Emergency and critical care

Critical care rabbit anaesthesia

Plus


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Welcome to the October issue of Veterinary Practice. This month the focus is on emergency and critical care. Gayle Hallowell gives a useful overview of blood gas analysis for metabolic disorders in practice, and Adam Gregory looks at anaesthesia requirements in rabbit critical care. As well as this, Lara Brunori reviews the clinical use of plasma lactate in the emergency patient and RCVS Knowledge looks at how quality improvement can be used in response to significant events in practice.

Equine practitioners can find an interesting article on how to approach a case of acute haemorrhage – which laboratory tests to run and how to interpret the findings.

Melanie Spahn-Holmes describes emergency fluid therapy in adult cattle in the farm animal section this month, alongside an article from Richard Gard looking at the impact of COVID-19 on cattle vets.

Helen Rooney of Pet Blood Bank UK provides useful information and a step-by-step guide to blood transfusions in the nursing section, where you can also find an article by Shelly Jefferies who gives her tips and advice on how to best get involved in student nurse training.

Rabbits are highlighted this issue, with Adam Gregory’s previously mentioned article, but also a feature looking at the requirements for rabbits to ensure their correct welfare needs are met. Ashton Hollwarth looks at the emergency triage and first aid of small exotic patients in her exotics column.

Elsewhere in the magazine, Madi Hewitson is back with another sustainability column, this time exploring intersectional environmentalism and the veterinary profession. Laura Woodward continues her mental health column highlighting the importance of appreciating joy in the ordinary moments of our lives.

Three opinion pieces feature this month. Harriette Smart looks back at her time working for the NHS during the pandemic, David Williams discusses his recent experiences working with COVID precautions in place, and Gareth Cross reacts to the reception of the new TV adaptation of All Creatures Great and Small.

Other regular features can also be found in this issue, such as our legal, business and marketing columns in the practice management section. I hope you enjoy the content this issue has to offer!
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Farm vet James Russell elected president of the BVA

Farm vet James Russell was elected president of the British Veterinary Association (BVA) for 2020/21 at BVA Council and Officer handover, held virtually on 17 September 2020.

James graduated from the RVC in 2002, after which he went on to complete a post-graduate diploma in production animal and livestock medicine. He has over 17 years’ experience working in mixed practice and became an independent veterinary consultant in 2018 after eight years as director at a large veterinary practice in Ashbourne.

A highlight of James’s year as BVA junior vice president (2019/20) has been his role in developing and launching a comprehensive new bovine tuberculosis (bTB) policy position. The updated policy applies new and emerging evidence to set out a holistic roadmap to help eradicate and control one of the UK’s most challenging animal health and welfare issues.

Throughout a period of great uncertainty during the pandemic and UK lockdown, James led on much of the farm, large animal and rural veterinary guidance for members. He is also involved with Vetlife and joined the Vetlife board in January 2020. James plans to champion BVA’s Good Workplace activity and support the push for a more positive and inclusive working experience for all members of the veterinary team.

Commenting on his appointment as BVA president, James Russell said: “I feel humbled and thrilled to be entering into my presidential year at this crucial time for our profession. My year as junior vice president has definitely not reflected the advert – be prepared to be away from home quite a bit, but don’t worry the events make up for it – but it has been a privilege and a steep learning curve. When the pandemic hit, as an association we were able to draw on the breadth and depth of experience within our small team to respond with agility and accuracy to often very challenging situations.

“I am deeply enthused to be working to take forward BVA’s Good Workplace position over the next year. Reducing the leaks in the bucket of our profession and helping others to find fulfilment in their work are massively important to me, especially as we recognise the new and amplified mental health challenges facing the profession as we adapt to new ways of working.

“It is this which has reinforced my desire to make ‘keeping vets healthy’ the theme that I hope to apply to all my thinking and work this year.”

Mr Russell’s time at BVA began back in 2007 when he joined the then Veterinary Policy Group as an independent member. He was subsequently elected to BVA Council as the inaugural East Midlands representative following the alterations to Council structure. Latterly he served as chair of the BVA CPD committee.

Lucy Grieve inaugurated as new BEVA president

Lucy Grieve, an ambulatory assistant at Rossdales Veterinary Surgeons, Newmarket, has been appointed as president of the British Equine Veterinary Association (BEVA) for 2020/21. She has taken over the role from Tim Mair but in the absence of BEVA Congress this year, Lucy’s inauguration was virtual; she received the presidential chains via an online ceremony at the BEVA AGM on 10 September 2020.

Lucy qualified from Cambridge University in 2007 and went on to become the first diagnostic imaging intern at Rossdales. She then spent seven years as an in-house vet for Darley’s pre-training facility in Newmarket, where she worked on yearlings, horses in training, rehabilitation and the occasional National Hunt horse. She returned to Rossdales in 2015 as an ambulatory assistant. Her main areas of interest are lameness, diagnostic imaging and poor performance.

Lucy has been a member of the BEVA Council since 2012, serving as chair of the Ethics and Welfare Committee and sitting on the Equestrian Sports Committee. She is also co-opted onto the Horserace Betting Levy Board (HBLB) Thoroughbred Research Consultation Group. Lucy is particularly interested in equine obesity and weight management and was instrumental in helping to set up a pilot project earlier this year to help owners positively recognise and address weight problems. Building on this initiative will be central to Lucy’s presidency:

“Obesity is one of the biggest problems facing equine welfare in the UK but a significant proportion of owners still don’t recognise that their horse is overweight, or feel motivated to take action. We have been looking at new ways to engage with horse owners and are currently assessing the results of our pilot project which revolved around careful veterinary interaction with clients on the topic during vaccination visits.”

New president for the Sheep Veterinary Society

Amanda Carson became the new president of the Sheep Veterinary Society during the virtual Autumn Conference held on 19 September 2020. Amanda takes over the role from Nick Hart who becomes senior vice president as Yoav Alony-Gilboa retires from the committee. Joining the officials is new Junior Vice President Rebecca Mearns.

The Sheep Veterinary Society brings together vets, advisers and flock owners from all over the United Kingdom, Europe and the wider world who are interested in the welfare and production of sheep. The society is a forum for education and discussion on all matters relating to sheep health and welfare. It also builds strong links with sheep farmers through the National Sheep Association.
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BVA issues rallying call for veterinary settings to commit to its Good Veterinary Workplaces voluntary code

The BVA is appealing to veterinary settings across the UK to commit to its vision for good veterinary workplaces, to help ensure that all working environments are supportive and welcoming to everyone.

Launched on 21 September to coincide with the start of 2020’s International Week of Happiness at Work, the Good Veterinary Workplaces voluntary code sets out clear criteria for what makes a good workplace, based on a new evidence-based BVA policy position. The code is accompanied by a workbook which veterinary teams can work through together to look at how they can meet a range of criteria.

Teams will be asked to assess what they already do well in areas including health and well-being, diversity and equality, workload and flexibility, and providing opportunities for personal and career development, as well as identifying areas for improvement and any HR and management processes that need to be put in place to achieve a positive workplace culture.

The voluntary code is being published as part of the launch of BVA’s Good Veterinary Workplaces policy position, a comprehensive paper offering 64 practical recommendations for employers and staff on how to offer a fair and rewarding work environment where everyone feels valued.

The policy, which has been developed with input from a working group formed in April 2019, also includes 36 case studies showcasing successful changes and initiatives implemented in the veterinary profession and more widely in the world of work.

BVA decided to develop the Good Veterinary Workplaces policy off the back of an extensive body of work looking at key workforce issues in the profession, including recruitment and retention challenges, a lack of diversity across the workforce and general high levels of stress and burn-out in veterinary teams. The joint BVA/RCVS-led Vet Futures project identified the need to explore the work-related challenges facing vets and take action to create a sustainable and thriving workforce that can maximise its potential.

As well as the workbook, veterinary teams will also be able to download, sign and display a voluntary code poster signalling their commitment to working towards being a good veterinary workplace.

The full Good Veterinary Workplaces position can be downloaded at bva.co.uk/media/3708/bva-position-on-good-veterinary-workplaces.pdf

RCVS investigation into leaks of confidential information

The RCVS is now able to confirm that, over recent months, it has been obliged to commission an independent investigation into a series of leaks of confidential information contained in certain Council papers. This investigation has now concluded and was formally reported to RCVS Council at its meeting on 3 September 2020.

The College became aware that confidential information had been leaked earlier this year, after the Vet Record made the decision to publish details of it.

Following this discovery, the College – through the personal invitation of then President Niall Connell – provided a number of informal opportunities for the person leaking the information to come forward and discuss the reasons for their actions in an open and honest manner. Unfortunately, none of these was taken.

Therefore, a formal complaint subsequently made by a Council member triggered the complaints policy set out in the College’s Code of Conduct for Council Members and instigated the investigation.

The investigation itself was run independently of the RCVS by an external specialist consultancy, and coordinated by a legal assessor. Initially, the investigators were asked to focus on a single leak, but following a number of further leaks over ensuing months, it became necessary to significantly widen the scope and depth of the investigation.

The investigators’ report concluded that there had been several separate and deliberate leaks of confidential information by a current or former Council member over an extended period. However, as it had not been possible to identify who specifically was responsible for any or all of these leaks, and no one had themselves taken responsibility for their actions, no further action under the complaints policy of the Code of Conduct for Council Members was appropriate.

At its meeting on 3 September 2020, RCVS Council noted the report’s conclusion that the leaks were not the result of poor understanding of College or Council processes, but a deliberate decision to provide confidential information to third parties. Nevertheless, Council members agreed to review existing training requirements and mechanisms for handling confidential information, and to explore in more detail the potential motivation of the person(s) leaking the information, together with the underlying culture of Council that might have influenced their behaviour.
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1. TVM study A123737. Pivotal bioequivalence study of two formulations of phenobarbital in the dog.
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The London Vet Show postponed to 2021

CloserStill Media, organisers of the largest international veterinary event portfolio, have announced the postponement of the London Vet Show due to ongoing uncertainty surrounding the COVID-19 pandemic. The event will now run on 11 and 12 November 2021 at the ExCeL Center, London.

“COVID-19 has brought enormous pressures and uncertainty to the veterinary sector – both personally and professionally,” said Rob Chapman, MD of CloserStill’s veterinary portfolio. “Although the UK government gave the green light for exhibitions and meetings to start again in October, after examining the overall market and consultation with our partners, we feel the decision to postpone is in the best interest of the veterinary community.

“Although this news may be disappointing to those looking forward to the London Vet Show, unfortunately the coronavirus situation is continually developing. We want to be as clear and upfront as possible with our community and customers, and after careful consideration, our decision to reschedule was out of caution. As event organisers, the health and safety of our exhibitors, delegates, speakers, staff and supporters is our number one priority.”

The London Vet Show team want to thank their delegates, exhibitors, speakers and partners for their ongoing support during this time.

BAME scholarship scheme announced by IVC Evidensia

A new scholarship scheme aimed at improving diversity within the veterinary industry is being launched by one of Europe’s leading veterinary groups. IVC Evidensia has just announced the scholarship scheme will fund up to 12 undergraduates from BAME (Black, Asian and minority ethnic) communities for the next applicable vet school intake.

Amanda Boag, group referral director, is leading the launch of the scholarship and will be working with universities and other partners to raise awareness of the available funding.

“As industry leaders, we need to make sure we are at the forefront of driving the industry forward. Encouraging diversity within our group is hugely important to us and this scholarship scheme is a great start. It will help pave the way for more positive changes in the industry we work in and love, improving it for future generations,” Amanda said.

As well as making funds available to BAME undergraduates, IVC Evidensia is also ensuring that a support network is in place with a BAME Scholarship Board, a mentoring programme and support for student societies.

For more information email bame@ivcevidensia.com
Taking a closer look at veterinary nurse insurance during COVID-19

Are you self-employed? Do you work on a contract as a locum Veterinary Nurse? If you do, you may be finding things a little uncertain at the moment. While most veterinary practices remain open, the Coronavirus pandemic means that many are operating with skeleton staff and dealing with emergency cases only.

Why is now a good time to review your cover?
If you’ve been working as a Veterinary Nurse for a number of years it may be that you bought cover when you first started out on your own and haven’t reviewed it since. But over time, your work and responsibilities may have changed so it’s worth taking the time now to take a closer look at the details of your policy to make sure they still meet your needs and the risks you face.

If you have found yourself with time on your hands because of the current situation, it would definitely be worth putting some of that time to good use by reviewing your insurance. The insurers providing cover for Veterinary Nurses have changed too. At PLH Medical we’ve partnered with Tapoly who are on a mission to revolutionise the insurance landscape. Tapoly offer up to £5 million of Medical Malpractice Insurance for Veterinary Nurses which you can buy quickly and easily online.

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Improve International launches globally accessible distance learning postgraduate programmes

Veterinary surgeons keen to develop their skills and increase the profitability of their practice can enrol for one of Improve International’s new two-year Distance Learning (DL) Postgraduate Certificates set to launch in 2021. The RACE-approved Certificate in Small Animal Surgery will start in February with the Certificate in Feline Practice in April.

As travel restrictions continue, both programmes will be delivered using a range of high-quality blended learning techniques, including interactive online lessons, supported by notes and videos, hosted on an easy-to-navigate online learning platform. The small animal surgery programme will offer ten practical sessions at global training centres.

Delegates for Improve’s new DL certificate programmes benefit from a module tutor – a recognised veterinary specialist in their field – and a dedicated programme tutor, who works with individual delegates to ensure they are supported throughout the programme.

Commenting, Alison Babington, Business Development Coordinator at Improve International, said: “We recently set out our strategy to make the achievement of a postgraduate qualification a realistic goal for every veterinarian and the launch of these new DL programmes will help us to deliver on this goal...

“The addition of these new programmes significantly strengthens our e-learning offering. The new DL small animal surgery course focuses on soft tissue surgery in the first year and orthopaedics and spinal work in the second. Reflecting the latest thinking and techniques for small animal surgery, it offers an excellent platform for surgeons keen to extend their surgical capabilities. High-quality surgical videos will support every module which delegates will have access to throughout their programme.

“The feline practice programme offers an in-depth look at some of the more common medical and surgical issues affecting cats, as well as those which can be more challenging to diagnose and treat.”

Delegates for both programmes have the opportunity to progress to achieving a recognised qualification, a General Practitioner Certificate (GPCert) or a Postgraduate Certificate (PgC).

Further information for both programmes can be found at: improveinternational.com/uk/distance-learning/

Two new awards launched for 2021 RCVS Honours and Awards programme

At its virtual Honours and Awards evening on 10 September 2020, the RCVS launched two new awards for its 2021 Honours and Awards programme, both of which are about celebrating the power of compassion and community within the veterinary sector: the RCVS Compassion Award, reflecting the fact that compassion (along with clarity, courage and confidence) is one of the key themes of the RCVS 2020-24 Strategic Plan, and the RCVS Student Community Award.

At its September meeting, RCVS Council voted to establish a new Registration Committee to make decisions on policies and processes relating to the registration of veterinary professionals.

RCVS Council agrees establishment of new Registration Committee

At its September meeting, RCVS Council voted to establish a new Registration Committee to make decisions on policies and processes relating to the registration of veterinary professionals.

Members of RCVS Council voted unanimously on Thursday 3 September for the establishment of the new committee. Among its terms of reference will be: reviewing and monitoring the registration rules, policies and procedures relating to the registers of veterinary surgeons and veterinary nurses; advising RCVS Council in relation to the creation of new categories of associate members of the RCVS; keeping under review data for the Find a Vet service; monitoring registration activities and trends; considering applications for temporary registration; and monitoring reports from the Registration and Exams Appeal Committees.

Members of Council will now be appointed to the committee, which is expected to start formally meeting from the beginning of 2021.
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Ready for some good news?

The more we attend to joy in the ordinary moments of our lives, the more we experience it and the more joyous we become.

**LAURA WOODWARD**
LAURA WOODWARD COUNSELLING

Laura Woodward has been the surgeon at Village Vet Hampstead for over 10 years. Laura is also a qualified therapeutic counsellor and is affiliated with the ACPNL and the ISPC. She runs laurawoodward.co.uk – a counselling service for vets and nurses.

I got my two children out of bed this morning at dawn. That was after clearing up kitten diarrhoea, medicating the other cat, putting rubbish back into the bins that the foxes had strewn all over the road, packing lunches, shovelling some sort of food into myself, triaging the days necessities, organising the ops list at work... All of this completely mindlessly.

My daughter called out for me. Had I forgotten the PE kit? Was she worried about school? Whatever the problem, I'd just have to sort it and get to work.

No. She had looked out the window, seen a pink sunrise and paused to appreciate it. Then she had shared that moment, describing the trees being silhouetted like palm trees on an exotic island, and it felt good. Her delight was refreshing, and reminded me to practise what I preach.

Yes, there is a worldwide pandemic causing death and misery. What is happening is overwhelming if we allow it to be, but it's also in her life. Being a child doesn't shield you from the news and the repercussions and restrictions of COVID-19. But being childlike in allowing ourselves to take a good moment and make it huge and very present is a talent we can learn from those to whom we often preach.

It takes effort. We do have to coax these small moments of joy into our awareness. And then hold them there for longer than our autopilot-minds would comfortably do. Because, being realistic, the bigger picture is fairly grim these days. If we can shrink our attention right down to the mundane but pleasant experiences just a few times a day and revel in the joy they bring, then that joy becomes bigger, right?

I'm not suggesting we pretend that we're anywhere other than mid-pandemic. That would be denial of the truth. We are practised in acceptance from previous articles. It's just hopping off the hamster wheel of life for a moment several times a day and saying "stop" to ourselves. Stop and look/smell/taste the mundane good things and try to make them mundane great things which take up five minutes of our day instead of a fleeting five seconds.

**Why we tend to ignore the good moments**

Even without a pandemic, human beings tend to be downcast. The brain registers negative experiences more strongly than positive ones because it helped our ancestors survive. It's useful to have a brain highly attuned to threats when sabre-toothed tigers lurk in the darkness.

It's far less helpful when threats to our physical survival are fewer and when our enduring desire is to be at ease. We have evolved and we have developed so many methods of making our lives safer and our lifestyles more convenient and luxurious. What's the point of inventing the wheel and building roads to make life more convenient if we allow the traffic jams to irritate us as much as travelling on foot irritated our ancestors?

Paying attention to joyful moments takes practice. When we learnt mindful meditations and how to pay attention to the present moment on purpose, it was about learning to pay attention no matter what the moment, even if it is a dreadful moment. So, surely, paying attention to a pleasant moment should be easier, right?

Not necessarily so. It's pulling against our minds which are naturally hardwired to move on from the pleasant and safe good moments to more "important" things. Soaking in moments of delight requires mindfulness. It's challenging, for example, to enjoy the fact the cat castrate went smoothly when you're doom-scrolling on Twitter.

**Practices to help us notice the good news**

**Shift your frame of reference**

So often, we reserve celebration for milestones such as a wedding day, the birth of a child or a hard-won promotion. When we think of joy as belonging only to big events, we sideline the many small pleasures strewn along the way. Finding joy in the small things makes it far more accessible and creates a positive feedback loop. The more we attend to joy in the ordinary moments of our lives, the more we experience it and the more joyous we become.

**Living more mindfully**

We talked about slowing down just a tad in order to notice. Noticing the small pleasures will be easier if we make an effort to be living and doing in the present moment. Right now, you’re reading this. Try to put other thoughts, actions and phone pinging out of your mind. Take a moment to just be.

**Noticing what’s not wrong**

Sometimes it can be as simple as savouring the moment when you do have time for three deep breaths because no one’s bleeding and no one’s crying. Maybe make a list of what’s not wrong – the house isn’t flooded, you don’t have a headache, the car starts, the cat castrate went smoothly, you have a coffee in your hand.
Developing yourself as a leader

Planning your career can be daunting, especially when you don’t have a clear picture of where you’d like to be.

One of the most rewarding things about leadership is seeing colleagues flourish. However, developing others can mean that our own career goals can take a back seat. Let’s pause for a moment, evaluate where we are in our own career path and review some useful tools to help us practise what we preach.

When planning a journey, you need to know two things: your starting point and your destination. The more precise you can be about these two things, the easier it is to plan an efficient route between the two. Begin by considering your professional goals. This may be in terms of career progression, a move into a different organisation, role or area, or the skills you would like to develop or be recognised for. It may be a grand life destination, or just the next little step. Either way, write it down.

