Bioengineered human brain; *in vitro* model for personalized neurodegenerative disease and drug screening

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The talk will present novel results relating to the pioneering work of bioengineered 3D brain organoids to generate sophisticated *in vitro* model and genetic engineering for the personalized model platform. The recent breakthrough of 3 dimensional (3D), self-organizing Brain organoids created from human pluripotent stem cells (hPSCs) enables the recapitulation of the endogenous cellular composition, organ-specific structure, phenotype and functionality of human physiology and development including aging. To generate a reliable and feasible model to recapitulate the individual human brain as a first-in-kind, I have applied the bioengineering tools on hPSCs-derived brain organoids[1]. The development of a brain microenvironment-mimicking platform has produced sophisticated brain organoids generation and has shown less variability of the organoid production quality to be raised as a reproducible in vitro model. The state-of-the-art bioengineering approaches merged to resemble the brain-specific niche by combining the brain-mimetic 3D matrix and the dynamic microfluidic devices reminiscing the cerebrospinal fluid. Furthermore, to construct the brain organoid as a personalized model for the neurodegenerative disease model (i.e., Dementia, Motor neuron disease, Epilepsy), I have developed novel gene delivery tools for brain organoid[2]. This technique can target the diverse cell types and brain organoids which ultimately aims for translating the research findings to clinical usage.

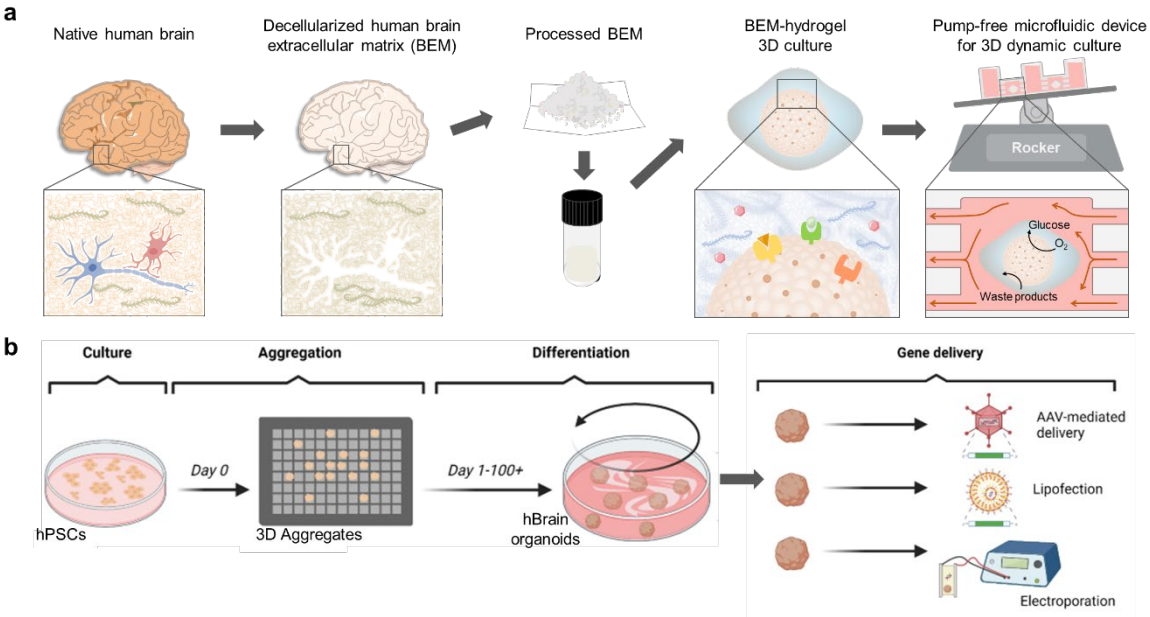

Figure 1: Schematic illustration of (a) Bioengineered[1] and (b) Genetically engineered brain organoids[2].

References

[1] Cho, AN. *Nature communications* **2021,** 12, 1, 1-23.
[2] Cho, AN. *Cells* **2022,** 11, 20, 3194.