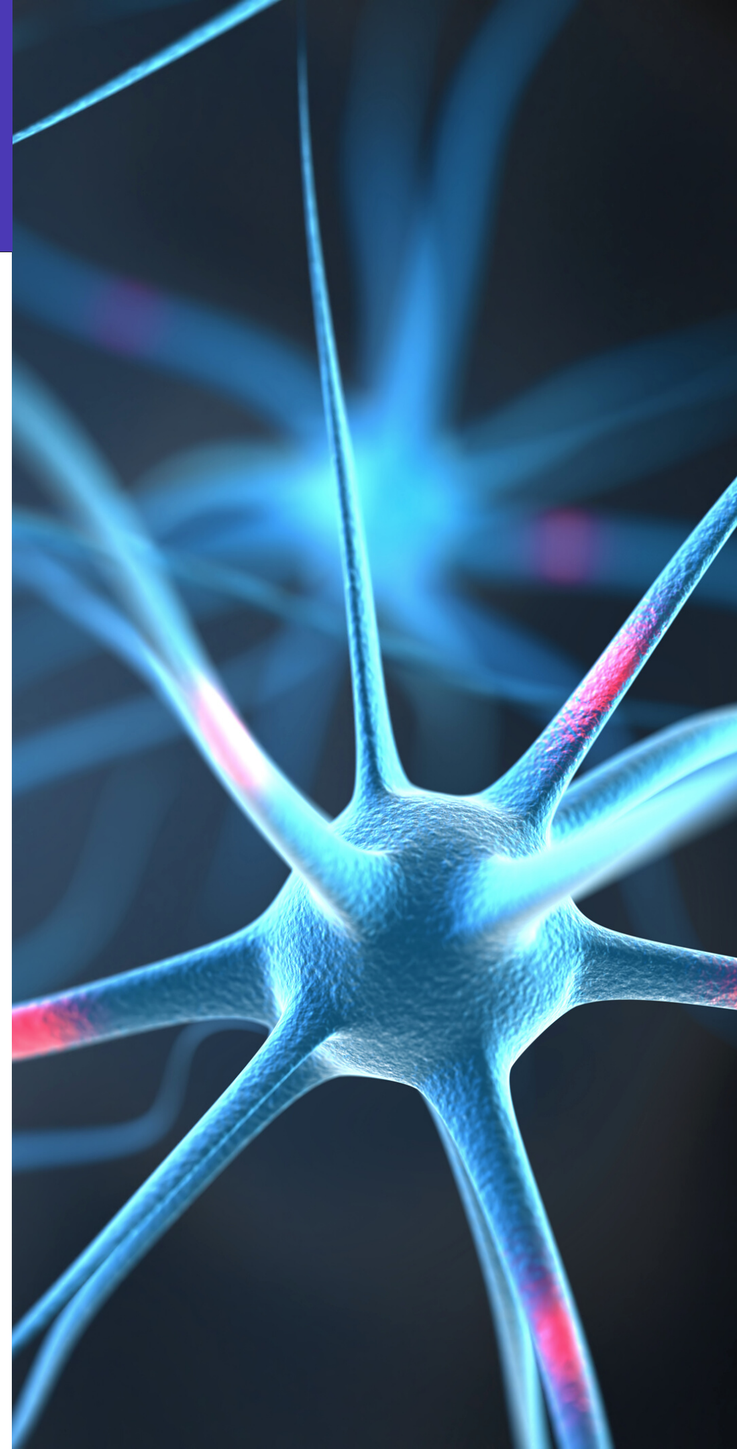
The Differences Between Various Memory-Improvement Treatments on Neurons

using Multielectrode Array



Some Background

What is a Memory?

A group of neurons (synapse) that is responsible of for specific thought or perception

How are Memories Formed?

A synapse is formed when two neurons create a connection by transferring electric signals between one another

These connections get stronger or weaker depending on when and how often they have been activated

How are Memories Retrieved?

Reactivation of the specific synapse that was originally formed when the experience first happened

The Research

Why bother?

