

NAP4DIVE
Non-Animal Platform for Nanoparticle-Based
Delivery across the Blood-Brain
Barrier Interface with Vehicle Evolution

Introduction:

The blood-brain barrier (BBB) is a major obstacle in treating diseases of the central nervous system (CNS) such as Parkinson's, Alzheimer's, schizophrenia and brain cancer, affecting 180 million Europeans with less than 5% of current candidate drugs effectively reaching the brain. NAP4DIVE strives to revolutionize the traditionally expensive and inefficient drug development for these diseases by establishing advanced non-animal alternatives for testing and predicting nanoparticle (NP)-based drug delivery across the human BBB. This approach aligns with EU and global initiatives to reduce animal testing and advance human-based biomedical research models.

Project description:

The project will develop two complementary non-animal tools: a high-throughput BBB-on-Chip and an *in silico* model based on machine learning ("NP Design Simulator"). A digital repository of optimized nanoparticle designs ("NP Design Library") will be created to gather publicly available and newly obtained NP characterisation data, specialised for BBB delivery. The design simulator screens thousands of NP designs to recommend the most promising ones, which will be tested *in vitro* on the microfluidic BBB-on-Chip with real-time measurement of barrier integrity. The accuracy and physiological relevance of both tools will be validated by the pharmaceutical partner through comparison with clinical and preclinical data.

By identifying nanoparticles for cross-BBB drug delivery and offering avenues for new effective treatment options, NAP4DIVE addresses one of the most pressing healthcare challenges of the century. A comprehensive HTA will demonstrate market readiness and cost-effectiveness of the tools, an ethical assessment will analyse harm reduction and engagement with regulators and policy makers will promote non-animal alternatives in preclinical testing on a larger scale.



Project facts:

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End date: 31/12/2028

Duration in months: 48

Project EU funding: € 7.76M

HE Research & Innovation Action

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Call (part) identifier:
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Topic:
Innovative non-animal human-based
tools and strategies for biomedical
research

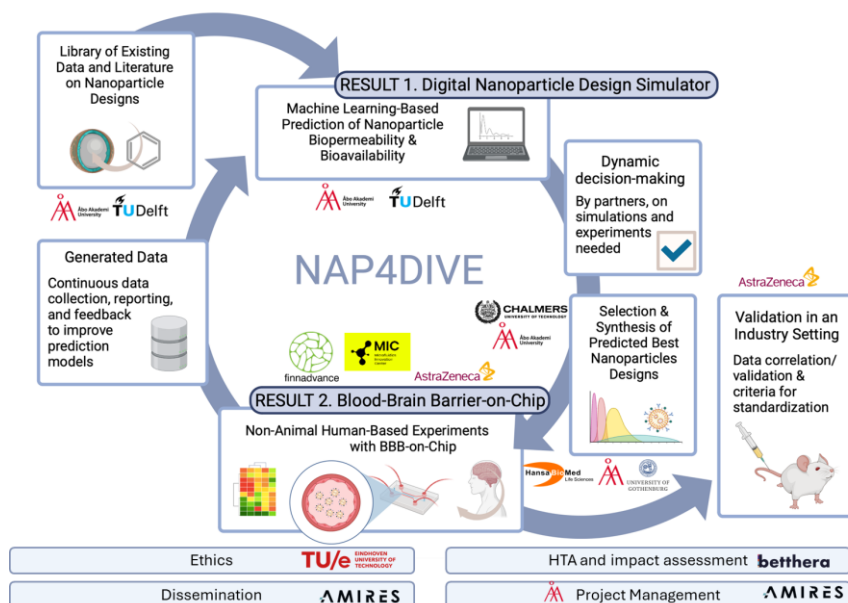
Keywords:
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NAP4DIVE concept which is based on two main aspects: digital nanoparticle design simulator and the blood brain barrier on chip. (Created in Biorender.com)

Expected impact:

NAP4DIVE offer new opportunities to deliver effective but as of now undeliverable drugs to the brain and develop new therapeutic, expanding scarce treatment options for CNS disorders such as Alzheimer's, Parkinson's, Huntington's, and schizophrenia. After the end of the project, NAP4DIVE tools can be adapted and used for personalized disease diagnosis, treatment, and monitoring – when extended with patient data, the computational model, for instance, holds the potential to be expanded for personalized treatment guidance.

NAP4DIVE thrives to reduce 95% of animal use in development of drug and delivery systems for CNS diseases, which will also save 30% of costs per drug tested, among other impacts.

Consortium:

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FINNADVANCE OY	FI
ASTRAZENECA AB	SE
GOETEBORGS UNIVERSITET	SE
CHALMERS TEKNISKA HOGSKOLA AB	SE
MICROFLUIDICS INNOVATION CENTER	FR
TECHNISCHE UNIVERSITEIT DELFT	NL
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Linked in

#bloodbrainbarrier, #nanoparticles,
 #microfluidics, #NPdesignsimulator,
 #organonchip, #CNSdiseases,
 #nonanimalmodels, #sustainability,
 #ethics, #drugdevelopment,
 #Alzheimers, #Parkinsons

