Science with Arctic Attitude

Science Under Radar

12th March 2019

Startups and pre-startups
Content

Cases to be pitched at 12th March 2019

1. Chain Antimicrobials Oy - an anti-microbial peptide coated catheters for treating hospital-acquired infections

2. Eco Sweeties - efficient production of Brazzein, a natural zero calorie sweetener

3. Maknee Oy - a tool to assess the health and quality of the knee join

4. MorphoLogic - new era of cartilage roughness characterization for osteoarthritis therapy development

5. AISpotter Oy - better team results with faster video analytics

Other cases

A. Cerenion Oy – next generation of brain monitoring

B. FAA – fatty acid analogs for treating ocular diseases

C. PARP10 – ADP-ribosylation inhibitors for treatment of cancer

D. S3 – credit-sized sensor card for environmental monitoring
Antibiotic resistance is a global threat and a ticking time bomb. Recently, several strains of *Escherichia coli* isolated from urinary tract infection (UTI) patients have become resistant to antibiotics and are spreading rapidly across the globe.

Plant tissues contain an unexplored source of microbes and their compounds, specifically, the plants of the boreal or arctic vegetation zones are largely unstudied. We discovered antimicrobial peptides from crowberry (*Empetrum nigrum*) microbiome (Tejesvi et al. 2016) that were optimized and commercialized by coating catheters to bacterial adhesion.

A new company called CHAIN Antimicrobials Oy was founded in 2017. Recently, the company obtained significant funding from Butterfly Ventures and Business Finland to proceed towards clinical trials with the Peptide coated urinary catheter (PAC) program. Currently, we are conducting pre-clinical trials in animals to validate the safety and efficacy of the PAC product.

The technology is valuable within the gram-negative antimicrobial space. The IPR covers the utilisation of three different series of narrow or broad-spectrum antimicrobial peptides for prevention of microbial growth related to, for example, the prevention of urinary tract infections (UTI) as catheter coatings amongst other potential uses. We have strong data suggesting that this approach will be effective in clinical use.
**Status**

**TRL level:**
- Pre-clinical PoC testing ongoing

**Patents:**
- Pending:
  - 3 patent families in EP, US, JP, IN & CN

**Key Claims:**
- 3 different peptide backbones for antibiotic use
- Covering multiple indication use areas

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**Field:**
- Medical Devices
- Anti-infectives

**Applications**
- Coatings
- Topical applications
- Intravenous drugs

**Opportunity**
- 15 - 25% of inpatients are catheterized
- Catheter-risk of bacteriuria increases each day of use:
  - Per day: 5%; 1 week: 25%; 1 month: 100%
- UTI societal burden of $3.5 Billion in US alone
- Resulting billion scale business opportunity

**Benefits and Features**
- Our product combines with all key requirements needed for great medical devices coating
- Biofilm formation is prevented
- Peptides kill relevant bacteria associated with UTI – *E. coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus pneumoniae*, *S. aureus*
- No potential safety issues identified
- Positive biocompatibility results obtained
- Peptides can be covalently linked on top of medical device or any other material
- Peptides are easily synthetically manufactured

**References**


**Technology Offer**
- Looking for investors to join our next financing round:
  - Fall 2019
  - Use of proceeds to execute first-in-man studies with the Peptide coated urinary catheter product
- Looking for licensing opportunities:
  - We are able to out-license some application areas / parts of our IP to selected partners
- Looking for partners to approach different funding sources with joint project proposals, such as EU funding.
With the world facing an obesity epidemic and existing artificial and natural sweeteners having major consumer safety and taste perception issues, there is an urgent need for sweetness to be reinvented. Having a safe, natural, zero-calorie sweetener that tastes like sugar is the number one thing consumers want to change in their diet. Fortunately, there is a solution. There is a natural sweetener that has been used for centuries in West Africa, the fruit of the Oubli plant. The sweet component from the Oubli fruit is a protein, Brazzein.

Brazzein:
• Tastes like sugar, with no unpleasant aftertaste
• Is up to 2000x sweeter than sugar
• Is highly thermostable and pH stable making it amenable for use in the food and beverage industry

The only reason this wonder product is not on the market already is cost of production. Yields from the Oubli plant are too low and other reported production systems have been uneconomical.

Our solution to the economic production of Brazzein is to combine production in E.coli (the most cost effective fermentation system in the market), with production in the cytoplasm (the largest compartment in the cell enabling higher yields), with our patented technology for the active formation of native disulfide bonds.

