

NETRI

Discovering **the brain**,
Reinventing **healthcare**,
Improving **lives**.

MEET NETRI

Created in 2018

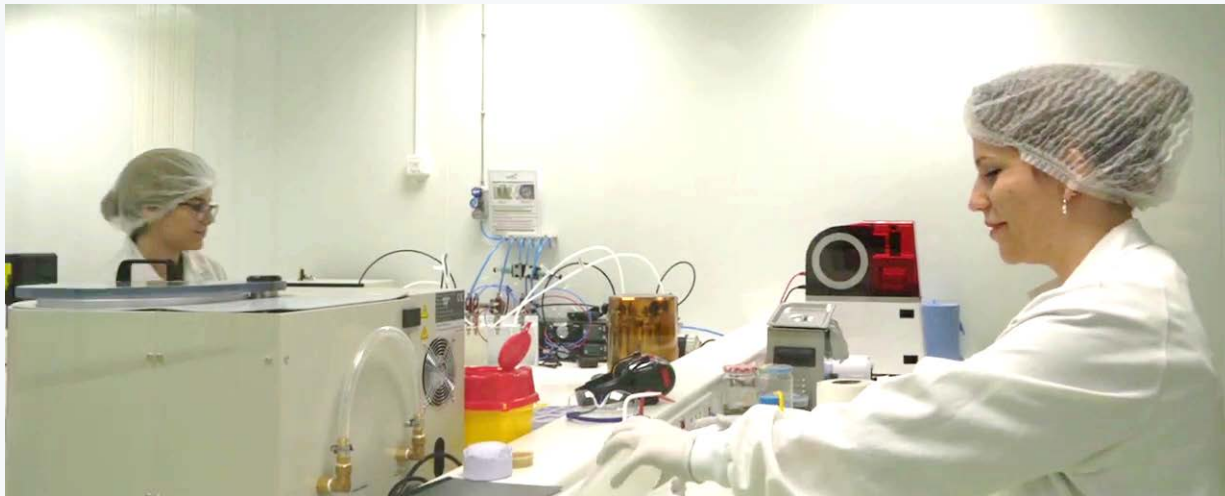
10 years of academic research

30+ papers, 8 patents, 3 brands

150 m² laboratories @ Gerland, Lyon

9 permanent technicians, engineers
and scientists

4 positions Q2 2020



FUNDERS



bpifrance



PARTNERS



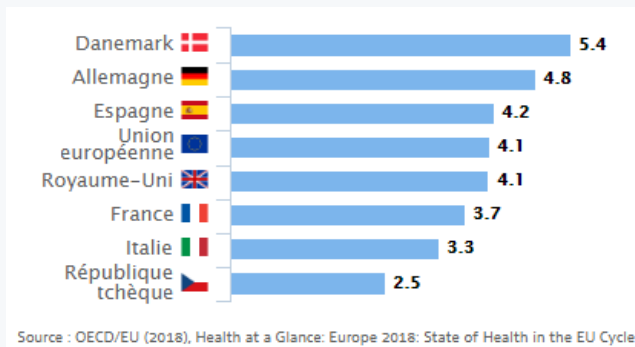
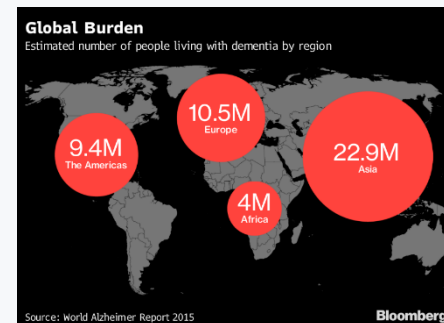
Inserm



CONTEXT

“Alzheimer’s disease and related disorders affecting over 7 million people in Europe, and this figure is expected to double every 20 years as the population ages.”

