A molecular biomarker to diagnose community-acquired pneumonia on intensive care unit admission

- Rapid and adequate identification of CAP (Sepsis)
- Reduce the time to first administration of antibiotics

**Background**

Community-acquired pneumonia (CAP) accounts for a major proportion of intensive care unit (ICU) admissions with severe sepsis. Non-infectious causes of respiratory distress complicate the diagnosis, which may lead to inappropriate treatment. Moreover, a delay in appropriate treatment of infectious critically-ill patients is associated with prolonged lengths of stay and heightens the risk of mortality. On the other hand, attempts to reduce the time to first administration of antibiotics in patients who do not have CAP have been associated with adverse consequences and have not resulted in decreased mortality. Thus, rapid and adequate identification of CAP upon admission to the ICU is of outstanding importance.

Currently, no test is available to the clinician to make the distinction between CAP and non-infectious patients presenting similar clinical manifestations (respiratory distress) upon ICU admission.

**The Technology**

AMC researchers solved this diagnostic problem by analyzing whole-blood gene expression profiles of CAP and non-infectious patients presenting similar respiratory distress. Using sophisticated statistical methods, including linear modeling, cross-validation statistics, principal component analysis and receiver operator characteristics, AMC researchers identified a 78-gene signature for the CAP versus non-infectious ICU patients with similar respiratory distress (denoted here onward as ICU controls). They refined this signature to a two gene ratio that clearly discriminated between CAP and ICU controls. Moreover, analysis of our the gene ratio in an independent cohort by means of highly sensitive and rapid quantitative reverse transcriptase-polymerase chain reaction (qRT-PCR) ascertained the robustness of the candidate biomarker.

Importantly, the AMC candidate biomarker outperformed plasma protein markers (Interleukin-8 [IL8], Interleukin-6 [IL6] and procalcitonin [PCT]) that have been routinely proposed to distinguish infectious from non-infectious patients. Therefore, the blood-based molecular invention can provide a unique tool to the clinician’s arsenal in rapidly identifying CAP from non-infectious patients presenting similar respiratory distress.

**Applications**

The biomarker can be used in isolation to distinguish between non-infectious causes of respiratory distress and CAP patients. This will help reduce time to the appropriate treatment.

**Intellectual Property**

A patent application has been filed with a positive search report.

**Inventors**

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**Key Publications**

Figure 1: (A) Supervised heatmap plot of the 78 gene expression CAP signature. (B) 3D principal component analysis plot. (C) Receiver operator characteristics and Wilcoxon rank sum test of the Gene 1:Gene 2 expression ratio.