Breath Analysis in Intensive Care: Non-Invasive Diagnosis of Ventilator Associated Pneumonia

BACKGROUND

Early and accurate diagnosis of infection on the intensive care unit (ICU) is a leading concern in medical practice and a major target for research. ICUs treat and monitor critically ill or unstable patients who may be unable to breathe on their own and whose organs may not function adequately. Medical equipment supports organ function until the patient recovers. Mechanical ventilators ('life support machines') support breathing. While this technology is effective, it can lead to life-threatening lung infection (ventilator-associated pneumonia; VAP) as a complication.

VAP is treated quickly and effectively with antibiotics, however, because patients on ventilators are already ill, it is not possible to diagnose pneumonia quickly and accurately. Therefore, many mechanically ventilated patients will also receive antibiotic treatments 'just in case', meaning that sometime antibiotics are used unnecessarily and over-used, potentially leading to the development of antibiotic resistant bacteria. We are developing a new technology to help decide quickly who has developed VAP during mechanical ventilation.

Exhaled breath has great potential as a diagnostic tool in this type of environment where rapid and multi-factorial changes take place could lead to significant morbidity and mortality. A platform has been developed at The University of Manchester that covers the very specific needs and requirements for breath analysis in mechanically ventilated patients in the ICU. The platform allows us to extract sensitive and accurate information in relation to the metabolites (volatile organic compounds) within the breath sample which can serve as diagnostic markers for VAP. The chemical profiles of breath collected from ICU patients distinguishes patients acquiring dangerous lung microorganisms, and we are currently developing the basis of a rule out prognostic test for VAP.

THE TECHNOLOGY

- A novel rule-out test for VAP in the ICU;
- A bespoke minimally-invasive breath sampling methodology for critically ill ventilated patients on a mechanical ventilator;
- Specific breath-based biomarkers for VAP.

BENEFITS

- Useful to identify those patients that have proven infection who may develop VAP
- Advantage over current practice in terms of speed and ease of use. Current practice is to administer antibiotics on suspicion of VAP, with a ≥48-hour lead time for microbiological confirmation of infection. Our technology has the potential to deliver results in 1 hour.
- Delivery of benefits to individual patients and society by reducing reliance on antibiotics

APPLICATIONS

- The technology is being developed for diagnostic application in the ICU

INTELLECTUAL PROPERTY

A patent application is in preparation and we expect to file in 2017.

OPPORTUNITY

The technology will be of interest to medtech and pharmaceutical companies. We would like to collaborate with an industry partner for further preclinical and clinical investigations with a view to ultimately licensing the technology.

CONTACT

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