Promoters
Prof. Dr. Ir. Geert P.J. Janssens
Faculty of Veterinary Medicine, UGent

Dr. Marta Lourenço
Faculty of Veterinary Medicine, UGent

Dr. Ir. Evelyne Delezie
Institute for Agricultural and Fisheries Research (ILVO)

Members of the examination committee
Prof. Dr. Richard Ducatelle
Faculty of Veterinary Medicine, UGent

Dr. Ir. An Cools
Faculty of Veterinary Medicine, UGent

Prof. Dr. Ir. Filip van Immerseel
Faculty of Veterinary Medicine, UGent

Prof. Dr. Ir. Joris Michiels
Faculty of Bioscience Engineering, UGent

Ir. Ronny Mombaerts
Nutrex NV

Curriculum vitae
Alireza Khadem was born on the 8th of February 1982 in Sari, Iran. In 2000, he started a BSc study in livestock sciences at Faculty of Agricultural Engineering University of Mazandaran, Iran. In 2003, he obtained his bachelor's degree and consecutively, he started a master's program. He conducted his master thesis research in the field of molecular genetics in poultry and published a paper entitled “identification of single Nucleotide Polymorphisms in IGFI, IGFII, IGFBPII genes and their association with some productive traits in Mazandaran native hens”.

In 2012, Alireza was awarded a scholarship from Ministry of Science, Research and Technology of Iran (MSRT) and then started his pre-doctoral program at KULeuven. He also published a paper in British Journal of Nutrition entitled “Growth promotion in broilers by both oxytetracycline and Macleaya cordata extract is based on their anti-inflammatory properties” during his studies at KULeuven.

He had the honor to start his PhD at Department of Nutrition, Genetics and Ethology, Faculty of Veterinary Medicine, Ghent University in 2013, in collaboration with the feed company (Nutrex NV, Lille, Belgium) and the Institute for Agricultural and Fisheries Research (ILVO, Melle, Belgium). He got a scholarship from O&O project of Flemish Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT-Vlaanderen) and he was first author of several scientific papers submitted at international peer-reviewed journals. He has also participated actively in various international conferences.

INVITATION
Public defence of the doctoral thesis of

Alireza Khadem

19 December 2016

Laboratory of Animal Nutrition
Department of Nutrition, Genetics and Ethology
Heidestraat 19, 9820 Merelbeke, Belgium
You are kindly invited
to
the public defence of the doctoral thesis of

Alireza Khadem

Title of the thesis:
Exploring the modes of action of xylanase in broiler chickens

Date:
Monday, 19 December 2016

Time:
16:00

Venue:
Auditorium D
Faculty of Veterinary Medicine,
Ghent University,
Address:
Salisburylaan 133,
9820 Merelbeke, Belgium

After defence:
You are cordially invited to reception.

Confirmation of attendance:
Before 13 December 2016 to
Alireza.Khadem@UGent.be

Thesis summary

Some of the feed ingredients and raw materials used in poultry diets contain substantial amounts of anti-nutritional factors which limit both their nutritional value and their use in diets. The use of NSP hydrolyzing enzymes such as xylanase, as a feed additive, alleviate these anti-nutritive effects, allowing for more economic utilization of these raw materials. Typically, the modes of action of xylanase have been attributed to mainly three features: the reduction of digesta viscosity, the cage effect reduction (release of encapsulated nutrients), and a prebiotic effect. The aim of this study was to gain insight into the relative importance of the viscosity and cage effect in xylanase efficacy in broilers.

The complete removal of particles by centrifugation has been applied in viscosity measurements of the intestinal contents in many poultry studies. However, centrifugation may underestimate the digesta viscosity measurements by removing the particles, therefore in chapter 3, two viscosity measurement techniques (with and without centrifugation step) were compared in an in vitro model to evaluate whether both techniques result in similar conclusions. From this in-vitro study it can be concluded that results obtained with the common method, where centrifugation is used agrees quite well with the method without centrifugation. Although the two techniques are considerably different, they seem to render similar conclusions when applied to poultry feedstuffs.

One of the main working mechanisms of xylanase is reduction of digesta viscosity. In chapter 4, an in vivo experiment was conducted to study the relative contribution of digesta viscosity reduction to xylanase efficacy in broilers. This experiment showed that the efficacy of xylanase seems to depend on the viscosity properties of NSP that are determined by the NSP composition of the diet, and less on the prebiotic effect. Furthermore, the addition of too much AXOS or substrates with high fermentability with xylanase can negatively affect growth performance and nutrient digestibility and should be avoided in broilers diets. Reduction of the cage effect is one of the other main working mechanisms of xylanase, resulting in altered substrate for host and gut microbial fermentation. As the aim of chapter 5 was to explore the reduction in cage effect, the effects on digesta viscosity were ruled out by using diets based on corn. Furthermore, in order to have two diets that are exactly the same except for the cage effect, a freeze-thaw method was used. The results suggest that both xylanase and freeze-thawing may work through the cage effect reduction mechanism. Although both are similar in outcome, there are also some differences in the mode of action. It can be concluded that cage effect reduction may contribute to the efficacy of xylanase in broiler chickens, but likely includes prebiotic effects. The improvement in performance of freeze-thawed corn and xylanase coincided with increased gut absorption of glucose and increased number of Clostridium cluster IV in the caecum, and agreed with the higher gut villus height.

In conclusion although each mechanism has its own contribution to xylanase efficacy, it should be however noted that all proposed mechanisms involved in efficacy of xylanase appear to be relatively interrelated and are not completely independent.