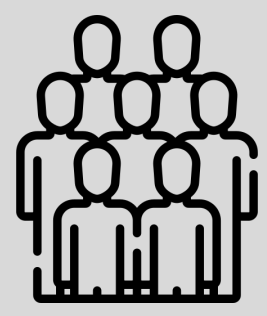


BRAIN-C LAB

COMPENSATION SYSTEMS IN NEURODEGENERATIVE DISEASES AND AGING



OUR TEAM



STAFF SCIENTISTS

- **CHRISTIAN NERI**
(CHRISTIAN.NERI@INSERM.FR)
- **EMMANUEL BROUILLET**
(EMMANUEL.BROUILLET@INSERM.FR)
- **LUCILE MEGRET**
- **MARC VERNY**



POST-DOCTORAL FELLOWS

- **MAIALEN ARRIETA-LOBO**
- **FRANCESCA FARINA**
- **NATAYME ROCHA TARTAGLIA**



PHD STUDENTS

- **PERWIN YASAR**
- **YEN NGUYENTHI (COTUTELLE)**



SCIENTIFIC SUPPORT STAFF

- **MORGANE FONTAINE**
- **LOU GUERRY**
- **ELSA LEVY**
- **CLOÉ MENDOZA**



OUR EXPERTISE



CELL BIOLOGY

- CELL AND MOLECULAR BIOLOGY OF STRESS RESPONSE
- NEURODEGENERATIVE DISEASES
- AGING
- INTERCELLULAR COMMUNICATION
- EXTRACELLULAR VESICLES



BIOINFORMATICS

- RNA-SEQ ANALYSIS
- STATISTICAL ANALYSIS
- NETWORK ANALYSIS & GRAPH THEORY
- SHAPE DEFORMATION ANALYSIS
- MACHINE LEARNING (RANDOM TREE FOREST, FEATURE SELECTION)
- WEB DEVELOPMENT
- DATABASE CURATION & MANAGEMENT



LATEST PUBLICATIONS

- MEGRET ET AL., *ELIFE* [JUNE 2021]
- VOISIN ET AL., *AGING CELL* [JUNE 2020]
- MEGRET ET AL., *BMC BIOINFORMATICS* [FEBRUARY 2020]
- HAMPEL ET AL., *PROGRESS IN NEUROBIOLOGY* [JULY 2019]
- BIGAN ET AL., *BIOINFORMATICS* [JUNE 2019]



COME MEET US!

CASSAN BUILDING B 6TH FLOOR
CASSAN BUILDING A 5TH FLOOR



UNDERSTANDING THE DYNAMICS OF CELLULAR RESILIENCE TO FOSTER THE DEVELOPMENT OF PRECISION MEDICINE FOR NEURODEGENERATIVE DISEASES AND AGING-ASSOCIATED DISORDERS



THE BRAIN-C LAB IS A MULTIDISCIPLINARY RESEARCH TEAM THAT INCLUDES NEUROBIOLOGISTS, CELL AND MOLECULAR BIOLOGISTS, MATHEMATICIANS, BIOINFORMATICIANS AND PHYSICISTS. OUR KNOWLEDGE DISCOVERY MODEL IS BASED ON THE COMBINED USE OF SYSTEMS MODELING, CELL BIOLOGY AND CLINICAL RESEARCH, AND WE WORK AT THE CROSSROADS OF THESE FIELDS.

WE PROMOTE A STRATEGIC MODEL BASED ON A MULTI-DISCIPLINARY AND TRANS-SECTORIAL APPROACH TO ADDRESS THE FOLLOWING QUESTIONS:

- WHAT ARE THE MOST IMPORTANT COMPENSATORY MECHANISMS THAT ARE LOST IN THE COURSE OF NEURODEGENERATIVE DISEASE PROCESSES?
- HOW TO REINSTATE THESE MECHANISMS TO PROLONG COMPENSATION AND DELAY THE PROGRESSION OF NEURODEGENERATIVE DISEASES?
- WHAT ARE THE FACTORS ALLOWING TO PREDICT THE INDIVIDUAL CAPACITY FOR BIOLOGICAL RESILIENCE IN NEURODEGENERATIVE DISEASE AND AGE-RELATED STRESS?
- WHAT ARE THE MOLECULAR DIAGNOSIS AND PRECISION MEDICINE MARKERS ALLOWING TO PREDICT THE MOST LIKELY COURSE OF NEURODEGENERATIVE DISEASE PROGRESSION RATE?

