

Vetscience

INTERNATIONAL

Nº 2 •
January 2021



Research in the
fight against
COVID-19

p. 16

Cooperating
for sustainable
agriculture

p. 36

Towards new
lymphoma therapy
for dogs and people

p. 66



Utrecht University

Vetscience international nr. 2 - January 2021

UTRECHT UNIVERSITY
FACULTY OF VETERINARY MEDICINE
P.O. Box 80.153 | 3508 TD Utrecht | The Netherlands
Phone: +31 (0)30 253 4722
E-mail: vetscience@uu.nl
Website: uu.nl/en/vet

FACULTY BOARD 2020
Prof. Wouter Dhert,
PhD, Dean of Veterinary Medicine
Prof. Dick Heederik, Vice Dean Research
Prof. Merel Langelaar, DVM, Vice Dean Education
Geert Tillemans, MSc, Faculty Director
Kim Hopman, BSc, Student Assessor
Chava Jurgens, MA, Secretary

EDITORIAL BOARD
Hilde Aardema, Alain de Bruin, Wouter Dhert,
Wieneke Driessen, Yteke Elte, Dick Heederik,
Hans Kooistra, Bart Spee, Erik Wouters

DEPARTMENT OF MARKETING,
COMMUNICATIONS & MULTIMEDIA
EDITOR:
Carien Duisterwinkel

DESIGNER:
Lisanne Rooth

INFOGRAPHICS:
Steffie Padmos/ Jeroen van Ingen/
Lisanne Rooth





PHOTO EDITOR:
Sil Heunks

TRANSLATION:
NST Science

PRINTING:
Xerox

©Utrecht University
All rights reserved. No part of this publication may
be reproduced, distributed, or transmitted in any
form or by any means without the prior written
permission of Utrecht University.

FOLLOW US ON SOCIAL MEDIA

vet_uniutrecht 
FaculteitDiergeneeskunde 
Diergeneeskunde Faculteit 
@faculteit_diergeneeskunde 

Science and education with impact

WOUTER DHERT,
Dean of the Faculty of Veterinary Medicine until January 2021:

'Before you lies the second international edition of Vetscience magazine, in which we share highlights of our work this past year and our vision for the future. 2020 has been an especially trying year for all of us. But throughout this crisis, the resilience and ingenuity of our people – researchers, lecturers, clinic and support staff – has been truly inspiring. As outgoing Dean, looking back at our achievements these past years fills me with pride. We laid a solid basis for a strong and impactful faculty, well positioned at the heart of major societal challenges. It is with full confidence that I hand over leadership to Dick Heederik as Acting Dean, until a new Dean has been appointed.'

DICK HEEDERIK,
Vice Dean Research and Acting Dean from January 2021:

'If anything, the coronavirus pandemic has shown the interconnectedness of major global issues and the contribution veterinary expertise can make to building a better, healthier world. During the past few years, we have implemented a new organisational structure. In order to facilitate collaboration within and beyond our faculty, we further focused our research around three themes: One Health, One Medicine and Veterinary Biomedicine. Our 2020-2025 Strategic Plan continues along this path, based on Utrecht University's guiding principles of cross-border collaboration, a future-proof educational culture, a close-knit community, a transition towards open science and a strong focus on sustainable development. I invite you to read more about our impact and our ambitions in this magazine.' ■

IMAGE: IVAR PEL



Dick Heederik and Wouter Dhert

Contents

Foreword	3
Short	6
Understanding infectious diseases: how six disciplines contribute	8
Photo series: Faculty in times of coronavirus	20
Our research focus	34
New linear accelerator for animals with cancer	35
International veterinary students tell their story	39
Horse therapy for veterans suffering from PTSS	42



Coronavirus research	16
A groundbreaking antibody discovery, studying outbreaks at mink farms, and more on our current coronavirus work.	



Strategic plan 2020-2025	32
With our veterinary expertise, we contribute to a better, healthier world. Our strategic plan sets out our priorities for the coming years.	



Regional Deal Food Valley	36
Collaborating for sustainable livestock farming and healthy food.	

200 years of Veterinary Medicine in Utrecht	44
--	----

Facts & Figures	52
----------------------------	----

Open Science	54
---------------------	----

Babies already exposed to hormone-disrupting substances in the womb	56
--	----

Our organisation	61
-------------------------	----

'Pugs' snoring isn't as cute as it seems'	62
--	----

What do we expect from a young veterinarian?	64
---	----

Death toll of North Sea porpoises revealed	72
---	----

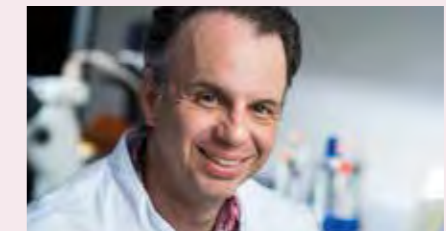
Appointments	75
---------------------	----



Vesicles with important messages	46
Marca Wauben and Leon Terstappen on the role of extracellular vesicles in cancer.	



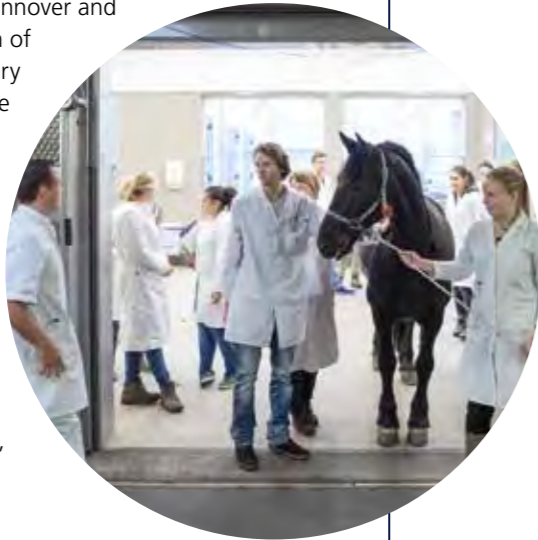
Lifelong learning	58
What does the future of veterinary continuing education look like? Daniela Salvatori, Lidewij Wiersma and Jimmy Saunders share their thoughts.	



New lymphoma treatment	66
Lymphoma is quite common in dogs, but also in people. Monique Minnema and Alain de Bruin are working together on new treatment methods.	

Erasmus grant for progress assessment

The European Union has awarded €420,000 for the implementation of progress assessment in veterinary curricula. In this project, lecturers Harold Bok and Theo van Haeften are working together with veterinary faculties in Copenhagen, Oslo, Helsinki, Uppsala, Hannover and the European Association of Establishments for Veterinary Education (EAEVE) on the development of an MCQ database, quality control and training for lecturers. Bok: 'Thanks to this grant, we can, together with our European colleagues, develop an assessment system that structurally analyses the development of students with respect to the relevant knowledge areas.'



€11 million for Virtual Human Platform

Assessing the safety of chemicals and pharmaceuticals without making use of laboratory animals. That is the goal of researchers from, among others, Utrecht University, University of Applied Sciences Utrecht and the National Institute for Public Health and the Environment. Together, they are developing a Virtual Human Platform to assess the safety of chemicals and medicines based on human physiology and biology, without using laboratory animals.

The consortium will receive 9.9 million Euros from the Dutch Research Agenda: Research on Routes by Consortia (NWA-ORC). Thanks to the contribution of foundations, government and private sector organisations, the total funding comes to 11.2 million Euros.



Vlogs boost morale

Suddenly everything had to happen at home: work, care and education for children and, if at all possible, also some time for yourself.

Colleagues and students in veterinary medicine made vlogs to help each other stay motivated and feel connected, even though they were unable to meet in real life. Communication officer Josien Jacobs and her young daughter Lena shared their favourite working from home tips: ask colleagues for feedback, go for a walk whilst having telephone conversations and occasionally do a little dance in the living room.

Human tissue from a printer

Researcher Riccardo Levato has received a 1.8 million Euros ERC starting grant for research into an ultrafast bioprinter. This printer can in 30 seconds complete a print job that takes an hour with a traditional 3D printer. Levato ultimately hopes to be able to produce large tissues and even organs that new drugs and treatments can be tested on.



The Avatar Zoo

Developing so-called 'avatars' to replace laboratory animals for learning and training. That is the aim of the project 'Avatar Zoo'. The avatars are dynamic, interactive holographic 3D models that are visualised in virtual reality (VR) and augmented reality (AR). With these avatars, students and researchers can acquire anatomical, physiological and pathological knowledge of different animal models (and ultimately of human systems) without the need to use living animals.



Knowledge clips for remote education

Flipped classrooms and broadening education; knowledge clips or short educational videos help in this process. The student watches the knowledge clip at home and completes exercises about this. Subsequently, there is more room to consider the subject matter in greater depth during a contact moment. In the dissection practical 'Kidneys and Urinary Tracts', students examine specific characteristics of the kidneys per animal species by making use of samples.

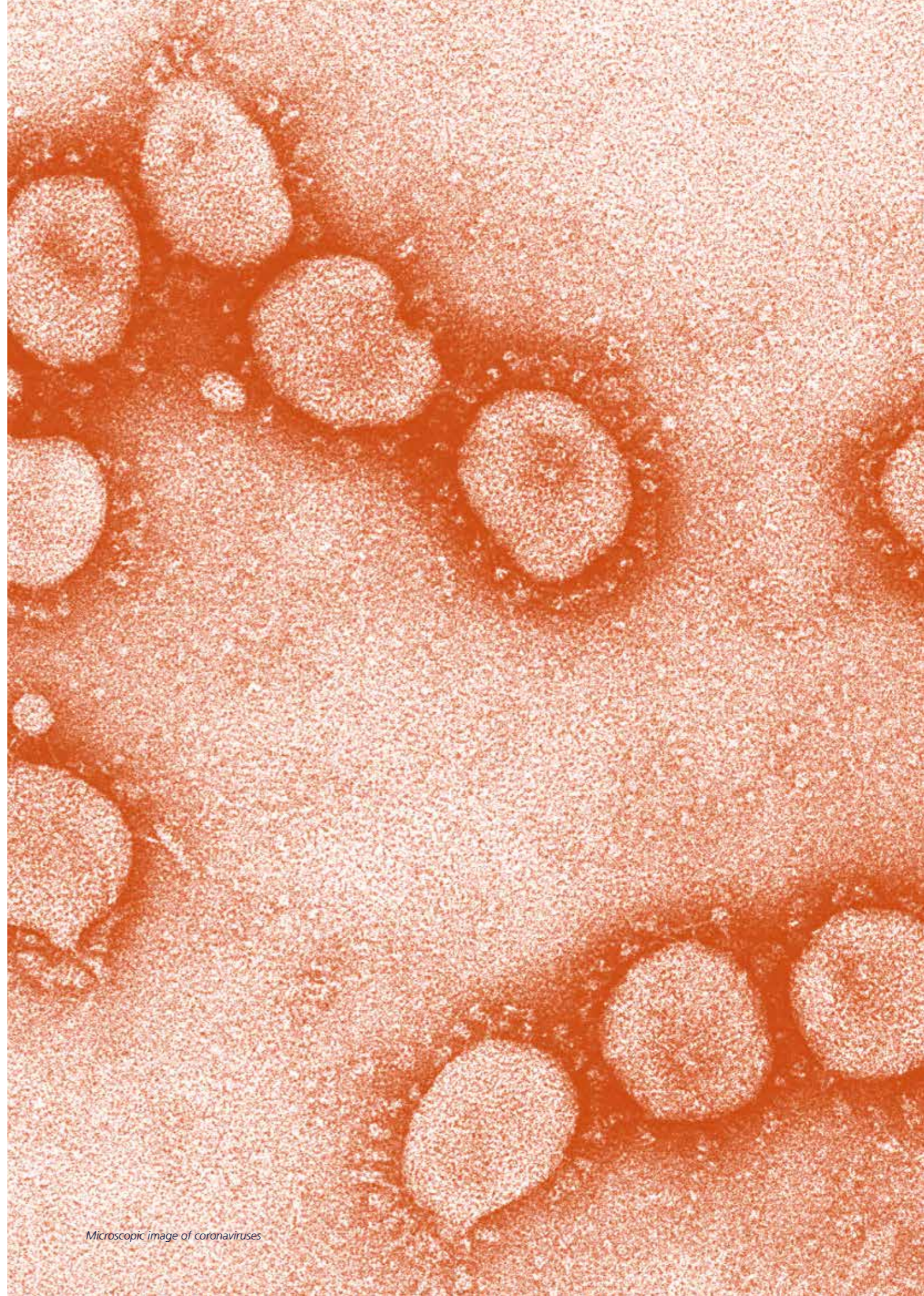
Lecturers Lisa Dietz and Sabrina Zeddies together with videographer Jonathan Joosten made knowledge clips to allow courses to proceed as well as possible despite the limitations imposed by the coronavirus measures.



The role of Veterinary Medicine research in the fight against infectious diseases

What are we doing to arm ourselves against pathogens?

Humans, animals and pathogens are locked in a perpetual struggle – and often a battle to the death. But what exactly is going on? If we can gain a better understanding of how micro-organisms or viruses cause illness and how they spread, we will be able to intervene more quickly and take more effective action to prevent new infections. We spoke with seven researchers from the Faculty of Veterinary Medicine about the roles played by their respective fields.



Microscopic image of coronaviruses

THEORETICAL EPIDEMIOLOGY

How do infectious diseases behave when introduced to human and animal populations, and which mechanisms are at work? The field of infectious disease dynamics attempts to answer this question using a variety of quantitative methods and various sources of data. 'Populations of people and animals form complex systems, large groups of similar individuals that are in contact with one another,' explains Hans Heesterbeek, Professor of Theoretical Epidemiology. 'Knowledge of the biology and behaviour of a given pathogen is not enough to fully understand how it will spread within a large population of socially active individuals. Interventions that seem useful at the individual level may turn out differently at a population-wide level – or may even prove counter-productive.'

One important example concerns efforts to understand the worldwide increase in emerging infectious diseases. 'The majority of new infections in humans originate in animals, with wild animals being the chief culprits. Not only are such diseases growing in number, their social and economic consequences are increasing as well,

due to illness, deaths and disruption. While this is usually in a specific region of the world, as was the case with Ebola, the spread of SARS-CoV-2 has demonstrated that it is possible for the kind of pandemic disruption that we have been predicting for some time now to occur quite suddenly. We really must gain greater understanding of how pathogens are able to jump from animals to humans and how – in today's complex world – this can escalate into an unmanageable and disruptive problem.'

'The majority of new infections in humans originate in animals, with wild animals being the chief culprits'

VIROLOGY

Virology involves conducting fundamental molecular research into viruses that affect animals and humans (e.g. coronaviruses, influenza viruses and picornaviruses). 'We study the structure of these viruses, which receptors they use to invade cells, how they use those cells to replicate their own genetic material and how viral particles are then released from the cells,' says Frank van Kuppeveld, professor of Virology. 'Our research also explores how viruses make the jump from one animal species to another – or to human beings – as well as how they suppress or circumvent the defence mechanisms of their host.' Armed with this fundamental knowledge, the virologists develop innovative strategies for new diagnostic methods, antiviral drugs, therapeutic antibodies and vaccines.

The current SARS-CoV-2 outbreak offers a fantastic opportunity to apply research into coronaviruses in a real-world setting. 'We've been conducting pioneering research aimed at the structure and function of the "spike proteins" found on the outside of coronaviruses. These proteins allow

the virus to adhere to cell receptors and gain entry into the cell. We also created spike proteins and injected them into mice that make human antibodies. As it turns out, one of those antibodies also inhibits SARS-CoV-2. In time, we may be able to use this antibody to treat COVID-19 patients or protect hospital staff from the virus. We also use our spike proteins as antigens in immunological testing to demonstrate the presence of antibodies. This is crucial to determining whether someone has been infected in the past.'