Our protein production technology is marketed by the University of Oulu as CyDisCo™ (Cytoplasmic Disulfide bond formation in E.coli). It was
developed to allow the efficient production of any disulfide bond containing proteins in industry and for academic research. CyDisCo™ development was based on the application of more than two decades of research into the mechanisms of oxidative protein folding by the principal investigator. It can be transferred between any *E.coli* strain, works in any media and has been successfully used for >400 proteins.

In early 2017 initial tests on Brazzein production were undertaken. High yields were obtained, and proof of concept money was obtained from the University of Oulu for the development of a scalable, cheap, and effective proprietary purification method. Currently the development of Brazzein production is going on in the Business Finland TUTLI (new business from research) funded project (July 2018 - June 2019) aiming to bring Brazzein to market.

**Benefits**

- Natural Zero calorie sweetener
- Excellent biophysical properties for the food and beverage industry
- Low production costs
- Tastes like sugar

**References**

Initial publication of the technology:


Example use for biotech important proteins:


Proof of concept for fermentation scale:


**Technology Offer**

We have completed the first four stages of the route to market and are now seeking investors to help with the final steps.
Non-invasive fast test
Multiple measurement modalities
Low cost

Knee diagnostics, rehabilitation, implants integrity, sports...

Portable device
Easy to use
Usable for multiple joints

Detection of lameness
MorphoLogic is a novel and unique innovation providing objective roughness analysis directly from 3D data.

MorphoLogic is bypassing the problems of conventional histology (subjective, non-comprehensive, slow, prone for errors):
- Objective and consistent results through algoritmic analysis
- Analysis covers 100% of the desired surface area – not even the smallest changes are missed
- No distortion due to lack of mechanical stress to the samples
- Time and cost saving due to 50% faster overall analysis process

MorphoLogic is the tool to detect smaller changes in the cartilage and to hasten the testing and verification process to finally create an effective cure.

“MorphoLogic is exactly what we need and test results look promising!”

Peter Richards
‘Big Pharma’ - company
AISpotter provides better team results with faster video analytics.

Coaches have lots of great data and lot of data files and videos, but they analyse it manually, which is both time consuming and expensive. AISpotter automatically breaks down your sports videos and combines them with your 3rd party data provides the details of any game. It takes this time consuming, tedious, expensive, manual process and shortens it from 10+ hours to under an hour. Our video-based analytics service is based on AI and computer vision. The service is scalable to other sports, broadcasting and other businesses.

Use Cases / Market Validation:
- 300+ Match analysis completed in 2018
- Pilots: in Sweden, Norway, Germany, Brazil
- Interviewed 50+ coaches to hear their needs and experiences on video clip production and analytics.
- “The view of whole pitch shows if players are in wrong places”, “Video clips shows exact data for players”

Problem:
- Video and tactic data are collected and analyzed manually after the games from various and separate video/data files.
- Time: It takes 8-12 hours after a match to prepare video-clip collection covering the main events in the match.
- Accuracy: low accuracy and low quality solution in use
- Money: coaches’ use long analyzing hours
- Separate Files: the 3rd party data, video data and sensor/numerical, data are in separate files
- Camera set-ups: expensive camera setups in stadiums

Solution:
- Our service relies on artificial intelligence (AI) analysis; using visual object detection, tracking and motion analysis.
- Time: Automation in video-clip production lowers the time used to create a video-clip collection to under an hour.
- Accuracy: The service provides a complete view of the pitch for the coaches and main events are efficiently picked up and a summary of the match is created.
- Money: short analysis time brings savings
- Combination: numeric data files: 3rd party data streams, sensor data can be combined and synchronized with video
- Camera set-ups: no need for dedicated camera setups, we can use broadcasting video or video recorded by team/club

Revenue Model: (prices starting from)
- Analysis price 100€/match/training
- Football clubs: Service Licence/year 12 500€
- Broadcasting companies: Service Licence/year 10 000€/year
- Fan engagement: Service Fee 5 000€/year

Market Opportunity:
- Sports analytics will be worth of $4.7 billion by 2021.
- In addition to football service is applicable to other sports such as basketball, ice hockey or volleyball.
- Video-clip service is scalable to other industries: broadcasting, fan engagement, betting and security

Competitive Advantage:
- Time: Automated video-clip production. This 1/10 of the current video clip production time.
- Accuracy: The whole Football pitch view can be seen to track the actions.
- Combining 3rd party data: Service can combine numerical and/or sensor data with videos

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Keywords: AI, Computer Vision, Team Sport, Analytics, Big Data, Tracking, Detection, Cloud