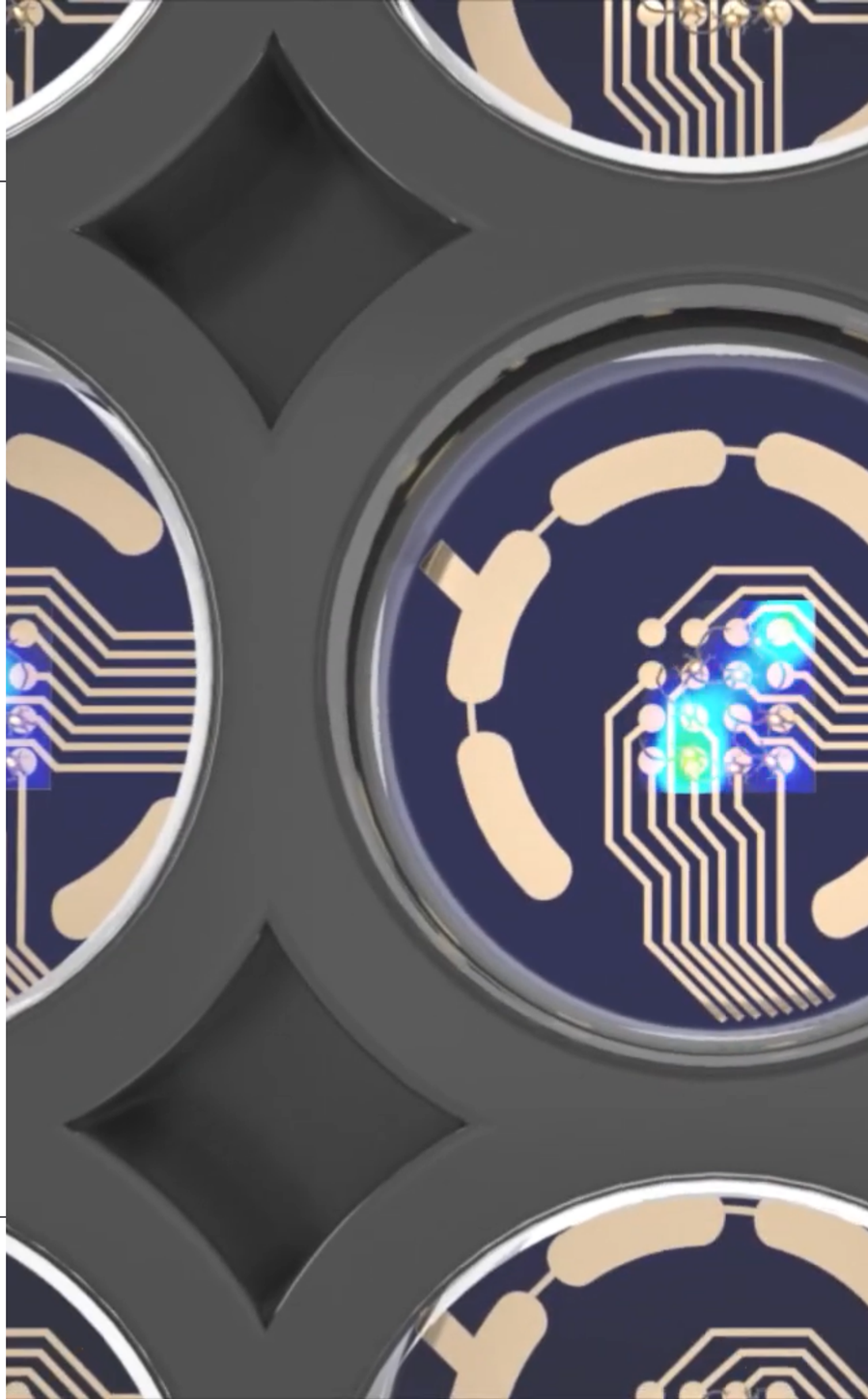
Efficient memory-improvement treatment might be the right path to prevent Alzheimer's Disease and dementia!

What is the problem?