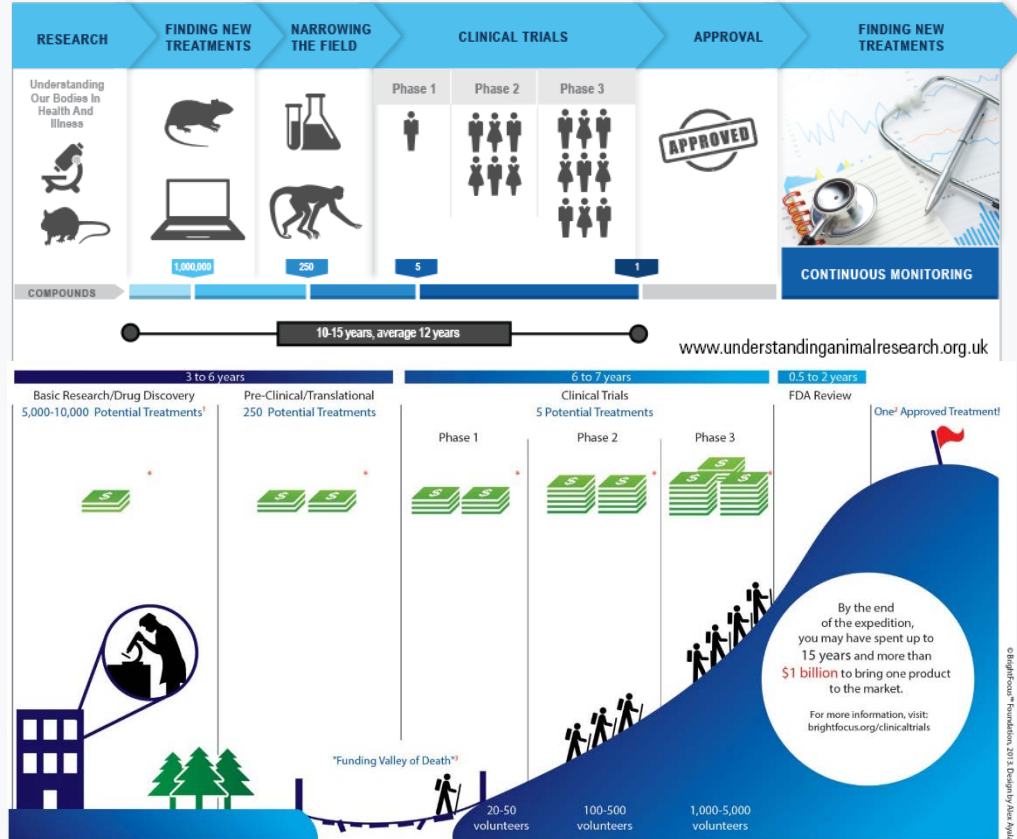
<http://www.neurodegenerationresearch.eu/about/why/>



