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Veterinary PracticeToday

THE JOURNAL FOR PERSONAL & PROFESSIONAL DEVELOPMENT

Opening our minds on welfare

A wider view

10 hours PPD

Dermatology clinic
Setting up a clinic from an RVN's perspective

Stress in the horse
The positive and negative effects

Keeping disease at bay
Making the cattle farm a fortress

Back to basics – insects and arachnids
Husbandry and symptoms of disease

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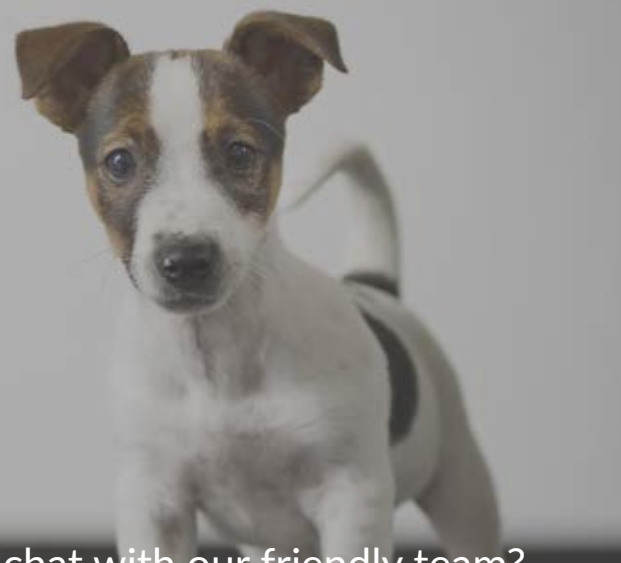

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UP FRONT...

So how much more evidence do we need?

'Like love, happiness, injustice and economics, it seems evidence-based veterinary medicine (EBVM) is everywhere,' writes RSPCA Putney clinician, David Mills, in the *Veterinary Record* [August 15, **177**(7): 181-182].

'Fashionable, modern, appealingly logical, and enthusiastically adopted by the RCVS and universities, it has become our profession's 21st century paradigm of how to do veterinary medicine well, or at least better than we used to,' he continues. 'However, there has been little serious discussion as to how justified, or ethical, adoption of EBVM is for our patients. In the embrace of the new without rigorous scrutiny, we may actually be putting our patients at risk.'

And taking that argument a bit further, perhaps we should consider whether or not the drive for more and yet more evidence is leading to our overlooking – or dare I say ignoring – the copious volumes of evidence about animal welfare, for instance, that are already plainly there for us to see.

In this issue of *Veterinary Practice Today*, award-winning RVN, Hayley Walters, reminds us that if we think about how horses behave in the wild then we know that they are sociable herd animals that graze and roam continuously. They are also a prey species that prefer to move away from the area where they have defecated or urinated, so as not to attract predators.

Yet we invariably keep them socially isolated, in an unstimulating environment, very restricted and unable to move away from their own excrement. It may be in a stable and it is certainly how we are used to seeing horses being kept, but that stable is essentially a cage. A box. So yes, the horse is healthy, but does it have what it wants?

And summarising her thought-provoking article on equine stress, behaviourist Wendy Gill writes: 'Although it is not possible definitively to identify distress in every horse, significant benefits can be had from addressing stress as a specific part of each clinical case.

'As well as a legal requirement to alleviate suffering – and a professional desire to do so – promoting eustress and minimising distress has benefits for the horse in terms of health and welfare, staff in terms of stress and safety, and the clinic in terms of finances and reputation.'

Add to this the all-too-regular news items involving inappropriate housing of rabbits and cats, and we should be asking ourselves just how much more evidence do we need before we act? The evidence is clear that decades of received wisdom about the husbandry of the companion animals committed to our care is simply wrong.

It is our responsibility to act on that evidence now, to put things right; and not to seek comfort in the creative avoidance and delay that are integral components of EBVM.

David Watson
Editor

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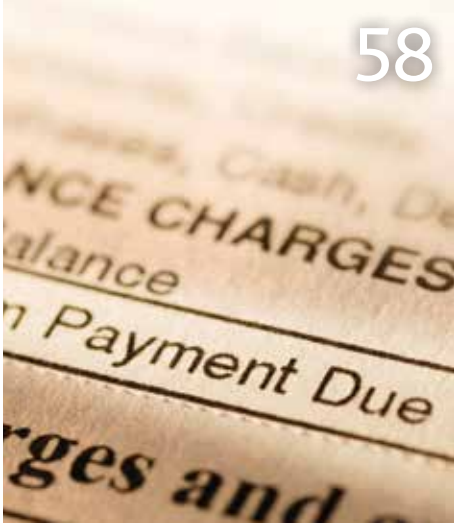

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Opening our minds on welfare – a science-based approach

Hayley Walters
RVN

Hayley qualified as a veterinary nurse in 1999. She spent 10 years in mixed animal practice in Derbyshire before she left England in 2006 to work with bears rescued from the bile farming industry in China and to run dog shelter management projects.

In 2012, she moved to Scotland to become a welfare and anaesthesia veterinary nurse for the University of Edinburgh; where she is responsible for training veterinary students and nurses in all aspects of anaesthesia, handling, inpatient care and pain management at the teaching hospital. Hayley also teaches animal welfare and clinical skills to veterinary students across the UK and overseas for the Jeanne Marchig International Centre for Animal Welfare Education.

