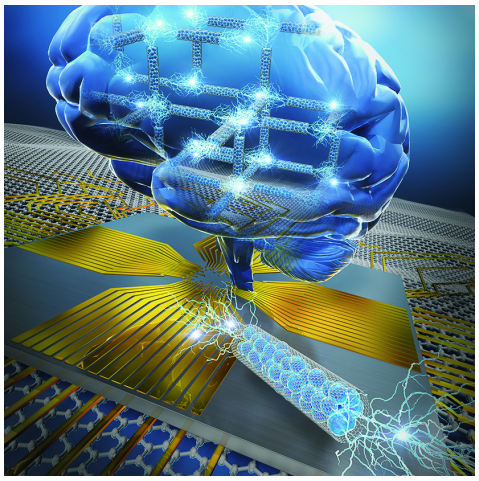
E23

To examine brain function, neuronal signals are recorded from spatially organized neurons

Neural interface for bottom-up tissue engineering

IOWN Evolution Well-being・Lifelong Health Support



Background

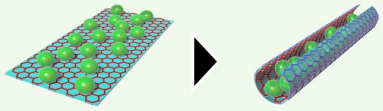
Culturing neurons is a common research method for studying brain physiology and pathology. However, cells behave differently in the two-dimensional environment of the culture dish and in the complex three-dimensional structure of the brain, resulting in poor understanding of cellular functions.

Summary

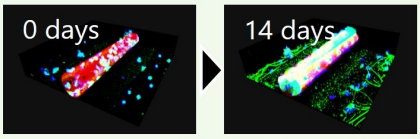
The on-chip device enables us to construct 3D neuronal clusters and make array of 3D clusters to form a complex neuronal network. Combination of this arrangement with recording methods enable us to build a recording system that more closely mimics the brain structure.

3D tissue construction × **Neural interface**

Step 1: wrapping living cells



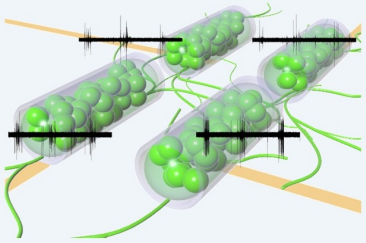
Step 2: growing cells



Film / Neuron / Nuclei

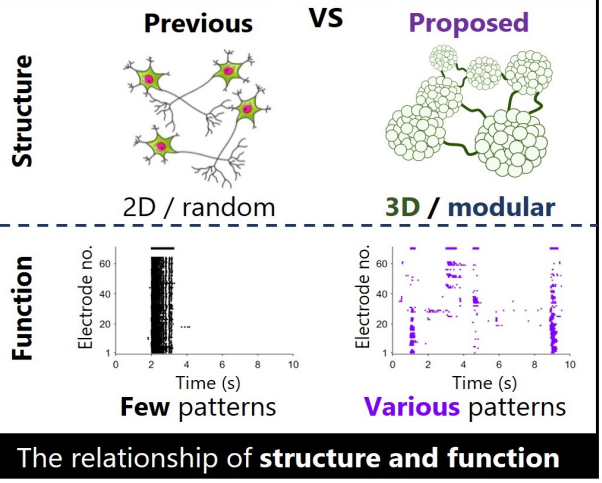
Step 3: aligning 3D tissues

Step 4: recording bio-signals



- Self-assembly of thin-film
- **3D** construction of tissue
- Electrode array fabrication
- **Modular** neuronal network

Brain-mimicking on-chip device



Features

- The first successful combination of "three-dimensional assembly of cells" and "signal measurement" on the biochip
- Mimicry of two brain's structural features including a "modular structure with clusters of cells as a unit" and a "three-dimensional structure"
- More diverse patterns of neuronal signals in complex neuronal networks than the conventional culture

Future_benefits

The on-chip technology will help medical researchers to understand how the brain structure is related to physiological functions and diseases at the cellular level.

Exhibiting Company

NIPPON TELEGRAPH AND TELEPHONE CORPORATION

Contact

rdforum-exhibition@ml.ntt.com