'Understanding the human immune system remains a challenge. It is present everywhere in the body.'

IMMUNOLOGY

Our immune systems protect our bodies from internal – and external – threats. Professor of Immunology Femke Broere explains. 'Depending on the type of inflammation or infection, the human body must counter with a specific immune response. Sometimes this process goes awry and the body responds too strongly or not strongly enough. We are researching how to steer the immune response in order to allow the body to recover.' The body sometimes fails to respond adequately to COVID-19 as well. 'In patients with a severe infection, the disease triggers an incredibly strong immune response. This actually does more harm than good. In such cases, the patient winds up in intensive care as a result of their immune system's overreaction, which is what makes them gravely ill.' Broere's research group is studying the immune response in connection with a variety of infections, parasites and different illnesses, such as muscle diseases, allergies and rheumatic disorders. Broere says that scientists in the field of immunology face a number of major challenges. 'There are several diseases, such as malaria, for which

developing a vaccine is an extremely complicated undertaking. What's more, understanding our immune system presents a constant challenge. The immune system is present everywhere in the body. It works in close cooperation with our hormones and other systems and is controlled by the brain. Imagine trying to simulate those conditions in a lab in order to conduct research. It is just terribly complex. You really need to have all the disciplines working together, from virology to clinical practice. That's the Faculty of Veterinary Medicine's strong suit – we have all those disciplines in-house and are able to integrate them.'

Fighting infectious diseases

INFECTIOUS DISEASES: THEIR IMPACT ON THE WORLD AND HOW SCIENCE WORKS TO COMBAT THEM

The science of developing, producing, evaluating and applying vaccines

VACCINOLOGY

VETERINARY EPIDEMIOLOGY

Studies the spread of infections between animals, between animals and humans and between animal populations

IMMUNOLOGY

Studies the immune system which protects the body from danger coming from within or outside

CLINICAL INFECTIOLOGY

Contributes to combating infectious diseases and antimicrobial resistance in humans and animals

VIROLOGY

Studies how viruses infect cells and how they are transmitted from animals to other animals or humans

THEORETICAL EPIDEMIOLOGY

Focuses on the dynamics of infectious diseases and the complex systems underlying the spread of diseases in populations

GROWTH FORECAST FOR THE DUTCH ECONOMY AS A RESULT OF CORONAVIRUS

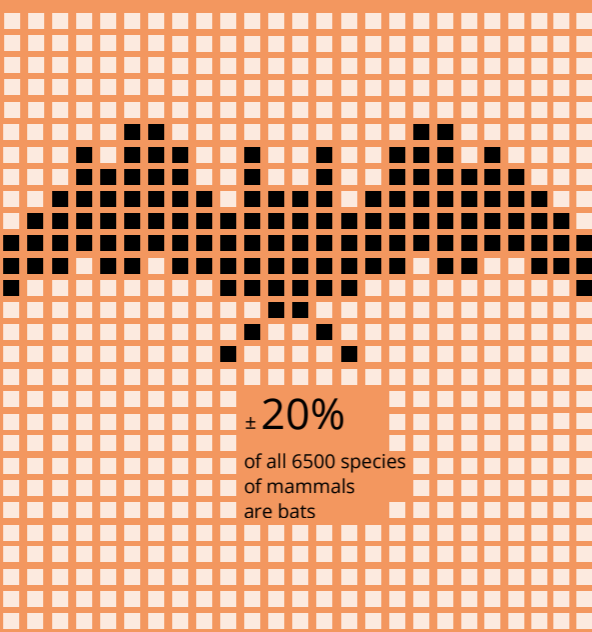
-7,5%

IMF April 2020

€1.000.000.000

EU funding for coronavirus research and innovation (May 2020)

WHY DO DISEASES OFTEN SPREAD THROUGH BATS?



$R_0 = <1$

disease declines and dies out



$R_0 = >1$

disease spreads



VACCINES

10 to 15 years

Average time needed for developing a vaccine



Eradicated

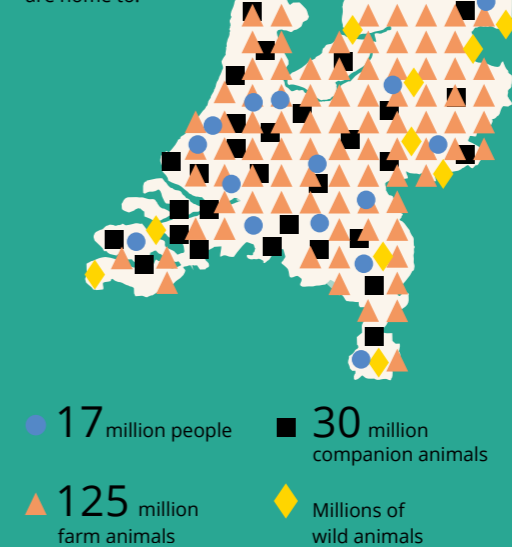
by vaccines

SMALLPOX

RINDERPEST

Densely populated

The Netherlands are home to:



RESISTANT

10 million people

Potential annual deaths as a result of antimicrobial resistance by 2050, if we don't intervene



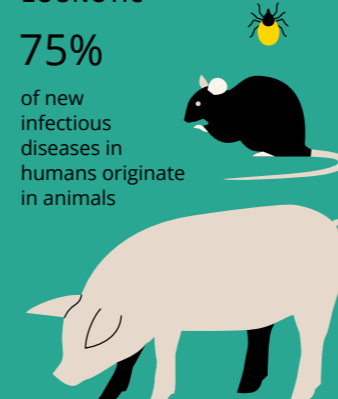
4 coronaviruses

Previously transferred from animals to humans, regularly causing the common cold

ZOOBOTIC

75%

of new infectious diseases in humans originate in animals



1.7 million

estimated number of viruses

600.000 - 800.000 of these are possibly zoonotic

6%

of the European population is affected by autoimmune diseases and the prevalence is rising

Outbreaks since 1980

a selection

1981 - PRESENT

HIV / AIDS (30 million deceased)

2002 - 2003 SARS (770 deceased)

2009 - 2010 SWINE FLU (150.000 to 500.000 deceased)

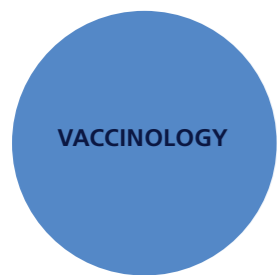
2014 - 2016 EBOLA (11.000 deceased)

2019 - PRESENT SARS-CoV-2/ COVID-19 (1.4 million deceased)



3x

The number of outbreaks of infectious diseases in humans has tripled each decennium since the 80s



also works at the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM). According to Van Els, this is an important bonus: 'It enables me to forge a connection between the research and knowledge of the Faculty of Veterinary Medicine and the RIVM.'

Vaccinology is the science of developing, preparing, evaluating and implementing vaccines. Cécile van Els is a professor of Vaccinology and her research focuses on unravelling the chain of immune responses that lead to effective and long-term protection from infectious diseases. These 'correlates of protection' differ for each pathogen but are still unknown for the majority of infectious diseases.

According to Van Els, there is growing demand for knowledge of how vaccines work. 'Within the field of human infectious disease control, vaccines make a major contribution to public health by reducing the prevalence of infectious diseases. Vaccination also has a major social and economic impact in the veterinary field. Emerging and potentially new infectious diseases in humans and animals require new or improved vaccines.' Especially in these times of urbanisation, increasing travel and climate change, new infectious diseases may have the opportunity to spread faster. This, Van Els emphasises, is what makes prevention important. 'But prevention requires knowledge regarding the correlates of protection and how they can be measured.' Van Els

'Emerging and potentially new infectious diseases in humans and animals require new or improved vaccines'



The field of Veterinary Epidemiology attempts to understand how infectious diseases spread between animals and animal populations, and what we can do to control that spread. 'Diseases can be divided into three major groups,' says Arjan Stegeman, Professor of Farm Animal Health. 'There are diseases that circulate between animals but do not make the jump to humans, such as foot-and-mouth disease and swine fever. Then you have diseases that can jump to humans, but that cannot be transmitted from one person to another, or only very rarely. Examples of this group are Q fever and avian flu. While such diseases are quite nasty for the people that catch them, they do not result in pandemics. The third group of diseases, on the other hand, does. These illnesses are capable of making the jump to humans and can then spread from person to person in an efficient manner. SARS-CoV-2 is obviously an example of this, as are flu viruses.' Stegeman's group uses mathematical models, experimentation and field observation at livestock farms to research the spread of disease. Stegeman also feels that Veterinary Epidemiology can help facilitate the

transition to sustainable agriculture. 'In sustainable agriculture, new risks of infection can arise, for example when another animal feed is introduced or there is more contact with the outside world. Pandemic viruses emerge mainly from contact between humans and wild animals, as with SARS-CoV-2, or from contact between wild animals and extensive livestock farming. In those cases you have different animals mingling together, like pigs, chickens and ducks for example. This makes it easy for viruses to exchange genetic material, which in turn gives rise to new pathogens. An example is that chickens housed outdoors are seven times more likely to catch avian flu than chickens kept indoors in a shed. Intensive livestock farming entails smaller risks because animals housed indoors have little contact with other animals. It is quite tricky to balance the opposing interests of animal welfare and a lower risk of infectious diseases. Scientific research allows us to put forth solutions to this challenge and, in that way, do our part for the transition to sustainable agriculture.'

'We have an active role in fighting infectious diseases in the Netherlands'



Clinical Infectiology contributes both domestically and internationally to the fight against infectious diseases and antibiotic resistance among humans and animals. These contributions take the form of high-quality research and education programmes aimed at current and future veterinarians and physicians, along with others. At the national level, Clinical Infectiology supports policy recommendations for bodies including the Royal Netherlands Veterinary Association and the Ministry of Agriculture, Nature and Food Quality. 'Internationally, we do so for organisations such as the European Commission, the World Health Organization (WHO), the Food and Agricultural Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE),' says Jaap Wagenaar, Professor of Clinical Infectiology. The WHO and OIE have recognised clinical infectiology as a WHO collaborating centre and an OIE Reference Laboratory.

'We also have an active role in fighting infectious diseases in the Netherlands,' says veterinary microbiologist Els Broens. 'This is because of our work to identify and report zoonoses [diseases that

can be transmitted between humans and animals] and antibiotic resistance in companion animals, presided over by the Veterinary Microbiological Diagnostic Centre (VMDC). For instance, we uncovered Brucella infections in imported dogs and demonstrated the first known cases of COVID-19 in dogs and cats in the Netherlands, together with our colleagues in Virology. Thanks to an extensive network of top-tier researchers, policymakers, animal owners and professionals from the veterinary and human medicine sectors, Clinical Infectiology is uniquely positioned as a bridge-builder between research and practice. ■

TEXT: ROSAN REUSKEN AND MYRNA TINBERGEN
IMAGE: BEREND-JAN BOSCH | INFOGRAPHIC: STEFFIE PADMOS

Building knowledge, sharing insights

Utrecht researchers help fight the coronavirus pandemic

We live in a period of unparalleled knowledge about viruses and pandemics.

Nevertheless, the coronavirus is dominating the world. Researchers from various disciplines within Veterinary Medicine are contributing to research on the coronavirus, and regularly share their insights with the outside world.

This is a brief overview of the impact of their work.

POP-UP LECTURE ABOUT CORONAVIRUSES

Virologist Raoul de Groot has been studying coronaviruses for more than 35 years. Soon after the first coronavirus patient was diagnosed in the Netherlands, De Groot gave an online pop-up lecture for the general public on 10 March 2020. 'At that moment, people had so many questions. And so I was pleased to share my knowledge.'

Need for reliable information

De Groot was one of the first in the Netherlands to inform the general public about coronaviruses, the danger of these and the need to flatten the curve in relation to the capacity in healthcare. The viewing figures demonstrate that there was a need for reliable information. The lecture was watched about 30,000 times. 'It was an incredibly busy period, but I feel it's part of the job to take the time to share knowledge with the general public.'

DISCOVERY OF ANTIBODY AGAINST THE CORONAVIRUS

At the start of 2020, virologists from Utrecht University, together with researchers from Erasmus MC and Harbour BioMed, discovered a human antibody that prevents infection by the SARS-CoV-2 virus. 'This research builds further upon the previous work of our groups', says Berend-Jan Bosch, who leads the research. 'We still had antibodies in the freezer against the SARS coronavirus that emerged in 2002/2003, and one of those also proved to block the new coronavirus.'

Developing monoclonal antibody therapy

Based on the discovery of this antibody, biopharmaceutical company AbbVie, Harbour BioMed, Utrecht University and Erasmus Medical Center entered into a collaboration. The focus of the collaboration is on advancing the fully human, neutralising antibody 47D11, and developing a novel antibody therapeutic to prevent and treat COVID-19.



THE ART OF PREDICTION

Professor Hans Heesterbeek is an expert in the area of infectious disease modelling. He considers it his duty to inform the general public. 'During the pandemic, the entire world is directly and drastically confronted with my discipline. People understandably have many questions. I talk to journalists almost every day to answer their questions and to explain things.' Demand for new scientific information remains high, as illustrated by the one million readers of Heesterbeek's article for the international platform The Conversation about the fact that COVID-19 will probably not disappear and will instead become endemic.

Coronavirus under control

Heesterbeek also leads a group of researchers – infectious disease experts, mathematicians and behavioural scientists – who are investigating better strategies for monitoring. The main themes of the research include mobility, contact tracing, risk behaviour, test policy and the reproduction number.

RESEARCH INTO COVID-19 IN (COMPANION) ANIMALS

Companion animals appear to play a negligible role in the current coronavirus pandemic. The pandemic is driven by human-to-human infections. Cats and dogs can contract the coronavirus, but for the known cases, it was apparent that they were infected by their sick owners and so these are cases of transmission from people to animals. Research to find out more about animals and COVID-19 is vitally important. The Faculty of Veterinary Medicine is therefore working together with partners like Wageningen University & Research and Erasmus MC on the research project "Fighting COVID-19 in animals and humans, a One Health approach", on behalf of the Dutch Ministry of Agriculture, Nature and Food Quality.

Webinars for vets

'The most important thing to establish is whether SARS-CoV-2 can continue to circulate between animals and between animals and humans if the transmission between humans is curbed', says project leader and Professor of Farm Animal Health, Arjan Stegeman. The research must make it clear how often the virus occurs in cats and dogs and to what extent animals can infect each other or can be infected by people. The study must also reveal the potential risk of the virus continuing to circulate among animals and which interventions can reduce that risk.

In the context of continuing education, the researchers organised two well attended webinars for general practice veterinarians about COVID-19 and companion animals.

CORONAVIRUS ON MINK FARMS

Researchers from, among others, Erasmus MC, Utrecht University and Wageningen University & Research investigated the genetic origin of the SARS-CoV-2 coronavirus on sixteen infected Dutch mink farms and the people who live or work there. Their conclusion as reported in a Science publication in November 2020: the coronavirus was initially introduced by humans and then mutated, probably as a result of widespread circulation among minks at the beginning of the infection period a few weeks before it was detected. 68% of the tested residents, staff and/or contacts were found to be infected with the SARS-CoV-2 virus, which originated from animals and not humans. This shows the transmission from animals to humans of the coronavirus via mink.

Transmission from minks to humans

Lidwien Smit: "Contrary to reports from Denmark, we found no evidence in the Netherlands that people in the surrounding area who did not live or work on the mink farms have been infected with mink variants of the SARS-CoV-2 virus."



