

Vetscience

INTERNATIONAL

Nº 1
January 2020



Rejuvenating the
intervertebral disc

p. 4

An alternative
to donor livers

p. 12

The dangers of
hormone disrupting
substances

p. 36



Utrecht University

Impact in One health, One Medicine and Veterinary Biomedicine

How can we confine outbreaks of viruses with potentially devastating effects on animal and human health and considerable economic impact? How can we feed the world's growing population while respecting animal and human health and wellbeing and the environment? How can we find effective treatments for dogs as well as for 700 million humans globally suffering from back pain?

Today's challenges are complex and require a collaborative and interdisciplinary approach. Collaboration across disciplines, between researchers and practicing veterinarians, and with societal partners. We are proud of our thriving community of over 1400 students, more than 800 researchers, teachers, clinicians and support staff as well as over 9000 alumni. And we cherish our collaboration with partners at the Utrecht Science Park, in the Netherlands and beyond. Together, we make a meaningful contribution towards the wellbeing and health of animals and man, in relation to each other and their environment.

In this first international edition of Vetscience magazine, we share highlights of our work. Major multi-year research programmes have successfully secured considerable EU Horizon 2020 and Dutch government funding, for example for developing new treatments for degenerative disc disease, studying the exposome and developing intervention strategies, and finding alternatives to current liver disease treatments. The Netherlands Centre for One Health, a unique nationwide collaboration between medical, veterinary and agricultural academia co-founded by Utrecht University, has grown into a scientific community exceeding 60 PhD students and many senior staff. Addressing the growing need for interdisciplinary professionals and researchers, we started the third year of our One Health Master's programme, the first of its kind in Europe.

And there is so much more. We hope you enjoy reading all about it in this magazine.

WOUTER DHERT
Dean, Utrecht University Faculty of Veterinary Medicine



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3D printed jaw for Labrador retriever 18
Specialists from the Faculty of Veterinary Medicine and UMC Utrecht gave Labrador retriever Sam a new jaw, and a new lease on life.



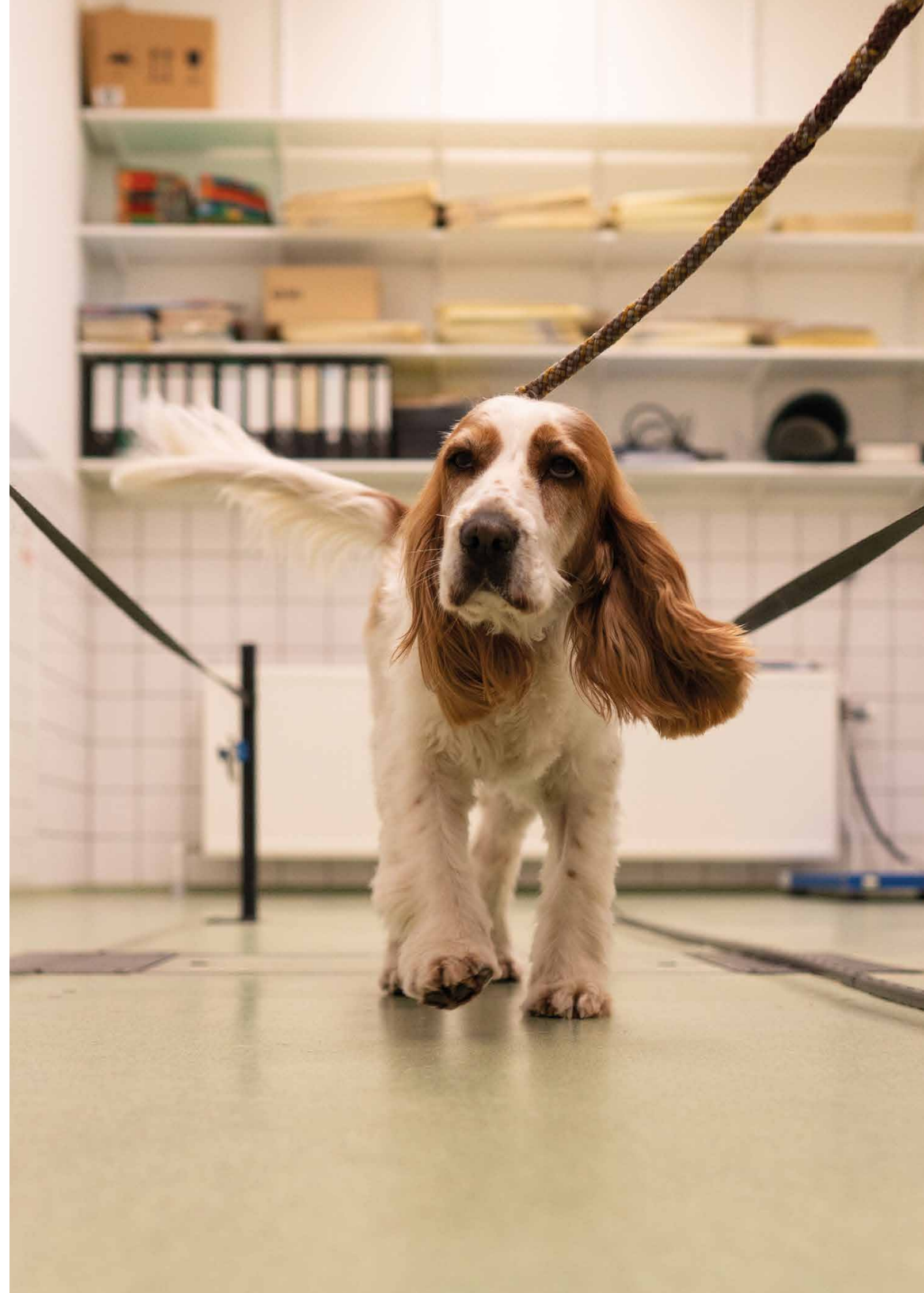
Netherlands Centre for One Health expands 24
Outbreaks of infectious diseases, antibiotic resistance; human, animal, and environmental health challenges are intertwined. The Netherlands Centre for One Health takes an integrated approach to tackling them.



Better testing methods for industry 36
Juliette Legler studies the effects of endocrine-disrupting substances. 'The effect of hormones is very similar between people and other animals. Endocrine-disrupting chemicals affect various organisms and not just humans.'

Innovative treatments against lower back pain in both dog and human patients

Marianna Tryfonidou is Professor of Regenerative Orthopaedics at the Faculty of Veterinary Medicine and focuses on addressing a global challenge: back pain. She is currently developing two innovative treatments for dogs, which doctors will eventually also be able to use to treat human patients with back pain. 'The strength of vets is that they have an eye for the similarities and differences between animal species.'



'It's fantastic to have an impact on the health of both dogs and human patients with back pain'

'Many people do not know that back pain occurs in dogs too. Half of all dogs, man's best friend, experience back pain', says Tryfonidou. Back pain is also a major problem in humans, she adds straightaway. 'It is estimated that 80 per cent of the population experiences lower back pain or neck complaints at some time in their lives. At any given moment, it is estimated that about 700 million people worldwide are suffering from chronic back pain.'

Tryfonidou's work focuses on specific complaints that originate in the intervertebral disc. 'Intervertebral discs are small cushions between the vertebrae and can - in both humans and dogs - dry out and age', she explains. 'We estimate that 40 per cent of all back pain is caused by such deterioration in the disc. For this group, there is no cure.' The cause for the remaining 60 per cent of people with back complaints is found, for example, in osteoarthritis of the joints, muscle problems or a trapped nerve.

Innovative drug release

One of the possible treatments that Tryfonidou is working on, focuses on patients, both dogs and people, with initial back pain complaints. Swallowing analgesic and anti-inflammatory drugs has little effect in general, explains the researcher. 'Drugs are administered orally and mainly end up in organs with a good blood supply. The disc, however, has a poor blood supply and therefore drugs reach it in very low concentrations.' With an extensive team of experts and in close collaboration

with the University Medical Center Utrecht, Tryfonidou is therefore working on an innovative treatment. In this treatment, the drug is administered directly at the source of the pain in small spheres produced from biomaterials, synthetic of natural materials that are used for medical applications. This packaging ensures that the drug remains in the disc and is gradually released over a long period. 'That has major advantages. We tackle the pain at its source, we only need a small dose, and we do not burden the rest of the body.' Furthermore, we hope that in this way, the effect of the locally delivered medication will also persist for a long time.

Limping less and happier

The injections have already undergone various tests in the veterinary clinic. 'We investigated dog patients with back pain or osteoarthritis. A group of patients received a local injection with the medication packed in the biomaterial, while another group received an injection without medication, a placebo. We are still busy analysing the data from the dogs with back pain, but for the dogs with osteoarthritis, we can already see that the treatment is effective. The dogs that receive medication limp less and have less inflammation in the joint. The owners also notice that they look happier.'

Tryfonidou is now trying to implement the treatment in the veterinary clinic. 'We need to obtain approval from various bodies. We are investigating whether pharmaceutical companies are interested in this innovative treatment strategy so that it ultimately ends up on the vet's shelf.'

15 million euros for cell therapy

Tryfonidou is also working on advanced treatment strategies of the future. 'If the intervertebral disc is highly worn, then the locally applied medication may be ineffective. For such cases,

an advanced stem cell therapy may be the solution.' To develop such a stem cell therapy, Tryfonidou has brought together a group of experts from around the world. This iPSpine consortium received 15 million euros from the European Union. 'Our idea is to insert advanced stem cells into the worn intervertebral disc. These stem cells will then rejuvenate the intervertebral disc. Then somebody aged 50 years would acquire an intervertebral disc of somebody aged 30 years,' says Tryfonidou with a smile.

However, that is easier said than done. 'A worn intervertebral disc is similar to a desert because it is so dried out,' explains Tryfonidou. 'Injecting stem cells without a supportive biomaterial would be like sending them into a desert with just a glass of water. They would not survive that. Therefore, in order to help them thrive we also shelter the specialised stem cells with biomaterials.'

Expertise from around the world

The EU project has a duration of five years. 'We will end the project with a study in which we will treat dog patients suffering from chronic back pain with this advanced stem cell therapy', says Tryfonidou. In order to address this challenge, the consortium contains a wide range of expertise. 'We are working together with twenty partners from around the world. Their expertise ranges from cell biology to regeneration, and from biomaterials to ethics. Everybody plays an important role in developing the concept. Veterinary specialists from Utrecht University contribute a lot of knowledge about disc stem cells with a rejuvenating effect. In addition, we know a lot about the translation from laboratory to clinic.'

Strength of the vet

Tryfonidou is a passionate researcher who knows where her strengths lie. 'What I find so fantastic about my work is that the treatments we develop can have an impact on both dogs and people. It's also great to coordinate and direct a consortium with so many different types of expertise. That is where my strength lies as both a vet and a researcher.' 'What makes the training to become a vet so special is that, as students, we learn to look at the differences and similarities between a wide range of animal species. As vets, we also ask ourselves, for example: how do differences in tissues between animals lead to whether or not certain diseases occur? Due to the broad training and their affinity with (bio)medical research, vets can bridge the gap between the laboratory and the clinic.' ■

** This project receives funding from the European Union's Horizon 2020 research and innovation program iPSpine under grant agreement No. 825925.*

