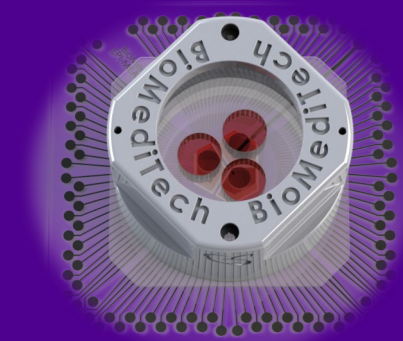


Brain-on-chip for modeling epilepsy: from research to business

Neurocenter Finland
Business Finland – Health Tuesday: Brainbreak
01/02/2022
Susanna Narkilahti, Pasi Kallio



Background

- Epilepsy is a multifactorial neurological disorder, appearing as abnormal transient discharges of neuronal activities in the brain
 - Epilepsy and seizures are major public health concern
 - 65 M people affected globally (1% of the general population)
 - Affects people in all age groups
 - In 30-40% of patients, seizures are not controlled with current antiepileptic drugs (AEDs)
 - Lacks the understanding of biology:
 - Mechanisms behind epileptic seizures have huge spectrum
 - The poor validity of preclinical (cell, tissue, and animal) models to mimic human epilepsies
- Need for better and efficient preclinical model for seizures detection and epilepsy to develop better AEDs**

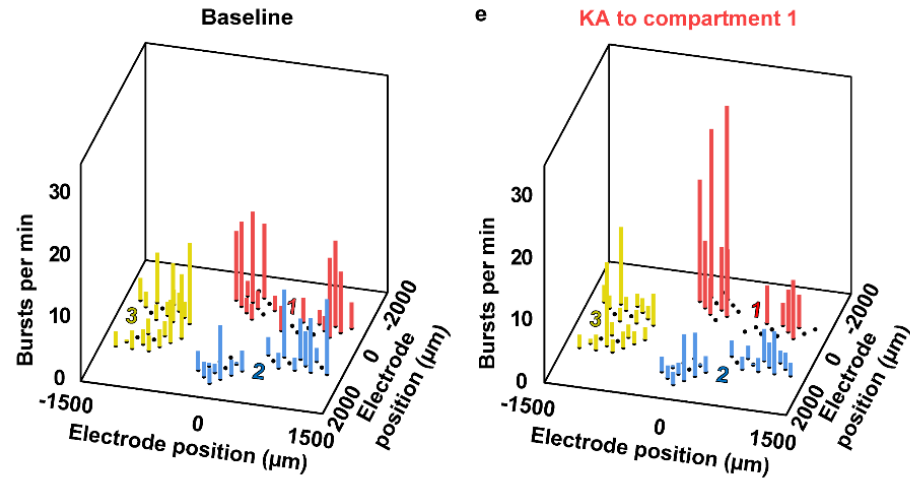
MEMO - Modular platform for Epilepsy Modelling in vitro

Prototype

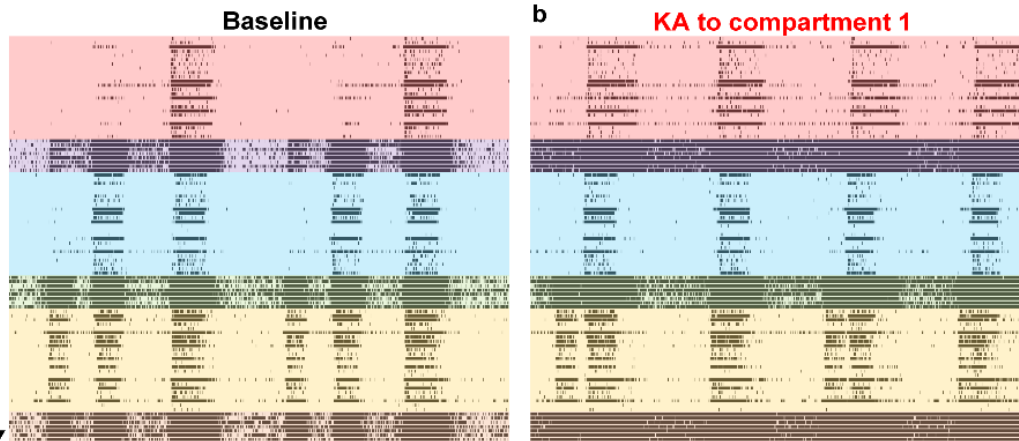
- Human pluripotent stem cell-derived neurons enable **the use of human based cells to model better human responses**
- The three-compartment microfluidic device enables the formation of **functional circuitry of neuronal network for mimicking brain functions**
- Customized microelectrode array (MEA) enables the **electrical measurement of neuronal activity for detecting epileptic seizures**
- Seizures can be **induced chemically or appear endogenously**
- Gas supply chamber enables **the micro-environment control for a long period**

MEMO – better relevance to human seizures

1.



2.