Client Base: paying customers in Football, Floorball

Raised: JP Holding AB 200 000€, National Public Funding 220 000 €

Looking to Raise: 500-750 000€

Revenue & Forecast:
- 2019: € M: 80 000€
- 2020: € M: 269 110€
- 2020: € M: 2 279 990€

Personnel:
CEO PhD Anri Kivimäki: marketing, funding, ICT, setting start up in Germany, 15+ business development
CTO Dr Tech Sami Huttunen: computer vision, machine learning, signal analysis
Director of Sales: BA Timo Rousti, 20+ experience in ICT sales and coaching
Data Scientist PhD Juha Rusanen: Expert in data management
Introducing the next generation of brain monitoring

Cerenion Oy develops the world’s first practical method for measuring the brain function of intensive care patients. Our Cerenion C-Trend™ technology (pat. pend.) reveals the status of the brain as one simple score – at the bed-side and without requiring any changes to the care of the patient.

The solution works by combining standard EEG-measurement with advanced machine learning algorithms and artificial intelligence.

The technology has the potential of improving both the quality and the cost of intensive care.

“There are currently no reliable methods for assessing brain function in the early stages of recovery from hypoxic, ischemic, or traumatic insults that might inform neurologic prognosis and therapy. Slow electroencephalographic waves induced by general anesthetics might provide a neurophysiologic signature of healthy brain function.”

Hugh C. Himmings, M.D., Ph.D., Handling Editor, ANESTHESIOLOGY in regards to our scientific publication in the journal (vol. 126, 2017)

“This invention will ease the day-to-day work at intensive care units”

Dr. Mika Kallio, Chief Physician of Clinical Neuropysiology and Dr. Jouko Laurila, the Associate Chief Physician of Intensive Care, Oulu University Hospital, in KALEVA, AAMULEHTI, TURUN SANOMAT and a range of other Finnish newspapers (May 2018)

WORLD’S FIRST PRACTICAL METHOD for MEASURING THE BRAIN FUNCTION of INTENSIVE CARE PATIENTS

■ Our product is a B2B software-only medical device developed under ISO13485:2016 QMS & IEC 62304 MEDICAL SOFTWARE PROCESS

■ 3 PATENT FAMILIES pending worldwide (EU, US, JP & CN) & a SCIENTIFIC PUBLISHING TRACK, including papers in Anesthesiology and JCMC

■ 1.2 M€ RAISED FUNDING so far, now looking for a PRE-A funding round of 2 M€

■ CLINICAL MULTISITE STUDY (N = 150+) ongoing with, e.g. Oulu University Hospital and Helsinki University Central Hospital

■ 2 STRATEGIC PARTNERSHIPS with BITTIUM CORP. & NIHON KOHDEN CORP. (expected availability in EU starting from 2019)

To get a copy of our PRE-A FUNDING ROUND INFORMATION PACKAGE, please contact

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Background

Oxidative stress and inflammatory processes are central factors in the initiation and progression of many eye disorders. On cellular level, protection against oxidative stress is an important therapeutic strategy for example for preventing macular degeneration in the back of the eye or corneal diseases at the ocular surfaces.

We have discovered fatty acid analogs (FAAs), which have significant antioxidant activity and potent cytoprotective capacity against cellular stresses through innate mechanisms. Currently we are in the process of demonstrating that FAAs can be used as a human therapeutics in retinal and corneal disorders. The potential value of the FAA technology is confirmed to be very high with low risks, validated by recognized pharma experts from ophthalmology field.

Invention

Our experimental data demonstrates that FAAs protect cells from oxidative stress, disruption of mitochondrial function, and loss of cellular viability. They provide a unique therapy for protecting retinal and corneal tissues in conditions that cause macular degeneration or corneal disorders, such as dry eye disease.

Field

Drug development, human therapeutics

Applications

Treatment of diseases - especially of ocular diseases
Status

TRL level: TRL 4-5
  - Tested with human cell lines and murine model (Wistar rats)

Patent:
  - Granted:
    - US10137102
  - Pending:
    - EP3177284
    - JP2017522386

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https://www.oulu.fi/university/universityinnovationcentre

Benefits

CHEMISTRY OF FAAs
  - Small (Mw < 300), stable, water soluble, colorless
  - Similar to native eukaryotic compounds
  - Essential physicochemical, pharmacokinetic and pharmacodynamic (PK/PD) parameters have been characterized

MECHANISM OF ACTION (MoA)
  - FAAs promote viability of cells under stress with direct antioxidation and innate cellular mechanisms