The second crucial aspect of planning a journey is knowing what’s stopping you. What are the barriers, distractors or other demands on your time or attention that prevent you from moving towards your goal? They may be work-based or things from other areas of your life that impinge in some way. Acknowledge them and consider ways in which they can be managed.

One of the most daunting steps of this process is to actively seek input from others. There are, however, some simple starting points. If you are looking to progress within your organisation, make sure you know what you are evaluated on in your current role, and what the criteria are for the next step up. If you don’t know, ask! It’s also helpful to do some research outside your organisation, and ask recruiters what they would expect to see on the CV of someone going for your dream role.

It’s very easy to skip over asking colleagues because we’re afraid of what we might hear. Start by asking trusted peers who can act as “critical friends” without damaging your self-esteem. Then try to expand this into a more diverse set of people – include those with different job roles and at different seniority levels to build a more complete picture. Ask for an honest appraisal of your strengths as well as areas for improvement.

Making the most of colleagues also includes seeking sound advice and mentoring. Join your professional association(s) and make the most of their social media groups and networking opportunities. Don’t be afraid to contact people whose work, ethos or career path you admire.

One theory of professional growth suggests that 70 percent of our professional learning comes from our working experience, 20 percent is from our interactions with others and just 10 percent is as a result of formal learning. Maximise your development by consciously reflecting on your working week. There are a myriad of tools available to help you do this: you can explore reflective writing, journaling or vlogging. Just make it a habit to note down what went well, what not so, how you felt under different circumstances, what you learned and what changes you will make as a result.

Career planning can be daunting – especially if you don’t have a clear picture of where you’d like to be. If that sounds familiar, rather than planning the entire journey at once, just think of the next step to help you to focus. Once your plan is in place, revisit it regularly – review your progress, adjust as necessary and actively prepare for the next step.

Once your plan is in place, revisit it regularly – review your progress, adjust as necessary and actively prepare for the next step.

HANNAH PERRIN

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Imagine this clinical scenario: during the weekend emergency clinic, a male neutered domestic short-haired cat, with a history of cystitis, is admitted. The owner has noticed him straining to urinate for the past few days. The cat presents as lethargic with bloody, gritty urine around his prepuce. Clinical exam shows a turgid, over-extended bladder and a diagnosis of a blocked urethra is made. A cystocentesis is performed to decompress the bladder, as well as a minimum database and a urinalysis. The patient is started on analgesia and fluid therapy with a plan to anaesthetise and place a urinary catheter to clear the obstruction once the patient is more stable. During the procedure, the patient suffers from cardiac arrest and, despite the team’s best efforts, cannot be revived.

What happens next?
A significant event audit (SEA) is completed. An SEA is a retrospective audit and a quality improvement (QI) technique, which follows one case in detail to decrease the likelihood of repeating outcomes that went badly and increase the likelihood of repeating outcomes that went well. SEAs are carried out by bringing the team and the relevant case notes together to discuss the event. The event must be discussed without any blame, allowing team members to provide honest and constructive feedback on how they contributed to the care process.

During the SEA, it was identified that the patient was showing spiked T waves on ECG, indicating polarisation abnormalities caused by hyperkalaemia. However, the team were not confident in interpreting the ECG trace, so had not identified this in time. The team were quite new to emergency and critical care, with a few members being newly qualified. The need for training was discussed, in particular specific training in general anaesthetic monitoring and ECG.

To get a clearer picture of the procedures that needed to be put in place, a retrospective audit was completed on general anaesthetic monitoring sheets. The information required on each sheet included a GA chart completed and loaded on to the practice management system (PMS), the multiparameter monitor (MPM) used, the surgical safety checklist used, drugs and dosage recorded, monitoring of vital signs and record of ECG trace and notes on quality of GA and recovery.

Each sheet was marked out of three, zero being “missing information”, one “basic information”, two “contains relevant details” and three “excellent level of detail”. The audit showed that GA sheets were only used on 29 percent of sedations and 63 percent of anaesthetics, with no mention of ECG when they were used. Most of the forms were scoring one, with basic levels of information.

What changes were implemented?
Nurse clubs were set up to engage the team and supply training. The first involved the use of the multiparameter machine and understanding of the ECG. Training was also given one-to-one for individuals that required it. After the nurses received the training, they then delivered the training to other members of the team, to further develop their understanding. The team members who had wanted more support were observed during a GA when possible. The team set up a folder within the prep area that contained articles and tips on anaesthetic monitoring and emergency and critical care topics, so the whole team had access to the information if required.

A repeat audit was completed after the training had been delivered to all team members. The audit showed that the MPM was used on 100 percent of anaesthetics, and 70 percent of sedations, with surgical safety checklists being completed for all. 75 percent of the sheets were filled with an excellent level of detail, and observations made on ECG traces and identification of complex ECG traces. Importantly, there have been no patient mortalities or significant events related to general anaesthetic or sedation since the training was implemented, which is a great success for the whole team. As quality improvement is a continuous process, the team will continue to audit and reflect on their performance.

In summary
SEAs are a useful way to investigate a significant event, as they allow an honest and constructive account on the quality of care provided, focusing on how to learn from the event to implement changes that lead to future improvements. They can guide further development of guidelines, protocols or checklists and may result in additional clinical audits that measure whether the changes have been adopted (process audits) and whether they led to an improvement (by auditing outcomes).

For further information visit: rcvsknowledge.org/quality-improvement/tools-and-resources
I recently read a post on a veterinary Facebook page that got me pretty wound up and caused me to rewrite this piece almost immediately. In summary, the post was raising issue with the fact that NHS workers get discounts at certain places and vets do not. The post tried to compare jobs and suggested that vets had it harder during these times. Let me tell you, having experienced it first hand – what we do as vets does not compare to anyone working for the NHS, especially during a global pandemic.

I graduated in July, in the middle of some pretty strange and isolating times. Revision on my own was never my forte and a lot of us students were left fearful of what exams would mean for our futures. Thankfully, it worked out well for myself but equine jobs were hard to come by. As someone that’s never been very good at sitting still and doing nothing, I needed to find a job and I wanted to do something to benefit others.

My partner is a student paramedic and was aware of a large-scale recruitment that was taking place for our local NHS trust. In April I started working for the West Midlands Ambulance Service (WMAS) NHS Trust as a 111 call handler. My job entailed answering calls, reassuring patients, assessing symptoms and either signposting or arranging further help for them. I figured telephone triage on human patients couldn’t be that difficult so jumped straight to it. Of course a large volume of the calls we received were COVID-19 related; I was expecting that. But even though the 111 service isn’t meant to be an emergency line, we did get a large volume of emergency calls – often when individuals did not ascertain the severity of their situation. This was certainly something that I did not expect.

During the peak of the pandemic there was a 300 percent increase in the call volume for WMAS. They have had to recruit over 1,000 staff members, doubling the amount of call handlers to cope with this increase. To help with the abundance of calls, 178 student paramedics also volunteered to step up to the front line. Can you imagine a 300 percent increase in your workload, almost overnight? All while being chronically underfunded, understaffed and with resources maxed out...

No. Because we as a profession providing a private healthcare service have not had to face this. We have not been on the “front line”. It is not the same for us. We have not had to put our lives and our family’s lives at risk on a daily basis, coming face-to-face with and caring for those individuals who were infected and critically unwell. At the time of writing, over 41,000 patients have lost their lives to COVID-19 in the UK alone (Public Health England and NHSX, 2020). Imagine having to phone those families and inform them? Those families who haven’t even been able to be with that loved one in their final hours. I understand that these have been challenging times for us all but our work as vets simply does not compare.

In my five months with the NHS I have had a lot of ups and downs. I have had the pleasure of meeting amazing colleagues who I now consider to be dear friends, I have cried so many tears of laughter and definitely pain and I have worked so many ungodly hours. I’ve been able to help patients in labour, have given CPR instructions for a three-year-old child and talked to people while in the darkest of times in their lives. I have no doubt that the number of mental health calls is rapidly increasing, with more and more individuals being home alone and financial worries mounting.

But for me, the hardest side of the job was dealing with the time wasters, the repeat callers and the abusive ones. While going through the training we were warned about this, but experiencing it first-hand was shocking. There were many shifts that I walked away from in utter disgust. I was sworn at, shouted at and called all the names under the sun. NHS workers are not there to be abused but it sadly happens very frequently. Despite this, overall it was a positive experience for me. I have grown as an individual, I am able to work much better under stress and I feel I have a much better appreciation for our NHS service on a whole.

Our NHS workers have definitely earned more than 10 percent off shopping during this pandemic. They deserve a whole lot more. We all clapped for our NHS and frontline workers during this pandemic. But frankly, what did that achieve? We all displayed our appreciation for their efforts, but what are we actually doing to help solve the problems that the NHS are facing? Our death rates would have been even more horrendous without it; we cannot let it continue on its knees.

References
Intersectional environmentalism and the veterinary profession

The veterinary profession has a huge part to play in the fight for climate and social justice; we have the ability to positively impact many human and animal lives.

Intersectional environmentalism is an inclusive version of environmentalism that advocates for both the protection of people and the planet. It identifies the ways in which injustices happening to marginalised communities and the earth are interconnected. It brings injustices done to the most vulnerable communities, and the earth, to the forefront and does not minimise or silence social inequality” (Intersectional Environmentalist, 2020).

It is clear to see across the globe that the people who have contributed the least to the environmental crisis are suffering the most severe consequences. A clear-cut example is the continent of Africa, where droughts, flooding and consequential disease are increasing in severity every year. Home to 17 percent of the world’s population (United Nations, 2019) and contributing only 4 percent to global carbon emissions (Statista, 2020), 8 out of the top 10 countries most vulnerable to climate change are in Africa (Notre Dame Global Adaptation Initiative, 2020).

Why is this relevant to the veterinary profession? Our profession is global. We have colleagues in every country fighting for animal health and welfare and public health. It is our colleagues who are witnessing the communities that they serve suffer from famine, the animals that they have taken an oath to protect die from heat exhaustion, bush fires, starvation and increased disease prevalence, to name the least. Whilst our coastal colleagues are facing increased infertility in endangered species, destruction of critical ecosystems and animals suffering as a result of plastic consumption. In the UK we cannot claim to be naive to these problems. We witness these famines, extinctions, communities displaced from their homes and their countries; all whilst we sit comfortably on our sofas listening to David Attenborough.

How does this link to Black Lives Matter in the UK? The BLM movement has brought attention to the inequalities in our society and has highlighted the importance of intersectional environmentalism. In the UK, Black British Africans are 20 percent more likely to experience higher air pollution than their white counterparts (Fecht et al., 2015). The impacts of the climate crisis are not borne equally by all. These disparities are leading to both health and environmental crises that fall along racial lines in communities. The inequalities are not limited to the low percentage of BAME colleagues within the veterinary profession, they affect our careers and the sectors we influence; for example, animal product consumption (the cost of organic vs conventional food products), product development (reduced opportunities for people of colour whitewashes industries and prevents new ideas and beneficial development), sourcing of materials (who, what and where are your products and their materials sourced from and under what conditions), preventative medicine measures (financial burden of veterinary costs) and owner compliance (cultural and religious differences prevent successful communication), to name but a few.

Without a doubt we are living in the most critical moment
It is clear to see across the globe that the people who have contributed the least to the environmental crisis are suffering the most severe consequences in history - for humanity, for the environment and for ourselves. We are waking up to injustices worldwide and it is no longer possible to ignore the fact that we are all completely co-dependent. In this moment we need to consider the responsibility that we have, not just to our colleagues abroad but to our future colleagues everywhere who will be affected by increasing climate disruption; the responsibility that we have to animals, in the UK and globally, whom will increasingly suffer from the emergence of new diseases, as a consequence of changes in climate and biodiversity loss; and furthermore, the responsibility that we have to unlearn structurally ingrained racism and educate ourselves on a struggle that allies will never experience or understand. Climate Justice is social justice and it has consequences for all of our lives. To quote Leah Thomas of Intersectional Environmentalist: “The longer racism is not addressed, the harder it will be to save the planet.” This is in part because black activists’ time and energy are being drained, explaining their existence to the dominant white environmentalist community, but also because we are not adequately providing opportunities for BAME colleagues to be present and their voices and experiences to be heard in the veterinary community on the topic of environmentalism.

As a profession we understand how important and influential education can be. It helps us to understand the people, the communities and environment around us. The veterinary profession has a huge part to play in the fight for climate and social justice; we are the sentinels of animals, have significant influence in our communities and are contributors to pollution. The example that we set to others has the ability to positively impact many human and animal lives.

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GlycoZoo is an aqueous otic solution composed of Boric Acid and Glycolic Acid. Offering antibacterial, cerumenolytic, keratolytic, lipolytic, astringent, non-irritating and replenishing action for dogs and cats. Its combination of active ingredients provides a synergistic effect making it a particularly effective ear cleaner in which yeasts participate.

Oh — and it smells amazing too! (Good for client compliance)
Agria Pet Insurance protects the oldest pets with lifetime cover this autumn

From 1 October to 30 November, dogs, cats and rabbits of any age can access a full lifetime insurance policy from Agria Pet Insurance

Agria’s “Age Amnesty” campaign is ready to launch for the sixth year running. Nick White, Head of Veterinary Channel at Agria Pet Insurance, says, “We’re especially pleased to launch Age Amnesty this year – if there was ever a time that pet owners needed some certainty over expenses, it’s now. We always see a lot of interest and a great uptake in lifetime policies for older pets during the campaign, and the support we receive from the vets we work with is great.

“We continue to hear about owners struggling to find cover for their much-loved older pets. This is obviously a heart-breaking situation for those pets that then go on to need complicated or long-term treatment. By providing this opportunity, and raising as much awareness about the campaign as we can, we’re hoping to be able to give many more owners of older pets the peace of mind that lifetime cover brings with it.”

Robin Hargreaves, Vet Lead at Agria Pet Insurance, backs the campaign, “Lockdown has illustrated once again how important our pet companions are to our own well-being. Being able to insure older pets who may be reaching an age when health issues are more likely to arise is one less worry when it comes to looking after their health and well-being.”

Having lifetime cover for an older pet can make a significant difference by protecting owners against the costs connected with new conditions or problems they are diagnosed with without insurance could cost the owner £12,500.

Providing they are not pre-existing, such conditions are included in cover from Agria Pet Insurance, enabling owners to authorise the right care for them, helping their pets to enjoy their older years.

Owners taking out a new policy for their cat or dog during Age Amnesty can also benefit from a £50 voucher towards anything from their vet that supports their pet’s health. This could be a check-up, food or preventative healthcare, or can contribute towards a consultation.

This year, Age Amnesty is supported by a social media campaign showing the bonds that develop and grow with our pets through their lives. Bacon the Staffordshire Bull Terrier is now 15 and has led a very full life. The film takes us through some of Bacon’s memories, illuminating the relationship between pet and owner. Produced to raise awareness of Age Amnesty 2020, the video will feature on social media throughout the campaign.

Nick continues, “We encourage vets to share our social media campaign and help Age Amnesty to reach as many owners of older pets as possible, giving them an opportunity to benefit from lifetime cover at a time when they may need it the most.”

Age Amnesty runs from 1 October to 30 November 2020. Owners can get a quote for their older pet at agriapet.co.uk/AAM, quoting HS19 to take advantage of the £50 free healthcare voucher.

For more information about how Agria Pet Insurance supports veterinary practices visit: agriapet.co.uk/vets or call 03330 30 83 73

Having lifetime cover for an older pet can make a significant difference by protecting owners against the costs connected with new conditions or problems they are diagnosed with.
Good rabbit welfare means friends and forage

Rabbits are not a low maintenance pet; they have some key requirements that must be adhered to if they are to stay healthy for many years

The domestic rabbit (*Oryctolagus cuniculus domesticus*) is a popular pet in the UK and beyond, with an estimated 900,000 rabbits being kept as pets in the UK in 2019 (PDSA, 2019). Whilst familiar to many, rabbits are technically classed as an “exotic pet” and can have some exacting requirements when it comes to medicine and surgery. A well-kept rabbit can make an excellent companion animal; they can be trained to live inside as a house pet, as well as housed in spacious outdoor accommodation. When all their needs are provided for, rabbits can live up to 12 years. Rabbits are not a low maintenance pet; they have some key requirements that must be adhered to if they are to stay healthy for so many years. These requirements are not too difficult to cater for and they centre around providing the correct diet, housing and social group, and giving pet rabbits enrichment to keep them mentally and physically stimulated.

Pet rabbits should also have vaccinations kept up to date to ensure they remain healthy and can achieve these ripe old ages. Rabbits are susceptible to several specific pathogens associated with diseases which, without prophylaxis, can be fatal. These include myxomatosis (caused by the myxoma virus transmitted by mosquitoes and fleas) and the two strains of rabbit viral haemorrhagic disease, R(H)VD1 and R(H)VD2. Owners also need to keep a watch out for the parasite *Encephalitozoon cuniculi*, which affects the rabbit’s nervous system and manifests as head tilting and loss of balance, and the non-specific respiratory infection “snuffles” which is generally caused by *Pasteurella multocida*, *Bordetella* spp. or *Pseudomonas* spp. A rabbit can become infected with *E. cuniculi* from grazing in an area that a carrier of the parasite has had prior access to, and as socialisation is so key to good rabbit welfare, owners should try to manage any rabbits being kept in stable social groups, get rabbits tested as good disease surveillance (Woolfe, 2016) and discuss treatment options as soon as *E. cuniculi* is suspected.

Access to grazing and social interactions are crucial to a rabbit’s long-term health and good well-being; hence mitigation of any disease risk is important as rabbits should not be restricted in their opportunities for foraging and being gregarious. Many non-infectious rabbit diseases are caused by stress and incorrect husbandry, such as an inappropriate social grouping, substandard housing and a lack of forage in the rabbit’s diet. Consequently, some authorities argue that hutch-housing, with a lack of companionship and a kibble-based diet, with no forage or access to grazing, is much more harmful to a rabbit’s health than diseases posed by *E. cuniculi*, for example.

Wild rabbits have a complex social structure with a defined hierarchy (Surridge _et al_. , 1999); this social complexity is still found in domestic rabbits and aspects of a linear dominance hierarchy as well as differences in aggression between the sexes (males are generally more...
aggressive (Varga, 2014)) and key resource defence (e.g. a female rabbit’s protection of her nest) will still be present in companion, pet or farmed rabbits (Bill et al., 2020). Keeping a solitary rabbit deprives it of this behavioural outlet and hence reduces its chances of performing a range of activities that keep it physically and psychologically stimulated. Wild rabbit behaviour patterns differ during day- and night-time, reflecting differences in periods of grazing, basking in the sun, digging and socialising both above and below ground (Varga, 2014). Whilst domestication has reduced some of the rabbit’s wild tendencies (e.g. they have a reduced fear response and are less inclined to burrow), being outside to run, dig and play are still essential components of good rabbit welfare. Owners should be advised to provide a pair of rabbits with an enclosure of at least 3x2x1m, tall enough to allow the rabbits to stand up on their back legs comfortably.

Useful pointers on welfare-friendly behaviours that a rabbit enclosure should enable are documented on the Rabbit Welfare Association website (RWAF, 2020a), as well as advice on rabbit enrichment, to keep your pet stimulated in body and mind (RWAF, 2020c). Digging, hiding, running, exploring, grazing and chewing are all welfare-positive behaviours that keep a rabbit calm, making it less fearful of changes around it and more able to cope with any sudden or short-term stressors, improving both the animal’s quality of life and that of its owners too.

Collection and processing of food take up a large proportion of a wild rabbit’s day. Rabbits have evolved a complicated digestive system to extract as much energy and nutrients as possible out of a highly fibrous diet (Rees Davies and Rees Davies, 2003). Rabbits are hindgut fermenters, trickle feeding to keep the population of microbes in their caecum (hindgut) alive and thriving on large quantities of fibrous matter. This complicated digestive process produces two forms of pellet: hard, dry pellets that are waste products of indigestible food, and softer pellets, called caecotrophs, which are intermittently excreted throughout the day to be reingested by the rabbit to further increase digestion and absorption of nutrients. Caecotrophs are produced and ingested during a quiet, undisturbed period several hours after feeding (Varga, 2014). Consequently, rabbit housing should provide safe, secluded areas for the rabbit to retire to, so that this essential part of the digestive process can be performed unimpeded.

