

Curriculum Vitae

Personal Details

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Profile

Enthusiastic and resourceful mathematical modeller and quantitative epidemiologist, whose main interests are mathematical modelling of infectious diseases. Proven experience in development and fitting of transmission models to experimental data, testing hypotheses and comparing models. Using a combination of (experimental) data, mathematical modelling and whole genome sequencing data, I hope to gain better understanding of, and insight in, the mechanisms that underlie (both spatial and temporal) spread of diseases.

Education

2015 – Present	Postdoctoral Research Fellow, Epidemiology Research Group, Usher Institute & Centre for Immunity, Infection and Evolution. University of Edinburgh (UoE)
2012 – 2015	Postdoctoral Researcher, Epidemiology Research Group, Centre for Immunity, Infection and Evolution UoE
2007 – 2012	PhD candidate, Quantitative Veterinary Epidemiology, Wageningen UR
1997 – 2006	MSc. Biology, University of Groningen, Faculty of Natural Sciences
1996 – 1997	Computer Science, University of Groningen, Faculty of Natural Sciences
1990 – 1996	VWO (Secondary School), R.-K. Scholengemeenschap "St. Canisius", Almelo

Relevant Work Experience

2020 COVID-19 related work

Lead modeller for the COVID-19 outbreak response within the Epidemiology Research Group of the UoE, giving advice via the SPI-M and SAGE workgroups. The work has been used both in the UK government and the Scottish government and has been submitted to high ranking journals for publication.

09-2015 – Present

Postdoctoral Research Fellow within the Epidemiology Research Group, Centre for Immunity, Infection and Evolution & Usher Institute at the UoE.

Involved in different projects:

COMPARE (COllaborative Management Platform for detection and Analyses of (Re-)emerging and foodborne outbreaks in Europe) (£650.000, EC Horizon 2020)

COMPARE is a multidisciplinary research network that has the common vision to become the enabling analytical framework and globally linked data and information sharing platform for the rapid identification, containment and mitigation of emerging infectious diseases and foodborne outbreaks.

- Task leader for the development of transmission models and rapid risk assessment.
- Dissemination of work through scientific papers and presentations.
- Supervised three undergraduate students.

STARCS (Selection and Transmission of Antimicrobial Resistance in Complex Systems) (£300.000, JPIAMR, MRC)

The central aim of STARCS is to characterise and quantify the processes of selection and transmission of antimicrobial resistance genes and drug-resistant bacteria in complex (eco)systems from a 'One Health' perspective and to integrate these elements into predictive mathematical models, which will be used to inform policy development.

- Epidemiological modelling of the dissemination of antibiotic resistant bacteria between humans and animals.
- Dissemination of work through scientific papers and presentations.

Global Sewage Project (£6m (£500.000 UoE), Novo Nordisk Funder)

This project focusses on the worldwide metagenomic sequencing of human sewage to determine the occurrence, transmission and burden of resistance in the healthy global human population

- Co-wrote grant-application.
- Responsible as project manager for the UoE part of the project.
- Daily supervisor for two PhD-students.
- Epidemiological analysis of abundance of resistance genes and mathematical models for the spread of resistance on the human-livestock interface and the contribution of the environment to the transmission of antimicrobial resistance.
- Dissemination of work through scientific papers and presentations.
- Progress reports for funders.

Versatile Emerging infectious disease Observatory (EC Horizon 2020. (£400 000))

This projects aims to build an observatory for the generation and distribution of high-quality actionable information for evidence-based early warning, risk assessment and monitoring of Emerging Infectious Diseases and Antimicrobial resistance.

- Responsible as work package leader.
- Epidemiological analysis of abundance of resistance genes and mathematical models for the spread of resistance on the human-livestock interface and the contribution of the environment to the transmission of antimicrobial resistance.
- Dissemination of work through scientific papers and presentations.
- Progress reports for funders.

09-2012 – 09-2015

Postdoctoral Researcher within the Epidemiology Research Group, Centre for Immunity, Infection and Evolution at the UoE.

Topic: Flow of antibiotic resistance genes through the population

Research funded by EvoTAR (Evolution and Transfer of Antibiotic Resistance), an EU 7th framework program.

The purpose of EvoTAR was to increase the understanding of the evolution and spread of antibiotic resistance in human pathogens.

- Development of mathematical models for the spread of health-care associated infection and antibiotic resistance through the population.
- Dissemination of work through scientific papers and presentations.
- Supervised one Infectious Disease Honours student.

2007 – 2012

PhD-research within the Quantitative Veterinary Research department at Wageningen University and the Central Veterinary Institute of Wageningen UR.

Topic: Mechanisms underlying disease transmission between spatially separated hosts.

