



Highly sensitive troponin tests can diagnose a myocardial infarction within half an hour

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Providing insights into new cardiac testing methods, Professor Stefan Holdenrieder, Director of the Institute of Laboratory Medicine at Munich's German Heart Centre, explained why biomarkers are a game changer in diagnostics.

Interview: Daniela Zimmermann

Professor Holdenrieder: 'Obviously the good news is that sensitivity, and thus the quality of biomarker tests for the early diagnosis of cardiac diseases, is constantly improving. Moreover, the change of marker levels and combinations of markers are increasingly used in diagnostics to obtain even more precise results.'

Does this mean diagnostics is like a veritable orchestra with various instruments?

'Correct. With regard to cardiac diseases new biomarkers, such as copeptin, are on the rise, complementing troponin since they provide results faster – an important factor particularly in the emergency room.'

But troponin is here to stay?

'Absolutely, particularly since today we have highly sensitive troponin tests that can diagnose a myocardial infarction within half an hour. The crucial advantage of highly sensitive tests is the fact that they measure even low values very precisely. Troponins take a while, until they increase significantly.'

'Before, a patient with symptomatic chest pain, but unsuspecting ECG and unsuspecting troponin values had to wait for about three hours until a new test showed the troponin changes. The new and highly sensitive tests can show changes after only an hour – if a myocardial infarction has happened.'

'This allows us to either intervene early or, if the values are unsuspecting, confirm that there was no cardiac event and we can send the patient home. This new type of test is faster and more precise. Equally important – with the help of troponins we can detect previous damage to the heart.'

These highly sensitive tests are not yet available in Germany?

Indeed. Having said that, many medium size labs are already equipped with the analytic tools required for these tests. Processing the tests is simple and not particularly expensive. Nevertheless, there are places where the tests cannot yet be applied, such as in your doctor's (GP's) surgery. Today, no POCT units are available that can use these highly sensitive tests. The development of such POCT tools will play a major role in the future.'

Since troponin can be measured with such high precision, will other markers, such as copeptin, still be needed?

'Yes, in the case of a disease we try to intervene as early as possible. There is still a gap between the onset of symptoms and detection of troponin, or rather the onset of the therapy. During this time gap there is a risk of the coronary vessels being obstructed. Copeptin can help us get through this phase because it's a pro-hormone, which, in a stress situation, is released by the hypophysis within minutes.'

'Obviously the stress can be triggered by a number of events, be it an accident, inflammation or infarction. Usually copeptin is already elevated when troponin is still unsuspecting. Thus copeptin gives us important time to prepare treatment. While the marker does not confirm the diagnosis myocardial infarction it does offer an important warning signal of a cardiac event. 'If, by the same token both copeptin and troponin values are unsuspecting, we can say with 99 percent likelihood that no myocardial infarction happened.'

Where else can biomarkers be used?

'In cardiology there are two reliable biomarkers that indicate cardiac insufficiency: the peptide BNP and the precursor fragment NT-proBNP. Both indicate the degree to which the heart muscle cells are stretched. Increased myocardial wall tension is a clear indicator of cardiac insufficiency. Increased markers are a serious alarm signal. However, for the initial diagnosis it is irrelevant which marker is being measured.'

BNP has a shorter half-life in the blood, thus the NT-proBNP value is more precise. With acute heart failure, though, both values are increased. Moreover, both values are used for risk assessment and follow-up. Since certain therapies affect BNP metabolism, NT-proBNP is the marker of choice to measure outcome: When NT-proBNP decreases, the therapy is effective. Further promising markers are in the pipeline, such as ST2, galectin-3 or GDF-15.'

What role will biomarkers play in the future?

'The potential of biomarkers is far

Biomarkers are diagnostic game changers

Exposing activities in wayward hearts



With previous roles at the Institute for Clinical Chemistry and Clinical Pharmacology at Bonn University, and

the Institute for Clinical Chemistry at Munich University, today Professor Stefan Holdenrieder is the Director of the Institute of Laboratory Medicine at Munich's German Heart Centre. His research focus lies on the development and evaluation of new laboratory diagnostic biomarkers and technologies for cardiology, oncology, immunology and neurology, with an additional special focus on circulating nucleic acids and their genetic and epigenetic changes.

from exhausted. Currently a number of studies are investigating which biomarker categories can be used for which types of clinical issues. Generally speaking, biomarkers can play a role in genetics, epigenetics, with micro-RNAs or exosomes, lipids, proteins or as metabolomic markers, or any combi-

nation of biomarkers. There are many and various possibilities.

'We are charting new territory here and further exploring the potential will require large-scale studies and handling of huge data volumes.'

New diagnostic technologies open up new horizons with regard to under-

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standing the development of arteriosclerosis and cardiovascular disease. However, meticulous assessment of diagnostic findings is crucial to determine a suitable treatment that will help the patient.'



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Space missions are famous for driving innovation, from Mylar blankets to microchips. So when French scientists learned one of their compatriots would be aboard the Soyuz MS-03 spacecraft to reach the International Space Station (ISS), they gathered cutting edge technologies for him to carry into orbit.

