BIOGRAPHICAL SKETCH

NAME: Martin K. Nielsen

POSITION TITLE: Associate professor

EDUCATION/TRAINING: DVM, PhD, DipEVPC, DipACVM

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
The Royal Veterinary and Agricultural University, Denmark	DVM	01/2001	Veterinary Medicine
University of Copenhagen, Denmark	PhD	09/2007	Equine Parasitology
European Veterinary Parasitology College	DipEVPC	11/2011	Veterinary Parasitology
American College for Veterinary Microbiologists	DipACVM	12/2013	Veterinary Parasitology

A. Personal Statement

My research focus is on providing solutions for equine parasite control. My background as a veterinarian with experience as an equine practitioner allows me to take an applied approach to equine parasitology. Research efforts in the past five years have concentrated on the following topics: 1) New and improved diagnostics of important equine parasites, 2) Evaluation of existing and novel approaches for equine parasite control, 3) Studying the inflammatory and immunological response to parasitism and antiparasitic treatment, 4) Studying epidemiology of equine parasites, and 5) Computer simulations of equine parasitism and anthelmintic resistance. Through collaborators, we are also generating data on microbiomes in relation to parasitism and parasite treatment, metabolomics in relation to equine ascarid infection and genomics and transcriptomics for the equine ascarid *Parascaris univalens*. Key publications are listed below:

1. Leathwick DM, Donecker JM, **Nielsen MK,** 2015. A model for the dynamics of the free-living stages of equine cyathostomins. Veterinary Parasitology 209, 210-220.
2. **Nielsen MK**, Loynachan AT, Jacobsen S, Stewart JC, Reinemeyer CR, Horohov DW, 2015. Local and systemic inflammatory and immunologic reactions to cyathostomin larvicidal therapy in horses. Veterinary Immunology and Immunopathology 168, 203-210.
3. Bellaw JL, Pagan J, Cadell S, Phethean E, Donecker JM, **Nielsen MK,** 2016. Objective evaluation of two deworming regimens in young Thoroughbreds using parasitological and performance parameters. Veterinary Parasitology 221, 69-75.
4. Slusarewicz P, Pagano S, Mills C, Popa G, Chow M, Mendenhall M, Rodgers DW, **Nielsen MK,** 2016. Automated parasite fecal egg counting using fluorescence labeling, smartphone image capture and computational image analysis. International Journal for Parasitology 46, 485-493.

B. Positions and Honors

Positions:

2001-2004: Veterinary assistant in clinical practice, Denmark.
2004-2007: PhD student, University of Copenhagen, Denmark.
2007-2011: Assistant professor, Department of Large Animal Sciences, Faculty of Life Sciences, University of Copenhagen, Denmark.
2011-2016: Assistant professor, M.H. Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington, KY, USA.
2016-: Associate professor, M.H. Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington, KY, USA.

Other Experience and Professional Memberships

2005-: American Association for Veterinary Parasitologists
2005-: Danish Society for Parasitology
2011: European Veterinary Parasitology College
2012-: American Association for Equine Practitioners
2012: Kentucky Association for Equine Practitioners
2012-: UK Ag Equine Programs Council
2013: American College for Veterinary Microbiologists
2014-: American Association for Veterinary Microbiologists, Parasitology Exam Committee
2017-: Co-editor in Chief, Veterinary Parasitology

Honors:

2006: Young Scientist Award. Joint Spring Symposium - Danish Society for Parasitology and Danish Society for Tropical Medicine & International Health.
2007: AAVP-Intervet Outstanding Graduate Student Award, American Association of Veterinary Parasitologists.
2008: Albert and Lorraine Clay Research Fellowship, University of Kentucky, USA.
2009: Young Elite Scientist Award. Danish Research Council, Denmark.
2016-2019: Jes and Clementine Schlaikjer professorship, University of Kentucky.