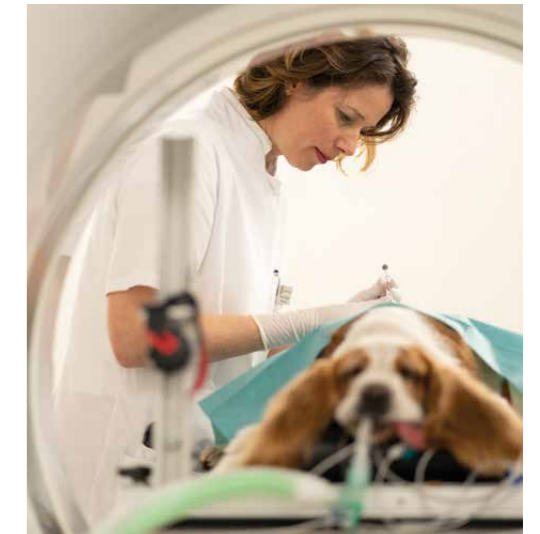
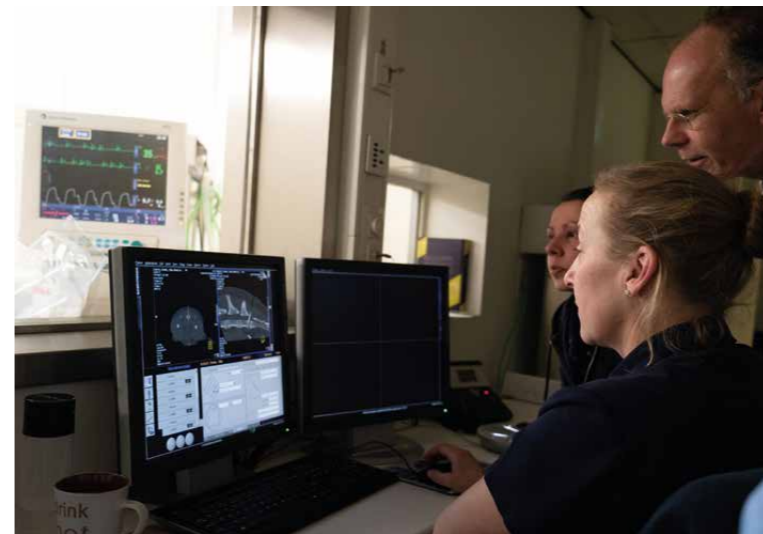
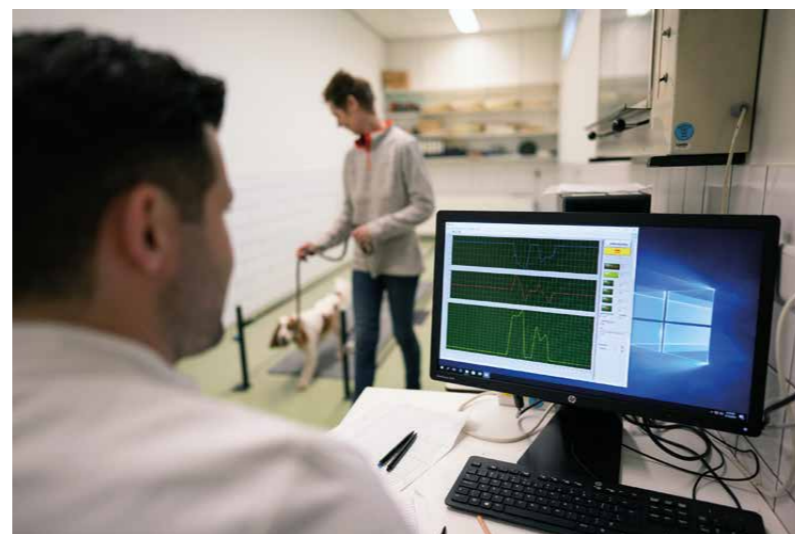
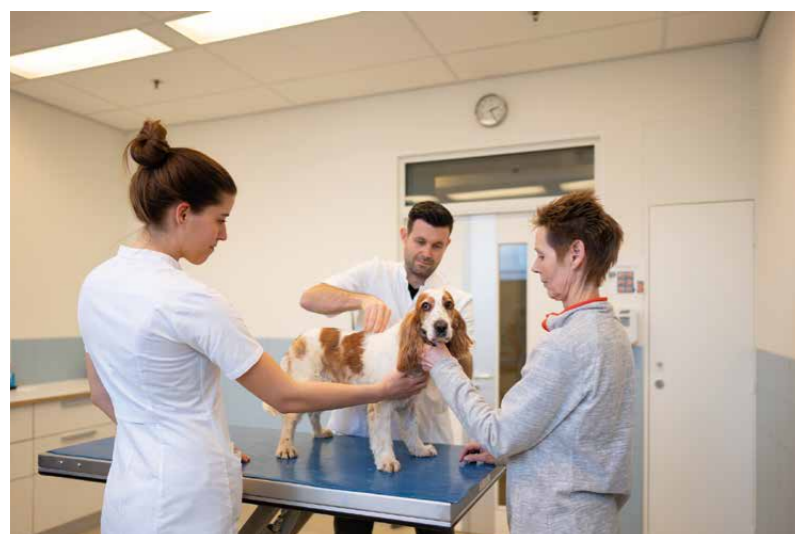
TEXT: ROSAN REUSKEN | IMAGE: BAS NIEMANS

Left to right: Veterinarians thoroughly examine patients in the animal hospital, through physical, orthopedic and neurological examinations.

On the pressure plate, motion analysis is performed in order to objectively measure the severity of symptoms.

Using an MRI scan, specialists identify the location of disc wear and pain points.

Tryfonidou injects medication and biomaterials under a CT-scan, in order to determine the precise location. The medication is released over an extended period of time, acting as anti-inflammatory and pain relief.





Keita Ito is Professor of Orthopaedic biomechanics at Eindhoven University of Technology and is collaborating in the iPSpine consortium.

‘The consortium is a broad mix of experts from a variety of disciplines. It is tremendous that we can work with other scientists, engineers, clinicians, social scientists and commercial partners to really tackle the entire problem. Together we hope to quickly develop a treatment by taking advantage of different technologies and combining the individual advantages of these synergistically. We tend to focus on human medical problems, but other species often suffer from the same medical complaints too. We can learn from the similarities and differences between species and well as from similar diseases, and we can learn from how each of these different patient groups responds to the treatments we develop. Therefore, by working with both veterinary and human clinicians, we can advance our solutions safer and faster.’



Jerome Guicheux is Professor of Regenerative Medicine and works at the University Medical Centre of Nantes in France.

‘The iPSpine consortium brings together the most eminent labs working on intervertebral disc degeneration in Europe and Asia. It is an amazing opportunity to synergise all the expertise we have developed in our European labs. Without the support of the European Research Council, it would have been impossible to set-up such a large, risky and ambitious project.’
 ‘The iPSpine consortium will make it possible to transfer notochordal cells, only present in juvenile human discs, generated from induced pluripotent stem cells to (veterinary) clinics. That is really exciting because, at present, no therapeutic solution exists for either animal or human patients suffering from lower back pain. We are highly committed to transferring innovative therapies to the veterinary clinics. The concept “One Health–One Medicine” (also named “Manimal” in France) allows us to welcome several veterinary surgeons in my lab. Together with our human clinicians, they are developing some therapeutic concepts for both animal and human patients. Gathering both these types of expertise will allow the basic concept to be rapidly transferred the clinics.’

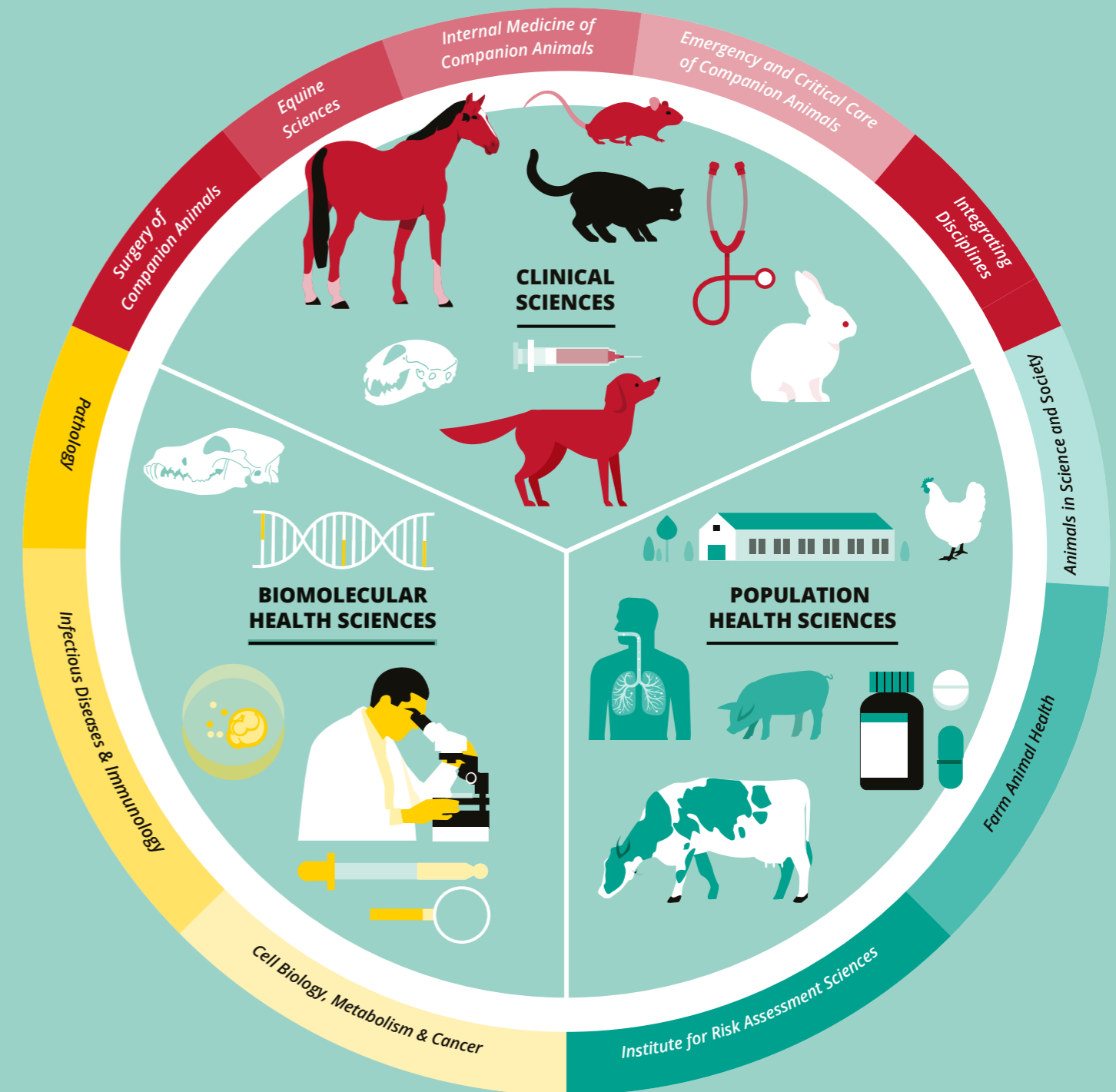


Cumhur Öner, Professor of Spinal Surgery at UMC Utrecht.

‘One Health–One Medicine gives us a fantastic opportunity to bridge the gap between human medicine and veterinary medicine. The basic structures are the same in all animals, but due to the arrogance of Homo sapiens, human medicine has unfortunately created a large and artificial distance between itself and veterinary medicine. However, the similarities and differences can act as a large source of knowledge. Together with the Faculty of Veterinary Medicine, we are working on frequently occurring problems caused by the degeneration of the intervertebral disc in both people as well as some other animal species. This work will enable us to better understand the parallels and differences between the species, and we can utilise the experiences of non-human patients as part of the translational research.’

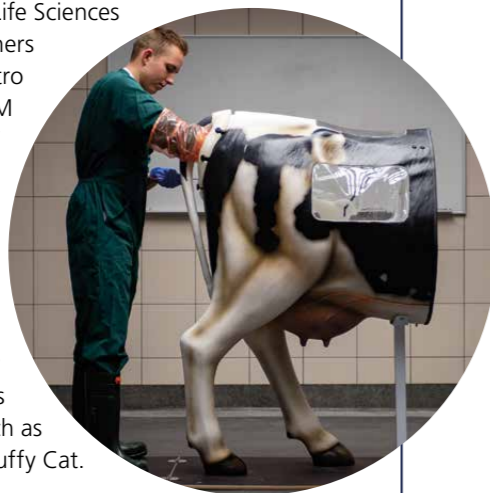
OUR ORGANISATION

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.



Animal welfare at the heart of education and research

Utrecht University aims to be a leader in the development of animal-free innovation. The Faculty of Veterinary Medicine plays a key role in the 3Rs-Centre Utrecht Life Sciences (ULS) and is one of the partners of the Utrecht Advanced In Vitro Models Hub, U-AIM. U-AIM acts as a “one-stop-shop” where high potential in vitro models are being developed, validated and transitioned to stakeholders. When it comes to educating students, we are strongly reducing the use of animals, for example by developing (flexible) plastinates and deploying resources such as the Haptic Cow and the Fluffy Cat.



Hille Fieten awarded Veni grant for identifying disease genes in dogs and humans

The Dutch Research Council (NWO) awarded researcher Hille Fieten a 250,000 euros Veni grant for research into genetic diseases in dogs and people. This grant allows promising young scientists to further develop their ideas during a period of three years. Fieten aims to identify disease genes in purebred dogs and then to study these in humans. Purebred dogs suffer from the same genetic diseases as humans. As a result of inbreeding, tracking down disease genes in purebred dogs is more successful than in humans. The research results will lead to improvements in diagnostic and prognostic analysis and the subsequent treatment of genetic diseases.