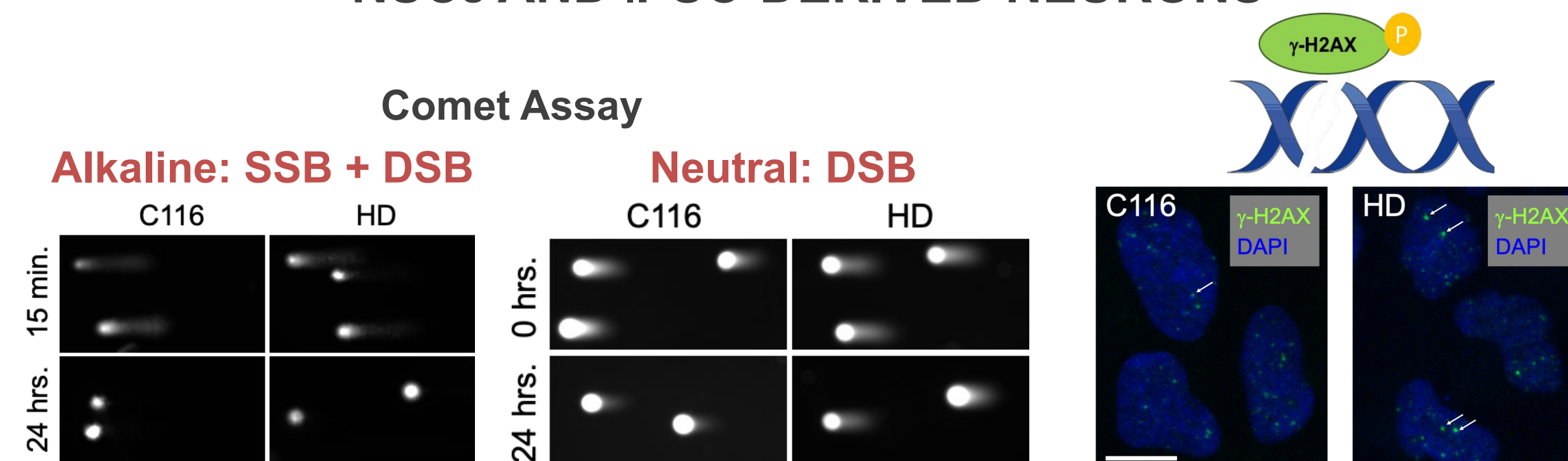
WE STUDY THESE QUESTIONS IN THE CONTEXT OF HUNTINGTON'S DISEASE (HD), A GENETIC NEURODEGENERATIVE DISEASE FOR WHICH WELL-CHARACTERIZED MODELS AND HIGHLY DIMENSIONAL DATASETS ARE AVAILABLE ACROSS SPECIES, AND IN ALZHEIMER'S DISEASE (AD). WE ALSO HAVE AN INTEREST IN THE PROCESS OF AGING AND ALTERED HOMEOSTASIS. WE TAKE ADVANTAGE OF THE MOST COMPREHENSIVE DATASETS TO UNDERSTAND HOW NEURODEGENERATIVE DISEASES MAY WORK ON A SYSTEMS LEVEL, PARTICULARLY IN TERMS OF AGING & COMPENSATION.

HUMAN NEURAL STEM CELLS

PANELS OF ISOGENIC AND NON-ISOGENIC LINES:

