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Project:

An ICU bed-side device for real-time early detection of Ventilator Associated Pneumonia (VAP) (cheqVAP)

Technological key words:

Ventilator Associated Pneumonia; VAP; SRS; Stimulated Raman Scattering; spectroscopy; clinical diagnosis, ICU, intensive care unit

Industrial sectors addressed:

Health, Insurance, medical device, clinical diagnostics

Total project costs: approx. 2.600.000 Euros

Partners' descriptions:

- **optiQGain Ltd.**, Israel (www.optiqgain.com) - the consortium coordinator and main integrator, also responsible for the development of: a). the low cost SRS spectrophotometer –dedicated, small, low-cost system placed at the bed-side; B).the metabolite extraction unit; c). the VAP detection algorithm (collects and assembles data from patients of the IUC, both VAP and NON-VAP, and integrate that data into the developed database); and d) the bedside unit CPU, memory and communication.
- **Sacher Lasertechnik GmbH**, Germany (www.sacher-laser.com)- is a leading developer and manufacturer of conventional tunable External cavity Diode Laser laboratory systems (ECDL). The goal is to develop a tunable ECDL to be used within the SRS detector. Technical approach is to miniaturize the ECDL system and set the complete assembly within a hermetic sealed housing. The control electronics will be realized as a hybrid electronics in sync with the other elements of the SYS detector subsystem.
- **University Hospital of Jena (UHJ)**, Germany (<http://www.uniklinikum-jena.de/en/Start.html>)- database is a critical component of the overall cheqVAP system. Its ICU is a leading medical center with 60 bed ICU department and a research and development orientation. The role UHJ is to develop the metabolite database required for the project. In addition, UHJ will collect and assemble data from patients of the IUC, both VAP and NON-VAP, and integrate that data into the developed database.



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- **OptoCap Ltd.**, Scotland (www.optocap.com) - provides contract package design and assembly services for microelectronic and optoelectronic devices. Optocap will design and produce high power diodes array for the SRS detection element of checVAP. The design will assemble high power diodes and connect all the emitted beams to a single output fiber. The design enables production a high quality, reduced cost product which is essential for meeting the target BOM price.

Project abstract:

Ventilator Associated Pneumonia (VAP) is a type of lung infection that occurs in people who are connected to a mechanical ventilator for more than 48 hours. VAP is currently detected and diagnosed through general and non-specific clinical findings (increased body temperature & WBC count and a change in chest x-ray – followed by culture of lung extract to detect pathogen and determine treatment). Delayed diagnosis of VAP is a major contributor to increased illness, sepsis and death. Persons with VAP have increased lengths of ICU hospitalization and have up to a 20-30% death rate.

There is general agreement by all participants in the healthcare business (government, insurance companies, hospitals etc.) of the need for early detection of VAP onset. It will save lives, shorten hospital stay and save money. Furthermore, there is currently no system that even attempts to provide continuous monitoring of VAP.

The cheqVAP project is based in a proven photonic method – i.e. SRS (Stimulated Raman Scattering) spectroscopy. The aim of the photonic aspect of this project is to devise an SRS spectroscope that is low cost while still accurate for its intended use.

The cheqVAP project aims at producing a specific design, namely the cheqVAP for ICU early detection and continuous support. The introduction of such an instrument will enable earlier and more accurate detection of VAP onset and should significantly reduce morbidity, mortality and length of hospital stay.

The cheqVAP system is an ICU bedside diagnostic device, connected to the exhaled air of the mechanical respirator. End-expiratory air is continuously captured and tested (several times per day). The system detects and measures different immune system and pathogen metabolites and records changes in content and concentration. Staff is alerted when changes indicate onset of pneumonia. Suspected causative pathogens are listed. Results are displayed in real time to the ICU staff and enable early detection of infection as well as close monitoring of the antibiotic treatment.

The Project is such funded to enable first clinical testing of the prototype. In the process of the project a database will be formed to be the basis for the eventual full database for the project. The end results and the size of the full clinical trial to follow will be determined based on the results of this project.



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Expected results and exploitation plan:

- Successful design and construction of the SRS detection element. It is the heart of the system, re-designed for low-cost, field reliability and is the cornerstone of the project - paramount for its success.
- Initial develop the metabolite database for VAP. The database is essential for differentiating VAP from NON-VAP patients and consequentially enabling early inset warning
- Initial proof of concept designs for the metabolite extraction unit and bedside unit. Full development of these elements will require additional funding.
- Approval for clinical use (FDA / CE) **is NOT within the scope of the program.** However, the use of cheqVAP will clearly require some sort of scientific and regulatory review to evaluate the safety and effectiveness. Thus, it is within the scope of this program to gather as much information to facilitate such approval in the future.

