



PRESS RELEASE

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Ziccum signs Academic Collaboration with University of Copenhagen on inhalable mRNA vaccine project

Ziccum AB (publ) has signed a Collaboration Agreement for a project jointly with the Department of Pharmacy, University of Copenhagen (UCPH), on the engineering of inhalable solid dosage forms of mRNA vaccines which will include in-vivo studies of mRNA/LNP materials formulated and dried using Ziccum's unique LaminarPace. The UCPH counterpart is international vaccine Key Opinion Leader (KOL) Prof Camilla Foged, the author of 130 papers and the leader of UCPH Department of Pharmacy's international Vaccine Design and Delivery group.

The project is of strategic significance for Ziccum, who explored collaborating with several institutions before finalizing the agreement with UCPH. It will use Ziccum's unique formulation and drying technology for biologics, LaminarPace, which transforms delicate liquid mRNA/LNP materials into stable, bioactive dry powder without exposing them to extreme temperatures, stress factors or degradation - setting it apart from legacy pharmaceutical drying systems.

The project will include *in-vivo* studies comparing LaminarPace-formulated solid dosage forms of mRNA/LNP materials and liquid dosage forms in head-to-head mice studies. The purpose is to further validate the LaminarPace performance academically with a potential of scientific publications.

Project phases and timeline

The project is structured in several phases from physicochemical characterization and *in-vitro* testing to *in-vivo* imaging and immunogenicity. The project will compare the solid dosage forms with liquid dosage forms in mice studies, then evaluate the most promising solid dosage forms. The project is scheduled to run 2023 - 2024.

Focus on inhaled treatments

Inhalable solid dosage forms of mRNA vaccines are of great interest to the biopharmaceutical industry. They promise increased storage stability compared to liquid formulations, simplified patient administration avoiding injections and an ability to stimulate the mucosal immune system. LaminarPace was originally developed specifically to dry liquid biologics into aerosols for inhalation. It offers particle engineering and characterization capabilities, major advantages when formulating inhalable dosage forms.

Ziccum recently reported external mRNA activity data that confirmed high activity levels and excellent *in-vitro* characteristics of mRNA/LNP material formulated and dried by LaminarPace. The company has recently signed agreements with two multinational Pharmaceutical Corporations for Evaluation Studies assessing LaminarPace's capabilities on mRNA/LNP materials.

Ziccum CEO Ann Gidner: "We are excited to be partnering with UCPH's Vaccine Design and Delivery group, an international team working on a range of vaccine delivery systems. Also, I am delighted to tie this Key Opinion Leader in vaccine development, Professor Camilla Foged, to Ziccum's network of international, senior expertise. This is a great step to taking LaminarPace forward in new stable delivery forms for next-generation vaccines."

Ziccum Scientific Director Fabrice Rose: "We are in a period of intensive data generation, both externally and in our internal mRNA/LNP project. This collaboration is an important part of that progress, addressing the inhalation field. We are very happy to address LaminarPace for inhaled applications in an advanced academic setting".

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About Ziccum

Ziccum is developing LaminarPace™, a unique drying method for biopharmaceuticals and vaccines based on mass transfer, not heat transfer. The technology is offered by licensing to vaccine and biologics developers and manufacturers in the global pharmaceutical industry. By reducing drying stress to the active ingredient, LaminarPace™ uniquely enables particle-engineered, thermostable dry powder biopharmaceuticals which can be easily handled and transported and are highly suitable for novel administration routes. The technology has been successfully applied to mRNA, peptides, proteins, antibodies, lipids and enzymes as well as excipients and adjuvants, and is well suited for industrial application. Ziccum is listed on the Nasdaq First North Growth Market.

About the mRNA field

The new mRNA technology, first implemented in the Covid mass vaccinations, has become a game-changer in pharmaceutical development, generating multi-billion-dollar development efforts all over the global industry. Solving stability limitations and delivery challenges, as mRNA in LNP formulation is a very complex and delicate structure, would enable a cornerstone treatment across new indications, also targeting so called undruggable genes. A market forecast predicts the mRNA domain to grow to 59 BUSD by 2031 (1). However, existing methods for treatment, formulation or drying do not solve the limitations regarding stability nor fragility, and options for delivery are limited to injection currently.

(1) Straits Research, June 08, 2023

Attachments

[Ziccum signs Academic Collaboration with University of Copenhagen on inhalable mRNA vaccine project](#)