We need to determine whether the treatments are efficient or not, and if so, which of the two is more efficient

Collecting the Data

- Neurons are bred in a well in the laboratory
- Each well has 16 electrodes monitoring its activity
- Some wells receive a treatment, out of two: AP5, FGL
- Some are the control group
- When a neuron send a signal, it is recorded by the electrodes



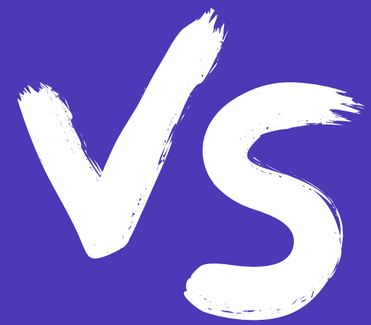
Data Overview

- **24 data files**, automatically produced by the multielectrode array
- **24** wells, each has **16** electrodes
- Recorded for **11 minutes** every hour for 24 hours
- **3** main features:
  - Electrode sending the signal
  - Time the signal was sent
  - Voltage of the signal sent
- Around **2,340,000** records of neural activity!

Key Methods

Pearson's correlation

ANOVA tests



Tukey's methods for multiple comparison

What did We Find?

The treatments are significantly different!

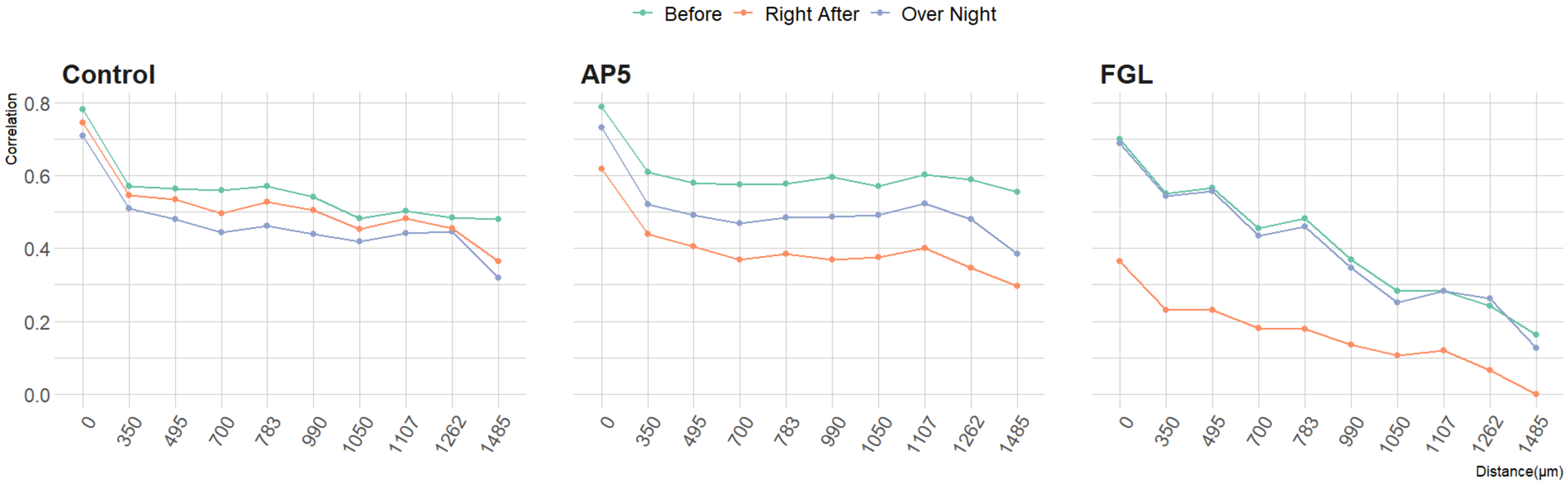
AP5 has no significant difference from the control group, while FGL has

The neurons connections are weakening

With treatment or without, the neurons could not keep the strength of the connections they formed prior for the rest of the day

FGL is the more efficient treatment

Overall, FGL's wells correlation decreased insignificantly.
Therefore it is efficient for maintaining connections formed prior to the treatment, rather than for building new ones


Before
Right After
Over Night
Control
AP5
FGL
Correlation
0.8
0.6
0.4
0.2
0.0
0
350
495
700
783
990
1050
1107
1262
1485
Distance(μm)