Her focus is on improving veterinary education through excellence in patient care and promoting humane alternatives to live animals in veterinary education. Hayley has been involved in many clinical skills workshops in veterinary teaching schools in Asia and Eastern Europe and is the first veterinary nurse to sit on the BSAVA's International Affairs Committee.

COMMENT

Often, when people are asked to think about animal welfare, images of animal suffering similar to the ones shown in this article, can commonly be what people conjure up in their minds, along with very emotional and disturbing language such as 'cruel,' 'barbaric' or 'torture'. But animal welfare is not just about being cruel to animals.

When you read the comments and look at the photographs in **Figures 1** and **2**, how does it make you feel? Shocked? Sad? Angry? Hopeless?

Figure 1. *"Can you see the sweet dog peering out from his cage in the picture? His eyes tell a story of such fear and suffering. I can only imagine his terror as he's caught and then crammed into a cage with so many other frightened dogs. They're then transported a long distance – often with no food or water. It breaks my heart to think of what happens next."*

Figure 2. *"Homeless and neglected animals are left to scavenge for whatever meagre scraps of food or sources of clean water they can find as they wander the slum-like streets and alleys. Many of the animals in these desperately poor areas are suffering from untreated injuries, raging parasites and unchecked diseases that can come from a lifetime without veterinary care." (Photo: Jack Merridew).*

Such connotations cause a problem when it comes to assessing animal welfare. For many people, it can be a very emotive subject, which makes it a real challenge if we want to talk rationally and sensibly about it.

Alongside this, there is the additional problem that it often means different things to different people, making it hard to define. And whilst the images shown here are extreme cases of poor welfare, I'd like to start this article by saying what animal welfare is not.

Welfare v. rights

Animal welfare is not the same as 'animal rights', and the two are regularly confused. Animal rights is an ethical construct whereas animal welfare is about the state of the animal. Animal rights is often extreme and promotes the concept that animals should not be used or 'exploited' by humans in any way – for work (guide dogs or police dogs, for example); for food; for laboratory testing of medicines or in veterinary research; as exhibits in zoos, in circuses, in horse and dog shows or in entertainment industries.

Many extreme animal rights activists believe that humans and animals should not mix at all, not even as pets. 'Animal rights advocates are campaigning for no cages, while animal welfarists are campaigning for bigger cages' (BBC Ethics Guide, 2014)*.

Animal welfare is not just about not being cruel to animals. Some people believe that animal welfare is simply about not beating an animal or being cruel to them in some way.

And finally, it is certainly not 'bunny hugging'! Often those who work in welfare can be branded as 'hippy-ish', 'do-gooders' or 'overly sensitive'; and while this may be the case for some, there are plenty of rational scientists doing very valuable research and taking an evidence-based approach to animal welfare.

So what is animal welfare?

Many animal welfare scientists have tried to define exactly what it means. Marian Stamp-Dawkins simply asks: "Is the animal healthy and does it have what it wants?" This is simple and straightforward and if we ask ourselves that question every time we look at an animal in our care, we may be surprised by the answer.

The bird in **Figure 3**, for example, is clearly unhealthy and has lost its feathers either through some disease or from self-mutilation (feather plucking) as a means of coping with its unchallenging, unstimulating environment. If we think about where these parrots live and how they behave in the wild – free to fly and forage for food in the rainforests of Africa and roost in large groups – then the owner is failing this parrot on many levels. It is not healthy and it does not have what it wants.

If we compare it to the horse in **Figure 4**, then we can see a very healthy animal. Good coat, lovely body condition, alert and interested. Much better. It is certainly healthy. But does it have what it wants?

If we think about how a horse behaves in the wild then we know that they are sociable herd animals that graze and roam continuously. They're also a prey species that prefer to move away from the area where they have defecated or urinated so as not to attract predators.

Yet here is this horse, socially isolated, in an unstimulating environment, very restricted and unable to move away from its own excrement. It may be in a stable and it is certainly how we are used to seeing horses being kept, but that stable is essentially a cage. A box. So yes, the horse is healthy, but it does not have what it wants either.

Animal welfare, very simply, is ensuring that the physical and the psychological well-being of an animal is being met, irrespective of our ethical viewpoint on the use of the animal.

Freedoms and domains

We are familiar with the Five Freedoms categorised by the Farm Animal Welfare Council in 1979 and based on the earlier Brambell Report (1965):

- freedom from hunger or thirst
- freedom from discomfort
- freedom from pain, injury or disease
- freedom to express normal behaviour
- freedom from fear and distress.

Whilst these do offer animals some level of protection they can also be seen as very negative. They only protect the animal from having negative experiences. Excluding 'freedom to express normal behaviour', they don't actually promote positive welfare. They are also unachievable – no life is free from fear or discomfort.

The Five Domains, compiled by animal welfare scientist, David Mellor in 1994, promote a far more positive approach when it comes to ensuring animals are getting the standard of care they need.

Figure 3. *Feather plucking (Photo: Joel Zimmer).*

Figure 4. *Horse in a stable.*

Physical domains

- nutrition – appropriate consumption of nutritious foods is a pleasurable experience
- environmental – benign conditions offer adaptive choices and variety
- health – physically sound (uninjured, disease-free) animals enjoy good health
- behaviour – environment-focused and inter-animal activities are satisfying and engaging.

Mental domain

Mental or affective state – animals experience comfort, pleasure, interest and confidence.

Regardless of what situation an animal is in – whether it be a laboratory animal, captive wildlife, companion, farm or working animal – delivering good animal welfare is about meeting the physical and psychological needs of each individual in their specific situations, irrespective of our ethical viewpoint on that situation.

Can we measure welfare?