Without a high-fibre diet (lots of forage and structural carbohydrates), this highly specialised gut function will not work effectively and this is the cause of many health problems in pet rabbits, including gut stasis, malocclusion, overgrown teeth and jaw abscesses that can be particularly dangerous. To keep a rabbit healthy, muesli-style mixes should be avoided (Meredith et al., 2015) and rabbits need to be fed a diet of around 80 percent forage (good quality hay), a small amount of leafy greens and, depending on the size of the rabbit breed, a tablespoon of bespoke rabbit pellet twice a day. High-sugar treats (e.g. fruits and vegetables) that can disrupt the activities of the gut microbes should be avoided. Hay might not look that exciting from a human perspective, but for a rabbit, the act of foraging, chewing, reingesting of caecotrophs and a constant cycle of processing fibre keeps it occupied, satiated and relaxed.

Although as much forage as possible is excellent for rabbit health and welfare, certain plants are toxic to them. Rabbits are not native to the UK and hence some plants such as ivy (Hedera helix) and holly (Ilex aquifolium) are toxic to them (RSPCA, 2020; RWAF, 2020b). Whilst access to grazing and outdoor space can be very beneficial to pet rabbit welfare, check what plants are in nibbling distance. The symptoms of ivy poisoning, for example, can appear a few days after ingestion and therefore owners need to keep a close eye on what vegetation their animals have had access to.

Pet rabbits should also have vaccinations kept up to date to ensure they remain healthy and can achieve these ripe old ages.

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The FIRST and ONLY vaccine that protects against myxomatosis and rabbit haemorrhagic disease caused by both classic (RHDV-1) and variant (RHDV-2) strains.

Visit www.nobivacmyxorhdplus.co.uk to update your rabbit vaccination protocol.
Emergency triage and first aid of exotic patients

Exotic patients are often more critical on presentation than canine and feline patients, due to their nature of hiding signs of illness.

Exotic animals are inherently prey species and as such hide evidence of minor illnesses. Because of this, by the time an exotic patient is showing signs of disease it is often in the advanced stages and likely has been ongoing longer than the owner has noted signs of illness. This results in a greater proportion of emergency presentations in our exotic patients than we see in our canine and feline patients. Whilst many veterinarians find the prospect of a consultation with a sick exotic patient a daunting task, often early intervention can be the difference between life and death. Any ill exotic patient should be seen within 24 hours of initial contact; however, some conditions should be assessed in consultation without any delay (Box 1).

The principles of emergency triage and first aid in exotic species is very similar to that of companion animals, barring some minor physiological differences. Every practice is equipped with the tools they require to provide emergency care to exotic patients, even if just in the short term to stabilise the patient and refer to an exotics practice if required.

All staff members should be informed of the patient’s state and estimated arrival time, if known in advance, and the patient taken immediately for assessment on arrival. Initial assessment of the emergency patient takes less than a minute. Assess the patient’s mentation, respiratory rate and effort and, if possible, their heart rate and rhythm. Any collapsed patient should be immediately assessed for respiratory or cardiac arrest with cardiopulmonary resuscitation (CPR) commencing without delay if necessary. Chest compressions in exotic species should be replicated as close to their resting heart rate as possible, as minimal study data exists for the rate of compressions in exotic species (Onuma et al., 2017).

Drug therapy can also be instigated, including the use of adrenaline and atropine. The use of atropine in rabbits is not recommended as rabbits can have circulating serum atropinesterase, which degrades atropine and renders it ineffective, so glycopyrrolate should be used instead (Lichtenberger, 2007). Emergency drug doses are available in many exotic formularies, and a “cheat-sheet” of drug doses is recommended for easy access in case of emergency. The patient should be intubated if possible, after clearing the oral cavity of any food that may be present, to facilitate oxygenation. If the patient is not able to be intubated then a tight-fitting face mask can be used (Lichtenberger and Lennox, 2012).

If the patient is dyspnoeic then oxygen should be administered as soon as possible. Some small mammal patients will tolerate oxygen provision with a face mask (Figure 1A); however, the use of an oxygen chamber reduces stress compared to mask placement (Figure 1B; Lennox, 2007). Care should be taken to monitor a patient placed in an oxygen chamber.
oxygen chamber to ensure they do not decompensate, or cause damage to the chamber (in the cases of parrots and small rodents) or themselves. Low-dose sedation may be required if the patient is overly anxious (Lichtenberger and Lennox, 2012). Ideally, the oxygen chamber should be warmed, as exotic patients often have a larger surface area to volume ratio and lose heat quickly when they are ill. If the patient is not dyspnoeic then it should still be placed inside a warm, quiet brooder or provided with supplemental heat (Bowles et al., 2007) unless heat stroke is suspected.

Vascular access should be obtained in dull or obtunded patients. In larger mammals such as rabbits, ferrets and guinea pigs, placing an intravenous catheter is straightforward, with access sites well documented (Figure 2, Lichtenberger and Lennox, 2012). In smaller mammals and reptiles, the placement of an intraosseous catheter may be required with a combination of sedation and local anaesthesia (Lichtenberger and Lennox, 2012). Common sites for intraosseous catheterisation include the proximal femur and the proximal tibia (Lennox, 2007). In larger avian patients an intravenous catheter can be placed in the medial metatarsal vein; however, in collapsed and smaller avian patients, intraosseous catheterisation can be technically easier, with common sites including the distal ulna and the proximal tibiotarsus (Bowles et al., 2007). If no vascular or intraosseous access can be gained, then subcutaneous fluid therapy can be utilised.

Fluid therapy should be commenced in situations where the patient is in hypovolaemic shock (Lichtenberger and Hawkins, 2009). Administering fluid therapy as boluses should be considered, as constant rate infusions are poorly tolerated by most exotic patients and, unless constantly monitored, there is a high risk in most species of chewing the giving set (Rosenwax, 2018), resulting in possible exsanguination. Any fluids administered should be warmed prior to administration (Maclean and Raiti, 2004). Choice of fluids depends on the clinician’s preference, species and any metabolic derangements; however, the author prefers the use of lactated Ringer’s solution in the first instance and through the majority of most patients’ treatment.

Any specific treatments should be carried out once vascular access has been achieved and the patient is not in arrest or distress. Covering any wounds, temporary fixation of any fractures and minor sampling (for example blood glucose, crop swab, faecal samples) can be taken at this time. Once the patient has been stabilised, a history can be taken from the client. It may be useful for one team member to take a history whilst other team members work on stabilising the patient. A detailed review of the patient’s husbandry should be taken alongside a medical history.

A more in-depth examination can be completed once the patient is more stable; however, a low-dose sedation may be required to achieve this if the patient becomes distressed with handling. Low-dose midazolam is often useful in these situations (Lichtenberger and Lennox, 2012). Emergency presentations are varied, and each requires a different approach once the cause has been identified. Medical or surgical therapy can be commenced once the patient has been stabilised. It is important to remember that most drugs administered to exotic patient are “off-licence” and the prescribing cascade must be followed (Headley, 2020). If administering off-licence drugs to an exotic patient at any time, informed consent must be gained from the owner. In addition, meat and egg withholding periods need to be considered when treating food-producing animals such as poultry.

Every veterinary practice has the resources available to provide emergency first aid to exotic patients. Technical skills such as intubation and intravenous catheterisation take time and practice; however, as described above, substitutions can be made. Having an emergency toolkit with small-gauge catheters, small-diameter endotracheal tubes, emergency drugs and warming equipment can save time in an emergency. Multiple resources are available to assist with emergency care of exotic patients, both in print and online, and exotic referral practices are available to give advice or accept referrals as required, if consented by the owner. Exotic patients are often much more critical on presentation than canine and feline patients, due to their nature of hiding signs of illness, and examination and treatment should never be delayed.
Erythema multiforme: is it a cutaneous reaction pattern or a diagnosis?

Erythema multiforme has typical histological changes, with variable clinical signs depending on individual response

ANITA PATEL

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Erythema multiforme (EM) in dogs is an uncommon multifactorial condition, usually of acute onset. In humans the condition is characterised clinically by classical "target lesions" whereas in animals it is recognised on histological findings of epidermal apoptosis and lymphocytic satellitosis, making it a histological diagnosis. This is a reaction pattern which can be triggered by an immune response targeting the antigenically altered keratinocytes. Depending on the extent of the body involved and the severity of lesions it is classified as erythema multiforme minor (EM minor), or erythema multiforme major (EM major). EM minor in dogs has a wide range of lesions with truncal, axillary and inguinal, mucocutaneous, head and/or generalised distribution, with only one or no mucosal site involvement. The affected animals have no systemic signs. Dogs with EM major have similar lesions and distribution; however, more than one mucosal site will be involved and they may have systemic signs (Yager, 2014).

Pathogenesis

Although the exact pathogenesis of EM is not understood, it is thought to be a T cell-mediated hypersensitivity response in which the cytotoxic T-lymphocytes target the antigenically altered keratinocytes leading to cell death by apoptosis.

The antigens implicated include drugs, viruses and bacteria, vaccines, neoplasia, food (Itoh et al., 2006) and nutraceuticals, but are often not proven in individual cases, except if re-challenged accidentally. In one case, immunohistochemical staining with CPV-2-specific monoclonal antibodies confirmed parvovirus-associated EM major in a dog (Favrot et al., 2000). In another case, EM was directly associated with a thymoma, when the clinical signs resolved following thymectomy (Tepper et al., 2011).

In humans, the condition is associated with herpesvirus infections, even though the viral particles are not found in the damaged skin. Herpesvirus-associated erythema multiforme is reported in cats, but, unlike in humans, viral DNA has been demonstrated in lesioned skin.

Clinical signs and diagnosis

The distribution of the lesions is generally symmetrical and tends to involve the trunk (mainly axillae and groin), head and mucocutaneous areas. The lesions tend to be on the concave aspects of the pinnae, foot pads, mucocutaneous junctions and oral cavity. The lesions typically described as "target lesions" are erythematous macules, papules or plaques (Figure 1), vesicles and bullae which when ruptured cause ulcers. Unlike the typical target lesions seen in EM
in humans, these generally lack the indurated borders and central purpuric area. The lesions tend to have arciform or annular configurations. Thick adherent crusted plaques which are a particular entity of idiopathic chronic EM is seen in older dogs. These plaques tend to wax and wane.

The clinical signs and histological findings should be correlated to reach, or support, the diagnosis of the reaction pattern. The other differentials such as dermatophytosis, demodiconis, pemphigus complex, bacterial folliculitis and superficial spreading pyoderma (when target lesions seen) should be ruled out. If there is marked scaling and crusting, superficial spreading pyoderma (when target lesions seen) or annular configurations. Thick adherent crusted plaques which are a particular entity of idiopathic chronic EM is seen in older dogs. These plaques tend to wax and wane.

To make the histological diagnosis, it is crucial that the biopsy sites are areas of erythema, without crusting or ulceration, because otherwise the secondary changes are likely to mask the changes due to EM. The findings include interface dermatitis, where the dermo-epidermal junction is targeted by mononuclear cells. Apoptotic keratinocytes and lymphocytic satellitosis are seen in both the basal and spinous layers. The follicular epithelium can also be involved.

Hyperkeratosis and parakeratosis are seen in canine EM, which is sometimes then referred to as hyperkeratotic EM.

Identification of suspected triggers requires meticulous history taking and correlation with onset of the condition. The time between the trigger and onset varies from days to weeks and, in some cases, months.

**Prognosis and treatment**

The prognosis varies depending on the severity of the condition, ranging from poor to guarded, and the condition also tends to wax and wane. There is no single universal drug for each condition, but there are a range of drugs with immunomodulating properties that can be employed (Table 1).

For suspected drug-induced cases of EM, drug withdrawal is essential. Idiopathic forms may require long-term symptomatic treatment. Generally, ciclosporin, azathioprine, glucocorticoids, pentoxifylline and mycophenolate mofetil (Figures 2 and 3) can be considered for EM. None of these drugs have evidence-based information to validate their use in any case. This is probably because they are rare conditions.

The choice of treatment should depend on an individual assessment and if there is a poor response, or adverse effects, alternatives to the chosen treatment should be considered. Regular monitoring of haematological and biochemical parameters is required, and the frequency will depend on the drug of choice.

Topical shampoo treatment is useful to remove crusts and scale and prevent secondary microbial infections.

**Summary**

Erythema multiforme is a reaction pattern with typical histological changes, with variable clinical signs depending on individual response. It usually has an acute onset and can involve mucocutaneous areas. It can be triggered by drugs, infections and neoplasia; meticulous history taking and assessment is needed to identify the trigger. The condition has a variable prognosis depending on the severity of the disease.

**References and further reading**


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**Table 1** Useful drugs for management of erythema multiforme

<table>
<thead>
<tr>
<th>DRUG</th>
<th>DOSAGE</th>
<th>COMMON ADVERSE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisolone</td>
<td>2 to 4mg/kg q24 hours for induction phase and then tapered very slowly</td>
<td>Polyuria, polyphagia, polydipsia, hepatomegaly</td>
</tr>
<tr>
<td>Mycophenolate mofetil</td>
<td>10 to 20mg/kg q12 hours initially and reducing to q24 hours</td>
<td>Anaemia, leucopenia, nausea, vomiting and diarrhoea</td>
</tr>
<tr>
<td>Azathioprine</td>
<td>2mg/kg orally q24 hours</td>
<td>Anaemia, leucopenia and liver damage</td>
</tr>
<tr>
<td>Ciclosporin</td>
<td>5 to 7.5mg/kg q24 hours</td>
<td>GIT disturbances, gingival hyperplasia, papillomatosis</td>
</tr>
</tbody>
</table>

---

Erythema multiforme: is it a cutaneous reaction pattern or a diagnosis?
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**The Suprelorin implant and mechanism of action**

Suprelorin contains the active ingredient, deslorelin, in a lipid matrix biocompatible implant. Deslorelin is a GnRH superagonist created by modifying the amino acid sequence of endogenous GnRH at positions 6 and 9. This results in a compound with the same action as GnRH but with 7-fold increased GnRH receptor binding affinity, increased stability and increased potency. Although more stable than endogenous GnRH, GnRH analogues are still rapidly absorbed and eliminated following parenteral administration, but the lipid matrix of the implant allows continued release of deslorelin over time.

The effect of GnRH on target cells is mediated via binding to specific GnRH receptors (GnRH-R) located in the anterior lobe of the pituitary gland. Under the normal pulsatile release of GnRH, the GnRH-R activates secondary messengers which are responsible for the production of the LHβ and FSHβ subunits, and for the α-subunit which is common to both FSH and LH. However, under sustained stimulation which occurs with the deslorelin implant, a complex series of network transduction pathways involved in gene expression are activated. This results in an inhibition of the mRNA coding for the β-subunits and therefore a decrease in the circulating level of gonadotrophins. Understanding the mechanism of gonadotrophin and testosterone production, and the effect of continued stimulation of GnRH-R as opposed to episodic stimulation through pulsatile release of endogenous GnRH, allows an understanding of what to expect once an implant has been placed. Initially, there is an increase in plasma testosterone as the deslorelin released from the implant binds to GnRH-R and stimulates production of LH, FSH and consequently testosterone. This flare up effect is transient and testosterone levels then decrease rapidly to <0.4ng/ml under the continued secretion of deslorelin and consequent down-regulation of GnRH-R. This usually occurs within 9-20 days, though the 9.4mg implant will take slightly longer to down-regulate. Once testosterone levels reach 0.4ng/ml, 3-4 additional weeks are necessary to observe a total absence of sperm production. Infertility is therefore achieved from 6 weeks with the 4.7mg implant and from 8 weeks with the 9.4mg implant so treated dogs should be kept away from bitches in heat until these time periods have been observed. Clinical studies demonstrated maintenance of testosterone <0.4ng/ml for at least 6 months post implant with the 4.7mg and for at least 12 months with the 9.4mg implants.

**Clinical effects**

As expected, the lowered testosterone levels result in reduced semen volume, sperm production and motility with increased sperm abnormalities. A reduction in libido is also seen, though it is important to note that a lack of testosterone does not always lead to complete absence of mating behaviour. A retrospective study of neutered dogs, both male and female, found that 27.3% continued to display sexual behaviour following surgery and the same would be expected of implanted dogs. There is a reversible reduction in testicular volume in the vast majority of dogs following the implant due to atrophy which can provide a useful external marker of the implant’s action.

**Reversibility**

In clinical trials, more than 80% of dogs implanted with the 4.7mg Suprelorin returned to normal plasma testosterone levels (>0.4ng/ml) within 12 months of implantation, and 98% by 18 months. In dogs given the 9.4mg implant, 68% returned to normal testosterone levels within 2 years and 95% by 2.5 years. Once normal testosterone levels have been established, fertility does not instantly return to normal as spermatogenesis generally takes 7-9 weeks in the dog. After recovery, the seminiferous tubules, epididymal ducts and prostate tissue all show functional activity.

**References**

Potential applications for probiotics in small animal veterinary medicine, now and in the future

Probiotics may offer many potential therapeutic applications but many questions remain unanswered

A previous article discussed the growing interest in the gastrointestinal microbiota and its many and varied roles in pet health and disease. Four key ways have been identified to manipulate the gastrointestinal microbiota therapeutically: antibiotics, faecal matter transplants, prebiotics and probiotics. This article will focus on current and future applications of probiotics.

Probiotics – properties and proposed mechanisms of action

Probiotics, as defined by the World Health Organization, are “live microorganisms which when administered in adequate amounts confer a health benefit on the host” (WHO and FAO, 2001).

This report listed the ideal properties of a probiotic as being non-pathogenic, stable during shelf-life and resistant to temperature, resistant to gastric and intestinal digestion by acid, bile and enzymes, able to adhere to intestinal epithelium, able to interact with gastrointestinal flora in a positive way and capable of influencing host immune responses.

Proposed mechanisms of actions for some probiotics include: reducing intestinal pH allowing beneficial bacteria which generally thrive in acidic environments to survive; destroying pathogenic bacteria and toxins; competing for essential nutrients or receptor sites required by pathogens; binding of pathogenic bacteria; or producing inhibitory antimicrobial substances such as bacteriocins and peroxides.

Although the mechanism of action of probiotics is not completely understood, they are likely to exert an effect on the resident intestinal microbiota of the host and may also affect the intestinal and systemic immune system (Hart et al, 2012).

Probiotics in gastrointestinal disease

Some of the primary applications for probiotics in companion animals are acute and chronic gastrointestinal disturbances, and evidence for use of them in this context is generally strongest (Bybee et al., 2011; Lappin, 2018). In cats, Enterococcus faecium SF68 has been shown to reduce the duration of acute diarrhoea in cats housed in shelters in a double-blinded, placebo-controlled study (Bybee et al., 2011). This was a short-term study, suggesting the beneficial effect was likely from probiotic influences on intestinal microflora, rather than systemic immunomodulation. E. faecium SF68 has also been shown to have benefits in acute diarrhoea in kittens (Czarnecki-Maulden et al., 2007). A multi-strain symbiotic administered to cats with chronic diarrhoea resulted in improvements in mean faecal score based on a standardised faecal scoring system, and 72 percent of owners perceived an improvement in their cat’s diarrhoea after a 21-day course of symbiotic supplementation (Hart et al., 2012) although there was no control group in this study.

In dogs, E. faecium SF68 has been shown to have benefits for canine stress-related diarrhoea (Gore and Reynolds, 2012). E. faecium 4b1707 has also been associated with a better clinical outcome compared to a placebo in dogs with acute, uncomplicated diarrhoea, where dogs in the treatment group receiving the probiotic had on average a 15-hour shorter duration of diarrhoea (Nixon et al., 2019). Although this was concluded to be of limited clinical relevance, fewer dogs in the treatment group required additional medical intervention for non-improvement or worsening. This is potentially of more clinical relevance, since it suggests probiotics could have the potential to decrease the use of antimicrobials – one of the main medical interventions which might otherwise be considered.

