

Adrian Harel on Personalised Medicines



ADRIAN HAREL

Caroline Richards, Editor of *Drug Target Review*, interviews Dr Adrian Harel, CEO of Medicortex Finland Oy, a company that is developing a diagnostic kit for the rapid detection of brain injury. The diagnostic system is based on the company's proprietary, patent-pending findings of a novel biomarker found in non-invasive samples of the body fluids. Medicortex is also developing a drug to halt the progression of the secondary injuries in the brain.

What is traumatic brain injury and are treatments currently available?

Traumatic brain injury (TBI) is caused by a hit to the head or a sudden acceleration or deceleration movement of the head. TBI is difficult to diagnose with imaging techniques in the first few hours after injury and there is no definite laboratory test to support the diagnosis. Treatments are only available for severe cases where head scans have shown major lesions and bleeding inside the skull, and include acute surgery to remove mass lesions and other clinical actions that minimise intracranial pressure. For mild and moderate head injuries and other cases where imaging has not revealed alterations in the brain's normal structure, the only practical treatment is to monitor the patient and respond to changing conditions such as alternations in blood pressure, breathing problems and sudden intracranial pressure. A request to rest typically is the guidance and

the only 'treatment' given to TBI patients who have sustained a mild head injury.

An undiagnosed TBI followed by a premature 'return to play' can result in severe consequences such as blood clots spreading. Another potential scenario is heavy sport activity resulting in overstrain of the brain. There are reported cases of a sudden death following an undiagnosed and non-supervised head trauma. Meanwhile, frequent and repeated brain injuries, even sub-concussive traumas without prominent symptoms, can lead to early onset of chronic neurodegenerative conditions later in life.

Why is there a need for a more personalised approach in diagnosing traumatic brain injury?

Young children and babies are at a high risk of falling and hitting their heads when playing and learning to walk. The next peak in incidence rates (by age) are teenagers

and young adults, who are most likely to engage in dangerous sport activities and drive their first cars and motorcycles. The third peak are the elderly who easily hit their heads when falling and colliding with objects.

Military personnel who are exposed to blasts and explosions suffer frequently from brain traumas. Motor vehicle accidents and violence/assault also are leading causes of such injuries.

It is difficult to diagnose concussion or a closed head injury that might occur in the aforementioned situations without visible injuries being present. The diagnostic kit being developed by Medicortex will provide a tool to diagnose the brain condition quickly and precisely and suggest the next clinical activity to be taken.

The kit will be used by a range of people, including paramedics at an accident site, first responders, military doctors, parents at home, or coaches and first aid groups at the sport arenas. It will

enable medical personnel, sport trainers and parents to quickly evaluate whether a person who has received a head injury needs to stop their current activity and go to hospital. First responders in mass casualties will have a new tool to prioritise evacuation and to determine the treatment required and the type of medication that should be avoided in the situation.

How did you first discover your 'traumatic brain injury' biomarker and do you expect the data you have uncovered in animal studies to translate well to humans?

Biomarkers for brain injury have been studied for several years. Those biomarkers have mostly been proteins and cytokines, found in cerebrospinal fluid (CSF) and blood. As of today there is no United States Food and Drug Administration-approved kit based on a validated biomarker. Our approach is to find new biomarkers from a

type of biomolecules that have been less well investigated for brain injury. In addition, we can detect biomarkers in easily accessible body fluids that have not previously been used for this purpose.

On the basis of the preclinical studies and several experts' opinions, we believe that the results of animal studies will be successfully translated into humans. The preclinical data has indicated a significant increase in a biodegradation molecule. This molecule will be detected by our kit in a way that will not require electricity or medical background for the results to be interpreted. The kit will use a non-invasive sample of body fluid, making it easy to use by a non-professional medical professional.

Can you tell me more about your clinical trial and when you expect to provide preliminary data?

In our clinical trial, we will collect several types of body fluid samples from TBI patients and healthy volunteers. The samples will be analysed using state-of-art biochemical methods. The levels of targeted biomarkers and the biomarker profiles will be analysed and the findings will be compared between patients and healthy subjects. Enrolment of the study subjects started in September 2016.

The trial is being undertaken in collaboration with the Turku University Hospital (Tyks) and



ABOVE: Medicortex's diagnostic will be designed to quickly and precisely diagnose brain injuries

results, which are expected to demonstrate the level of the biomarker and its importance as a predictor of a brain injury, should be available in the first quarter of 2017. The outcome of the study will be a significant milestone for the company and a clinical proof of concept that enables the new TBI biomarker test to be developed further.

As well as the diagnostic you are working on, do you plan to develop treatments for traumatic brain injury?

As discussed previously, doctors do not have a drug or a direct treatment to help brain-injured patients to recover. Medicortex's second mission is to develop drug candidates (new chemical entities; NCEs) to halt the progression of the brain injury damages (secondary

cascade). Our unique approach combines several drug activities in a single chemical entity. This new multifunctional drug will affect several deteriorating biochemical pathways instead of a single route, compared with normal drugs that only have one activity. All recent clinical trials, which use a conventional single mechanism approach, have failed in Phase III at the latest. This demonstrates the need for an innovative approach such as the one suggested by Medicortex, whereby a complex problem needs to be addressed with a complex solution, in other words, a multifunctional drug.

Medicortex has synthesised some of these NCEs and those have been found to be safe to administer in the preclinical studies. The next step in the development process requires substantial investment, which the company does not yet have.

A comprehensive solution to the huge problem of head injuries is required. Medicortex is trying to address both parts of this challenge; diagnosing brain injuries quickly and cheaply and providing doctors with the medications they need. 📷

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