

**DICK
VET
NEWS**

ISSUE 33



NEWS



THE UNIVERSITY of EDINBURGH
The Royal (Dick) School
of Veterinary Studies

Welcome

After a very full year, I am delighted that the Dick Vet News enables me to reflect on the past year and share with you the incredible work of our colleagues and students at the Easter Bush Campus.



Professor David Argyle
Head of School

As with 2020, 2021 presented challenges around delivering excellence in clinical work, teaching and research as we navigated our way through the complexities of working during a major pandemic. I am incredibly grateful to staff and students who rose to this challenge and allowed us to deliver on so many fronts. Our campus Covid Response Team continued to meet regularly throughout the year and allowed us to put measures in place to keep everyone safe on campus while coordinating activities such as teaching students and maintaining clinical services. As Head of School, I have never been so proud of the staff and students on this campus who continue to demonstrate that tangible Dick Vet community spirit.

One of our major challenges through the pandemic has been to ensure that we could graduate all of our final year undergraduate veterinary students while maintaining our accreditation standards. I am incredibly grateful to everyone involved in student teaching and teaching support, who delivered such excellence in innovation during this period. Despite all the complexities of face-to-face teaching and clinical contact, we once again graduated an amazing cohort of new veterinary surgeons in June. The personal commitment of our staff and students cannot be overstated. We have learned a lot from teaching during the pandemic and many of the new innovations and ideas are now being incorporated into our thinking around curriculum development. While this was an amazing team effort, I would personally like to thank Professor Susan Rhind as our Head of Education, who skilfully navigated us through all of this while ensuring we kept close contact

with the Royal College and provided students with the best experience possible. We were delighted again to be recognised as the highest scoring school in the University in the National Student Survey. Equally, we were once again ranked first for Veterinary Medicine in The Guardian League Tables and The Times and Sunday Times Good University Guide. This is testament to the excellence in teaching and student support we provide.

Delivering all of our clinical services while teaching students in a Covid-safe manner added a further layer of complexity. We have an amazing clinical team whose dedication to clinical work and teaching has been incredible. Our clinics have never been busier and all of our staff rose to the challenge of ensuring we could operate the very best clinical services. Again, a

“we were once again ranked first for Veterinary Medicine in The Guardian League Tables and The Times and Sunday Times Good University Guide. This is testament to the excellence in teaching and student support we provide”.

really strong community effort but special mention goes to Dr Sue Murphy, our Director of Clinical Services, who kept the show on the road and, despite all of the challenges that arose, was able to grow our clinical services to now include Ophthalmology, Dentistry and Behaviour clinics. This provides an even greater service for our referring vets and also a fantastic opportunity to provide an outstanding student experience. In addition to enhancing student teaching via these new services, we increased our elective opportunities for students in remote and rural practice. Many thanks to Dr Fraser Murdoch for leading on this, and to all our colleagues in remote and rural Scotland and at SRUC, who worked with us to deliver yet another unique educational opportunity for students.

Under the leadership of Professor Bruce Whitelaw, our research programmes have also thrived despite the pandemic, with many colleagues contributing to our understanding of the Covid-19 virus and its spread. Equally, we have pushed forward a strong agenda in research focused on one health, and food and environmental security. In February, we launched a £74 million Agritech Hub at Easter Bush that will be a vehicle for improving the efficiency and output of agricultural applications, in addition to enhancing worldwide food security. The virtual hub will foster collaboration between researchers and companies to contribute to global food systems, work towards net zero carbon in the agritech sector, and inform food and environmental policies. In November, we launched a new initiative with Community Jameel at COP26. The new Jameel Observatory for Food Security Early Action will help tackle the growing threat

posed by the increasing severity and frequency of climate-related disasters to people in the world's drylands. The venture brings together the expertise of five partners – the University of Edinburgh, the International Livestock Research Institute (ILRI), Save the Children, the Abdul Latif Jameel Poverty Action Lab (J-PAL), and Community Jameel. We also celebrated 25 years of Dolly the Sheep, a landmark discovery that changed the scientific landscape and testament to the quality of research that embodies the Roslin Institute.

As we emerge from the pandemic, our sights are firmly set on the future. Earlier this year we launched our new five-year strategic plan, which is unashamedly ambitious and includes the development of new initiatives including a Centre for Aquaculture Genetics and Health, and a new Centre for Epidemiology. Recently we also signed agreements to open our first All4Paws outreach clinic in Edinburgh, which will support homeless and vulnerable people whose pets require veterinary care. We also have ambitious plans for a new first opinion practice in Midlothian to support our new Division of General Practice, again supporting clinical development and enhancing the student experience.

The infrastructure we have built on the Easter Bush Campus has enabled us to develop one of the strongest veterinary schools in the world. The year 2023 marks our bicentenary and we are planning some amazing events for that year that we hope you will be able to join us for. In the meantime, I hope the articles in this edition of the DVN will give you a flavour of the excitement and ambition that underpins our thriving veterinary community.

The front cover photograph was submitted to our World Wildlife Day staff photo competition by John Pate, Lecturer in Equine Practice.

"I was lucky enough to spot this magnificent stag as I drove down Glen Etive. He couldn't have posed better for me with the mountains behind as I quietly got out the car to take this shot"



Year In Review

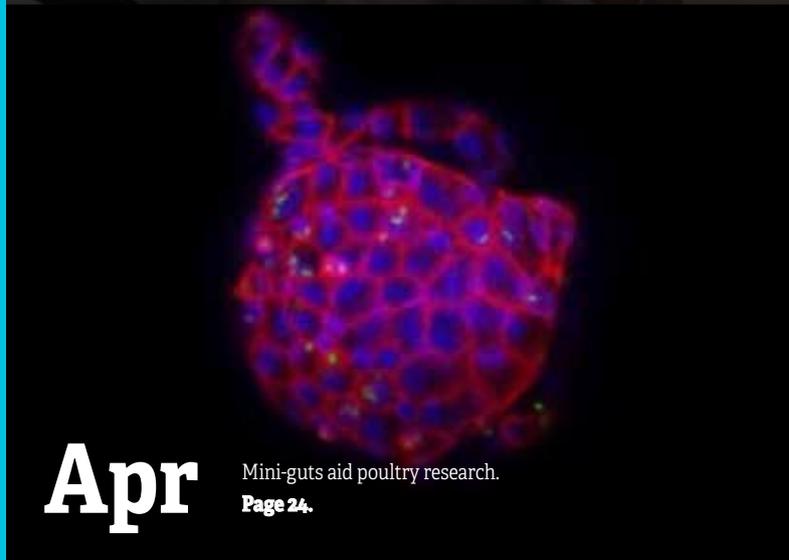
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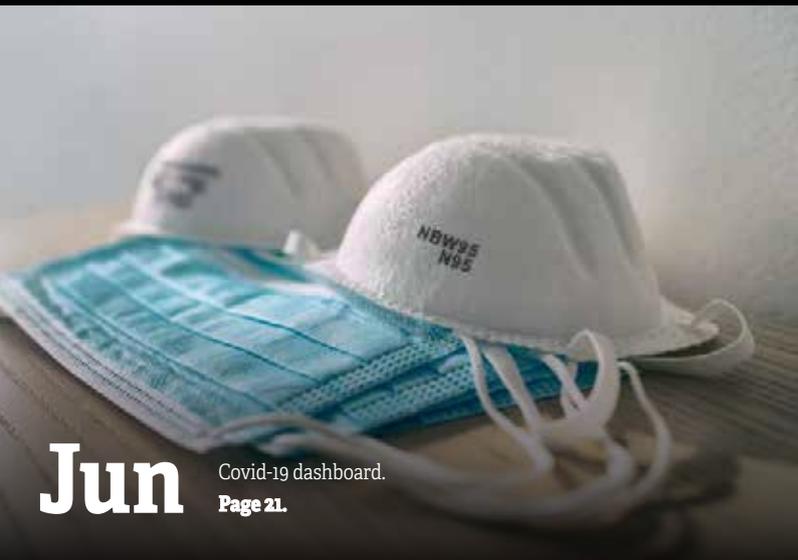
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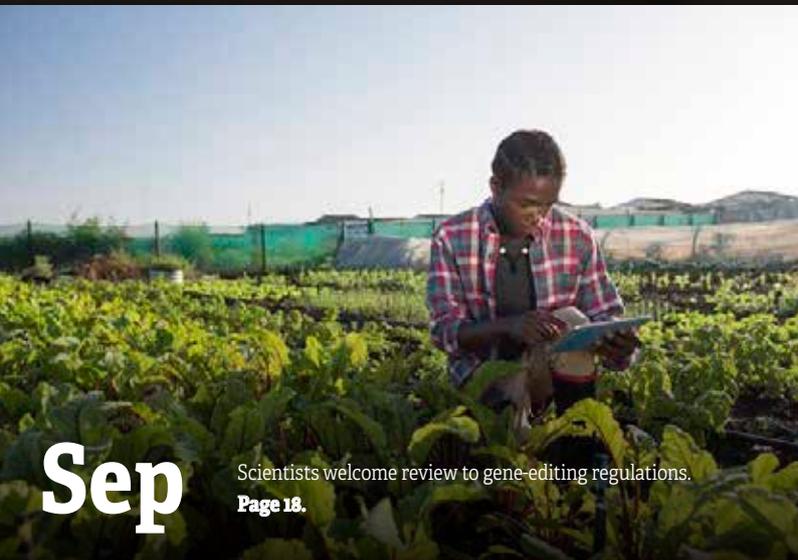
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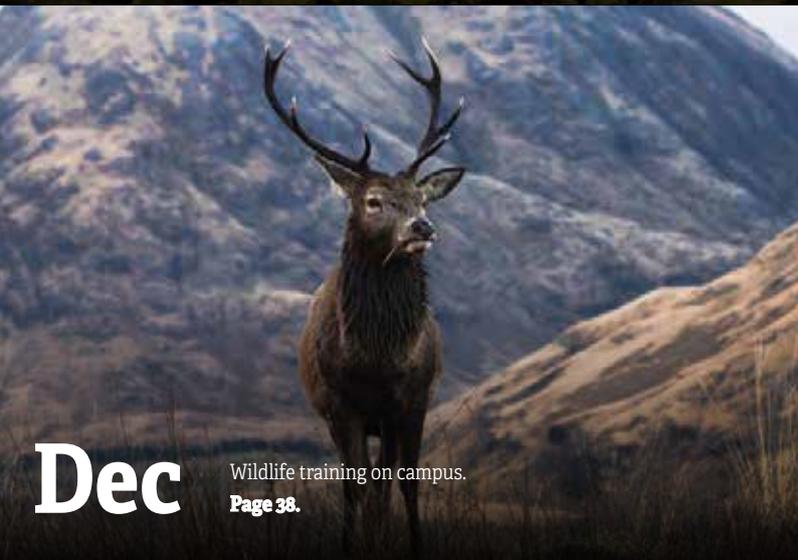
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The past 12 months have provided many challenges to teaching teams and students alike.

Teaching Update

UNDERGRADUATE STUDENTS

Throughout this academic year, our teaching teams have continued to meet regularly, planning activity across the undergraduate and postgraduate curricula.

For undergraduate veterinary students, this planning has ensured they receive the vital practical and in-person teaching required for their training.

We are fortunate to have a large and open campus, with our clinics and large laboratory facilities enabling students to safely attend clinical skills and practical classes. The student support team has also been very active in supporting students through the various challenges they have had to deal with during such a significant global crisis.