Karin Strijbis receives ERC Starting Grant for research on intestinal health

Intestinal bacteria, or the microbiota, play an essential role in human and animal health, but they can also be responsible for gastroenteritides, including food poisoning or inflammatory bowel disease (IBD). It is largely unknown how different bacteria affect the human body. However, we do know that gut bacteria interact with the body in the intestinal mucosa. Within the mucous layer, specific proteins called transmembrane mucins are present, which detect bacteria and transmit signals to the body. A 1.5 million euros ERC Starting Grant will allow Karin Strijbis to set up a team of four researchers to study the contribution of these transmembrane mucins to gastroenteritis as well as to mucosal barrier function among humans and animals. As a result of this research, new therapies against enterobacterial infections and IBD and innovative applications to promote intestinal health may be developed.

App with impact for working equids

Draft horses and donkeys are of vital importance to communities in developing countries. The timely detection and tracking of health problems in these animals can be a challenge. A new version of the EPWA pain recognition app for horses and donkeys provides a solution. Thanks in part to donors from Friends of VetMed, a collaboration will start in 2020 with Brooke Hospital to develop EPWA 3.0. Based on scientifically validated pain scales, owners of working equids will be able to use the app to monitor acute and chronic pain, and to obtain advice about animal welfare.



Prep Course for Master's Farm Animal and Veterinary Public Health

In the summer of 2019, the first batch of students joined a preparation course for international students interested in the Master's Farm Animal and Veterinary Public Health. Students who successfully complete the preparation course and meet further admission requirements, are eligible to start the Master's programme. Previously, only students with a relevant Dutch Bachelor's degree were eligible. Opening up the programme to international students aims to help address shortages in the Dutch labour market, while at the same time enriching the quality of education. The four-week course is organised in cooperation with Utrecht Summer School.



Debate series: the future of livestock farming

The Netherlands is the world's second largest exporter of agricultural products, after the USA. But how can we ensure that livestock farming respects animals, the environment and people? The Faculty of Veterinary Medicine brought together academic experts, policy makers, farmers, veterinarians and representatives from business and non-profit organisations in three debates to exchange views on reducing farm antibiotics, improving animal welfare and circular agriculture.





Alternatives to donor livers

Utrecht University researchers receive Horizon 2020 grant

End-stage liver failure is a major healthcare challenge. Liver diseases account for approximately 2 million deaths per year worldwide. Liver transplantation is the most effective way to re-establish a liver with normal functions for various diseases, including acute liver failure or liver malignancies. Currently, less than 10% of global transplantation needs are met and the gap between patients on transplant waiting lists and available donor organs is steadily increasing.

'We're developing an automated platform to produce and assemble bioprinted liver constructs'

Bart Spee and Kerstin Schneeberger are working on the urgently needed alternative treatments. Their research received an extra boost with the award of a Horizon 2020 grant of 6.3 million euros, of which 1.4 million euros is for Utrecht University. In the ORGANTRANS consortium, Spee and Schneeberger are partnering with experts from across Europe to develop a liver tissue printing platform, an important step towards replacing donor organs.

Stem cell transplantation in dogs
 'With all the expertise that comes together here on the Utrecht Science Park, we have already made major

progress in recent years', says Spee. 'Building further on the work of Hans Clevers and his lab on adult stem cells cultured as organoids, we have applied autologous stem cell transplantation in dogs with inherited metabolic liver disease. After gene correction, we placed the cultured cells back in the dogs. During this six-year study, we have learnt how we can administer cells safely. We established that cells are still present after two years, but unfortunately not yet in sufficient numbers to realise full clinical recovery.'

Mini-livers on a large scale
 'Existing culture technologies limit the reproducibility, size, architecture and complexity of the organoids that we are able to make', says Kerstin Schneeberger. 'By combining technologies in the

area of biofabrication and organoids, we hope to overcome the current limitations.' Schneeberger has recently developed a new suspension method to culture large amounts of genetically stable liver cells that produce the most crucial liver proteins, such as detoxification enzymes, for a long period of time.

Building an automated platform
 Spee and Schneeberger are joining forces with experts from across Europe in the ORGANTRANS consortium. Its aim is to tackle current obstacles to liver regenerative medicine by combining advanced know-how in cell biology, biomaterials, bioengineering, automation, standardisation and clinical translation. Spee: 'We're developing an automated platform to produce standardised multicellular liver spheroids and assemble them into a bioprinted



ORGANTRANS PROJECT PARTNERS

- CSEM (Switzerland)
- Utrecht University (the Netherlands)
- AMIRES s.r.o. (Czech Republic)
- DWI - Leibniz-Institut für Interaktive Materialien e.V. (Germany)
- regenHU (Switzerland)
- VIB - Vlaams Instituut voor Biotechnologie (Belgium)
- King's College London (United Kingdom)
- Kugelmeiers (Switzerland)

liver construct. The platform will be deployed by leading European transplant centres and the technologies it delivers can be scaled to other organ systems.'

Safe medicines

Both Spee and Schneeberger are ORGANTRANS workpackage leaders, responsible for in vitro and in vivo testing of the liver constructs respectively. Spee: 'We're already making liver constructs in vitro from organoids, in order to create models of liver disease and toxicological screens. These miniature livers are in high demand from pharmaceutical companies, as a lot of drugs currently get withdrawn from the market because

'An alternative that bypasses the need to test new drugs in animals could save a lot of animal lives'

they turn out to be toxic to the liver. A system to check this is needed, and we think that biofabricated livers can solve part of this problem.'

Saving animal lives

'We want miniature livers to function just like real livers. That is a real challenge because you have to reconstruct the entire liver with multiple cell types and include microfluidics to mimic the entire organ and function. We are now optimising that together with Jos Malda (Utrecht University, Biofabrication facility) and his group. Currently, drug legislation requires animal testing, so if we successfully

develop an alternative that bypasses the need to test a new drug in animals then we could save a lot of animal lives.'

Value chain cooperation

Spee: 'What makes ORGANTRANS unique, is that it covers the entire value chain, from cell source, tissue engineering, bioprinting and post-processing to testing. This will allow for early adoption of results in clinical practice.' Schneeberger: 'Although in vivo testing activities in the ORGANTRANS project will focus only on mouse models, and we still have a long way to go, the ultimate aim we're working towards is alternatives to donor organs for patients with chronic or end-stage liver diseases. ■

TEXT: CARIEN DUISTERWINKEL | IMAGE: IVAR PEL, BAS NIEMANS AND KEES RUTTEN

The Netherlands as front runner in the transition towards circular agriculture? That is not without risk, argue professors Arjan Stegeman, Dick Heederik and Saskia Arndt of Utrecht University Faculty of Veterinary Medicine together with colleagues from Wageningen University & Research in a letter submitted to the Dutch national newspaper de Volkskrant on 3 October 2019.

The Netherlands must not close its eyes to negative side effects of "circular agriculture"

Next week, the Minister for Agriculture, Nature and Food Quality, Carola Schouten, defends her budget in the Dutch House of Representatives – the first since she accelerated her policy towards a "circular agriculture". Dutch agriculture and livestock farming must focus less on low-cost price and more on the efficient use and reuse of raw materials and energy, preferably on a regional scale.

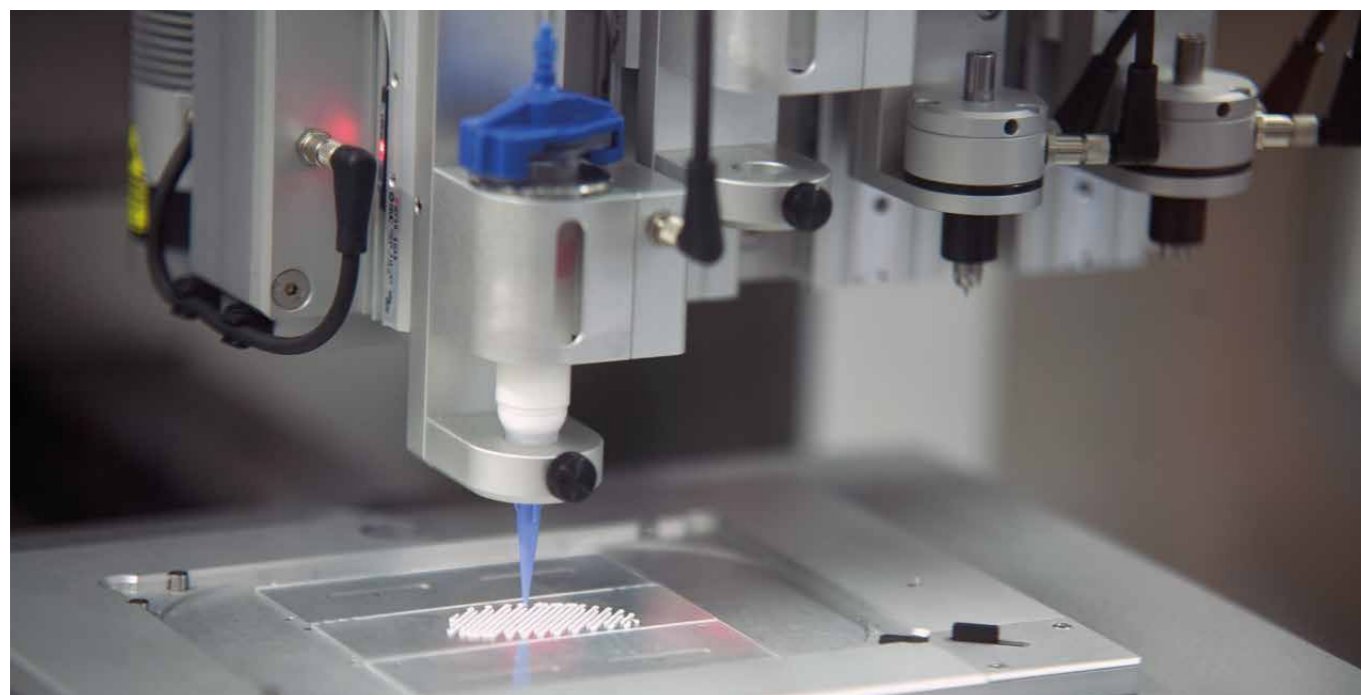
In the future circular system, cows, pigs, goats and chickens will receive a new role in the Netherlands. They must produce food by consuming locally produced roughage and organic residual and waste streams. The aims are to reserve good agricultural ground for high-value crops and to allow fewer waste substances and greenhouse gases to disappear into the environment. These efforts to tackle climate and environmental problems are necessary. They require drastic changes in how our farm animals produce food. But how that can be realised with sufficient efficiency and safety for both animals and consumers is something we still know far too little about.

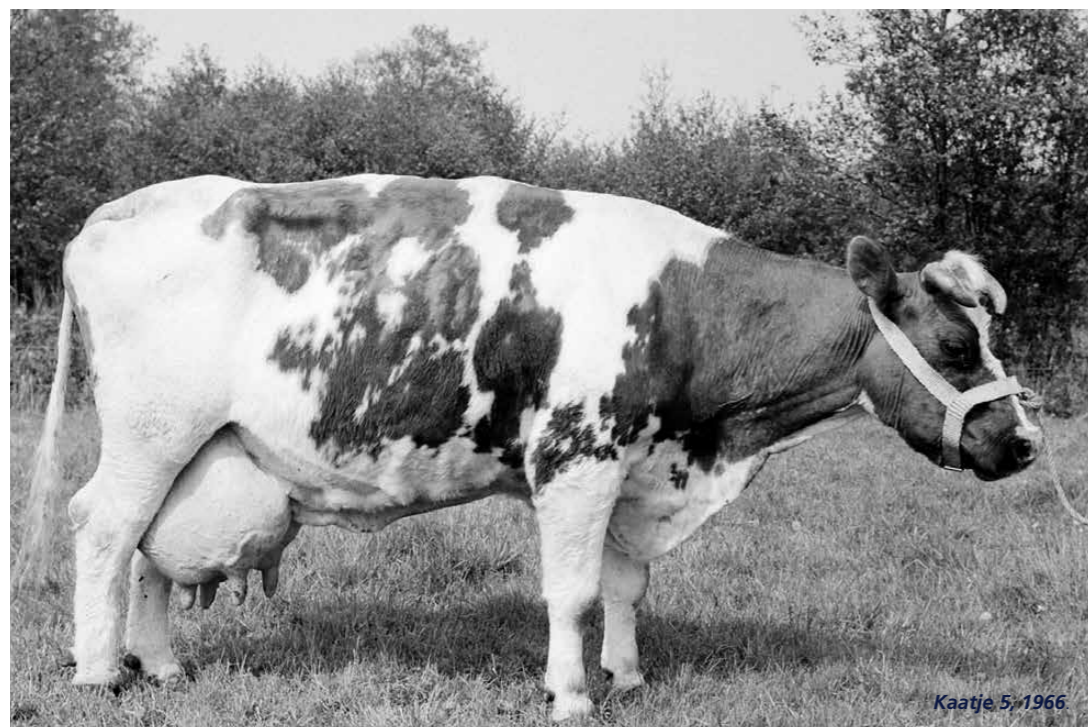
Champions

After the Second World War, Dutch farm animals developed into production champions. An average Dutch cow now yields two-and-a-half times as much milk as it did seventy years ago. A broiler chicken 6 weeks old now weighs four times as much as it did 70 years ago.

