SAK 11 – 2019

Søknad fra SEARCH om finansiering av PhD stipendiat til forskningsprosjektet 'Microwave Technology to detect traumatic torso injuries'

Hva saken gjelder

SEARCH søker om støtte på kr 2,1 mill som andel av kostnader ved en PhD-stipendiat knyttet til et større forskningsprogram innen bruk av mikrobølger for å diagnostisere hjerneslag, skader i bryst/bukhule og deteksjon av blødninger under huden. Prosjektet vil gi SEARCH og forskningsmiljøet på Høyland en viktig kompetansebygging som kommer helsesatsingen i hele regionen til gode. Prosjektet er et samarbeid mellom fagmiljøene ved NMBU Sandnes, SUS og Helsevitenskapelig fakultet ved UiS. Stipendiaten vil være knyttet til Universitetet i Stavanger.

Prosjektet skal gå over 3 år og PhD-stipendiaten vil ta doktorgraden som en del av prosjektet. Søknaden gjelder bidrag til dekning av lønnsutgiftene. Budsjett er ikke presentert i søknaden.

Det vil bli gitt en nærmere orientering om forskningsprosjektet i styremøte.

Vurdering

Universitetsfondet har tidligere bidratt med betydelige midler for å bidra til å bygge opp kompetanse ved forsknings- og utdanningsmiljøet på Høyland. Seneste bevilgning var knyttet til investering i forskningsinfrastruktur i det nye bygget som er reist knyttet til SEARCH.

Staten har gjennom bevilgninger i de senere årene vist at forskningsmiljøet på Høyland er viktige også i nasjonal sammenheng. Samtidig ser en at miljøene er små og kan være utsatt når det skjer endringer.

Slik vi forstår søknaden er en avhengig av at finansieringen fra Lærdalsfondet faller på plass når det gjelder utgifter til dyreforsøk, forskningsutstyr, teknisk støtte, mv.
Lærdalsfondet vil beslutte en eventuell tildeling i juni 2019.

Det anbefales at styret er positiv til en tildeling på kr 2,1 mill fordelt over 3 år i tråd med søknaden, men at en utsetter beslutningen til en ser om finansieringen fra Lærdalsfondet kommer på plass.

Forslag til vedtak:

Styret stiller seg positiv til å bidra med kr 2,1 mill for videre oppbygging av kompetansemiljøet ved SEARCH gjennom det omsøkte forskningsprosjektet og ansettelse av en PhD-stipendiat ved UiS.

Endelig vedtak om å tildele støtten utsettes til neste styremøte når det er avklart om øvrig finansiering med bidrag fra Lærdalfondet faller på plass.

Vedlegg: Søknad fra SEARCH

Søknad til Universitetsfondet for forskningsprosjektet
"Microwave Technology (MWT) to diagnose traumatic torso injuries"

Vi retter herved en søknad til Universitetsfondet om økonomisk støtte til forskningsprosjektet **"Microwave Technology (MWT) to detect traumatic torso injuries"**.
Forskningsprosjektet er en del av et større forskningsprogram innen bruk av mikrobølger (radarbølger) for å diagnostisere hjerneslag, hodeskader, skader i brystkasse/bukhule og deteksjon av pågående blødninger under huden (se beskrivelse under vedlegg). Dette forskningsprogrammet er godt forankret via signerte avtaler mellom Stavanger Universitetssjukehus (SUS) og Chalmers tekniske Universitet (CU) i Gøteborg (se avtalene under vedlegg). I henhold til disse avtalene skal partene aktivt samarbeide for å innhente støtte til forskning på bruk av mikrobølger til å diagnostisere og behandle noen av vår tids mest kostbare sykdommer og skader. Videre legger avtalene føringer for at forskningen og utviklingen skal gjennomføres ved Sandnes Education And Research Center Høyland (SEARCH), ved Norges Miljø- og Biovitenskapelige Universitet, som tidligere har mottatt tildelinger fra Universitetsfondet til utstyr og infrastruktur i nybygget på Høyland i Sandnes. Universitetet i Stavanger (UiS) er en av de tre samarbeidspartnerne i SEARCH samarbeidet sammen med NMBU og SUS, og således viktig i fremtidige prosjekter som planlegges ved senteret (se informasjon om SEARCH samarbeidet under vedlegg). Det fremheves at det i 2014 og 2016 ble det gjennomført 2 vellykkede pilotstudier ved SEARCH, der vi sammen med ingeniører fra CU fikk testet et mikrobølge-belte for brystkassen og buken på en svinemodell. Resultatene er lovende, men som vårt forskningsprogram antyder trengs det ytterligere forskning og utvikling innen mikrobølgediagnostikk. Dyreforsøk er nødvendige for validering av teknologien. Vi har derfor parallelt med denne søknaden til Universitetsfondet søkt Lærdalsfondet om årlig programstøtte på 1.2 millioner kroner (3-årig tildeling) for å dekke alle utgifter med dyreforsøk, innkjøp av nødvendig forskningsapparatur, teknisk støtte og andre drifts- og utviklingskostnader. Kunngjøring av eventuell tildeling er forventet primo juni 2019.