In August, our Final Year students were able to start their programme as planned, with other years returning in September. The relaxation of social distancing rules meant we could effectively double the amount of time on campus. Large group lectures have remained online. This format provides students with an interactive online experience that enables them to annotate slides and ask questions as they learn.

In May of this year, Drs Patrick Pollock and Kristina Pollock took Year 4 students through immersive simulation training in how to handle a roadside incident involving animals. This allowed students to explore how they perform under pressure, working towards peak performance and resilience in the face of high-stakes situations.

The introduction of Reassessment Campaign on Veterinary Resuscitation (RECOVER) basic and advanced life support training into the undergraduate veterinary curriculum has been a huge success and well received by our students.



Students take part in RECOVER training part during their annual onesie day!



This gold standard veterinary CPR training uses immersive simulation to drill students in basic and advanced life support techniques for dog and cat resuscitation.

Other innovations to help keep students and staff safe during this time include using video recording in examination spaces. Led by Caroline Mosley, this work helped us ensure our students were able to demonstrate and be assessed on core skills despite reduced room capacities.

Our undergraduate Agricultural Science and Agricultural Economics students are now fully back on-campus for in-person teaching this semester, following a digitally delivered second semester in the last academic year. We have already had several visits out to organisations involved in the agri-food supply chain, including a trip to a fish farm on the west coast of Scotland, and Agri-Epi farms focusing on Precision Farming.

Some of our courses are being delivered at the Easter Bush Campus, but many are being delivered at the Central Campus or King's Buildings to allow students from across the University to join courses that interest them. This interaction with students from other degrees facilitates inter-disciplinary discussion and learning. We also have veterinary undergraduate students intercalating in our BVetSci Global Agriculture and Food Security, and it has been a joy to incorporate their perspectives.

Our students have continued to be active in their newly formed Food Security and Sustainability Society - hosting webinars, developing a growing plot at Easter Bush Campus, and creating a Planetary Health meal plan with students in Dundee University. This also involved a live 'cook-a-thon' with the Director of our Global Academy of Agriculture and Food Security,

Professor Geoff Simm, demonstrating his skills.

Students have also been involved in organising and attending online and in-person sessions around COP26, attending the Youth4Climate conference in Milan, and reflecting on COP26 and what it means for sustainable food systems.

We are proud of our students – in particular how they have adapted to circumstances that can seem continually in flux. Our staff have continued to go above and beyond in ensuring our students' educational experience is not compromised.

POSTGRADUATE TAUGHT STUDENTS

Our PGT community has continued to grow and flourish despite the pandemic. We now have over 800 students studying for postgraduate taught qualifications (Certificate, Diploma and MSc/ MVetSci) across 15 different programmes. These vary from Animal Welfare and Behaviour based programmes; Clinical Practice and Veterinary Anaesthesia & Analgesia programmes; more global facing programmes in Food Security & Nutrition, Conservation Medicine and One Health.

For our on-campus students, the pandemic has presented some challenges. During the first lockdown almost all of the projects that our Applied Animal Behaviour and Animal Welfare MSc students were planning to do had to change as fieldwork (including farm visits) had to be completely changed at short notice, involving a lot of effort and time by the programme team and supervisors. Despite this, excellent dissertations were produced. For the last academic year, as restrictions waxed and waned, the on-campus MSc was converted to an online MSc, which required a huge amount of resource and effort. While

Students visiting Bielgrange Farm, part of the Agri-Epi Farm Network

Some of our courses are being delivered at the Easter Bush Campus, but many are being delivered at the Central Campus or King's Buildings to allow students from across the University to join courses that interest them.

projects were again impacted by restrictions on travel and fieldwork, this did not impact on the quality of the dissertations. The programme team were delighted to welcome an in-person cohort once more this September.

The vast majority of our PGT students are online intermittent students, carrying out their studies in over 70 countries across the world - from Fiji, Rwanda and Argentina to North America, continental Europe and the UK. Whilst our programme teams are used to delivering teaching and support to students located in multiple time zones, it has been very encouraging how engaged our students remained as their own countries were impacted by the pandemic at different times and to different degrees. Our students were determined to maintain their learning and our programme teams were equally determined to deliver to a high quality.

We were delighted to be the top-rated School in the University of Edinburgh in the 2021 Postgraduate Taught Experience Survey, achieving >95% Overall Satisfaction. This is recognition of the dedication and work of our excellent programme teams and tutors continuing to provide excellence during this time, despite

disruptions to their own lives from the pandemic. Their dedication, and that of our students, has not been diminished by the pandemic.

POSTGRADUATE RESEARCH STUDENTS

The campus continues to be a vibrant research environment for our PhD and MScR students. Our PGR community is over 170 strong and scattered throughout the five PGR programmes that the School offers.

Although our students have faced a difficult academic year with laboratory closures and limited access to the campus buildings, they have submitted their work for examination and moved forwards in an exemplary manner. In many cases, funded extensions of up to six months were awarded to our students in their final year to allow them a little extra time to complete their studies. However, in many cases, and in particular for our MScR students, projects had to be altered to accommodate the lack of laboratory facilities. This involved changes to the experimental approach and usually involved

the inclusion of research that could be done on a laptop or computer rather than in the lab. Our students rose to the task and completed their projects. This will give them a solid training in scientific enquiry and stand them in good stead in their future careers.

The students' supervisors and thesis committee members continued to do an excellent job, offering guidance and mentorship when required via digital platforms. Even the students' final oral examination (viva voce) was affected, as they had to be conducted digitally. This added extra stress to the occasion, as the students and the examination team were scattered throughout the country and in many cases overseas as well.

Now that the buildings have opened up, this has created a more 'normal' atmosphere - which our new students who started in autumn have welcomed. The change provides them with unlimited access to the laboratories and supervisors, allowing lab discussion and Thesis Committee meetings to take place in person. Attending national and international congresses is now also a possibility, as is Graduation, which took place in McEwan Hall in December 2021.

Dick Vet staff contribute to RCVS Knowledge evidence-based veterinary medicine course



RCVS Knowledge has updated and expanded its highly regarded, evidence-based veterinary medicine (EBVM) course to provide a free, practical grounding in applying EBVM, available on the charity's new e-learning platform.

Several Dick Vet staff contributed to the project, which is the product of an international collaboration with 18 leading veterinary educators and practitioners. It offers veterinary surgeons, nurses, students and educators six hours of free CPD, which cover the five stages of EBVM and an overview of its evolution.

"I worked on the Acquire module with a small group of colleagues from the UK and US. We (as the group of librarians) want to help EBVM Learning users develop the skills and strategies to effectively search for and

access the information needed to answer a clinical query."

- Fiona Brown, Academic Support Librarian.

Users can progress through the six modules in order, or can access individual sections to deepen their knowledge in particular areas. Practical examples and quizzes are provided, as well as the opportunity to download a certificate of completion.

The mobile-friendly course can also be used as a reference tool for specific aspects of EBVM, such as how to search the literature effectively, and there is an extensive thematic set of references for those who are keen to explore the subject further.

The updated EBVM Learning is housed on RCVS Knowledge Learn, the charity's new e-learning platform.

"Ian Handel and I focused on revamping the ASK module, with additional input from external veterinary associates. It was an honour and a pleasure to be involved in a project that is so central to helping veterinary professionals across the world to practice evidence-based veterinary medicine."

- Louise Buckley, Academic E-facilitator - ChM Urology

Celebrating

30 YEARS

of teaching in animal welfare

Our MSc in Applied Animal Behaviour and Welfare was the first programme of its type in the world. This is a fully collaborative programme between Scotland's Rural College (SRUC) and the University.

In the 30 years since the inception of the programme, more than 700 students from all over the world have graduated and gone on to careers in research, education, government, veterinary practice, and non-governmental and industry organisations, among others. They have made significant contributions and tangible improvements to animal welfare around the world.

Professor David Wood-Gush, one of the first scientists to investigate the effects of factory farming on animals, initiated the programme in 1990 with contributions from the Scottish Agricultural College, the Roslin Institute, the Royal Zoological Society of Scotland and University departments the Institute of Ecology & Resource Management, the Royal (Dick) School of Veterinary Studies and the Department of Divinity.

The MSc started out in the University's Institute of Ecology & Resource Management, which was then part of the Division of Biological Sciences, and moved to the R(D)SVS field station on Easter Bush Campus in 2002.

Today, the programme has popular international appeal and is endorsed by many organisations for its up-to-date understanding and application of the latest animal welfare research.

In 2011, the Jeanne Marchig International Centre for Animal Welfare Education (JMICAWE) was integrated into the R(D)SVS with a grant from the Marchig Animal Welfare Trust. Its mission was to provide education in animal welfare for veterinarians in the UK and overseas,



particularly in Asia. In its first four years, JMICAWE was established as an internationally recognised hub for animal welfare education. Work during this period included the development of a Massive Open Online Course (MOOC) on Animal Behaviour and Welfare and an online MSc in International Animal Welfare, Ethics and Law.

In 2016, JMICAWE developed another MOOC on the behaviour of dogs and cats, and a second online MSc programme in Clinical Animal Behaviour.

JMICAWE continues to deliver workshops on animal behaviour and welfare across Asia and to develop resources to support animal welfare education for vets and vet nurses globally.

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Interview

The future of VR in veterinary education



Our Digital Education Unit (DEU) works with lecturers to provide students with immersive learning experiences. Here, Senior E-Learning Developer Brian Mather talks about digital education and the future of Virtual Reality in teaching.

"The term 'Immersive Media' includes Virtual Reality, Augmented Reality and 360° video – but each is very different," explains Mr Mather. "Virtual Reality (VR) places you inside a completely digital environment; augmented reality overlays digital content onto the real world, and 360° video plays out a recording that you observe and can manipulate but cannot move independently within."

The School has been using 3D models in teaching since 2015, and it has been possible to view the content in VR since 2018, but in a limited sense. "The dream is to offer students a virtual practical experience, but the reality is still a way

off," says Mr Mather. "However, we use some fantastic technology in our teaching to enhance the student experience."

Explorations into 3D printing at the School formed the beginnings of what is now an extensive 3D modelling project. "Once you've done the preparatory work to create a 3D model, you can actually do quite a lot with it beyond print it. You can put it into a virtual space for students to explore, you can label it, you can create layers," says Mr Mather. "It's better than a printed model. There's huge potential."

The School has a bone library for students to borrow from, which is helpful for their anatomical studies. The collection is incredibly valuable, and difficult to replace. However, thanks to 3D modelling techniques, portions of the library have been digitised. The digital bone library can be accessed anytime, anywhere, and provides the added benefit of enabling students to

zoom in or out, rotate the images, view overlays or cross-sections and even study at the dinner table without upsetting friends and family!

360° photography and video technology has enabled the recording of high-quality video tutorials for students to review at home or in practice. Students at the Dick Vet can use their phones to access hundreds of video tutorials via an online library or by using QR codes around the School. For example, a student in the Equine Practice can remind themselves of tutorials they previously received on a particular procedure by pointing their phone at a QR code in the relevant area.

This technology is also used to ease the transition from practicals in the Clinical Skills lab to practice in our clinics. Students can view videos of techniques they have learned being put into practice by the School's clinical staff, which enables students to move more confidently into the next stage in their learning. This also eases

anxiety, helps to consolidate learning and enables students to 'meet' the team they will work with in the hospital environment before they progress.