Yes we can. However, unlike degrees centigrade or kilograms, there is, unfortunately, no single unit to measure welfare. We cannot say 'this animal has a welfare of 2'. We can, nevertheless, use representative indicators of welfare which can be broadly categorised into resource – (input) and animal – (output) based measures. In short, we can measure the whole animal.

Animal welfare is a science and we can measure four basic areas:

Behaviour

Behaviour-based measures are considered to give us more direct access to what is going on for an animal. For example, we can look at changes from normal behaviour – either from earlier on in the animal's history or from how an animal living in the wild would behave – and record it using an ethogram (an inventory of behaviours or actions exhibited by an animal).

An animal's body language is extremely important and usually very simple to observe. As veterinary professionals, hopefully, most of us would agree that dogs and cats are easy to read and we can tell if they are happy or sad or scared or wanting to play or in pain. But reading and interpreting body language can be more challenging in species with which we are unfamiliar – for example lizards, so we must be careful not to use this as a standalone indicator.

We can also do preference testing for animals and 'ask' them what they prefer by offering them choices – different foods, substrates, temperatures or bedding material.

Physiology

Indirect measures of animal experiences are also useful. Various hormones, such as cortisol, are released in response to stress, sparing available glucose for fuelling the brain, generating new energy from stored reserves, and diverting energy from low-priority activities (such as the immune system) in order to survive immediate threats or prepare for the exertion of new challenges.

Not all stress is negative. For example, glucocorticoids (such as cortisol) are released in response to situations that are not normally regarded as negative experiences, such as courtship, mating and hunting. Ours could rise in response to being on a roller coaster! Short-term stress is a normal part of living.

> "Animal welfare is a science and we can measure four basic areas"

However, severe chronic stress (prolonged periods of high cortisol concentrations) may decrease an animal's fitness by immunosuppression and atrophy of tissues.

Cortisol concentration can be measured from blood, saliva or faeces samples. Heart rate, respiration rate, body temperature and blood pressure can all also be measured and each of these can give us an indication of how an animal is coping with the experiences it faces.

Physical state

The physical state is probably the most familiar welfare aspect for us to measure. It is certainly where the emphasis is placed during veterinary education. But we must remember that just because an animal is healthy, it doesn't necessarily mean it is experiencing good welfare. Health is an important component of welfare but it is not the whole picture; we need to go deeper.

Environmental resources

Resource – (input) based measures are extremely easy to observe and record. We can simply look at what is actually provided for – and available to – the animal. We must be careful, however, not to assume the animal has good welfare just because it has been provided with comfortable bedding, a clean environment and good food. Whilst these factors ought to be a prerequisite for good welfare, they do not guarantee it. If the animal doesn't have a good relationship with its owner/keeper or it is diseased, then its welfare will still be compromised. It is important to look at animal-based measures as well as resource-based measures.

By collectively measuring these four different areas we can more objectively look to see if an animal is suffering, thriving or coping in the situation in which it finds itself. If we can measure it, then we can manage it.

We can start to make – or advise upon – the necessary changes that may need to take place for improvements in welfare to appear. And then we can measure the changes and see if they have had an impact on that animal's quality of life.

Why is it important?

Aside from the fact that animals are sentient beings and we have a moral obligation to ensure not only that they do not suffer, but also that they have a life worth living and pleasurable experiences, science has proven time and time again that good welfare makes good sense. Lack of an adequate standard of animal welfare compromises the ability of animals to grow, reproduce and survive. Maintaining an adequate level of animal welfare reduces the incidence of disease and improves animal health.

And for those of us who just simply like animals and do not view them as a commodity, we are happy when our animals are happy. It is not important what a person's motivations are for improving animal welfare – whether it be for profit or more reliable drug trial results – as long as they are doing it.

The *ethics* of how we use animals, however, is another subject altogether! ■

**BBC Ethics Guide (2014). http://www.bbc.co.uk/ethics/animals/rights/introduction.shtml*

John Redbond
RVN

John is co-head nurse at Castle Vets in Reading, where he trained and qualified in 2004. During his 13 years working at the practice, he has overseen an entire refit of the laboratory. This activity has deepened his interest in dermatology and has also led to his setting up 'skin clinics' for the practice.

Setting up a dermatology clinic – an RVN's perspective

Skin cases make up a high proportion of all consultations in practice, with many of them going on to become second-opinion referrals. This is not an article to teach the science and practice of dermatology, but a practical guide to setting up dermatology nurse clinics, based on the author's experience.

Dermatology cases are often lifelong – involving long-term management tailored to each individual case, often at great expense without what many owners would hope for as a satisfactory conclusion. A key aspect of treating these cases is managing expectation as well as the condition itself, working with the owner to do a comprehensive 'work-up' with an understanding that there may never be a total resolution. All of this takes time and much of it can be carried out professionally and in a cost-effective way by qualified RVNs running dermatology clinics.

Any 'consult' can take longer than you want it to – none more so than with an animal presented with a skin condition. Taking the time to gather a history is critical to having any chance of understanding what may be causing the skin problem, along with a thorough examination of the entire patient to ascertain the affected areas and the tests required. These alone can be difficult to fit into a 10 or 15 minute consult.

Then when you add in time to discuss the possible issues, the benefit of a work-up and the potential long-term management needed, it becomes impossible. And we haven't even done any skin tests yet! They alone can take half an hour if performed thoroughly (**Figure 1**).