In canine inflammatory bowel disease (IBD), use of a multi-strain probiotic VSL#3, containing four strains of Lactobacillus, three strains of Bifidobacterium and one strain of Streptococcus thermophilus, appeared to confer some protective effects to dogs, with a significant decrease in clinical and histological scores and a decrease in CD3+ T-cell infiltration (Rossi et al., 2014). Protection was associated with an enhancement of regulatory T-cell markers in dogs receiving the probiotic, and this was not seen in dogs receiving a combination therapy of prednisolone and metronidazole. A
normalisation of dysbiosis after long-term therapy was also observed in the probiotic group. This study indicated the potential immunomodulatory effects of probiotics.

Probiotics may also have potential benefits in constipation. A pilot study with a multi-strain probiotic containing *Lactobacillus* spp. and *Bifidobacterium* spp. was conducted in cats with chronic constipation refractory to traditional therapy (Rossi et al., 2018). Treated cats showed significant clinical improvement and biopsies of the colonic mucosa showed improvements in the feline chronic enteropathy activity index and mucosal histology scores, suggesting a potential anti-inflammatory effect of the probiotic.

A final application for probiotics impacting gastrointestinal clinical signs in companion animals is their potential role to help ameliorate the negative impacts that some antibiotics – given for gastrointestinal disease or other reasons – may have on the microbiome. *E. faecium* SF68 has been shown to both offer benefits to companion animals with diarrhoea in the presence of concurrent antibiotic administration (Fenimore et al., 2017) and potentially ameliorate adverse side-effects of a commonly administered antibiotic in cats (Torres-Henderson et al., 2017).

**Applications of probiotics beyond the gastrointestinal tract**

There is also evidence that some probiotics may induce immune-modulating effects with potential benefits reaching beyond the gastrointestinal tract, including helpful roles in the management of atopy and infectious diseases with systemic involvement in companion animals including feline herpesvirus-1 (FHV-1). In one placebo-controlled study of cats with chronic FHV-1, cats were administered either the probiotic *E. faecium* SF68 or a palatability enhancer as a placebo. When mild stress was induced, cats supplemented with the probiotic had significantly fewer episodes of conjunctivitis compared to the placebo group, suggesting the probiotic lessen morbidity associated with chronic FHV-1 infection (Lappin et al., 2009). The test group also demonstrated a more stable faecal microbiome. In chronic kidney disease (CKD), increased concentrations of uraemic toxins may contribute to intestinal dysbiosis. The probiotic *VSL#3* has demonstrated benefits in, for example, increasing glomerular filtration rate and degree of proteinuria in dogs with CKD, although there was no improvement in the degree of azotaemia (Lippi et al., 2017). In azotaemic cats with CKD, serum urea nitrogen and creatinine concentrations decreased after administration of a probiotic for 60 days (Palmquist, 2006). However, concurrent treatments varied and the relationship to quality of life and survival time was unclear. The potential application of probiotics to aid treatment in chronic kidney disease is a particularly interesting area that warrants more research before any clear recommendations can be made.

Probiotics have also been looked at when considering anxiety in dogs. In one placebo-controlled, crossover study conducted with anxious Labrador Retrievers, administration of the probiotic *Bifidobacterium longum* BL999 appeared to reduce anxious behaviours including barking, jumping, spinning and pacing and reactivity to strangers (McGowan, 2016). Physiological changes including lower cortisol responses to stresses were also noted.

**The effectiveness of supplementation in veterinary patients is likely to depend on the combination of appropriate cases with specific probiotic strains**

**How can veterinarians increase the likelihood that a particular probiotic may have benefits in individual patients?**

Whilst the above discussion has focused on studies where probiotics appear to have been found to have beneficial effects, in the context of gastrointestinal health or extraintestinal diseases, it is important to highlight that not all studies have found this (Jensen and Bjørnvad, 2019). There are a number of challenges associated with interpretation of the efficacy of a particular probiotic, both in the research setting and in clinical practice. Variability in the species, strains and dose rates of probiotics can lead to differing results, especially since each probiotic strain will have specific properties which may make it useful for a particular phenotype. When considering use in gastrointestinal disturbances, diarrhoea – whether acute or chronic – can have multiple causes so it can be difficult to apply a single product to a whole range of different diseases. The initial variability in test animals’ microbiomes may also impact on study findings. As with the use of probiotics in humans with gastrointestinal diseases, the effectiveness of supplementation in veterinary patients is likely to depend on the combination of appropriate cases with specific probiotic strains (Hart et al., 2012), and it would be potentially useful to identify clinical criteria that would predict perceived therapeutic success, or failure, prior to initiation of supplementation. Unfortunately, there is still a relative lack of research in this area. Within a clinical context, probiotics are often used as part of a multimodal approach where it is difficult for clinicians to determine their individual impact on any improvement in the animal.

**Are all probiotics created equal?**

Unfortunately, there is great variability in the quality and potential efficacy of different probiotic products available within the veterinary profession, and the focus for the authorisation of most probiotics is based only on provision of nutritional support for animals in good health. Clinicians
Probiotics may offer many potential therapeutic applications and is an exciting and rapidly developing area of research; however, many questions remain unanswered.

should critically assess the evidence for the particular strain and preparation of probiotic being marketed, since some probiotics have strong evidence for efficacy, whilst for others, the evidence is scant. Only a small number of veterinary-authorised probiotic products have shown efficacy in controlled studies and this should be a key factor in selection (Lappin, 2018). Probiotics should be purchased from a reputable company with excellent quality control and that supports research of their product efficacy. One study of commercially available products demonstrated that many probiotic labels were inaccurate: only 4 out of 15 products that had specific claims of viable organisms met or exceeded their label claim, and only two of these also had an acceptable label which accurately described the contents (Weese and Martin, 2011). Thus, deficiencies in veterinary probiotic quality remain. Where possible, a probiotic product should be selected that has been tested and shown success in the same species in providing the right nutritional support for the condition it is being used in. It is not enough to know the species of bacteria in the probiotic product: the specific bacterial strain is very important, as not enough to know the species of bacteria in the probiotic product. The optimum dose of probiotics has also not been identified. More, larger scale and preferably multicentre controlled studies are needed (Jensen and Bjørnvad, 2019). It is important to remember that the types and amounts of microbes in products differ greatly, the quality of products varies and veterinarians cannot extrapolate from one product to another – just as they cannot extrapolate the impacts different antibiotics may have. Not all probiotics are created equally and there should be critical appraisal of the evidence for efficacy before products are selected.

Unanswered questions
Nutritional support in the form of supplements such as probiotics show great potential and may have roles in both acute and chronic diarrhoea, ameliorating the adverse side-effects encountered with some antibiotics, decreasing anxiety and modulating the immune system. Probiotics may offer many potential therapeutic applications and is an exciting and rapidly developing area of research; however, many questions remain unanswered. It is not yet known if multi-strain probiotics are more effective than single-strain probiotics, since different bacteria may have counteractive effects, and we still do not know which particular probiotic may be of most benefit for pets presenting with different disease conditions. The optimum dose of probiotics has also not been identified. More, larger scale and preferably multicentre controlled studies are needed (Jensen and Bjørnvad, 2019). It is important to remember that the types and amounts of microbes in products differ greatly, the quality of products varies and veterinarians cannot extrapolate from one product to another – just as they cannot extrapolate the impacts different antibiotics may have. Not all probiotics are created equally and there should be critical appraisal of the evidence for efficacy before products are selected.

References


Plasma lactate is currently recognised as a valuable triage parameter, prognostic indicator and therapeutic target in both human and veterinary emergency patients (Rosenstein et al., 2018). From a physiological point of view, lactate is a normal by-product of glycolysis and in healthy conditions approximately 10 percent of pyruvate is converted into lactate by a specific cytosolic enzyme called lactate dehydrogenase (LDH) (Pang and Boyesen, 2007).

Glycolysis is the cytosolic process that converts a glucose molecule into two molecules of pyruvate, two molecules of ATP and two molecules of reduced nicotinamide adenine dinucleotide (NADH). This process is not oxygen dependent; however, the further transformation of pyruvate into acetyl-CoA and ATP requires oxygen availability. In hypoxaemic conditions pyruvate tends to accumulate into the cytosol and triggers the up-regulation of LDH so that the pyruvate in excess can be transformed into lactate. The lactate molecule, therefore, acts as a form of energy storage that can be easily reconverted into pyruvate when the oxygen supply is restored (Kamel et al., 2020). While virtually all body tissues are capable of synthesising and metabolising lactate, the major lactate producers at rest are skeletal muscle, brain, adipose tissue and red blood cells. The physiological amount of lactate produced under normal conditions is usually taken up by the liver (60 to 70 percent), the renal cortex (20 to 30 percent) and the myocardium (10 percent) (Rosenstein et al., 2018). These processes are, however, saturable and when the production of lactate exceeds the physiological levels, elevated plasma lactate concentration ensues.

Hyperlactataemia is defined as a serum, plasma or blood lactate above the species-specific reference range – more than 2.5mmol/l in dogs (Hughes et al., 1999; McMichael et al., 2005) and more than 2mmol/l in cats (O’Neill, 2000; Rand et al., 2002). Hyperlactataemia has been classified into two broad categories: type A which is due to an insufficient oxygen supply and type B which occurs despite adequate oxygen delivery. Type B hyperlactataemia is further sub-classified into B1 (associated with underlying disease), B2 (associated with drugs and toxins) and B3 (resulting from congenital metabolic abnormalities) (Table 1; Rosenstein et al., 2018).

**Case 1: absolute type A hyperlactataemia – hypovolaemic shock**

A six-year-old female neutered Labrador Retriever presented collapsed, tachycardic (heart rate 168 bpm) and with pale mucous membranes. Mean arterial blood pressure on arrival was 32mmHg. A point-of-care ultrasound of her abdomen showed 4/4 free abdominal fluid and a large splenic mass. Diagnostic abdominoceintesis was consistent with a diagnosis of acute haemoabdomen. The initial venous blood gas analysis showed a plasma lactate value of 8.4mmol/l. The patient was successfully volume resuscitated with boluses of colloidal fluids and blood. A repeated venous blood gas analysis showed a lactate concentration of 1.6mmol/l. This patient represents a typical example of hypovolaemic shock.

**TABLE (1)** Classification of hyperlactataemia and relative most common causes (Adapted from Rosenstein et al., 2018)

<table>
<thead>
<tr>
<th>TYPE A</th>
<th>TYPE B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Neoplasia</td>
</tr>
<tr>
<td>Seizures</td>
<td>Hyperthyroidism</td>
</tr>
<tr>
<td>Shivering</td>
<td>SIRS/Gpseis</td>
</tr>
<tr>
<td>Tremors</td>
<td>Occult shock</td>
</tr>
<tr>
<td>Struggling</td>
<td>Pneumocromyotoma</td>
</tr>
<tr>
<td>Struggling</td>
<td>Liver failure</td>
</tr>
<tr>
<td>Struggling</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Struggling</td>
<td>Thiamine deficiency</td>
</tr>
<tr>
<td>Exercise</td>
<td>Glucocorticoids</td>
</tr>
<tr>
<td>Seizures</td>
<td>Epinephrine</td>
</tr>
<tr>
<td>Shivering</td>
<td>Paracetamol</td>
</tr>
<tr>
<td>Tremors</td>
<td>β-agonists</td>
</tr>
<tr>
<td>Struggling</td>
<td>Ethylene glycol</td>
</tr>
<tr>
<td>Struggling</td>
<td>Xylitol</td>
</tr>
<tr>
<td>Struggling</td>
<td>Cocaine</td>
</tr>
<tr>
<td>Struggling</td>
<td>Etc</td>
</tr>
</tbody>
</table>

**TABLE (1)** Classification of hyperlactataemia and relative most common causes (Adapted from Rosenstein et al., 2018)
of haemodynamic parameters. This phenomenon is referred to as "cryptic shock"; it is typical of distributive (i.e. septic) shock and is usually associated with both microcirculatory and mitochondrial dysfunction (Ryoo and Kim, 2018).

**Case 2: relative type A hyperlactataemia – seizing patient**

A three-year-old female neutered Staffordshire Bull Terrier was presented after an episode of generalised seizure activity lasting about two minutes which occurred about 15 minutes before presentation. On clinical exam the patient was cardiovascularly stable but still showing post-ictal symptoms with severe ataxia and dull mentation. A venous blood gas analysis showed a plasma lactate of 4.6mmol/l. Progressive improvement of the neurological status was noted and a repeated blood sample at 60 minutes after arrival showed a plasma lactate value of 2.1 mmol/l.

Seizure activity as well as severe shivering and trembling can cause a sudden spike in tissue oxygen demand which might temporarily not be met by the normal tissue oxygen delivery. Anaerobic metabolism will ensue with consequent enhanced lactate production.

This is a transitory hyperlactataemia which usually self-resolves within 20 to 60 minutes following muscle activity cessation (Vincent et al., 2016). Persistent hyperlactataemia after this physiological lactate half-life should raise concerns of concurrent pathologies responsible for ongoing lactate production.

**Case 3: type B2 hyperlactataemia – salbutamol toxicity**

A one-year-old female neutered Tibetan Terrier presented after chewing through a salbutamol inhaler. On presentation, the patient was severely tachycardic (heart rate 200 bpm) but cardiovascularly stable. Venous blood gas analysis showed moderate hypokalaemia (2.3mmol/l, RI 3.4 to 4.9) and severe hyperlactatemia (8.7mmol/l, RI less than 2.5mmol/l).

The dog was treated symptomatically with administration of a beta-blocker (atenolol 0.9mg/kg PO q12) and potassium supplementation (0.3mEq/kg/h). Full recovery was achieved within 24 hours from admission. A repeated venous blood gas obtained before discharge showed resolution of hyperlactataemia (1.67mmol/l) and hypokalaemia (4.2mmol/l).

Salbutamol is a selective β2-receptor agonist and it is widely used as a bronchodilator in both human and veterinary medicine. β-receptor stimulation induces enhanced cytosolic glycolysis mediated by Na+/K⁺-ATPase (Levy et al., 2008). The subsequent significant increase in pyruvate results in an enhanced lactate production. No specific treatment is needed to treat hyperlactataemia in these cases. Once the β stimulation ceases, the lactate in excess gets reconverted into pyruvate and redirected into the mitochondria to follow the normal aerobic production of ATP.

**Discussion**

Hyperlactataemia is a common occurrence in the emergency veterinary patient. This was originally considered a pathognomonic marker of systemic hypoxia and anaerobic metabolism; however, it is now proven to have multiple aetiologies, each requiring a tailored approach (Rosenstein et al., 2018).

As shown with the three cases described above, hyperlactataemia is a fairly non-specific finding that should be evaluated together with concurrent physical and laboratory findings, and treatment specifically focused at normalisation of lactataemia isn’t always required. Instead, identifying and addressing the underlying cause is recommended.

Lactate should be considered as an important energy storage molecule and often a protective mechanism that the body activates to preserve cellular energy production and mitigate acidosis from ATP hydrolysis (Rosenstein et al., 2018).

Nevertheless, several studies in both dogs and cats showed that non-survivors tend to have a higher plasma lactate value at admission (Hayes et al., 2010, 2011) and more importantly that persistent hyperlactataemia despite treatment is associated with an increased mortality (Stevenson et al., 2007; Zacher et al., 2010; Cortellini et al., 2014).

With the development of point-of-care lactate analysers which are relatively inexpensive and readily available, lactate measurements are becoming very widespread in veterinary practice and sampling techniques and handling should be carefully considered in order to obtain consistent and reliable values. It is essential to process blood samples rapidly, as red blood cells are major lactate producers and it has been demonstrated that lactate concentrations increase by 20 percent each hour of storage at room temperature (O’Neill, 2000). Alternatively, samples can be stored on ice or if needed to be sent to an external laboratory they can be stored in tubes containing sodium fluoride which inhibits intracellular glycolytic enzymes (O’Neill, 2000).

Sampling sites are also relevant when interpreting plasma lactate values as peripheral venous samples will tend to reflect regional perfusion and arterial samples are the best reflection of the systemic lactate concentration (Hughes et al., 1999). Struggling and prolonged vein occlusion should also be avoided as they can both falsely raise the plasma lactate value (Rand et al., 2002).

**In summary**

Hyperlactataemia is a common finding in the emergency veterinary patient and should always prompt further investigations to determine the underlying cause and implement appropriate treatment. It is important to realise that a high plasma lactate value is not harmful in itself and should be interpreted as a protective mechanism for the body to preserve cellular energy production. Nevertheless, persistent hyperlactataemia has been associated with higher mortality, so repeated plasma lactate measurements and relative trends are valuable prognostic indicators. Sampling techniques should also be carefully considered when interpreting these results.

A full reference list can be found online.
“Could you please look at the dog in cage 43?” came the text message. And so I popped along to the kennel suite to give a quick ophthalmic examination of the Chihuahua in the relevant enclosure. In for BOAS surgery, it had the classic pigmentary keratitis we often see in pugs but here it was in a Chihuahua cross. Interesting! You could see that through the cage door but I opened it, stroked the dog and chatted to him for a moment before getting out my ophthalmoscope and taking a closer look. No entropion to see, nor distichia or ectopic cilia that might account for the pigment on the cornea. “Probably just corneal exposure that accounts for the pathology” I scrawled on the case notes with a quick drawing of the lesion. Thank goodness we still work off hard-copy records to allow a quick picture of a corneal ulcer or a cataract! I found the resident who had asked me to look at the dog and reported my findings. “You’ve looked at him already? On your own? Did you muzzle him? Did he bite you?” My answers were yes, yes and no, no, in that order. Did I see the sign saying “CARE!” on the kennel door? No, it must have fallen off – the dog seemed fine to me. It turned out that he has tried to bite everyone else who had examined him. But somehow not being at all concerned and approaching the dog with a stroke and talking quietly seemed to do the trick!

Do dogs react differently to people who are fearful of them compared with people with no such anxiety? Normally at this point I’d zip onto Google Scholar, find a few relevant papers and then tell you about them as if I were well up on the literature. But I really can’t find much when searching this time. For sure we know that dogs can differentiate between different behaviours in their handlers. Buttelmann and Tomasello (2012) showed that dogs chose containers over which their owners appeared happy compared with ones that elicited an appearance of disgust. But they couldn’t distinguish between happy and neutral emotions, so maybe this was just avoidance of disgust. Merola et al. (2014) investigated dogs’ understanding of people expressing happy and sad emotions and noted that dogs could differentiate these in their owner but not in a stranger. But how do dogs behave towards fearful or unconcerned individuals? We just don’t seem to have any clear evidence on this – a student project on the way maybe!

I must admit that this has gone off on somewhat of a tangent compared with where I was heading. What I was aiming for was President Franklin D. Roosevelt’s famous quote: “The only thing we have to fear is fear itself!”. Without fear of that dog, I went to the animal and examined him without a second thought. Maybe you can see where I am going. COVID-19 is certainly a virus worthy of our concern, but my real worry is that often, our fear of the virus seems more paralysing than the disease itself.

Today, I had to console an owner over the permanent sudden loss of her dog’s vision. I told her that in any normal time I would have given her a hug… but she seemed inconsolable and merely telling her I was giving her a virtual hug was ineffective. Hugging is something I regularly did and now hardly do at all. But maybe sometimes, just occasionally, can humanity overlook epidemiological concerns of potential viral transmission? I hope so!

“Often, our fear of the virus seems more paralysing than the disease itself”

References:
Blood gas analysis for metabolic disorders in practice

Blood gas analysis can help guide appropriate therapies, especially with patients with complex co-morbidities or those not responding as you might expect.

The minute blood gas analysis gets mentioned, many vets glaze over and feel that it is a theoretical entity that isn’t of value to their patients and won’t change what they do as veterinary surgeons. I am the first to admit that blood gas analysis is not relevant to all patients, but for those that have complex co-morbidities or simply are not responding as you might initially expect, it can guide appropriate therapies. The principles of blood gas evaluation can be applied to all species. However, to practically use blood gases, a basic and more complex understanding of physiology behind the numbers is required. The aims of this article are to recap prior knowledge of blood gas analysis and then move on to more complex concepts you can apply to clinical cases.