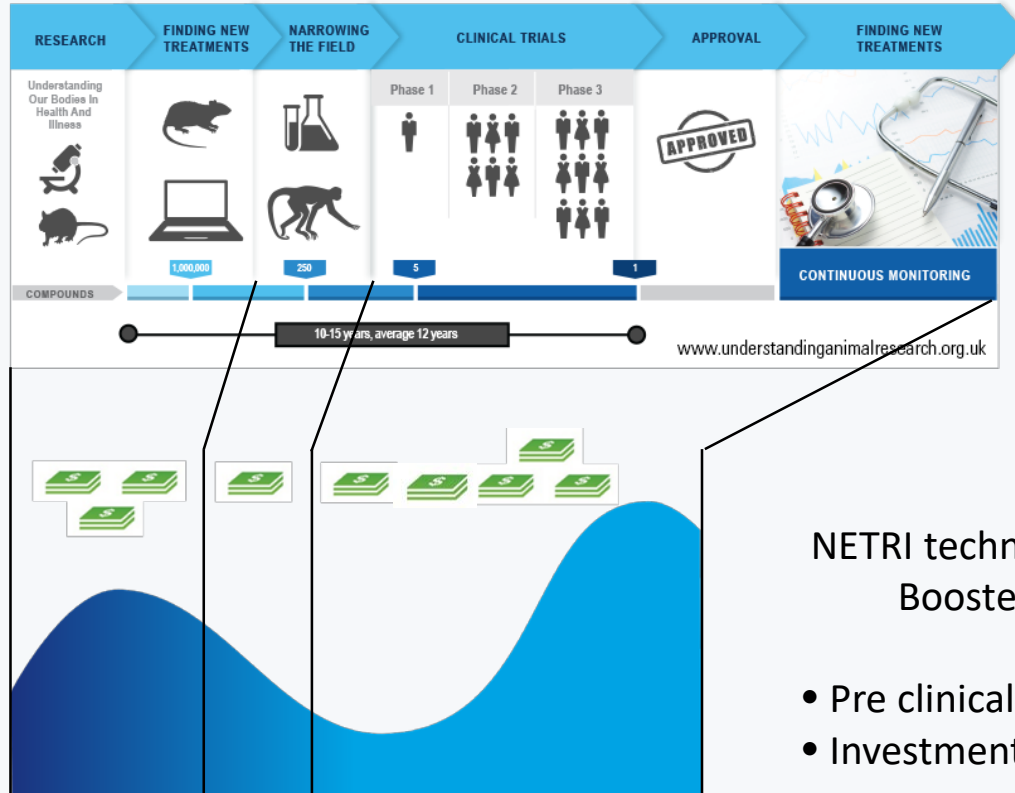
COST FOR SOCIETY

NO CURE

NEW TREATMENTS DEVELOPMENT PROCESS



NEW TREATMENTS DEVELOPMENT PROCESS



NETRI technologies for Biotech:
Booster to clinical trial

- Pre clinical trials time reduction
- Investment reduction

ORGAN ON CHIP

REPRODUCE THE FUNCTIONALITY OF AN ORGAN INSIDE A MICROFLUIDIC CHIP WITH RELEVANT CELLS



CONNECTOME ON A CHIP

COMPLEX STRUCTURE :

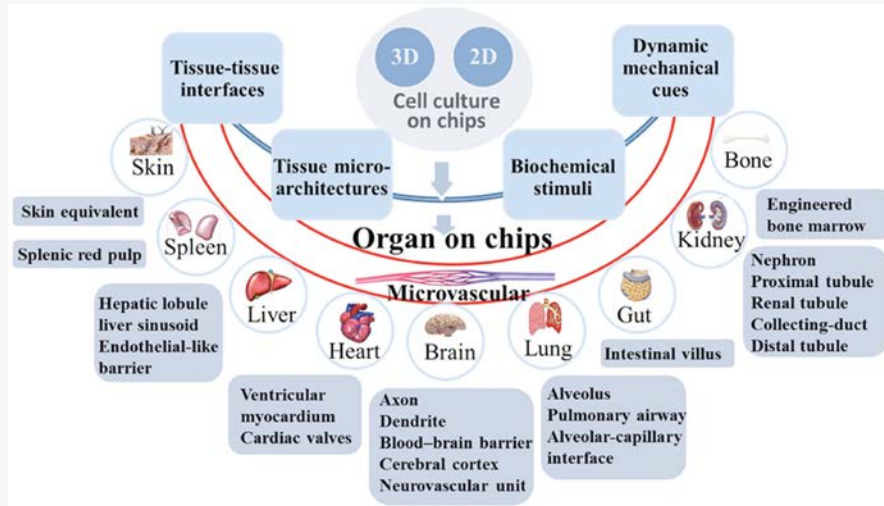
~ 3000 major cell types + ~ 737 brain regions

$8,6 \cdot 10^{10}$ neurons + $5,8 \cdot 10^{10}$ non neurons

FUNCTION:

Information processing

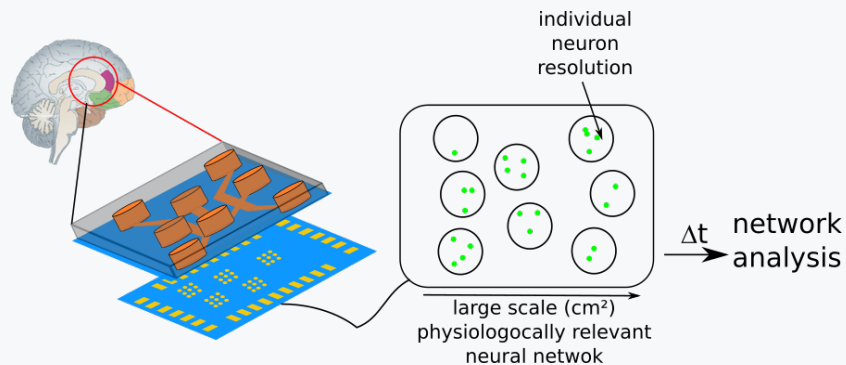
multi-scale : neuron-neuron to network level