An hour, therefore, is the ideal length for a comprehensive skin consult. However, whether this is the most cost-effective use of a veterinary surgeon's time is a moot point. All of the basic things can be done by an RVN – a qualified professional who, with additional dermatology training, can do all this groundwork for a justifiable fee, giving the client and the case the time they need and leaving the case veterinary surgeon to review the findings, confirm the diagnosis and recommend appropriate treatment.

***Figure 1**. The microscope, your new best friend.*

Organising a dermatology clinic

Critical to the success of specialised skin clinics is ensuring that their purpose is fully understood by the whole practice team and that they are set up to be consistent in terms of timing and availability. It worked for me to select a day in the week – 'Derm Tuesdays' – so that all the staff knew on which day to book dermatology work-ups.

It is important to try and ensure that nothing else gets booked into the dermatology clinic that will interfere with the hour-long skin consultation. Consider how the cases will be arranged too – either arrange the nurse skin clinic first with a routine vet appointment to follow once results are back; or for a veterinary surgeon to see the client first before deciding to book the clinic as a follow up.

I have found the latter to work best for me in that it allows the vet referring the case to discuss it following workup and to decide on treatment options. The most important thing, however, is to establish a system which will function in your surgery.

Constructing clinics

Make sure you have a plan for how the clinic will run *before* you call the client in. Whilst an hour may seem a long time, it will soon pass by, so it is important to structure the time properly. A questionnaire is very effective way of obtaining direct, targeted information quickly – if you cannot afford an hour-long

**Suggested Personal & Professional Development (PPD)*

consult then have the client fill it out prior to the examination.

I find completing the questionnaire together with the owner is a great way to glean even more information. Don't rush the moments when the client talks because this is the benefit of the longer consult. Listen to them and you will gain a much clearer picture of the patient's problem.

I spend the first 15-20 minutes completing the questionnaire before sharing with the client the possible causes of the skin problem and the tests I think would be advisable. The client likes to hear that you have listened to the issues and will often become excited when you discuss possible explanations. This is a relief for them and offers hope of a solution – it is important to use this energy to your advantage as it can really help overall compliance.

Be careful not to bombard them with too much information, keep it concise and then offer a handout to take home covering all the topics discussed. This is also a great time to impress upon the client the frustrations of skin disease and the possibility of the condition never being completely resolved. This conversation in a 15 minute consult can sound like an excuse, but in an hour-long period during which the client has been able to discuss the issues in great detail, it sounds honest and sympathetic.

I also consider it important to introduce myself at the beginning of the consult, making sure the client is aware that I am a qualified veterinary nurse and outlining my role in the diagnostic process and subsequent management of the case. This helps prevent any confusion and reduces the risk of their thinking you are a specialist dermatologist.

Having done all this, there should be 25-30 minutes to carry out the tests required on the patient – either in the consulting room with the client or in an adjacent room with another nurse restraining the animal. The former option allows even more time to talk with the client, whilst being away from them may make it easier to examine the patient and to take samples. You might use a combination of both.

Figure 2 is an example of a medical history questionnaire and **Figure 3** a specific dermatology one. Notice the 'open' nature of some of the questions, which can really help you glean more information from the client.

Which tests to perform

The vet may have given you and the client an idea of which tests he or she would like performed; or, as I have found on many occasions, the consult has guided me to what I felt was needed in order to help the case veterinary surgeon confirm a diagnosis.

Always perform cytology – be it tape strips, impression smears or swabs from the ear (**Figure 4**). They give you a snapshot of what is going on in each area and are often overlooked because of time constraints. Bacteria and *Malassezia* are the primary concern here.

If you suspect the presence of parasites, then skin scrapes are worth performing – even as a 'rule out'. Always let the client know that a negative result is actually a positive one with skin work-ups, then they will feel less disappointed if you don't find anything. If demodicosis is suspected, a trichogram is cheaper and easier to perform than skin scrapes – I have yet to find *Demodex* on skin scrapes but not on 'plucks' from the same patient.

Blood samples for allergy testing can be very useful as well. Whilst it may be better to rule out other possible causes first, it may be more difficult for the client to return for blood tests later. Use the time you have to discuss with them whether atopic dermatitis is suspected and proceed at this stage if they would rather. Perhaps surprisingly from a cost point of view, they invariably do.

Whether performing intradermal testing in house or sending blood for serological examination externally, it is important to remember neither are diagnostic tests. Asymptomatic patients can test positive, so it is vital to be sure the case veterinary surgeon suspects atopic dermatitis and that the other tests needed to rule out parasites and infection have been taken.

As an RVN, blood testing for serology is something I can do, therefore, it is what I use regularly; intradermal testing often requires sedation and this is going to require veterinary surgeon time once more. Serology is less affected by medical therapy; although some testing methods are compromised by steroid therapy, so be sure to consult your external laboratory and select a testing method that suits your needs.

Stay involved

The diagnosis and treatment must, of course, always be decided by the case veterinary surgeon; but a nurse with experience and training in dermatology may well still be able to contribute a great deal to the treatment plan.

Consider the wide range of topical treatments now available. These can help the patient in the short-term and are proven to be effective management tools in the long-term – many of them are 'non-prescription' products, so the RVN can put them up.

***Figure 2**. Example of a medical history questionnaire.*

General medical questionnaire

- client's name?
- pet's name?
- breed?
- neutered?
- species?
- sex?
- vaccinated?
- how long have you owned the pet?
- travelled overseas?
- areas exercised?
- daily food?
- major health problems?
- appetite?
- thirst?
- exercise tolerance?
- coughing/sneezing?
- lifestyle: town/ country/ working / show/ pet?
- imported?
- regular contact with?
- bedding?
- snacks/treats?
- behaviour problems past or presently?
- consistency of stool?
- frequency of urination?
- changes in weight?
- any discharge?