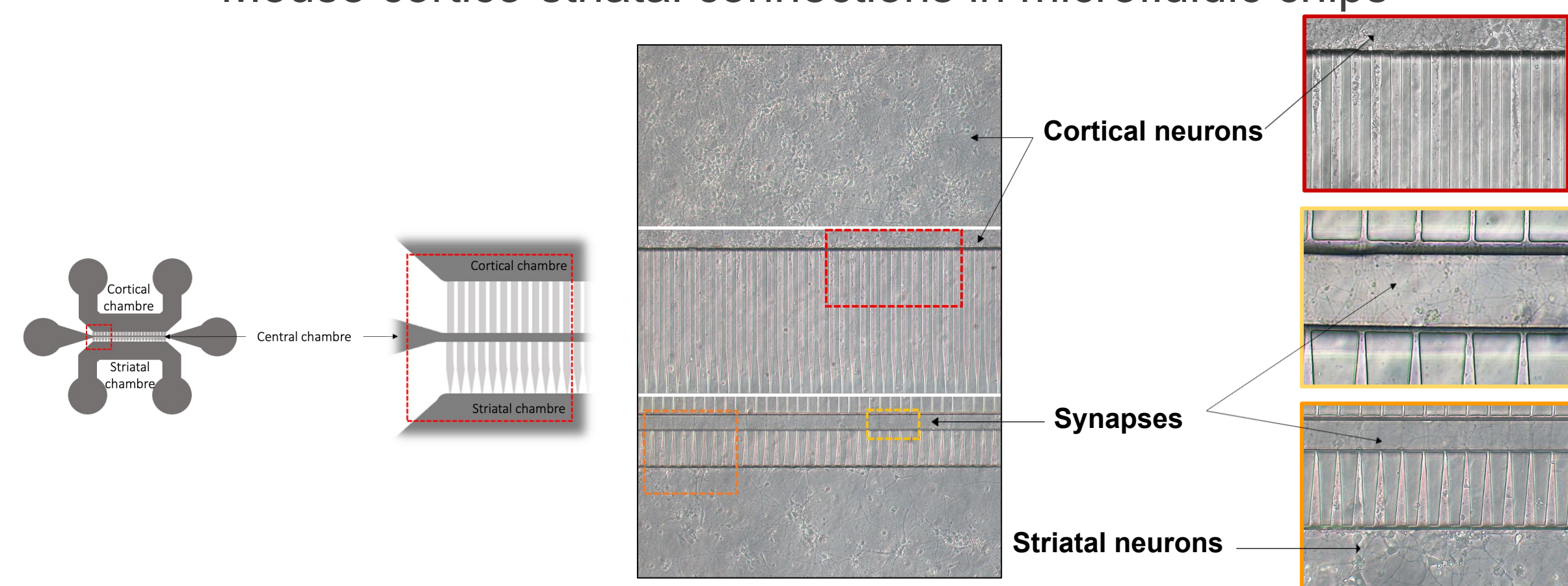
- HUMAN iPSC-DERIVED ISOGENIC CELLS HD 72Q/19Q AND C116 21Q/19Q (L. ELLERBY, BUCK INSTITUTE, CA)
- 2 NON-ISOGENIC HD (60Q AND 109Q) AND 2 CONTROL LINES (18Q AND 20Q) (CEDARS-SINAI)

DISSECTING THE DNA DAMAGE & REPAIR MECHANISMS IN NSCs AND iPSC-DERIVED NEURONS



DISSECTING SYNAPTIC FUNCTION

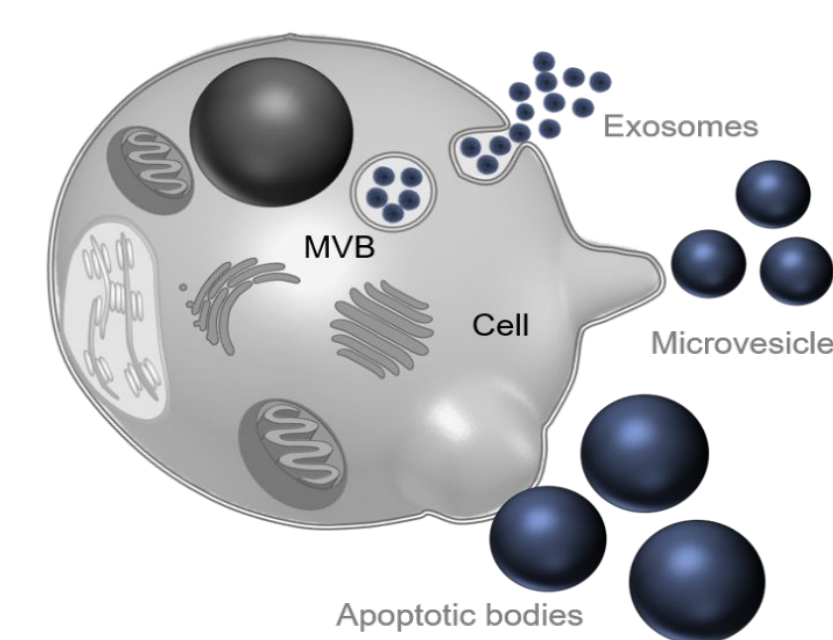
Mouse cortico-striatal connections in microfluidic chips