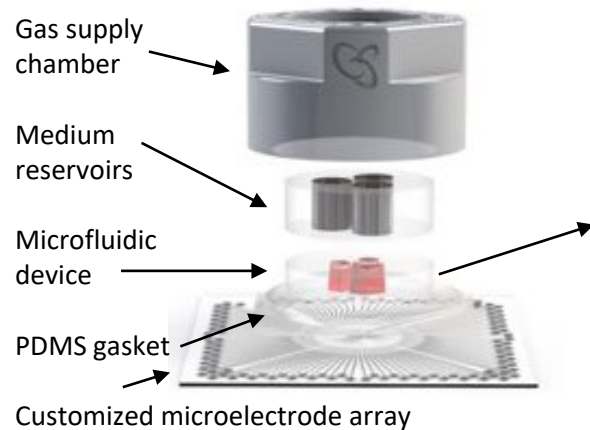
1. Focal seizure-like activity detectable after KA
2. Alterations in circuitry level behavior after KA
3. Seizure-like activity suppression by phenytoin
4. More advanced signal analysis algorithm for circuitry level function under finalization (Vinogradov & Kapucu)

MEMO - Modular platform for Epilepsy Modelling in vitro

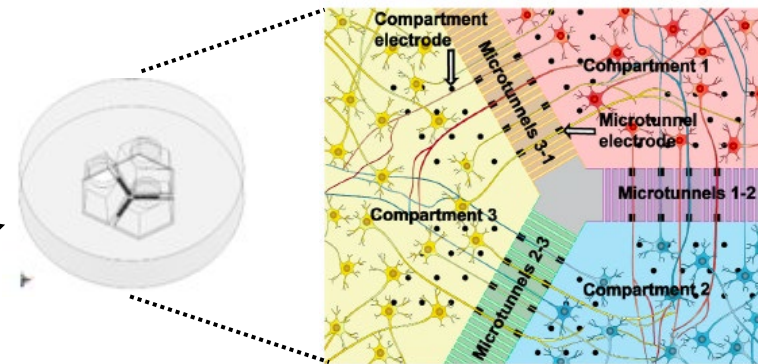
- MEMO concept:
 - Proved high validity as a preclinical model for human seizures
 - Unique solution for detection of seizure activity
 - Better predictive power for true positive and true negative hits
 - Acceleration of R&D process of epilepsy drugs, faster market entrance



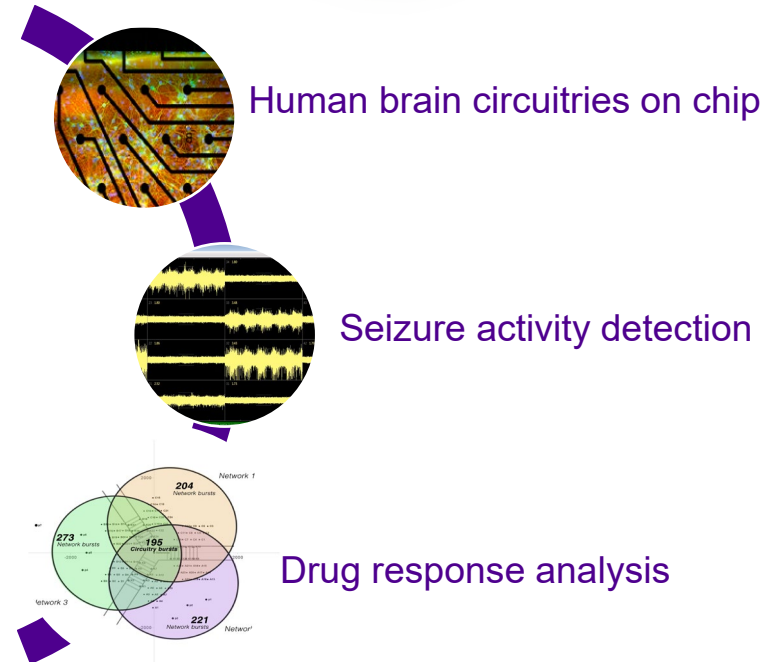
Prototype



Concept



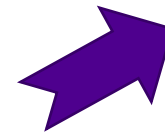
Functionally connected neuronal network



MEMO – Value proposition

Value propositions

- ✓ Improved human relevancy yields **BETTER RESULTS**
- ✓ More consistent and reliable test methods for **EFFECTIVENESS**
- ✓ Better predictability yields **MINIMIZED RISK OF FAILURE**
- ✓ Faster test methods for **REDUCED LEAD TIMES**
- ✓ Increased **FLEXIBILITY** in running test operations yields better customer service
- ✓ Ambition to replace and **REDUCE ANIMAL STUDIES**