Vår søknad til Universitetsfondet er for finansiering av en helsevitenskapelig stipendiatstilling, der kandidaten skal forske på bruk av mikrobølger for å detektere skader i bryst- og bukhulen. Stipendiaten vil være ansatt ved UiS og tilknyttet Helsefakultetet eller Teknisk-Naturvitenskapelig Fakultet (Tek.Nat). Veiledere vil være Nils Petter Oveland (SUS/UiS) og Marianne Oropeza-Moe (NMBU) sammen med andre ingeniører og forskere fra både UiS og CU. Det søkes om 2.1 millioner kroner for en 3-årig ansettelse (700.000 NOK/år) fra høsten 2019/vår 2020. Midlene dekker lønn inkludert arbeidsgiveravgift iht. satser fra Forskningsrådet.

Vennlig hilsen Stavanger 15. mai 2019

Nils P. Oveland Marianne Oropeza-Moe

Nils Petter Oveland, MD, PhD **Marianne Oropeza-Moe, DVM, PhD, Dipl. ESPHM**

Vedlegg – Microwave Technology (MWT) research program

Title: Microwave Technology (MWT) to diagnose stroke, traumatic cerebral hemorrhage, traumatic torso injuries and subcunateous bleeding.

Principle investigators: Nils Petter Oveland, MD, PhD. SUS and UiS
Marianne Oropexa-Moe, PhD, Dipl. ESPHM. NMBU

Hypothesis: We hypothesize that MWT can detect bloodclots, bleeding and pockets of air within the brain, thorax, abdomen and skin, due to the dielectric contrast between blood, air and the surrounding tissues. This research program is therefore divided in 3 parts: A) Brain, B) Torso (Thorax and Abdomen), C) Skin.

Background –

A) MWT diagnostics for stroke and brain trauma in prehospital and critical care settings:

Portable diagnostics for ambulances remain a major challenge for the 20 mill. individuals who each year sufferers a stroke or brain trauma. When an ambulance arrives at the scene of an accident or a suspected stroke the objective is to reduce the risk for death and provide optimal care of the patient. The patient is evaluated and based on limited information, decisions are made regarding which hospital the patient needs to be transported to and whether to initiate some form of treatment. Both these groups of patients, which are subject to these life and death decisions, would clearly benefit if medical personal had access to the additional support of diagnostic tools. No such tools are available today in clinical praxis. As the first group in the world, Chalmers University (CU) is developing such tools and have with our clinical partners at the Sahlgrenska University hospital and the Sahlgrenska Academy of Gothenburg University started to evaluate them in clinical trials. In 2014 we published the first clinical results with application to stroke diagnostics [1]. In 2017 we published the first clinical results with application to traumatic brain injuries [2]. Request for collaboration has since been forthcoming and we have to date set up research collaboration with leading hospitals in Australia, Norway and Sweden. In Sweden two studies are ongoing at Sahlgrenska University Hospital, one on stroke the other on traumatic brain injuries. In Australia clinical trials have started this year. Partners are the Hunter Medical Research Institute and Hunter New England Local Health District. In Norway, in-hospital and pre-hospital clinical trials are initiated at the University hospitals in Stavanger and Bergen. These diagnostic tools are receiving considerable international interest, but there are still considerable challenges remaining that needs to be tested in controlled experimental settings at SEARCH, before the technology systems can be implemented into clinical praxis. Further research is required on accuracy, robustness and reliability. This requires advances in several areas related to MW systems, including antennas, measurement technology, computational electromagnetics, optimization, and signal processing. This proposed project is an inter-disciplinary effort to join forces from these different areas, with the ambition to provide new theory, methods and designs that are relevant for near-field MW measurement systems. The overall long-term goal of the proposed research program is the development of novel, compact, portable diagnostics system for stroke and trauma for potential use in ambulances worldwide. To achieve this goal, we will have to understand and generate new knowledge on how to best use MW and MWT for near field measurements, a task that will involve the whole spectrum from rather fundamental biomedical engineering research to applied research in an iterative and cross disciplinary manner.