LUNG DAMAGE AND CHRONIC SYMPTOMS AFTER COVID-19

Most people who recover from COVID-19 appear to experience persistent health complaints for a longer period of time. A Dutch consortium made up of top researchers, private parties and patient representatives is investigating which factors play a role in the development of long-term health complaints and who is vulnerable to these. Researchers from Utrecht University are mapping the "exposome" of the patients for this research. The exposome stands for all non-genetic factors that can influence your health, such as nutrition, exercise, smoking and air pollution.

Patients with a wristband

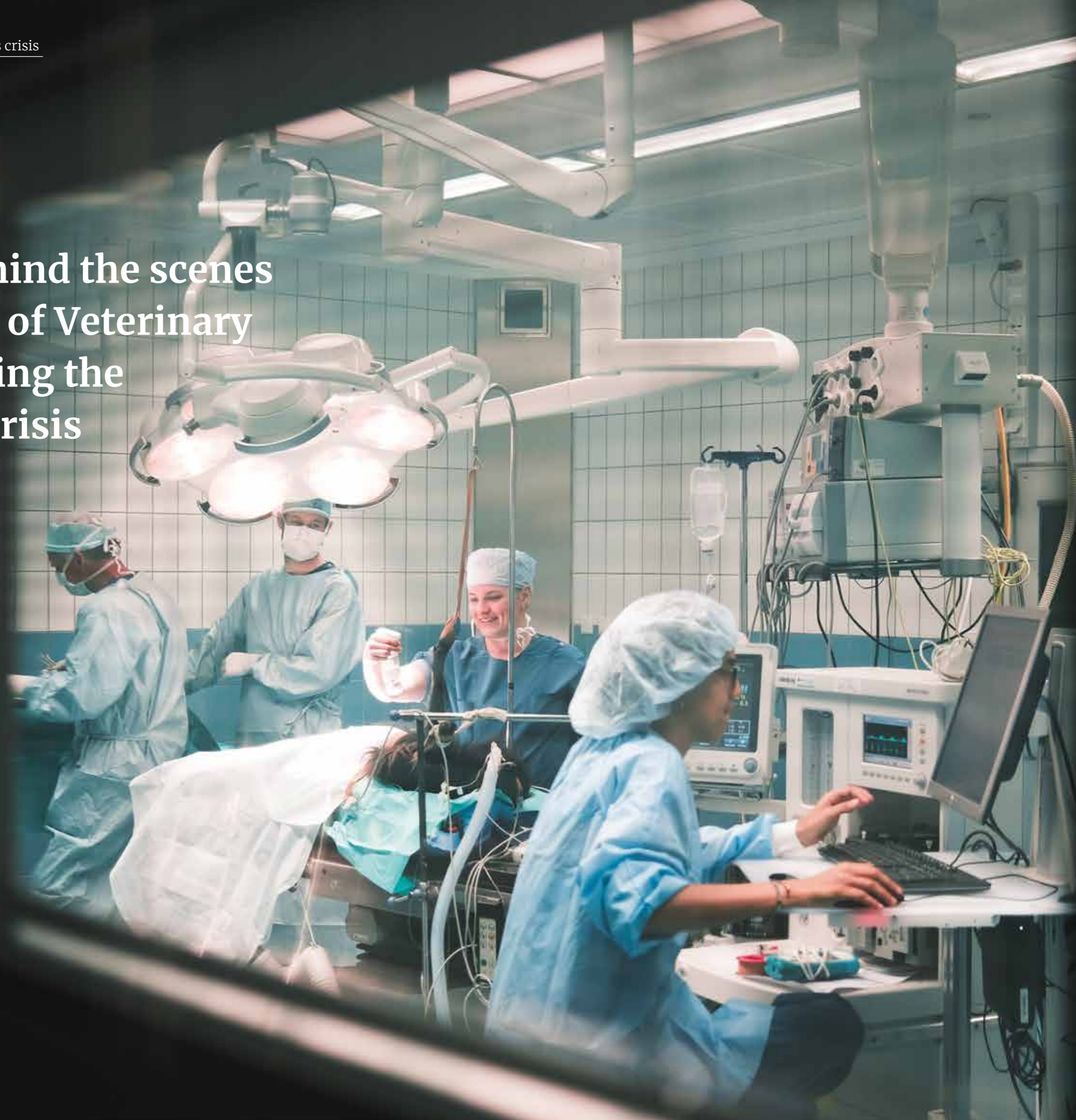
Roel Vermeulen, Professor of Environmental Epidemiology and Exposome Analysis, explains how they measure the exposome. 'Patients are given a wristband, for example, with which we can capture and analyse the chemical substances in their home and work environment.' As part of sharing information about the various COVID-19 research projects, Vermeulen and two colleagues from the Utrecht Exposome Hub gave a glimpse into their research during a webinar. 'We discussed several exposome studies that contribute to understanding and combating COVID-19. A good example is the wristband of my colleague Rick Grobbee (professor at UMC Utrecht) that continuously measures your temperature and breathing and in this way detects possible symptoms of COVID-19 at an early stage.' ■

TEXT: ROSAN REUSKEN AND MYRNA TINBERGEN | IMAGE: BAS NIEMANS AND LIDWIEN SMIT

A glimpse behind the scenes at the Faculty of Veterinary Medicine during the coronavirus crisis

And then silence descended, also at the Faculty of Veterinary Medicine. But not everywhere. Never before were our coronavirus researchers needed so much as now, our Intensive Care Department remained up and running, vital operations went ahead, lambs were born, and students were educated via remote learning. What follows is a unique glimpse behind the scenes.

IMAGES: BAS NIEMANS





In the operating theatre. From left to right: Bjorn Meij – surgery specialist, Eline van der Brink – intern surgery, Tijn Wiersma – surgery specialist in training, and Martina Lentini – intern anaesthesia.



Empty rooms at the outpatient clinic for companion animals

▲
‘The crisis creates a sense of solidarity. Furthermore, many owners are grateful that we can still help their pets despite the crisis.’

– Tijn Wiersema, specialist in training, surgery companion animals



Deserted streets at Utrecht Science Park



‘Due to the coronavirus crisis, you spend more time alone, and my world has become much quieter as a result of that. I think that after this crisis, I’ll find it easier to enjoy the small things in life.’

– Koen Slagboom, sheep farmer at the Tolakker



Jorn Vernooij farms maize and peas as feed for the cows



Research and education assistant Wim Lensing on his way to the cows in the field



Boots at the Farm Animal Clinic



Empty anatomy classroom

'I'm really pleased with how the lecturers do everything they can to continue to teach us as well as possible. Thanks in part to their efforts, students are now experiencing a minimal study delay.'

- Michelle Steka, first-year student veterinary medicine. During the crisis, Michelle Steka was one of the students who helped sheep farmer Koen Slagboom with the lambing at the Tolakker faculty farm.





Coronavirus researcher Irina Albulescu



Coronavirus researcher Wentao Li

◀ **'After years of fundamental research, we are now doing work that is directly relevant for society.'**

- Arno van Vliet, Coronavirus researcher



Coronavirus research leader Berend-Jan Bosch with fellow researcher Chunyan Wang.

Knowing animals to meet tomorrow's health challenges today

Faculty strategic plan 2020-2025

Caring for the health and wellbeing of animals in the wild, farming, sports, and in our homes. Combating diseases plaguing humans and animals alike such as cancer, Q fever, or COVID-19. Developing solutions for sustainable agriculture, food production and healthy rural and urban environments. We help build a better, healthier world. Our 2020-2025 plan sets out our priorities for the coming years.



AN OPEN, RESILIENT AND INNOVATIVE COMMUNITY

A new campus

Our university campus will see a true transformation in the coming years. A new common faculty building with a minimal CO2 footprint will provide a home base optimally equipped for innovation and collaboration.

Opportunities for development

Our people are our core strength. The coming years, we will allocate a fixed percentage of our turnover to employee training and development. We will foster leadership with specific attention for student and employee wellbeing and workload, facilitate knowledge exchange among staff and draw up a diversity action plan.

EDUCATION FOR A BETTER FUTURE

Multidisciplinary Life Sciences education

We educate students to be widely deployable veterinary professionals, applying their knowledge in veterinary practice and beyond in various roles. Together with the Faculty of Science and the Faculty of Medicine, we will offer multidisciplinary Bachelor's and Master's programmes. We will attract a more diverse student population by opening up our Master's programme to students from abroad and from other disciplines.

Cooperation, innovation and lifelong learning

We will invest in community engaged learning and continuing education as a means to bring together education, veterinary practice and society for knowledge exchange. We will capitalise on innovative education methods such as skills labs, plastination and digital microscopy, and join forces with international partners to co-develop programmes and create opportunities for staff and student exchanges.

IMPACT OF RESEARCH AND INNOVATION

Attracting talent with excellent research

Our clear research profile and our leading role in consortia such as Exposome NL or RegMedXB help us attract new talent and funding. We will provide researchers with the support and space they need to attract competitive research funding. We will evaluate the quality of our research based on the renewed Dutch universities' standard evaluation protocol and the principles of Open Science.

Impact through multidisciplinary cooperation

With our research in the areas of One Health, One Medicine and Veterinary Biomedicine, we contribute to making the United Nations Development Goals a reality. We help combat global diseases affecting animals and people, we improve animal health and wellbeing, develop solutions for sustainable agriculture and seek ways to enhance the quality of our rural and urban environments. We aim to expand existing cooperation with Utrecht Science Park partners such as the Hubrecht Institute and the National Institute for Public Health and the Environment (RIVM), and within consortia such as the Netherlands Centre for One Health (NCOH). And we will identify new opportunities for strategic cooperation at regional, national and international level.

EXCELLENT PATIENT CARE

Teaching hospital at the heart of a broad network

Our academic veterinary hospital will act as a teaching hospital, representative of veterinary practice in the Netherlands, where students work towards clinical day one competencies in an academically solid manner. Excellent customer relations and partnerships with external veterinary care providers will position the hospital firmly at the centre of a veterinary network of referring clinics, educational and clinical care partners.

Top referral care and research

The hospital will provide cutting edge specialist care to patients from referring veterinary practices. We have selected a set of distinctive focus areas, including locomotion, reproduction, oncology and the Expertise Centre Genetics of Companion Animals (ECGG). With its academic approach and unique patient population, the hospital will attract partners for clinical and translational research, both from the Netherlands and abroad. ■

TEXT: CARIEN DUISTERWINKEL | IMAGE: LISANNE ROTH

OUR RESEARCH FOCUS



ONE HEALTH

Healthy people,
healthy animals,
healthy environments



ONE MEDICINE

Fostering human and
animal health through
innovative treatments



VETERINARY BIOMEDICINE

Improving animal welfare
& health



New linear accelerator for animals with cancer

The Faculty of Veterinary Medicine is the only place in the Netherlands where animals with cancer can be treated with a linear accelerator. The recently installed accelerator will help reduce the number of treatments necessary to fight cancer in animals.

Cancer is the number one cause of death in humans and animals. For some forms of cancer, radiation with a linear accelerator is the only treatment option. Radiation is effective, but treatments remain stressful for the patient. In human radiotherapy, work is now being carried out on less intensive treatment processes with a lower treatment frequency, but a higher dose. Of course, administering such a dose requires great precision.

For animals, the impact of radiation is perhaps even greater, because sedation is required. The new accelerator will allow the number of treatments for animals with brain tumours to be reduced from 16 to just 10, and hopefully fewer still in the long term. With the arrival of the new accelerator, veterinarian researchers can start working towards this goal, while continuing their efforts to optimise existing radiation routes. ■

TEXT: JOSIEN JACOBS | IMAGE: BRAM PETRAEUS



The purchase of the linear accelerator was possible thanks to contributions from Elekta, UMC Utrecht, Leiden UMC and the animal welfare foundations, Stichting Het Waardige Dier, Stichting Abri voor Dieren, Stichting D.O.G. and Stichting DierenLot.

‘A livestock farmer who switches from calving to mealworms immediately has fewer emissions’

Regional Deal Foodvalley: collaboration for sustainable livestock farming and healthy food

Eight municipalities, three knowledge institutions, farmers’ organisation LTO-Noord and the regional water board have concluded a deal: they will collaborate on sustainable farming and awareness about healthy food. Dick Heederik of Utrecht University and Henk Kievit of the Christian University of Applied Sciences in Ede are enthusiastic about the approach of Regional Deal Foodvalley. ‘We face a considerable challenge, but we are confident we can do it.’



‘Without the farmers, we won’t make it’, says Henk Kievit. He is a professor at the Christelijke Hogeschool Ede, lives in Barneveld and is surrounded there by millions of chickens. Kievit regularly has contact with farmers in the area. ‘We want to involve seventy farmers from the provinces of Utrecht and Gelderland in the deal. They are important. They must help to come up with solutions, test these and ultimately implement these.’

Dick Heederik, Professor of One Health Risk Analysis at the Faculty of Veterinary Medicine is coordinator of one of the three major projects part of the deal. The part of the Regional Deal Foodvalley that Heederik and Kievit are working on encourages sustainable forms of livestock farming. The aim is to increase biodiversity, clean air and water and reduce emission of nitrogen and particulate matter. One way of doing that is to increase the use of feed produced in the region. The programme involves 14.6 million euros of subsidies.

In the media, we often see discontented farmers.

How is the collaboration going?

Kievit: ‘The farmers are keen to collaborate. However, we do not impose any measures on them like Carola Schouten, Minister of Agriculture, Nature, and Food Quality, did with the protein measure. That does not work and upsets the farmers - and with reason.’

Heederik: ‘Back then, the Minister interfered with the details of how farmers should run their business.’

Kievit: ‘That is why we, together with

farmers, search for solutions and sustainable production techniques. We start with the individual livestock farmer and subsequently Dick and his team analyse the effects at a wider level.’

What exactly are you going to do?

‘The livestock farmers set to work on sustainable production techniques, and we subsequently analyse the effects of the changes made’, explains Heederik. ‘What happens with the outside air, the health and wellbeing of the animals and the quality of the soil? It is important that we do not measure just one outcome, but all possible effects. That will prevent us from solving one problem, but causing another one elsewhere.’

‘The livestock farmers can also inspect the data’, adds Kievit. ‘That way, they gain direct feedback about their actions.’

Do you have an example of such a sustainable production technique?

‘Take the use of waste streams from hospitals and care institutions for animal feed’, says Heederik. ‘Insects eat that waste and the chickens can subsequently eat the insects or the insects can be used to produce protein containing products for cattle. By making use of waste streams and local feed streams, we hope to limit import of large quantities of soy from South America and Asia. We are doing everything possible to reduce the ecological footprint. Such adjustments to the feed not only have potential consequences for emissions but also for animal health and welfare,

to name two examples. Livestock farming is a complex matter. I think this collaboration is the only approach that offers the solutions needed to provide livestock farmers with a future.’

‘Another possible option is livestock farmers switching from cattle to insects’, continues Kievit. ‘They then immediately have lower nitrogen, particulate matter and ammonia emissions. And they can sell the insects as feed.’

What is your role within the Regional Deal Foodvalley?

‘My most important goal is to make the knowledge from this project available to the farmers who are not participating in it’, answers Kievit. ‘Seventy farmers are taking part, but there are more than 45,000 livestock farms in the Netherlands. We also want to involve the residents of the region and provide policy recommendations for the two provinces involved, as well as the Ministry of Agriculture, Nature and Food Quality.’

What do you think is the biggest challenge?

