presence or absence of specific genetic biomarkers. In contrast to infectious diseases, most diseases are diagnosed by measuring molecules other than nucleic acids (like small molecules or proteins) and require precise quantification of the biomarker for a diagnosis rather than just presence or absence of the marker. Moreover, the complex makeup of biological samples significantly impedes the accuracy of diagnostic quantification and the use of traditional calibration methods for simple, minimal-equipment diagnostics.

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Publications

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