"Critical to the success of specialised skin clinics is ensuring that their purpose is fully understood by the whole practice team"

***Figure 3**. Example of a dermatology questionnaire.*

Dermatology questionnaire

- current skin issue?
- has this problem affected any other pets or people in the house?
- when did the problem start?
- what age was the patient when this problem began?
- how did the condition look to begin with?
- where exactly on the patient did it begin?
- has it become progressively worse?
- have you noticed them: rubbing/scooting/chewing /licking/scratching/ grooming excessively?
- was the condition itchy at the beginning and if so, would you say it has become worse over time?
- describe how itchy your animal is on a scale of 1-5 (with 1 being slightly itchy and 5 being tremendously itchy)
- does the issue seem to be worse at any particular time of year?
- have there been any digestive problems?
- have you noticed hair loss? if so where on the patient?
- have female pets: been spayed, had abnormal or irregular cycles, been pregnant?
- Have male pets: been castrated, are other male dogs attracted to your male dog?

Medication

- please list the medications used on your pet for this condition (including shampoos and creams etc.)
- have any of these treatments helped? If so, which ones?
- is the patient still on any medication at the moment?
- list any recent flea treatments with date of administration
- how often do you use flea treatment?
- have you used an insecticide in your car or house? If so when?

Clinical signs

Tick the conditions your animal has displayed in the past or presently:

Greasy skin ☐
Greasy coat ☐
Scratching ☐
Fleas ☐
Dandruff (scurf) ☐
Chewing ☐
Lice ☐
Scabies (mange) ☐
Licking ☐
Red skin ☐
Rubbing ☐
Dark patches on skin ☐
Scooting (dragging bum) ☐
Ear mites ☐
Over grooming ☐
Ringworm ☐
Scratching at ears ☐
Thickened skin ☐
Shaking head ☐
Pimples (spots) ☐
Hairballs ☐
Open sores ☐
Scabs ☐
Small bumps ☐
Lumps ☐
Hair loss ☐
Any additional comments?

Select the practice's choice of shampoos carefully. Whether for keratinisation disorders, microbial infections or just to help normalise the skin, it is important to make the selection of an appropriate product logical and straightforward. Their strategic use for the correct conditions can really help treatment, so avoid the 'one-shampoo-for-all' approach.

Wipes are available that can help treat microbial issues with greater client compliance. There is a growing number of topical sprays too, as more value is given to the role of skin barrier function in allergy cases. Essential fatty acid supplements are also highly regarded for this purpose.

Doing research and having these types of treatments available will really help give our clients options and, when used adjunctively, can increase the chances of reducing the use of other 'prescription' medication.

Ectoparasite control

Ectoparasitic infestations are very common in dogs and cats and are, for the most part, easy to treat. Skin scrapes, tape strips, hair plucks, coat brushings, scale examinations and impression smears are all tests the RVN can do to aid definitive diagnosis.

Dermatologists always stress the importance of thorough environmental controls whilst working up a case, as these parasites can easily cause problems alongside another condition, even if they are not actually the cause. Veterinary nurses play an important role in disseminating advice, understanding and compliance with the application of ectoparasite prevention and treatments. This is never more the case than during dermatology clinics (**Figure 5**).

Difference between dogs and cats

The majority of dermatological cases I have seen by the author have been in dogs, but it is cats that can present some of the biggest challenges. The critical thing to remember is that they are not small dogs and react very differently to skin problems.

***Figure 4.** Never forget cytology!*

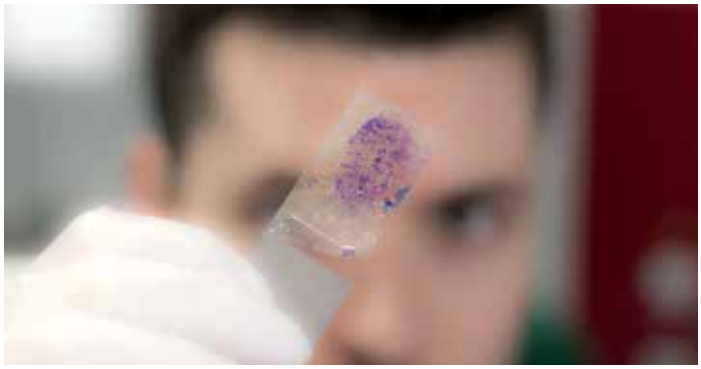

***Figure 5**. It's not just cats and dogs that have skin.*

> "The diagnosis and treatment must, of course, always be decided by the case veterinary surgeon"

Cats will mostly present with self-induced alopecia, miliary dermatitis, eosinophilic granuloma complex or head and neck pruritus. The presenting signs will often be indicative of likely differential diagnoses, but dermatology clinics can still be vital in confirming an underlying cause. The approach, however, is very similar to that for dogs regarding the questionnaire, tests and discussion – with even more stress on ectoparasite control as the majority of feline cases are flea related.

In this latter respect, coat brushings can be really helpful, because an 'official' diagnosis helps with client compliance when it comes to flea control.

Follow-up care

The lifelong management of skin cases can be frustrating and expensive for clients, sometimes causing them to seek advice from other practices. So utilising a dedicated dermatology nurse to give follow-up advice can help the client feel supported, and encourage them to remain loyal to you and to persevere with a long-term treatment plan.

Use your 'empty' dermatology consult slots to telephone these clients and discuss progress – maybe even booking follow-up appointments to see them. This utilises your clinic for even more than just initial work-ups.