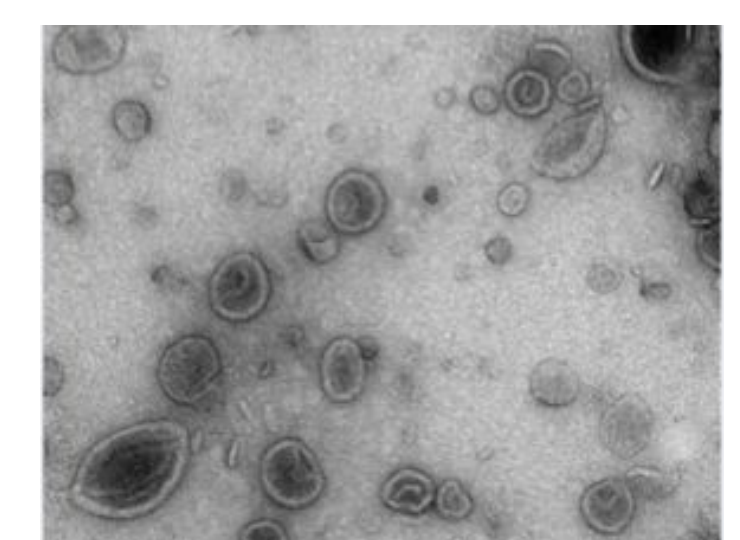
EXTRACELLULAR VESICLES

EXTRACELLULAR VESICLES (EVs) ARE CELL-DERIVED MEMBRANOUS STRUCTURES WITH EITHER ENDOSOMAL ORIGIN OR ARE SHED FROM THE PLASMA MEMBRANE.

WE ARE ISOLATING SMALL EV (EXOSOMES) FROM HUMAN HD iPSC-DERIVED NSCs AND CAG-CORRECTED CELLS AND INVESTIGATING THEIR ROLE IN THE RESPONSE TO PROTEOTOXIC STRESS AND NEURONAL SURVIVAL IN HD.

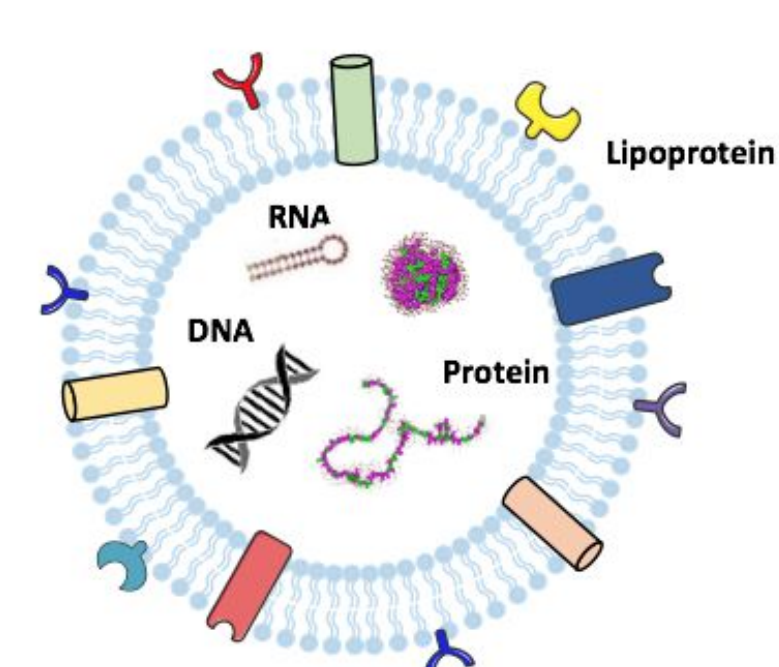


Nano-sized particles



Transmission electron microscopy (TEM) of extracellular vesicles (EVs)

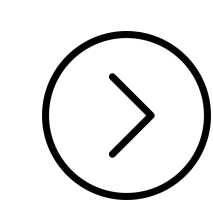
- Characterization of EVs:
 - Microvesicles
 - Exosomes
- Biogenesis
- Biological effects
- Applications