Zheng 2016

OUR SOLUTION

ORGAN ON CHIP FOR NEUROSCIENCE



TRANSLATIONALITY RODENT TO HUMAN:
PHYSIOLOGICALLY RELEVANT



NETWORK LEVEL MARKERS

MULTI-NODES CELL INTERFACES (1-7 nodes)

CO-CULTURES IN ALL NODES

CONTROLLED MICRO-ENVIRONMENT

LOW SHEAR STRESS

MICROSCOPY COMPLIANCE

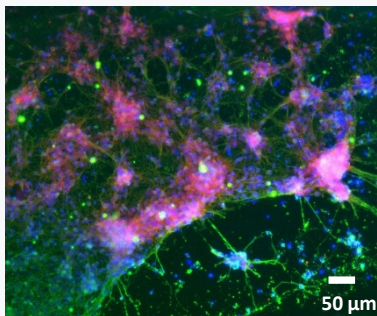
SMALL AMOUNT OF REAGENTS

CONTROLLED STRUCTURAL CONNECTIVITY

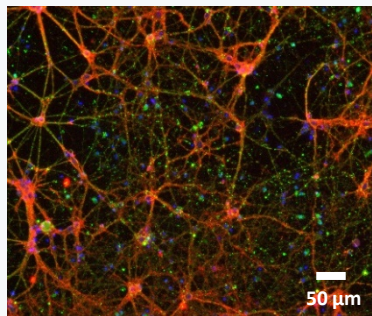
NEURAL CIRCUIT OF ANY COMPLEXITY

FUNCTIONAL NETWORK ANALYSIS

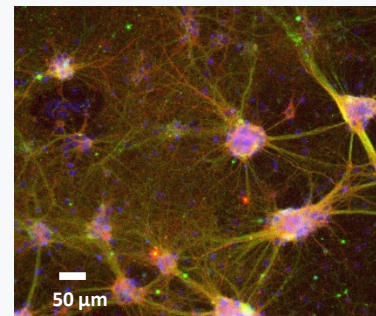
BUILDING THE ARCHITECTURE



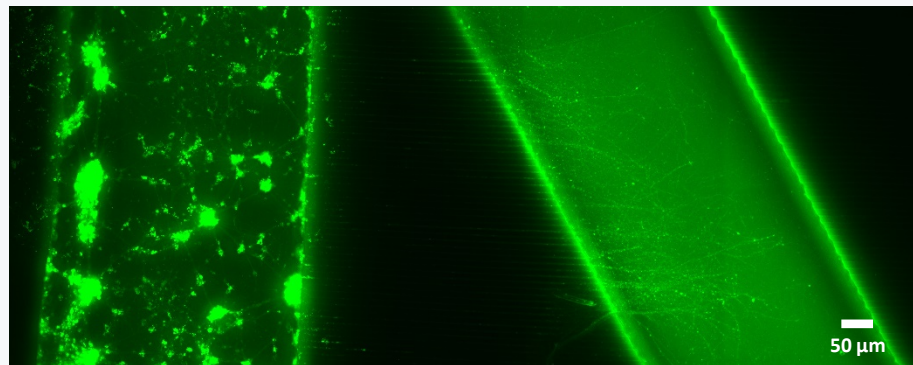
Cortical
DAPI B-III tubulin NeuN / TAU



Hippocampal
DAPI, B-III tubulin, synapsin



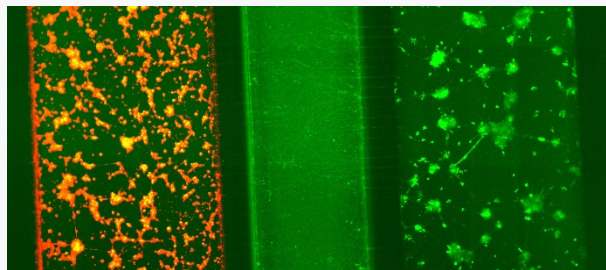
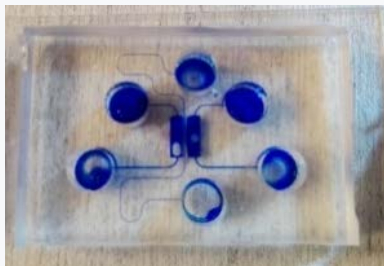
Striatal