- Developed a diffusion model to explain mechanisms of indirect transmission.
- Developed an extended Susceptible-Infectious-model, including the environment as a reservoir.
- Performed (designed, carried out, analysed samples and data) transmission experiments using the spatial spread of *Campylobacter jejuni* and *Escherichia coli* as a model system.
- Used statistical models to analyse data (Generalised linear models and master equations).
- Published four scientific papers.
- Tutoring in the course: "Mathematical Modelling in Biology",
- Developed and lectured a course on infectious disease epidemiology.

09-2004 – 02-2006

Masters Research with the Chronobiology department at the University of Groningen

Topic: "Modelling the SCN (Supra Chiasmatic Nuclei). A model for the entrainment of an ensemble of neurons".

- Developed a computer model for the SCN.

- Co-authored a scientific paper.

08-2002 – 08-2004

Masters Research with the Behavioural Biology department at the University of Groningen

Topic: "Local sleep need in the visual cortex: the effects of unilateral visual stimulation"

- Co-authored two scientific papers

Selection of Training and Courses

- 2019 Research Leader Programme for new and aspiring Principal Investigators. College for Medicine & Veterinary Medicine, IAD Research Development Program, UoE.
- 2018 Supervisor Briefing: College of Medicine and Veterinary Medicine, UoE.
- 2018 ERC Starting Grant Information Session, Edinburgh Research Office, UoE.
- 2017 Dealing with Data, Information Services, UoE.
- 2014 How to peer review manuscript for Journals, IAD Research Development Program, UoE.
- 2014 Managing your time. IAD Research Development Program, UoE.
- 2013 Bayesian Disease Mapping, Centre for Population Health Science, UoE.
- 2011 Reviewing a Scientific Paper, Wageningen Graduate Schools, Wageningen University, Wageningen
- 2011 Course on laboratory animals science, University of Utrecht, Utrecht
- 2011 Statistics for the Life Sciences, WIAS Graduate School, Wageningen University, Wageningen.
- 2010 Epidemiology and Control of Infectious Diseases, Department of Infectious Diseases Epidemiology, School of Professional Development, Imperial College, London
- 2009 Ethics and Philosophy of Animal Science, Wageningen Graduate Schools, Wageningen University, Wageningen
- 2009 Writing for Academic Publication, Linda McPhee, Linda McPhee Consulting
- 2008 Mathematical Modelling in Biology, WIAS Graduate School, Wageningen University, Wageningen

Scientific publications

- Meghan R. Perry, Hannah C. Lepper, Luke McNally, Bryan A. Wee, Patrick Munk, Amanda Warr, Barbara Moore, Pota Kalima, Carol Philip, Ana Maria de Roda Husman, Frank M. Aarestrup, Mark E. J. Woolhouse and **Bram A. D. van Bunnik**. (2021). Secrets of the Hospital Underbelly: Patterns of Abundance of Antimicrobial Resistance Genes in Hospital Wastewater Vary by Specific Antimicrobial and Bacterial Family. *Frontiers in Microbiology*.
- Zhang, F., Chase-Topping, M., Guo, C.-G., **van Bunnik, B. A. D.**, Brierley, L. & Woolhouse, M. E. J. (2020). Global discovery of human-infective RNA viruses: A modelling analysis. *PLOS Pathogens*.
- Wee, B. A.*, Muloi, D. M.*, & **van Bunnik, B. A. D.** (2020). Quantifying the transmission of antimicrobial resistance at the human and livestock interface with genomics. *Clinical Microbiology and Infection*.
- van Bunnik, B. A. D.**, Morgan, A. L. K., Bessell, P. R., Calder-Gerver, G., Zhang, F., Haynes, S., Ashworth, J., Zhao, S., Cave, N. R., Perry, M. R., Lepper, H. C., Lu, L., Kellam, P., Sheikh, A., Medley, G. F., & Woolhouse, M. E. J. (2020). Segmentation and shielding of the most vulnerable members of the population as elements of an exit strategy from COVID-19 lockdown. *Philosophical Transactions of the Royal Society B-Biological Sciences*.
- Morgan, A. L. K., Woolhouse, M. E. J., Medley, G. F., & **van Bunnik, B. A. D.** (2020). Optimising time-limited non-pharmaceutical interventions for covid-19 outbreak control. *Philosophical Transactions of the Royal Society B-Biological Sciences*.
- Aarestrup, F. M., & **van Bunnik, B. A. D.** (2020). Comment on Gross national income and antibiotic resistance in invasive isolates: analysis of the top-ranked antibiotic-resistant bacteria on the 2017 WHO priority list. *Journal of Antimicrobial Chemotherapy*. 2020
- Muloi, D., Fevre, E. M., Bettridge, J., Rono, R., Ong'are, D., Hassell, J. M., Karani, M. K., Muinde, P., **van Bunnik, B. A. D.**, Street, A., Chase-Topping, M., Pedersen, A. B., Ward, M. J., & Woolhouse, M. (2019). A cross-sectional survey of practices and knowledge among antibiotic retailers in Nairobi, Kenya. *Journal of Global Health*, 9(2), 10.
- Muloi, D., Kiiru, J., Ward, M. J., Hassell, J. M., Bettridge, J. M., Robinson, T. R., **van Bunnik, B. A. D.**, Chase-Topping, M., Robertson, G., Pedersen, A. B., Fevre, E. M., Woolhouse, M. E. J., Kang'ethe, E. K., & Kariuki, S. (2019). Epidemiology of antimicrobial-resistant Escherichia coli carriage in sympatric humans and livestock in a