Mechanism for intercellular communication

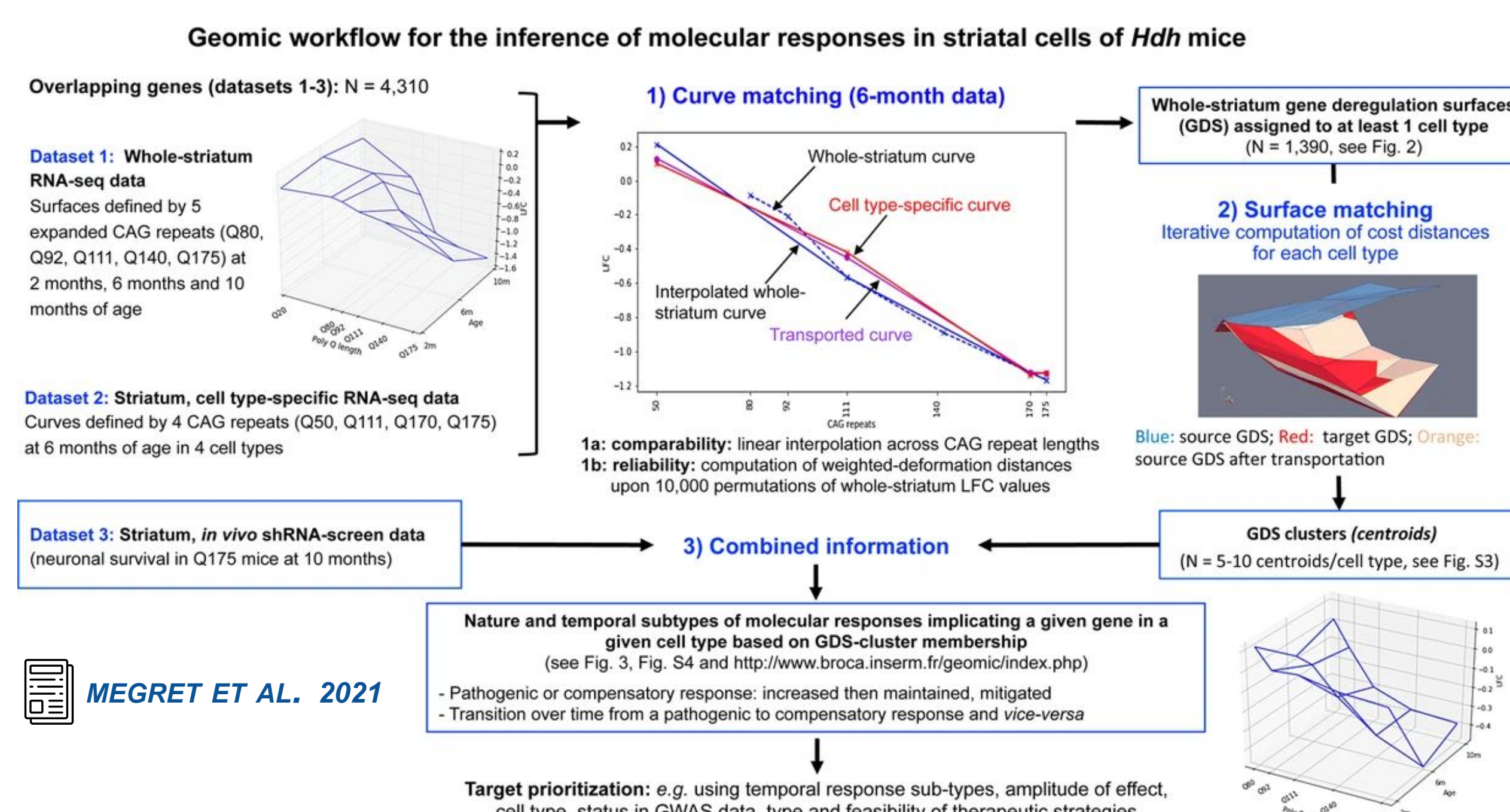
SPECIFIC SETS OF PROTEINS, DNA, LIPIDS OR RNA SPECIES THAT THEN DETERMINE THEIR FATE AND FUNCTIONS.