‘Getting the farmers to adopt a learning mode. They’re working hard on their own farm, and farmers learn from other farmers. We therefore need to create an enthusiastic group of front-runners. They can then get the rest to follow suit. Livestock farmers also need to see that unity is strength. And with that, I don’t just mean joining a tractor convoy to a protest in The Hague, but jointly developing new knowledge just like farmers used to do forty years ago.’

'We hope to reduce import of for instance soy by making use of local waste streams and feed streams'

How will you ensure that livestock farmers can earn a decent income?

Kievit: 'We will work together with them on the business models. One livestock farmer might have a small plot on which he can start a mini camping site, and another could culture locust colonies. However, what plays a role in all of these cases is the succession problem among livestock farmers. Therefore one of our objectives is to ensure that, in ten years' time, we still have viable farms in this area with a resilient future.'

It sounds like a fantastic project. But isn't more needed to tackle the problems in livestock farming?

Kievit: 'You're right. We cannot

solve the problems with sustainable production techniques alone. Such a solution would also require a change in consumption patterns and reduction of exports. And this is already happening. A growing number of people are becoming vegetarian, flexitarian or vegans.'

Heederik: 'We want to make livestock farmers more aware of the changing demands of the consumer. As a result of this, some livestock farmers will produce specific niche products such as kefir, or sustainable, high quality cheese, dairy, eggs or meat.' Kievit: 'Sharing knowledge with the farmers is also a part of the project. During the workshop, we allowed an egg farmer to stand next to the egg rack

in a supermarket for half a day to ask consumers how they chose which eggs to purchase.'

The integral approach is fantastic, but it also seems rather ambitious.

'Yes, we face a considerable challenge', says Heederik. 'But we're also confident about the project, and partners share a spirit of cooperation. Perhaps you should go and visit a few farmers after a while to hear how things are going?' ■

TEXT: ROSAN REUSKEN | IMAGE: ISTOCK



International students

Studying Veterinary Medicine in Utrecht

Nowadays, the veterinary profession has a far more international character. Colleagues and clients have various backgrounds. Globalisation has led to complex global problems in the area of animal health and welfare in relation to the living environment. Attracting international students contributes to an ambitious international educational climate and prepares students for the future.

What makes our programme attractive to international students? What is it like to come to the Netherlands and to study at the Faculty of Veterinary Medicine? We interviewed four students.

INTAKE OF INTERNATIONAL VETERINARY STUDENTS

The board of the Faculty of Veterinary Medicine has decided to make places available in the Master's Veterinary Medicine, programme Farm Animal Health and Veterinary Public Health, for students studying veterinary medicine at a European institution. These international students are eligible for admission after they have successfully completed the "Prep course Farm Animal Health and Veterinary Public Health" given in English and they have satisfied the language requirements.

More information about the "Prep course": www.utrechtsummerschool.nl

More information about the Master's degree Farm Animals and Veterinary Public Health: www.uu.nl/masters/en/farm-animal-health-and-veterinary-public-health



'Dutch people are quite direct. In Suriname, we try to soften things a bit'

Zainab

I grew up on a large plot. We had a lot of animals at home. Lots of animals are “dumped” in Suriname, and we took these animals in. At school, I was interested in studying medicine. Via an international study grant, I found out about studying veterinary medicine in the Netherlands. You cannot study veterinary medicine in Suriname. I considered going to Trinidad or Brazil. Unfortunately, it was not easy communicating with the institutions there. After an online orientation, I contacted Utrecht University, and suddenly things fell in place. Everything is so well arranged here. I really enjoy the programme and the education provided is very good. It is easy to make contact with the lecturers, they explain things well and they're willing to help you. My first year in the Netherlands was hard. There were moments I burst into tears. You don't have friends and family close by anymore. The switch from high school to university is pretty difficult because everything is so different. For example, I had never worked in an electronic learning environment. Plus I also had to get used to the food, the temperature and the culture. Dutch people are pretty direct. In Suriname, we try to broach a subject more gently. However, now I've found my feet. I hope that other international students also have the opportunity to study here.



'Lecturers know exactly at what level you are, and what you still need to learn'

Lucia

I originally come from Italy, and I've lived in Germany since the age of 19. There I trained to be a professional rider because there no places were available on the veterinary medicine course. I chose Utrecht because I had a good feeling about the personal contact. Subsequently, a private tutor taught me Dutch in a few months. The switch to the Netherlands was not easy. I had to get used to the Dutch mentality, speaking Dutch every day and, because the textbooks are in English, the constant switching between languages. However, now I feel completely at home at the university and the horse clinic. I now really belong here, and I am active in the student council, the Master's representative group and in the student society Hygiea. It's amazing what we can learn here. From an early stage in the course, you learn to look at the animal, to handle it, and you can do clinical research on patients. The theory is linked to the practice, which I find very important for the learning process. Lecturers know exactly which level you are at and what you still need to learn. They support you until you can do that. I do not want to be an all-round vet. I want to know a lot about a specific area and become a specialist, for example in surgery orthopaedics. So once I've graduated, I will first of all apply for an internship.



'At my first lecture, I thought: I'm never going to make it'

Andreas

I was born in Germany grew up in Greece. There is an enormous gap between how animals are treated in Greece and how they are treated in the Netherlands. Take for example the monitoring of animals in livestock farming and the use of antibiotics. In high school, I realised that I wanted to become a vet, but at that time, Greece was experiencing an enormous economic crisis. As Utrecht University had a good reputation, I eventually chose the Netherlands. During my first lecture, I thought: am I ever going to make it? In retrospect, however, that thought was what motivated me. I wanted to prove that I could do it. I spent a lot of time studying in the first year, and I passed all my exams. During the Master's programme, I also completed the Honours programme. The many facilities, such as the clinic, De Tolakker farm and the collaboration with the University Farm Animal Practice are definitely a plus point. You gain a considerable amount of practical experience. I also see the short lines of communication with the lecturers as something positive. In about a year, I will complete the Master's degree in farm animals. At some point, I want to return to Greece, but first I want to work in the poultry sector, either in research or in the field.



'Alongside my studies, I'm working on Food and Product Safety in abattoirs'

Nadine

My mother is Dutch and my father is Italian. In the Netherlands, I attended the European school. After that, I did a bachelor in biology at the University of Florida, but actually, I wanted to become a vet. Studying to be a vet is very expensive in the US, and you have to be the best student to gain entry to the course. Due to my Dutch background, I decided to return to the Netherlands to study veterinary medicine. I improved my Dutch through self-study. The start of the course was pretty tough. Requesting exemptions was not wise due to the binding study advice and much of the study material, for example about epidemiology, was new for me anyway. Furthermore, I did not know the Dutch university education system, and I had a lot of questions. My mentor group was particularly valuable during that period. Besides the considerable amount of practical experience you gain during your study, I was particularly pleased with the e-learning modules. Alongside my study, I now work in abattoirs together with veterinarians from the Netherlands Food and Consumer Product Safety Authority. I still need to think about what I want to do once I've graduated. ■

TEXT: RENKE BELT | IMAGE: BAS NIEMANS

Horse therapy for veterans with post-traumatic stress disorder

A safe and effective form of therapy, with the help of horses, for veterans with a post-traumatic stress disorder (PTSD). That is what researchers from Utrecht University want to develop. In 2020, research started on the project “Horse Power”, a Faculty of Veterinary Medicine initiative. The Military Mental Health Service (MGGZ) of the Dutch Ministry of Defence is involved in an advisory capacity. The research is being led by Dr Nienke Endenburg and Prof. Col. Eric Vermetten and is being carried out at stables Stal Groenendaal in Bunschoten, the Netherlands.

Urgent need for new treatments

Col Vermetten, attached to Leiden University Medical Center, is a MGGZ psychiatrist specialised in treating psychotraumas. ‘Many military personnel have seen traumatic events during a mission. Sometimes these experiences are so dramatic that the veteran still suffers from this after the mission has been completed. They continuously relive these experiences and the associated anxieties and feelings of powerlessness. PTSD hinders many returning veterans in their everyday lives. There is an urgent need to develop evidence-based treatments to help these veterans, and especially those who are resistant to therapy in the current setting’, says Vermetten.

Welfare of the horse

Dr Nienke Endenburg is a registered psychologist and specialised in the interaction between people and animals. Endenburg: ‘In our current research, we can see that interacting with dogs has a favourable effect on the well-being of veterans with PTSD. However, not everybody can have a dog at home. We have therefore developed a special 12-week trajectory during which veterans in small groups work with horses. The veterans are supervised by experts. We

monitor their physical and mental health. We expect to see a decrease in the PTSD symptoms, an increase in the quality of life and a more positive self-image. In addition, we suspect that the hormone oxytocin will be an indicator of a positive social interaction between the veteran and the horse. The welfare of the horses will also be measured during this project. That will be done, for example, by measuring cortisol and oxytocin. But heart rate variability will also be measured as an important parameter.’

The Horse Power project is being made possible by Friends of VetMed, the charitable fund of the Faculty of Veterinary Medicine. Inga Wolframm, head of Friends of VetMed: ‘There is a considerable need for this project, which is very important for society. Unfortunately, such research is often not yet eligible for funding from the government. Thanks to generous contributions from anonymous donors and funds like the Dr. C.J. Vaillantfonds, the K.F. Hein Fonds and donations from private parties, we can now make a start and help veterans with PTSD. Of course, we hope to receive even more support in the coming period from people and organisations who are committed to the cause of veterans.’ ■

TEXT: JOSIEN JACOBS | IMAGE: LISANNE Rooth





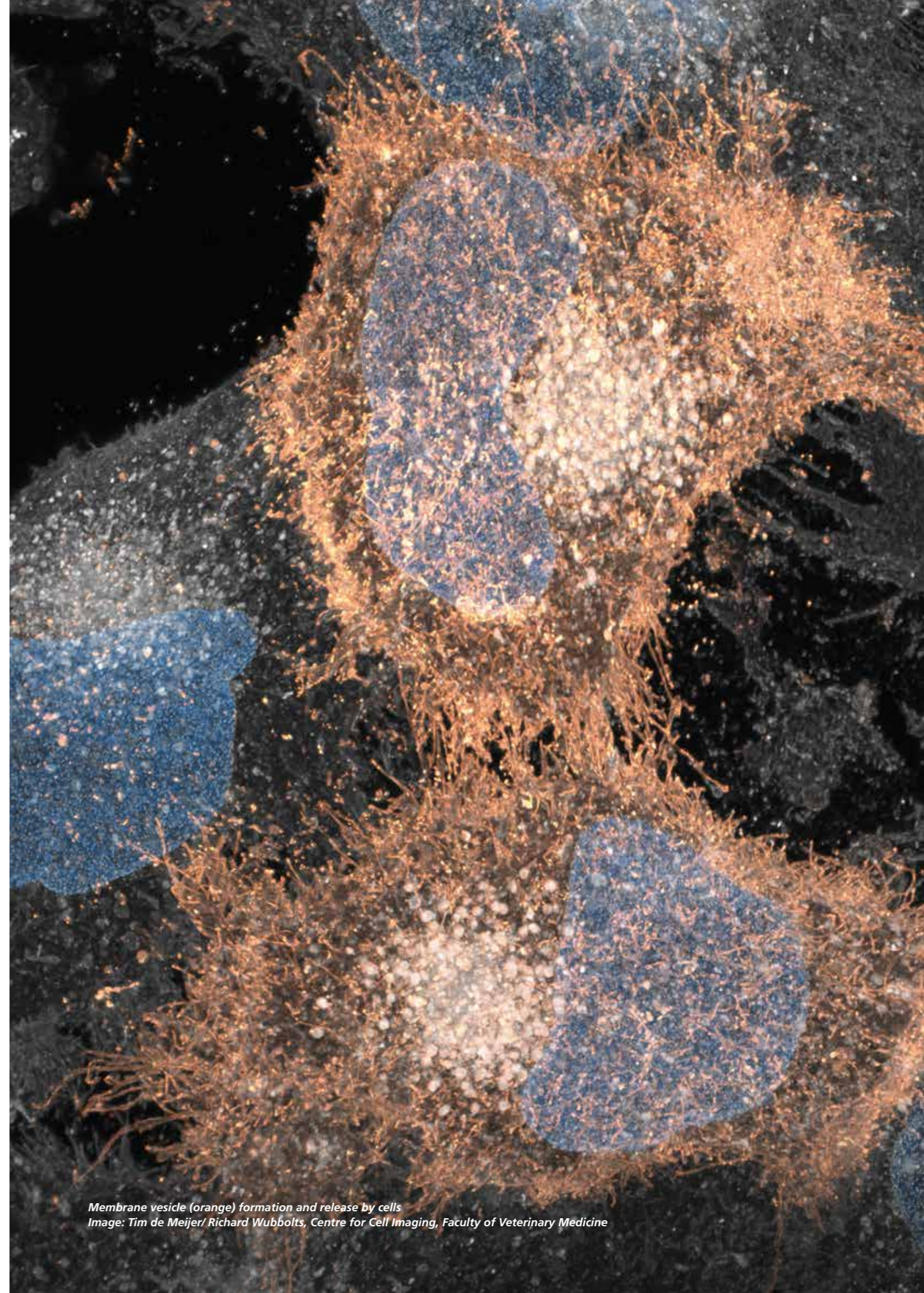
200 years of Veterinary Medicine

2021 marks the 200th anniversary of Veterinary Medicine in Utrecht. A rich history of educating veterinarians and knowing animals. This photo, taken between 1898-1913 when only male students were admitted, pictures veterinary students during an anatomy practical. Times have changed since then, but our curiosity about animals and our dedication to their health, and to human health, remain a constant.

Vesicles with important messages

Marca Wauben and Leon Terstappen talk about the role of extracellular vesicles in cancer

She is a biologist, and he is a physician and biophysicist. Together they are investigating cell vesicles, and especially the role these play in cancer. This has been a booming business for twenty years, and Utrecht is one of the world leaders in this field. An interview with Marca Wauben, immunologist and Professor of Cell Biology at Utrecht University and Leon Terstappen, Professor of Medical Cell Biophysics at the University of Twente. 'To be honest, we don't really understand how cells communicate with each other. Until we know that, we will not understand how biological systems work.'



Membrane vesicle (orange) formation and release by cells
Image: Tim de Meijer/Richard Wubbolts, Centre for Cell Imaging, Faculty of Veterinary Medicine

Marca Wauben and Leon Terstappen have been working together for more than five years on research into cell vesicles in cancer. They both come from the province of Limburg in the south of the Netherlands, know each other well, and they share their passion for extracellular vesicles. What do these biologically important vesicles do in the communication between cells? Which kinds of vesicles are there, and what is their function? Wauben mainly looks at their role in controlling the immune system, whereas Terstappen focuses on vesicles excreted by cancer cells. The more of those you find in a

cancer patient's blood, the worse the prognosis, the biophysicist discovered years ago. But more about that later.

What exactly are cell vesicles?

'Extracellular vesicles are "tiny sacs" that are excreted by cells', explains Wauben. 'Extracellular means outside the cell. Therefore cell vesicles not only regulate transport mechanisms in the cell, but they also transfer messages

'I am the apostle for the extracellular vesicles.'

between cells. They ensure that biochemical processes work well. That transport system in the cell has already been described in biology and was also awarded a Nobel Prize.'

Are they like tiny balloons that transfer messages from A to B?

'Yes, they are effectively tiny spheres surrounded by a layer of fat. These spheres contain proteins, genetic material and sugars; all of the building blocks a cell needs for biochemical processes. Via vesicles, these building blocks are transported from A to B inside the cell, but also outside of it.'