C. Contribution to Science

1. New and improved diagnostics of important equine parasites

This has been a main area of emphasis since the completion of my PhD. Diagnostic techniques applied in equine parasitology have generally remained largely unchanged during the past several decades. Most of the diagnostic work has been based on various techniques for determining fecal egg counts and coprocultures with subsequent identification of third stage infective larvae. In my lab we have developed and patented an ELISA for diagnosing migrating stages of *Strongylus vulgaris*, we have developed an ultrasound technique for enumerating *Parascaris* spp. parasites in foals, and we have developed an automated smartphone-based egg counting technique for equine fecal egg counts.

a) Andersen UV, Howe DK, Dangoudoubiyam S, Toft N, Reinemeyer CR, Lyons ET, Olsen SN, Monrad J, Nejsum P, **Nielsen MK,** 2013. rSvSXP: A *Strongylus vulgaris* antigen with potential for prepatent diagnosis. Parasites & Vectors 6: 84.
b) **Nielsen MK**, Donoghue EM, Stephens ML, Stowe CJ, Donecker JM, Fenger CK, 2016. An ultrasonographic scoring method for transabdominal monitoring of ascarid burdens in foals. Equine Veterinary Journal 48, 380-386.
c) Slusarewicz P, Pagano S, Mills C, Popa G, Chow M, Mendenhall M, Rodgers DW, **Nielsen MK,** 2016. Automated parasite fecal egg counting using fluorescence labeling, smartphone image capture and computational image analysis. International Journal for Parasitology 46, 485-493.
d) Noel ML, Scare JA, Bellaw JL, **Nielsen MK**. Accuracy and precision of Mini-FLOTAC and McMaster techniques for determining equine strongyle egg counts. Journal of Equine Veterinary Science 48, 182-187.

2. Evaluation of existing and novel approaches for equine parasite control

It is important that recommendations for parasite control are backed up by scientific evidence. In the past five years, we have taken initiative to evaluate parasite control programs using more than the traditional fecal egg counts. One thing is to evaluate if there are parasites present or not, but it is more important to evaluate if there is any measurable impacts on health and/or performance. Furthermore, we are first to have documented resistance to the larvicidal doses of fenbendazole and moxidectin, and we are evaluating the long-term efficacy of various formats of combination deworming.

a) Reinemeyer CR, Prado JC, Andersen UV, **Nielsen MK**, Schricker B, Kennedy T, 2014. Effects of daily pyrantel tartrate on strongylid population dynamics and performance parameters of young horses repeatedly infected with cyathostomins and *Strongylus vulgaris*. Veterinary Parasitology 204, 229-237
b) Reinemeyer CR, Prado JC, **Nielsen MK**, 2015. Comparison of the larvicidal efficacies of moxidectin or a five-day regimen of fenbendazole in horses harbouring cyathostomin populations resistant to the adulticidal dosage of fenbendazole. Veterinary Parasitology 214, 100-107.
c) Bellaw JL, Pagan J, Cadell S, Phethean E, Donecker JM, **Nielsen MK**, 2016. Objective evaluation of two deworming regimens in young Thoroughbreds using parasitological and performance parameters. Veterinary Parasitology 221, 69-75.
d) Scare JA, Lyons ET, Nielsen MK, 2016. Combination Deworming- a solution or exacerbation? EIDC X, Buenos Aires, Argentina, April 4-8, 2016. Journal of Equine Veterinary Science 39, S47.

3. Studying the inflammatory and immunological response to parasitism and antiparasitic treatment
Work in human research and in rodent models has illustrated how intestinal helminth parasites appear to possess immunomodulatory capacities and can reduce or even counteract inflammatory reactions. Over the course of several studies we have evaluated a wide selection of inflammatory markers and studied gene expression of pro-inflammatory cytokines in horses that were either experimentally infected with equine strongyle parasites, or treated with different anthelmintics. We have documented that although some local inflammatory reactions can be measured, there is very limited systemic response to be measured.