DAPI, B-III tubulin, MAP2



Rat E17
Hippocampal

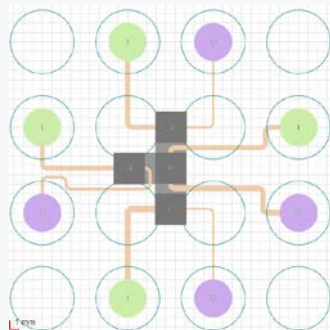
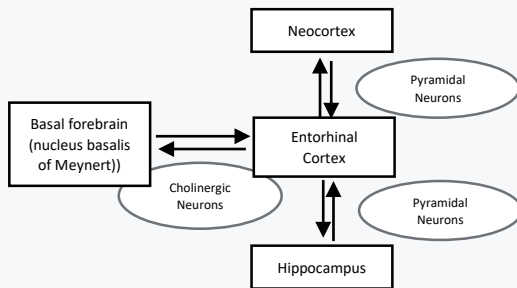
R&D: ALZHEIMER'S DISEASE

1- NEUROINFLAMMATION MODEL



Glial cells
Hippocampal neurons

2- NETWORK MODEL



ALZHEIMER:

1- α - β INJURY ON GLIAL CELLS ONLY

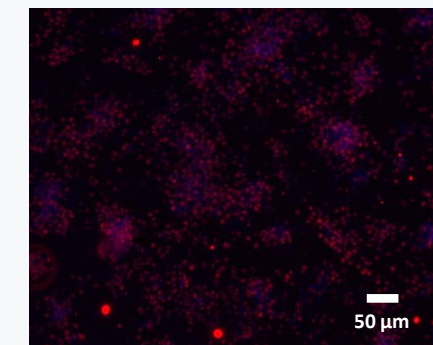
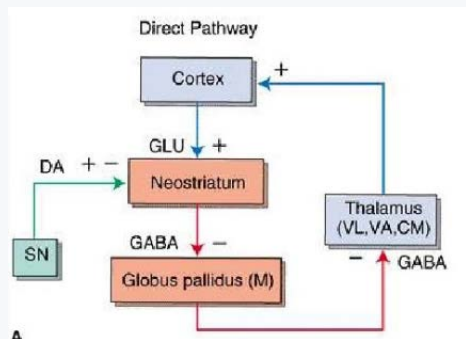
2- α - β INJURY ON EACH NODE

READOUTS:

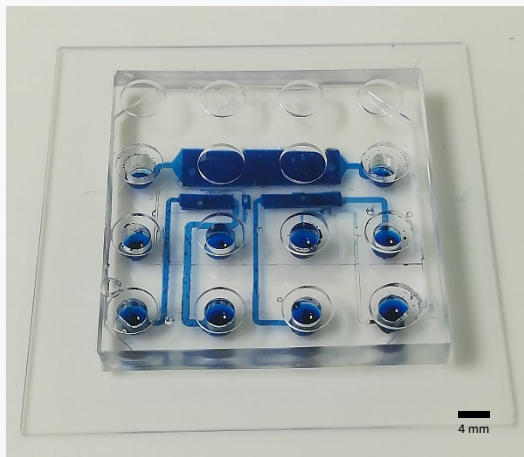
CELL VIABILITY, INFLAMMATION, GLIAL CELL
LOCALISATION, FUNCTIONAL RECORDING,
NETWORK ANALYSIS

CURRENT VALIDATION: DOPENEZIL
FUNCTIONAL EFFICIENCY

R&D: PARKINSON'S DISEASE



Dopaminergic neurons staining in SNc chamber



Network level: Live staining, Immunofluorescence, node cell lysis or secretome for PCR, ELISA, Mass spectro.