Pricing

Don't be afraid to charge for your dermatology clinics. CPD training for a nurse to become competent in dermatology, alongside their qualification as an RVN, come at a cost to the surgery. This should be reflected in the charge for an hour-long consult. Decide on a figure and stick to it, because in my experience, the client seldom resents it – they are keen to find a resolution and happy to receive such a lengthy and understanding service.

You can also point out that free telephone consultations are included within the service, as well as reduced fees for follow-up checks. These are likely to encourage them back, helping the case in the long term and freeing up veterinary surgeon appointments for other consults.

Summary

Specialised nursing clinics for difficult cases makes medical and business sense. They support the client, support the veterinary surgeon and support the practice in maximising the care given to those patients – whilst generating revenue for the business at the same time as giving the client value for money.

Dermatology clinics are a perfect example of this. First-opinion practices can rarely afford a full-time dermatologist and even if they could, they would utilise qualified nurses as described above. But what these clinics offer the most is the chance for RVNs to challenge themselves, expand their skill set and offer their practice something new. ■

PPD Questions

1. How long is ideal for a dermatology clinic?
2. What type of test should you always aim to perform?
3. Name two of the four typical presenting conditions in cats.
4. What cheap test is good when looking for *Demodex*?

Answers

1. 1 hour
2. cytology
3. self-induced alopecia, miliary dermatitis, eosinophilic granuloma, head and neck pruritus
4. a trichogram

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Dealing with recurrent bacterial pyoderma

The key to managing recurrent bacterial pyoderma (RBP) is to identify the underlying disease process and control it effectively. Focus on the resolution of individual episodes of bacterial pyoderma will have no impact on the frequency of future episodes and could promote the development of antimicrobial resistance through the overuse of antimicrobial agents. This article provides an overview of the approach to RBP.

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Following her residency, Laura worked in private practice where she provided a dermatology service for two referral clinics in Yorkshire and London and for the Guide Dogs Centre at Redbridge in Essex. Laura returned to the University of Liverpool in 2014 as lecturer in veterinary dermatology and clinical skills, and teaches and assesses the postgraduate RCVS CertAVP dermatology course there.

Laura's clinical interests include canine and feline allergic skin disease, antimicrobial resistance and chronic otitis.

**Suggested Personal & Professional Development (PPD)*

DERMATOLOGY

The structure and physiology of healthy skin work together to produce a very effective barrier against infectious organisms. Bacteria, present on the surface of healthy skin, are only capable of causing infection when the barrier has been breached as a consequence of external insults. In cases of superficial wounding and bacterial contamination, healthy skin is still capable of dealing with most infectious organisms without the use of antimicrobial agents.

Pathogenesis

What this means is that all cases of recurrent bacterial pyoderma (RBP) are the result of an underlying disease that interferes with skin barrier function and/or suppresses the immune system. Primary bacterial pyoderma is extremely rare and is presumed to occur as a consequence of inherent immune dysfunction.

Resident cutaneous microorganisms are most commonly responsible for RBP. *Staphylococcus pseudintermedius*, formerly known as *Staphylococcus intermedius* (Sasaki et al, 2007), is the predominant mucocutaneous commensal of dogs and cats and, therefore, the cause of most bacterial pyodermas. Bacteria from the oral cavity, environment and gastrointestinal tract – such as *Pasteurella multocida, Pseudomonas aeruginosa* and *Escherichia coli* – can be present on the skin transiently and may be cultured following swabbing of the skin surface. With the exception of cat bite abscesses, these organisms rarely cause true bacterial pyoderma in dogs and cats and would not typically be associated with RBP.

Treatment of insignificant bacteria as a result of inappropriate choice or interpretation of diagnostic tests can lead to the use of unnecessary and/or inappropriate antimicrobial agents. This is a problem because whenever they are used, antimicrobial agents apply selection pressure on bacterial populations, resulting in the elimination of susceptible bacteria and survival of those bacteria that possess mechanisms of resistance. When systemic antimicrobials are used, this selection pressure is applied to both the cutaneous and gastrointestinal flora, in addition to pathogenic bacteria.

Since first isolated in Europe (Loeffler et al, 2007), multi-drug resistant (MDR) *S. pseudintermedius* and methicillin (oxacillin)-resistant *S. pseudintermedius* (MRSP) have been reported with increased prevalence from clinical samples (Bardiau et al, 2013).

A recent UK study outlined the emergence of resistance to routinely used antimicrobials, including cephalexin, cefovecin and enrofloxacin, in veterinary small animal practice (Beever et al, 2015). We must, therefore, take all possible steps to reduce the need for antimicrobial use and, where they are indicated, ensure they are used effectively and responsibly.

Approach to management

The key points for management of RBP are to:

- confirm the presence of bacterial pyoderma based on recognition of cutaneous lesions *and* diagnostic tests
- select appropriate antimicrobial therapy and use it at the correct dose and frequency until there is a clinical cure
- diagnose and manage the primary underlying cause
- institute maintenance treatment to prevent recurrence.

Confirmation of bacterial pyoderma

The diagnosis of bacterial pyoderma should be made based on compatible clinical signs and confirmed using cytology. Owing to the large number of sterile dermatological diseases that can mimic bacterial pyoderma – pemphigus foliaceus, erythema multiforme, epitheliotropic lymphoma, amongst others – and the problems associated with overuse of antimicrobial agents, a diagnosis of bacterial pyoderma should never be based on clinical signs alone.

