
Monitoring of red blood cell aggregation, a strong marker of inflammation

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Background



Inflammation is a protective mechanism in response to an injury. This condition is usually localized and accompanied by a fever, a malaise, an immune response, and an increase in specific circulating plasma proteins called acute-phase reactants, some of these being involved in the mechanism of red blood cell (RBC) aggregation. The inflammatory response in conjunction with abnormal levels of RBC aggregation can be severe and fatal and thrombotic complications in conditions promoting a strong acute reaction, such as septic shock. Therefore, monitoring of the inflammation response in real-time with ultrasound can save lives.

Technology

Prof. Guy Cloutier at the Laboratory of Biorheology and Medical Ultrasonics in Montreal has developed a new technology for the real-time monitoring of the level of inflammation by measuring the size of RBC aggregates with ultrasound.

Results

The RBC aggregate measurements are based on the Structure Factor Size Estimator (SFSE), a 2nd order data reduction model based on the pair correlation function of neighboring red blood cells, applied to the frequency dependent backscattering coefficient (BSC) of blood. Two physical parameters (W , the packing factor, and D the aggregate diameter, expressed in number of RBCs) extracted from the model and experimental ultrasound measures of BSC are used to quantify the level of aggregation, a strong marker of inflammation.

Applications

This technology will lead to a stand alone dedicated instrument that will measure levels of aggregation to support medical decisions and allow in-bed critical patient monitoring, which is currently done for physiological measures (such as the electrocardiogram, blood pressure, body temperature, respiration rate, and systemic oxygen saturation with pulse oxymetry).

The technology targets patients with severe acute inflammation, as in septic shock (typically cancer patients in chemotherapy or radiotherapy more susceptible to infections) or difficult surgeries (typically cardiopulmonary bypass surgeries). In addition, it may be useful to monitor and predict acute vaso-occlusive pain crises in malaria, sickle cell anemia and β -thalassemia, where strong RBC aggregation also exists. It may also predict deep vein thrombosis.

Competitive Advantages

The method is the first and only to allow the real-time monitoring of RBC aggregation. Moreover, it is non-invasive, non toxic and quantitative.

Patent Status

US and CA pending applications (Q2/2008)

Business Opportunity

Exclusive or non-exclusive rights are available.

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