- rapidly urbanizing city. *International Journal of Antimicrobial Agents*, 54(5), 531-537.
- Hendriksen, R. S., Munk, P., Njage, P., **van Bunnik, B. A. D.**, McNally, L., Lukjancenko, O., Roder, T., Nieuwenhuijse, D., Pedersen, S. K., Kjeldgaard, J., Kaas, R. S., Clausen, P., Vogt, J. K., Leekitcharoenphon, P., van de Schans, M. G. M., Zuidema, T., Husman, A. M. D., Rasmussen, S., Petersen, B., Amid, C., Cochrane, G., Sicheritz-Ponten, T., Schmitt, H., Alvarez, J. R. M., Aidara-Kane, A., Pamp, S. J., Lund, O., Hald, T., Woolhouse, M., Koopmans, M. P., Vigre, H., Petersen, T. N., Global Sewage, S., & Aarestrup, F. M. (2019). Global monitoring of antimicrobial resistance based on metagenomics analyses of urban sewage. *Nature Communications*, 10, 12.
- Muloi, D., Ward, M. J., Pedersen, A. B., Fevre, E. M., Woolhouse, M. E. J., & **van Bunnik, B. A. D.** (2018). Are Food Animals Responsible for Transfer of Antimicrobial-Resistant *Escherichia coli* or Their Resistance Determinants to Human Populations? A Systematic Review. *Foodborne Pathogens and Disease*, 15(8), 467-474.
- van Bunnik, B. A. D.**, & Woolhouse, M. E. J. (2017). Modelling the impact of curtailing antibiotic usage in food animals on antibiotic resistance in humans. *Royal Society Open Science*, 4(4), 8.
- Gibbons, C. L., **van Bunnik, B. A. D.**, Blatchford, O., Robertson, C., Porphyre, T., Imrie, L., Wilson, J., Fitzgerald, J. R., Woolhouse, M. E. J., & Chase-Topping, M. E. (2016). Not just a matter of size: a hospital-level risk factor analysis of MRSA bacteraemia in Scotland. *Bmc Infectious Diseases*, 16, 7.
- Woolhouse, M., Ward, M., **van Bunnik, B. A. D.**, & Farrar, J. (2015). Antimicrobial resistance in humans, livestock and the wider environment. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 370(1670), 7.
- van Bunnik, B. A. D.**, Ciccolini, M., Gibbons, C. L., Edwards, G., Fitzgerald, R., McAdam, P. R., Ward, M. J., Laurenson, I. F., & Woolhouse, M. E. J. (2015). Efficient national surveillance for health-care-associated infections. *Bmc Public Health*, 15, 9.
- van Bunnik, B. A. D.***, Ssematimba, A.*, Hagenaars, T. J., Nodelijk, G., Haverkate, M. R., Bonten, M. J. M., Hayden, M. K., Weinstein, R. A., Bootsma, M. C. J., & De Jong, M. C. M. (2014). Small distances can keep bacteria at bay for days. *Proceedings of the National Academy of Sciences of the United States of America*, 111(9), 3556-3560.
- Ward, M. J., Gibbons, C. L., McAdam, P. R., **van Bunnik, B. A. D.**, Girvan, E. K., Edwards, G. F., Fitzgerald, J. R., & Woolhouse, M. E. J. (2014). Time-Scaled Evolutionary Analysis of the Transmission and Antibiotic Resistance Dynamics of *Staphylococcus aureus* Clonal Complex 398. *Applied and Environmental Microbiology*, 80(23), 7275-7282.
- van Bunnik, B. A. D.**, Hagenaars, T. J., Bolder, N. M., Nodelijk, G., & de Jong, M. C. M. (2012). Interaction effects between sender and receiver processes in indirect transmission of *Campylobacter jejuni* between broilers. *Bmc Veterinary Research*, 8, 7.
- van Bunnik, B. A. D.**, Katsma, W. E. A., Wagenaar, J. A., Jacobs-Reitsma, W. F., & de Jong, M. C. M. (2012). Acidification of drinking water inhibits indirect transmission, but not direct transmission of *Campylobacter* between broilers. *Preventive Veterinary Medicine*, 105(4), 315-319.
- Beersma, D. G. M., **van Bunnik, B. A. D.**, Hut, R. A., & Daan, S. (2008). Emergence of circadian and photoperiodic system level properties from interactions among pacemaker cells. *Journal of Biological Rhythms*, 23(4), 362-373.
- Van Bunnik, B. A. D.**, Boerema, A. S., Wijers, A. A., Beersma, D. G. M., Daan, S., & Strijkstra, A. M. (2004). Unilateral Visual Stimulation Reduces REM Sleep Latency. *Sleep Research in the Netherlands*, 15, 2.
- Van Bunnik, B. A. D.**, Boerema, A. S., Strijkstra, A. M., Wijers, A. A., & Beersma, D. G. M. (2003). Sleep intensity and sensory processing during sleep: an auditory event related potential study. *Sleep Research in the Netherlands*, 14, 4.

