## LES RENCONTRES LYONNAISES DE CARDIOLOGIE

#### COMITÉ SCIENTIFIQUE

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Nouvelles pistes en biologie moléculaire

# NETRI

# Organe sur puces et innervation



# Adriana TOMA HOUEL, Lyon

# Conflits d'intérêts

• aucun



## FOUNDED IN 2018 35 PEOPLE | MULTIDISCIPLINARY TEAM 16 PATENTS | 100+ CLIENTS



NETRI is an innovative industrial start-up dedicated to enhancing human health through the discriminating power of the nervous system.



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# THE CLINICAL PIPELINE PROBLEM

Advancing a drug candidate to clinical trials is rigorously validated at the preclinical stage...

#### DRUG DISCOVERY > PRECLINICAL > CLINICAL > APPROVAL



FOR EACH NEW DRUG

**CLINICAL DRUG** 90% DEV. FAILURE RATE... ... OF WICH DUE TO LACK OF CLINICAL EFFICACY 50%

## DRUG DEVELOPMENT IS A LONG, COSTLY AND RISKY PROCESS

Sun et al., Acta Pharm Sin B. 2022 Feb 11;12(7):3049-3062. doi: 10.1016/j.apsb.2022.02.002

#### ....but current preclinical models suffer from lack of clinical translation

#### ANIMAL MODELS

- Do not accurately predict human response
- Face ethical concerns



#### **TRADITIONAL 2D/3D CULTURES**

- Fail to reproduce human morphology
- Lack the complexity of cell-cell interaction and cell environment



#### **ORGANS ON CHIP (OoC)**

- Classically lack reproducibility and scalability
- Fail to provide real-time data
- Face adoption hurdles

### CURRENT APPROACHES STRUGGLE TO MITIGATE COSTS AND RISKS



Neuron as a sensor (NaaS) approach



# **EVERYTHING YOU FEEL IS NEURONS**

reproducti

Sympathetic Nerves: increasing ph









# THIS IS NOT A NEURON

IT'S A SENSOR TO DIGITIZE HUMAN BIOLOGY



# NEURONS ARE SOPHISTICATED SENSORS

# THEY HOST A VARIETY OF DEDICATED RECEPTORS

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ENCODING A COMPLEX STIMULUS RESPONSE

# 33 1.15 μV BASELINE

## WHICH CAN BE DECIPHERED TO BE <u>SPECIFIC</u>





# NEURONS ARE SOPHISTICATED SENSORS

# THEY HOST A VARIETY OF DEDICATED RECEPTORS



ENCODING A COMPLEX STIMULUS RESPONSE



RESPONSE TO COMPOUND

**OR SIMPLY:** 



A DIGITAL SIGNATURE FOR A COMPOUND OR A CONDITION



A

A DIGITAL SIGNATURE WHICH CAN BE COMPARED TO A LIBRARY OF COMPOUNDS AND CONDITIONS TO PREDICT SAFETY & EFFICACY OR DIAGNOSE

DIGITALLIBRARY

Ø

Ø

Ø

82%

МАТСН



# NeuroFluidics<sup>™</sup> MEA

Hardware & Software enablers







16 CHIPS IN A 96 WELL-PLATE | PUMPLESS AND STANDALONE DEVICES | INTEROPERABLE WITH LAB EQUIPMENT



**AI-DRIVEN SEGMENTATION** 

WITH AN INTEGRATED SOFTWARE PIPELINE FOR EXTRACTION AND ANALYSIS



Axis Navigator

UpLink DataLink

0





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# **NEURON-TO-X GENERIC APPROACH**



#### NEURONS

Organized neurons allows to test efficacy or toxicity modes of action on dendrites vs. somas independently SENSORY | MOTOR NEURON | GABAERGIC NEURONS | ...







Adding cell culture supernatant on neuron endings allows the exploration of modes of action as processed by target organs METABOLITES | NEUROTRANSMITTER | CYTOKINES | VESICULES...

#### **CO-CULTURE**

Full neuron-organ cell co-culture allows the recreation on chip of integrated metabolic phenomena INNERVATED EPITHELIA (SKIN/GUT/VAGINA/GUMS/CORNEA...) | MUSCLE | LIVER | ...







# 0 Autonomic Cardiomyocyte Nervous System Atrial Ventricular Cardiomyocyte Cardiomyocyte



For co-cultures

TriaLink<sup>™</sup> MEA For tri-cultures



# NMJ WITH COMPARTM ENTALIZED ELECTROPHYSIOLOGY

A DEDICATED SUITE OF TOOLS FOR A UNIQUE SELLING PROPOSITION





Motor Neurons can be cultivated and connected to skeletal muscles in our chips. Neurons and Muscles can be independently stimulated chemically or electrically.

Extracting 1500+ Variables from electrophysiological signal into digital signatures... ... which can eventually be compared to a library of compounds and conditions to predict safety & efficacy, reduce attrition rates, development costs and animal use.

Confidential documen



# **THANK YOU**

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