SAFETY - Non-toxic and well tolerated
  - The in vitro and in vivo safety assessments show that FAAs are non-toxic to human retinal cells (ARPE-19) at very high (<12 mM) concentrations. In studies carried out with rats (RccHan®: Wist) topical administration of FAAs as 1-5 % (49 - 245 mM) eye drop solution created no visible symptoms of immediate toxicity

SYNTHESIS of FAAs
  - Synthesis route of FAAs has been optimized with capacity for the up-scaling to current Good manufacturing practices (cGMP) as defined by the current EU, ICH and FDA guidelines to Active Pharmaceutical Ingredients (API). The quality of the synthesized FAA compounds is high: purity by HPLC 99.7% with 0.3% impurities. All impurities have been identified as non-toxic.
  - All rights related to the production of FAAs (economic or technical information, documentation and products related thereto, whether or not patented or patentable) are assigned as the exclusive and absolute property of University of Oulu

References

Technology Offer
  - Available for collaboration
  - Available for licensing
  - Looking for investors
Background
Human ADP-ribosyltransferases are targets for therapeutics. It was shown earlier that PARP inhibitors, targeting especially ARTD1 (PARP1), can be used to sensitize BRCA-deficient cancer cells to DNA damage. The research culminated in the approval of the first therapeutic, Lynparza/Olaparib, in 2014.

Recently, it has been evident that also other ADP-ribosyltransferases control multiple cellular signaling pathways by affecting protein localization, activity and stability. This has opened up a new avenue for drug discovery, as the ADP-ribosylation of specific target proteins is a key factor in e.g. cancer cell survival and cell death.

Invention
We have discovered a small molecular chemical probe OUL35 for ARTD10 (PARP10) enzyme, which is potent, selective and functional in cell based assays. As ARTD10 is involved in cell death, proliferation and DNA repair the found inhibitor provides a potential therapeutic strategy especially against cancer.

We have shown that the found compound sensitizes cancer cells to DNA damage though a different mechanism than the more studied ARTD1 (PARP1) inhibitors like Lynparza.

The structure-activity relationship studies have shown that the scaffold can also be used to inhibit other human mono-ADP-ribosyltransferases like ARTD8/PARP14 and ARTD15/PARP7, which are also identified drug targets for treatment of hematological cancers.
**Status**

**TRL level:** TRL 3  
- Tested in cellular models

**Patent pending:**  
- EP3440052  
- US16/091551

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**Benefits**

- Selective for mono-ADP-ribosylating ARTD/PARP enzymes
- Confirmed target engagement in cells without cytostatic/toxic effects
- Submicromolar potency in biochemical and cell-assay
- Sensitizes cancer cells to the clinically used chemotherapeutics
- Potential for targeted therapeutics through inhibition of specific ARTD (PARP) enzymes

**References**


2. **Derivatives:**

**Technology Offer**

- Available for licensing
- Available for collaboration
Background

- Business Finland funded TUTLI (new business from research) project
- Collaboration between four research units from two faculties at the University of Oulu

Invention

- Credit-card sized sensor card
- Easy interface between external sensors and smartphones
- Concept: Turning the smartphone into a powerful measurement instrument
- Focus lies on sensors which are not available on smartphones
- Ultra-low power consumption electronics allow a completely battery free design

Field:

- Electronics
- Embedded systems (portable and wearable technology)
- Biosensors
- Health and wellbeing

Applications

- Environmental monitoring: Obtaining vital sensor data, for example about the current environmental conditions in less than a heartbeat
- Big Data: Large-data collection, for example within smart cities, citizens can collect data wherever they go (citizen science)
- Collected data can be brought into virtual/augmented reality
**Status**

**TRL level:** TRL 7
- Tested with Nokia
- Tested with VTT

**Patent:**
- Filling based on inventions
  - OU17006
  - OU17007

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**Benefits**

- Users can obtain data in an easy way everywhere they are
- Completely battery-free device
- Mobile application provides feedback and information on the collected sensor data
- Sensor data is directly uploaded to the cloud and can be shared with other users

**References**

- C. Schuss, T. Leikanger, and J. Häkkinen: “Efficient External Sensors for Smartphones through Near Field Communication (NFC)”. Proceedings of the IEEE Instrumentation and Measurement Technology Conference (I2MTC); Houston, TX, USA; pp. 1291-1296; 2018;

**Technology Offer**

- We are looking for investors and business angels
- We are looking for collaboration partners, interested either in working with us or licensing our innovative sensor technology
- We are looking forward providing users our sensor card and innovative sensor technology