* Authors contributed equally.

Oral / poster publications

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- Edinburgh Infectious Disease Symposium, Edinburgh, United Kingdom, 2019. (Oral & poster)
 - Antimicrobial Resistance – Genomes, Big Data and Emerging Technologies conference. Hinxton United Kingdom, 2019. (Oral & poster)
 - Edinburgh AMR Symposium. Edinburgh, United Kingdom. 2017. (Poster)
 - COMPARE general meeting. Rotterdam, The Netherlands. 2017. (Poster)
 - Epidemics 5, Clearwater Beach, Florida, United States of America. 2015. (Poster)

- Public Health Science: A National Conference Dedicated to New Research in UK. Glasgow, United Kingdom. 2014 (Poster)
- ICAR, Madrid, Spain. 2014. (Oral)
- Epidemics 4, Amsterdam, The Netherlands. 2013. (Poster)
- ISVEE 2012 Conference, Maastricht, The Netherlands. 2012 (Oral)
- InFER, Warwick, United Kingdom. 2011. (Poster)
- SVEPM, Leipzig, Germany. 2011. (Poster)
- ISVEE 2009 Conference, Durban, South Africa. 2009. (Oral)
- VEEC, Deventer, The Netherlands. 2009. (Oral)
- SVEPM, London, United Kingdom. 2009. (Poster)
- WIAS, Wageningen. The Netherlands. 2009 (Oral)

Prizes and awards

- 2019 Awarded best poster prize at the Edinburgh Infectious Disease Symposium
 2012 Awarded best oral presentation prize at the ISVEE 2012 conference

Other scientific responsibilities

- Peer-reviewed scientific paper for several scientific journals, including Lancet Planetary Health, BMC Medicine, Nature Communications, PLoS Computational Biology, PLoS One and Royal Society Open Science.
- Peer-reviewed grant applications for the Wellcome Trust and UKRI.
- Member of PhD review panels

Other dissemination activities/public engagement

- 2020 Invited presentation at the Edinburgh Infectious Diseases workshop on COVID-19.
 2020 Invited presentation / public engagement activity at UK Houses of Parliament - Antimicrobial Resistance: How research is tackling the Challenge. Presentation using information & activity stand. Meeting at UK Houses of Parliament attended by politicians, funders and health professionals.
 2020 Invited presentation at "Antibiotic Resistance-Related Intervention Impact Evaluation Workshop" hosted by The London School of Hygiene and Tropical Medicine in collaboration with the CGIAR A4NH Research Programme.
 2019 Invited presentation and participation in discussion panel at the One Health Society discussion panel on AMR.
 2014 Information & activity stand at the European Researchers' Night Edinburgh, Explorathon, meet the experts (<http://www.explorathon.co.uk/>) in the National Museum of Scotland. Edinburgh.
 2014 Interview for the podcast of the School of Biological Sciences. (<http://www.ed.ac.uk/schools-departments/biology/news-events/biopod>) (broadcasted September 2015)

Teaching / Supervising

- Developed and lectured a course on Quantitative Veterinary Epidemiology for the MTEC course on Food Safety at Wageningen University & Research.
- Lectured in the Master of Public Health (MPH) program of the UoE.
- Organised multiple rounds of a reading club on modelling infectious diseases for PhD-students on Postdoctoral Researchers within Biological Sciences / Usher.
- Supervised numerous (>10) BSc- and MSc-student to completion.
- Co-supervisor of two PhD-students, external expert on PhD review panel.
- Expert collaborator on a PhD research proposal.

Other Skills

Computers Excellent knowledge of multiple computer systems (Microsoft Windows, Linux) and software. Programming experience: C++, GNU R, Mathematica, Matlab, Python (Jupyter), PHP, SQL, HTML

Hobbies

Computers, electronics, reading, hiking, field hockey, sailing, traveling, gardening.

Personal features

Socially skilful, perseverant, studious, enthusiastic, involved, persistent.