

Technical Project Summary- SDI

Project title

Nanoworx

Project leader + organisation

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File number:

10920012310005

Key words

Nanomedicine; High-throughput; Automation; Nanoparticle; Contract Research Organization

Domain 4D Map ([link](#))

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| ☒ A. Basic Science & Target Identification | ☐ F. Regulatory review |
| ☐ B. Target Pharmacology | ☐ G. Post-marketing |
| ☒ C. Lead Identification | ☐ H. Medical Landscape |
| ☒ D. Lead Optimization | ☐ I. Commercial Manufacturing & Distribution |
| ☐ E. Clinical Research & Development | |

Aims and objectives

Nanoworx is a contract research organization (CRO) initiated by TU/e's nanomedicine experts, supported by Pivot Park and the biotech company Trained Therapeutix Discovery (TTxD). Nanoworx provides nanomedicine expertise & infrastructure to assist clients in nanomedicine design & optimization, library development & screening, and scaling & manufacturing of innovative nanomedicine-based drugs.

User group and application

Nanoworx is establishing a forward-thinking expertise and equipment infrastructure for the development, screening, optimization, and scaling of innovative nanomedicine-based drugs. It provides general access to nanoparticle expertise and production infrastructure to small and medium-sized companies and knowledge institutes. The combination of infrastructure and nanomedicine expertise will cater to the clients' unique requirements. Nanoworx provides personalized support and guidance at every step of the development process. From prototype design, formulation optimization, to library construction & screening, the Nanoworx team is dedicated to delivering tailored solutions. We envision that this will diversify, accelerate & strengthen the development of nanomedicine-based drugs, and help unlock its full potential.

Impact

Nanomedicine harbours tremendous potential for the treatment of a diverse range of diseases. Although the field was established over 50 years ago, its actual benefits have only recently emerged. The translation of innovative nanomedicines from academic concepts to real-life products that benefit patients is, however, hampered by a knowhow and manufacturability gap. Nanoworx' ambition is to fill this void by offering a unique expertise and library production infrastructure, tailored to foster clients' needs by assisting in nanomedicine design & fine-tuning, and by expediting & scaling the development process. Optimization of the composition and production process of nanomedicine-based pharmaceuticals has the potential to increase safety and efficacy by orders of magnitude. We envision that this will diversify, accelerate, and strengthen the development of nanomedicine, and help unlock its full potential, ultimately making better treatments available to patients.

Technical description of the shared infrastructure

Nanoworx' unique selling propositions lie in the integration of a nanomedicine knowledge and a one-of-a-kind manufacturing infrastructure. Leveraging the unique blend of nanomedicine expertise provided by TU/e and Nanoworx' initial R&D efforts, we will deliver a broad spectrum of nanomedicine development needs to clients. Phase 1 of the implementation of the project is divided into two modules that are described below:

Module 1: Design and Prototyping of Nanomedicine**Equipment Infrastructure:**

- SunShine (Unchained Labs)*: An automated system for nanomedicine production, offering customization of flow rates and various microfluidic mixing options. Additionally, can be run in continuous mode for medium to large scale production.
- HPLC-CAD and HPLC-PDA (ThermoFisher): For detailed molecular-level analytics of nanomedicine.
- TFF (Tangential Flow Filtration): For efficient buffer exchange for large volumes of nanoparticles.
- Access to cryo-EM infrastructure: Offers insights into nanoparticle morphology.

Module 2: Library Construction and Screening

Equipment Infrastructure:

- Sunscreen (Unchained Labs)*: A high-throughput platform capable of producing 96 nanoparticle formulations in less than 6 hours via microfluidic mixing.
- Big Tuna (Unchained Labs): Designed for high-throughput buffer exchange of nanoparticles.
- Stunner: A system for high-throughput UV-Vis absorbance measurements to determine RNA/DNA or protein concentration. Multi angle Dynamic Light Scattering (DLS) measurements, providing data on size, polydispersity, particle concentration, aggregation.
- Andrew+ (Waters): A liquid handling robot for precise fluid manipulation.
- MINI 96 (INTEGRA Biosciences): A 96-channel electronic pipette for high-throughput liquid transfer between 96-well plates.
- Plate Reader and Live Cell Imager: Essential for assay development and in vitro screening.

*Nanoparticle production machines use the same microfluidic mixers ensuring scalability.

Project group and collaborating partners

Nanoworx is an initiative of the **Institute of Complex Molecular Systems (ICMS)** – a TU/e interdepartmental institute. ICMS contributes the collective expertise of a diverse team of academics with knowhow in nanomedicine, protein engineering, synthetic chemistry, drug development and analytical methods.

Additionally, Nanoworx is supported by **Pivot Park** and the nanomedicine start-up **Trained Therapeutix (TTxD)**.

Pivot Park's diverse expertise in commercialization, production, and markets is a crucial element to support the successful implementation of Nanoworx' business plan.

TTxD provides unique experience in deciphering the particulars of complex nanomedicine Chemistry, Manufacturing & Controls (CMC) and product scaling.

Innovation and Distinctiveness

As demonstrated by the market analysis conducted by the independent consultant, Nanoworx' services are unique and not available. The Nanoworx infrastructure will allow for the rapid nanomedicine library construction and screening, addressing a current unmet market need.

Presently, such high-throughput facilities are only available in-house to large pharma, limiting access for smaller players, such as academic groups and biotech start-ups. Nanoworx' primary focus is to fulfil this unmet market need for library construction and screening. Yet, we believe that offering complementary services in design and prototyping novel nanomedicines will support new clients who lack the expertise and know-how to directly enter Module 2.

Additional Information

<https://nanoworx.nl>

<http://linkedin.com/company/nanoworxbv/>