This dramatic increase in production could only take place by feeding specially bred animals a carefully balanced diet. The gastrointestinal system of our cows, pigs and chickens is now adapted to specially prepared feeds full of highly digestible materials. The production, quality and safety of these feeds are strictly monitored for the sake of food safety, animal health and animal welfare.

Allowing our livestock to switch to locally produced feed and residual streams, such as excess food and kitchen waste, involves risks for the animals but also for people. A lot of specific research will be needed to determine the size of these risks and define ways of limiting these with success.





Kaatje 5, 1966



Bertha 85, 2015

In the post-war era, Dutch farm animals have developed into production champions. An average Dutch cow nowadays produces 2,5 times more milk than 70 years ago.

Adaptations

Without specific adaptations, our cattle will suffer from more metabolic diseases and disorders to the digestive system, which will have a negative effect on their welfare. Due to a reduced digestion, they will possibly produce less, whereas emissions via manure and gases could increase.

But there are also incidental and potentially severe risks for animals, farmers, nearby residents and consumers. Mad cow disease demonstrated how disastrous it can be if pathogens end up in cattle feed via organic waste: more than two hundred consumers died and the destruction of more than four million cows nearly decimated the British beef sector.

There are also more recent examples that we can learn from. China has already destroyed more than one hundred million pigs after kitchen waste in animal feed caused wide dissemination of African swine fever.

Viruses

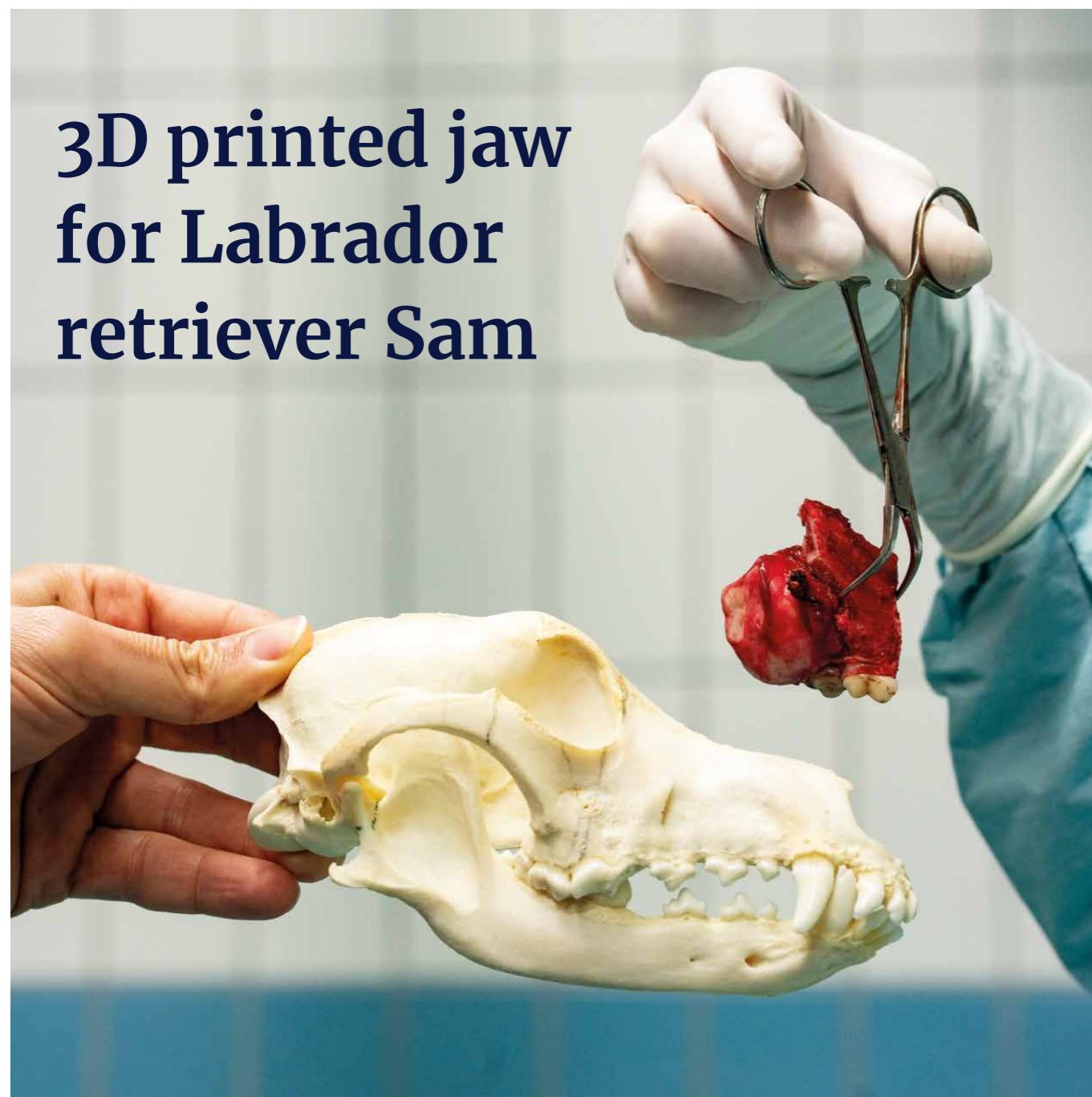
Other viral diseases such as foot-and-mouth disease and classical swine fever as well as salmonella and antibiotic-resistant bacteria can end up in our food by waste. The same is true for chemical contaminants such as dioxins, fungal toxins, hormones and antibiotics. If that happens, a circular system exacerbates the problem because in a circular system, contaminants can accumulate and can scarcely be removed.

So far, policy has devoted too little attention to these risks. Government policy documents about the circular economy in agriculture scarcely consider the subjects of health and safety. The agricultural budget has also not made any funding available for studying the side effects or for designing methods to keep on safeguarding food safety, such as effective treatments of residual streams and the strict monitoring of all sources of animal feed.

We are in favour of a circular economy that will reduce the detrimental effects of our farming on the climate and the environment. However, the Netherlands must not close its eyes to the potential negative side effects. A successful transition to a genuinely sustainable agriculture requires attention for the health of people, animals and the environment, and the wide-ranging interactions between these. ■

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PROFESSOR OF ANIMAL BEHAVIOUR, UTRECHT UNIVERSITY

3D printed jaw for Labrador retriever Sam



Left: The tumor in Sam's jaw is removed along with a few molars and held up next to an example dog skull.

Top right: The 3D implant can be viewed on a computer screen during the operation, as an additional safety measure.

Bottom right: Prof. Björn Meij and colleagues have started surgery. Veterinary Medicine students observe through the camera above the operating table.



Top left: The 3D implant in its sterile packaging

Bottom left: The 3D implant is inserted in Sam's skull and secured with screws.

Right: Six weeks after surgery. Sam is doing well, eating well and licking his nose!

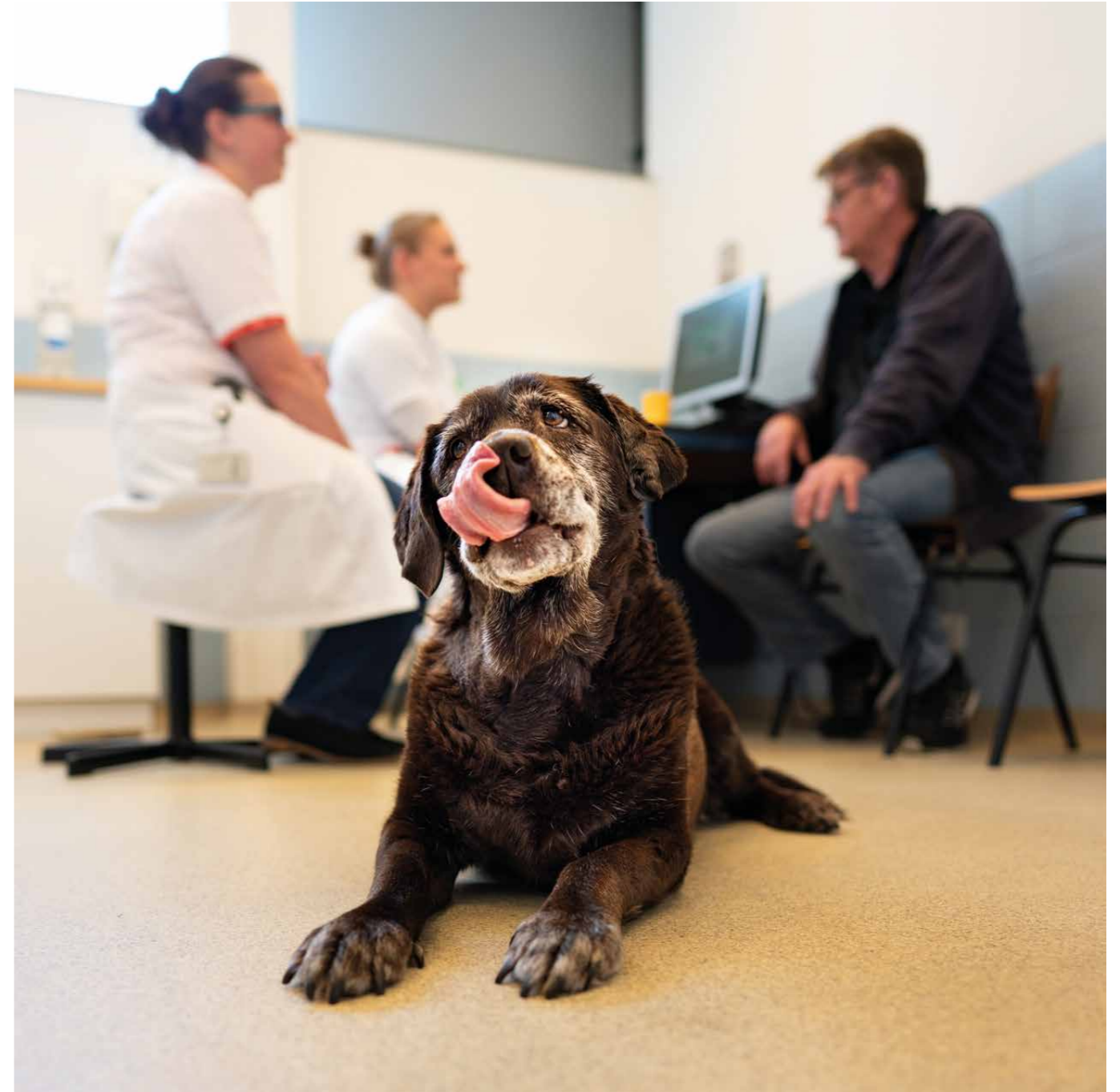


IMAGE: BAS NIEMANS

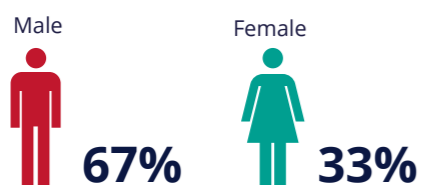


Utrecht University

Veterinary Medicine

Facts & Figures

Professors



400
Researchers

426

Publications
in scientific
journals
in 2018

The only veterinary
faculty in the
Netherlands

Accredited in:

Canada (CVMA)

USA (AVMA)

the Netherlands (NVAO)

Europe (EAEVE)

