

*Søknad til Universitetsfondet om støtte til forskningsprosjektet*

***“Microwave Technology (MWT) as a diagnostic tool to detect traumatic torso injuries”***

Vi retter herved en revidert søknad til Universitetsfondet om økonomisk støtte til forskningsprosjektet **“Microwave Technology (MWT) as a diagnostic tool to detect traumatic torso injuries”**. Forskningsprosjektet vil bli en viktig del av et større forskningsprogram innen bruk av mikrobølger (radarbølger) for å diagnostisere hjerneslag, hodeskader, skader i bryst- og eller bukhule og deteksjon av pågående subcutane blødninger. 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).

Vår søknad til Universitetsfondet gjelder bidrag til finansiering av en helsevitenskapelig stipendiatstilling, der kandidaten skal fokusere på bruk av mikrobølger for å detektere skader i bryst- og bukhule. En gruppe av forskere fra NMBU, SUS og CU har allerede gjennomført en pilotstudie på bruk av mikrobølgeteknologi for å detektere luft i brysthulen og blod i buken ved SEARCH (2014-2016). Et mikrobølge-belte ble brukt på brystkassen og buken på en grisemodell. Resultatene var lovende, men det er behov for videreutvikling av teknologien. I denne forbindelse er dyreforsøk uunnværlige. Modelldyret gris vil bli brukt videre da anatomiske og fysiologiske likheter med mennesket anses som store. Midlene det søkes om skal dekke lønnskostnadene til stipendiaten. Det søkes om 2.100.000 kr for en 3-årig ansettelse fra 2020 til 2022.

Kandidaten 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 to ingeniører og forskere fra UiS og CU. I budsjettet nedenfor synliggjøres personal- og driftskostnader samt finansiering. Driftskostnader skal dekkes i form av et spleiselag som inkluderer støtte fra Lærdalsfondet og Medfield Diagnostics. Parallelt med søknaden til Universitetsfondet er det søkt om 600.000 kr i prosjektmidler fra Lærdalsfondet, søknadsfrist 01.10.2019 for å dekke de nevnte driftskostnader (se budsjett). En eventuelt ny søknad kan rettes til Lærdalsfondet i årene 2020 og 2021 ved behov for ytterligere testing av teknologien.

**Budsjett:**

<b>KOSTNADER</b>				
Personalkostnader	<b>2 020</b>	<b>2 021</b>	<b>2 022</b>	<b>SUM</b>
PhD kandidat	680 000	700 000	720 000	2 100 000
SUM personalkostnader	680 000	700 000	720 000	2 100 000
Driftskostnader				
Reiser stipendiat inkl. kurs	60 000	30 000	30 000	120 000
Teknisk utstyr og teknisk support	100 000	60 000	60 000	220 000
Generell drift inkl. dyreforsøk	440 000	100 000	80 000	620 000
Kjøp av tjenester	60 000	20 000	20 000	100 000
Lab. utstyr	60 000	5 000	0	65 000
Publiseringskostnader	10 000	15 000	50 000	75 000
Leiestedskostnader (SEARCH)	150 000	50 000	40 000	240 000
SUM driftskostnader	880 000	280 000	280 000	1 440 000
SUM totale kostnader	1 560 000	980 000	1 000 000	3 540 000
<b>FINANSIERING</b>				
Egeninnsats				
Anestesilege/ Veileder	-60 000	-60 000	-60 000	-180 000
Veterinær/ Veileder	-60 000	-60 000	-60 000	-180 000
Forskningstekniker	-60 000	-60 000	-60 000	-180 000
SUM egeninnsats	-180 000	-180 000	-180 000	-540 000
Ekstern finansiering				
Universitetsfondet i Rogaland	-680 000	-700 000	-720 000	-2 100 000
Medfield Diagnostics	-100 000	-100 000	-100 000	-300 000
Lærdalsfondet	-600 000	0	0	-600 000
UiS sine midler fra bidragsytere	-1 560 000	-980 000	-1 000 000	-3 540 000
SALDO ÅRSSLUTT	0	0	0	0

\*Eventuelt behov for ytterligere midler for 2021 og 2022 må prosjektgruppen dekke via ekstern finansiering. Det er aktuelt å sende ny søknad til Lærdalsfondet i løpet av 2020 og evt. 2021.

Med dette takker vi Universitetsfondet for vurdering av søknaden.

Vennlig hilsen

Stavanger 05.09.2019

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) as a diagnostic tool to detect traumatic torso injuries***

***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 thorax and abdomen due to the dielectric contrast between blood, air and the surrounding tissues.

### ***Background***

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.

### ***Clinical significance of preliminary studies and overall aims***

There have been several smaller experimental and clinical studies for torso diagnostics. I have attached documents that highlight previous preliminary results within the field of MWT diagnostics. A further detailed description of all conducted studies will be delivered on request if our application is approved. We will then provide a more detailed 3-year research plan.

We want to conduct an experimental proof-of-concept research-based trial on 20-50 pigs at the SEARCH centre. The aim is to test the ability of MWT to diagnose thoracic bleeding, pneumothorax and abdominal bleeding in a pig model. The group already has extensive experience in pilot projects at SEARCH, but we now want to perform a larger multidisciplinary research project. The infrastructure at the new biomedical SEARCH centre is ideal to conduct such an extensive research program.

### ***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, Chalmers University)
- 4) Stefan Candefjord, MSc, PhD (Ass. Professor, Depart. of Electrical Engineering, Chalmers University)

### **References:**

Candefjord et al. 2017. Microwave technology for detecting traumatic intracranial bleedings: tests on phantom of subdural hematoma and numerical simulations. *Med Biol Eng Comput*, 55(8):1177-1188

Ljungqvist et al. 2017. Clinical Evaluation of a Microwave-Based Device for Detection of Traumatic Intracranial Hemorrhage. *J Neurotrauma*, 34(13):2176-2182

Oveland et al. 2015. A wearable microwave detector for diagnosing thoracic injuries-test on a porcine pneumothorax model. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 23: A20

Oveland et al. 2013. Using thoracic ultrasonography to accurately assess pneumothorax progression during positive pressure ventilation: a comparison with CT scanning. *Chest*, 143(2):415-422

# 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 disciplines (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.

**Best regards**

**Nils Petter Oveland PhD**

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## Letter of Intent

“Microwave Technology (MWT) as a diagnostic tool to detect traumatic torso injuries”

**Partner legal entity: Medfield Diagnostics AB**

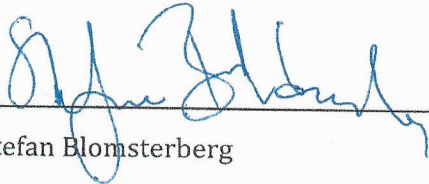
**Organisation type: SME**

**Partner short name: MEDF**

Medfield Diagnostics AB will support the project «Microwave Technology (MWT) as a diagnostic tool to detect traumatic torso injuries» with financial and technical support for a total value of 300.000 NOK, if the University fund and the Laerdal fund also supports the project according to the suggested budget.

Medfield will actively contribute to the above defined project according to described content in each work package and will jointly work for achieving the over all objective with this project.

Göteborg 2019-09-10



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Stefan Blomsterberg

CEO

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