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#### Promoter:

**Prof. dr. Luc Bouwens**  
Cell Differentiation Laboratory  
Vrije Universiteit Brussel



PhD in Medical Sciences  
2021-2022

INVITATION to the Public defence of

**Céline MOENS**

To obtain the academic degree of

**'DOCTOR OF MEDICAL SCIENCES'**

**Rooibos phytochemicals as beta cell protectants**

The public defence will take place on

**Thursday, 23 June 2022 at 4 p.m.**

**In Auditorium Piet Brouwer**

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

**and can be followed online**, accessible through the following link:

[https://gf.vub.ac.be/redirects/PhD\\_defense\\_Celine\\_Moens.php](https://gf.vub.ac.be/redirects/PhD_defense_Celine_Moens.php)

## Summary of the dissertation

Type 2 diabetes is characterized by chronic hyperglycemia and oxidative stress which leads to  $\beta$  cell toxicity and cell death. In contrast to other cell types,  $\beta$  cells have a low expression of antioxidant enzymes which makes them prone for oxidative stress. Today's treatment still relies on symptomatic alleviation of the disease. Thus, there is a great need for treatments that include  $\beta$  cell protection. In this thesis the use of South African Rooibos (*Aspalathus linearis*) is proposed for  $\beta$  cell protection. In our first paper, we demonstrated that the main polyphenol present in Rooibos, aspalathin, protected INS1E  $\beta$  cells and primary rat islets against oxidative stress and glucotoxicity by upregulation of antioxidant genes and a significant downregulation of *Txnip*, which is being recognized as a master regulator in  $\beta$  cell survival and function. In a second paper, the protective effect of aspalathin was compared to its metabolite isoorientin, its aglycone 3-hydroxyphloretin and a standardized Rooibos extract (GRT), while also including the antidiabetic drug exendin-4 and ROS scavenger NAC. We demonstrated protection against oxidative stress and lipotoxicity with all molecules, whereas aspalathin's metabolite isoorientin did not offer any protection. GRT and aspalathin offered better protection than antidiabetic drug exendin-4 and NAC. In the third study, we showed cytoprotection with quercetin against oxidative stress. Taken together, administration of these molecules protect  $\beta$  cells against oxidative stress-induced  $\beta$  cell death and lipotoxicity, with quercetin and aspalathin exerting the highest protection. Further research is needed to elucidate the exact working mechanisms of these molecules, especially in vivo. It can be concluded that this doctoral thesis has provided a contribution to the promising use of nutraceuticals in  $\beta$  cell protection.

## Curriculum Vitae

Céline Moens was born on the 14<sup>th</sup> of October 1993 in Jette, Belgium. She studied Science-Mathematics in secondary school before she decided to pursue an academic career in Sciences at the Vrije Universiteit Brussel. She obtained without an obstacle a bachelor's degree in Biomedical Sciences and obtained her master's degree magna cum laude. Céline found her love for science during her master's thesis work at the department of Hematology and Immunology of Prof. Dr. Karin Vanderkerken. In 2016, Céline started her PhD at the Cell Differentiation Lab of Prof. Dr. Luc Bouwens and was assigned an A.A.P. mandate for the practical classes of biology. The past 6 years she taught first year students of Biomedical and Pharmaceutical Sciences, which she enjoyed very much. During her PhD, Céline focused on  $\beta$  cell protective nutraceuticals found in the South African Rooibos plant. Céline also has been actively participating in University related boards such as the University council, Academic council, Education council, Biomedical Research council and Doctoral School council. Besides that, she was the president of PhD United for two years and participated in open house days at our campus. She has supervised two short internship students and one master dissertation in the Biomedical Sciences. She published 2 articles related to her research and one is submitted.