Students

Bachelor's students

780

Master's students

680

Alumni

100%

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

>9000

94%

of Veterinary
Medicine alumni
recommend studying
at Utrecht University

PhD
candidates

179

International
39%

Dutch
61%

QS World
University Rankings
Veterinary Science
2019

3

Ranked
#3

Projects

34

projects made possible by
Friends of VetMed

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

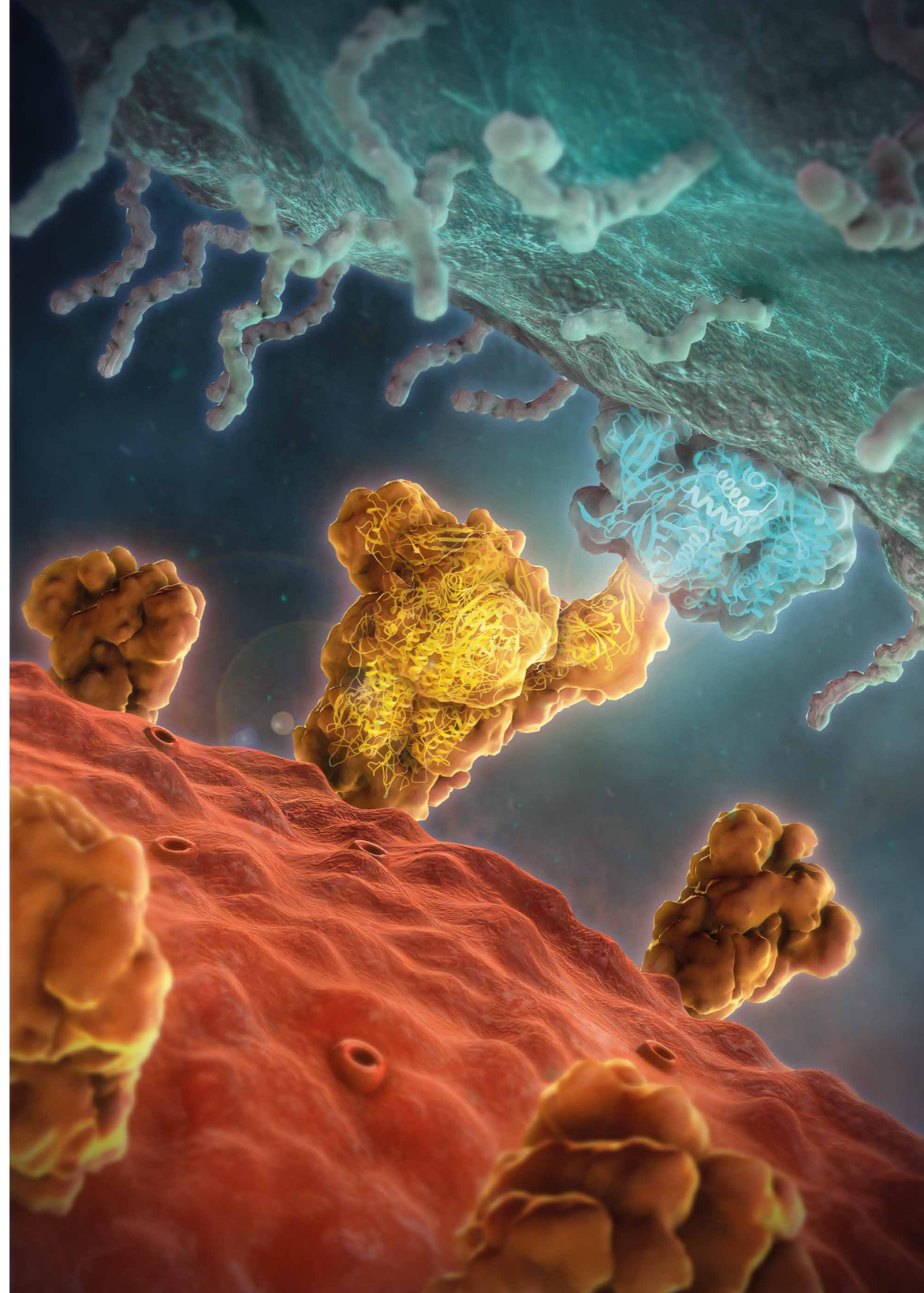
Veterinary education partners

104
Veterinary clinics

Netherlands Centre for One Health more than doubles research capacity

17 million people, 3.9 million cows, 12 million pigs, 97 million chickens, 2.6 million cats, 1.5 million dogs, and far more still, live together on a small surface in one of the most densely populated countries in the world.

The Netherlands is perhaps the ideal testing ground for developing new knowledge in the area of people and animals living healthily together. In the Netherlands Centre for One Health (NCOH) eminent researchers have joined forces. In 2019, NCOH increased its research capacity to 60 PhD students.



NCOH is a collaboration of nine Dutch academic research institutes focusing on One Health. It aims to realise an integrated approach to the global risks of infectious diseases and to create sustainable solutions for major societal challenges in the areas of human, animal and ecosystems health.

Dick Heederik is Vice Dean Research and Professor of One Health Risk Analysis at the Utrecht University Faculty of Veterinary Medicine and chair of the NCOH Executive Board. 'NCOH is a unique partnership. We work together in an open innovation network and share our complimentary scientific knowledge. That enables us to find solutions to antibiotic resistance and outbreaks of infectious diseases faster.'

NCOH PARTNERS

- AMC Amsterdam
- Erasmus MC
- KNAW
- Leiden UMC
- Leiden University
- Radboud UMC
- UMC Utrecht
- Utrecht University
- Wageningen University and Research



Dick Heederik

Increasing research capacity

Besides contributions from NCOH partners to new research on complex systems and metagenomics, NCOH received a major impulse from external funders in 2019, which increased its research capacity to about 60 PhD candidates. Heederik: 'The Dutch Research Council (NWO) awarded NCOH 9 million euros of funding to a 5-year programme led by Erasmus MC, which focuses on measuring and modelling how projected demographic, climatological, ecological and

ONE HEALTH MASTER'S PROGRAMME

Interdisciplinary professionals and researchers who understand the principles of human, veterinary and environmental health risks and the interrelations are in high demand. Utrecht University offers a 2-year Master's programme with a clear focus on research, the first of its kind in Europe. Students have the opportunity to collaborate with partners in innovative research projects, intern at prestigious partner institutions and carry out hands-on research projects at renowned research groups.

planological changes will impact the risk of vector-borne disease emergence for the Netherlands. Seven collaborating public partners increased the total programme budget to 10 million euros.' 'Another example is that NCOH partners Wageningen University and Research and Utrecht University are involved in the so-called Regio Deal Food Valley, a programme focused on circular and low-emission farming in the Utrecht/Gelderland region. This project truly exemplifies One Health research, as it entails evaluation of potential changes resulting from introduction of circular and low emission farming on animal health, animal welfare, use of antimicrobials as well as emissions of particulates and ammonia and potential effects on the environment and human health.'

Creating impact together

NCOH brings together academic experts, but it is also a hub for broader cooperation. 'We closely collaborate with a wide range of parties. For example, in the Regio Deal Food Valley, we are working together with farmers' organisations, employers' associations and regional government. And in the NWO programme, citizen science is a key component; high school pupils and other citizens will be involved in collecting research data about birds, mosquitos and water.'

'One of the really inspiring aspects of NCOH is how it gives young researchers the opportunity to build their network and exchange ideas with each other. In the Young NCOH network, PhD students and postdocs come together for masterclasses, pitch sessions or site visits.'

Preparing for outbreaks of coronaviruses

Berend-Jan Bosch is a researcher at the Faculty of Veterinary Medicine and affiliated with NCOH. With his group, he is investigating coronaviruses; viruses that can be transmitted between mammals, birds and people with all of the associated consequences for the health of people, animals and the economy.

One Health

'Coronaviruses are notorious for their potential to cross the species border. This was demonstrated by the recent emergence of the zoonotic SARS and MERS coronaviruses, so our research is typically One Health. Studying these viruses at the molecular level is crucial to understanding various aspects of coronavirus biology, such as how these viruses evolve, cause disease, cross the species barrier, and for developing novel intervention strategies.'

Often too late...

'New viruses will continue to emerge, enhanced by the growing world population, connectivity of people by travelling, deforestation and climate change. For each newly emerging virus pathogen, a specific vaccine has to be developed. The development, manufacturing and registration track for vaccines is currently too time-consuming. Therefore we are often left running behind the facts when a virus outbreak surfaces, as we saw in recent cases of PEDV, Ebola and Zika.'

Joined efforts to develop broad-spectrum vaccines

'We have recently established an NCOH PhD consortium between Erasmus MC and Utrecht University partners that aims to develop vaccines that can offer protection against several members of a family of viruses. Broad vaccines have the potential to protect us against new emerging diseases. Furthermore, they would be more effective against viruses that rapidly change, such as influenza

(flu). That virus continually changes and so vaccines against it lose their effectiveness.'

'Five PhD students from the Utrecht University Faculty of Veterinary Medicine and Faculty of Science and the Viroscience Department at Erasmus Medical Centre together have embarked on a research programme that aims to identify vulnerable sites that are shared between related viruses and that can be targeted by protective antibodies.'

'Together with Utrecht University partners within the Utrecht Molecular Immunology Hub, we are developing novel immunisation strategies for a targeted immune response towards these common regions of these viruses so that the vaccine can offer broad protection. Our ultimate goal is that in gaining more fundamental insights, we will be able to develop better and broad-spectrum vaccines and medication against emerging viruses and the diseases these cause,' says Bosch. ■

TEXT: CARIEN DUISTERWINKEL | IMAGE: EVAN OTO, ED VAN RIJSWIJK AND BAS NIEMANS

Utrecht Science Park

The largest and fastest growing science park in the Netherlands:

- 25,000 employees, 52,000 students and 100+ science-based organisations on 300+ hectares
- 400,000 patients receiving health care annually
- €1,500,000,000 investment between 2016 and 2021
- At the heart of one of Europe's most competitive regions

Utrecht Life Sciences

Utrecht Science Park hosts a unique Life Sciences community for multidisciplinary innovation:

- 1,700 researchers
- 1,750 PhD candidates
- more than 1,200 Bachelor's and Master's students
- 3,500 international summer school students

Utrecht University

Founded in 1636, Utrecht University boasts:

- 7 faculties, 6,700+ employees and 30,000+ students
- 49 Bachelor's programmes
- 146 Master's programmes

‘The chance that there are two victims in your consulting room is quite high’

We still know little about the nature and scope of animal abuse even though research has demonstrated a link between animal abuse and domestic violence or child abuse. An interview with the founders of the Forensic Veterinary Expert Centre (LED) Nienke Endenburg, healthcare psychologist, and centre coordinator and forensic doctor Huub Nijs from the Netherlands Forensic Institute (NFI).

The Forensic Veterinary Expert Centre was established 18 months ago. How is it doing now?

‘We started small, and at first, about 25 veterinarians were affiliated with the LED. We have since initiated a national rollout, and now there are 60 veterinarians in the Netherlands who can report cases of animal abuse to the LED. That is still far from enough, but we are growing. In the first year, we received about 30 notifications and about half of the notifications concerned animal abuse’, says Endenburg.

Why is animal abuse so difficult to recognise?

Endenburg: ‘First of all, abuse is often not in the mindset of veterinarians, and so they do not know what they need to look out for. Secondly, the relationship of trust with the animal’s owner can play a role too. If the cause of the injury is unclear, then, as a veterinarian, you may not be sure whether you’re dealing with a case of abuse. Reporting such a case is awkward when you are not even sure if any abuse has actually taken place. Perhaps it was a genuine accident? I understand veterinarians’ anxiety about submitting a notification, but that is often not necessary because notifications submitted to the LED are anonymous.’

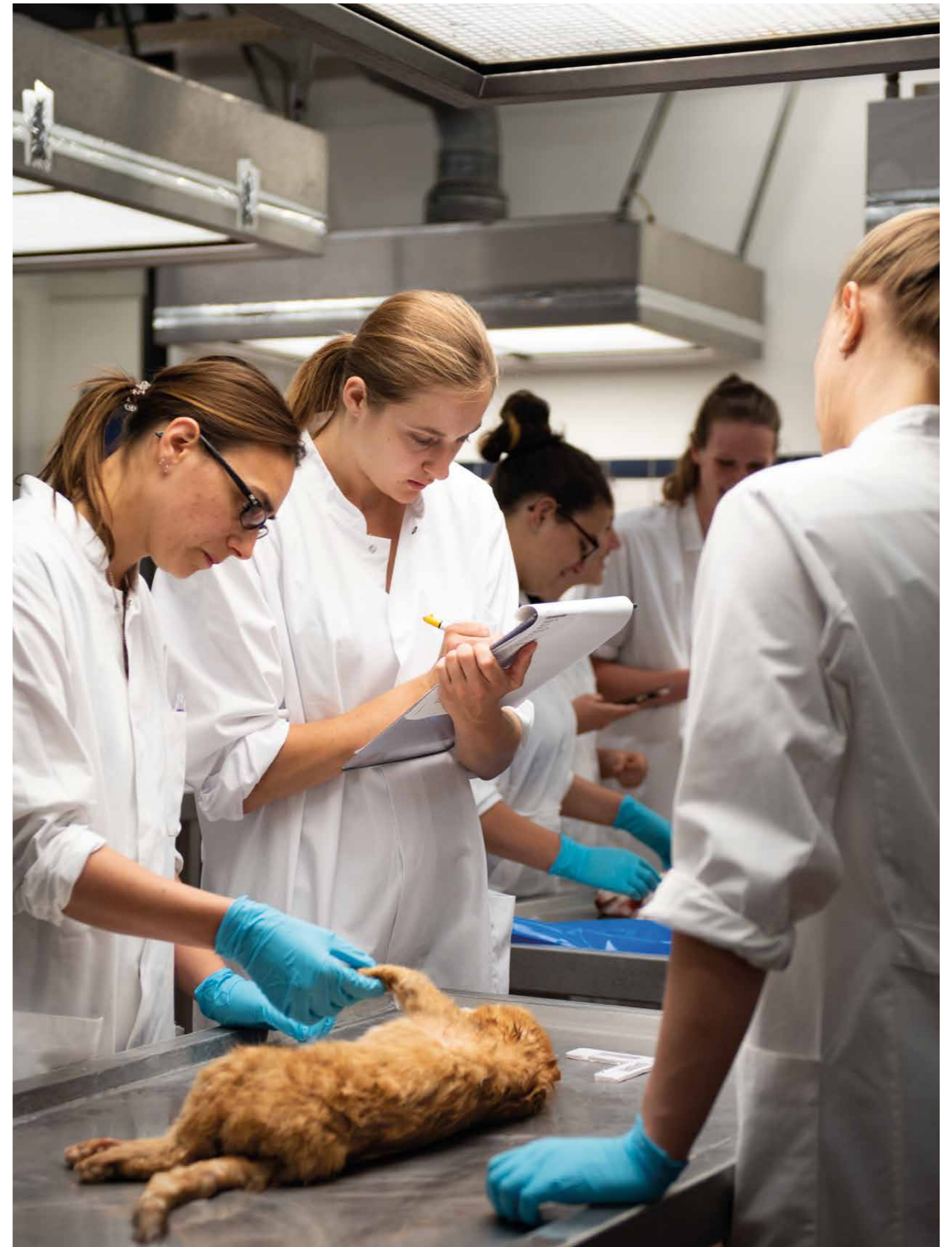
Nijs: ‘Recognising abuse can also be difficult at times because bruises under an animal’s fur are not directly visible. Fortunately, we can detect an awful lot of things on X-ray photos. We carefully examine the entire picture: under which conditions was the animal found and what is the situation at home? We describe what we see as neutrally and objectively as possible to prevent tunnel vision. As forensic experts, we often have the task of separating the findings from our interpretations. Finally, we have to formulate our conclusions for the veterinarians very carefully. Besides being correct, our conclusions also need to be written in clear and unequivocal language. That is particularly true if the notification eventually reaches the police or a judge.’

