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Prof. dr. Lorenzo Piemonti
Diabetes Research Institute
Università Vita Salute San Raffaele

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Hepatobiliary, Transplantation and Endocrine surgery
University of Antwerp

Prof. dr. Ilse Rooman
Laboratory of Medical and Molecular Oncology
Vrije Universiteit BrusseL

Prof. dr. Ilse Smolders
Center for Neuroscience
Vrije Universiteit BrusseL

Prof. dr. Alain Dupont, Chair
Clinical pharmacology and pharmacotherapy
Vrije Universiteit Brussel

Prof. dr. Bart Keymeulen, Promoter
Diabetes Pathology and Therapy
Vrije Universiteit Brussel

Prof. dr. Daniel Pipeleers, Promoter
Diabetes Pathology and Therapy
Vrije Universiteit Brussel

VRIJE UNIVERSITEIT BRUSSEL

PhD in Medical Sciences
2019-2020

INVITATION to the Public defence of

Ines DE MESMAEKER

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

Formation of a Functional Beta Cell Mass by Microencapsulated Prenatal Porcine Islet Cells.

The defense will take place digitally on

Thursday, 16 July 2020 at 4 p.m.

via Zoom meeting, accessible through the following link:

https://qf.vub.ac.be/redirects/PhD_defense_Ines_De_Mesmaeker.php

Summary of the dissertation

Porcine pancreases have since long been considered as large-scale source for beta cell replacement therapy in type 1 diabetes. Islet cell preparations derived from organs of different age have the capacity to restore the diabetic state when protected by encapsulation and/or immune-suppressive regimen. Selection of the donor for clinical cell therapy product will depend on the efficacy of islet cell preparations to form a metabolically adequate functional beta cell mass (FBM) in animal studies, as determined by number of beta cells and their functional state. The objective of this doctoral work was to assess this metabolic capacity for islet cells derived from prenatal porcine pancreas. The present studies demonstrate advantages of these immature organs compared to adult human pancreases. A sustained metabolically adequate FBM was formed when porcine pancreatic islet cells (pp-IC) were implanted as alginate (ALG) microcapsules under the skin of immune-deficient mice, an effect that could not be achieved with encapsulated human islet cells (ALG-hu-IC). A progressive decrease in FBM was observed for hu-IC grafts as result of beta cell loss. In contrast, ALG-pp-IC implants exhibited a beta cell replication resulting in an increased number, and a maturation of the beta cells with time. The isolation procedure for prenatal porcine pancreases, that processes all organs from one litter, yields more beta cells following culture than the current procedure for a human donor organ, indicating the potential of the immature porcine organs to meet quantitative demands for clinical translation. Moreover, the cultured pp-IC preparations have a higher endocrine purity with a high proportion of replicating beta cells, characteristics that determine their positive metabolic outcome.

Curriculum Vitae

Ines De Mesmaeker obtained a master's degree in Bio-engineering Sciences, Cell and Gene Biotechnology at Vrije Universiteit Brussel in 2012, and continued the molecular biology work of her master thesis for one year in the research group "Cellular and Molecular Immunology" guided by Prof. Serge Muyldermans. She started in 2014 as PhD student in the research group "Diabetes Pathology and Therapy" of Vrije Universiteit Brussel, under supervision of Prof. Bart Keymeulen and Prof. Daniel Pipeleers. Her thesis focussed on formation of a Functional Beta Cell Mass by microencapsulated prenatal pancreatic porcine islet cells; a translational research in context of beta cell therapy for type 1 diabetes. Throughout her thesis, Ines De Mesmaeker, contributed as first or co-author to 4 research and 2 review publications in international peer-reviewed journals, and presented her work on international scientific conferences.