a) **Nielsen MK**, Betancourt A, Lyons ET, Horohov DW, Jacobsen S, 2013. Characterization of the inflammatory response to anthelmintic treatment in ponies naturally infected with cyathostomin parasites. Veterinary Journal 198, 457-462.
b) Andersen UV, Reinemeyer CR, Toft N, Olsen SN, Jacobsen S, **Nielsen MK**, 2014. Physiologic and systemic acute phase inflammatory responses in young horses repeatedly infected with cyathostomins and *Strongylus vulgaris*. Veterinary Parasitology 201, 67-74.
c) **Nielsen MK**, Rubinson EF, Chambers TM, Horohov DW, Wagner B, Betancourt A, Reedy SE, Jacobsen J, 2015. Interaction between anthelmintic treatment and vaccine responses in ponies naturally infected with cyathostomins. Veterinary Immunology and Immunopathology 164, 110-117.
d) **Nielsen MK**, Loynachan AT, Jacobsen S, Stewart JC, Reinemeyer CR, Horohov DW, 2015. Local and systemic inflammatory and immunologic reactions to cyathostomin larvicidal therapy in horses. Veterinary Immunology and Immunopathology 168, 203-210.

4. Studying epidemiology of equine parasites
Epidemiological studies of transmission pattern of equine parasites and their implications in defined disease complexes are scarce in the scientific literature. Nonetheless, these types of studies are critical because they generate important information to be used of developing guidelines for equine parasite control. We have been fortunate to conduct a few such studies during the past five years. Our focus has been on the reemergence of the most pathogenic helminth parasite of horses, *Strongylus vulgaris*, and the most pathogenic parasite of foals, *Parascaris* spp.

a) **Nielsen MK**, Vidyashankar AN, Olsen SN, Monrad J, Thamsborg SM, 2012. *Strongylus vulgaris* associated with usage of selective therapy on Danish horse farms – is it reemerging? Veterinary Parasitology 189, 260-266.
b) **Nielsen MK**, Vidyashankar AN, Gravatte HS, Bellaw J, Lyons ET, Andersen UV, 2014. Development of *Strongylus vulgaris*-specific serum antibodies in naturally infected foals. Veterinary Parasitology 200, 233-304.
c) Donoghue EM, Lyons ET, Bellaw JL, **Nielsen MK**, 2015. Biphasic appearance of corticated and decorticated ascarid egg shedding in untreated horse foals. Veterinary Parasitology 214, 114-117.
d) **Nielsen MK**, Jacobsen S, Olsen S, Bousquet E, Pihl TH, 2016. Non-strangulating intestinal infarction associated with *Strongylus vulgaris* in referred Danish equine patients. Equine Veterinary Journal 48, 376-379.
e) **Nielsen MK**, Lyons ET, 2017. Encysted cyathostomin larvae in foals - progression of stages and the effect of seasonality. Veterinary Parasitology 236, 108-112.

5. Computer simulations of equine parasitism and anthelmintic resistance

Our work on developing computer simulation models for various aspects of equine parasitism remains a very active component of our program. It has allowed us to reassess the scientific literature and organize all current knowledge about parasite biology, host-parasite interactions, and anthelmintic resistance. This has served as an effective strategy for identifying knowledge gaps and areas of future research priority. These models make use of climate data, which can be downloaded from weather stations located all over the world. Model predictions can be evaluated in subsequent field studies and research findings can be used to refine the models. This is a unique and very dynamic relationship between dry model outputs and real-life field research findings.

a) Xu J, Vidyashankar AN, **Nielsen MK**, 2014. Drug Resistance or Re-emergence? Simulating Equine Parasites. Transactions on Modeling and Computer Simulation 24, Article 20.
b) Leathwick DM, Donecker JM, **Nielsen MK**, 2015. A model for the dynamics of the free-living stages of equine cyathostomins. Veterinary Parasitology 209, 210-220.
c) Leathwick DM, Donecker JM, **Nielsen MK**, 2016. A model for the development and growth of the parasitic stages of *Parascaris* spp. in the horse. Veterinary Parasitology 228, 108-115.
d) Leathwick DM, Sauermann CW, Geurden T, **Nielsen MK, 2017**. Managing anthelmintic resistance in *Parascaris* spp.: a modelling exercise. Veterinary Parasitology, in press.