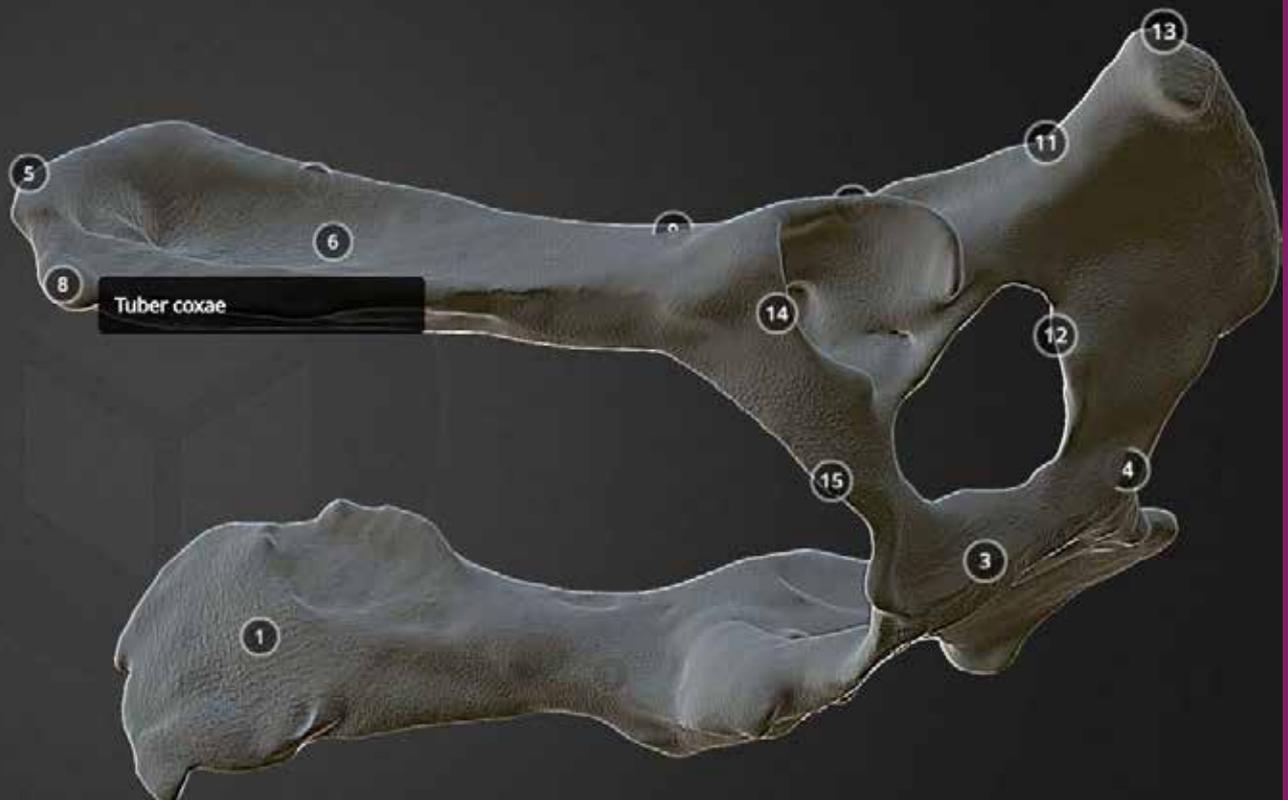
There is considerable interest from staff, students and the wider University in developing the use of VR as a teaching aid. "The tricky part is developing the teaching material. Without digital content there is nothing to experience in the virtual space. Pedagogical practice still applies with the development of interactive simulation. 'What am I teaching? Why am I teaching in this way? How will the students learn? How will they benefit from this form of teaching?'"

Future development of VR to enhance clinical education depends in part on the technology. "The exciting part is when you can manipulate and interact with the environment. The development of hand (and, more importantly, finger) tracking will make the experience more valuable. After that, the sense of touch needs to be replicated. Haptic feedback is in development, but it will be some time before it is commercially available.

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- Brian Mather, Senior E-Learning Developer



Clinical Services

Imaging team lends expertise to racehorse studies

Specialists in equine health at the Dick Vet have joined forces with imaging teams in the University's Medical College to advance understanding of heart health and leg fractures in horses.

The team sought to evaluate the patterns of small fibres in the left atrium, or chamber, of the equine heart, which is useful knowledge in developing techniques to identify electrical activity in the heart.

Equine cardiology experts and teams from Edinburgh Imaging used scanning technologies, known as diffusion tensor MR and micro CT, to create detailed images of post-mortem specimens from horses.

Both techniques led to excellent visualisation of the three-dimensional organisation of fibre tracts within the heart chamber.

"Applying non-destructive imaging techniques to better understand the anatomy of equine hearts has shown to be a valuable approach, which we hope can inform efforts to develop methods of studying electrical activity in the heart – an important indicator of heart health," says Dr John Keen, Senior Lecturer.

In a separate project, experts from Edinburgh Imaging collaborated with equine orthopaedic

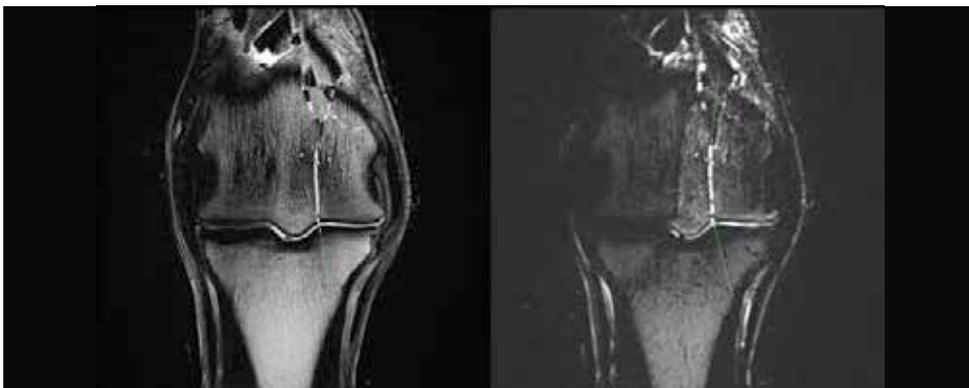
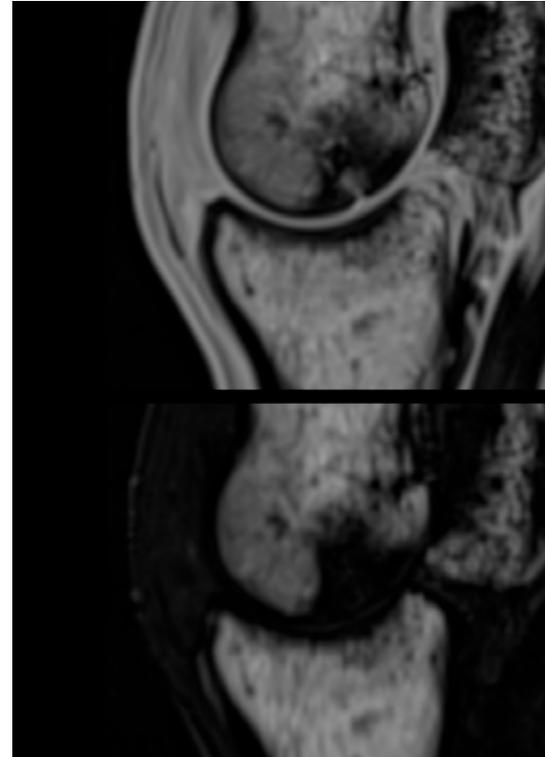
specialists at the Dick Vet on imaging of the Thoroughbred fetlock – the high motion joint between a horse's knee and hoof.

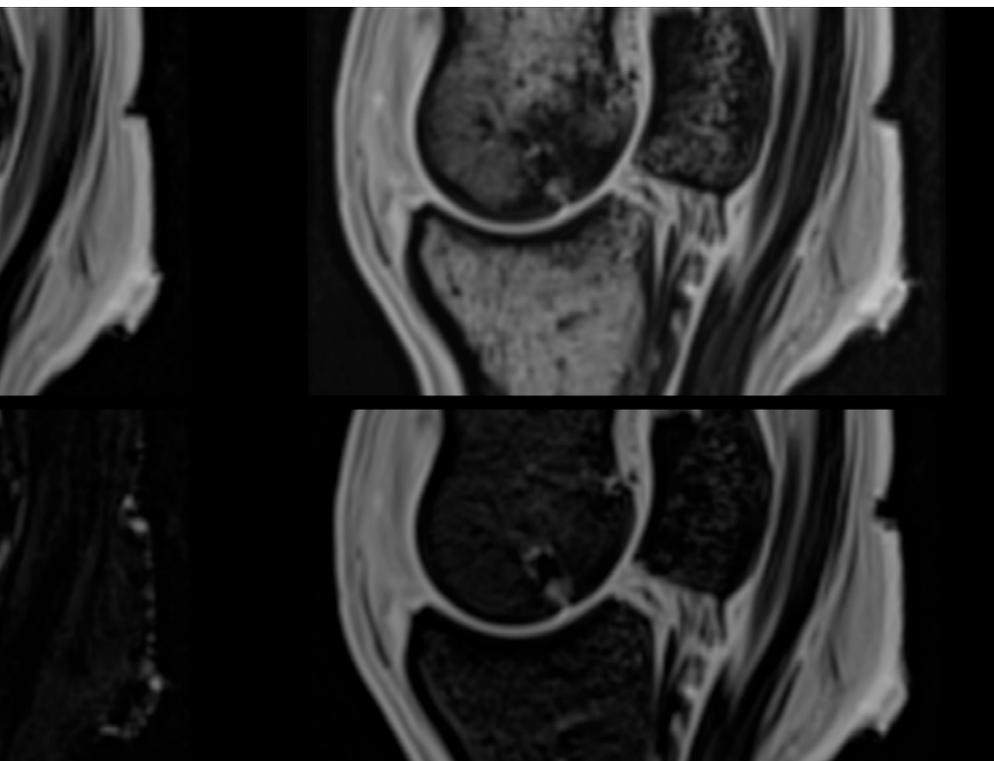
The team used a newly installed 3T Siemens Skyra MR scanner to capture images of 17 limbs recovered from horse cadavers. The scanner forms part of the advanced imaging services available at the Dick Vet's Large Animal Research Imaging Facility (LARIF).

Our researchers hope to use MR look for biological indications to help predict fracture occurrence in athletic horses, whose bones becomes more dense as they train.

"I hope these advanced imaging studies will give us further insights into how fractures occur in horses, which may help in future prevention and timely treatment."

-Dr Sarah Taylor, Equine Orthopaedic Surgeon





CEPEF4 equine anaesthesia mortality study gathers data

Veterinary Anaesthesia and Analgesia service staff are leading the worldwide milestone Confidential Enquiry into Perioperative Equine Fatalities (CEPEF4) study, investigating equine mortality associated with general anaesthesia and standing sedation.

Thousands of anaesthetists and equine clinicians are being invited to participate in a study collecting data on horses undergoing general anaesthesia and standing sedation, to help lower the associated risks of general anaesthesia in horses.

Results from the multicentre study will reveal trends in equine anaesthetic practice and the outcome, in terms of disease and mortality. The study uses an online questionnaire.