In her lectures, Wauben often compares the function of the vesicles to the car industry. 'If you want to produce a car, then the parts are often made in separate factories specialised in one of those parts. Such a semi-finished product then goes to the next factory and, eventually, everything comes together. Cell vesicles play a role in transporting semi-finished products in one factory in the cell – an organelle – to another factory. They pack the products well to protect these, attach an address code and sender's address and send the vesicle to the next factory. It's a highly efficient transport system

'If you can keep the system in balance, then you can turn cancer into a chronic disease'

to get stuff to the right place in good condition.'

You talk about transport mechanisms in the cell, but extracellular means outside the cell?

'That's correct, these vesicles are mainly known for transport in the cell, but

since the 1960s we have also learned that vesicles can be excreted by cells into the surrounding environment. They then become extracellular. For a long time it was thought that this only happened in culture dishes or that vesicles were merely tiny waste containers from the cell. It took a very long time before the biological activity of the vesicles came to light. That is what makes this research new.' 'There are indeed many vesicles that neatly tidy up waste, just like in dustbin bags', adds Terstappen. 'The problem is that at present we cannot see which is which. Which vesicles are there exactly



Leon Terstappen,
Professor of Medical Cell Biophysics at the University of Twente.



Marca Wauben,
Immunologist and Professor of Cell Biology at Utrecht University

and what is their function? That is what we want to investigate now.' There are also cells that tidy up the dustbin bags. 'If you put dustbin bags outside and these are not collected, then you do not have a sustainable system', says Wauben. 'And in biology, systems are always set up in such a way that they seek to achieve a balance. We call that homeostasis; keeping an organism's internal environment in balance.'

So there are basically two categories: transporters and dustbin bags?

'No, far more', they both answer at once. 'And it is anybody's guess how many. You can see that now with COVID-19 as well', says Terstappen. 'People are dying because the immune system gets knocked off balance and can no longer regulate itself. These vesicles probably play an important role in that too. So there are cell vesicles that disrupt the balance of the system, but also vesicles that restore the balance of the system again.'

In fact, you could say that they have a vital role for the cell and organism?

'Yes, for both people and animals', says Wauben. 'But plants and bacteria excrete these vesicles too. All living organisms make use of communication via extracellular vesicles. I see it as a new dimension in cell biology. That insight is missing in many textbooks, but it is a new field that yields knowledge about how biological systems communicate with each other. And it is a booming business worldwide.'

'People travel here from around the world to sort and distinguish vesicles using our facility'

Terstappen: 'Hormones are relatively simple and do not need to be packaged in vesicles to ensure they survive. But RNA, such as micro-RNA, is immediately destroyed in the blood. Similarly, some medicines also need to be given a thick coating to prevent them from being destroyed in the stomach. Not all particles can be transported without taking protective measures. The problem is that we do not know which messages are contained in which vesicles. And there is such a large diversity that we do not know which vesicles do what.'

How did you discover that some vesicles transfer messages from cancer cells?

'I come from the field of cancer research and was busy working on detecting tumour cells in blood', says the oncologist. 'I observed a lot of small vesicles, and when I examined these more carefully, I discovered that these vesicles exhibited a very strong correlation with the outcome for the patient. If the blood contained a lot of these vesicles, then the person usually died very quickly; the more vesicles, the more aggressive the tumour. Therefore the number of vesicles is an indicator for the severity of the disease.' 'Blood normally only contains blood

cells, no epithelial or cancer cells', continues Terstappen. 'However, our markers exhibited cells that had to have come from a cancer cell because I could see that from their membrane proteins. However, they were too small to measure. At that time, we started a Perspectief research programme from Technology Foundation STW (now NWO Applied and Engineering Sciences) to develop techniques that would allow us to study the vesicles better and to understand what these look like. Now we want to examine exactly how they are formed, to which cells they are transported and which function they have in cancer.'

Differently coloured marbles

'You need to see it as follows', adds Wauben. 'In the blood, you have a bag with differently coloured marbles. These marbles are the different types of vesicles, and these all come from different cells. On the vesicles are markers that you could use to determine which cell each vesicle comes from: a sort of sticker of origin. Leon has identified several characteristic molecules on tumours that are also found in some vesicles in the blood. Of the millions of vesicles in the blood, a few therefore originate from the tumour. If the technique can be made accurate enough, then we can examine these individually.'

Which technique do you need for this?

'At the Faculty of Veterinary Medicine, we have a very good system for measuring individual vesicles: high-

resolution flow cytometry', says Wauben. 'People travel here from around the world to sort and distinguish vesicles using this facility. I can honestly state that we are one of the few labs in the world that has this expertise. But we are always working on improving our system. We are also increasingly aware that there are still even smaller vesicles that we cannot yet identify properly. Therefore, we need to continuously hone the existing techniques and develop new techniques to properly describe the allocation and composition of these particles. They contain very complex messages; nature is so ingenious that it does not communicate

with a single molecule. So there are an infinite number of variables. That makes the field extremely complex.'

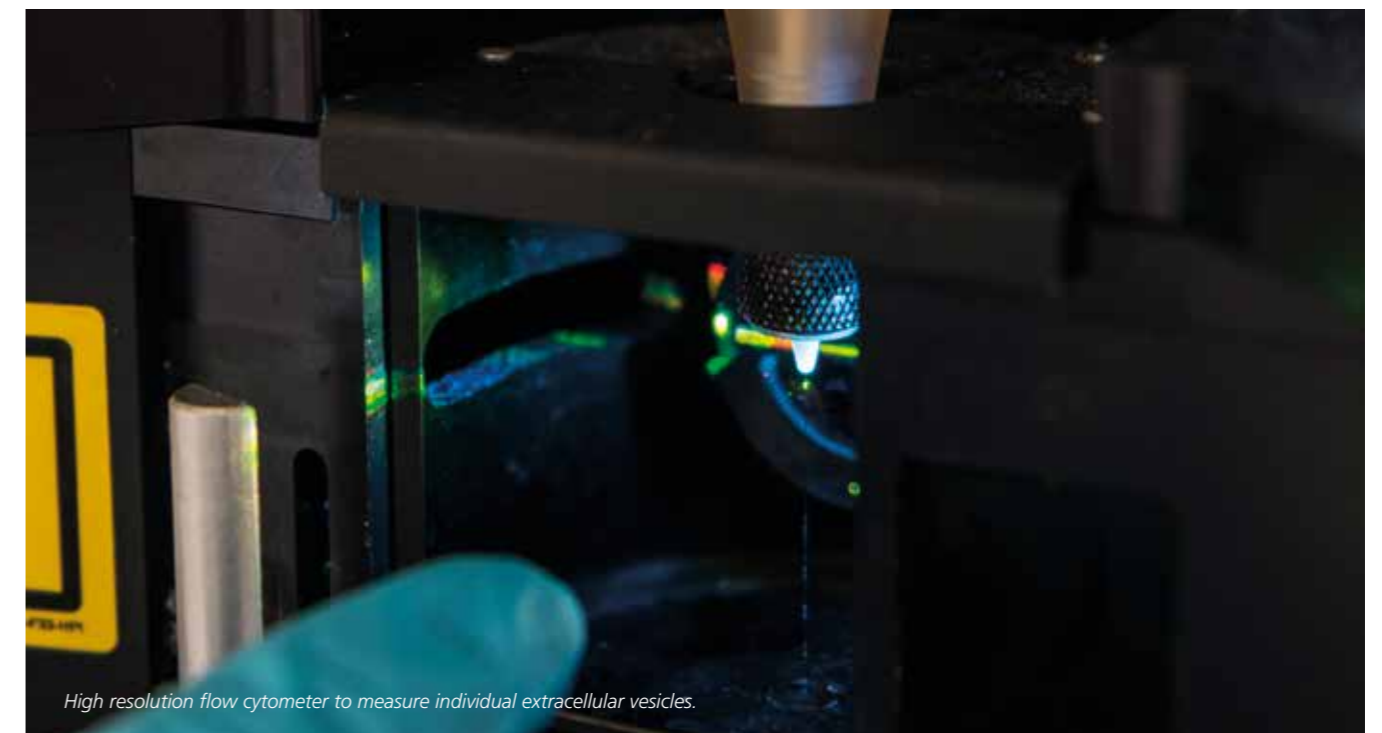
What is your dream?

Terstappen: 'I hope to be able to prevent cancer, at least its spread. That's what I want to work on. If you can prevent metastasis, then people will no longer die from cancer. People with AIDS are also not cured, but they do still live. That is what matters the most. Then cancer would become a chronic illness.'

Wauben: 'My big dream is that I understand how extracellular vesicles control the biological system. As a

biologist, I want to understand how homeostasis works in a system. If you can keep the system in balance, then you can turn cancer into a chronic disease. But you can also deal with infection pressure such as during a COVID-19 pandemic, or problems in your environment due to pollution. In all these cases, you need to know how the system keeps itself in balance. My motivation is to gain insight into that. I am the apostle for the extracellular vesicles.' ■

TEXT: MYRNA TINBERGEN | IMAGE: GUS VAN OUWERKERK, BAS NIEMANS, LISANNE ROUTH



High resolution flow cytometer to measure individual extracellular vesicles.

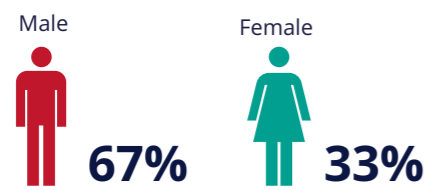


Utrecht University

Veterinary Medicine

Facts & Figures

Professors



435
Researchers

520

Publications
in scientific
journals
in 2019

The only veterinary
faculty in the
Netherlands

Accredited in:

Canada (CVMA)
USA (AVMA)

the Netherlands (NVAO)
Europe (EAEVE)

Students

Bachelor's students

745

Master's students

745

Alumni

>9000

100%

of Master's alumni
employed within a year
after graduation (based
on sampling of 2017
graduates)

94%

of Veterinary
Medicine alumni
recommend studying
at Utrecht University

PhD
candidates

165

International
44%

Dutch
56%

QS World
University Rankings
Veterinary Science
2020

4

Ranked
#4

Friends of VetMed



€2.5
million raised to date

University animal hospital

Companion Animals:

>10.000
cases treated annually

Working with

400 livestock farms
through the University Farm
Animal Health Practice

Equine:

>7.000
cases treated annually

Veterinary education partners

100
Veterinary clinics

‘Any discoveries made using public funding must be available to all’

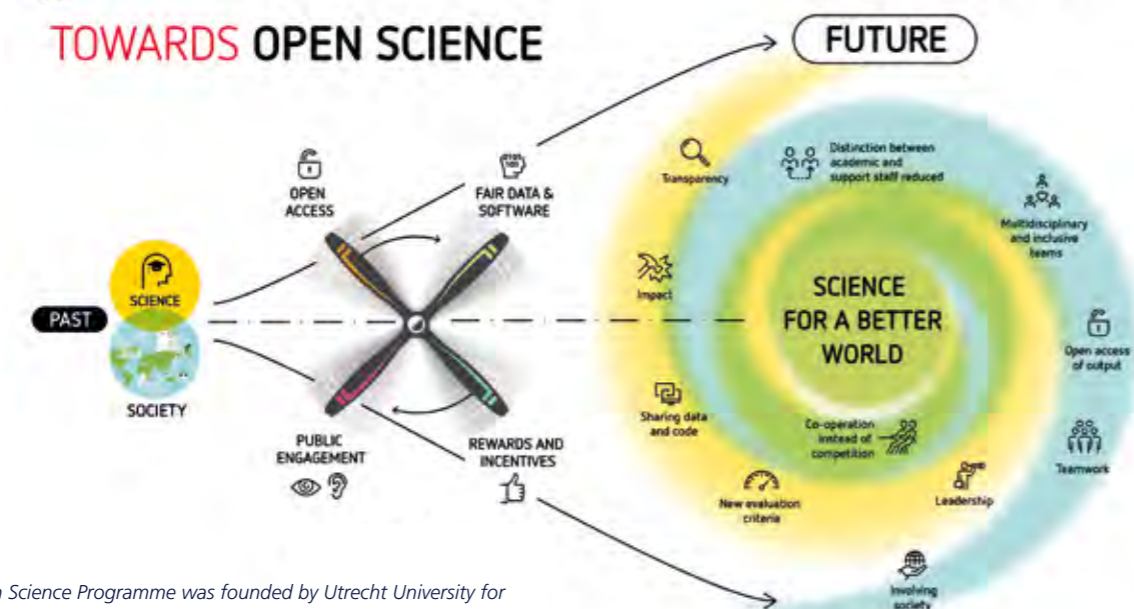
Towards Open Science

Femke Broere is Professor of Infectious Diseases and Immunology at Utrecht University and a member of the Utrecht University Open Science Platform. She is committed to promoting Open Science within the university and beyond.

What is Open Science?

‘The underlying principle of Open Science is to integrate science and society: any discoveries made using public funding must be available to all. One of the cornerstones of Open Science is ensuring publications are available free of charge, known as “open access”. Utrecht University has clear ambitions: all publications by UU academics must be

open access by 2021. As it now stands, researchers in poorer countries are at a particular disadvantage in that they are frequently unable to access academic journals from major publishers.’
 Last May, Elsevier and the Dutch research institutions launched the world’s first national open science partnership. The partnership agreement includes services for the publication of and reader access to academic and scientific content and sets out the development of open science services for the valuation and dissemination of knowledge.
 ‘In addition to making articles themselves open access, it is also vital that the data on which research is based – including the methods used to collect and analyse the data – be made available to others as well. This makes it possible for others to reuse the data in new research.’



The Open Science Programme was founded by Utrecht University for the purpose of encouraging and facilitating researchers in putting Open Science into practice.

‘With Open Science, we want to make science more open, more reliable, more efficient and more relevant.’

Does that alter the role of academics?

‘No one can do everything. Who can say they are an excellent researcher, inspiring manager, enthusiastic researcher and are also capable of explaining things in a fun way on a children’s television programme? And why would we want someone to be able to do all that, anyway?’
 Broere feels that the transition to Open Science calls for a new way of evaluating research and researchers. ‘We need to start evaluating individual academics based on more than just their number of publications, and at the same time, shift our emphasis to achievements made as a team rather than through the work of a single leading researcher.’
 Stakeholders both in the Netherlands and at an international level are hard at work on a new model, Broere explains. For instance: thousands of parties, including the Association of Universities in the Netherlands (VSNU), the Royal Netherlands Academy of Arts and Sciences (KNAW), the Dutch Research Council (NOW) and Utrecht University, have signed the San Francisco Declaration on Research Assessment, a global initiative aimed at decreasing the reliance on publications and citations as a means of evaluating research and researchers. Major financial backers such as the EU and NWO already require academics to openly share their results – another contribution to the goal of Open Science.

Has the COVID-19 pandemic actually increased momentum?

‘An incredible need for scientific insights are in high demand. The Dutch government bases its coronavirus-related policy on current scientific knowledge that is being openly shared. While the Dutch National Institute for Public Health and the Environment (RIVM) naturally conducts a great deal of research on its own, a large quantity of additional knowledge from other institutions is now becoming immediately available as well. Take for example data concerning the usefulness of personal protection equipment in veterinary practice and the likelihood of pets becoming infected with the virus.’
 Major publishers have removed the paywalls around all literature related to the coronavirus, including articles about previous epidemics such as MERS and SARS in 2003. Prevalence statistics are being shared so that scientists all around the globe can work with them.
 ‘You can tell that people are more willing to share nowadays, because there is a tremendous sense of urgency. A new trend we’re seeing now is that scientific studies are being openly shared before having undergone peer review.’
 According to Broere, this has both advantages and disadvantages: on the

one hand, knowledge becomes available more quickly and can immediately be put to use. Yet on the other hand, there is also a chance that a given article will later be retracted if it is rejected during peer review. ‘You have to have faith in other people’s ability to accurately judge the information, which can be quite suspenseful at times.’