B) Background - MWT diagnostics for torso injuries (thorax and abdomen):
With 5.8 mill. deaths per year, injury accounts for 10% of global mortality. It is the leading cause of death for young people, also in Scandinavian countries, and 4th overall. Adding to societal burden, injury yearly leads to tens of mill. victims facing lifelong disabilities. Traffic accidents and fall accidents at home are common causes. Mortality/morbidity can be reduced if the indicated treatment is provided faster; the key is to bring diagnostic solutions to the prehospital and emergency fields. Internal injuries to the torso pose a high risk of death and are difficult to diagnose in the prehospital and critical care setting. Of considerable concern are pneumothorax, hemothorax and abdominal bleeding. In this research program, we intend to evaluate the use of MWT combined with bioimpedance to diagnose and monitor the target injuries, and measure vital signs such as heart rate, respiratory rate and hemodynamics. The project is based on the use of a realistic animal model at SEARCH, MWT developed by a research group from CU/Medfield Diagnostics, and a commercial bioimpedance system. Pilot tests of 10 pigs have yielded promising results and have received attention from world leading experts (publication pending). We now intend to extend the pilot study to measure 50-100 pigs to obtain proof-of-concept. Next, we will verify a window in market for the potential product, and further develop the MW laboratory prototype into a product prototype that can be combined with bioimpedance. The product prototype will be evaluated in user tests with helicopter and ambulance crews, as well as in EDs in Scandinavia. If this project is successful it paves the way for clinical trials and commercialization. Since trauma is one of the largest global public health problems there will be a big interest worldwide for such a product, for both civil and military customers.

C) Background - MWT diagnostics for subcutaneous bleedings:
A smaller, but still important area is the detection of unwanted subcutaneaous bleeding. Today, many medical procedures require vascular access to the arteries or veins in the groin (i.e. coronary interventions and stenting/coiling of thoracic and abdominal vessels). Commercial femoral vessel compression devices are often applied when catheters are withdrawn at the end of these procedures, leaving a whole in the artery/vein. If these devices are dislocated, a massive subcutaneous bleeding may occur undetected. In this resarch program we will test if MWT can detect subcutaneous bleeding to signal an alarm, so that the unwanted bleeding can be stopped and the compression device reapplied.

Clinical significance of preliminary studies (references)
There have been several smaller experimental and clinical studies for both brain and torso diagnostics. I have attached two documents that highlights previous studies and preliminary results within the field of MWT diagnostics. A further detailed description of all conducted studies will be delivered on request if our program project application is approved. We will then provide a more detailed application and research plan.

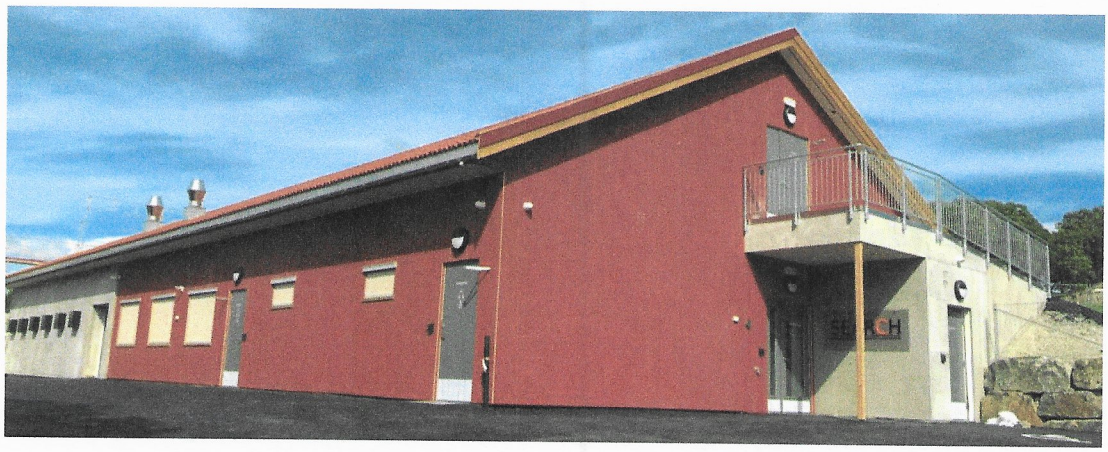
Research plan and design
We want to conduct an experimental proof-of-concept research-based trial on 50-100 animals at the SEARCH centre. The aim is to test the ability of MWT to diagnose cerebral hemorrhage in a sheep model and thoracic bleeding, pneumothorax and abdominal bleeding in a pig model. The group already has extensive experience in smaller pilot projects at SEARCH, but we now want to perform a larger multidisciplinary research project/program. The infrastructure at the new biomedical SEARCH centre is ideal to conduct such an extensive research program. A further detailed description of all preliminary studies will be delivered on request if our application is approved. Furthermore, we will then provide a more detailed application with references, a 3-year research plan and budget details.