Equine anaesthetic fatalities have been reported in previous studies as 10 times more likely than for other animals such as dogs and cats. The team behind the CEPEF4 initiative hopes to help reduce this risk of death by throwing light on practices associated with higher fatality.

Researchers behind the global project will update the findings of a similar initiative carried out almost two decades ago, known as CEPEF2. Use of new technologies allows interactive data collection with virtually simultaneous analysis, allowing continuous updating of the information.

The project is led by the R(D)SVS in collaboration with specialists from CEU Cardenal Herrera University, Spain and the University of Zürich, Switzerland. The team also is integrated with two authors of the previous CEPEF studies and is supported by the Association of Veterinary anaesthetists (AVA).

"We hope to generate a large dataset from different clinics around the world, to assess current trends and practices, and point to potential improvements in anaesthesia for horses and other equine animals."

- Miguel Gozalo-Marcilla, Senior Lecturer in Veterinary Anaesthesia and Analgesia.

Working together with remote and rural veterinary practices

Veterinary practices in remote and rural areas of Scotland face challenges in recruiting and retaining vets to work in their area; issues that are shared with other professions such as medicine and dentistry. Veterinary provision in rural areas of Canada, America and Australia have similar challenges.

Given the international nature of the veterinary profession and our student cohort, we are developing closer links with colleagues in rural mixed practices to assist where needed, offering R(D)SVS students the chance to experience life in this part of the world and to showcase career opportunities in the rural sector outside of standard veterinary practice.

The Highlands and Islands of Scotland covers a vast area of remote communities which are home to a wide variety of different animals. To ensure veterinary provision to the crofting communities in these areas, the Scottish Government provides support to these remote rural practices through the Highlands and Islands Veterinary Services Scheme (HIVSS), which includes over 20 practices.

Dr Patrick Pollock from our Equine team and Dr Fraser Murdoch from our Farm Animal team have been working together with the HIVSS practices to deliver virtual CPD evenings, as well

as targeted CPD on topics such as large animal rescue. We have also been awarded a grant from the University of Edinburgh Principal's Teaching Award Scheme to develop resources for schools and practices to use with students in the Highlands and Islands interested in pursuing a career in veterinary medicine.

Working in collaboration with the HIVSS network, Scotland's Rural College (SRUC) and Glasgow University Veterinary School (GUVS), we have established a selected rotation offering for our Final Year students in the Highlands and Islands. This involves spending time at one of the mixed veterinary practices within the HIVSS network, and a subsequent week based at the SRUC Inverness Campus focusing on other career options within the rural sector including aquaculture, applied epidemiology, veterinary diagnostic laboratory work and supporting field diagnostics services.

Feedback from students on this selective rotation in spring 2021 was excellent, even resulting in job opportunities for one of our students.

We are actively working to develop this partnership further, so that we can respond to changes in the profession, and meet the specific needs of colleagues working in remote and rural veterinary practice.





Pet recovering well after treatment for rare cancer



A pet cat is recovering from a rare type of cancer following care from a range of expert teams at the Hospital for Small Animals.

Misha, a 14-year-old shorthair, was found to have cancer affecting several of his organs, despite showing no signs of ill-health. Following surgery to remove tumours, and ongoing chemotherapy, Misha's condition is now in remission.

Misha's illness was discovered when blood checks in preparation for dental work flagged a change in his liver health. Levels of key enzymes in his liver, which had been slightly high in a routine check six months earlier, had worsened to become markedly elevated.

Further tests revealed Misha had multicentric plasma cell neoplasia, also known as myeloma related disorder, which had caused tumours in his spleen, liver and on a lymph node. This type of tumour, previously known as multiple myeloma, occurs in stem cells of the bone marrow or, as in Misha's case, in other organs.

Teams from surgery, anaesthesia, feline medicine, intensive care, oncology, pathology and dentistry at the Dick Vet collaborated on Misha's treatment and recuperation.

Surgery was carried out to remove Misha's spleen and lesions from his lymph node, as well as resolving dental issues. He was prescribed chemotherapy to treat the lesions on his liver.

"I'm very happy that Misha is now doing so well. His illness highlights the importance of regular health checks to help spot issues that may otherwise be undiagnosed, and the benefit of treating animals early on their illness, to improve their chances of recovery".

- Tobias Schwarz, Radiologist and Misha's owner

Collie home with barely a scratch after sticky situation



A twig was removed from a dog's eye after the animal had an unusual accident while playing outdoors.

Mia the collie had the 5-centimetre twig removed by veterinary ophthalmologists thanks to specialist scans that allowed them to see the stick's placement.

Remarkably, the stick was carefully removed, leaving Mia with only a small scratch.

Mia's owners feared their six-year-old pet had lost her eye after she was playing in a hedge and emerged with a stick poking from her eye socket.

She was referred by her local vet to the specialist ophthalmology service at the Hospital for Small Animals. Once there, our vets performed a CT scan. Images revealed that the stick was still in one piece and lodged just above the eye.

Pictures from the CT scan allowed the vets to carefully remove the object without the need for an invasive operation, leaving Mia with only a superficial scratch on her eye. After flushing the area with fluids to make sure there were no remaining fragments, Mia was able to walk out of the clinic unaided and has suffered no long-term damage to her sight.

"This was an unusual situation for us, and we are really pleased to see Mia back to full health and enjoying life. We are lucky to have such an amazing group of people here, including Specialists in anaesthesia and radiology, and a highly skilled and compassionate nursing team."

- Ben Blacklock, Vet Specialist Ophthalmologist

Walking aid helps dogs recover after spinal injuries

Generosity between dog owners has given injured pets from five different families the chance to learn to walk again.

Polar, a nine-year-old husky, underwent emergency neurosurgery at the Hospital for Small Animals after a sudden, severe neck injury – a slipped disc, also called an intervertebral disc herniation.

After the successful surgery, at the recommendation of the Dick Vet, Polar's owners invested in a wheelchair to aid his recovery, from a ruptured disc compressing his spinal cord.

An intensive programme of physiotherapy and hydrotherapy, started by Royal (Dick) Edinburgh Physiotherapy Assessment and Intensive Rehabilitation Centre (REPAIR) centre and continued at home, helped Polar recover.

With use of the wheelchair and a support harness, Polar was able to run unaided just three months after the procedure.

Following Polar's recovery, his owners lent the wheelchair to four other dogs treated at the Dick Vet, each of whom had suffered spinal problems.

In each case the custom-made wheelchair was professionally adjusted to fit each dog. All were treated by experts in neurology, neurosurgery and physiotherapy.

Ripley, a six-year-old Labrador, became paralysed while playing with a ball. Within a few hours she was evaluated by the Neurology and Neurosurgery team and underwent an MRI.

Ripley was found to have experienced a slipped disc. A fragment of disc had hit the spinal cord at speed, causing bruising. Injuries of this type respond best to medical treatment with pain relief and physiotherapy, rather than surgery.

When Ripley was showing good progress, Dick Vet staff contacted Polar's family, who kindly offered to lend her their wheelchair. With continued physiotherapy and enthusiastic use of the wheelchair, Ripley was able to walk again unaided.

Susie, a 10-year-old Labrador, became unable to walk due to a degenerative condition in her neck commonly referred to as 'wobbler syndrome'.

An MRI scan identified that her condition had progressed too far for surgery. Susie was prescribed a palliative plan of pain relief and physiotherapy, to ease her final days.

Polar's owners once again offered the use of the wheelchair, enabling Susie to spend the final weeks of her life happy at home.



Shadow, a six-year-old spaniel, became weak and wobbly in all four limbs after a walk, and quickly became unable to move.

Shadow was diagnosed by the Dick Vet with an intervertebral disc problem, which had caused bruising to the spinal cord. Similarly to Ripley's paralysis, injuries of this type respond best to medical treatment, rather than surgery.

The wheelchair was again adapted to suit Shadow's needs, and together with intensive physiotherapy and hydrotherapy, enabled Shadow to walk with minimal support, just two months after his injury.

Diesel, an 11-year-old Dalmatian, suffered a herniated disc in his neck and needed surgery.

Diesel also had a degenerative condition in his spine, which over time had affected his spinal cord function. Owing to this, Diesel was at risk of not being able to walk again.

However, the surgery was successful and followed by intense physiotherapy and hydrotherapy with the REPAIR clinic.

With the help of the wheelchair Diesel was back on his feet within a month and able to play with his four other Dalmatian family members.

“Thanks to the kindness of our clients, many dogs have been able to share the benefits a wheelchair can bring, as part of their programme of carefully managed therapies.”

- Dr Zohra Khan, Veterinary Neurologist and Neurosurgeon

Research

Scientists back plans to progress gene editing regulations

Roslin Institute scientists have welcomed moves by the UK Government to review regulations around gene editing that could help farmers grow more resistant, nutritious, and productive crops.

The Government plans follow a nationwide consultation on gene editing, to which the Roslin Institute responded.

The move could allow the UK to revise rules on the use of gene-editing technologies that enable changes in an organism's DNA. These changes could make breeding more precise and efficient.

The UK's recent departure from the EU means it is able to develop its own regulations on gene editing.

Gene editing does not involve the introduction of DNA from other species. Its use could bring about genetic changes similar to those that could be produced more slowly through natural breeding processes.

Under current rules, gene editing is regulated in the same way as genetically modified organisms, in which additional DNA, sometimes from another species, may be introduced into an organism. This is currently controlled by EU GMO regulations.

As a first step, the Government's Department for Environment, Food & Rural Affairs (Defra) will seek to change the rules relating to gene editing to cut red tape for crop trials and make research and development easier.

The focus will be on plants produced by genetic technologies, where genetic changes could have occurred naturally or could have been a result of traditional breeding methods.

Further steps will be to review the regulatory definitions of a genetically modified organism, to exclude organisms produced by gene editing and other genetic technologies where these could have been developed by traditional breeding.

GMO regulations would continue to apply where gene editing introduces DNA from other species into an organism.

Gene editing offers major opportunities to address the combined challenges of rapidly



increasing global demand for healthy and nutritious food with the goal of net zero carbon emissions.

"I welcome the announcement as a first step towards reducing unnecessary and unscientific regulatory barriers to the use of advanced breeding techniques which are precise and targeted, allowing us to make specific genetic changes.

"Adopting a more proportionate and enabling approach to regulation will open up increased opportunities for international research collaboration, inward investment and technology-based exports, bringing a major boost for UK science.

"Although we welcome the developments announced by Defra we are disappointed that currently the proposals do not include development of regulations relating to applying genome editing in farmed animals in parallel to crops. There are major opportunities to improve animal health and welfare that are in development, that use gene editing technologies."

- Professor Helen Sang

"I am a strong advocate for the technology, a confidence that comes from seeing projects emerge which benefit animal, farmer and consumer alike – such as those which reduce the burden of disease in animals. I view Defra's intention to incentivise innovation as pointing the way to capture the benefits of this technology, supporting UK innovation in both future plant and animal agriculture."

- Professor Bruce Whitelaw, Professor of Animal Biotechnology, Roslin Institute





Celebrating Dolly the Sheep's legacy, 25 years on

Scientists have reflected on the impact of Dolly the Sheep, some 25 years after she was born at the Roslin Institute, the first mammal to be cloned from an adult cell.

Dolly's story made headlines around the world, and she continues to be regarded as a scientific milestone.

The pioneering research that led to Dolly's creation paved the way for ongoing discoveries using stem cells and gene editing.