How will Open Science affect veterinarians?

‘The Bachelor and Master’s programme focuses quite strongly on evidence-based medicine. During their time at university, students are constantly exposed to new scientific insights. Yet if they go into primary practice after graduation, they will probably no longer have access to academic and scientific publications. Open access will change this: by making the latest veterinary expertise freely accessible to all, vets will be able to apply that knowledge in treating their patients.’

And how will it affect others?

‘Well, a baker might not find an academic text on mathematical epidemiological models particularly useful for their day-to-day work. Nor would I, for that matter,’ Broere says, grinning. ‘You have to share your knowledge with specific target groups in the right way, to ensure that it is both relevant to them while avoiding creating false expectations. That’s why public engagement and outreach is another cornerstone of Open Science. To reach the general public, for instance, we share knowledge via the media, events like the Weekend of Science or science-related television programmes. Policymakers and other parties are in turn being informed in other ways. A good example is the IRAS, the Institute for Risk Assessment Sciences at Utrecht University: the knowledge they generate provides the basis for the Dutch government’s decision-making as to where we should or shouldn’t be building new housing. With Open Science, we want to make science more transparent, more reliable, more efficient and more relevant. The more effectively we share our knowledge with the rest of the world, the greater our positive impact will be.’ ■



Femke Broere, immunologist

TEXT: CARIEN DUISTERWINKEL | IMAGE: STUDIO TURNER AND ED VAN RIJSWIJK (PORTRAIT)

Babies already exposed to hormone-disrupting substances in the womb

Toxicologists Hanna Dusza and Juliette Legler made the cover of Environmental Science & Technology

Amniotic fluid contains numerous unknown chemicals that could disrupt hormone metabolism, discovered PhD student Hanna Dusza and Prof. Juliette Legler, toxicologists at the Faculty of Veterinary Medicine. In December 2019, their research made the cover of the authoritative American Journal Environmental Science & Technology. 'A baby in the womb is exposed to more hormone-disrupting substances than we had ever thought. Our work is an important step forwards in the research into these substances.'

In recent decades, hundreds, if not thousands of synthetic chemicals have ended up in our environment', says Juliette Legler. 'This concerns a wide range of substances. Personal care products, for example, contain parabens and crops and food products can contain pesticides. Furniture is treated with bromine-containing fire retardants and bisphenols.' And there are many more chemicals in numerous industrial and consumer products, states the professor of toxicology. 'Each day, we are exposed to a wide range of chemical substances, and that also applies to pregnant women. And this continues to be so despite the growing body of scientific evidence concerning the harmful effects of these substances on human health.'

Disruption of natural hormones

For a long time, it was thought that the placenta formed a barrier against polluting substances. Further research has shown that numerous environmentally hazardous substances

occur in umbilical cord blood, the placenta, amniotic fluid and meconium. 'Early exposure to hormone-disrupting substances is problematic for the development of the baby', warns Legler. 'These substances can disrupt the body's hormone system, for instance, by blocking or simulating natural hormones. In this way, they can disrupt developmental processes that are very precisely regulated by hormonal signals.' The baby in the womb is particularly vulnerable for exposure to these substances. Furthermore, this exposure is correlated with disorders such as cancer, diabetes and obesity at a later age. Other developmental, reproductive and neurological effects can also occur long after birth.

Storage place for polluting substances

'The research into prenatal exposure to polluting substances and the contribution of these substances to the development of diseases is still in its infancy', says Hanna Dusza, who carried out the PhD research. 'We do not know what many of these chemical substances are and which effects they could have on the developing foetus. Amniotic fluid is a storage place for many polluting substances and is in direct contact with the baby in the womb. Fortunately, we can collect amniotic fluid outside the body and, therefore, in a non-invasive manner. That makes it an ideal matrix to study prenatal exposure.' Dusza developed a new method to detect and describe chemical substances in the amniotic fluid that have biological activity. 'We obtained a wide range of foreign substances

'It is incredibly important to identify these unknown substances and to determine their risk for the baby's health'



ACS Publications
Cover Environmental Science & Technology

from the amniotic fluid. We tested that extract on cells specifically designed for this. These cells produce light when they are exposed to chemicals that bind to hormone receptors, such as receptors for oestrogen and androgen. We found a high production of light in the cells. That points to the presence of chemical substances with a hormone-like effect.' In the amniotic fluid, she also discovered hormone-disrupting

substances from different classes of chemicals, such as parabens, triclosan, PFAS, dioxin, bisphenol A (BPA) and the alternative bisphenol S (BPS). 'This confirms that these substances can penetrate the placenta and that the baby in the womb is exposed to these.'

Other chemical products

'What was really surprising', continues the PhD student, 'was that we could not explain the biological activity if we only took the natural hormones present in the amniotic fluid into account. The known hormone-disrupting substances also scarcely contributed to the total outcome in our cell tests. This means that the remaining biological activity could originate from other chemicals or their metabolites that have not yet been identified. We are trying to detect these in the current research.'

Risk for baby's health

'Our study reveals that during its development in the womb, a baby is exposed to more substances with potentially hormone-disrupting effects than we ever thought', concludes Legler. 'It is incredibly important to identify these unknown substances. Then we can determine the risks for the baby's health and take measures to reduce the exposure.' ■

TEXT: MYRNA TINBERGEN | IMAGE: ACS PUBLICATIONS



Professionals during a Herpetology course

Lifelong learning

Paving the way for easily accessible and broadly recognised veterinary continuing education

In addition to Bachelor's and Master's programmes, Utrecht University increasingly offers education to professionals, from short courses and workshops to extensive programmes.

Daniela Salvatori, Professor of Comparative Anatomy and Physiology, was recently appointed Director of Professional Education at the Faculty of Veterinary Medicine.

Meanwhile at European level, the demand for accessible and widely recognised continuing education is also rising. Lidewij Wiersma is CEO of EBVS, the European Board of Veterinary Specialists.

Jimmy Saunders is former President of the EBVS and current President of VetCEE, Veterinary Continuous Education in Europe. We spoke to these three veterinarians about the changing landscape of continuing education.

Why is continuing education important?

Salvatori: 'As our Utrecht University Dean of Lifelong Learning Wieger Bakker puts it: a university diploma needs maintenance. Continuing education is incredibly valuable for both veterinary professionals and for us as a faculty. Our world is rapidly changing and with that the veterinarian's role. Continuing education is not only a way of sharing new scientific knowledge with the professional field, but also offers us here at the faculty an opportunity to learn from practitioners. Their expertise and the challenges they face are valuable input for our research and education. If through continuing education we can bring science and veterinary practice closer together, we will all benefit.'

Wiersma: 'Putting more emphasis on continuing education will also help further professionalise our sector. Currently, regulation across Europe is fragmented: in some countries, continuing professional development is compulsory for veterinarians, in others it isn't. That means there is no extra incentive for veterinarians, and for clients no way to know if their veterinarian is investing in keeping skills and knowledge up to date.'

'The boundaries between Bachelor's, Master's and Education for professionals will blur'

There are only limited places available for veterinarians who want to become a certified specialist. How is EBVS working on making veterinary continuing education more accessible?

Saunders: 'When it comes to specialisation, the current system throws up quite a few roadblocks. To date, a veterinarian wanting to become an EBVS-approved specialist had only two options: apply for a fulltime three-year residency, or a part-time alternate residency programme lasting up to six years. In some disciplines, there aren't that many vacancies, so candidates end up missing out and we end up with too few specialists.'

Wiersma: 'Being a specialist in training is also a financial sacrifice: pay is often well below that of a regular veterinarian. And it's incredibly hard to fit into your family life. Daniela and I met while working towards our Veterinary Pathology specialisation. I did a fulltime residency, she was in an alternate programme, while working fulltime and raising a kid. Frankly, I don't know how she did it!' she adds, smiling.

Wiersma continues: 'In November 2020, the EBVS Board of Directors approved a plan to introduce what we call a modular pathway towards specialisation. Veterinarians will be able to take separate courses as part of their path towards specialisation, and accumulate credits for each course they successfully complete. Obviously, this

won't be done and dusted overnight. We're looking for partners interested in helping us test out this approach in a pilot phase, so we can finetune it before rolling it out broadly.'

What about continuing education for primary practice veterinarians?

Salvatori: 'There is a lot of interest, but some of the same constraints also apply: veterinarians are hardworking, busy professionals. We need to make sure that the courses we offer fit into their work and family life. Our alumni have a clear preference for blended learning: online and in their own time when possible, face to face with their peers and experts where it adds value. The COVID-19 crisis has been somewhat of a pressure cooker for our ability to offer distance learning. We are now putting those skills to good use while developing new programmes for professionals.'

Saunders: 'We need to develop a vision for a veterinarian's learning path in general. How do we ensure veterinarians, specialist or not, keep their skills and knowledge up to date? The veterinarian's role is changing and expanding and with it how we define the day one competencies of graduates. We are now including concepts such as Artificial Intelligence or One Health into our Bachelor's and Master's

programmes. We teach students the basic knowledge and skills required to be a qualified veterinarian, but they don't have to know all the details the day they graduate. In my own field of radiology for example, I focus on how to interpret images, on the artificial intelligence software they will be using, and recognising common issues such as a tumour or pneumonia. I pay less attention to more complicated thoracic radiographs. If graduates come across such cases in practice, they would want to call in a specialist, or perhaps decide to build their own skills through continuing education.'

Salvatori: 'Exactly. We need more emphasis on professional development of veterinarians in primary practice. Every veterinarian should define their own career path and learning needs. Together with the Dutch Royal Society of Veterinary Medicine (KNMvD), we are discussing whether a professional portfolio might be a way to enable this.'

How will European accreditation help?

Saunders: 'There is a gap in evaluation of veterinary education in Europe: Bachelor's and Master's programmes are accredited by the European Association of Establishments of Veterinary Education (EAEVE). For specialisations, there is the EBVS. But evaluation of post graduate programmes has been lacking to date. That is why veterinary academia,

'We need to develop a vision for a veterinarian's learning path'

specialists and the profession have come together to set up VetCEE, Veterinary Continuous Education in Europe. VetCEE has developed a framework to fill the gap: we evaluate post graduate veterinary programmes. We want to facilitate mutual recognition of those programmes across Europe. In doing so, we hope to provide veterinarians with more opportunities for continuing professional development. But we can't do this alone: regulation is developed at national level. That's why together with the Federation of Veterinarians of Europe, in the first half of 2021, we are reaching out to national veterinarians' organisations and other stakeholders to get them on board.'

Salvatori: 'Accreditation across Europe will also mean that for us at the faculty, it will be much easier to team up with other veterinary faculties and private partners abroad to jointly develop high quality education and make it available to a wider group of interested professionals. We will be able to capitalise on our respective strengths to offer accredited programmes for veterinarians, regardless of their home country.'

What are the next steps at Utrecht University?

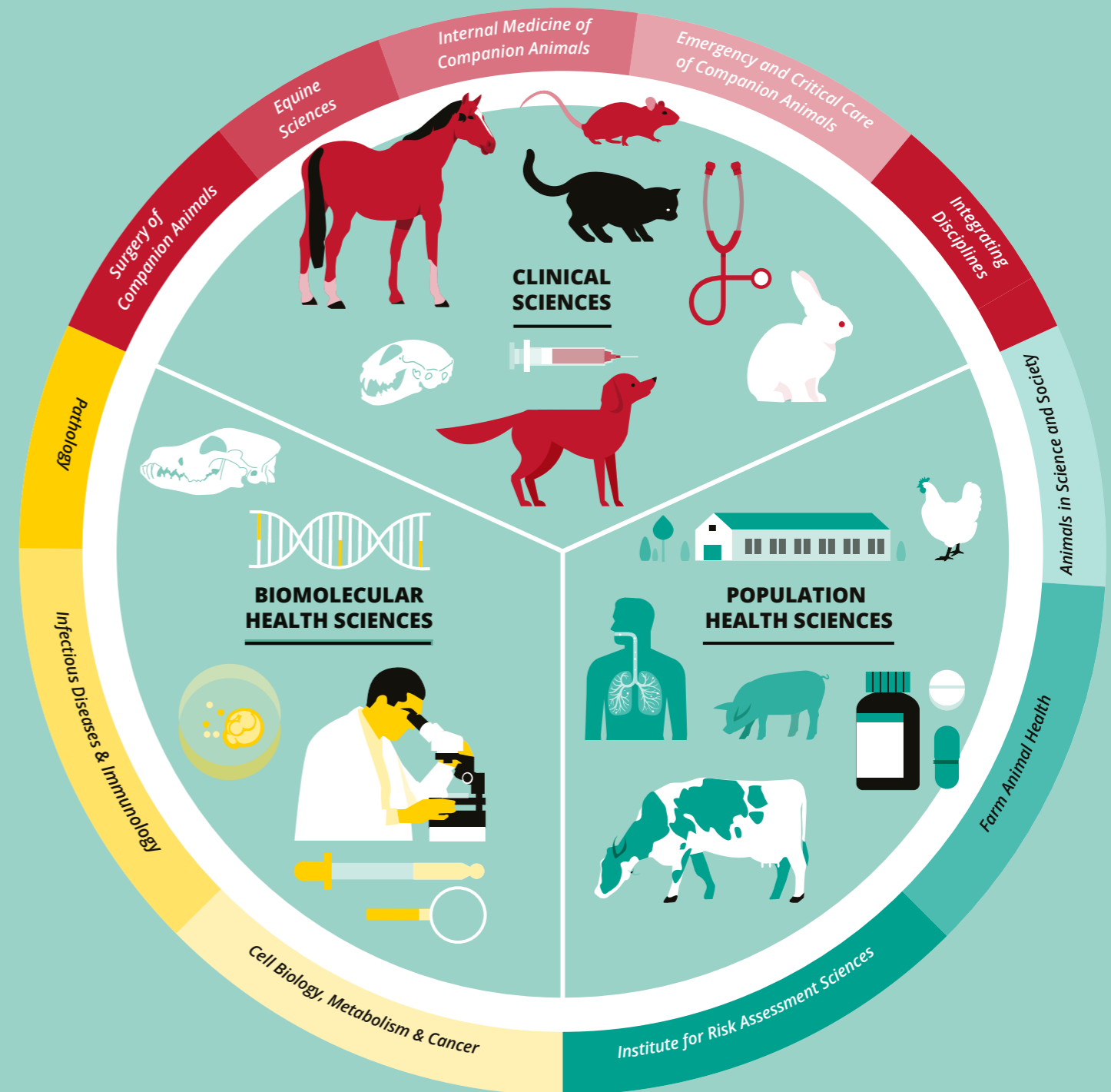
Salvatori: 'In 2020, we started off with a relatively modest set of courses. In the coming five years, my vision is to build a broad offering tailored to the needs

of veterinary professionals. Thanks to digitalisation and other advanced technologies, we can respond well to current developments. On the longer term, my view is that the boundaries between Bachelor's, Master's and continuing education will blur. I see them working as interconnecting cogs. Of course, each programme has its own objectives, and the students and participants from veterinary practice differ in terms of competencies and experience. But they can also learn from each other, which is why we want to facilitate collaboration wherever possible. Our lecturers here at the faculty are unique professionals, who are incredibly enthusiastic about sharing their knowledge. Developments at European level only help steer things in the right direction. It's an exciting space and I have full confidence that we will be able to offer veterinarians the skills and knowledge they need to provide the best possible care for animals.' ■

TEXT: CARIEN DUISTERWINKEL | IMAGE: BAS NIEMANS

OUR ORGANISATION

Together, our 800+ colleagues across three departments work towards one common goal: health and wellbeing for animals and people, in relation to each other and their environments.





