Urinary Test that Detects Lung Diseases with Polymer-Inorganic Nanocomposites

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Technology description

Increases diagnostic accuracy while lowering production costs and improving patient comfort

This urinary test uses silicon nanoparticles suspended in a polymer to identify chronic lung diseases, including tuberculosis and lung cancer. Tuberculosis (TB), one of the world's deadliest diseases, infected approximately 9 million people across the globe in 2011. Lung cancer is the most prevalent cancer among men worldwide and the second-most-prevalent cancer among women (after breast cancer). The United States spends approximately $154 billion a year on chronic lung disease care. Available techniques for diagnosing chronic lung disease include costly scans that cannot be performed in developing countries, or tests that require invasive sputum samples that cause patient discomfort. These diagnostics often miss less-advanced cases, delaying treatment. Inexpensive tests that detect early-stage disease and allow for prompt, life-saving medical interventions are in high demand. This diagnostic urine test developed by University of Florida researchers requires patients to inhale a small amount of dry powder. In the presence of chronic lung disease, the powder quickly breaks down, causing fluorescent silicon to be excreted in the urine within hours. The body safely eliminates the nontoxic powder over time.

Technology

This urine-based test for detecting lung diseases includes a peptide-linked polymer that encapsulates silicon nanoparticles. Patients inhale small amounts of the product in a micro-scale powder. The peptide cross-linkage breaks down in the presence of MMP-9, a byproduct of several chronic lung diseases. This causes the release of fluorescent silicon nanoparticles into the bloodstream, which are quickly excreted in urine. Patients urinate onto a strip that can then be tested for the presence of silicon in any standard spectrometer. Since this diagnostic test employs the same manufacturing techniques as many over-the-counter products, it is easily implemented in a wide variety of settings.

Application area

Non-invasive diagnostic for identifying chronic pulmonary diseases

Advantages

Eliminates false positives, reducing the number of misdiagnoses
Utilizes readily available starting materials, widening the potential market to include developing countries
Provides results in just a few hours, alleviating patients' anxiety

Institution

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