

Instrument for the non invasive and contemporary measurement of the perfusion and the water content in the biological tissues

KEYWORDS

- ☐ WATER CONTENT
- ☐ MICRO-CIRCULATION
- ☐ PERFUSION
- ☐ BIOLOGICAL TISSUES
- ☐ CONTEMPORARY MEASUREMENT
- ☐ NEAR INFRARED SPECTROSCOPY
- ☐ BEDSIDE MEASUREMENT

AREA

- ☐ BIOMEDICAL

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Patent Type

Patent for invention.

Ownership

Sapienza University of Rome 100%.

Inventors

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Industrial & Commercial Reference

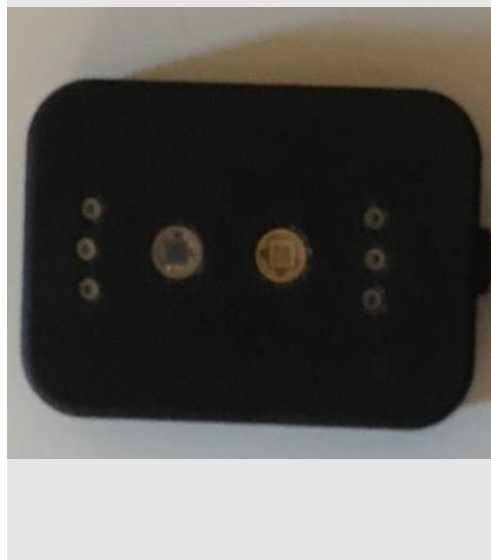
Biotechnology in healthcare application for the development of the in vivo diagnostics and monitoring.

Time to Market

3 years to complete experimental phase, instrument engineering, software and hardware development for analysis, transmission and diffusion of data.

Availability

Cession, Licensing, Research, Development, Experimentation, Collaboration, Start-up and Spin-off.



Abstract

The measurement of the water content inside tissues has a crucial importance in evaluating the oxygen delivered to cells during a diffuse inflammation and the therapeutic effect of drugs and fluids administration.

We conceived an instrument of Near Infra Red Spectroscopy (NIRS) technology capable to in vivo measure changes in the water content of tissues.

We aimed to obtain a contemporary measurement of the perfusion and the water content change inside tissues like brain, skeletal muscle and kidney in the adults and children affected by acute diseases characterized by a diffuse inflammation.

To assess the absolute water content within tissues we provide for the technology implementation enlarging the number of wavelengths emitted and applying a calibration system with a phantom at different water concentrations.

Publications

- ❖ De Blasi RA, Romagnoli S, Rocco M., Bedside Assessment of the Microvascular Venous Compartment in Cardiac Surgery Patients With Valvular Diseases Undergoing Cardiopulmonary Bypass, Journal of Cardiothoracic and Vascular Anesthesia 31:105–114 (2017).



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Technical Description

The patent system will include manufacturing of instruments constituted by: a chassis that contains several laser diodes emitting light at different wavelengths capable to penetrate within human tissues in a range comprised between 600 and 1300 nm; probes, containing optodes that emit and receive photons from tissues, differently shaped to be applied on the skin above tissues like skeletal muscle, skull for brain, and kidney, for children; a control unit for electrical signals processing and amplification; a calibration system based on phantoms at different concentrations of water.

In addition to the hardware, instruments are provided with a high autonomic software that analyzes data to obtain volumes and pressures variables from microvascular bed and the measurement of the water leakage from capillaries to the interstitial space.

Technologies & Advantages

The patent, applying the quantitative NIRS technology, integrates the light absorptions due to the hemoglobin and the water giving rise to an innovative measurement of the water content change related to microvascular volumes and therein pressures.

The business venture related to the patent consists of the production of instruments that, by measuring the hemoglobin concentration and the water content changes within tissues like skeletal muscle, brain and kidney (in children), provide numeric indicators of microvascular bed's volumes and pressures, differently from the preexisting devices.

These highly automated instruments and capable to be easily used also by not expert personnel will provide clinician numerical variables on-line and at bedside that could be used for the patients' treatment.

Disposable probes for an individual patient with different shapes are planned to be applied on the surface of the different organs.

Applications

The benchmark sector is the biomedical technology applicable in vivo, on humans, for the non invasive evaluation of tissues' perfusion and suffering.

Possible users: medical doctors specialized in fields where monitoring of tissues perfusion and evaluating of the effects of fluids addition or removal are crucial for the diagnosis and treatment.

Fields of application:

- Intensive Care Units;
- Emergency department;
- Anesthesia in several surgeries;
- Cardiology;
- Nephrology;
- Pediatric neurology;
- Sport Medicine.

The benchmark targets are the Operative Units within public or private hospitals, health care centers, research centers, and centers of the sport medicine in Italy or abroad.

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