"The diagnosis of bacterial pyoderma should be made based on compatible clinical signs and confirmed using cytology"

Table 1. Cytological sampling techniques

Sampling technique	Lesion type	Method
Direct impression smear	Pustules, exudative lesions, crusted erosions	Glass slide applied directly to lesion (following rupture of pustule with sterile needle or removal of crusts from erosions)
Indirect smears	Exudative lesions	Material collected on a cotton bud and rolled onto a glass slide
Adhesive tape impression	Seborrhoeic lesions	Scotch tape applied several times to affected skin
Fine needle aspiration	Nodular lesions	Material collected using sterile needle, transferred to slide using syringe – smear made using second slide

Most RBPs are superficial and common clinical signs include erythema, papules, pustules, scaling, focal alopecia (impetigo, superficial spreading pyoderma, bacterial folliculitis) and/or erythema, erosions, alopecia and exudation (pyotraumatic dermatitis). Pruritus is common with superficial pyoderma; whereas lesions caused by deep pyoderma are, more often, painful. Ulceration, draining sinus tracts, nodules and/or regional swelling are usually associated with deep pyoderma.

Cats rarely exhibit the lesions considered typical of superficial pyoderma. In addition, pyoderma in cats can present as reaction patterns including crusted papular (miliary) dermatitis and lesions of the eosinophilic granuloma complex, such as eosinophilic plaques and indolent ulcers. A retrospective study of 52 cats presenting with superficial pyoderma revealed the most common lesions are crusting (83 per cent), alopecia (67 per cent), ulceration or erosion (54 per cent) and erythema (46 per cent) (Yu and Vogelnest, 2012).

Diagnostic tests

Cytology is a quick, low-risk technique, that can be performed on conscious animals. The sampling techniques used to prepare cytology samples are summarised in **Table 1**.

Following sample collection, modified Wright-Giemsa stains are used to identify inflammatory cells and microorganisms. It is important to stain adhesive tape with the eosinophilic and basophilic stains only, as the fixative can damage the sample. Bacterial pyoderma is confirmed following the observation of large numbers of (often degenerate) neutrophils with intracellular bacteria (**Figure 1**). These bacteria will be circular (cocci) in the case of staphylococcal pyoderma. Bacterial overgrowth is characterised by large numbers of bacteria with no – or low – numbers of inflammatory cells (**Figure 2**). This differentiation is important as bacterial overgrowth responds well – and in many cases – better, to topical therapy.

> "It can be difficult to confirm the presence of deep pyoderma cytologically owing to the high rate of contamination"

Where pyogranulomatous or granulomatous inflammation is identified, particularly from samples taken from nodular lesions, submission to a laboratory for special stains, such as Ziehl-Neelsen, is indicated to assess for atypical bacteria or fungi.

It can be difficult to confirm the presence of deep pyoderma cytologically owing to the high rate of contamination with transient bacteria. The accuracy of diagnosis can be improved through collection of a skin biopsy and submission for tissue culture +/- histopathology. The skin surface must be prepared aseptically prior to biopsy to prevent contamination of the sample by surface organisms.

Culture and susceptibility testing of cutaneous swabs does not confirm the presence of bacterial pyoderma because of the potential for sampling non-pathogenic commensal flora in sterile skin disease and contaminants and

Figure 1. *Impression smear cytology demonstrating bacterial pyoderma. Note the large number of degenerate neutrophils and intracytoplasmic cocci.*

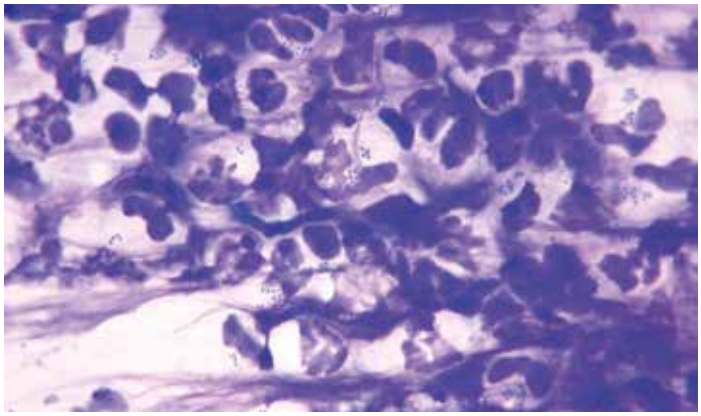

Figure 2. *Acetate tape impression cytology from a skin fold demonstrating overgrowth of rod-shaped bacteria. Note the absence of inflammatory cells and the large number of bacteria. This bacterial skin fold dermatitis (intetrigo) requires topical antimicrobial therapy.*

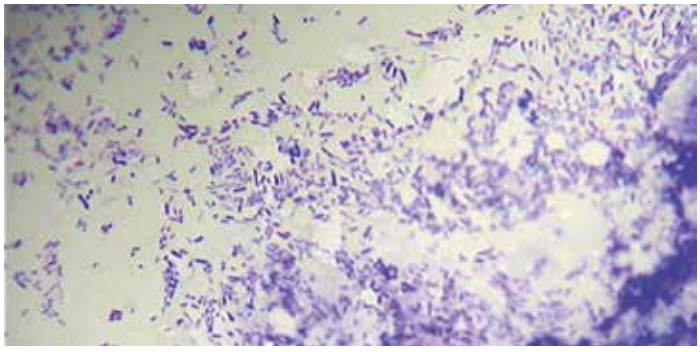

Table 2. Bacterial pyoderma cases where culture and susceptibility testing is essential

Recurrent pyoderma	
Life-threatening infection	
Antibiotic resistance more likely with:	■ one or more broad-spectrum antibiotic courses ■ non-healing wounds ■ postoperative infection ■ when owner or animal has recent hospital contacts
Clinical lesions consistent with deep pyoderma	
Rod-shaped bacteria confirmed as cause of pyoderma via cytology or aseptically harvested tissue culture	

or overgrowth of transient organisms in cases of staphylococcal pyoderma. Cytology should be used to confirm the diagnosis and identify the morphology of the bacterium involved.

