

INNOVUS

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A Nano-Biosensor for the Assessment of Human Platelet Function

Innovus Technology Transfer (PTY) Ltd is Stellenbosch University's wholly-owned technology transfer company. Contact Anita Nel, Innovus Chief Executive Officer, on (021) 808 3826 or send an email to ajnel@sun.ac.za for more information.



A novel, innovative way of assessing the degree of blood platelet activation in patients suffering from cardio-vascular disease.



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BRIEF DESCRIPTION

Cardiovascular disease (CVD) is the number one cause of death globally, and more people die annually from CVDs than from any other cause. It is estimated that 17.7 million people died from CVDs in 2015, representing 31% of all global deaths. Of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke.

People with CVD or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes or high cholesterol levels) need early detection, as well as effective management of prescribed medication, and a way to monitor disease progression. **Platelet hyperactivity** plays a central role in the pathogenesis of chronic inflammation and atherosclerosis, associated with CVD.

There are many platelet function tests available, such as the light transmission aggregometer (LTA), platelet function analyzer 200 (PFA-200), VeryfyNow, Immuno-phenotyping, and VASP. These platelet function instruments are not readily available in all laboratories because they are expensive and require skilled personnel to operate the instrument and interpret the results. Flow cytometry and confocal microscopy are only available in highly specialized (research) laboratories. Quality control has always been a problem with platelet function tests, since there is no standardization between instruments. The consequence is that thrombin cannot be effectively generated. Furthermore, normal reference ranges for these instruments are also not clearly defined.

THE NEED

There is therefore a need for *efficient, easy and cost effective monitoring, as well as early identification* of both the level of platelet reactivity and the exact pathway that is involved in the platelet reactivity of the particular individual.

UNIQUE CHARACTERISTICS

Our planned nano-biosensor will allow us to study the degree of platelet activation in platelets from individuals with CVD and particularly type 2 diabetes, before and after exposure to 5 different platelet agonists (ADP, Collagen, Serotonin, Arachidonic acid, Thrombin). Individuals with CVD will have a higher sensitivity for any or all of the 5 platelet agonists, and increased binding/activation will be noted depending on the particular pathway that is most pathologic in these individuals. We will measure the concentration/number platelet GP IIb/IIIa receptor expression, which indicates platelet aggregation capacity, and which is greatly increased on the activated (pathological) platelet surfaces.

TARGET MARKET

All entities in countries who are affected by CVD such as private and state hospitals, clinics, health care practitioners and mobile clinics.

VALUE PROPOSITION

The nano-biosensor for platelet activation will allow medical practitioners to diagnose inflammatory responses, at an early onset, much sooner and much cheaper. It will give information regarding treatment regimens that will prevent platelet hyperactivation, and will allow the GP to follow both the progression of the disease, as well as compliance of individuals to treatment regimens. Such a tool will be used both in state-of-the-art hospitals and clinics, but also in rural areas where the nano-biosensor will be used by nurses.

TECHNICAL DESCRIPTION

The nano-biosensor circuit and nanostructure interface will be designed to allow the detection of degree of platelet activation/hyperactivation and which of the activation pathways are most activated. Degree of platelet receptor activation will also be quantified. Detection will be done from a single drop of blood and/or plasma. Electronic signals emitted from the biosensor will be amplified and analyzed by using specifically developed software. Results will be transmitted to a centrally-placed database, where the medical practitioner can possibly also access the data remotely.

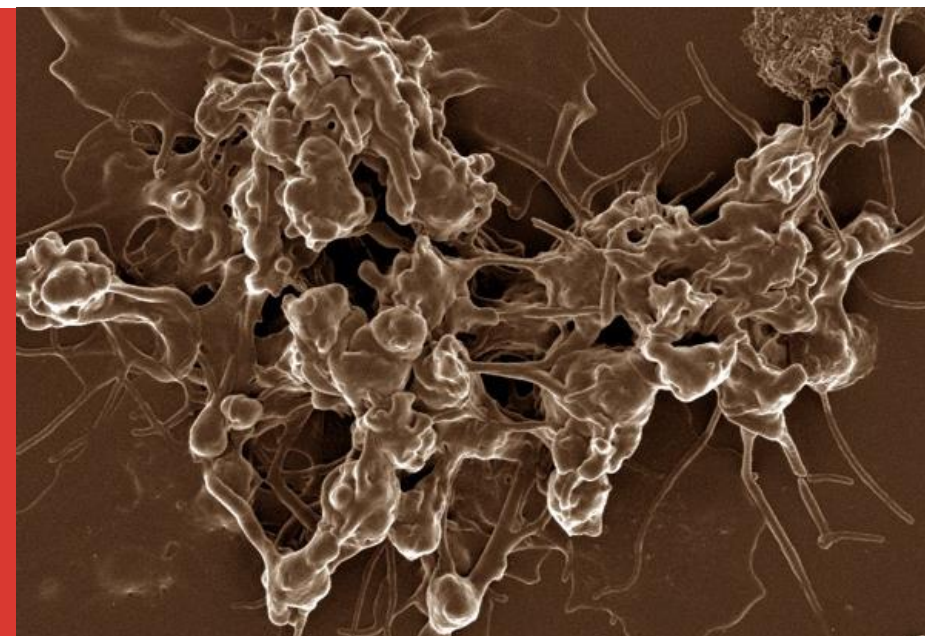
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INNOVATION STATUS

A provisional South African patent application (application number 20180/2056) has been filed for this innovation.