MATHEMATICAL MODELING, BIOINFORMATICS AND MACHINE LEARNING

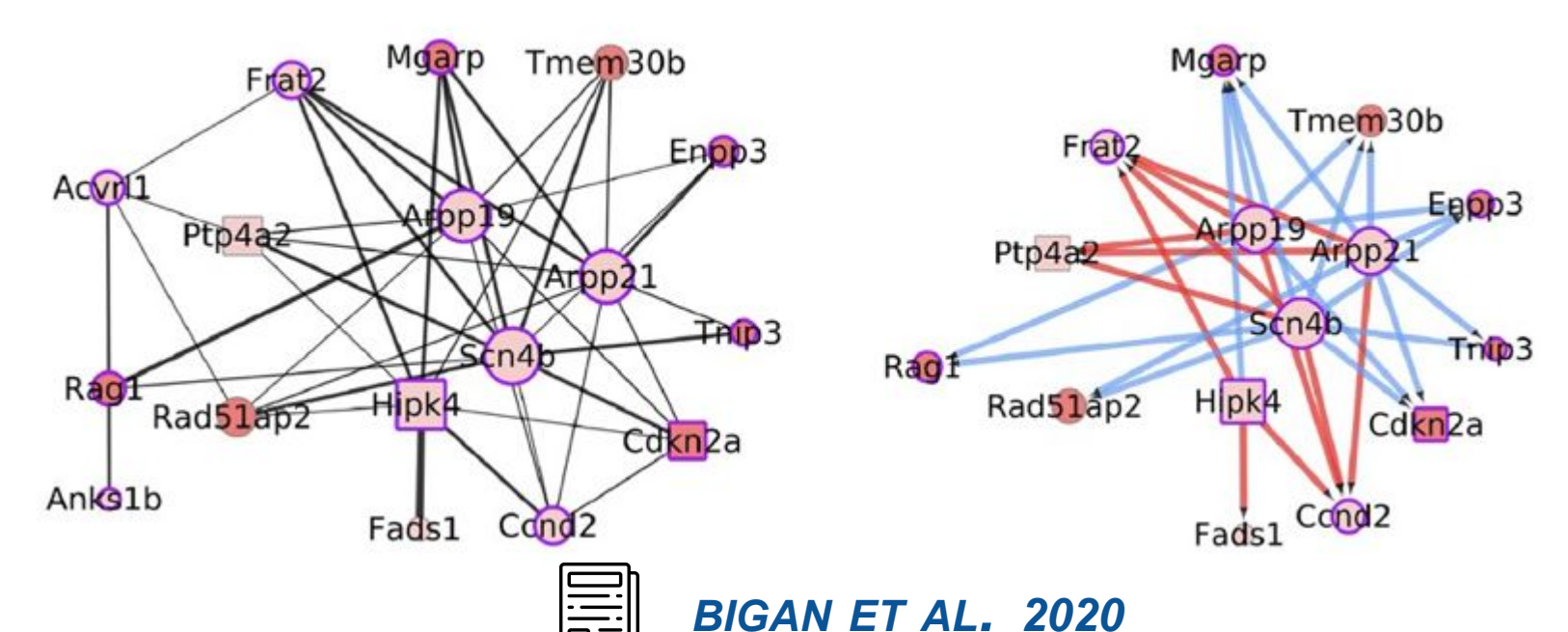


TO UNDERSTAND HOW NEURODEGENERATIVE DISEASES AND AGING MAY WORK ON A SYSTEMS LEVEL, WE DEVELOPED **BioGEMIX** — A DATA INTEGRATION FRAMEWORK BASED ON INNOVATIVE MACHINE LEARNING APPROACHES FOR BIOLOGICAL PRECISION IN THE ANALYSIS OF DIMENSIONAL DATA — AND WE USE IT FOR BASIC RESEARCH AND CLINICAL DISCOVERY PURPOSES. **BioGEMIX** INCLUDES DIFFERENT PIPELINES AND IS CONTINUOUSLY BEING DEVELOPED TO INCORPORATE NEW DATASETS AND TOOLS THAT WE CONTINUE TO DEVELOP.

GEOMIC - SHAPE ANALYSIS



WEIGHTED EDGE NETWORK ANALYSIS



BRAIN-C LAB HD KNOWLEDGE DATABASE