Lactate
No discussion regarding blood gas evaluation would be complete without discussing lactate concentrations and for the purposes of this article will be confined to measurement in the blood. Lactate is produced by anaerobic metabolic processes and its subsequent quantitative assessment provides the opportunity to gain an insight into the presence and severity of tissue hypoperfusion (or hypoxia) in the majority of our clinical patients. Point-of-care laboratory tests have allowed more rapid assessment of patient lactate status and increased its clinical usefulness. They work best on plasma, but you can get an idea of trends using whole blood. Normal lactate concentrations in plasma of normal animals should be less than 1.5 to 2.0mmol/l. Although absolute values correlate with the severity of the disease process, survival in many diseases is better correlated to reduction in lactate concentrations in response to therapy. Hyperlactataemia can be split into two types: A and B. A is the most common, but in patients that do not respond to standard therapies (fluid, oxygen or blood administration depending on the underlying cause), understanding causes of type B hyperlactataemia is required (Brunori, 2020).

Practical points regarding blood gas analysis
Venous blood gas analysis is performed to evaluate acid-base status and jugular venous oxygen analysis can be of value to assess tissue oxygen uptake. Compared with arterial samples, pH will be slightly lower and PCO₂ slightly higher. When collecting samples, try to avoid excessive preparation of the sampling site. Samples should be collected into heparin only – citrate or EDTA will alter pH and make measurements of K and Ca unreliable. Samples should be analysed as quickly as possible.

Basic physiology behind blood gas evaluation
The basic knowledge many of us have of acid-base disturbances are centred around the relationship of pH to partial pressures of CO₂ and bicarbonate. These factors are related by the Henderson-Hasselbalch equation:

$$\text{pH} = \text{pK} + \log[\text{HCO}_3^-] \times 0.03[\text{PaCO}_2]$$

This can be simplified as: \(\text{pH} \approx \text{HCO}_3^- / \text{PaCO}_2\)

Normal ranges do vary between species. In a very basic sense for mammals, we can use the rule of fours: normal pH=7.4, PCO₂=40mmHg and HCO₃⁻=24mmol/l. This rule does not work well for cats, but works adequately for other species (Table 1).

The initial basic evaluation of a blood gas is to determine whether the patient is acidocaemic or alkalaecmic and whether the primary derangement is respiratory, metabolic or mixed. Initially the primary disorder is identified as being either respiratory or metabolic depending upon the changes seen in PCO₂ and HCO₃⁻. The next step is to consider

<table>
<thead>
<tr>
<th></th>
<th>DOG</th>
<th>CAT</th>
<th>HORSE</th>
<th>COW</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.4</td>
<td>7.41</td>
<td>7.39</td>
<td>7.40</td>
</tr>
<tr>
<td>PCO₂</td>
<td>40mmHg</td>
<td>37</td>
<td>31</td>
<td>42</td>
</tr>
<tr>
<td>HCO₃⁻</td>
<td>24mmol/l</td>
<td>22</td>
<td>18</td>
<td>29</td>
</tr>
</tbody>
</table>

**Table 1** | Normal ranges of pH, PCO₂, and HCO₃⁻ vary between animals, but in a very basic sense for mammals we can use the rule of fours
Anion gap (AG)

The number of measured cations in the body is usually greater than the number of measured anions (this includes proteins, phosphates and sulphates) hence the normal AG is positive (8 to 25 for dogs and 10 to 27 for cats).

\[ \text{AG} = (\text{Na}^+ + \text{K}^+) - (\text{Cl}^- + \text{HCO}_3^-) \]

As acid accumulates in the body, buffering by \( \text{HCO}_3^- \) occurs. If the acid is HCl, then there is a mEq for mEq exchange of Cl\(^-\) for \( \text{HCO}_3^- \), and the AG remains unchanged. This will also occur if there is a net loss of \( \text{HCO}_3^- \) (e.g., diarrhoea). If the reason for the acidosis is due to an unmeasured anion (e.g., ketoacidosis), the gap increases as the \( \text{HCO}_3^- \) falls. Although previously relied upon as a diagnostic aid, its usefulness has been questioned.

### The Stewart approach

Unlike Henderson-Hasselbalch (H-H), this approach considers three independent variables as contributors to changes in pH: \( \text{PCO}_2 \), the difference between strong cations and strong anions (strong ion difference [SID]) and total weak acids (albumin, globulins and inorganic phosphate [ATOT]) (Stewart, 1983).

\[ \text{SID} = [\text{Na}^+] + [\text{K}^+] - [\text{Cl}^-] - [\text{lactate}] \]

This theoretical approach allows detection of the individual contributors to the metabolic component (within reason), which can help to narrow down the primary cause of the acid-base disturbance (Hopper and Haskins, 2008). This approach acknowledges that electrolytes and plasma proteins play a significant role in acid-base disturbances and that bicarbonate does not, but instead changes in response to other primary causes. Unlike BE or AG, it can be used to analyse acid-base problems even in the presence of electrolyte abnormalities or hypoalbuminaemia.

Due to the cumbersome nature of calculations and assumptions, the development of a modified Fencl-Stewart approach, designed to be easily applied clinically for evaluating the metabolic contribution to acid-base, provides more detailed information of the various contributors.

### The Fencl-Stewart approach

This approach combines BE and the Stewart approach by separating BE into components to assess metabolic changes to the acid-base disorder. These components form five equations, which allow the magnitude and contribution of each parameter to be calculated. These equations are based on:

**TABLE (2)** Evaluation of basic blood gas analysis

<table>
<thead>
<tr>
<th>PRIMARY DISORDER</th>
<th>PH</th>
<th>PRIMARY CHANGE</th>
<th>COMPENSATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory alkalosis</td>
<td>rises</td>
<td>( \text{PaCO}_2 ) falls</td>
<td>( \text{HCO}_3^- ) falls</td>
</tr>
<tr>
<td>Respiratory acidosis</td>
<td>falls</td>
<td>( \text{PaCO}_2 ) rises</td>
<td>( \text{HCO}_3^- ) rises</td>
</tr>
<tr>
<td>Metabolic alkalosis</td>
<td>rises</td>
<td>( \text{HCO}_3^- ) rises</td>
<td>( \text{PaCO}_2 ) rises</td>
</tr>
<tr>
<td>Metabolic acidosis</td>
<td>falls</td>
<td>( \text{HCO}_3^- ) falls</td>
<td>( \text{PaCO}_2 ) falls</td>
</tr>
</tbody>
</table>

**TABLE (3)** Ways to quantify degree and extent of compensation

<table>
<thead>
<tr>
<th>DISTURBANCE</th>
<th>CLINICAL GUIDE TO COMPENSATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolic acidosis</td>
<td>For each 1mEq/l fall in ( \text{HCO}_3^- ), ( \text{PCO}_2 ) falls by 0.7mmHg</td>
</tr>
<tr>
<td>Metabolic alkalosis</td>
<td>For each 1mEq/l rise in ( \text{HCO}_3^- ), ( \text{PCO}_2 ) rises by 0.7mmHg</td>
</tr>
<tr>
<td>Respiratory acidosis</td>
<td>For each 1mEq/l rise in ( \text{PCO}_2 ), ( \text{HCO}_3^- ) rises by 0.15mEq/l</td>
</tr>
<tr>
<td>Chronic</td>
<td>For each 1mEq/l rise in ( \text{PCO}_2 ), ( \text{HCO}_3^- ) rises by 0.35mEq/l</td>
</tr>
<tr>
<td>Respiratory alkalosis</td>
<td>For each 1mEq/l fall in ( \text{PCO}_2 ), ( \text{HCO}_3^- ) falls by 0.25mEq/l</td>
</tr>
<tr>
<td>Chronic</td>
<td>For each 1mEq/l fall in ( \text{PCO}_2 ), ( \text{HCO}_3^- ) falls by 0.55mEq/l</td>
</tr>
</tbody>
</table>

Whether there is any compensation that is a result of the primary event (Table 2). For respiratory disorders, this can provide us with information regarding chronicity of disease as it requires changes in \( \text{HCO}_3^- \) concentration. Calculations are available in order to quantify expected compensation (Table 3). The main limitation of this approach is that if you have a metabolic derangement, it does not help you to categorise the underlying cause.

**Base excess (BE)**

This is the difference between the normal concentration of buffer bases (Hb, proteins, phosphate, etc) and the measured concentration. It should more accurately identify the metabolic component of any disturbance, but can also identify a compensatory metabolic abnormality in chronic respiratory disorders. Please also note that the terminology is confusing as it is possible to have a negative base excess.

The initial basic evaluation of a blood gas is to determine whether the patient is acidaemic or alkalaemic and whether the primary derangement is respiratory, metabolic or mixed.
(1) a free water effect (indirectly derived from sodium concentration); (2) chloride effect; (3) albumin effect; (4) lactate effect; and (5) phosphate effect. These equations are easily applied clinically for evaluating the metabolic contribution to acid-base balance, separating the net metabolic abnormalities into components thus allowing easier detection of mixed metabolic acid-base abnormalities. The basic rules are that for each effect, the larger the number is from one, the more impact that effect is having on the metabolic derangements in that animal. If the number is negative, the change is having an acidifying effect and if it is positive, it is having an alkalinising effect. When you start to evaluate animals with metabolic derangements using this approach, it becomes evident that many have marked acidifying and alkalinising components, such that the pH in some circumstances is less severe than the changes that are evident and indeed the degree of clinical signs evident in the patient.

**Free water effect**

Free water effect = 0.22 (cats)-0.25 (other species) x ([Na⁺] – normal [Na⁺])

An excess of free water (positive value) causes Na⁺ concentration to decrease (hyponatraemia) which is acidifying. A deficit (negative value) of free water has the opposite effect; it increases Na⁺ concentration (hypernatraemia) and is alkalinising.

**Chloride effect**

Chloride = normal [Cl⁻] – corrected [Cl⁻]  
Corrected [Cl⁻] = [Cl⁻] x ([Na⁺ ‘normal’] / [Na⁺])

Chloride is the most prevalent anion in the extracellular fluid (ECF). Increased chloride leads to a metabolic acidosis by decreasing SID, whereas decreased Cl⁻ causes an alkalosis due to increased SID. Chloride itself is overlooked in the H-H approach, despite playing a pivotal role in acid-base status and is acknowledged here.

**Albumin effect**

Albumin effect = 0.37 (normal [alb g/l] – patient [alb g/l])

**Lactate effect**

Lactate effect = –1 x [lactate]

A common abnormality in critically ill patients is lactic acidosis. Lactic acidosis results when the anaerobic production of lactate exceeds its utilisation by the liver and kidneys and is usually due to systemic hypoperfusion and tissue hypoxia, but can rarely also be caused by septic shock, rhabdomyolysis and renal failure. Lactate is a large contributor to the acid-base status, yet only the Fencl-Stewart approach takes lactate concentration into consideration as an individual parameter when evaluating acid-base status.

**Phosphate effect**

Phosphate effect (mmol/l) = 1.8 (normal [phos mmol/l] – measured [phos mmol/l])

Phosphorus is the most abundant intracellular anion and has a large array of functions within the body including acting as a buffer, an enzyme cofactor and aiding in the production of adenosine triphosphate (ATP). Inorganic phosphate, much like albumin, is a non-volatile weak acid in which changes in its plasma concentrations can produce significant acid-base disturbances. Hypophosphataemia causes acidosis in the critically ill. If you are unable to measure phosphate, then this can simply become an unmeasured anion.

When you start to evaluate animals with metabolic derangements using this approach, it becomes evident that many have marked acidifying and alkalinising components, such that the pH in some circumstances is less severe than the changes that are evident and indeed the degree of clinical signs evident in the patient.

**Hypophosphataemia causes acidosis in the critically ill**
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Unmeasured anion effect (UAE)

UAE = standardised base excess – sum of effects

Sum of effects = free water effect + chloride effect + phosphate effect + albumin effect + lactate effect

The unmeasured anion effect is calculated by subtracting the sum of the phosphate, free water, chloride, lactate and albumin effects from the standardised base excess. This equation represents unidentified acids or alkalis contributing to the acid-base status. These are usually unidentified acids and include ketoacids, propylene glycol, sulphuric acid, D-lactate, salicylic acid, metaldehyde, ethylene glycol and ethanol. Compared to the anion gap, this equation is of greater use as it takes more of the key factors into consideration when calculating and evaluating metabolic acid-base derangements (Hopper and Haskins, 2008).

Practical application

A 13-year-old Cob gelding is presented following a history of moderate to severe colic signs of 18 hours’ duration. The horse has distended loops of small intestine consistent with a strangulation lesion. The horse’s heart rate is 108 bpm; Table 4 shows the venous blood test results prior to stabilisation before surgery.

Traditional interpretation

This blood gas doesn’t fit with such a sick animal, nor does the alkalaemia (these patients would normally be markedly acidaemic). The alkalaemia is due to a hypochloraemic metabolic alkalosis (BE 4.6). The difference in bicarbonate from normal is 14mmol/l, so for compensation would expect the PCO₂ to be 46.8mmHg and is in fact 47.5mmHg so in the range for a compensatory respiratory acidosis.

In addition, this horse has a low partial pressure of venous oxygen (23.6mmHg; normal range 30 to 40), which is suggestive of a marked increase in tissue oxygen demand/poor tissue oxygenation (assumming that the horse is not hypoxic). This high extraction ratio is suggestive of severe hypovolaemic shock, and so the horse is likely to have refractory hypotension under anaesthesia and will likely benefit from inotropes and vasopressors during and potentially after surgery.

Fencl-Stewart interpretation

This animal has a mixed metabolic component: the metabolic alkalosis is due to marked hypoalbuminaemia (this animal is likely to need plasma) and hypochloraemia and the metabolic acidosis is due to the hyperlactataemia (see calculated numbers in Table 5).

Conclusions

In this short article, I hope that I have reminded you of what you knew about blood gases and also given you a different and practical approach to allow you to better evaluate and treat your critically ill patients with metabolic derangements. If you don’t currently have a blood gas machine, an initial place to start is to begin measuring lactate; the patient-side machines are affordable as is each individual sample. The best way to appreciate the value of blood gases is to start running them on patients and practising interpretation with no time pressure.

References and further reading

Maximising anaesthesia efficiency is an essential component to achieving a successful outcome in rabbits

In practice it is almost guaranteed that at some point a rabbit patient will present, with 900,000 rabbits being estimated as pets in the UK by the PDSA (2019). Whilst the ideal consult would be for routine treatments such as vaccinations, ecto-/endoparasite treatment and health check-ups, the sad reality is, as with all patients within our care, at some point they may require emergency treatment in some capacity.

One of the most common hospital admissions is for gut stasis treatment. It is always important to note that gut stasis is effectively a side effect of a causative condition, rather than being a diagnosis in itself. Whilst it is true that stress (such as changes to environment) and fear can result in ileus, these are often seen to resolve relatively quickly and, in comparison, most gut stasis is caused by some other underlying disease. Four of the more common conditions seen in practice by the author are ear disease, dental disease, liver lobe torsions and gastrointestinal obstruction. Depending on severity, all four will likely require anaesthesia at some point and the status of the patient by this stage can be critical, especially within the latter two conditions.

Assessment and diagnosis of these are varied, with radiography, CT and blood work being used routinely within practice. However, a key indication of the status of a patient with obstruction is the use of blood glucose. A comparatively unobtrusive technique, the utilisation of blood glucose levels gives an instant indication of the patient’s status. Regardless of the cause, fluid therapy should be provided, ideally through a mixture of intravenous and subcutaneous provision. Rabbit maintenance rates are 100ml/kg/24 hours (Grint, 2006) which should be used as a baseline. The assessment of dehydration status is key, and uses an estimated 10ml/kg fluid replacement per 1 percent dehydration. This 10ml/kg is also relevant to 1 percent increase in PCV if bloods have been taken, with a rabbit’s normal PCV range between 0.36 and 0.48 (Flecknell, 1996).

Subcutaneous fluid provision can be provided dorsally between the shoulder blades or in the lateral thorax areas, with a maximum of 30 to 60ml split into a minimum of two sites. Intravenous fluid provision will be limited on the size and stability of the cannula and placement is best achieved within the lateral ear vein, the cephalic vein or the saphenous vein.

Categorising the patient within the American Society of Anaesthesiologists (ASA) classification is important within such critical scenarios and likely the patient will usually be classified as at least a 3. The emergency drugs should be calculated prior to anaesthesia and if the patient is deemed at high risk then the first dosage drugs should be drawn up ready for use (Flecknell and Meredith, 2006):

- Adrenaline: 0.01mg/kg low dose and 0.1mg/kg high dose
- Atropine: 0.02mg/kg
- Glycopyrrolate: 0.02mg/kg

Once the decision has been made to anaesthetise the patient, things will need to progress quickly. The ideal would be to stabilise the patient as much as possible prior to anaesthesia; however, this may be limited if the reason for surgery is time sensitive. Regardless of the cause, fluid therapy should be provided, ideally through a mixture of intravenous and subcutaneous provision. Rabbit maintenance rates are 100ml/kg/24 hours (Grint, 2006) which should be used as a baseline. The assessment of dehydration status is key, and uses an estimated 10ml/kg fluid replacement per 1 percent dehydration. This 10ml/kg is also relevant to 1 percent increase in PCV if bloods have been taken, with a rabbit’s normal PCV range between 0.36 and 0.48 (Flecknell, 1996).

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- Glycopyrrolate: 0.02mg/kg

Around 60 percent of rabbits have a serum enzyme called atropinesterase which breaks down atropine, effectively preventing it from working (Flecknell, 2000). As such, glycopyrrolate is a suitable alternative. Atropine has a short-term but instantaneous effect, whilst glycopyrrolate has a delayed onset of action, but a longer lasting effect.

Once intravenous access has been obtained, then suitable analgesia can also be provided; most often this is buprenorphine at 0.03 to 0.05mg/kg (Harcourt-Brown, 2011). Meloxicam should only be used post-operatively and ideally only once the patient’s renal and liver values have been shown to be normal within blood work, as the risk of hypovolaemia in rabbits is high intraoperatively (Girling, 2013). Analgesia will assist in stabilising the patient prior to full anaesthesia.
as well as reducing the minimum alveolar concentration (MAC) of the anaesthetic gas used during the anaesthesia, in turn reducing the anaesthetic risk. The two most common gaseous agents used in practice will likely be isoflurane or sevoflurane. Each has their own advantages and disadvantages; however, the latter is preferred for chamber induction as it is less irritant and the author has found sevoflurane to produce a more stable anaesthetic when the patient is intubated. Anaesthetic induction will ideally be performed via intravenous drugs for greater control, with the author’s practice most commonly utilising alfaxalone at 3 to 4mg/kg via slow provision to prevent apnoea (Grint et al., 2008). Propofol is a common alternative in practice to alfaxalone and, whilst risks of apnoea are higher with its use, can be provided at 5 to 10mg/kg for induction (Girling, 2013). Pre-oxygenation prior to induction is always preferred, ideally two to five minutes, due to many pet rabbits having underlying respiratory conditions and as such this provision of oxygen will delay desaturation during intubation (Girling, 2013).

Once induction has been achieved then the patient should be intubated (Figure 1). Many first opinion practices utilise masks for maintenance of anaesthesia; however, these cannot allow provision of IPPV if required unless the mask is very tightly fitting. In turn, apnoea is very common within rabbits and having the ability to bypass the olfactory components of the respiratory mucosa greatly minimises apnoea and associated complications. As such, the use of endotracheal tubes or v-gel are preferred. In the authors practice, intubation is achieved via endoscopy; however, in first opinion this may not always be possible. Though more technically challenging than in dogs or cats, intubation can be achieved via the eye or laryngoscope. A comparatively recent development of the v-gel laryngeal mask can be used as an alternative for ease. The v-gel sits on the glottis and the lumen, and lies over the larynx to provide inhalation anaesthesia. Though fairly easy to place, they in turn can be easy to “slip” from position during movement in surgery and so placement must always be monitored with capnography.

