A start-up concept: Commercializing MESOTAS-SIEVE Brain-on-chip technology in neuropharmaceutical drug development

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Drug development expenses have skyrocketed over the past decades, whilst the number of approved neuropharmaceutic drugs on the market each year has declined[1]. This puts a burden on society by health care expenditures and an increasing challenge to improve treatment for neurodegenerative diseases such as Parkinson's disease and epilepsy. In particular, a high failure rate is observed in novel drugs for brain diseases, with reduced approval at market entry, longer approval times and often limited to symptom treatment only.

In pre-clinical screening, creating time- and cost-effective models for drug development is essential to "fail early and fail cheaply" in the discovery of effective new drug candidates. Current pre-clinical models rely heavily on animals or 2D cell culture, both of which do not reflect the complex human tissue. MESOTAS-SIEVE[2] Brain-on-Chip (BoC) technology will revolutionize drug development by providing a realistic brain model at the microscale that can aid in intelligent drug design and a deeper understanding of devastating brain diseases.

Considering this need for advanced human brain models and the unmet need for actual disease targeting, BoCs utilizing MESOTAS-SIEVE technology will enable 3D *in vitro* brain models containing well-defined engineered neuronal microtissue and electrically functionalized micropores pairing single neurons to single electrodes[3] to obtain a spatially controlled functional readout of the electrophysiology at the neurocircuitry level in the live tissue.

As part of an expanding field of Organ-on-chip (OoC) technology, the overall value for BoC products is expected to grow up to about one billion dollars by 2025[4]. Of the competitors in the OoC field, few focus on BoC technology. The new start-up, hence, focuses its business on the development of a new method for *in vitro*, quantitative, specific neuronal activity read-out (Fig. 1).

As OoC technology is currently in its infancy, we already foresee MESOTAS-SIEVE BoC technology to be able to generate revenues by selling research products to the pharmaceutical CRO companies in the drug development pipeline.

In conclusion, MESOTAS-SIEVE BoC technology can deliver a viable business case to open up a new market and has the potential to achieve much needed innovation for drug development with regard to neurodegenerative diseases.

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[1] J.A. DiMasi, H.G. Grabowski, R.W. Hansen, *J. Health Econ.* **47**, p. 20-33 (2016).
[2] ERC-PoC-2015, Grant NO. 713732
[3] J.M.S. Frimat, B. Schurink, R. Luttge, *JVSTB* **35 (6)**, 10.1116 (2017)
[4] L.H.M. van de Burgwal, P. van Dorst, H. Viëtor, R. Luttge, E. Claassen, *PharmaNutrition* **6**, p. 55-63 (2018)

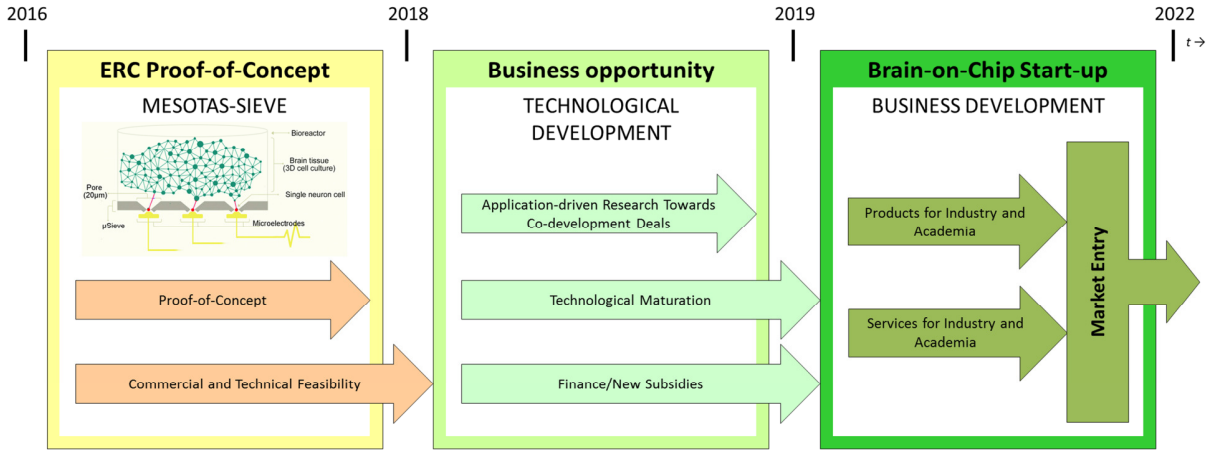

Figure 1: MESOTAS-SIEVE Brain-on-chip to startup roadmap.