

INVITATION

PUBLIC DEFENSE

Title: **Effects of heat stress conditions on Belgian Blue cattle fertility: warming up for future challenges**

NAME DOCTORANDUS: Gretania Residiwati

DATE : June 21st 2021 at 4 pm

PROMOTERS

Prof. dr. A. Van Soom

Faculteit Diergeneeskunde, UGent

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Curriculum Vitae (add here things that you did)

Gretania Residiwati was born on March 15th 1993, Kediri, East-Java, Indonesia. She obtained her Bachelor of Veterinary Medicine in 2014, Veterinarian Profession in 2015, and Master of Disease and Veterinary Public Health in 2016 in Veterinary Faculty, Airlangga University, Indonesia. She applied for a grant with the Indonesia Endowment Fund for Education (No. 201707220411226) for pursuing a Doctorate of Veterinary Sciences. She arrived in August 2017 at the Department of Reproduction, Obstetrics, and Herd Health to start a PhD study on Belgian Blue cattle fertility in collaboration with AWE.

She organized the Global Minds Sensitizing Event 'Paradise of Indonesia', '*Vet Peduli* (Charity of COVID-19 for Indonesia)', and received the Global Minds Fund Capacity Building 'Belgian Blue project Belgium Indonesia'.

Gretania Residiwati is author or coauthor of several scientific publications and reports. She attended several national and international conferences.

Where?

De defense will be a digital defense (Teams-meeting) following the COVID19-rules on Monday 21 June 2021 at 16 hours

Faculteit Diergeneeskunde
Universiteit Gent, Campus Merelbeke
Salisburylaan 133, Merelbeke

There will be no reception due to COVID19.

Registration

If you want to be follow the digital defense, please contact us before 18 June 2021 by email: ann.vansoom@ugent.be

Member examination committee

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Summary PhD

Nowadays, multiple tropical developing countries, including Indonesia, are experiencing a higher demand for meat which cannot be produced by local cattle, because of their low meat production (quantity and quality). Recently, the Indonesian government tried to solve the problem by introducing Belgian Blue cattle. It is known as a superior breed of cattle which has an excellent carcass conformation due to their double-musled properties. It might become a good solution for Indonesia, as well as other tropical developing countries, in order to improve their local breed quality and fulfill their local meat demand with the local production. However, the genetic peculiarity on Belgian Blue also brings about several impacts which should be addressed by the tropical countries, especially their sensitivity to heat stress, as in the tropical condition as reviewed in **Chapter 1**.

In developing countries alternative methods are necessary to develop a successful breeding program, such as providing affordable methods to investigate how bull fertility adapts to the tropical condition. Since bull fertility is one of the key factors to reach success in breeding programs, we should do an accurate and routinely examination in the AI centers where the pure breed of Belgian Blue is taken care for then spreading their frozen-semen. In **Chapter 3** we demonstrated multiple staining methods which are straightforward, less expensive, and yielding an accurate result, suitable under field condition. Furthermore, we showed that heat stress condition impacted the quality of Belgian Blue semen in multiple post-thawing motility parameters, such as DNA-, acrosome- and plasma membrane integrity, as well as mitochondrial activity.

Another challenge that we should address whilst breeding Belgian Blue under tropical condition is their lesser adaptability to tropical conditions. This can be solved by doing a crossbreeding program of Belgian Blue with local cattle breeds. In **Chapter 4**, we demonstrated by *in vitro* fertilization that a crossbreeding program of Belgian Blue semen with other beef cattle breed (Limousin) yielded a better results on embryo quality compared with the pure breed (Belgian Blue) or the dairy breed (Holstein-Friesian). This study provides preliminary results to mimic what may happen in aspects of potential fertility in a Belgian Blue breeding program. However, more studies need to be conducted to draw definitive conclusions.

A higher sensitivity of Belgian Blue with heat stress condition should be addressed with an appropriate feeding management. A huge number of antioxidant sources in tropical countries might become a good solution in order to improve their fertility under heat stress condition. One well-known antioxidant is lycopene, which has an antioxidant potency 100-fold higher compared with vitamin C and E. In **Chapter 5**, we applied heat stress (HS; 40.5°C) and non-heat stress condition (NHS; 38.5°C) in the maturation media of bovine oocytes with lycopene and without lycopene supplementation. We showed that under NHS, lycopene supplementation had an impact on blastocyst rate and embryo quality of bovine oocytes. Furthermore, under HS condition, we showed that lycopene supplementation reduced the oocyte ROS production and improved the nuclear maturation rate of bovine oocytes.

The general discussion and the conclusion of this thesis are presented in the **Chapter 6**:

1. Extra attention should be paid for the maintenance, feed, accommodation and welfare of Belgian blue cattle for successful breeding in tropical developing countries.
2. Multiple straightforward and practical methods yielding accurate result is pivotal to access frozen-semen Belgian Blue under field condition, as in the tropical developing countries. Using the methods, we found that heat stress affected some quality parameters of Belgian Blue semen.
3. Using an *in vitro* model for Belgian Blue crossbreeding program, we showed that blastocyst development was greater in beef (Limousin) than dairy (Holstein-Friesian) and the Belgian Blue F1-crosses
4. Using an *in vitro* model, the supplementation of lycopene on the maturation media of bovine oocytes under HS and NHS condition improved the oocytes developmental competence to the blastocyst stage.