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Laboratory of Molecular & Cellular Therapy  
Vrije Universiteit Brussel



PhD in Medical Sciences  
2019-2020

INVITATION to the Public defence of

**Patrick TJOK JOE**

To obtain the academic degree of '**DOCTOR OF MEDICAL SCIENCES**'

**From mRNA to vaccines against infectious diseases and back again.**

**Monday, 16 December 2019 at 4 p.m.**

In **Auditorium 5**

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

How to reach the campus Jette:

<http://www.vub.ac.be/english/infoabout/campuses>

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## Summary of the dissertation

Vaccines form one of the cornerstones of modern medicine capable of preventing infection and 2-3 million deaths per year and even providing protection for those that cannot be vaccinated. Recent decades in particular have heralded new and improved vaccine technologies that are both safer and more potent.

In this regard, mRNA vaccines deliver the promise of a highly versatile platform, capable of rapid and scalable production, enhanced safety and high expression of any protein. Therefore mRNA can be used to vaccinate against highly specific viral antigens whilst simultaneously delivering immunostimulatory proteins.

In this PhD project, we investigate the use of mRNA to encode conserved antigen constructs and TriMix, a mRNA-based adjuvant composed of CD40L, a constitutively active TLR4 and CD70, to develop novel vaccines against HIV-1 and influenza based on protective T-cell responses.

For HIV-1, we show that the vaccine is immunogenic and boostable in *ex vivo* human models and *in vivo* animal models, which prompted the initiation of Phase I and II trials in HIV-1 patients.

For influenza, we show that the vaccine is highly immunogenic at low doses and provides heterologous protection.

Finally, we extrapolate knowledge gained during the influenza vaccine project, to a new mRNA application in which the influenza protein hemagglutinin is used to enhance mRNA expression.

## Curriculum Vitae

After achieving his Master in Biomedical Sciences at the Vrije Universiteit Brussel (VUB), Patrick Tjok Joe joined the Laboratory of Molecular and Cellular Therapy (LMCT) at the VUB under the guidance of Prof. dr. Joeri Aerts and Prof. dr. Kris Thielemans. During his PhD, he did research on mRNA vaccines and immunostimulatory compounds and was involved in multiple research partnerships including in the preclinical work of the iHIVARNA project, a European multi-center novel HIV vaccine clinical research project, the development of an universal flu vaccine with the Flemish institute for Biotechnology (VIB), and several early stage projects with the Luxembourg Research Institute, eTheRNA immunotherapies and IBCP – Université de Lyon.

Aside from research, he provided training and supervision to Master and PhD students and developed a profound interest in organization, capital raising, marketing and the life sciences industry. This prompted him to pursue a Msc in Management at the Solvay Brussels School, while simultaneously engaging in the co-organization of lab activities and career events for life sciences students, becoming an ambassador for BCF career events and attending the interdisciplinary translational medicine course at the I3H institute, as well as the advanced Biobusiness winter retreat course of BCF.

Currently, he is a business analyst at Agio Capital & Business solutions, an international financial advisory firm linking innovative European biotech&medtech companies to European and Chinese investors and strategic partners.