inno•cc

Introducing non-invasive measurement of Cardiac Output and VO$_2$ in ventilated patients

- Cardiac Output and lung volume measurement by inert gas rebreathing

- VO$_2$ measurement optimized for pediatric patients

- Measurement of Lung Clearance Index

- Compact and portable point-of-care device

Proven technology now available for research use

InnoCC is a spinout of the Danish company Innovision. Their state-of-the-art Innocor® technology proven in exercise and cardiopulmonary testing sites all over the world is the core technology now being developed for critical care allowing non-invasive measurements of Cardiac Output, FRC and VO_2 even in pediatric patients.

The Innocor technology has FDA approval and CE mark for use in spontaneously breathing patients and InnoCC is now performing clinical testing of the Innocor technology in ventilated patients at renowned US and German university hospitals. The prototypes are fully functional and now offered for research use until FDA approval and CE certification have been obtained, expectedly by the end of 2015.

We expect the non-invasive measurement of Cardiac Output, FRC and VO_2 to be a breakthrough in the critical care environment and as such you have the opportunity to base your research on novel and game-changing technology. Using the Innocor prototypes thus requires local approval for research usage.

The test
During a rebreathing test, the subject rebreathes an oxygen-enriched mixture containing very small amounts of two physiologically inert gases - one blood soluble and one insoluble component - from a closed rebreathing system. The test lasts about five breaths or app. 15 seconds. During this time, the blood soluble gas is dissolved in the blood perfusing the ventilated parts of the lungs. Innocor measures the concentration curve of the blood soluble gas and calculates the washout rate, which is proportional to Cardiac Output. The blood insoluble gas is measured to determine the lung volume and to account for other factors that affect the distribution of the blood soluble gas. The validity of Inert Gas Rebreathing is documented in an impressive number of peer reviewed scientific papers.

Innocor Technologies
Innocor utilizes Innovision's proprietary gas analyzer technology for measuring nitrous oxide (N_2O, blood soluble), sulphur hexafluoride (SF_6, insoluble) and CO_2 continuously and simultaneously. The advanced analyzer is a photo acoustic infrared type, which combines a fast response with unsurpassed sensitivity, accuracy and inherent stability. No tedious calibrations are required. The oxygen sensor uses laser diode absorption spectroscopy, meaning no limited life parts. A Nafion sampling tube ensures optimal humidity removal.
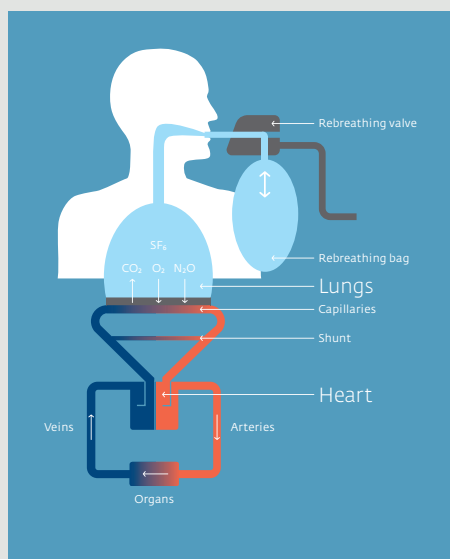
Parameters

Hemodynamic
CO	Cardiac output
CI	Cardiac index
SV	Stroke volume
SI	Stroke index
PBF	Pulmonary blood flow
V_L	Lung volume (or FRC)
HR	Heart rate
SpO_2	Arterial oxygen saturation

Derived hemodynamic
SvO_2	Mixed venous oxygen saturation
A-V O_2 diff	Arterio-venous O2 saturation difference
Shunt	Intrapulmonary shunt fraction
SYS	Systolic blood pressure
DIA	Diastolic blood pressure
MAP	Mean arterial blood pressure
SVR	Systemic vascular resistance
SVRI	Systemic vascular resistance index
CPO	Cardiac power output
CPI	Cardiac power index

Metabolic
VO_2	Oxygen uptake
VO_2/kg	Oxygen uptake per kg
VO_2/HR	Oxygen pulse
VCO_2	Carbon dioxide excretion
R	Respiratory exchange ratio
V_E	Expiratory minute ventilation
V_A	Alveolar ventilation
V_D	Anatomical dead space
V_T	Tidal volume
f_B	Respiratory rate
$F_{ET}O_2$	End-tidal concentration of oxygen
$F_{ET}CO_2$	End-tidal concentration of carbon dioxide
V_E/VO_2	Ventilatory equivalent for oxygen
V_E/VCO_2	Ventilatory equivalent for carbon dioxide

Pulmonary
LCI	Lung Clearance Index
FRC	Functional Residual Capacity