Research team

1) Nils Petter Oveland, MD, PhD (Stavanger University Hospital and University of Stavanger)
2) Marianne Oropeza-Moe, PhD, Dipl. ECPHM (The Norwegian Life Science University)
3) Mikael Persson, MSc, PhD, (Professor Department of Signals and Systems, Chamlers University)
4) Stefan Candefjord, MSc, PhD (Ass. Professor, Depart. of Electrical Engineering, Chalmers University)

SEARCH

Sandnes Education And Research Center Hoyland



SEARCH is an interdisciplinary project initiated by the University of Life Science (NMBU), Stavanger University Hospital (SUS) and the University of Stavanger (UiS).

Vision

"To gain knowledge about diseases, new diagnostic modalities and treatments methods useful for both human and animals. To be a state-of-the-art testbed for new equipment, diagnostic tools, therapies and help establish new medtech and biotech industries"

Goals

- Increase research activities and publications from SUS, UiS and NMBU, in collaboration with other academic institutions nationally and internationally.
- Facilitate joint research between health care personnel, veterinarian personnel and engineers/medtech personnel.
- Become a leading training facility in Norway/Scandinavia for high-end training.
- Be a supportive partner in the education of new doctors, researchers, nurses, veterinarians and technicians etc. in the western part of Norway
- Have an emergency and critical care medicine focus on conditions such as stroke, cardiac infarction and advanced trauma care.

- Offer state-of-the art test-bed facilities for researchers, institutions and companies, accelerate commercialisation of research and innovation projects.

- Support start-up companies and encourage bio- and medtech clusters.

Background

SEARCH is a new and unique biomedical research centre at The Norwegian Life Science University (NMBU) in Rogaland county in Norway (15 min from Stavanger). NMBU Sandnes cover the veterinary disciplines swine and sheep diseases/ herd health as well as comparative medicine through the joint human-animal research projects at SEARCH.
The objective of SEARCH is to gather people from different disciplins (doctors, veterinarians, students, engineers, researchers and entrepreneurs) in order to generate new knowledge. SEARCH aims to include individual researchers, research groups, universities and health enterprises to larger national and international biotech and medtech companies in interdisciplinary projects. The state-of-the art hybrid CT-angio radiology lab at SEARCH will ensure international recognition as testbed for development of new technologies. This will benefit both the medical and veterinarian societies. The competitive advantages of SEARCH include the close proximity to UiS, the innovation park and the new University Hospital all situated in Stavanger.

The hybrid CT-angio radiology lab will allow multiple use:

- Scan animals (e.g. swine and fish) and cadavers
- Offer state-of-the-art pictures and live videos of anatomical structures
- Serve as a training site for multiple medical and veterinarian specialists (e.g. intervention radiology, cardiology, neurology, emergency medicine and critical care)
- Development of new imaging software
- Integration with simulation mannequins for more realistic training
- Scan drilling samples from the North Sea

We will continue to facilitate joint collaborations. SEARCH can offer world-class facilities, good infrastructure and necessary know-how, resulting in better research, education and innovation. This will improve human and animal health, and augment "green" economic growth. This is exactly what "one world – one health" implies.