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Rapid Low-Cost Detection of Valley Fever

Valley Fever (VF) or coccidioidomycosis is a systemic fungal infection that is endemic to the Southwestern United States with the highest frequency occurring in Arizona. Studies suggest that as few as 10 inhaled spores are sufficient to cause an infection. Of those who become infected, 40% experience flu-like symptoms or develop skin rashes, fatigue, or respiratory ailments that last from months to years. Approximately 5-10% of patients, particularly in susceptible populations, progress to a disseminated form of the disease affecting organs such as the skin, bones, joints, and meninges with potentially fatal consequences.

VF imposes a substantial burden on the healthcare system with studies showing hospitalizations cost about \$49K per stay. Because VF's clinical presentation resembles other infectious diseases, accurate diagnoses are often delayed, on average, 156 days until diagnosis, and in some cases ≥ 2 years before a final VF diagnosis. Thus, sensitive and accurate diagnostics are needed for early detection of VF.

Prof. Alexander Green at the Biodesign Institute of Arizona State University has developed an extremely low-cost and easy-to-use method for rapidly detecting the causative agents of VF. Combining the capabilities of cell-free systems with easy-to-use paper-based diagnostics these methods enable detection of nucleic acids associated with VF infection in a few hours with direct read out by eye. These methods have limited instrumentation requirements, only require a small volume of blood and provide greater sensitivity, all without needing biosafety level 3 containment.

This sensitive and specific VF diagnostic method could facilitate more widespread testing and earlier identification to help mitigate the impact VF has on the economy and healthcare system.

Potential Applications

- Valley Fever detection

Benefits and Advantages

- Low-cost – aim to get below \$1.00 per assay
- Can be read by eye
- Low-equipment requirements
- Decreased technician requirements
- Provides viable test results within at least 4 hours
- Sensitivity – Femtomolar level detection without false activation in response to other infections with similar symptoms
- The system can be freeze-dried in test tubes to render them stable at room temperature
 - o Easily reactivated using water
- Can be implemented in decentralized contexts

For more information about the inventor(s) and their research, please see [Dr. Green's departmental webpage](#)