Can you explain the link between animal abuse and child abuse?

‘Power and control can be an important cause of abuse. Animals and children are vulnerable because they cannot defend themselves well. They are helpless. We also see that animals are used as a means of blackmail. Sometimes an animal is even purchased to be used as a means of blackmail later’, says Endenburg. ‘Child abuse often involves very young children because they cannot talk or run away’, explains Nijs.

Are there similarities between the injuries?

‘The forensic investigation of a person or an animal is essentially the same’, says Nijs. ‘We do indeed see the same types of injuries in people and animals who are abused. An example of this is (healing) broken ribs. Nevertheless, we need to be very careful. After all, an animal can injure itself on the street, in a herd or in a stable. Therefore a good collaboration with the veterinarians is essential: they know far more about animal behaviour, and so together we can better establish the cause of the injury.’



'Power and control can be an important cause of abuse in animals and children'

Are there any more similarities between animal abuse and domestic violence?

Endenburg: 'There are not just similarities between injuries but also between excuses: falling from the stairs, walking against a door, colliding with a kitchen cupboard. All of these are excuses that the hospital emergency department is also familiar with. A veterinarian should also not be surprised if there are two victims in the consultation room because not only the animal is abused in such a situation but the woman or child too. We try to make veterinarians aware of this: examine the context and the family situation.' Nijs: 'And the converse is also true because the medical officers and social workers of Veilig Thuis (National Domestic Violence, Child Abuse & Elderly Abuse Hotline) who visit families in their homes, should not only focus on the children but examine the animals too.' ■

TEKST: JOSIEN JACOBS | IMAGE: BAS NIEMANS



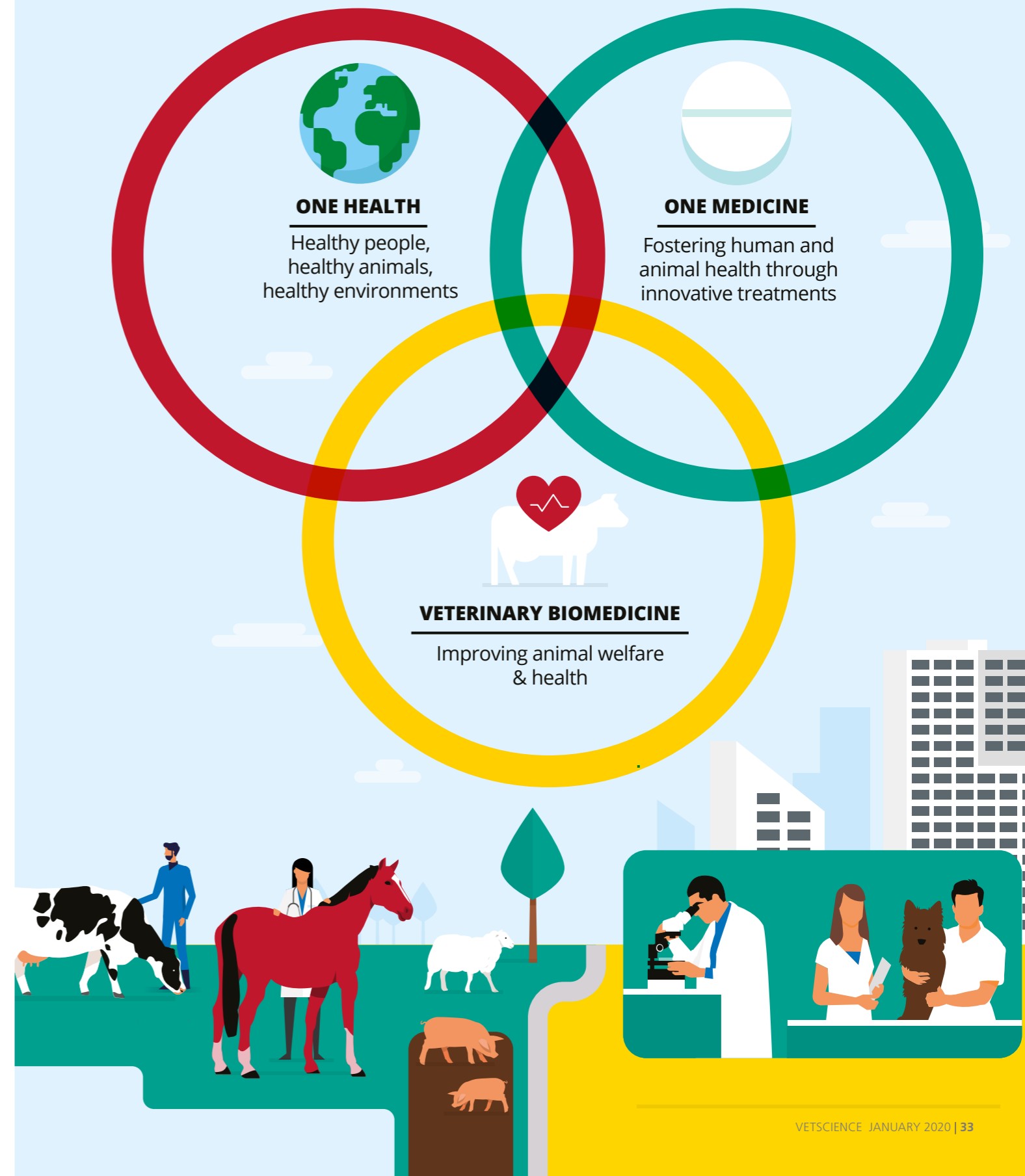
ELECTIVE COURSE

In cooperation with the NFI, the Faculty of Veterinary Medicine offers an elective course Forensic Veterinary Medicine to both students and veterinarians. During the lessons, they work with dead animals which have been donated for research purposes, and which died a natural death or through euthanasia on account of illness or old age. The dead animals are deliberately wounded as if they had been victims of animal abuse, which gives a unique opportunity to work with dogs and cats with wounds that could suggest animal abuse. Completing this module does not qualify the students as forensic vets. However, it does teach them to recognise animal abuse in practice and the action that they should subsequently take.

ABOUT THE LED

The LED is a unique collaboration that brings together the knowledge of veterinary experts and forensic-medical experts. Via a secured website, veterinarians can anonymously upload details if they suspect a case of animal abuse. The specialists from the LED can interpret this data to distinguish animal abuse from (rare) disorders, accidents and the consequences of the behaviour of the animal concerned or other animals. The combined assessment of this expert panel ensures diagnostics that satisfy the highest requirements and prevent suspicions of being wrongly interpreted. Subsequently, the veterinarian has a substantiated case, and he or she can decide whether or not to submit a formal notification to the Save an Animal hotline (phone number 144 in the Netherlands).

OUR RESEARCH FOCUS



Criteria for breeding healthy short-nosed dogs



Three examples of short-nosed dogs: a Pug, a Lhasa Apso mix and a Petit brabançon.

Due to malformation of the skull and muzzle, short-nosed dogs often have stenotic nares, bulging eyes and deep nasal skin folds. This disposition is associated with a high risk for shortness of breath and painful eye disorders. However, the open standard in the existing Dutch law made it difficult to enforce rules against breeding with these malformed animals. On behalf of the Minister of Agriculture, Nature and Food Quality, the Expertise Centre Genetics of Companion Animals (ECGG) of the Faculty of Veterinary Medicine of Utrecht University has now developed enforcement criteria. Due to these new criteria, the Food and Consumer Product Safety Authority and the National Animal Protection Inspectorate can better enforce the existing legislation.

Physical and physiological hardship

Breeding selection has led to an increasingly extreme malformation of the dog skull to ultimately obtain a dog with a so called 'cute' round shaped head and prominent eyes. Breeding dogs with this type of severe skull and muzzle abnormalities leads to physical and physiological hardship and limits the natural behaviour of these dogs. This violates their integrity and is a big risk for their welfare and therefore contravenes Dutch animal welfare legislation. Choosing breeding dogs with only mild malformations can favourably influence the welfare risks in the offspring. Unfortunately, this choice is still made too infrequently in modern dog breeding.

New animal welfare criteria

Following the report "Fokken met kortsnuitige honden" [Breeding with short-nosed dogs], the Minister for Agriculture, Nature and Food Quality, Carola Schouten, has introduced new animal welfare criteria for dog breeders. These focus on the assessment of the severity of the dog's skull malformation, writes Minister Schouten in a letter to the Dutch House of Representatives, based on for example sniffing or snoring sounds when at rest, relative muzzle length, and the ability of the dog to close the eyelids.

'The criteria point the way to a new generation of dogs that can breathe easily and do not suffer from painful eye problems'

Marjan A.E. van Hagen, ECGG

Besides a limited number of enforcement criteria, the report also describes numerous additional criteria that can further help vets and breeders to select for healthy parent animals. Breeding selection in the direction of an (increasingly) less extreme skull and muzzle malformation considerably reduces welfare risks. The outcome of this project is therefore an important stepping stone for the further development of enforcement criteria for breeding dogs and other animals with respect to a larger number of health and welfare risks. ■

TEXT: JOSIEN JACOBS | IMAGE: BAS NIEMANS

‘I want to increase the awareness about the enormous importance of a healthy environment for people and animals’

Juliette Legler aims to improve European tests for endocrine-disrupting chemicals

As a child, Juliette Legler was already busy saving the environment and our beautiful planet. A fascination for nature and ecology and her passion for research eventually led her to the field of toxicology. Since 2018, Legler leads ‘one of the strongest toxicology groups in the world’. With her research into the effects of endocrine-disrupting substances (substances that disrupt how hormones work), she is building a bridge between environmental science and human toxicology. With that, the circle for her is complete.



'Hormones are incredibly important for a wide range of processes in the body', says Juliette Legler, environmental scientist and Professor of Toxicology at the Faculty of Veterinary Medicine. 'Hormones influence the correct development of the brain and a wide range of organs during early life. Throughout our lives, they regulate many different important facets such as reproduction, development and our body's temperature.'

Hormone systems disrupted

Our living environment contains substances that can damage these hormones or disrupt their function, explains Legler. 'Examples are pesticides, substances in plastics, packaging, medicines, and cosmetics and also industrial substances such as flame retardants. These are produced by the chemical industry for very different purposes but can have undesirable side effects for the endocrine systems of people, animals and the functioning of ecosystems. As a toxicologist, I investigate how the substances can disrupt the endocrine system.'