Already within one generation the muzzle of a dog can be extended. Here clearly visible in mother (left) and son (right).

‘Pugs’ snoring isn’t as cute as it seems’

Short-nosed dogs that are always short of breath, hairless cats that can’t navigate due to their lack of whiskers and dog breeds that are prone to epileptic fits. The breeding of purebred dogs and cats has led to all sorts of harmful physical features and hereditary diseases. We spoke with Minister of Agriculture, Nature and Food Quality Carola Schouten and veterinarian and geneticist Hille Fieten to discuss their joint efforts towards more sustainable and healthy breeding.

Animal welfare is an important part of her work, explains Minister Carola Schouten. ‘It’s important to me that we treat animals with respect. I’m also seeing the issue of animal welfare pop up in more public debates. We’re all responsible for taking good care of our animals, so I’m glad we’re finally discussing the issue.’

Hille Fieten, what’s your view on the current problems in the pet breeding business?

Fieten: ‘Nearly two-thirds of the animals I treat at the university clinic suffer from a hereditary disease or harmful trait specific to their breed. Those symptoms are difficult to treat. I usually can’t do much to help, but we could have prevented the problems with a responsible breeding policy. As a veterinarian and researcher, I believe the latest developments in genetics can really help us create a healthy pet population.’

‘The Dutch approach is drawing a lot of international attention’

Under Dutch law, breeders must take measures to prevent serious hereditary defects and diseased offspring. Unfortunately, this legal requirement has proven difficult to enforce in practice.

Schouten: ‘Some animals, like short-snouted dogs and short-legged cats, are bred for specific physical traits without any thought for the animal’s health. As it turns out, the law is hard to enforce in practice. We asked the Faculty of Veterinary Medicine’s Expertise Centre Genetics of Companion Animals to formulate workable criteria.’

Fieten: ‘Schouten has taken a very important step in the right direction. The current problems have a long history. Veterinarians and other stakeholders have been sounding the alarm about animal welfare for over forty years now. Until now, the government has always shifted responsibility back to the industry. That didn’t work, and the problems have only gotten worse. I really admire and respect the Minister’s clear-cut approach.’

Still, there shouldn’t be any need for laws and enforcement, right?

Fieten: ‘That’s true, but it turns out we need laws to shake people up and make them take responsibility. For example, breeders and owners seem to have gotten used to the idea that puppies are now born with a C-section, or that certain dog breeds snore because they can’t breathe properly. People tend to think the snoring is cute, but it’s not.’

So what can we do to address the problems, other than legalisation and enforcement?

Schouten: ‘We need a change in mindset. Breeders, the Cynological Federation, dog owners and veterinarians all have a part to play in that regard. For example, veterinarians need to advise dog owners. As Hille just explained, most people aren’t aware of the health issues. Breeders are also responsible for choosing the right breeding stock, and inspectors will have to start prioritising health over appearance.’

Fieten: ‘That’s right. The Faculty of Veterinary Medicine will be playing a leading role in that regard. We’ve now developed the Fit2Breed method to help breeders find the most suitable male for their bitch. It’s basically Tinder for dogs’, Fieten laughs. We also set up the FairDog platform in collaboration with other industry stakeholders. The platform will eventually

help consumers buy a healthy and sociable dog. ‘We’re also seeing lots of new developments in research. For example, we’re developing new DNA tests for hereditary diseases in cats and dogs. We can use them to test breeding stock and prevent hereditary diseases.’

The Dutch guidelines have now been translated into German and English. So how do other European countries view the new guidelines?

Schouten: ‘The Dutch approach is drawing a lot of international attention. I regularly share this information with other member states working to regulate the trade in purebred dogs, so we can learn from each other’s experiences.’



Minister of Agriculture, Nature and Food Quality Carola Schouten and veterinarian and geneticist Hille Fieten

Do you have any pets of your own?

Schouten: ‘I grew up on a farm surrounded by animals, including a dog. That experience taught me that animals are a source of happiness, support and friendship. I don’t have any pets at the moment because I spend so much time away from home. Still, you never know what the future holds.’

Fieten: ‘I also grew up in the countryside. We used to have ponies, cats and rabbits, and there were usually bottle-fed lambs in the spring. Unfortunately we don’t have any pets at the moment. Our cat Belle just died. She lived till 19.5, which is definitely a respectable age.’ ■

TEXT: ROSAN REUSKEN | IMAGE: BAS NIEMANS EN MARTIJN BEEKMAN

What do we expect from a young veterinarian?

Review of the Veterinary Medicine Master's Programme

What makes an ideal veterinarian? That was the first question in the survey about the review of the Master's programme sent out to Veterinary Medicine alumni. About 300 veterinarians completed the survey. Their answer: the ideal veterinarian combines theoretical knowledge with a practical attitude, is empathic, and has outstanding social and communication skills.



The results of the survey are valuable input for the Master's programme review committee under the leadership of Vice-Dean and Educational Director, Merel Langelaar. The committee is developing a revised curriculum from 2022 onwards, based on input from veterinary practice, lecturers and students.

More practical internships, earlier on

The survey shows that besides theoretical knowledge, the internship at a veterinary practice and the internships at the university clinics are aspects of the Master's programme that alumni highly appreciate. But survey respondents would like to see even more practical education integrated into the curriculum. Robert Hendrickx is a Veterinary Medicine student and member of the Master's programme review committee. He just finished his 5 week internship at a veterinary practice and is about to graduate. The outcomes of the survey mirror his own experiences. 'In the current curriculum, the external internship is the concluding part of the three-year Master's programme. Gaining experience at a veterinary practice is very valuable, but I think that students should have this opportunity earlier in the curriculum and more often too. Now, as a Master's student, you might spend three years worrying whether you will be able to vaccinate or palpate; practical skills that turn out to be quite simple. Once you have done it a few times in a first internship, you can then use the next one to focus your attention on acquiring other competencies that proved to be more challenging in practice.'

Interacting with animal owners

One of those challenging elements of the job is, according to the survey, communicating with animal owners. Respondents indicate that young veterinarians have thorough theoretical knowledge and are skilled at clinical reasoning and making diagnoses. However, they struggle with deciding on a particular treatment and discussing the options with animal owners. Owners may not be able to afford certain treatments, or can be in a very emotional state. More attention to communication skills in the programme and more real life experience with it during internships at the university clinic or at an external veterinary practice could help students build competencies and confidence in this area.

Balancing practical skills and academic knowledge

While survey respondents feel that recently graduated veterinarians have solid theoretical knowledge, they are critical about their practical, primary veterinarian care skills. Hendrickx: 'I can understand that, as a vet, you'd prefer to have a new colleague who can hit the ground running. However, veterinary medicine is a university degree programme at a high level, and as far as I am concerned, it is more important to learn to reason clinically than to perform a perfect castration on day one. But this does not mean that a certain basis in practical skills may not be expected from a graduate.'

It's a familiar discussion which seems to pop up time and again, says Langelaar. 'Mastering skills is comparable to getting a driving licence: you have the basic competency to drive on the road, but very few people can genuinely drive well at this stage. You learn that by doing in practice, over time.' It is no coincidence that clinical reasoning and veterinary expertise are and will remain at the top of the list of programme outcomes, adopted in 2018. These outcomes describe the required competencies of students finishing their Master's degree. Langelaar: 'Students learn much more than just how to give a vaccination: what impact does the disease you are vaccinating against have on the animal and humans? How do you deal with an owner who expresses doubts about the usefulness of vaccination? And how do you discuss diseases of pedigree or imported animals with owners, with colleagues but also with policy makers to drive change at national level?'

PROGRAMME OUTCOMES MASTER'S VETERINARY MEDICINE

1. Clinical reasoning and decision-making
2. Individual animal care and management
3. Animal population care and management
4. Veterinary public health/ one health
5. Communication
6. Collaboration
7. Professionalism and professional identity
8. Entrepreneurship, financial and practice management
9. Scholarship

New Master's programme in 2022

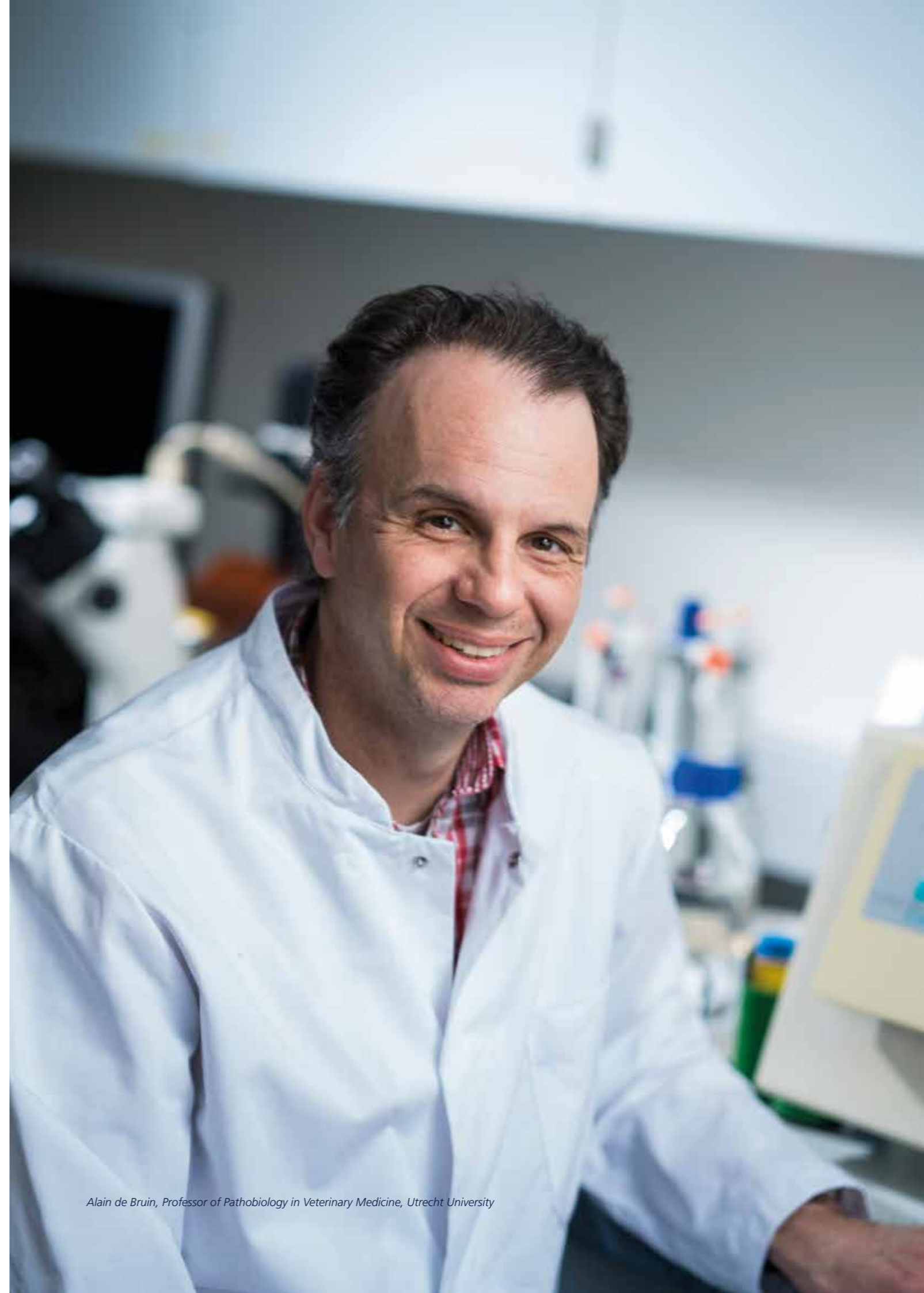
'We can be proud of our programme and our profession. Anyone who completes the Master's programme is an academically trained professional who has many career options, in veterinary practice and beyond. That is already the case today, and will be hopefully even more so after the introduction of the new Master's programme. We will take the results of the survey on board, while developing the new curriculum. That includes the demand for more experience in veterinary practice and attention for communication skills.' The revised Master's programme is expected to start in September 2022. ■

TEXT: CARIEN DUJSTERWINKEL | IMAGE: STEFFIE PADMOS

‘I’m really hopeful that we can develop better therapies for both dogs and people’

Working together on a new treatment for lymphoma

Lymphoma is quite common in dogs, but also in people. Patients are treated with chemotherapy, but the cancer often returns over the course of time. Alain de Bruin, Professor of Pathobiology in Veterinary Medicine, and Monique Minnema, internist-haematologist and Professor of Haematology at UMC Utrecht, want to jointly develop a new therapy against lymphoma. The idea? Combining chemotherapy with a frequently used drug against breast cancer.



Alain de Bruin, Professor of Pathobiology in Veterinary Medicine, Utrecht University

Lymph glands assist our immune system. They are the glands that swell up somewhere in the body if there is an infection, for example a throat infection. The immune system then attacks the infection and tries to suppress the inflammation. That happens with the help of white blood cells, so-called B lymphocytes and T lymphocytes, which die once they have completed their “immune task”.

Never in a single place

However, sometimes this goes wrong and lymphocytes change into cancer cells. That is when lymphoma develops. ‘Lymphoma is a cancer of cells from the lymph glands’, explains Monique Minnema. ‘As a result of one or more mutations, B cells no longer die, and an enlargement of a lymph gland occurs. People feel that as a non-painful lump.’ What makes lymphoma so special is that it is never just in one place. Minnema: ‘Our immune cells are trained to move throughout our body, from your toe to your ear. They

continuously swim through our body and use the circulatory system and bone marrow to do so. Lymphoma can be found at several locations, but usually in the lymph glands, the bone marrow, liver and spleen. We do not usually find it until it has spread to more than one location. It is a systemic disease that we cannot treat locally with radiotherapy or surgery, but only with chemotherapy. That is the only therapy that passes through the entire body.’

Comparable with people

Lymphoma is also common in dogs. Actually, it is the most frequently occurring form of cancer in dogs, irrespective of the breed. ‘The disease is very similar to that in humans’, says Alain de Bruin. ‘In dogs, we also see a clear swelling of the lymph glands, especially in the neck. That is often what we first see in people too. For dogs, we also use chemotherapy to treat this disease.’ Chemotherapy is rarely given at veterinary practices, but usually happens in specialised clinics such as



Monique Minnema,
Internist-haematologist and Professor of Haematology at UMC Utrecht

‘I really had to think carefully before I entered the field of cancer research because it is both tough and emotional.’

the University Clinic for Companion Animal Health in Utrecht. Therefore the veterinary oncologists of the university clinic, Maurice Zandvliet and Erik Teske, see patients with lymphoma relatively often. They play an important role in the research team for cancer therapy.’

New therapy

Minnema and De Bruin are now working together to develop a new therapy for lymphoma. ‘We do not want to do just fundamental research. We would also like to set up clinical studies together’, says De Bruin. ‘We have submitted a joint research proposal for this. In Utrecht, Monique is one of the specialists in this area, and that is why we invited her to take part in this project. We first of all want to set up clinical studies in dogs and, later on, in people too. The dog is a good model for humans.’

‘What attracted me to this research is whether we can translate knowledge about the lymphomas that naturally occur in dogs to people’, says Minnema. ‘That really intrigues me. We mainly work with cell lines, but the results from the laboratory rarely work in people, and that really shocked me. They call that the Valley of Death. As lymphomas in dogs and people are very similar to each other, I see this research as a step towards treating people. Do discoveries made in dogs have a higher chance of succeeding in people? In my view, this is a genuinely unique project.’

