

INVITATION PUBLIC DEFENSE

Towards the improved diagnosis and control
of nematode infections in laying hens

Kazim Ali

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PROMOTORS

Prof. dr. **Peter Geldhof**
Faculty of Veterinary Medicine, UGent
Dr. **Leen Seys**
Faculty of Veterinary Medicine, UGent

Curriculum Vitae

Kazim Ali was born on 10 December 1990 in Jhang (Pakistan). He obtained his Secondary School Degree from St. Mary's High School Quetta (Pakistan) in 2006 and Higher Secondary School Degree from Army Public Degree College Multan (Pakistan) in 2009. He obtained his Bachelor's degree in Doctor of Veterinary Medicine from University of Veterinary and Animal Sciences Lahore (Pakistan) with distinction (received 4 gold medals) in 2014, followed by his Master's degree from the same university in Parasitology in 2017, also with distinction (silver medal). The title of his Master's thesis was 'Molecular detection & isolation of benzimidazole resistant *Haemonchus contortus* and evaluation of anthelmintic activity of herbal extracts'. He joined as a Lecturer of Parasitology in the same university in 2017. In 2022, he joined the Laboratory of Parasitology at Ghent University under the supervision of Prof. dr. Peter Geldhof funded by the Higher Education Commission Pakistan. His doctoral research focuses on development and evaluation of serological ELISA assays as novel diagnostic tools for nematode infections in laying hens and the investigation of molecular mechanisms underlying benzimidazole resistance in poultry nematodes. He has contributed as a co-author in scientific book chapters and research publications, and presented his work at a number of scientific conferences.

Where?

The defense will take place on Monday 26 October 2026 at 16.00h

Auditorium A

Faculty of Veterinary Medicine
Ghent University, Campus Merelbeke
Salisburylaan 133, Merelbeke

How to attend?

If you would like to attend the defense and reception, please confirm your attendance by 19 October 2026 by email to kazim.ali@ugent.be

Members of the Jury

Prof. dr. Siska Croubels
Chair of the Jury
Faculty of Veterinary Medicine, UGent

Prof. dr. Gunther Antonissen
Faculty of Veterinary Medicine, UGent

Prof. dr. Filip Van Immerseel
Faculty of Veterinary Medicine, UGent

Dr. Annatachja De Grande
ILVO-Flanders Research Institute for Agriculture,
Fisheries and Food, Belgium

PD Dr. Gürbüz Daş
Research Institute for Farm Animal Biology (FBN),
Dummerstorf, Germany

Summary

Ascaridia galli and *Heterakis gallinarum* are the two most important nematodes of laying hens in both conventional and alternative production system. Only two anthelmintics are registered in the EU for use in laying hens, flubendazole and fenbendazole, both of which belong to the benzimidazole class. The lack of alternative anthelmintic classes and the intensive treatment programs form a high risk for the development and spread of anthelmintic resistance. The optimal use of these anthelmintics requires the availability of information on infection thresholds from which onwards it is advisable to treat and accurate diagnostic tools that can be used to measure the infection status of a flock in a quantitative way.

Hence, the overall objective of this PhD thesis was to develop and evaluate novel diagnostic tools for nematode infections and to investigate the emergence and spread of benzimidazole resistance in poultry nematodes.

Three serological assays were developed, evaluated and compared for the diagnosis of *A. galli* and *H. gallinarum* infections, based on three different antigen preparations under experimental and field conditions by comparing ELISA results with worm counts and faecal egg counts. The results demonstrated that the ELISA based on excretory-secretory (ES) antigens of *A. galli* performed best, showing higher reliability in terms of sensitivity, specificity, and cross-reactivity for the detection of both worm infections. To further identify the immunogenic proteins, both 1- and 2-dimensional gel approaches integrated with western blotting and LC-MS/MS analysis were used to characterize the ES composition. Three proteins, polyprotein ABA-1, a serpin and an activation associated secreted protein ASP, were selected for recombinant production in *Escherichia coli* bacterial expression system. ELISA assays for all three individual recombinant proteins demonstrated a small difference in ODR values between ascarid-positive and ascarid-negative chickens. However, when all the three recombinant proteins were combined, an increased differentiation was observed.

One of the main importance of *Heterakis gallinarum* lies in being a key vector for the protozoan parasite *Histomonas meleagridis*, the causative agent of histomoniasis. In recent years, reduced efficacy of anthelmintics against *H. gallinarum* has been increasingly reported, suggesting the emergence and spread of resistance. Hence, we evaluated the efficacy of benzimidazole class drug fenbendazole in naturally occurring *H. gallinarum* infections in laying hens under controlled conditions, and observed a reduced drug efficacy of 82%. Subsequently, a *de novo* transcriptome assembly was generated to investigate potential molecular mechanisms underlying this reduced efficacy and to further investigate gene expression patterns in *H. gallinarum* worms before and after exposure to fenbendazole. Further investigation of the β -tubulin gene family resulted in the identification of five candidate β -tubulin genes in *H. gallinarum*. Further analysis did not result in the detection of the classical benzimidazole resistance-associated single nucleotide polymorphisms (SNPs) at codons 167, 198, and 200. However, a specific isoform of *Hga-bt-B* was exclusively detected in worms surviving treatment, highlighting it as an interesting candidate resistance-associated isoform for further investigation.

Overall, this thesis demonstrates that serological assays provide valuable opportunities for monitoring parasite exposure and deepen our understanding of host-parasite interactions, even if their primary application lies in epidemiological surveillance rather than treatment decision-making. Second, it provides the first evidence for reduced benzimidazole efficacy in a Belgian isolate of *H. gallinarum* and identifies novel candidate molecular mechanisms that may contribute to resistance development.