PARKINSON:

BASAL GANGLIA DIRECT LOOP MODEL

96 WELLS PLATE STANDARD

5 CELLS TYPES CONNECTED

6-OHDA INJURY ON SNc ONLY

READOUTS:

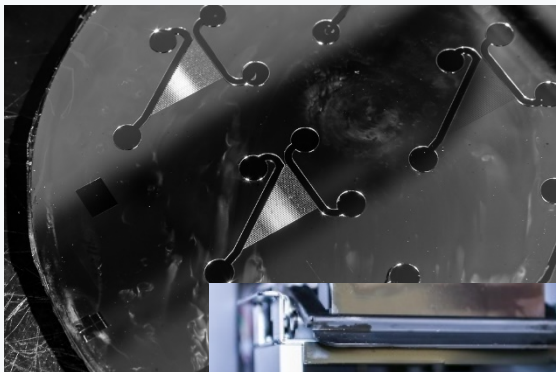
CELL VIABILITY, α -synuclein LOCALISATION, FUNCTIONAL RECORDING, NETWORK ANALYSIS

CURRENT VALIDATION: LEVODOPA

FUNCTIONAL EFFICIENCY

NETRI

IN HOUSE FABRICATION



Pending Patent

MICRO TO MESO SCALE LAYERS

3D PDMS ASSEMBLED LAYERS

3D PRINTING TECHNOLOGIES

PDMS MOLDING

RAPID PROTOTYPING

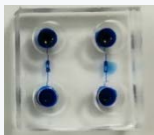
STANDARD PRODUCT LINE

~ 150 CHIPS / WEEK

PRODUCTS: NEUROFLUIDIC™ CHIPS

1 node + MEA

Dissociated 2D cultures:
from 100 to 1M neurons



CD10-SDS



CD100-SDS
CD50-SDS
CD1000-SDS

Explants:
fine positionning



4 cm

2 nodes + MEA

Dissociated 2D cultures:
Length / width / direction variation



WD450-SDS



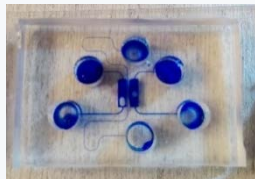
TR-SDS



CD2-SDS

3+ nodes

Dissociated 2D cultures:
Network level connectivity



Alzheimer



Epilepsy



Parkinson

4 mm

STANDARDIZED CHIPS

SDS COMPATIBILITY

PDMS BASED

STERILE PACKAGING

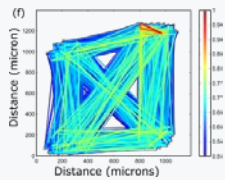
READY TO USE

GLASS SLIDE OR MEA

SHELF TIME 6 MONTHS