Concerned about nature

Juliette Legler grew up in Canada. She was always outside, busy with plants, bugs and birds in the garden. 'From a young age, I've always been concerned about ecology and the environment. In Canada, I was surrounded by endless nature, and I loved that. At high school, I studied ecology, and that subject thoroughly fascinated me. I had a eureka moment when I realised life was all about connections: between people and animals, between different animal species and between animals and their environment! It was fantastic to see how all of that fitted together. So once I had finished high school, I went to study environmental sciences. Not because my family wanted me to but because of my own interest in ecology and the environment.'

'I consider myself to be a bridge between environmental and human toxicology'

During her study, Legler did an internship in the Netherlands where she gained her first experience with laboratory research and in toxicology. 'I enjoyed that so much! Toxicology is about how poisonous substances affect people and the environment. This subject offered me a way to protect both. So back then, I decided I wanted to be both a researcher and a toxicologist.' Over the years, Legler's research has increasingly focused on human health. 'Some people no longer consider me to be an environmental toxicologist because I have stopped working on bugs in the soil. However, it is humans who need to be made aware of the effects of substances around us. I consider myself to be a bridge between environmental and human toxicology.' After a successful scientific period at VU Amsterdam and Brunel University (London), Legler was appointed Professor of Toxicology at the Faculty of Veterinary Medicine in 2018. There she leads 'one of the best toxicology groups in the world'.

Why does this group have so much impact worldwide?

'We do well in the international rankings, and we really excel in certain niches. We have an international reputation in neurotoxicology, immunotoxicology and alternative models as well as my own research into endocrine disrupting chemicals (EDCs). For example, within the research of Remco Westerink, we have developed tests to assess the toxicity of substances on the developing brain, especially the effects of toxic substances on neurons. Martin van den Berg has played a worldwide leading role in the standardisation of dioxins. And my own research into the role of EDCs in obesity and diabetes is new and of international repute. I led the first European project in this, and so within Europe, I am a pioneer in this field.'

What is the link to veterinary medicine?

'Within toxicology, there is a veterinary branch concerned with the poisoning of domestic and farm animals. This is an important line of research in toxicology, and so we do teach this subject. I never thought that I would end up in a faculty of veterinary medicine, but to be honest, everything is intertwined. We should not forget that veterinary medicine is not only about the treatment of diseases but also their prevention. And that is where the environmental aspect is so important. I want to increase awareness about the enormous importance of a healthy environment for both people and animals and, as a toxicologist, I consider that to be my most important mission.'

One Health, One Toxicology

Returning to hormones and substances that disrupt their function. This is a subject that fits within the concept of One Health, which connects the health of people animals and the environment. One Health is also a strategic focus within the faculty of veterinary medicine. 'One Health really appeals to me', says Legler, and it also played a prominent role in her inaugural lecture "One Health, One Toxicology". 'The effect of

'The effect of hormones is very similar between people and other animals. Endocrine-disrupting chemicals affect various organisms and not just humans.'

hormones is very similar between people and other animals. Endocrine-disrupting chemicals affect various organisms and not just humans.'

The clearest evidence comes from field studies with fish or mammals in the environment. Several years ago, there was a famous case study. 'Fish that swim during their development in surface water contaminated with chemicals that mimic female hormones were found to become more feminine. Male fish then become far more similar to female fish, and that effect was so extreme that they developed both male and female reproductive organs. That is really drastic. The problem is mainly due to substances excreted by people, such as synthetic hormones in the contraceptive pill and other medicines that we take. These eventually end up in the environment.'

That sounds disturbing...

'What is most disturbing is that we do not really know whether this is the case for many of the substances we produce, as they are not sufficiently tested before they are launched on the market. For pesticides, a wide range of animal experiments are done to test whether the substances are toxic for rodents, as a model for people, but hormonal changes are not measured in standard toxicity tests. These tests do not examine the more subtle effects that make an animal or person more vulnerable to diseases in the longer term. That is a significant shortcoming.'

Vulnerable to obesity

Since January 2019, Legler leads the Horizon2020 project GOLIATH, funded by the European Union. The project focuses on the influence of EDCs on the development of metabolic disorders, such as obesity, diabetes and non-alcoholic fatty liver disease. 'We are currently examining how exposure to EDCs during development influences the development of fat cells. That research is already being done elsewhere with mice, but we are doing it with zebrafish as an alternative model. Under the influence of such substances, zebrafish form fat cells that are larger or function differently, for example. That makes an organism more vulnerable to become overweight.' 'There are not yet any validated, internationally accepted test methods for substances that possibly play a role in the

development of metabolic diseases. That means a substance can be marketed, which has an undesirable hormonal influence on fat cells. According to the law, substances must be tested for their endocrine disrupting effect, but industry cannot satisfy this requirement if the tools are not there. That is an important omission. We must start with the development of simple, animal-free tests that manufacturers can use to screen the hormonal influence of substances before these are launched on the market. Fortunately, the EU has now invested 50 million euros in eight projects that all concern better test methods for EDCs. Our goal is that in five years' time, we will have many better tests that industry needs.' Legler is also the coordinator of the overarching cluster of these eight projects, the so-called "EURION" cluster, which has the aim of facilitating synergies between the projects.

Many of the EDCs occur indoors too, states Legler. 'They bind to dust, and you breathe that in. A piece of simple advice is to ventilate rooms a lot and, in particular, to Hoover a lot.'

Don't you simply then ventilate these substances into your house again?

(Laughs) 'No, hoovering really does help! Besides food, dust in the home is one of the most important sources of EDCs. Hoovering is therefore very important. And for pregnant women, my advice is not to eat too much fatty fish, and certainly not more than is recommended. Research has already demonstrated that these type of substances accumulate in the fat of fish and may end up in the foetus. New research conducted by Hania Dusza, one of our PhDs, has shown that numerous chemicals with endocrine disrupting activity can be found in the amniotic fluid that surrounds the developing baby.'

Should we dispose of vacuum cleaner bags with the chemical waste in future?

'I do not do that myself, but perhaps we should. I assume that the Dutch waste incineration plants remove these substances with the latest technologies, but perhaps it is chemical waste after all. It is a good question and one I have not reflected on before. Everything comes together in ecology. This is why we need to stop endocrine disrupting chemicals at the front door, as otherwise, we will never get rid of them. We must all do our bit.' ■

TEXT: MYRNA TINBERGEN | IMAGE: BAS NIEMANS



When it hurts to move

Osteoarthritis research is a real challenge for scientists

Osteoarthritis has a considerable impact on people's lives. No less than 85% of osteoarthritis patients experience pain. This disease is caused by a deterioration in the quality of the cartilage. Unfortunately, restoring this tissue is far from easy. Nevertheless, researchers from Utrecht University see possibilities.

'If we are successful with horses, I am convinced it will work in humans too'

Osteoarthritis affects 240 million people worldwide, and the disease is also a problem in horses. René van Weeren, Professor of Equine Musculoskeletal Biology: 'One-third of all consultations with equestrian veterinarians concern joint problems. Osteoarthritis causes pain and stiffness and makes movement difficult.' Known forms of osteoarthritis are knee and hip arthritis, but arthritis in the hand or the ankle frequently occurs too.

Similarities between humans and horses

With his research, Van Weeren first of all wants to gain a better understanding of how osteoarthritis works. 'There is still so much we do not know', he says. 'If we know more, then perhaps we can develop better treatments. Current medicines alleviate the pain somewhat, but they don't actually cure the osteoarthritis.' Van Weeren carries out his research on horse patients. With respect to cartilage, they are more similar to people than you might think. 'The cartilage of horses and people is almost identical in terms of thickness, composition and function.'

Limiting the damage

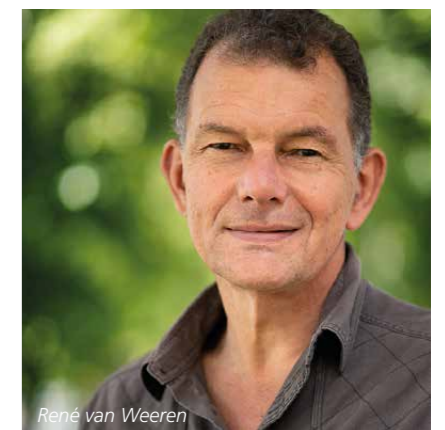
According to Van Weeren, it is disastrous that we often only detect cartilage damage in a late stage. 'As the cartilage contains no nerves, your body does not notice the damage. That only happens when the damage is advanced. Therefore, one of our objectives is to diagnose osteoarthritis when the damage is still limited.'

Repairing cartilage with stem cells

Van Weeren is also working with various groups, including the research group of Jos Malda that works on tissue engineering. Malda, Professor of Biofabrication in Translational Regenerative Medicine at Utrecht University, says: 'Once the cartilage is damaged it does not recover. That is different from our intestines, for example, because intestinal tissue renews itself every four days. Cartilage never does that.' A metal joint implant is a frequently used and successful treatment at present. Artificial joints, however, have a limited lifetime, and people are becoming increasingly older. Malda: 'We make small pieces of tissue from stem cells, which in the future could be transplanted into the joint to repair the cartilage. With this, we eventually hope to further postpone the

need for a metal artificial joint.' Van Weeren is currently investigating whether this tissue actually leads to cartilage regeneration in horses. Van Weeren: 'Unfortunately, cartilage of adult individuals has no blood supply, which has made its restoration difficult up to now. However, if we are successful with horses, then I am convinced it will work in humans too.' ■

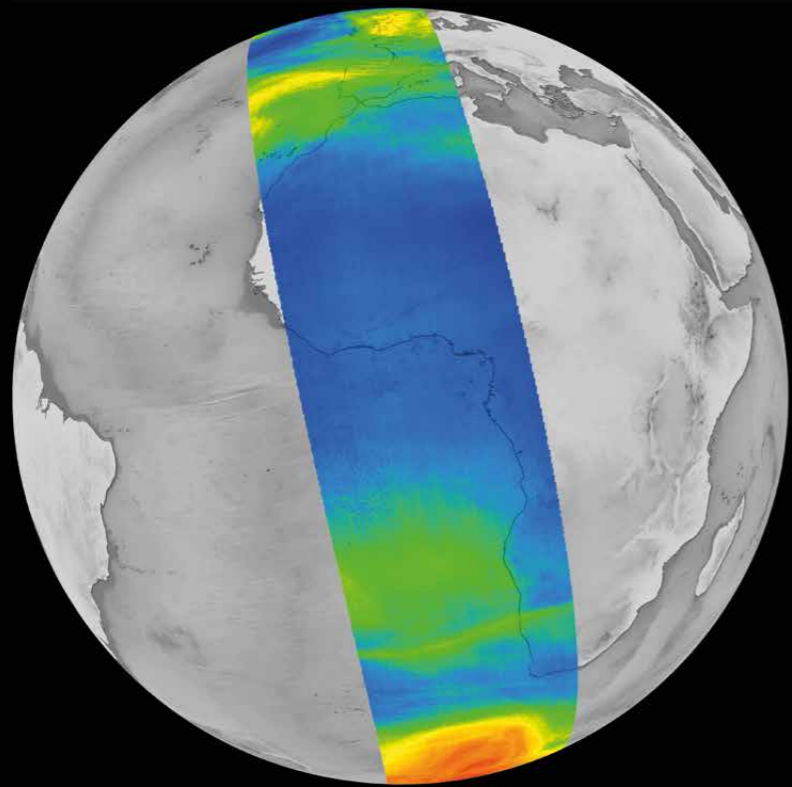
TEXT: ROSAN REUSKEN | IMAGE: IVAR PEL, BAS NIEMANS AND ED VAN RIJSWIJK



René van Weeren



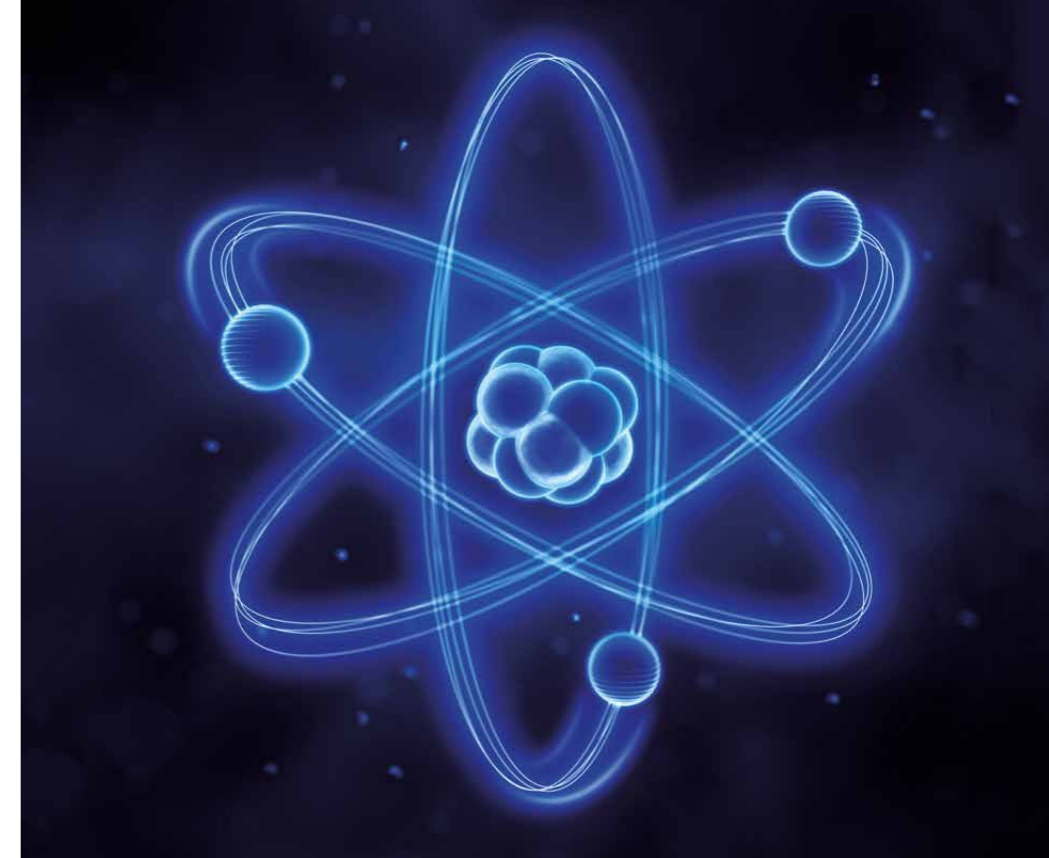
Jos Malda



Exposome research extends from satellites to microscopes. The image above shows the amount of ozone, in a 2,600 kilometres wide strip, measured by a satellite.