Best-in-class enabling technology for pharmaceutical R&D

Novel and better
AED-drugs for
patients

Testing for CNS
adverse effects
(seizure liability) of
other investigative
drugs

MEMO- Positioning in Value chain

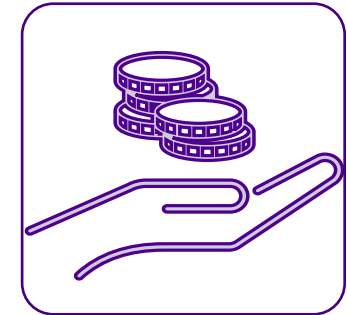
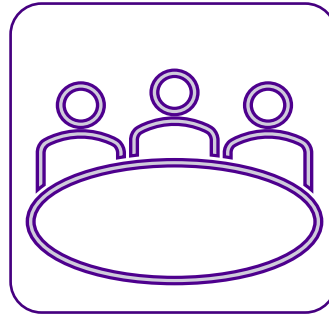
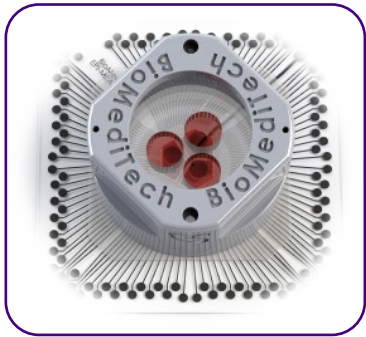
Drug discovery phases

- ✓ Target validation
- ✓ Lead molecule identification
- ✓ Drug-like candidate selection

Drug development phases

- ✓ Drug differentiation
- ✓ Indication expansion
- ✓ Repurposing
- ✓ CNS safety assessment

R2B project – milestones



R2B

YEAR 1

- Customer pilots and communications
- Technology refinement
- IPR strategy
- Market and competitor analysis

R2B

YEAR 2

- Business model investigations and commercialization path
- Partner network set-up
- Production scale-up
- Funding plan and team

After R2B

YEAR 3

- Commercialization
 - spin off vs licensing vs joint venture
- Set-up production
- Marketing and sales network
- First paying customers
- Expanding markets
 - General Drug R&D (toxicity testing)

MEMO team



Satu Jäntti, MSc

Business Champion
Cell technology



Lassi Sukki, MSc

Technology expert
Microfluidics &
microfabrication



Anna Vallius,

Coordinator



Jouni Sirviö, PhD

Senior Expert
Market surveys
Commercialization routes
Sparring



Juha Heikkilä

Laboratory Specialist
Lab validations
POCs with pharma partners

Advisors



Susanna Narkilahti,

Adj. Prof
neural technologies
commercialization



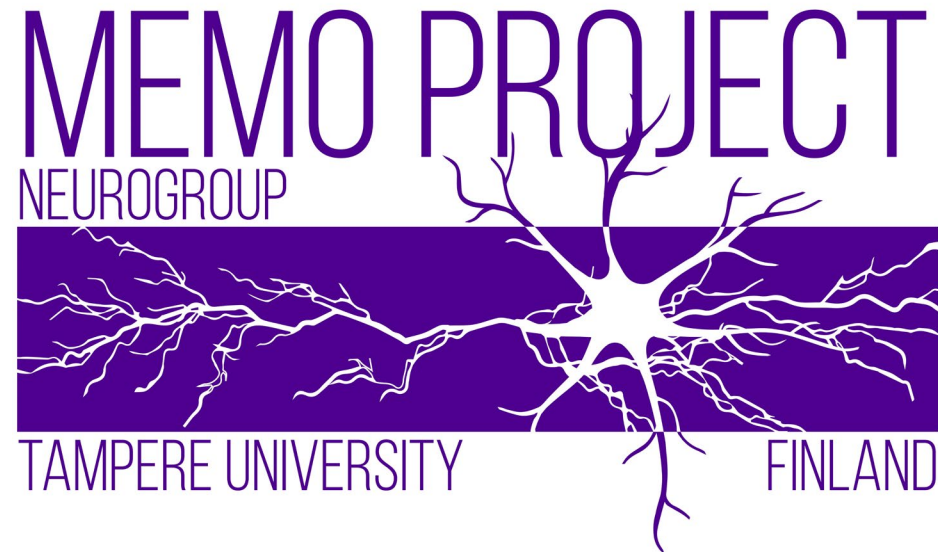
Pasi Kallio,

Prof
engineering technologies
spin-off establishment

Steering committee



- **Juho Väisänen**, Senior Specialist, Innovation Services and Partnerships, TAU, over 10 years experience in commercialization of research results
- **Giedrius Kalesnykas**, PhD, President and Chief Executive Officer, Experimentica. Founder of CRO company developing and offering novel preclinical ocular models and services.
- **Asla Pitkänen**, Prof, UEF. Leading epilepsy researcher globally.
- **Jussi Holopainen**, Business advisor, having a long and extensive experience in business management in Finland as well as in international and global environments, especially in the pharmaceutical industry.
- **Hannu Lepomäki**, Technology advisor, has 30 years' experience of industrial technology and concept development and commercialization of new technologies within energy, pulp & paper, machinery and cleantech industries.



”TRANSFORMING EPILEPSY RESEARCH AND DRUG DISCOVERY”

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