On 17 November 2016 the European Space Agency (ESA) astronaut Thomas Pesquet was launched into space with NASA astronaut Peggy Whitson and Russian cosmonaut commander Oleg Novitsky for the six-month Proxima Mission.

Inside Pesquet's space gear were equipment and materials for two assignments, the Matiss project designed by the French National Centre for Space Studies (CNES), and the ESA's EveryWear program.

The EveryWear tablet computer serves as the data platform for two devices from BodyCap, a start-up based in Caen, France, which collaborated on a zero-gravity study of wearable technology with the CNES laboratory focusing on microgravity science and the Swiss Institute for Space Medicine and Physiology.

Monitoring sensors

A sensor in the e-TACT patch worn by astronaut Pesquet combines activity tracking, skin temperature monitoring and body position detection; data is sent wirelessly in real time or stored on the device for subsequent analysis. The patch can be worn on any body area for some time, monitoring chronic diseases, sleep disorders and overweight people, for example.

'As there is no gravity in the ISS, the astronaut needs to be attached to the bed to avoid drifting around the capsule, which makes it difficult to sleep. What becomes important is an

ability to quantify movement during his sleep, as this is a very good indicator of sleep quality, a measure of whether he is truly sleeping or is restless,' explained Sébastien Moussay MD, a co-founder of BodyCap.

The other device from BodyCap is the Blood Pulse Wave sensor finger-worn device to detect changes in the blood pulse of the carotid artery when the astronaut presses his finger against his neck. This tonometer is being used as part of a study of modifications to astronaut Pesquet's cardiovascular system during long-term exposure to microgravity.

Without the resistance of gravity, Moussay said, the heart does not need to force blood flow to the brain and it progressively weakens, requiring a period of therapy for recovery once Pesquet returned to earth in May 2017.

The pulse wave sensor is a work-in-progress, Moussay pointed out,

but e-TACT is a CE-approved product with down-to-earth medical applications in programs for the obese and diabetic patients where physical activity is a vital measure, as well as for sleep labs. An example is patient compliance to prescribed physical therapy routines in the period following bariatric surgery.

Connected watches and other activity trackers popular with consumers do not make the grade with clinicians, he said.

'What's very important for doctors and medical staff is a measurement of metabolic change linked to activities such as walking and swimming. They are less interested in measuring hand movements of someone playing a video game, which is the data provided by connected watches,'

Finger-worn Blood Pulse Wave sensor is a tonometer that checks on modifications to the cardiovascular system



Moussay explained.

The Matiss project is a test of smart surfaces to resist bacterial colonisation inside the spacecraft with an eye on the future.

'If we are going to send people to Mars, we don't want them to get sick on the way, nor do we want them scrubbing and cleaning all the time,' said Guillaume Nonglaton, the project manager for the Matiss experiment at the Grenoble-based Leti research institute.

Housekeeping in the space station takes up an inordinate amount of the astronauts' time, which could be better spent performing their scientific mission.

Keen housekeeping is a vital task

Astronaut Pesquet installed four plaques in spots regularly frequented by fellow astronauts, such as the kitchen area. Each plaque holds 20 different samples of hydrophobic materials that will be exposed to the air in order to come in contact with water droplets circulating within it, each possibly carrying bacteria.

The sample surfaces were each designed to repel the droplets so that they remain in the air and can be filtered, rather than being absorbed on a surface where they may take root.

Advanced materials developed for the experiment include a fluorinated thin layer, an organic silica and a biocompatible polymer, all chosen for their hydrophobicity, and ability to be manufactured on an industrial scale.

The materials also have practical benefits back on Earth for germ-free medical device surfaces and even elevator buttons.

Nonglaton: 'One never knows where the next good idea for practical applications will come from; perhaps this time it will come down from space.'



Report: Anja Behringer

Medical Augmented Reality (AR) assistance systems overlay information onto a surgeon's field of view. However this technology is complex and expensive. Therefore, the procedure must offer a big advantage compared to conventional treatment and diagnostic methods to qualify for standard use. The objective is a system that shows

Getting a grip on dermatology diagnostics

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Stainless steel forceps

The company has now also produced high quality, sterile, single-use, sharp angled epilation forceps, designed with correctly sprung handles adjusted with the right amount of tension for greater control to increase visibility. 'With pointed ends to enable precision in epilation and the removal of fat deposits, they are the perfect solution when it comes to delicate procedures,' the manufacturer explains.

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The copy of DTR's new dermatology catalogue is available now.

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'Its next generation LEDs produce an unparalleled quality of light with a colour temperature (CCT) of 4.500 °K and a colour rendering index (CRI) of 95,' the manufacturer Acem explains. 'The lamp has a light intensity of 130.000 lux with a low energy consumption of 69W. The life cycle of its LEDs is about 50.000 hours.'

'Three reflectors produce a well-blended and intense cone of light focusable through the automatic adjust-

ment of the light spot diameter. Its slim, practical and compact design makes it perfect for several uses.'

Ergonomical and easy to move and position the lamp suits the laminar flows of an operating room.

STARLED3 NX ENDO function also offers light for endoscopy and minimally invasive surgery, the company adds.

The entire system, including the I-SENSE control panel, has been designed for easy cleaning and sterilisation.

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