Dolly was created by replacing the nucleus in an egg cell from a Scottish Blackface sheep with the nucleus of an adult udder cell from a white-faced Finn Dorset sheep. She was born to a surrogate Blackface ewe. It was the first time that an adult cell had been used to create a cloned animal.

The research that led to Dolly has supported new understandings of stem cells – early stage cells that can develop to form various tissues. Scientists are researching how to control their development, and how mature cells may revert to behave once more as undeveloped cells.

Insights from Dolly have also enabled advances in gene modification and gene editing – making beneficial changes to the DNA of an organism, such as a plant or animal.

The researchers who produced Dolly were working on cloning as a method of producing genetically modified livestock for research.

The advance, carried out by a team from Roslin and PPL Therapeutics, was technically difficult. Dolly was the result of many months of research involving a highly skilled team.

Cloning has since been superseded by other technologies and is no longer carried out at Roslin.

"Dolly the Sheep remains a significant scientific breakthrough, 25 years after her birth. The legacy of Dolly, and the creative spirit of the team involved, continues to inform and inspire researchers in their work, including at the Roslin Institute where we are using gene editing to tackle infectious diseases, food security and pests."

- Professor Bruce Whitelaw, Professor of Animal Biotechnology, Roslin Institute

"It is difficult to overstate the significance of Dolly, as the first mammal to be cloned from an adult cell – up until that point, this task seemed impossible. The creation of Dolly inspired and paved the way for later ground-breaking work to generate stem cells, called induced pluripotent stem cells (iPSCs), from adult cells. The use of iPSCs has truly revolutionised biomedical research and our understanding of how cells work. My team is using this knowledge to better understand animal disease and to develop novel therapies for animals."

- Dr Xavier Donadeu, Stem Cell Biology researcher, Roslin Institute

"The research behind Dolly the Sheep has helped give rise to developments in editing the genetic codes of organisms, and a route to developing and studying the effects of introducing changes to DNA, which underpins a swathe of ongoing scientific research – including how to mitigate important diseases. These technologies provided the basis for our team to produce gene-edited pigs that are resistant to a deadly virus."

- Dr Christine Tait-Burkard, Virologist, Roslin Institute

Experts devise system to identify Covid-19 outbreaks

Scientists are developing a Covid-19 early warning system by combining data on vaccine uptake with wastewater testing.

The project will forecast the pandemic's trajectory, allowing experts to identify potential hotspots early, predict stresses on hospitals and intensive care units, and create more focused access to vaccines.

The project, led by the Roslin Institute, is a partnership between the Universities of Edinburgh, Glasgow and Stirling, Scottish Environment Protection Agency (SEPA) and Scottish Water.

Protein linked to severe Covid-19

Patients with severe Covid-19 have been found to show increased levels of a key protein in their blood, in a development that could help identify those most at risk.

Levels of the protein, called GM-CSF, were nearly 10 times higher in those who died from Covid-19 than in healthy individuals, the study has found.

Increased protein levels could help to identify patients at risk in early stages of disease and provide a target for new treatments, researchers say.

Covid-19 dashboard tracks spread across Scotland

An online resource has been developed by statisticians and modellers from the Roslin Institute and Biomathematics and Statistics Scotland to demonstrate the detailed spread of Covid-19 infections across Scotland. The Tracking and Modelling for Scotland dashboard provides interactive, detailed weekly maps to track disease spread and inform control strategies.

The data and mathematical modelling results presented will help in formulation of timely, targeted, evidence-based, public health responses to Covid-19.

DNA variations linked to severe Covid-19 risk

Specific variations in DNA are associated with patients developing the most severe form of Covid-19, a large international study involving scientists from the Roslin Institute has found.

Factors such as smoking and high body mass index also cause patients to suffer from acute Covid-19, scientists reported.

The findings partially explain why some people become seriously ill with Covid-19 and could provide targets for future therapies using repurposed drugs, experts say.

Study gives clues on animal origin of coronavirus

Further clues about the potential origins of the novel coronavirus and its transmission to humans have been revealed in a study of coronaviruses' genes in different species.

An ancestor of the virus was once present in both bats and pangolins before reaching humans, the study suggests, adding to previous support for this idea.

However, further research is needed to find the animal coronavirus that first infected people, scientists concluded.

Covid experts in the media

Researchers from Roslin have given expert opinion on the Covid outbreak to national press such as The Times, The Guardian and BBC News, and their studies have been covered by national and international media outlets including Reuters, Sky and Bloomberg.

Global network formed to investigate coronaviruses

A new international network brings together researchers in animal and human coronaviruses to further understanding in a range of fields, such as disease transmission and immunity. The network aims to enhance knowledge of this important virus family, to inform response strategies for future outbreaks.





Surrogate cockerels and hens produce donor breed chicks

Sterile male and female chicken eggs have been implanted with reproductive cells from donor birds and the resulting chickens mated together, to produce chicks of the donor breed.

The chicks showed characteristics inherited from their real parents, the donor birds, along with the edited change to their DNA, rather than their surrogate parents.

The outcome, using gene editing, demonstrates an efficient way to introduce beneficial characteristics – such as tolerance for warm climates, or disease resistance – from one chicken breed to another.

Beneficial genes can be transferred from one breed into another via gene editing of embryos, in a single generation.

The approach could also help safeguard rare chicken breeds, by storing frozen reproductive cells.

A team from the Centre for Tropical Livestock Genetics and Health (CTLGH) and the Roslin Institute, with their commercial partner Cobb-Europe, demonstrated their approach by using sterile male and female chickens, known as empty nest chickens, to transfer feather characteristics between breeds.

Researchers demonstrated their approach by repairing a natural genetic change that causes distinctive white plumage in the White Leghorn breed. The chicks born to the sterile chickens had a black plumage.

Similarly, the team introduced a distinctive curly feather, which is believed to help Western African breeds cope with hot climates, into chicks bred from Light Sussex chickens, a British breed.



Rainfall drives adaptation in Ethiopian sheep

Rainfall may have a significant influence on the evolution of sheep in Ethiopia, researchers have found.

Genetic variations in sheep DNA are more linked to precipitation levels than to temperature or altitude, analysis of their genetic make-up and climatic data suggests.

Scientists also identified specific genes that may be involved in the adaptation to environmental factors.

A better understanding of environmental adaptation in native livestock breeds may help inform breeding and management strategies in tropical countries such as Ethiopia, where one-third of smallholders own sheep.

The study, led by the Roslin Institute and Centre for Tropical Livestock Genetics and Health (CTLGH), analysed the DNA of indigenous sheep living in different parts of Ethiopia.

The group sought to investigate if the environment had influenced changes in the sheep's DNA to help them to thrive in different climates.

Researchers from the Roslin Institute, Scotland's Rural College (SRUC), the International Livestock Research Institute (ILRI), and the International Centre for Agricultural Research in the Dry Areas (ICARDA) worked with collaborators from the University of Nottingham, Libya, Ethiopia and Australia on the study.

“Ethiopia is an ideal setting to investigate environmental adaptation in livestock, owing to its large range of climatic conditions and the rich genetic diversity of its livestock. By examining related sheep populations from a limited geographical region, our study was able to focus more specifically on the impact of environmental variables, giving us a greater degree of confidence in our results.”

- Dr Pam Wiener, Reader, Roslin Institute



Poultry study points to genes linked to food bug

Research has identified genes in chickens that could offer resistance to harmful bacteria commonly found in poultry, and could inform ways to limit the risk of associated food poisoning in people.

The study, led by a team from the Roslin Institute, has identified a large number of genes in chicken guts that may determine whether the birds are resistant to *Campylobacter*.

The insights could inform research towards breeding chickens that are less likely to carry *Campylobacter* bacteria, and so limit the risk to poultry consumers.

Scientists tested the effects of *Campylobacter* infection on chickens that were bred to be resistant or susceptible to the bacteria.

Analysis of gut tissue showed differences in activity of a large number of genes, including some involved in immunity, such as the so-called Major Histocompatibility Complex and antimicrobial peptides.

The variation between these genes in susceptible and resistant chickens may partly explain their response to *Campylobacter*.

These findings, published in *BMC Genomics*, reinforce previous research by the same team.

Agreement targets disease-resistant gene-edited pigs

The Roslin Institute and animal genetics company Genus have signed an agreement to produce pigs that are resistant to a respiratory disease which costs around \$2.5 billion each year in the US and Europe alone.

Researchers and the company hope the licensing agreement will lead the way to gene-edited, disease-resistant pigs being available to global pork-producing markets.

With the signing of the agreement, facilitated by the University's commercialisation service Edinburgh Innovations, Genus will continue planned work for testing multiple generations of pigs and conducting studies required for approval by the US Food and Drug Administration (FDA).

Porcine Reproductive and Respiratory Syndrome (PRRS) causes breathing problems and deaths in young animals and can result in pregnant sows losing their litters.

Vaccines have mostly failed to stop the spread of the virus that causes PRRS, which is endemic in most pig-producing countries worldwide.

The Roslin Institute has produced pigs that can resist the disease, by editing their genetic code. The research received funding from Genus and the Biotechnology and Biological Sciences Research Council.

"Roslin is rightly recognised for pioneering animal biotechnology that enables genetic engineering of farmed animals. The strong, productive and durable partnership with Genus has been a key aspect in seeing academic endeavour translate to useful and useable translational projects for the livestock sector."

- Professor Bruce Whitelaw, Interim Director of the Roslin Institute and Dean of Innovation.

"We have long and fruitful relationships with Roslin and admire the depth of Roslin's research and pioneering spirit. Together we laid out the groundwork for combating PRRS, and Genus is working with the FDA to obtain approval for this technology."

- Dr Elena Rice, Chief Scientific Officer at Genus PLC.

Rapid testing system to detect oyster diseases

Scientists from the Roslin Institute are developing a PCR test that will detect a range of diseases and accumulation of organisms affecting oysters and mussels.

A validated testing system will allow oyster growers to test for a common and potentially fatal disease that is otherwise difficult to detect and cannot be eliminated, known as *Bonamia ostreae*.

Access to a rapid, cheap, pre-emptive test will help farmers decide whether to move oysters to different locations, to prevent the spread of disease and boost shellfish health and wellbeing.

The testing system will be easy to use and will detect the presence of oyster herpes virus and vibrio bacteria, along with organisms such as tube worms.

“Our project will tip the way we currently diagnose diseases that affect oysters on its head, taking a pre-emptive rather than reactive approach. We are bringing together the right technology with the right people to solve some of the shellfish sector’s biggest health challenges and potentially make significant improvements to oyster health.

“Shellfish growers are often smaller businesses, which makes it all the more important the testing equipment is readily available, easy to use, and affordable.”

- Dr Tim Bean, Research Fellow,
Roslin Institute



Inside-out mini-guts aid research into poultry

Scientists have developed inside-out miniature intestines, also known as enteroids, grown from stem cells, for researching gut biology in poultry.

The three-dimensional tissue cultures, mimicking the chicken gut, are composed of many cell types and will enable researchers to study poultry health and disease including infections such as Salmonella and bird flu. They will also support research to better understand the immune response to disease in chickens.

They may also support the testing of feed additives, vaccines and drugs targeted at the chicken gut and determine gut health in chicken breeds through collaborative work with industrial partners.