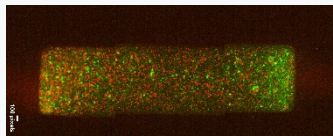
IN HOUSE PRODUCTION

SCREENING SERVICE: NEUROSCOPE™



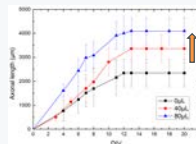
Small worldness

functional network



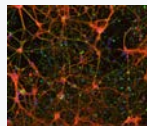
Live/dead assay

growth kinetics



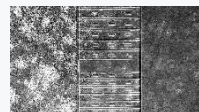
Growth rate slope

synaptogenesis

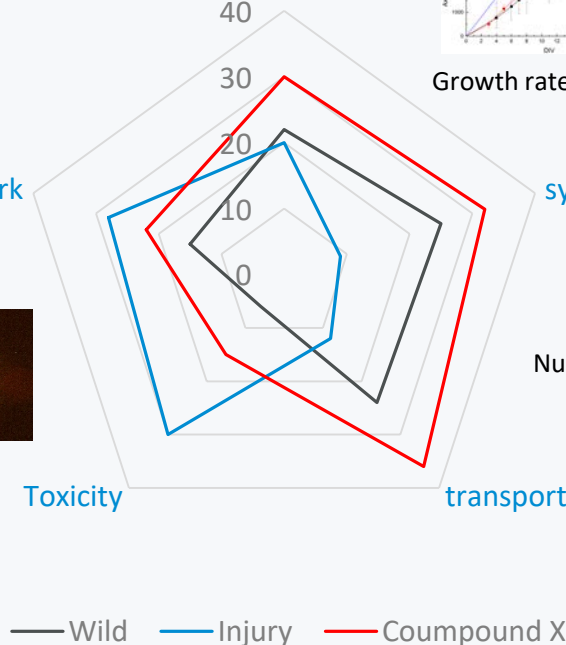


Number of synapses

transport rate



Fluidic isolation
+ HPLC/mass spec



— Wild — Injury — Compound X

RAPID SCREENING OF EFFECTS OF
COMPOUND ON NEURAL NETWORK

PRIMARY RODENT NEURAL EXTRACTION

INJURIES:

ALZHEIMER : α - β (NETWORK / INFLAMATION)

PARKINSON: 6-OHDA (NETWORK)

READOUTS:

GROWTH / TRANSPORT KINETICS,

DOSAGE SCREENING,

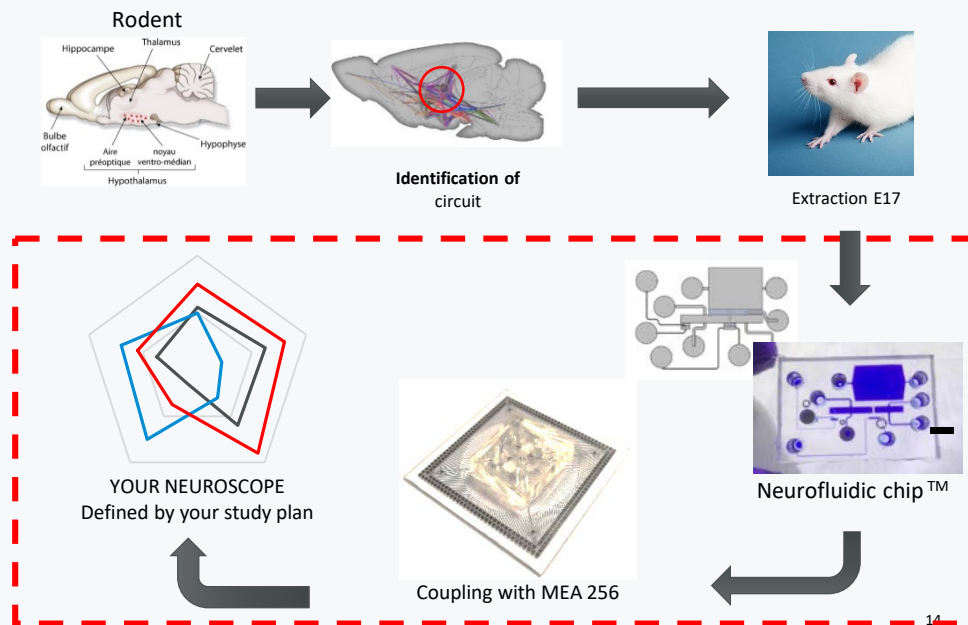
APPLICATION ON CELL BODY OR AXONS,

SYNAPTIC CONNECTIVITY,

FUNCTIONAL ACTIVITY

LEAD TIME: < 1 MONTH

SERVICE: HIGH THROUGHPUT DRUG SCREENING



IN HOUSE TESTING

~ 3 MONTHS STUDY

RODENT CELLS

NO IP CONFLICT

~200 CHIPS / STUDY

SPECIFIC STUDY PLANS

APPLICATIONS:

Compound benchmarking

Mechanistics of action of compound

THANK YOU!

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