Intraoperative monitoring of heart rate is best achieved via an oesophageal stethoscope and an expected heart rate under anaesthesia will be around 200 beats per minute or over (Girling, 2013). The use of an oesophageal stethoscope also allows much more clarity to assess heartbeat rhythm, especially within the potentially noisy and limited space of the operating theatre, and as such any issues can be picked up quicker. Respiration rate of 40 to 50 breaths per minute can be expected when conscious so a reduction of this by more than 50 percent under anaesthesia can indicate cause for concern (Harcourt-Brown, 2011). The use of a multiparameter machine provides a much greater range of monitoring. The aim for oxygen saturation is 100 percent whilst anything under 93 percent will indicate significant hypoxaemia requiring IPPV to treat. Capnography allows monitoring of CO₂ levels, with acceptable levels being in the range of 35 to 45mmHg (Girling, 2013). Anything above this shows hypercapnia alongside some form of apnoea and, if untreated, cell damage and further reduction in oxygenation will occur. Sudden decreases can indicate a range of issues from machine malfunction to airway obstruction or even a prior warning of cardiac arrest. If IPPV is required, the use of a ventilator allows suitable levels of IPPV to be manually controlled whilst monitoring the patient’s vitals more effectively if available. Alternatively, manual provision can be used; however, this is much harder to achieve effectively longer term whilst monitoring the patient at suitable levels for its risk status (Longley, 2009).

One of the most common risks during anaesthesia in rabbits is hypothermia, and constant monitoring is required to ensure a normal temperature of 37 to 39.5°C is maintained (Harcourt-Brown, 2011). During anaesthesia you are effectively fighting a battle with the effects of the drugs used and techniques required for surgery, namely: peripheral vaso-dilation, the depression of the hypothalamus “thermostat” in the brain and the clipping of hair over the surgical site (Girling, 2013). Maintaining a consistent body temperature is integral for suitable metabolism of drugs as MAC values are reduced if temperature drops too low.

Unfortunately, rabbits are eight times more likely than dogs and six times more likely than cats to have a mortality event under anaesthesia (Brodbelt, 2009). These statistics highlight that maximising anaesthesia efficiency is an essential component of a successful outcome. Post-anæsthesia, rabbits require monitoring, especially in critical cases, as 1 in 72 cases will die within 48 hours of anaesthesia. Post-operative care is just as integral to all of your hard work during a critical anaesthesia, so close patient monitoring should not be ceased once the anaesthetic has ceased. [1]
A look through the latest literature

Exposure of companion animals to toxins in the home environment
Alexandra Swirski and others, University of Guelph, Ontario, Canada

The natural curiosity of cats and dogs can make them highly susceptible to being exposed to potentially hazardous substances. There is a wide range of toxic materials in the typical family home such as biocides, human and animal medicines, and cleaning and household products, as well as food items that are unsuitable for other species. The authors analysed the cause of concern in 241,261 incidents reported to the US Animal Poison Control Center over a 10-year period. Chocolate and Lilium plants (lilies) were the most commonly reported toxins in dogs and cats, respectively. The human cancer medication fluorouracil and the insecticide bifenthrin produced the highest case fatality ratios for the two species. They suggest that these findings will help inform future education programmes for both pet owners and veterinary staff.

Quality of life in companion animals following mechanical ventilation
Rebekah Donaldson and Dominic Barfield, Royal Veterinary College, Hertfordshire

Human patients that are mechanically ventilated are expected to experience a prolonged recovery with significant impact on their quality of life (QoL). Mechanical ventilation is also used widely in veterinary hospitals but there is little information on the long-term effects. The authors describe the owner’s perceptions of the effects of ventilation on QoL in 27 patients. There were no reported adverse effects in this group of patients other than in those ventilated for the treatment of neurological conditions.

Pain management in cats and dogs treated as emergencies at a university clinic
Frédérik Rousseau-Blass and others, University of Montréal, Canada

Numerous surveys have indicated that pain is under-recognised and undertreated in companion animals. The authors assessed the prevalence and management of pain in dogs at a veterinary teaching hospital. The patients were subject to two evaluations using both validated and unvalidated pain scales. Those patients considered to be in pain at the second evaluation were given analgesia in the clinic, others received either no medication or an analgesic to be given at home. The use of analgesics was considered suboptimal, suggesting that further training is needed in pain assessment and analgesic use.

Use of Foley catheter balloons to stabilise traumatic skull fractures in two foals
Alison Gardner and others, Ohio State University, Columbus

Skull fractures resulting from kicks or blunt trauma are common injuries in horses, particularly foals. While many injuries heal well without intervention, fixation may be necessary in some to maintain normal function. The authors describe two cases in which Foley catheter balloons were used to support sinus fracture repair and maintain stability of the surgical reconstruction during convalescence. In both patients there was an acceptable cosmetic outcome and they went on to achieve a high level of athletic performance.

Spontaneous pneumothorax in a companion Kunekune pig
Joe Smith and others, Iowa State University, Ames

Pneumothorax is an emergency presentation in several domestic animal species but has not been recorded previously in the Kunekune, a small exotic pig breed originating in New Zealand. The authors describe a case in a three-month-old male companion pig which had a 24-hour history of respiratory distress. Conventional radiography, ultrasonography and CT imaging led to a diagnosis of pneumothorax, secondary to a ruptured pulmonary bullae. The patient made a full recovery following medical management and thoracostomy tube suction.

Veterinary Parasitology, 282, 109143
Cattle vets and COVID-19

Despite being able to work in the fresh air with space and applied hygiene, there are still dangers and analysing risk is now the norm.

Talking to cattle veterinary surgeons about the past few months, the repeated phrase is that they consider themselves lucky compared to other sections of the profession. The observations and comments are personal to particular situations and do not include financial impacts on a business, that will need to be assessed later. With the introduction of lockdown and the new order of working it is emphasised by all that there was an initial period of change and adaptation but that the new routines that were developed have not only enabled animal welfare and farm management to continue, but in many cases the enforced changes have shown improvements that will be ongoing.

One of the early areas of difficulty and concern was maintaining a two-metre distance with TB testing (Figure 1). A few key phrases from the Veterinary Record in April indicate some of the angst in interpreting the directives: “the risk of infection is as much from our clients to our vets as it is from our vets to our clients”; “it is not acceptable for, often young, OVs to be pressurised into testing cattle that require manual restraint”; “all of us would put human health and safety above any animal disease control, notifiable or not” (Biggs, 2020).

Vets, having put the question to farmers about how they can manage protected testing, found that many clients responded very positively and found practical ways of overcoming disease transfer risks, particularly with handling calves. A general observation is that farmers were unfurled and simply expected the vet to get on with the job, and that this resilience is admirable and may be a reflection of farmers having experienced foot and mouth and bovine spongiform encephalopathy. Farmers are said to be “quite good at isolation” and lockdown left them somewhat bemused and commenting “welcome to our world”.

It is also a general finding that, credibly, vets and practice staff all simply adapted to the work requested at the time. Non-essential work initially included training and herd health. Veterinary consultancy appears to have been a major casualty with cancellations of overseas trips and gatherings of vets, farmers and industry. The situation was described as “glum”. Having had diaries “wiped out” with lockdown, there has been considerable development and adaptation, but although technology has helped, it will take time for disease control programme modules to catch up. Getting initiatives operating effectively is described as “such hard work” but now that the social distancing requirement is likely to operate for many months, if not years, the effort is expected to lead to more targeted and effective means of delivery. Reduced travelling has meant that more allocation has been available for “thinking time” and significant changes can be anticipated in content as well as means of delivery. Time available to take stock is seen as a positive outcome.

It is clear that cattle practices have taken action to protect vulnerable members of staff. In some cases this
has meant furloughing, but for all practices working from home is a reality. Not allowing vets to come into the prac-
tice premises at the end of the day is highlighted as one of the
downsides. Considerable efforts are moving ahead to reinstate the social interaction between practice members
without putting individuals at risk. Also emphasised is
the need to not put the practice at risk. Self-isolation for
two weeks is manageable for the practice when it only
affects one individual, but if several vets and support staff
are involved, the impact on
day-to-day administration
is considered too great. The
use of Zoom within a prac-
tice is a reality that is being
enhanced and developed.
Not everyone finds online
conversations particularly
satisfying but, for now, that
is the way to prevent work-
ing in complete isolation.

Farmer clients are advised
not to enter the veterinary
premises. Medicines are
dispensed in various ways, with a collection point and de-
ivery by the vet common options. Visits by reps and others
have not taken place and video conferencing sessions have
allowed planned discussions, which individual vets have
found beneficial, with targeted outcomes. During March,
practices saw an increased uptake of medicines by farm-
ers, a reflection of the uncertainty of supply, but this soon
settled down. The spring saw difficulties with milk buyers
encouraging reduced supply, due to the reduced catering
uptake of liquid and cream. Dairy farmers are often experi-
encing milk buyer-led difficulties, over supply and price, but
they are genuine threats to management. Stability appears
to have returned for many producers, until the next alarm.

It is inaccurate to generalise, but there appears to be
a forward-looking idea that “there are no plans to lay off
cattle vets because of COVID”. It is somewhat heartening
to learn that Synergy Farm Health has recently introduced
two new graduate interns. It may be that the class of 2020
will consider cattle medicine a viable option for their skills.
All agree that ways of working have changed, are undergo-
ning continual development and cattle practices are prepar-
ing for the long term. It is recognised that there is some
weariness within the working teams as the busy winter
period approaches and that COVID has changed the work/
home balance.

Remote vetting is described as a transformation. Initially,
vets and clients were “forced to Zoom” but more focused
meetings have now arisen. More virtual meetings about
prevention and online modules are seen as increasingly
convenient for delegates, although less so for the trainers.
On a one-to-one basis there has been effective talking
with colleagues and with clients. One practice indicates
specifically that discussion groups with beef and sheep
farmers have worked, with online interaction and exchanges
between the delegates and with the vet presenting being
effective. A survey of 387 English and Irish farmers in
May (Boehringer FarmComm 2020) indicated that some
70 percent of farmers would take part in social media and
online meetings. That figure is likely to be greater now. The
company has stated an intention to support vets who want
to be proactive in engaging
with their farmers whatever
the COVID restrictions.
Farm assurance and herd
health became restricted
between vets and clients
initially but this has now been overcome. When initially intro-
duced, the programmes were
not enthusiastically embraced
by some farmers and were
seen as outside interference.
The COVID restrictions appear
to have been used by a minor-
ity as an excuse not to fully engage. Practices recognise that
non-engaging clients are a challenge. However, in response
to the specific question of whether individual vets feel that
animal welfare has been compromised and an upsurge in
disease can be anticipated, the view is that enough has been
done to prevent undue problems in the coming months.

One of the areas that directly challenges dairy herd
viability is foot health. Initially, the view was that lame cows
can wait a week or two but that no number of lame cows
can justify the loss of one human being. It seems that foot
trimmers have been able to carry on working in a socially
distanced manner with minimal human contact. Fortunately,
the length of the cow has allowed social distancing for vet-
ery treatment. Mobility scoring will be able to be contin-
ued. There are indications that the thinking time benefit will
directly enhance the delivery of healthy feet programmes in
the future.

One of the points about luck is the recognition that
cattle vets are able to work in the fresh air with space
and applied hygiene. There are dangers and analysing
risk is now the norm with formal assessments carried out
for each clinical and advisory situation. The veterinary
practice risk assessor is now an indispensable member of
the team.

Grateful thanks for their personal observations from
Owen Atkinson, Andrew Biggs, Nick Bell, Paddy Gordon, Jon
Reader and Matt Yarnall.

References
Biggs, A. (2020) Government advice needed on TB testing during
COVID-19 outbreak. Veterinary Record, 186, 456
Emergency fluid therapy in adult cattle

The metabolic abnormalities commonly seen in mature cattle are quite different from those of calves and other species so must be discussed separately.

Fluid therapy is very much used when treating calves with diarrhoea. The cost and the time it takes to properly restrain a cow, administer the volume needed and monitor the animal make us often reluctant to correct fluid imbalances properly in adult cattle. It is necessary to discuss fluid therapy of mature cattle separately from fluid therapy of calves because the metabolic abnormalities commonly seen in mature cattle are quite different from those of calves and other species (Roussel, 2009). The underlying cause needs to be identified and corrected, but fluid therapy is often a key factor in the recovery process. The type of fluid, the volume and the route the fluids are to be given will help to correct circulatory collapse, electrolyte imbalances and base deficits.

Certain emergency conditions of adult cattle cause different degrees of fluid and electrolyte deficits and changes in the animal’s acid-base status. Often, it is not practical to perform laboratory analysis when working as a field vet. It would mean taking a blood sample, driving back to the surgery to analyse it and then back to farm to administer the right fluids. What we do know is that in adult cattle, conditions such as grain overload and choke (oesophageal obstruction) cause an acidic state. We also know that gastrointestinal catastrophes such as abomasal volvulus and caecal or abomasal torsion result in a metabolic alkalosis (Roussel, 2009). Circulatory collapse is often a result of endotoxaemia caused by peracute Gram-negative bacterial infections, such as Escherichia coli mastitis, severe endometritis and septic peritonitis (Sargison and Scott, 1996). In these above-mentioned scenarios, correction of dehydration will often restore renal function sufficiently that electrolyte and acid-base imbalances will then self-correct.

When addressing hydration status, body weight and rumen fill can be misleading, as can skin tent time and eyeball recession – for example, animals in poor body condition will have skin that tents and retracted eyeballs, regardless of their hydration status (Pedersen, 2013). Clinical signs vary between the various degrees of dehydration in the adult ruminant (Table 1).

When deciding on route of administration it is also important to consider the cardiovascular status of the animal. In conditions such as acute toxic mastitis, abdominal catastrophes or severe endometritis, the gastrointestinal motility will also be substantially reduced. This makes oral fluid therapy less effective (Green, 1998; Hallowell et al., 2012). For this reason, IV fluids are often indicated once moderate to severe signs of hypovolaemia are seen.

**Intravenous therapy**

Dehydrated adult cattle need huge volumes of isotonic fluids. This is time consuming and costly. Instead, hypertonic fluids offer a more practical option in the field situation. You can safely administer 4ml/kg to 5ml/kg over five minutes, equivalent to approximately 2 to 3 litres in a 650kg cow. Use of a 10G catheter and wide-bore giving set allows faster administration (Pedersen, 2013).
For cows in metabolic acidosis due to, for example, grain overload, alkalinising solutions are used. If we use 8.3% NaHCO₃ solution, 3 litres are required. If we use 5% NaHCO₃ solution 4.5 litres are required. If we use isotonic NaHCO₃ solution, 18 litres are required to correct the acidosis (Roussel, 2009).

Most gastrointestinal diseases of adult cattle and many other causes of dehydration (with the exception of those mentioned above) are associated with metabolic alkalosis, hypokalaemia and hypochloridaemia. The degree of these changes may be mild (as in early left displaced abomasum) or severe (as in abomasus volvulus). If the gastrointestinal tract is patent and functional, oral rehydration is the method of choice. If obstruction, ileus or circulatory shock is present, intravenous fluids should be administered. Hypertonic saline (7.2% NaCl) solution may be used to correct dehydration and electrolyte abnormalities with smaller volumes of IV fluid. A 650kg animal requires 2.5 litres of hypertonic saline (Roussel, 2009).

Dextrose can be used in anorectic cows or those in ketosis. 500ml of 50% dextrose can be added to 5 litres of isotonic solution (Roussel, 2009). Calcium should be added in freshly calved dairy cows.

For the use of hypertonic saline fluids to be effective, it relies on the uptake of water from the rumen to restore circulatory volume. Cattle should be provided with a supply of fresh water immediately after treatment. Most cattle will drink 20 to 40 litres within 10 minutes. The animals that are not drinking should be rumen pumped (Pedersen, 2013).

**For the use of hypertonic saline fluids to be effective, it relies on the uptake of water from the rumen to restore circulatory volume**

**Oral therapy**

The electrolyte solutions for intraruminal use should be isotonic or hypotonic to avoid suppression of dry matter intake. This means that we cannot use the same rehydration solutions for calves in adult cattle. These calf “lectades” are mostly hypertonic and alkalinising. This would increase the level of dehydration and alkalosis, consequently depressing the food intake. In most situations, an electrolyte solution containing sodium chloride, potassium chloride and calcium and magnesium salts is suitable.

The “stomach” pump has made the administration of oral fluids so much easier and quicker in adult cattle. Nowadays, a farm vet will feel lost without this piece of equipment. It takes only a matter of time to pump a cow with 20 to 40 litres of the appropriate electrolyte solution.

Oral fluids alone are not indicated in the recumbent dehydrated patient. Remember, if the rumen is distended with fluid, do not administer oral fluids. There is already an excess of fluid in the rumen in the face of dehydration. Adding more will only increase abdominal distention. The excess fluid should be removed if possible, the rumen alkalinised and intravenous fluid therapy initiated.

Oral fluids can prove beneficial in a variety of scenarios. In addition to cases of obvious fluid loss, such as diarrhoea and abdominal surgery, oral fluid therapy has also proved to be useful in cases of toxic mastitis, acute ruminal acidosis and immediately after calving (Pedersen, 2013). Administering oral fluids to dairy cows at risk of developing a left displaced abomasum is believed to reduce this condition. The rumen will be “weighed down” by the administered fluids, making it more difficult for the abomasum to pass under it. In the case of the fresh-calved cow a solution in which calcium rather than sodium is the major cation is preferable in order to reduce the risk of hypocalcaemia, and cases of ruminal acidosis require an additional alkalinising agent (Pedersen, 2013). Many commercial preparations are available to be mixed into water. They provide oral sources of energy and calcium, which can be useful in treatment of conditions such as ketosis and recurrent hypocalcaemia (Silk, 2014).

**Blood transfusions**

Another type of emergency fluid therapy is whole blood transfusion. It can be relatively simple to perform and clinically rewarding in carefully selected cases. Infection with *Babesia divergens* (red water), or following severe blood loss as a result of abomasal ulceration or severe trauma, may provide a suitable opportunity. No more than 25 percent of total blood volume should be collected from a healthy donor at one time. In practice, 10 to 15 percent of an adult’s blood volume (5 to 6 litres) is usually sufficient for most indications (Soldan, 1999).

**References and further reading**


Despite the advantages that remote CPD can bring, the benefits of in-person events are also important to consider.

Jonathan Pycock is a past president of the British Equine Veterinary Association.

Like many of us, I found it odd not to be at the annual BEVA Congress in September. Having spoken at each one for the last 31 years, it certainly was a variation from normal! Of course, what is normal has been redefined this year and whether or not an equine veterinary congress goes ahead or not pales into absolute insignificance when compared with the issues we have all had to face this year. Nevertheless when events such as these do not occur, there are consequences collectively and individually for both the organisation and equine vets.

The presidency system at BEVA involves a three-year process of moving through the presidential "tree". This year, Dave Rendle was appointed as junior vice president of BEVA meaning Dave will become BEVA president in 2022/23. Huw Griffiths will be president in 2021/22 and Lucy Grieve took over as president from Tim Mair in a virtual presidential handover in mid-September.

BEVA and the UK equine profession were fortunate to have Tim as president, along with an extremely competent, efficient and well-established team at BEVA HQ, during 2020. Tim calmly and effectively steered the organisation through its most turbulent time since inception back in 1961. I have no doubt that Lucy will continue with this work through her presidential year as we hopefully make progress in returning to how things used to be.

As BEVA president you have the opportunity to help shape the programme of the congress at the end of your term. For me it was congress 2018 and I picked the theme of "plenty to smile about". Back then, as now, veterinary professionals faced many challenges, some of which can have a negative impact on our health and well-being, but I wanted to focus on the positives at congress.

My aim was to celebrate our incredible careers as equine veterinary professionals and to help colleagues learn how to achieve the right work–life balance. As part of the build-up to congress we set out to obtain 100 personal video clips in the 100 days leading up to the event, giving personal insights into why it's great to be an equine vet. Some responses were funny, some innovative and some poignant, but all of them giving us tremendous cause for optimism. Conveying positive and encouraging messages to young colleagues in this way is supporting the very future of our profession.

My favourite aspect of these videos was the collegiality, friendship and laughter that the contributors provided. I have enjoyed looking back at many of them over the past few turbulent months!

Let's remember that virtual meetings aren't necessarily a negative thing; in fact, they hold many advantages. Virtual pub quizzes and weekly get togethers with family and relatives provide welcome interaction on a social level. Similarly, in a professional capacity we have learned to use virtual meetings as a way of keeping up to date professionally, especially with accessing CPD. Recently I was involved in a virtual CPD event with delegates from over 20 different countries attending. One colleague from Western Australia who runs a busy practice single-handedly said he would never have been able to get to the lectures as originally planned and had found the online sessions a fabulous resource.