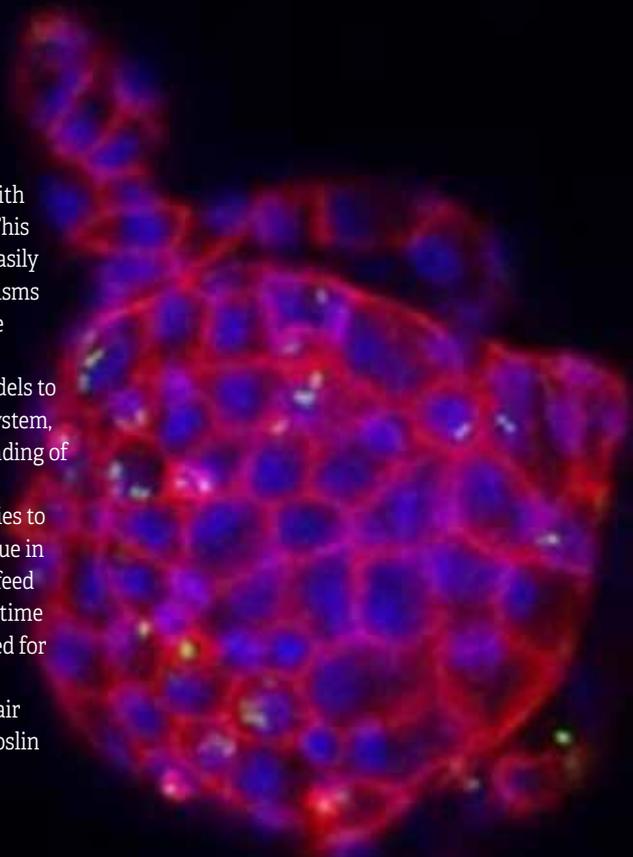
The development, following a decade of research in the area of organoids, should accelerate studies into gut health and diseases that affect birds around the world, and reduce the number of animals used in research.

Scientists have created the mini-guts with the internal gut surface on their exterior. This accessible surface enables researchers to easily expose the tissue to disease-causing organisms and feed additives, and then to monitor the effects.

The enteroids are the first mini-gut models to naturally include cells from the immune system, enabling a more comprehensive understanding of the chicken’s response to infection.

“Inside-out organoids will support studies to develop our understanding of how gut tissue in chickens responds to for example disease, feed additives, nutrition and heat stress, saving time and reducing the number of animals needed for this process.”

- Professor Lonneke Vervelde, Personal Chair of Immunology and Infectious Diseases, Roslin Institute.



Public Engagement

Online scheme puts pupils in touch with scientists

Almost 2,500 pupils from across Scotland have benefited from an online scheme in which they can meet scientists and learn about their work.

Some 13 scientists at the Roslin Institute have participated in the popular programme, Meet A Roslin Scientist, aimed at pupils from P6 to S6 and hosted by the Easter Bush Science Outreach Centre (EBSOC).

The sessions give school pupils the opportunity to learn about the work of scientists and give insight into careers in science.

Pupils submit questions beforehand and can ask additional questions during the 40-minute sessions, which include a live demonstration.

Schools events would normally take place at EBSOC, with school classes travelling to the campus, taking part in a practical workshop and speaking to scientists in person.

Due to Covid-19, schools now engage virtually, which has allowed EBSOC events to reach pupils in 21 of the 32 local authority areas in Scotland.

The online format has enabled access for schools which are in rural areas or far from Edinburgh and for multiple classes to participate in a session.

Pupils read the scientist's profile, watch a short video and submit questions before the sessions and a live video feed allows students to see scientists demonstrate practical and computational work linked to their research.

The sessions offer scientists a chance to build skills in public engagement, and to communicate about their research to a bigger audience.

"Meet a Roslin Scientist has enabled us to connect schools with real-life research at the Roslin Institute, despite the current restrictions, and that it has also extended the reach of our engagement programme across Scotland has been a wonderful bonus. Online engagement is here to stay for the Easter Bush Science Outreach Centre!"

- Dr Nicola Stock, Public Engagement with Research Manager, Roslin Institute.



"It would be great to keep online sessions in the future, our school is in the Highlands and we would never be able to visit the Easter Bush Science Outreach Centre. Our pupils were very engaged throughout the session and it helped ignite a spark in science in them."

- P6/7 teacher, Cromarty Primary School

COP26

Research helps lower emissions from animal farming

The Roslin Institute's work supports the aims of the United Nations Conference of the Parties (COP26) by enabling sustainable livestock production and improved animal health and welfare, while reducing the climate impact of farming in the UK and internationally.

Roslin scientists are using world-leading research and knowledge translation to develop scientific, technical, and systematic solutions that will help achieve UN Sustainable Development Goals including zero hunger, while also helping decrease carbon emissions from farmed animal production.

Roslin's commitment is set out in our statement on sustainability and net zero, available on our website.

Scientific developments that reduce the environmental impact of livestock are needed at a time when meat and dairy consumption is growing year-on-year.

Roslin's research aims to help the farmed animal food system achieve net zero emissions without compromising global and national food and economic security, animal welfare or the eco-system.

Advanced breeding, supported by genetics expertise and technology, reduces the climate impact of livestock by generating efficiencies throughout meat and dairy production.

Our world-leading research programmes target enabling the production of more food using fewer resources and fewer animals, enhancing welfare, and reducing losses to disease. Breeding more efficient animals, which use fewer resources, such as land, water, and feed, directly reduces the carbon footprint of livestock farming.

Selective breeding in farming has enabled improved efficiency in recent decades, to maintain the same production levels with fewer animals, and so reducing the environmental impact. Further benefits to sustainable livestock can be



achieved through genome editing. We work with animal breeding companies to introduce precise changes to animal genomes that bring about beneficial changes, such as disease resistance, leading to higher animal welfare and a reduced carbon footprint.

Roslin expertise includes developing ways to control infectious disease and keep livestock healthy, which reduces losses and improves sustainability of the sector.

Our research ranges from genetic tools to breed animals that can withstand infections, to developing vaccines and diagnostics, and data-driven tools to predict disease spread and aid decision-making.

Researchers at Roslin are studying DNA of the microbes in cattle stomachs, to develop animals that produce lower levels of the potent greenhouse gas methane, so cutting emissions from one of its largest man-made sources.

Roslin is a world leader in applying genomic technologies to improve fish and seafood farming, which is the fastest growing food production sector, with benefits including nutritional

products and a low carbon footprint. Meanwhile, the Centre for Tropical Livestock Genetics and Health, a joint centre with our partners SRUC and ILRI, seeks to remove losses due to disease and improve livestock food production in tropical countries, with a major focus in Africa. Doing so will significantly improve the sustainability of livestock, and so reduce their carbon footprint.

Elsewhere, our scientists are working with industry partners to develop insect animal feed as a low-carbon, protein-rich alternative to soya feed.

"The climate crisis is one of the greatest problems humanity has faced, and we welcome the UK Government's commitments as part of a global strategy to reduce greenhouse gas emissions and rising global temperatures. Roslin's research aims to make livestock production more efficient, while safeguarding health and welfare for animals, which could help meet the rising demand for food in a sustainable manner."

- Professor Mick Watson, Personal Chair of Bioinformatics and Computational Biology, Roslin Institute.



Student joins international COP26 youth event

An undergraduate student has joined a United Nations event for young people ahead of the COP26 climate change summit.

Xandru Cassar, a third-year BSc in Agricultural Economics student, represented his home nation of Malta at the Youth4Climate Summit in Milan.

Mr Cassar was one of 400 young delegates representing nations around the world at the pre-COP26 gathering, at which young people were tasked with developing and presenting their proposals for tackling climate change. He and other delegates met and took part in preparations via an online forum for several months, before meeting in Italy.

Their conference in Milan comprised three full days of meetings and activities, including the opportunity to meet delegates from around the world, together with prime ministers and foreign ministers.

“Much of what I’ve heard and experienced at the Youth Summit will remain with me ... however, meeting people from all over the world, with so many walks of life and experiences represented, will remain with me much more than the hard documents we worked on together.”

- Xandru Cassar, BSc Agricultural Economics student.

Balloon blow-up helps pupils learn climate science

More than 3,000 primary school children will be blowing up balloons in a hands-on science investigation that will teach them about the role of microorganisms in climate change.

The Big Balloon Blow-Up activity, organised by the Roslin Public Engagement team to coincide with COP26, is designed to encourage pupils to explore the production of carbon dioxide, and relate this to research by Roslin scientists into gut microorganisms in cattle that produce greenhouse gases.

A Roslin team also took part in public engagement at the UKRI stand at COP26, talking to visitors about their work that aims to keep farmed and wild oysters healthy.

Expert joins sustainable livestock event at COP26

A scientist whose work on sustainable livestock production has influenced government policy in Brazil joined a high-profile event at COP26.

Dr Rafael Silva, a Chancellor’s Fellow in the Global Academy of Agriculture and Food Security, took part in a Sustainable Livestock panel in Brazil’s Pavilion.

In this panel, government representatives and farmers discussed promotion and adoption of low carbon emission technologies.

Dr Silva’s expertise is in applied mathematics, working with models of agriculture, food security and biodiversity conservation, to better understand the relationships between energy, livestock and deforestation. His work has previously informed policy. At the meeting in Glasgow, Dr Silva gave scientific advice to support discussions on sustainable intensification routes, and the evaluation of the success and the future of ongoing agricultural programmes.

Brazil faces the challenge of reconciling international commitments on greenhouse gases, biodiversity conservation and maintaining economic growth in the agricultural sector through meeting global beef demand. This is taking place as other countries support reduced red meat consumption.

Lessons from India on scaling up natural farming

Learnings from a large-scale organic farming programme were discussed at an event at COP26.

Speakers shared their experience of the sustainable agriculture operation, implemented by the government of Andhra Pradesh in India, which aims to transform 6 million farms on 8 million hectares of land in the southern state into natural farming by 2030.

The project is the world’s largest agroecology programme – that is, sustainable farming that works with nature. Agroecology has been welcomed by the UN Food and Agriculture Organization as helpful to governments in making progress on achieving global targets for climate change, biodiversity, nutrition, and post-Covid economic development.

Panellists from the UK and India took part in the event, held as part of the ‘Recipes for resilience: the food and climate zone’ programme at COP26, organised by Nourish Scotland.





Partnership for data-driven early response to hunger launched

Leading research and humanitarian agencies have joined forces to harness data and technology in a bid to stop climate shocks resulting in hunger in vulnerable livestock farming communities.

The Jameel Observatory for Food Security Early Action is being created to help tackle the growing threat to people in the world's drylands posed by the increasing severity and frequency of climate-related disasters.

The venture, which was launched at COP26, brings together the expertise of five partners – the University of Edinburgh, the International Livestock Research Institute (ILRI), Save the Children, the Abdul Latif Jameel Poverty Action Lab (J-PAL), and Community Jameel.

The partnership will connect cutting-edge technology and data surveillance on early warning signs of severe weather and systemic climate change with community-driven applications and interventions.

The Jameel Observatory will engage with agencies that work with farmers to develop and apply digital and analytical tools that help them shape their own food security, nutrition and livelihoods.

Researchers plan to use community-level data together with satellites, drones, weather data and remote sensing to understand, prepare for, and mitigate the likely impact of climate shocks.

Drylands, which are home to billions and make up 40 per cent of the world's land area, are

at risk from fluctuating rainfall, drought, rising temperatures and land degradation. These create insecurity and conflict caused by competition for resources.