A full list of all my publications can be found on my ResearchGate and Google Scholar profiles:

https://www.researchgate.net/profile/Martin_Nielsen5
https://scholar.google.com/citations?user=Co7khMkAAAAJ&hl=en

D. Research Support

Ongoing Research Support

Zoetis Nielsen (PI) 5/1/16-8/1/16
Evaluation of drug efficacy with combination deworming and the long term consequences.
The goal of this study is to measure short and long term effects of a combination of pyrantel pamoate and oxibendazole against a population of cyathostomins with known resistance to both drug classes.
Role: PI

15-9200-0415-CA USDA Nielsen (PI) 8/1/2015-1/1/17
NAHMS 2015 Equine survey: Anthelmintic efficacy on horse farms in the United States.
The goal of this study is to generate national data on anthelmintic usage and observed efficacy levels in the United States.
Role: PI

R01 HD080644-01A1 Aroian (PI) 3/1/16-3/1/20
Engineered probiotics for farm animal and human nematodes.
The goal of this study is to develop and test a *Bacillus thuringienses*-derived crystal protein with anthelmintic properties.
Role: Co-PI

Merial Nielsen (PI) 5/1/16-1/1/17
Field anthelmintic efficacy study.
The goal of this study is to evaluate field efficacy of commonly used anthelmintics on equine farms.
Role: PI

Zoetis Nielsen (PI) 6/1/16-6/1/17
Mucosal inflammatory reaction study
The goal of this study is to evaluate the mucosal reactions to larvicidal treatments in naturally infected horses.
Role: PI

Zoetis Nielsen (PI) 8/1/16-1/1/17
Smartphone egg count validation study
The goal of this study is to validate a recently developed smartphone-based method for automated determination of fecal egg counts.
Role: PI

Zoetis Nielsen (PI) 8/1/16-9/1/17
Combination Anthelmintic Therapy - Short and Long Term Benefits.
measure short and long term effects of a combination of moxidectin and oxibendazole against a population of cyathostomins with known resistance to the benzimidazole drug class.
Role: PI

Completed Research Support

USDA-SBIR Slusarewicz (PI) 8/1/15-8/1/16
Development of a simple and rapid on-site veterinary fecal egg count test
The goal of this study was to develop a novel technique for determining fecal egg counts in horses.
Role: Co-PI

Zoetis Nielsen (PI) 8/1/15-12/1/16
Larvicidal efficacy of moxidectin or fenbendazole against equine cyathostomins – quantitative and qualitative influence of the interval post-treatment.
The goals of this study were to evaluate the larvicidal efficacy of moxidectin and fenbendazole and to evaluate the influence of the post-treatment interval on the efficacy data.
Role: PI

MEP Equine Solutions Nielsen (PI) 6/1/14-1/1/16
Optimizing methods for parasite egg isolation and detection
The goal of this study was to provide proof of concept for a novel technique for determining fecal egg counts in horses.
Role: PI

Zoetis HorseCall Grant Nielsen (PI) 1/1/14-1/1/15
Transabdominal ultrasonography: A monitoring tool for *Parascaris equorum* burdens in foals.
The goal of this study was to develop and validate an ultrasonographic technique and scoring system for determining and enumerating the presence of *Parascaris* spp. parasites in the small intestine of foals.
Role: PI

Zoetis Nielsen (PI) 1/1/14-1/1/15
Evaluation of the mucosal inflammatory response to larvicidal treatment.
The goal of this study was to evaluate the mucosal inflammatory response to larvicidal treatment with moxidectin and fenbendazole.
Role: PI

Zoetis Nielsen (PI) 1/1/14-1/1/16
Objective evaluation of deworming regimens in horses – growth rates, disease incidence, and financial aspects.
The goal of this study was to evaluate two different deworming regimens in foals with parasitological parameters as well as growth rates and body condition scores.
Role: PI

Grayson-Jockey Club Nielsen (PI) 3/1/13-3/1/14
The interaction between anthelmintic treatment and vaccination.
The goal of this study was to evaluate the possible interaction between vaccination and deworming in horses naturally infected with cyathostomin parasites.
Role: PI

Virbac Animal Health Nielsen (PI) 6/1/13-1/1/15
Characterizing the role of *Strongylus vulgaris* infection in referred colic cases.
The goal of this study was to conduct a retrospective case-control study among patients admitted to the veterinary teaching hospital at the University of Copenhagen. The focus of the case-control study was the role of S. vulgaris in various types of colic.
Role: PI