Enthusiasts for virtual meetings point out that face-to-face meetings are expensive and take up valuable time that could be spent on more important things. Many conclude that such meetings are inefficient and frankly unnecessary these days. I disagree, believing that such proponents may be underestimating the benefits that actual gatherings such as BEVA Congress have. As a speaker for more years that I can remember, being able to see and interact with your audience is the best way of getting your point across. You can pick up body language much easier than when trying to look at a video screen where participants may not even be visible. And a remote hand being stuck up will never replace the in-depth questions you may be asked during a lecture where your audience is in the same room.

In the end it may be the less obvious or certainly less tangible benefits that a congress can bring that will be most missed. How many positions have been filled after meeting at BEVA Congress? How many ideas have been formed about new working practices or approaches to clinical cases as a result of group discussions over a coffee or a glass of wine?

So whilst we have to be guided by persons far wiser than me, let's hope we can all get back to being able to meet up safely and support and encourage each other to get the most out of being an equine vet. I look forward to seeing you all live and in-person at Birmingham in September 2021.
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Approaching acute haemorrhage

The degree of blood loss will dictate if the patient needs a specific therapy and if this should take priority before surgery

Imagine this scenario: You are called to attend an eight-year-old TB gelding who has suffered a deep laceration to the plantar and lateral aspect of his right hind pastern in the field. The owner is concerned about the amount of blood loss and the fact the wound is continuing to bleed. Clinical examination reveals a quiet but alert and responsive horse with tachycardia (heart rate 80 bpm), tachypnoea (44 bpm), hypothermia (35.8°C), pale mucous membranes and a capillary refill time of two seconds. On examination of the wound, you are concerned about digital flexor tendon sheath (DFTS), distal and proximal interphalangeal joint involvement and notice there is an arterial bleed from the lateral digital artery.

This horse needs to have the clinical implications of the wound with respect to the DFTS and joint involvement investigated, and potential synovial surgical flushing and debridement needs to be performed. However, decisions also need to be made on the degree of blood loss and if the patient needs any specific therapy for this, and if this should take priority before surgery. This article will focus on the treatment and management of the acute blood loss; it is beyond the scope of this article to comment in depth on the management of the deep laceration, tendon sheath or joint issues.

With acute haemorrhage it is important to monitor for clinical signs of hypovolaemia, laboratory evidence of tissue hypoperfusion and laboratory evidence of acute blood loss.

Hypovolaemia

Hypovolaemic shock occurs when there is a decreased circulating blood volume, as a result of external or internal loss, or plasma volume third spacing. Decreased venous return to the heart ensues, in turn reducing stroke volume and decreasing cardiac output, if heart rate alterations fail to compensate. The body’s response to hypovolaemic shock includes increase in heart rate, peripheral vasconstriction and fluid movement into the plasma to increase intravascular pressure and maintain perfusion of vital organs. If hypovolaemia is severe or prolonged, tissue hypoperfusion occurs with a shift from aerobic to anaerobic metabolism, production of lactate and progressive cellular damage. Overproduction of lactic acid inhibits normal cell function and leads to metabolic acidosis. If shock continues, irreversible tissue damage starts to occur.

In adult horses, the clinical signs of hypovolaemia reflecting these pathophysiological compensatory mechanisms include hypotension (low blood pressure), tachycardia (increased heart rate), weak peripheral pulse, tachypnoea (increased breathing rate), reduced urine output (oliguria) and hypothermia (reduced body temperature).

The horse in this clinical scenario has tachycardia, tachypnoea and hypothermia; thus, along with the known history of acute haemorrhage, hypovolaemic shock should be presumed. It is critical to pay attention to clinical examination findings in these cases which can direct you to diagnosing hypovolaemic shock. It is important to bear in mind that in neonatal foals, the clinical signs of hypovolaemia can be much less apparent.

Laboratory evidence of tissue hypoperfusion and acute blood loss

It is important to gauge for the degree of blood loss and the effect of the hypovolaemia on the body’s function. Some rapid, cheap and easy to perform tests can help to establish the current state and be useful for ongoing monitoring response to therapy (Table 1).

Laboratory tests performed on the horse in this scenario were as follows:

- PCV: 32 percent – within reference range
- TP: 33 g/l – hypoproteinaemia
- Blood lactate: 6.9 mmol/l – hyperlactataemia

Hyperlactataemia indicates hypoperfusion and anaerobic metabolism are occurring. Blood lactate concentration is a useful and sensitive indicator of acute blood loss in horses (Magdesian et al., 2006; Hurcombe et al., 2007). This information combined with the clinical signs indicates the need for urgent treatment of hypovolaemic shock.

The PCV appears to be within the normal range, whilst the TP is decreased. This is not surprising, since the effect of the blood loss will only be reflected in the PCV once the lost volume has been replaced by interstitial fluid. TP tends to decrease first before changes in PCV are seen clinically. Therefore, the PCV measurement in itself is of little value in

<table>
<thead>
<tr>
<th>TEST</th>
<th>REFERENCE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKED CELL VOLUME (PCV)</td>
<td>Between 30 and 43 percent</td>
</tr>
<tr>
<td>SERUM TOTAL PROTEIN (TP)</td>
<td>Between 53 and 73g/l</td>
</tr>
<tr>
<td>BLOOD LACTATE</td>
<td>Less than 2mmol/l</td>
</tr>
</tbody>
</table>

Table (1) A venous blood sample should be collected to perform tests useful to establish the current state of the animal and monitor response to therapy.
initial assessment of acute haemorrhage, but it is an important tool for monitoring changes.

**Initial management**

Horse blood volume is 6 to 10 percent of body weight, depending on breed (Marcilese et al., 1964). Horses can tolerate up to 15 percent blood loss without the need for transfusion, and up to 20 to 30 percent blood loss may be tolerated by some individuals before a transfusion is needed. So, for a 500kg horse, blood volume is 30 to 50 litres, so a loss of 4.5 to 7.5 litres and up to 15 litres in some individuals may be tolerated. Blood transfusion decision making depends not only on the volume of blood lost but also the speed of blood loss, as animals adapt to chronic anaemia with low PCV and cope better than in sudden volume loss. As a general rule, a blood transfusion should be considered in any horse with a PCV less than 18 percent and is crucial if the PCV drops to 12 percent.

The case here presents with acute haemorrhage, so blood transfusion may indeed be indicated if the oxygen carrying capacity of the blood is decreased, compromising oxygen tissue delivery. However, in all cases of acute haemorrhage, hypovolaemia should be corrected first, as this is the immediately life-threatening event that needs addressing as a priority. Several studies have indicated that immediate surgical treatment of synovial penetration is not necessary for a positive outcome, and furthermore, anaesthetic induction for treatment of synovial sepsis outside of normal working hours has been associated with death (Smith et al., 2006; Walmsley et al., 2011; Milner et al., 2014, Crosby et al., 2019). Thus, it would be prudent to delay surgery until the patient is haemodynamically stable. In the interim, the wound should be cleaned of organic debris as far as possible and a pressure bandage applied to stem the bleeding. If bleeding cannot be controlled, the arterial bleed should be located and ligated. If a horse is suffering from uncontrolled haemorrhage (usually an internal bleed), then aggressive fluid therapy to correct hypovolaemia should be avoided, since a rapid increase in blood pressure can destabilise clot formation.

**Hypovolaemia treatment**

There are a variety of different fluid types that can be used to treat hypovolaemia, but the essence of treatment is rapid replacement of intravascular fluid volume. Thus, a wide gauge intravenous catheter (or two) should be placed and preferably wide-bore tubing used if possible to facilitate rapid fluid administration.

The easy to use principle of “shock dose” of fluids should be applied. An adult horse shock dose, applied over 60 to 90 minutes, corresponds to 60 to 80ml/kg of crystalloid fluids (30 to 40 litres for a 500kg horse), 10 to 15ml/kg pentastarch (5 to 7.5 litres for a 500kg horse), 10ml/kg hetastarch (5 litres for a 500kg horse) or 2 to 4 ml/kg of 7% hypertonic saline (1 to 2 litres for a 500kg horse). Initially, a bolus of 0.25 to 0.5 of the total shock dose is given, followed by reassessment of the clinical signs of hypovolaemia, and further 0.25 doses of the shock dose given up to the full dose if necessary. Fluids that will draw extracellular fluid into the intravascular space are preferable to isotonic crystalloid fluids for rapid volume replacement in adult horses for the simple reason that a smaller volume can practically be delivered in a short period of time. Hypertonic saline will draw intravascular fluid rapidly into the vasculature and replace blood volume, but the effect will be short-lived (30 minutes) and thus replacement of fluid with large volumes of crystalloid fluids must follow hypertonic saline administration (within 2.5 hours). Colloids (synthetic or plasma) will draw extravascular fluid into the vascular space by means of oncotic pressure, and since the large molecules will be slower to leave the vascular space than saline, exert their effect for a more prolonged period of time. In any case, it is important to remember to continue to treat dehydration after hypovolaemia has been corrected. This will normally require intravenous crystalloid therapy over the following 12 to 24 hours.

The case here was treated with a hydroxyethyl starch synthetic colloid preparation (pentastarch), at a dose of 5ml/kg (2.5 litres for a 500kg horse) bolused in (by squeezing the bags attached to the drip line) over 20 minutes. The horse was then reassessed for signs of hypovolaemia. Heart rate was 60 bpm, respiratory rate 28 bpm and temperature 36.5°C. Thus, there was a marked improvement in the clinical signs of hypovolaemia, and a further 2.5ml/kg (1.25 litres for a 500kg horse) of pentastarch was given over a further 10 minutes. This further improved the clinical signs of hypovolaemia (heart rate 44 bpm, respiratory rate 16 bpm, temperature 37.0°C). At four hours post initiation of treatment, laboratory tests were repeated:

- PCV: 26 percent
- TP: 40g/l
- Blood lactate: 2.1mmol/l

Intravenous crystalloid fluids were continued for a further 12 hours at a rate of 4ml/kg/hour. Measurements repeated at 12 hours revealed:

- PCV: 24 percent – low
- TP: 47g/l – hypoproteinaemia
- Blood lactate: 1.5 mmol/l – within reference range

The horse was considered a more stable candidate for general anaesthesia and surgery at this stage, and a blood transfusion was not deemed necessary in this case, based on the clinical and laboratory findings. It is important to be able to recognise the clinical signs of hypovolaemia that accompany acute haemorrhage and understand how to address this rapidly in order to preserve organ function. Not every case of acute haemorrhage needs a blood transfusion, but it is important to monitor for changes in clinical and laboratory parameters that might indicate tissue oxygen demand is not being met.

A full reference list can be found online.
A clinical coach is a member of the veterinary clinical team and is usually a veterinary surgeon or veterinary nurse. They are responsible for overseeing the training of the student veterinary nurse(s) and being their mentor. Whilst other members of the team will be involved in helping teach the student new skills and experiences, it falls to the clinical coach to provide guidance, support and structure to the daily learning. In addition, the coach is responsible for the completion of the online assessment log.

Being a clinical coach is not a role to be taken on lightly. It’s a demanding role and requires you to be organised and empathetic, as well as being firm but fair. Once you have decided to complete the clinical coach training (which is normally performed via your local veterinary nurse training course provider), you need to prepare for taking on a student. Reflecting on your own veterinary nurse training is a good place to start with your planning and preparation. Although all students learn differently, you will recall key aspects of what worked well for you and what parts of your learning caused you problems. Was there a key time when you felt your confidence was at a high, and what caused a dip? All these experiences in your own training will help you to guide your new student.

**Being prepared is key**

As we are all too well aware, things can change at the drop of a hat in a busy veterinary practice: tasks overrun and the best-laid plans have to be sidelined. Whilst these things are inevitable and often unavoidable, it is important to ensure they do not interrupt or interfere with your time with the student. Ensure everybody in the practice understands what is required in training a student veterinary nurse.

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**SHELLY JEFFERIES**

Shelly Jefferies, RVN, NCertPT, has been a veterinary nurse for over 20 years, and has worked in a variety of veterinary settings. Her main nursing interests are wound management and canine rehabilitation. Having been a clinical coach for most of her qualified life, Shelly enjoys training student nurses and regularly presents CPD events on her favoured topics.

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**Why become involved in student nurse training?**

Training the next generation of nurses is a rewarding task and helps to keep things fresh in your mind - remember, somebody had to train you!

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Reflecting on your own veterinary nurse training is a good place to start with your planning and preparation

This doesn’t mean everyone has to read the syllabus, but explaining training requirements to the rest of the team will ensure they have some idea of what is involved – this is especially important if there hasn’t been a student in practice for some time. The Associated Teaching College has standards to uphold and there is a certain amount of time that the student should benefit from in terms of training and mentoring. Ensure all staff members are aware of what you are doing and why – not everyone will understand why the student nurse may be “just” standing watching a procedure! A prior explanation can prevent animosity or bad feeling at a later date.

Once you have prepared the team for what is going to happen, it’s now time to prepare yourself. Organisation is key; if you are prepared as much as possible it will help you feel more settled and confident in your role. Your student will also have more confidence in your training if you can instantly reach to the resource needed, or answer their question. Of course, there will be occasions when you will have to check your responses to your student, or you may even need to seek guidance yourself, but these incidences can be reduced if you have prepared in advance.

To complete your preparation, ensure the following are easy to access:

- College scheme of work
- Syllabus of learning
- OSCE tasks
- Assignment details
- Online assessment manual – normally provided by the course provider to give you a more in-depth guide of what is expected for each task
- RCVS Day One Skills
Plan, plan, plan
Having a plan prepared will help to structure your time spent with your student – these plans can include a teaching plan, tutorial or practical training plan. Try to involve your student in some of the planning – ask them if there are any particular areas they would like to cover or refresh in the coming sessions. Try to give them a rough subject area, so that they can prepare as well. Asking “in the coming sessions we are going to be looking at anaesthesia, are there any particular areas you would like to cover?” is more beneficial to both yourself and the student, and you can both prepare for the planned session.

How students learn
We all learn differently – some of us are visual learners, some like to write reams and reams of notes. It is important to have lots of different training aids available to your students to suit their individual needs and best learning set.

Another consideration should be any specific learning requirements your student may have, ie any sight or hearing impairments, phobias or dyslexia.

There are certain ways around these learning requirements and best practice would be to speak with the course provider along with the student. Either may have ideas or experience about how best to deal with things. An example here shows how a student with dyslexia may benefit from different methods.

- **Listening to recordings** – try recording training sessions for your student with dyslexia. They will often find it easier to absorb information from listening, rather than struggling to read words which may become jumbled. Recording tutorials, training sessions, etc is now easily done and can be shared and stored for revision.

- **Using a reading guide** – if tasks involve reading, using a thick ruler to follow under each sentence can help them get direction on the words in view, otherwise the other words on the page can become muddled.

- **Coloured paper** – some students find that having written work on yellow paper helps them focus, rather than the bright white.

- **Typing instead of writing** – often it is easier for a student with dyslexia to type on a computer or keypad rather than writing.

Variety and an element of fun during some training will help the student to process and retain the knowledge they are learning. Repeatedly writing and reading reams of paperwork becomes repetitive and robotic – try to mix up your training styles.

> It is important to have lots of different training aids available to your students to suit their individual needs and best learning set.

There are lots of resources online for use, but consider making your own. Speak with your practice manager or head vet and ask if you can spend some time making training resources prior to your student starting. It is beneficial to the team as a whole, as it means your student will be more competent – equally it will also be beneficial to you as it will refresh your knowledge on technical issues and ensure you are focused and training correctly. Once these training resources are made, they are there for ever. A lot of the background basic knowledge never changes so they can be used for students now and in the future.

Practical training
As previously discussed, while hands-on learning is the best way to learn most tasks, it is not always possible or practical to repeatedly practise tasks on patients. There is a lot of scope within the veterinary practice to make simulations, and practise the practical hands-on type tasks. This can be true for all stages of training ranging from initial training, through to OSCE practising.

It is handy to have a box of practical equipment used for SVN training, so everything goes back in one place. Often practices and clinical coaches may be worried about the financial aspect of having these items for repeated practice. The key is to collect items as you go through day-to-day life in practice and speak to drug and manufacturing companies to ask for samples for nurse training; most are happy to help.

Looking at the OSCE tasks is a good place to start so you can get an idea of the sort of equipment you need to obtain/source.

Get inventive – often there is at least one willing staff member’s dog who is happy to be used for bandaging practice in exchange for a treat or two. Also, you can find a toy stuffed dog that has a mouth that opens and long legs that can be modified and practised on.

So that’s a whistlestop guide on being a clinical coach and training veterinary nurses within practice. Remember we are all humans, some things don’t go to plan and some training doesn’t suit some students. Be flexible and approachable and the rest should follow.
Blood transfusions

It is essential to monitor patients throughout the procedure to ensure any sign of adverse transfusion reaction is caught early on.

When selecting blood products to use, it is worth noting the existence of component therapy to deliver targeted blood components, possibly through the UK-based not-for-profit charity Pet Blood Bank UK (PBB). Transfusing only the required component (e.g., fresh whole blood, packed red blood cells, fresh frozen plasma, cryoprecipitate; Pet Blood Bank, 2020) reduces the volume of the product to be administered and reduces both the anaphylactic risk and the development of any inadvertent recipient sensitisation to the unnecessary blood components that may affect the safety of future transfusions.

Compatibility testing

Prior to transfusion of any blood product, but particularly a red cell product, blood typing to determine the dog erythrocyte antigen (DEA) 1 status of the recipient should be established. This can be done quickly and easily even in an out of hours or emergency setting using an in-house kit. Establishing the recipient as DEA 1 negative or positive allows a compatible red cell product to be administered which reduces the risk of an adverse transfusion reaction during subsequent transfusions as a result of DEA 1 sensitisation. In addition, as only 30 percent of PBB blood donors are DEA 1 negative and 70 percent are DEA 1 positive, using type-matched red cells supports PBB in managing their stock levels.

A major cross-match detects existing recipient antibodies to any donated red cell antigen, including and beyond DEA 1, as even when DEA 1-typed blood is given correctly to patients there is still the potential to introduce other antigens that may be seen as foreign and that the patient may create antibodies against (Young et al., 1949). It is therefore recommended in dogs to perform a cross-match prior to transfusion if:

- The transfusion history of the dog is unknown
- Previous transfusions have caused a reaction
- A transfusion has been administered more than four days previously

A cross-match should be carried out prior to transfusion for the lifetime of the dog.

A compatible cross-match result means that an acute haemolytic transfusion reaction (AHTR) would be unlikely. As with blood typing, a cross-match can be carried out in-house using a commercial test kit in under 30 minutes.

Preparation of the patient

Blood products can be given by the intraosseous and central venous routes but are generally administered via a peripheral intravenous catheter. Due to blood being an ideal growth medium for bacteria, gloves should always be worn when handling the blood product and line or the intravenous catheter (IVC) being used. Confirm the IVC is in situ by disinfecting the port and flushing with sterile saline before disinfecting the port again and attaching the blood administration/extension set.

Patients are generally not given food during a transfusion, but water can be provided. It is best to avoid using the catheter to administer drugs and other fluids, especially fluids containing calcium such as Hartmann’s solution, during the transfusion. Where a drug is time critical, for example an analgesic, and cannot be given earlier or later, the drug can be administered if a second IVC is available.

Once started, the blood administration set should not be disconnected, or the transfusion stopped, except when a potential adverse reaction is occurring. Make sure patients have been walked out and have no owner visits scheduled during the transfusion window.

Monitoring for adverse transfusion reactions

The recipient should be placed in a kennel that permits constant visualisation and a transfusion nurse assigned. It is preferable to have the same nurse monitoring the entire transfusion for consistency and so subtle changes are more likely to be identified, and a specific transfusion monitoring form completed. Staff availability may need to be considered when planning a non-urgent transfusion on a busy shift.

Prior to starting the transfusion, obtain the baseline values. Pulse rate and quality, respiratory rate and effort, temperature, mentation, mucous membrane colour and capillary refill time are the minimum parameters to be monitored, as well as recording the passage of urine and faeces and their appearance, any episodes of vomiting and noting any changes in behaviour. In addition, SpO₂ and arterial blood pressure can be recorded. The author prefers to attach transfusion patients to a multiparameter monitor with the ECG and blood pressure cuff attached (Figure 9) and where tolerated the rectal and pulse oximetry probes placed. This allows continuous monitoring without repeatedly disturbing the patient.