By the time the full force of these crises is felt and hunger takes hold it is often too late to respond effectively, experts say.

Each partner will bring specific insights to the work of the Jameel Observatory. The University of Edinburgh will use its expertise in data-driven innovation to combine data, information and local knowledge to better predict climate risks, encourage coordinated actions and guide interventions.

The Jameel Observatory will be based at the International Livestock Research



Institute (ILRI) in East Africa. ILRI works with partners throughout the continent and is home to projects focused on food security and environmental research in dry lands.

Save the Children brings a wealth of experience supporting communities to respond, prepare and adapt. The Abdul Latif Jameel Poverty Action Lab will connect Jameel Observatory with teams of researchers to help assess the initiative's interventions. J-PAL will also share evidence on effective climate change and adaptation programs from existing literature.

Community Jameel is an international organisation tackling some of the world's most urgent issues and challenges, based

on evidence, science, data and technology. It is providing its expertise in establishing collaborative institutes and research programmes for the past 75 years.

"No single organisation has the ability to address the complexities facing drylands communities. With expertise in data-driven innovation in a range of contexts, the University of Edinburgh is well placed to lead this partnership by bringing pastoralist communities together with experts in big data, earth observation and food security."
- Professor Alan Duncan, Global Academy of Agriculture and Food Security.

"The Jameel Observatory's approach will enable a shift from reacting to the climate crisis to data-driven anticipation and adaptation, helping to find better solutions to the challenge of food insecurity."

- George Richards, Director of Community Jameel



Agriculture and Food Security

Partnership to deliver data-driven tech to farmers



The Global Academy of Agriculture and Food Security is forming a partnership with software development company Trinity AgTech, with the aim of helping farmers achieve greater profitability and environmental progress.

Under the collaboration, the organisations will work together to apply data-driven innovation to farming. They will seek to develop technologies that will add value to supply chains, to help producers and benefit the environment.

Their partnership is formed at a time when food production and land use management involve complex challenges relating to climate change, poor nutrition and lack of biodiversity.

In addition to the partnership, Professor Geoff Simm, Director of the Academy and the University's Chair of Global Agriculture and Food Security, has joined Trinity AgTech's Scientific Board.

"We're in the middle of climate change, malnutrition and biodiversity crises with food, farming and land use at the heart of these. These issues are complicated and interconnected but through data-driven innovation – a priority theme for us in the University of Edinburgh – we can empower farmers to create real change."

- Professor Geoff Simm, Director, Global Academy of Agriculture and Food Security.

"Most of our farmers' talent has been untapped and under-nurtured and that genie needs to be freed from the bottle. At Trinity AgTech we believe that it will be the genius of the many that will deliver farming a flourishing future and ensure we have vibrant rural communities."

- Dr Hosein Khajeh-Hosseiny, Trinity AgTech's Founder and Executive Chairman



Changing markets put pressure on livestock sector

Changes in the livestock sector are likely to be influenced by market pressures driven by concerns over the environmental and health aspects of producing and eating meat, according to a review study published in *Animal*.

Changing consumer preferences, as well as pressures from sector investors and government concerned by the risks and impacts of raising livestock and of meat consumption, could prompt a response from producers, research indicates.

Researchers from the Global Academy of Agriculture and Food Security reviewed economic studies of sustainable livestock systems, considering aspects that are likely to affect demand in the sector.

The global consumption of meat is converging, as consumers in developed regions opt to eat less meat and better products including meat substitutes, while meat demand is growing in low- and middle-income countries. The sector also faces concerns from investors, most of which are related to intensive production systems.

Livestock production is expected to account for 80 per cent of all greenhouse emissions by the year 2050, with similar risks emerging in relation to antimicrobial resistance and land use. Producers may need to respond with technical innovation or revised production practices to ensure sustainability. Meanwhile, policymakers must manage the impacts of these so-called social costs on health, the study found.

Consensus breaks out on net-zero farming

Professor Geoff Simm, Director of the Global Academy of Agriculture and Food Security, took part in a panel of farmers, academics and NGO representatives who have published a consensus pathway for making Scottish farming climate compatible. In a polarised debate, Farming for 1.5 Inquiry was able to set out a credible way forward by bringing different perspectives and aspirations around the same table.

Following a two-year Inquiry, the Farming for 1.5 panel produced a consensus set of policy recommendations, aimed at taking the sector from where it is today to net zero in 2045.

The panel heard evidence from experts on farming practices, environmental impacts and behavioural change, and conducted farm visits. The key recommendations of the report include: whole farm contracts to deliver on farming and nature from 2024; reducing total emissions from agriculture while maintaining food production per capita; rapid uptake in low methane breeding for cows and sheep.

Health warnings can nudge consumers to eat less meat

Labels warning of the harmful health effects of red meat are more likely to dissuade consumers than labelling relating to its associated environmental impact, research shows.

In a study involving the Global Academy of Agriculture and Food Security, consumers who were given the option of ready meals labelled as harmful to the environment, health, or both, were more likely to be influenced by health warnings, especially those relating to a specific condition.

The findings suggest that warning labels may aid efforts to deliver the targets of the recently released National Food Strategy in the UK, which suggests nudging consumer habits to deliver a 30 per cent reduction in meat consumption over the next 10 years.

Warning labels alone will not make significant headway, but could support progress as part of a package of measures to nudge consumer action, scientists say.

In experiments with warning labels, specific health warnings associated with red meat – relating to colon and rectal cancer – were found to be more discouraging among consumers than a general warning of risk of early death.

The impact of warnings on product selection was stronger among people who ate more meat, the outcomes suggest, which may be valuable in targeting this important demographic.

The findings chime with previous studies showing that people adopt vegetarianism for health reasons rather than meat's impact on the environment, regardless of their views on climate change.

Despite little evidence of shifting consumer behaviour for the environmental impact of meat production, researchers suggest that labelling could raise awareness of this aspect and influence shoppers in future.

The research team was led by the University of North Carolina Chapel Hill and included the University of South Carolina Arnold School of Public Health, Harvard TH Chan School of Public Health, Harvard Pilgrim Health Care Institute, and the University of Amsterdam.

“Our findings give valuable insights into how warning labels are perceived by consumers and could inform efforts to use food labelling as a nudge towards reduced meat consumption, as a package of measures to influence people’s decision making around what they choose to eat.”

- Dr Lindsay Jaacks, Chancellor’s Fellow Global Challenges, Global Academy of Agriculture and Food Security.

Monocroppers at increased risk of poor diets in lockdown

During the most restrictive part of Covid-19 lockdown in India, farmers planting only one type of crop were more likely to experience a decline in diet quality than those cultivating two or more.

Findings are based on surveys of farmers by researchers from the Public Health Foundation of India, the Centre for Sustainable Agriculture (Hyderabad), Harvard University (US), and the Global Academy of Agriculture and Food Security.

Crop diversity influences diets through two major pathways: home consumption and increased income, which can be used to buy food. During the initial lockdown, access to markets was restricted and demand dropped. Therefore, the second pathway was largely blocked.

On average, farmers consumed just two food groups per day. Staples and dairy were the most commonly eaten, followed by vegetables. The number of foods consumed fell most in the initial phase of the lockdown, from May to June 2020, and then rebounded slightly as the lockdown was eased from June to August.

Farmers who grew a single crop, in most cases rice, were approximately twice as likely to eat fewer types of food compared with those who cultivated two or more crops.

About half of farmers had a kitchen garden, and they were significantly less likely to experience a decline in the number of food groups consumed throughout the entire lockdown.

Kaela Connors, a Master's student at Harvard University and lead author of the study, said, "Our findings clearly demonstrate that diversifying production systems may be important for safeguarding nutritional security in the event of other large-scale global shocks such as future pandemics and climate change."



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Crowd-sourced data shows what livestock eat

A new tool makes it possible for farmers to visually explore standardised data on what livestock eat in low-and middle-income countries.

The data behind the visualisation was generated using the Feed Assessment Tool (FEAST), and is the product of thousands of data uploads from more than 150 sites in 14 countries.

It aims to give farmers, extension workers, researchers and policymakers working on livestock a good understanding of animal feeds.

Researchers at the Global Academy of Agriculture and Food Security and the International Livestock Research Institute (ILRI) helped initiate the development of the FEAST Tool, which helps users assess overall availability of feeds, the quality, and the seasonality in a particular site.

Users collect the data in a standardised format, and are encouraged to submit their results to the open access FEAST Global Data repository.

“There is a real dearth of data as to what livestock are fed. This tool was originally developed to help farmers, but it has generated a wealth of farmer-based data that we felt was useful for a wider community.”

**- Professor Alan Duncan
Global Academy for Agriculture and Food Security, and International Livestock Research Institute (ILRI)**

Innovation

Roslin Innovation Centre – A Year In Review

There is no doubt the impact and restrictions imposed as a result of Covid-19 made the past year another challenging one for all of us. At the Roslin Innovation Centre, we implemented new ways of working and operating within public areas, lab and office space for the safety of colleagues, tenants and visitors.

In the last few months, we have welcomed the gradual return of our community to Roslin Innovation Centre and the Easter Bush Campus. We can once again fully experience the energy and enthusiasm for collaboration, and the drive for innovation and business growth, as we work together to tackle global challenges and those closer to home – head on.

We have been 'open for business' now for over four years. Since we opened in August 2017 our unique business gateway to innovation has continued to nurture entrepreneurship, growth and collaboration within the dynamic environment of the Easter Bush Campus.

Our occupancy is now at the optimal target of 85 per cent, with 31 tenant companies – ranging from established local and international organisations, start-ups and spin-outs, to community interest companies.

Our entrepreneurs continue to shine. Beta Bugs Ltd, an insect farming innovator, expanded their team and launched a new insect breeding facility on Campus. The entrepreneurial company develop and distribute high-performance breeds of Black Soldier Fly for the 'insects as feed' industry.

Ishani Malhotra, MD and founder of Carcinotech Ltd, a MedTech company, has achieved significant success and recognition for the innovative manufacturing of 3D cancer research models and joins a six-month AI Accelerator – part of a wider Data Driven Entrepreneurship (DDE) programme at the Bayes Centre - together with neighbouring tenant and



Beta Bugs Ltd, an insect farming innovator.

fish health experts, Pulcea Ltd, also being part of the current DDE cohort.

Rhizocore Technologies Ltd, an applied mycology start-up developing novel propagation techniques for woodland restoration, joined us as part of Food & Agriculture Science Transformer (FAST) in partnership with Deep Science Ventures. FAST, a paradigm shift in scientific company creation, is a pilot programme to develop and build new high growth tech companies for Scotland's agricultural bioeconomy, through an iterative process that delivers founding team members, advisors, technologies, customers and investors, all designed to succeed and scale.

Another one to watch is Wobble Genomics Ltd, a spin-out of the Roslin Institute, providing biochemical and bioinformatic solutions for gene biomarker discovery, with a successful £1.2 million investment round supporting expansion of the team and relocation to Roslin Innovation Centre, and also helping to drive sales and demonstrate



**Above: The Wobble Genomics Ltd team.
Below: Dyneval Ltd.**

the company's ability to improve clinical outcomes.

The recent arrival of Dyneval Ltd is also a great strategic fit for Roslin Innovation Centre. The company is delivering world-leading innovation that could make a significant difference to the agri-food supply chain, and the drive towards more sustainable farming practices. Dyneval has secured total funding of over £1.8 million to establish a new quality control standard for semen analysis that will benefit users across the livestock production chain on a global scale.