Dog as (intermediate) model

The basic cancer research often takes place with mouse models, but they frequently fail to work when translated to humans. De Bruin: ‘Only five to ten percent of the preclinical mouse models can be translated to people. One of the reasons for this is that mice are more or less genetically identical. They live in the same environment and receive the same food, and that means it is relatively easy to find differences in a therapy. However, each person is different in terms of genetics, nutrition and his/her environment. Then it is harder to detect the differences in therapies. Dogs are a good intermediate model: they acquire the same disease spontaneously, are



PET CT scan of a lymphoma patient. A PET CT scan makes use of the increased uptake of glucose by cancer cells. Administering radioactively labeled glucose makes tumours visible. On this scan, on the right, in the patient’s neck and armpit, enlarged lymph nodes are visible, and below the right collar bone, a large tumour. The patient received treatment and has been cured.

'I cannot always keep somebody alive, but we fight together to do so as long as possible and with the best possible quality of life.'

treated in the same manner and live in the same environment as people. Differences in dogs can probably be more easily translated to people, and American studies have already shown that in part. I'm really hopeful that we can develop better therapies for both dogs and people.'

What does your new therapy look like?

De Bruin: 'We want to take the standard treatment for lymphoma and combine it with a drug that is intended to strengthen the effect of the chemotherapy. Chemotherapy causes a lot of damage to the DNA of tumour cells, and as a result of this, the cancer cells die. That mainly occurs in rapidly dividing cells. Cancer cells try to repair the damage as quickly as possible and often become resistant to chemotherapy. This drug inhibits the repair of the DNA damage in cancer cells, as a result of which the DNA damage accumulates and the cancer cells die faster. Consequently, the chemotherapy is more effective.'

What sort of drug is this?

'It is a frequently used drug against breast cancer, the cyclin-dependent kinase inhibitor CDK 4/6. In combination with another therapy, that is reasonably successful. We now want to use CDK 4/6 for lymphoma too. Preclinical studies in cells and mice have revealed that this is effective in combination with chemotherapy: on the one hand, to inhibit cell growth, but also to hinder the repair of DNA damage. Now we want to take the next step.'

'We'll start with a small group of patients, about twenty dogs', continues De Bruin. 'If that works, then we can set up a clinical study for people. Another advantage of this approach is that no experimental animals are required. We can try it out directly on dogs in the clinic, and they will also benefit

from this. Dogs live longer and will perhaps require less chemotherapy.'

Could this combination work with other forms of cancer? 'Most definitely! Especially because chemotherapy is given for many types of cancer. More than hundred studies with CDK 4/6 inhibitors for different types of cancer have been published but never in the combination that we want to try here for lymphoma. That is what makes our project unique for both veterinary medicine and human medicine.'

How did you find each other?

'Inga Wolfram [head of fundraising and manager Friends of VetMed, Ed.] played a large role in that', answers De Bruin. 'Inga came up with the idea of seeking collaboration with human medicine. She also helped with finding the research funders.'

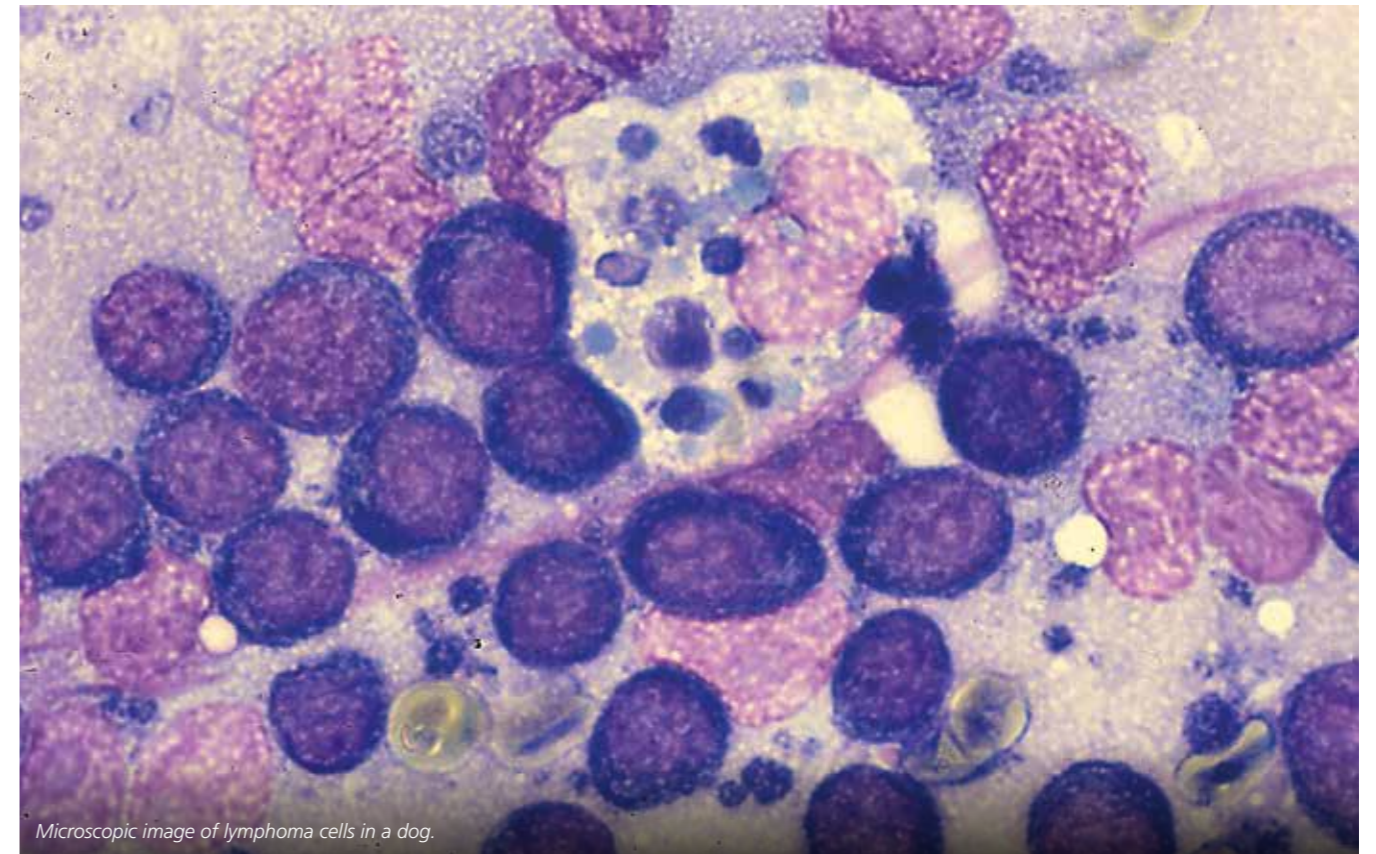
Where does your fascination for cancer come from?

'That did not occur automatically in my case', says Minnema. 'I gained my PhD for research on blood coagulation and then I became an internist and haematologist. I really had to think carefully before I entered the field of cancer research, because it is both tough and emotional. But in the end, I'm really pleased that I chose this discipline. Now I only do cancer research.'

Minnema is fascinated by the huge number of developments in this discipline. 'Sometimes you cannot keep track of how many fantastic results there are; it's like being a child in a sweet shop! Furthermore, you have intensive contact with the patient, and so you know your research is making a real difference. Patients are very motivated for treatment, and I have already known some of them for ten years. You build up an intensive relationship and they know my children by name, so to speak. I cannot always keep somebody alive, but we fight together to do so as long as possible and with the best possible quality of life. It is this deep dimension in the research that attracts me so much.'

Does the same hold for you, Alain?

'I've always wanted to understand how cells divide. Which mechanisms underlie that? I do the research together with Bart Westendorp (cell biologist) and our research team. In



Microscopic image of lymphoma cells in a dog.

'Many people die from cancer. I find it satisfying that through my work, I can contribute to the development of new therapies against this terrible disease.'

the case of cancer, we often see mutations in genes that play a role in cell division as a result of which the cell starts to grow uncontrollably. Why does that happen? Many patients are treated with drugs, but the cancer often returns. Why do some cancer cells die during therapy, whereas other

survive? How does resistance develop? That's what we want to understand. We want to inhibit the repair mechanisms of cancer cells to make the cancer therapy more effective.'

'One in three people develop cancer and many people die as a result of it', continues De Bruin. 'Friends, your family, cancer affects everybody. It is in the public interest that we do something about this. I find it satisfying that through my work, I can contribute to the development of new therapies against this terrible disease.' ■

TEXT: MYRNA TINBERGEN | BEELD: IVAR PEL, CHRIS VAN KESTEREN, UMC UTRECHT, FACULTY OF VETERINARY MEDICINE

Death toll of North Sea porpoises revealed

More than 16,000 dead harbour porpoises, including 2600 on UK beaches, have been found on Europe's coastlines around the North Sea since 1990. This is according to a new international study led by Utrecht University in the Netherlands and involving the Scottish Marine Animal Stranding Scheme (SMASS), part of Scotland's Rural College. The study showed a significant rise in the annual number of strandings in areas on the south of the North Sea since 2005, while numbers were relatively stable in northern regions. The increase in the south corresponds with an increase in sightings of live animals in this region, but it is not entirely clear what has caused the consistent steep increase in strandings.

The study, the findings of which have been published in *Biological Conservation*, included harbour porpoise strandings from five countries over 28 years, with dedicated stranding schemes from Scotland, England, Belgium, the Netherlands, Germany and Denmark all contributing data. It was commissioned by Rijkswaterstaat (Dutch Directorate-General for Public Works and Water Management) as part of its Offshore Wind Energy Ecological programme (WoZEP), a research programme addressing the knowledge gaps relating to the effects of offshore wind energy developments on the marine ecosystems of the North Sea. Lonneke IJsseldijk, principal investigator of the research, said: 'The harbour porpoise is the most abundant species of cetacean in the North Sea. Most countries hold records and investigate strandings of the species at a national level, but harbour porpoises are a highly mobile species and move independently of these national borders. It therefore makes sense to examine these data at a scale that is ecologically relevant, and collate data from all individual countries for a population-level overview.'



Appointed professors 2019/2020

Harold Brommer
Equine Surgery

Merel Langelaar
Policy and Impact in Veterinary Medicine

Sjaak de Wit
Integral Poultry Health

Cécile van Els
Vaccinology

Daniela Salvatori
Comparative Anatomy and Physiology

The study examined seasonal and inter-annual variation in stranding numbers across the North Sea area. The seasonal pattern in stranding frequencies was different for different regions, yet was consistent throughout the 28 years covered by the study. Variation in stranding frequencies can be driven by a number of factors including variation in abundance, distribution and mortality of animals. To shed some light on the potential drivers for the different patterns found in the study, researchers looked at biological parameters of the stranded individuals.

Like all cetaceans, harbour porpoises are a protected species in European waters, but are notoriously difficult to monitor. Mariel ten Doeschate from SMASS and co-led in the study said: 'Harbour porpoises are one of the smaller and more elusive species of cetacean. Animals most commonly live alone or in small groups and spend very little time at the surface. This means that they are a particularly difficult species to monitor, and gathering information on even the most basic population metrics is very challenging.'

Surveys of live animals are being done to try to estimate abundance and distribution of the species, but these are often logistically restricted. Stranded animals, on the other hand, are being found all around the coastline and are reported year-round, and the schemes contributing data to this study have provided a systematic approach to strandings surveillance in their respective countries.'

'Examination of stranded individuals additionally allows us to gather information on parameters like age and sex class, which are indicative of population structure and habitat use - vital data that is very difficult to obtain via surveys of live animals'.

IJsseldijk said there was still a lot of uncertainty about the potential effects of offshore renewable energy developments on marine mammals and their habitats. 'To plan and minimise negative impacts of these developments on harbour porpoises, it is essential that consideration is given to vulnerable population groups and spatiotemporal variation in population resilience. Our study has provided valuable insights into baseline variation in stranding rates and population structure, and has therefore been a valuable first step in increasing our understanding of harbour porpoise demographics in the North Sea.'

The research was a collaboration between the Faculty of Veterinary Medicine at Utrecht University the Netherlands, The Scottish Marine Animal Stranding Scheme, the UK Cetacean Strandings Investigation Programme, Department of Bioscience of Aarhus University, Institute for Terrestrial and Aquatic Wildlife Research of the University of Veterinary Medicine Hannover, Royal Belgian Institute of Natural Sciences, Naturalis Biodiversity Center, Cetacean Atlas of Denmark, and the Natural History Museum & Fisheries and Maritime Museum Denmark. ■

TEXT JOSIEN JACOBS | IMAGE: NYNKE KOUWENHOVEN, JOOP FAMA AND BAS NIEMANS



Highlighted



CÉCILE VAN ELS:
VACCINOLOGY: CORRELATES OF PROTECTION

'Vaccines make a major contribution to human and animal health. Vaccine development in the 21st century is no longer a question of trial and error but of rational vaccine design. It is important to demonstrate protective immunity from the earliest stages of development. This will only be possible with knowledge about the correlates of protection and how they can be measured.'

Van Els focuses her research on unravelling the immune response chain of the immune system, leading to effective and sustainable protection against infectious diseases. Key properties of an effective immune response include specificity, quantity,

quality and localisation of tissue-resident memory. These so-called correlates of protection differ for each pathogen but are still unknown for most infectious diseases.

Van Els's research is anchored within both the Faculty of Veterinary Medicine and Life Sciences research at Utrecht University as well as the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM). According to Van Els, this is an important bonus: 'It enables me to set up a "Vaccinology: Correlates of Protection" knowledge platform to connect the research and knowledge of the Faculty of Veterinary Medicine and the RIVM'.

'Many developments are taking place in the international poultry sector. In a growing number of countries the production of eggs and poultry is no longer just about the lowest costs and highest efficiency. Aspects such as public health, antibiotic use, animal welfare, housing, growth rate, social acceptance and the environment are playing an increasingly important role too. The frequently interdependent links in the international chain form the basis for solving the challenges. These new requirements and rapid developments within the poultry sector require constant innovation from all parties involved, including vets and veterinary degree programmes. This is what I want to make a contribution to at both the national and international levels.'

De Wit does a lot of applied research that the poultry veterinarian can often immediately make use of in the Netherlands as well as abroad. Besides being a professor at the faculty, De Wit is also a poultry veterinarian and senior researcher at Royal GD Animal Health. De Wit's research mainly focuses on viral diseases: the cause, the degree of protection offered after vaccination, diagnostics and the relationships with other diseases. Through his knowledge of the international field and applied research, De Wit hopes to be able to build bridges between the underlying questions from the field and fundamental research. 'I'm really looking forward to being able to work on this with my colleagues in Utrecht and in partnerships with other groups.'



SJAAK DE WIT:
INTEGRAL POULTRY HEALTH

IMAGE: SANDER KONING AND ED VAN RIJSWIJK



Friends of VetMed believe in finding real, sustainable answers to urgent questions in the field of animal health and animal welfare. That's why we are proud to support the Utrecht University Faculty of Veterinary Medicine, the only veterinary academic institution in the Netherlands.

Their researchers and veterinarians are leading experts in their field who improve the lives of countless animals. Their research and development of innovative veterinary treatments lead to long-term solutions that will ensure our animals lead better, healthier lives. At the same time, their findings contribute to groundbreaking solutions in human medicine, too.

www.friendsvetmed.org

**We care about
animals and are
deeply committed
to their health and
welfare.**

**Today, tomorrow
and in years to
come.**

Together, we'll make a difference

Friends of VetMed