There are various forms of acute adverse transfusion reactions, including immunological reactions such as
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STEP-BY-STEP BLOOD PRODUCT PREPARATION

Select the blood product and check the unit for any unusual discoloration, cloudiness or particles and check the bag for signs of external damage. If any of these are observed, do not administer the unit and inform PBB. Check that the unit is in date and has been stored correctly and the appropriate temperature range was maintained during storage. It is sensible to have a double-check process to confirm that the blood product selected and the DEA 1 status are correct prior to unit preparation.

FIGURE (1) Prior to the administration of plasma it will need to be defrosted. This can be done for non-urgent transfusions by laying the unit on a flat surface at room temperature and will take approximately three hours. Alternatively, the unit can be placed in a plastic ziplock bag to prevent contamination of the administration ports and the bag placed in a warm water bath. The water bath should contain water not exceeding 37°C; this will defrost a large unit in approximately 11 to 15 minutes if the temperature is maintained by topping up with warm water as the bath temperature reduces. Before removing the unit, make sure that all the plasma is defrosted and no frozen crystals remain by gently palpating the unit. Red cell products that have been refrigerated do not need to be warmed before administration; however, warming can be carried out if preferred using a 37°C water bath in the same way and is definitely recommended where the recipient is very young or is hypothermic. Blood products should never be placed in a microwave as this will damage the cells and proteins.

FIGURE (2) Once warmed, the red cell/plasma unit should be removed from the plastic ziplock bag and hung on a drip stand. Don non-sterile gloves and apply hand sanitiser then access one of the administration ports on the unit by tearing the protective cover using aseptic technique.

FIGURE (3) Remove a blood administration set from its outer packaging and prepare for use by closing off the drip wheel and closing any in-line clamps. All blood products must be passed through a filter before reaching the patient to remove micro clots and cellular debris.

FIGURE (4) Unsheathe the administration set insertion spike and in an aseptic manner push fully into the revealed administration port using a rotating motion ensuring it reaches the blood product. The unit is now breached and must be discarded after four hours at room temperature.

FIGURE (5) Fill the drip chamber to approximately a half to two thirds by gently squeezing the drip chamber taking care not to damage the chamber filter. Ensure the fill level is above the filter but not so full that the drip rate cannot be observed.

FIGURE (6) Open any clamps on the administration line then slowly release the drip wheel.

FIGURE (7) Prime the entire length of the administration line to the very end, leaving the cover in place.

FIGURE (8) Only remove the cover immediately before attaching to the patient’s intravenous catheter.
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Blood transfusions

Acute haemolytic transfusion reaction, febrile transfusion reaction and transfusion-related lung injury, as well as non-immunological reactions such as allergic reaction/anaphylactic shock, erythrocyte haemolysis circulatory overload and sepsis. Signs of an acute adverse transfusion reaction include increased body temperature, increase or decrease in heart rate, weak or bounding pulses, increased respiratory rate or effort, dyspnoea, cyanosis, weakness or collapse, urticaria/erythema/oedema, hyperaemic mucous membranes, reduced mentation or responsiveness, shaking/trembling/seizures, vomiting or diarrhoea, or demonstration of unusual behaviours.

There is no one transfusion monitoring schedule; the following is based on the author’s experience:

- First 20 to 30 minutes: The nurse will remain with the patient continuously during this time, recording observations every 10 minutes
- 30 minutes to 1 hour: If there are no signs of an adverse transfusion reaction, monitoring can continue every 10 to 15 minutes
- 1 to 2 hours: If progressing unexpectedly, monitor at 30-minute intervals
- 2 to 4 hours: Monitoring can be reduced to hourly

**Administration of the blood product**

When small volumes of blood product need to be delivered, or if the desired volume cannot be completed within four hours, the unit may be separated into smaller volumes and stored labelled in a sterile empty blood bag or syringes. If kept in the fridge at +2 to +6°C, each syringe must be discarded after four hours at room temperature and the syringes can be kept refrigerated for 24 hours. The blood product must be passed through a filter and the product is then delivered using a syringe driver (Figure 10).

The transfusion rate is started slowly at 0.5 to 1ml/kg/hr, as the severity of an adverse reaction is, in part, related to the volume of blood that has been administered. If no signs of an adverse transfusion reaction have been observed in the first 15 to 30 minutes, the rate can be increased to 5 to 10ml/kg/hr. Any breached unit must be discarded after four hours. Lower rates of 1 to 2ml/kg/hr should be used for patients with circulatory compromise.

The ability to control the delivery of the blood product is important for recipient safety and use of an infusion pump or syringe driver for smaller volumes allows this. The current recommendation is to check with the manufacturer if the infusion pump is compatible for delivering blood products as some studies have reported a reduced red cell survival time with this type of delivery versus gravity flow (McDevitt et al., 2011).

The blood administration set should be changed after four hours or when a new unit is to be administered. Similarly, Hemo-nate filters should be changed after every 50ml of blood product, after four hours of use or whenever a new unit is attached.

**Unit traceability**

Once the transfusion is complete, it is vital that a transfusion log is maintained recording each unit and its recipient so the recipient of a given unit can always be traced.

**References and further reading**


FIGURE (9) Patient undergoing a packed red blood cell transfusion attached to a multiparameter monitor

FIGURE (10) The blood product must be passed through a filter and the product is then delivered using a syringe driver
On the question of diversity

Just because an individual is classed as being neurodivergent or on the autistic spectrum doesn’t mean that they should be overlooked during the recruitment process.

Take a straw poll on the high street and ask passers-by if they’ve heard of the term "neurodiversity" – it’ll be a safe bet that they haven’t.

Neurodiversity is a catch-all term which refers to the hidden differences of the brain such as dyslexia and dyscalculia, dyspraxia, attention deficit disorder and the autism spectrum. Helen Mitchell, press officer at the Equality and Human Rights Commission (EHRC), is more direct in her description. She says that neurodiversity "is a relatively new term and it refers to the different ways the brain can work and interpret information, highlighting that people naturally think about things differently".

The difference is more widespread than was previously thought. Tom Neil, Acas senior adviser, reckons that "a significant minority of society, often estimated at around 1 in 7 people, could be neurodivergent. And according to a November 2018 Chartered Institute for IT article, 'The rise of neurodiversity networks - and why it's a good thing', neurodiversity affects around 15 per cent of the population with dyslexia taking up two-thirds of that number.

No matter the rate, Tom says that "employers should never assume that a team member is neurodivergent or take it upon themselves to diagnose an employee". In fact, he recommends that employers should take steps to "make their workplace more inclusive so that it better meets the needs of all staff, whether they choose to disclose a condition or not".

As it affects the workplace

How employers react to neurodivergence is very important to the acceptance of those individuals with associated conditions.

According to Emma Kearns, Head of Enterprise and Employment at the National Autistic Society, the term doesn’t just refer to people who think differently, "it also involves appreciating the benefits this can offer". She adds that while "it could include people who are autistic, or with dyslexia, dyspraxia, ADHD or a number of different neurodevelopmental conditions... some people may have more than one condition".

From a legal perspective, Helen Mitchell warns that "being neurodivergent may amount to a disability under the Equality Act 2010. This means organisations have a legal obligation to make reasonable adjustments to the workplace, which could be removing barriers or providing extra support for a disabled worker or job applicant."

On this Emma warns that "a failure to make reasonable adjustments counts as unlawful discrimination and could leave the employer open to a discrimination claim from the individual".

But while some may be prejudiced against those with any form of disability – a discriminatory act which is generally illegal – Emma thinks that "those with autism have a huge amount to offer employers and many are desperate to find a job that reflects their talent and interests".

And it appears that a growing number of employers are actively taking on people with autism, Asperger’s syndrome, ADHD and other cognitive differences. In the UK, the BBC reported in January 2019 that Universal Music UK, insurer Direct Line and even the government’s listening station GCHQ are now actively hiring the neurodiverse.

However, National Autistic Society research from 2016 – the Autism Employment Gap Report – suggests that the number of autistic adults in full-time paid work is still very low, partly due to employers’ lingering misconceptions around what autism is and the type of jobs autistic people can do. As Emma explains, “Many employers say that they don’t know how to support autistic people and are worried about getting this wrong.”

The reality is that when an employee has a neurodivergent condition, "an employer only has to make adjustments where they are aware – or should reasonably be aware – that the individual has a disability," says Helen.

And this goes to the nub of the matter because until an employer is alerted to an employer’s condition, they need do nothing.

Characteristics of the neurodivergent

But just as people with conditions vary in their needs, so, as Emma Kearns outlines, "each autistic person will have their own strengths and areas where they will need more support. However, when autistic people find the right role and are well supported, they may have [their own] strengths." These include a logical or methodical approach to problem solving, an ability to focus intensely, being task oriented and persistent, possessing good accuracy...
and attention to detail as well as good memory, reliability, integrity, a strong sense of justice, strong visual skills and strong skills and knowledge in specific areas of interest.

Another way to look at the positivity that flows from employing the neurodivergent is that they deploy what is effectively an extra set of eyes and different thought processes.

**The best roles for the neurodivergent**

What roles are best suited to the neurodivergent is a natural point to consider. The problem is that there’s a depth of misunderstanding of the subject because everyone on the spectrum is different. In other words, just as anyone not on the spectrum can perform any job, subject to the right skills of course, so can those in the neurodivergent world – just differently.

As an aside, Emma adds that there’s also a misconception that some autistic people have almost superhuman abilities, which, she says, is most frequently not the case.

**Reasonable adjustments**

As to what the most effective adjustments are, Emma notes that an awareness and understanding of autism among managers and colleagues is best, “including what it’s like to be autistic in the workplace and the adjustments and strategies that can help”. She says that creating a supportive and inclusive culture is key.

A reasonable adjustment means adapting the working environment to enable an employee to be able to perform their job comfortably, to the best of their abilities. It’s about reducing barriers to allow access and inclusion.

With a knowledge of the law, Helen details that adjustments can vary depending on the individual’s condition and various factors which influence whether a particular adjustment is considered reasonable. She says that “the test of what is reasonable is ultimately objective and so employers could consider how effective the change will be in avoiding the disadvantage the disabled worker would otherwise experience, its practicality and cost, the organisation’s resources and size, and the availability of any financial support”.

Moving to the practical, Emma advises that “adjustments don’t necessarily need to be expensive and can vary from making physical changes to the workplace to introducing equipment/assistive technology or adapting work processes”.

Noting the same, Tom Neil also points to minor adjustments when he says that “often small, simple changes to working arrangements or responsibilities will be all that is required to enable an employee to perform at their best”. He gives the example of allocating staff a workspace away from noisy areas, speech-to-text software or the provision of dual screens to increase the visible working space.

On top of this Emma says that the National Autistic Society endorses assistive technologies like the Brain in Hand app that “can be programmed with helpful processes, reminders, timetables, anxiety tracking and management strategies, which can assist the user if they need help”. She says that this form of technology links the person with their manager and support network and provides an overview of how the person is progressing – “it can be really effective”.

Other things Emma also recommends management consider include reducing the level of lighting if it’s too bright or noise cancelling headphones if the sounds of the workplace are distracting – “small things like this can make all the difference for better work performance”.

But changes to work processes could benefit the neurodivergent including changing how colleagues communicate with autistic colleagues. Here Emma offers common sense advice: “Go for clarity, for instance by providing agendas ahead of meetings or by following up face-to-face meetings with an email outlining the agreed actions points and giving a clear timeframe for these to be completed.” As with many adjustments, these changes can help other employees too.

**In conclusion**

As we gain a greater understanding of human nature, we gain an insight into the various traits and skills that exist in people. Just because an individual is classed as being neurodivergent or on the autistic spectrum doesn’t mean in people. Just because an individual is classed as being neurodivergent or on the autistic spectrum doesn’t mean that they should be overlooked during the recruitment process. With a multitude of skills and abilities that non-neurodivergent people don’t possess, employers that cannot see the value in hiring the neurodivergent really are missing out.
I have given a personal guarantee to my landlord; what do I need to know?

A personal guarantee is a very onerous obligation and should not be entered into lightly or without first taking independent legal advice.

When a newly incorporated company takes on a new working space, an entire building or even part of a building, the landlord will usually ask for various forms of security. Most commonly this is a rent deposit and a personal guarantee.

A personal guarantee is a very onerous obligation and should not be entered into lightly or without first taking independent legal advice. By signing a personal guarantee, the director of a limited company agrees that where the company defaults – for example on payment of rent – the landlord can recover those monies from the director(s) personally.

The recovery is not limited to cash sums but includes all personal assets owned by that director including but not limited to home, vehicle(s) and jewellery. In essence anything of value becomes collateral. If the debt of the company exceeds any assets held by the director then there is a risk to the director of being forced into personal bankruptcy. This landlord security method actually defeats the whole concept of limited liability status which a company would ordinarily enjoy.

Moreover, a guarantor and director may not always be the same person. If a guarantor is not involved in the day-to-day running of the company and the lease is altered (where lease does not require guarantor consent to changes) they may without knowing become personally liable for new terms. There is no requirement for the guarantor to be informed of any changes by the landlord.

Where there is more than one guarantor to a lease, it should be noted that there will often be a joint and several liability clause; this means in the event of a default the landlord can call on all or one of the guarantors to satisfy any debt that becomes owing. This would mean the guarantors would have to take proceedings against each other where one of them suffers a loss. This is preferred by landlords as it is more cost effective and expedient to pursue one individual rather than several simultaneously.

It may be worth proposing a more substantial rent deposit to avoid the need for a guarantee although this is not always possible for cash flow reasons. If you have no alternative but to provide a personal guarantee, make sure you (1) negotiate the guarantee to exclude certain assets like a family home; (2) request that the guarantee be limited (cap on amount you would become liable for); and (3) request that the guarantee be time limited (first three years of the lease).

Personal guarantees will only come to an end upon a surrender or expiry of the lease, where the lease has been assigned more than once, or where the landlord expressly releases the guarantor from their obligations pursuant to a deed of release.
Personalising your service

By using data collected from clients, you can better educate them and answer their pets’ needs on an individual basis

Once you have mastered the systems for your annual marketing plan and social media, there are many smaller things you can do to tighten up your marketing processes and further help bond your clients to your practice. These are the little personalised touchpoints that set you apart from your competitors and leave your clients impressed with your professionalism and quality of service.

The marketing departments of the large corporate veterinary groups are using these processes all the time, reaching out to customers with personalised messages that speak directly to their individual needs.

The good news is that you can mimic their strategies by understanding how to properly use your own practice management software (PMS). A detailed knowledge of how to use your PMS combined with collecting accurate customer data means that you will be able to produce a range of targeted marketing that benefits each of your customers.

Many vets actively shy away from the word “upselling”, so if you have a problem with this term, you could instead view this as “fine tuning” your service, by putting systems in place to optimise the health outcomes of your patients.

Using your practice management software, you can pull out information in a report or you could use paid programmes that do most of the work for you. Ultimately, the goal is to free up your time and remove human error by automating these systems wherever possible. This way, your PMS is identifying customers through a series of automated triggers and sending them timely information whilst you are getting on with other things.

For example, you can have an automated series of vaccination reminder texts, emails and letters that trigger at various stages when people go overdue. And you could send pets yearly personalised birthday cards with targeted offers on toys and food. Puppies and kittens could receive neutering at your clinic.

Pet health plans

Pet health plans can be of great benefit for your practice because they allow you to collect, use and compare customer data all in one place. If you have a pet health plan, you have permission to contact members with tailored information and ensure that you see them for their annual health checks and other procedures. Some of the better pet health plan software even does much of the work for you by automating responses.

It is very important to make regular contact with your health plan members to remind them of all the annual benefits they get from their plan, so that they feel the value from their subscription. If you already have a practice plan, make sure you are using it to the most of its potential – just making the commitment to doing this can create a dramatic uplift in your revenues.

In practice

There are many things you can do in your practice to help pet owners get the most from their visit. You want clients to experience five-star service that sets you apart. Imagine you are a customer: walk through a customer’s visit from first phone call to payment. Look at every touchpoint and see what you can improve to give a unique and special touch. Automated text booking reminders, a coffee machine in the waiting room, car parking, nice lighting… it all makes a difference.

You could consider putting in a very valuable process at the end of each pet’s visit. As clients come to the counter to pay, your receptionist can schedule them in for their next preventative health check one year in advance! Doing this will create a huge upswing in revenues over time. A suggested script would be:

“I know it seems like ages away, but let’s schedule your pet’s next preventative care exam for this same day and time next year. If you schedule in now, you’ll get your first choice of vet, day and time. We’ll be in touch two weeks before the appointment to confirm by text, so you can rearrange then if necessary. Is that OK? Great! I’ll print off your appointment reminder for Tuesday, 14 October at 10am and attach it to your receipt.”

Linking up with local pet-related businesses that complement your own is an easy way to grow your business. Consider teaming up with a nearby groomer or kennel to cross-promote one another to clients. A great example of this would be to print vouchers for local breeders to give to new pet owners, with a discount on second vaccines and neutering at your clinic.

Actions

Data is the most underused asset within marketing according to 87 percent of marketers, but by fully utilising your practice management software, you can drive new success with a few comparatively easy steps.

We all know that prevention is the best medicine, and by having systems in place to create tailored messages and touchpoints for your clients, you can make pet ownership cheaper for owners and help pets to live longer, happier lives.
As many of you will be aware, there is a new series of All Creatures Great and Small on the television. For many vets, we will have memories of watching the original TV series in the late 1970s onwards and reading the books. They have been widely credited (or blamed!) for inspiring people to take up the profession. The theme tune “Piano Parchment” (1968) by Johnny Pearson has been indelibly inserted into the profession’s psyche and associated with the rose-tinted view of our job portrayed by James Alfred Wight MRCVS. It appeared briefly at the end of episode one of the new series, and was used by BBC Panorama in an investigative programme into alleged misbehaviour at a veterinary clinic. A sort of ironic auditory cue.

Now that I have placed the tune in your head, you can read on. The majority of us will have positive associations with Herriot and the TV series and books. However, I was surprised to learn that for a significant number of vets he is perceived somewhat as a malign character and the whole Herriot universe as an apologist for bad working practices, namely long hours, poor pay, bullying bosses, onerous on-call duties and a terrible work–life balance. Not to mention the fact he is a white male. It has been said by the BVA that he is no longer the face of the profession (Loeb, 2019).

The books were based on his working life and experiences, but it was by no means a factual account of working life. He also has been accused of encouraging poor working practices and client’s expectations for vets to work for free.

When I first heard that, I thought someone was pulling my leg. But no, this has recently been a topic of discussion from the upper echelons of the profession to down among the various veterinary Facebook groups. So, I feel the need to examine this a little.

Firstly, it needs to be remembered that Wight wrote fiction. He made no secret of this and that the books were based on his working life and experiences, but it was by no means a factual account of working life. A fictional series of books is then adapted further for TV and film. So, any perception of what he may have thought or felt about the work has been two steps removed.

Secondly, these books were set mainly in the 1930s, ’40s and ’50s. Much of the working activity takes place around 80 years ago, so the idea that anyone would expect us to use these accounts as some sort of benchmark for current working practices is ludicrous, least of all the real Alf Wight. I can’t imagine the General Midwifery Council putting out a statement to disown the BBC series Call the Midwife, also written by a working clinician around the same time as Herriot, also then adapted for TV for a feel-good series. We should continue to cherish Herriot and his legacy, and be proud to say “look how far we have come” and leave his work alone without criticising it in today’s terms of reference.

As well as leaving it in the historical perspective, there are still things we can learn and appreciate from his writing. He does not shy away from writing about (and it appears in the current TV series) the difficulty of obtaining payment from clients in difficult circumstances. “That’ll be half a crown” may not be a phrase we use any more, but he is clearly seen to have to obtain payment from clients. He also takes his fair share of complaints and criticism from clients and colleagues, manages to put them into perspective and carry on.

As with all historical sources (even semi-fictional ones) we should take inspiration and learn lessons when we can, but also treat them as historical and of their time, and be glad about how far we have progressed from then. And there will still be a surprising number of scenarios that we can laugh in sympathy with, as we relate to the truth of our strange and difficult work as it reaches across the decades to us.

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Loeb, J. (2019) Herriot is no longer the face of the profession. Veterinary Record, 185, 328-332
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