Our open plan office space is truly buzzing again ... with Beebytes, a social enterprise specialising in honeybee genetics and DNA analyses, formed by members of an expert team with research work based at the Roslin Institute, apiary management at Easter Bush Campus and King's Buildings and holding key roles in Beekeepers' Associations.

On a regional scale, Midlothian Science Zone has put Midlothian on the B-Line, 'insect pathways' mapped by BugLife, in recognition of the abundance of wildflower-rich habitats 'in the zone' and the benefits of these to bees, butterflies and other wildlife.

Meanwhile, tenant companies that joined us in the early days continue to grow. Following a successful year of collaboration, AbacusBio Ltd and global enterprise Bayer have agreed to expand their partnership in the area of predictive plant breeding. This marks the company's largest collaboration to date, and is anticipated to have a far-reaching impact among numerous crop supply chains.

Also making scientific breakthroughs in new approaches is Roslin Technologies Ltd. The

“Despite a very difficult couple of years for us all, Roslin Innovation Centre has proved to be very Covid-19 resilient, and has continued with some great business, if not ‘as usual!’”

**- John Mackenzie, CEO
Roslin Innovation Centre**

company is at the centre of commercialising lab-generated cultivated meat for commercial sale. Roslin Technologies is working with partners across the globe - including those in Singapore, one of the first countries in the world to give approval to cultivated meat for human consumption.

So, although this year has been very much one of Covid-19 restricted consolidation, even under these challenging times we reflect on the many positive highlights and achievements which steer us forward to a strong and optimistic position for the year ahead – and beyond.

A3 Scotland 2022 is one of the key dates already highlighted on our calendar. Postponed from last year, our inaugural conference for the Animal Health, Agritech and Aquaculture (AAA) sectors is rescheduled to 26 and 27 April 2022. It has retained the high-level sponsors, including Zoetis Ltd, and features influential and expert speakers to encourage innovation, investment and collaboration under the theme ‘Transition to Net Zero’.



£74m investment for AgriTech Hub on campus

A £74 million investment for a new AgriTech Hub will improve the efficiency and output of agricultural applications, and enhance worldwide food security.

The virtual hub will foster collaboration between researchers and companies to contribute to global food systems, work towards net zero carbon in the agritech sector, and to inform food and environmental policies.

Experts in the Hub will use data to develop genetics and health innovations for agricultural science and business, and to build initiatives and novel systems of production, such as robotics.

Work in innovative areas, such as data-driven breeding and aquaculture, will enable data generation and analysis that will improve the agriculture industry worldwide.

The AgriTech Hub will be nucleated at the Royal (Dick) School of Veterinary Studies' Easter Bush Campus – Europe's largest concentration of animal science research expertise, with reach across the University of Edinburgh.

Investment will comprise £27 million from the UK Government, including £1.3 million from the Scottish Government, as part of the Edinburgh and South East Scotland City Region Deal.

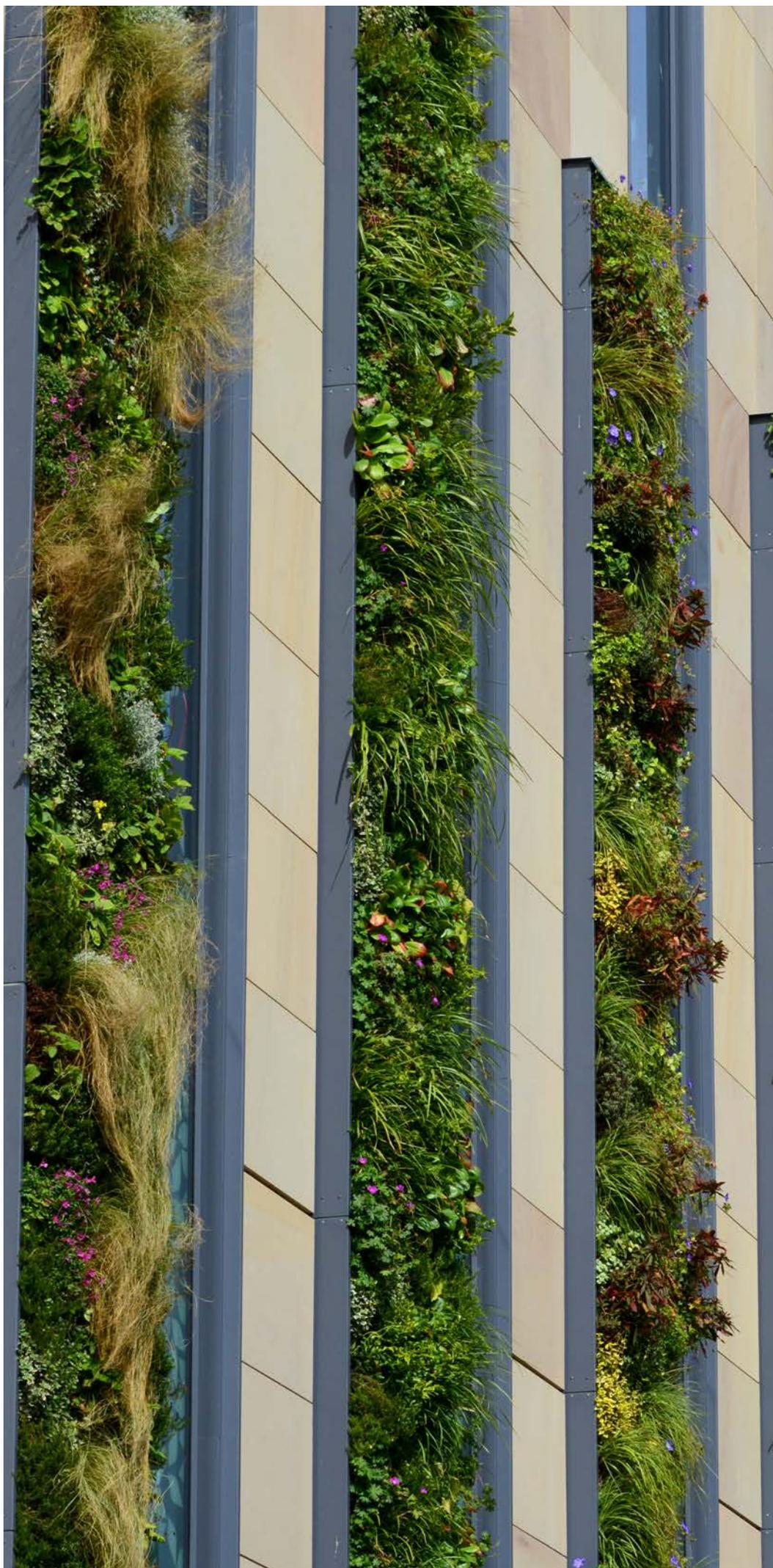
The investment will transform the scale and impact of agricultural technology in outputs from teaching, research and innovation.

The Easter Bush AgriTech Hub aims to develop world-leading research capability in data science.

It will address skills shortages and gaps in the industry, as well as encourage graduates to set up or join micro-agritech companies.

The Hub will bring together researchers from the University and other higher education institutions, along with commercial, public and third sector organisations, in collaboration with project partners Midlothian Council.

Researchers will work with the Scottish and UK public sector, including the Animal and Plant Agency (APHA), Scottish Government's Animal Health and Welfare Division, UK Department for Environment, Food and Rural Affairs (Defra), and industry, such as the InnovateUK Agri-Tech Centres.



A photograph of a modern building facade. The building features a series of vertical green walls (living walls) on the left side, each containing a variety of plants and grasses. To the right, there is a large glass window section with a decorative white screen featuring a repeating leaf pattern. The building's upper part has a curved, dark-colored roofline. The sky is clear and blue.

“This is a very exciting time for agriscience, with transformative technology and data sharing opening up new approaches for fair and inclusive growth. The City Region Deal will drive an innovation pipeline nucleated from Easter Bush campus in Midlothian, with reach both across our country and internationally, all built around novel research, fuelling a step change in upskilling, talent development and enterprise activities.”

-Professor Bruce Whitelaw, Interim Director, Roslin Institute

Community and Campus

Courses to connect students with campus wildlife



Training has been made available on the Dick Vet's Easter Bush campus to build skills in nature awareness, wildlife tracking and conservation.

A series of three courses to teach nature and ecosystem awareness and associated skills related to wildlife biology and conservation are aimed at improving understanding of the species and wider biodiversity on the campus.

Participants are learning to be more mindful of the wider ecosystem and of the biodiversity on campus as well as how to identify wildlife tracks, signs and bird calls, to set up camera traps, and to map existing species.

Lessons learned from the courses will help us better understand how to care for and steward the campus environment and the wildlife it sustains.

The initiative will be supported by a £3,240 Student Experience Grant funded by donations to the University of Edinburgh.

The weekend courses are being delivered by renowned environmental educator Dan Puplett

with the support of the School's own professional wilderness guide Dr Glen Cousquer.

Ecological findings and data collected could be used to adapt and evolve management of the campus to the benefit of both wildlife and students.

Findings will also be used to complement other campus initiatives, such as tree planting and monitoring of hedgehogs and raptors.

"This course series will connect participants with nature on our campus. We hope the courses will encourage better practices in sustainability as well as improve mental health."

- Paul Gogerty, BVM&S Veterinary Medicine student.

"These courses will help students understand better the patients they will be treating in their careers, as well as the challenges we face in conservation, One Health and ecosystem collapse."

- Dr Glen Cousquer, Lecturer and Programme Coordinator (MVetSci in Conservation Medicine and MSc One Health)

Student award aids efforts to safeguard hedgehogs

Students have won support from the University to further the creation of hedgehog-friendly spaces at our Easter Bush Campus.

A £2,000 Student Experience Grant, funded by donations to the University, will be used to implement changes that benefit hedgehogs and wildlife.

The project, to take place over 12 months, will extend previous measures to develop the site as a place where hedgehogs can safely feed, shelter and breed, and improve the environment for students, staff, and visitors.

Students Sarah Batiste, Niamh Duthie and Niamh Kinch will seek to use their award to survey the site, to establish where improvements might be best made and to highlight deficiencies.

These are likely to include the addition of safe water sources, creating ramps in ponds and cattle

grids, providing hedgehog highways, increasing wildflower coverage, and by making wooden hedgehog homes, compost heaps, and log piles.

The team also hope to include signs to alert drivers of hedgehog populations, and to install a wildlife camera to measure the impact of their efforts over time.

They also hope that more students will participate in the scheme, owing to the possible benefits of spending time outdoors and in cultivating leadership, collaboration, and connections to communities and the environment.

The development follows the University of Edinburgh's silver accreditation as a Hedgehog-Friendly Campus, and a 2020 summer survey that found hedgehog footprints in temporary tunnels around the Easter Bush Campus, as well as hedgehog sightings on camera.

“We are extremely lucky to work and study in a campus that is surrounded by green and forested landscapes and home to significant biodiversity. We would like to create spaces that foster and promote this by supporting dwindling hedgehog populations.”

**- Sarah Batiste
BVM&S Veterinary Medicine student**



How to contact us

We depend on your support to maintain our high standards and fund new developments. You can help us to deliver the future of veterinary medicine. Here's how to contact us:

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The Power of Three

The unique offering of Excellence in Teaching, Research and Clinical Care make up the three pillars of The Royal (Dick) School of Veterinary Studies