Scientists compare these types of data to microscopic research in order to map health effects.



‘Our ultimate goal is that people live healthily for longer’

Roel Vermeulen talks about his large-scale research into the exposome

Almost two years ago, the Utrecht Exposome Hub* started and Roel Vermeulen was appointed as Professor of Environmental Epidemiology and Exposome Analysis. The aim? To gain more insight into all of the non-genetic factors which, in interaction with each other, influence health. In other words, to understand the exposome better. Thanks to several prestigious grants that Vermeulen recently received, exposome research is now firmly on the international map. One of the grants he received was a large award of more than 17 million euros from the Ministry of Education, Culture and Science for the Dutch consortium Exposome-NL. Roel Vermeulen is the coordinator of the consortium and is confident the funding will lead to real impactful findings. He talks about the consortium’s big ambitions.

What we eat and drink, the air we breathe, our social interactions and lifestyle choices such as exercise are all examples of the non-genetic factors that influence our health and which together constitute the exposome. The biological reaction of an individual to these factors is also part of the exposome, which drives at least 70 per cent of the development of chronic illnesses. The other 30 per cent is dependent on genetic factors, the genome. Vermeulen: ‘We know far less about the exposome than we do about the human genome. So far, we only understand about half of the disease burden for which we know the environment plays a role. If we want to prevent people from becoming ill, then we need to understand the other half too. We therefore want to systematically analyse the exposome for the first time.’ Until recently, researchers did not have the methods and techniques needed to do this en masse. However, thanks to progress in the use of satellites, wearables, modelling and biomedical measurements, they can now do this research.

Exposome of the Dutch population

Measuring and analysing the exposome is a complex undertaking. ‘The ambitions are huge, and in ten years’ time, we want to have achieved three concrete objectives with the consortium. First of all, we want to have described the exposome of the Dutch population. In other words, we want to know which non-genetic factors play a role in the development of chronic diseases and how those factors are interacting with each other.’ The scientists will start with research into the causes of cardiovascular diseases and diabetes type 2, but ultimately the exposome applies to all chronic diseases and conditions.

‘To achieve our goal, we need to know the causes of chronic illnesses and be able to intervene effectively to address these causes.’

Google Maps for risk factors

‘The second goal is to produce an exposome map, a sort of Google Maps, but then with the risk factors for diseases, such as air quality, green, food environments and the possibilities for physical exercise. That will enable policymakers to see where there are hotspots with few or many risk factors. That is important, because the health inequities in the world are large. Even here in Utrecht, people who live in the best neighbourhoods live on average twelve years longer in good health than people in the poorer neighbourhoods.’ The third and last ambition of Vermeulen and his colleagues is to use the exposome map and biological measurements as a basis for issuing advice for a longer, healthier life at the individual level. ‘Knowledge of the risk factors, individual biological characteristics, and lifestyle and exercise patterns will enable us to give tailored advice.’

* The Utrecht Exposome Hub is an initiative of Utrecht University. In the Hub, scientists work together with societal partners on a concrete key issue. Researchers from Utrecht University work with various institutions, including UMC Utrecht, TNO and the National Institute for Public Health and the Environment (RIVM), to map the exposome.

Unique collaboration makes the difference

The Dutch consortium is a team of top scientists from different disciplines such as epidemiologists, geographers, sociologists, chemists, biomedics and ethicists. 'Thanks to this unique collaboration, we believe that we can unravel the exposome. Our partners are experts in their discipline, have unique knowledge and develop state-of-the-art technologies. By consolidating our strengths, we can make a difference and remain at the top internationally.'

Animals will be mapped too

Vermeulen will also implement the exposome research within veterinary medicine. 'With the help of small sensors, we recently described the chemicals cats are exposed to. Besides giving us a better understanding of diseases in cats, this knowledge can also provide us with new insights into potential exposure risks for people and how these could influence human health.'

Effective prevention

Up until now, knowledge about the impact of non-genetic factors did not result in a sufficiently effective approach. 'Although we all know about the detrimental consequences of unhealthy nutrition and little exercise, the prevalence of cardiometabolic diseases, like cardiovascular diseases and diabetes type 2, is rising. So setting up effective intervention programmes is an important aspect of the exposome research. We suspect that the current intervention programmes are too general in nature. We therefore want to develop programmes for specific groups or individuals. With this, we hope that in ten years' time, people will stay healthy for up to three to four years longer.' ■

TEXT: ROSAN REUSKEN | IMAGE: CONTAINS MODIFIED COPERNICUS SENTINEL DATA (2017), PROCESSED BY DLR/ESA, ED VAN RIJSWIJK, ISTOCK AND ESA / COPERNICUS SENTINEL DATA (2015)



Appointed professors 2018/2019

Juliette Legler,
Toxicology
Harold Brommer,
Equine Surgery
Marianna Tryfonidou,
Regenerative Orthopaedics
Sjaak de Wit,
Integral Poultry Health

Femke Broere,
Translational Immunology
Bas Rodenburg,
Animal Welfare
Jan Langermans,
Welfare of Laboratory Animals
Daniela Salvatori,
Comparative Anatomy and Physiology

Merel Langelaar,
Policy and Impact in Veterinary
Medicine
Cécile van Els,
Vaccinology

Highlighted



SASKIA ARNDT:
ANIMAL BEHAVIOUR

What can we learn about the behaviour of animals? And how can we measure animal welfare based on their behaviour? Saskia Arndt has been Professor of Animal Behaviour since 1 February 2018. 'Veterinarians must have knowledge and expertise about animal behaviour so that besides being the protector of animal

welfare, they can also act as an expert for clinical ethology. Furthermore, behaviour is an important measure for the physical and mental health of animals. Our faculty plays a key role in laboratory animal science both in the Netherlands and internationally. Behavioural expertise is also an indispensable element of this.'

HANS KOOISTRA: INTERNAL
MEDICINE OF COMPANION ANIMALS

'I want to realise a greater awareness of our important role in society. We are the leading knowledge centre in the area of health and welfare of companion animals with respect to healthcare, education and research. We have a lot to offer and we would very much like to collaborate with partners', says Hans Kooistra, who on 1 March 2018

became Professor of Internal Medicine of Companion Animals. In the area of research, Kooistra is also keen to establish collaborations with partners outside of his own department. 'We will give a lot of attention to the well-being of companion animals and reducing genetic disorders and harmful breed characteristics.'



CELIA BERKERS:
METABOLOMICS

Celia Berkers was appointed as Professor of Metabolomics at the Faculty of Veterinary Medicine and Faculty of Science (Department of Chemistry) on 1 February 2018. 'Studying metabolism is incredibly important, as it can lead to new ways of controlling resistant tumours or making immunotherapy more effective. For me, this

appointment combines the best of two worlds: the fundamental techniques of the Department of Chemistry with the medical-biological research at the Faculty of Veterinary Medicine.' Berkers' professorship not only establishes a bridge between the two faculties but also between fundamental research into cells and mass spectrometry with research questions that emerge from clinical health problems in animals.

TEXT: CARIEN DUISTERWINKEL | IMAGE: BAS NIEMANS AND ED VAN RIJSWIJK

Center for Sustainable Animal Stewardship

A bridge between faculty and society

We love animals. We live with them, we use them, we adapt them to our needs, we consume them. In fact, we ask quite a lot of the animals with whom we live together. How can we deal with all these animals in a good way? And what is good? The Center for Sustainable Animal Stewardship (CenSAS) has been established to address these questions. CenSAS stands for the sustainable and responsible coexistence of humans and animals. The center is a collaboration between the Faculty of Veterinary Medicine, Utrecht University and the Animal Sciences Group at Wageningen University and Research. Franck Meijboom, Head of the Center and Project Coordinator Maite van Gerwen spoke with us.



'Within the Faculty of Veterinary Medicine there is a lot of knowledge about animals, but it's a challenge to link this knowledge to social issues. There are many discussions about where we, as an academic organisation, can make important contributions,' Franck Meijboom explains. 'Together with relevant external parties, we work on social issues in a project-based way. These include scientific institutions and partners in the field such as livestock farmers, interest groups and breeding farms. Our ambition is to take ongoing discussions one step further, or discuss emerging themes at an early stage. It's striking that we see very enthusiastic reactions from the field. There's clearly

a need for an organisation that's able to make connections between parties, to focus and guide the discussion and to underpin it with scientific insights.'

Examples

Which types of societal issues do we address? 'Examples of key topics are for example, boiler chickens, euthanasia, pests and the pasturing of cows.' Says Meijboom. 'A quickscan of the issue of broiler chickens clearly reveals an underlying issue in this sector,' explains Maite van Gerwen. 'An animal welfare problem that's recognised by all stakeholders is the feeding restriction among broiler breeders. These parents are bred, like the broilers, to grow

'We need to imagine where we want to be in the next ten years'

quickly, but are used to produce the eggs from which the broilers hatch rather than for meat. Therefore, they are limited in their feed intake: they need to reproduce rather than grow quickly. This however, leads to undesirable problems, since it's plausible that these animals are therefore constantly hungry and that their well-being is affected. How can we solve this?' Meijboom adds, 'The Center for Sustainable Animal Stewardship

(CenSAS) explores underlying questions, such as what are sustainable breeding goals that can minimise or remove these problems. This is a topic,' Meijboom highlights, 'that we'd like to discuss with poultry farmers, retailers and animal welfare organisations.'

Pest control

Pest control within a livestock environment is less recognised and potentially complicated. 'Interestingly, there are generally strict rules and laws related to euthanasia of animals, but they don't apply to pests, such as rats and mice. Everyone can fight these animals on their own, regardless of the often animal-unfriendly methods they

use,' explains Van Gerwen. 'It's a kind of a 'black box' that nobody seems to be really concerned about,' agrees Meijboom, 'Yet the subject touches on important themes such as animal welfare and One Health: the connection between people, animals and the environment.'

Sustainable solutions

By bringing together scientific knowledge and insights from external parties, CenSAS tries to reach a consensus. But how exactly should we

'Rules don't apply to pests, such as rats and mice'

do this? 'It's important that we formulate objectives and that we imagine where we want to be in the next ten to fifteen years,' explains Meijboom, 'The ultimate goal is to involve more stakeholders in finding sustainable solutions for responsible handling of animals.' ■

TEXT: LYANNEKE KRAUSS | IMAGE: BAS NIEMANS



The Asian elephant is an endangered species. The number one cause of death among young captive elephants is EEHV – hemorrhagic disease, an aggressive disease, caused by 'Elephant Endotheliotropic Herpes Virus' (EEHV). Affected Elephants generally succumb within 24 hours after showing the first symptoms.

So far there is no vaccine or effective treatment. Researchers at the Faculty of Veterinary Medicine want to change this. Friends of VetMed are calling on the help of donors to enable research towards a vaccine, a treatment method and rapid diagnosis.

www.friendsvetmed.org

'Development of a vaccine and effective treatment against EEHV disease are essential for the survival of the Asian elephant.'

Prof. Victor Rutten, immunologist

Together, we'll make a difference

Friends of VetMed

