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A NOVEL INSTANT SCREENING TEST TO DISTINGUISH BACTERIAL RESPIRATORY INFECTION

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Background: In patients with clinical symptoms of respiratory infection, rapid identification of cases requiring antibiotic therapy is crucial to avoid development of multiple resistant bacteria. Neutrophils are important members of innate immunity and neutrophil extracellular traps (NETs) are released by neutrophils to control microbial infection. Here we have developed an affordable, stable, feasible, and accurate diagnostic tool detecting negatively charged substances (e.g. oligonucleotides), in sputum from patients with pneumonia, that showed high and instant reaction to aniline dyes. We evaluated the ability of this novel test to detect bacterial infection in cases of pneumonia.

Methods: A colorimetric test was developed. Leftover sputum samples (n=467) from patients with suspected pneumonia were blindly tested using the index test. These results were compared to the ultimate outcomes that were determined through independent clinical and laboratory assessments performed by the patient's physician. The sputum samples were further analyzed using ELISA, surface plasmon resonance, SDS-PAGE and ultraviolet-visible spectrophotometry.

Results: The test distinguished pneumonia with high accuracy (community-acquired and nosocomial pneumonia, n=73 and controls n=192 without infection, sensitivity 97.2% specificity 78.2%, negative predictive value 96.4% and positive predictive value 82.6). The results were highly correlated to presence of hepatocyte growth factor in samples (R=81%) The positive test result was present even after ultrafiltration of samples in <50 kDa filters. The UV-vis spectrum in samples with positive test result showed a peak at approximately 265 nm that significantly differed from the controls.

Conclusions: The presence of proteins and nucleic acids at the site of bacterial infection might indicate NETs release from neutrophils. The novel screening test has the potential to diagnose pneumonia at an early stage and thereby reduce mortality and morbidity, to guide antibiotic prescription, to monitor the therapy and to reduce the cost which is especially vital in poorly equipped centers and rural areas.

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