Culture and susceptibility testing is used to determine the species of bacteria involved and select an appropriate agent, where systemic antimicrobials are indicated. If multiple bacteria are cultured, selection should be based on those that match the morphology of the causative bacteria on cytology. Ideally culture and susceptibility testing should be performed whenever systemic antimicrobial agents are required but should always be performed in circumstances such as those described in **Table 2**.

Selection of appropriate therapy

Once bacterial pyoderma has been confirmed, the choice of antimicrobial therapy depends on whether the infection is severe – superficial or deep – and/or generalised enough to warrant systemic antibiotics. For focal and mild generalised superficial bacterial infections, topical antimicrobial therapy alone should be sufficient. Although more demanding practically for the owner, topical treatment has a number of benefits over systemic antimicrobial therapy including:

- the facility to be administered directly to the site of infection
- higher concentration (and potential for improved efficacy)
- physical removal of microorganisms and skin debris
- no interference with the commensal gastrointestinal and mucosal flora (reducing the risk of the development of resistance)
- reduced risk of adverse effects.

> "For focal and mild generalised superficial bacterial infections, topical antimicrobial therapy alone should be sufficient"

Topical biocides with proven antibacterial efficacy include chlorhexidine (1-4%), benzoyl peroxide, triclosan and ethyl lactate. Topical gels and wipes (containing chlorhexidine, for instance) are very useful for management of focal areas of bacterial pyoderma and are easy for clients to use. For more generalised disease, shampoos and sprays will be more effective.

Topical treatment can be used daily or two to three times weekly to effect. Where treatment is used daily, the skin should be monitored for excessive drying.

Generalised superficial pyoderma in immunocompromised individuals and deep pyoderma usually require treatment with systemic antimicrobials. Topical therapy is still indicated in these cases in order to hasten resolution of lesions and to reduce the duration of systemic therapy. Culture and susceptibility testing is indicated to identify an effective antimicrobial agent and to select one with the narrowest spectrum of activity (to reduce selection pressure on the commensal flora).

First-line antimicrobials should be used for the management of bacterial pyoderma (**Table 3**).

Second-line antimicrobials are important for animal and human health and should not be used empirically. These drugs should only be used when there is evidence from culture and susceptibility testing that first-line drugs will not be effective. There is rarely indication for use of fluoroquinolones for the management of bacterial pyoderma. Gram-negative bacilli are uncommonly the primary pathogen involved in bacterial pyoderma and staphylococci, which are commonly involved, are usually susceptible to more appropriate antimicrobials.

Third-line antimicrobials are very important for the treatment of MDR infections in animal and human health. The development of resistance to these drugs and their increased potential for adverse effects, mean their use in animals should be avoided.

Table 3. Examples of first-, second- and third-line antimicrobials*

First-line	Second-line	Third-line
Amoxicillin and clavulanic acid	Aminoglycosides	Azithromycin
Cephalexin	Cefovecin	Ceftazidime
Clindamycin	Cefpodoxime	Imipenem
Lincomycin	Chloramphenicol	Linezolid
Trimethoprim-potentiated sulfonamides	Fluoroquinolones (enrofloxacin, marbofloxacin, pradofloxacin and orbifloxacin)	Ticarcillin Teicoplanin Vancomycin

** Adapted from Beco et al (2013) and Hillier et al (2014)*

Table 4. Primary diseases that can result in recurrent bacterial pyoderma in dogs and cats

Skin barrier dysfunction	Immune suppression
Flea bite hypersensitivity	Diabetes mellitus
Atopic dermatitis ■ food-induced ■ environmental allergen-induced	Hypothyroidism (dogs)
Ectoparasite infestation	Hyperthyroidism (cats)
Keratinisation defect (e.g. primary seborrhoea, feline acne)	Hyperadrenocorticism
	Neoplasia
	Viral disease (FIV/FeLV)
	Immunosuppressive drugs

"Depending on the severity of the infection, animals should be re-assessed every one to three weeks to ensure resolution of the pyoderma"

When treating bacterial pyoderma with systemic antimicrobials, the high end of the dose range should be used because of the relatively poor blood supply to the skin. For example, the dose range for cephalexin is 10-25mg/kg per os every eight to 12 hours. The dose recommended by licensed formulations is 15mg/kg every 12 hours; however, it has been suggested that a dose of 22mg/kg may be more appropriate for cutaneous bacterial infection (Miller et al, 2013). Animals should be weighed to ensure accurate dosing.

A three-week antimicrobial course is usually required for the management of superficial pyoderma. For deep pyoderma, a longer treatment course of six weeks (or more) is usually required.

Treatment should be continued until the infection is visually and cytologically cured; although excessive treatment should be avoided in order to reduce the selection pressure for resistance in the commensal flora.

Depending on the severity of the infection, animals should be reassessed every one to three weeks to ensure resolution of the pyoderma.

Diagnosing the underlying cause

Some common underlying causes of RBP are listed in **Table 4**.

Where compatible history and clinical signs exist, diagnostic tests to investigate causes of immune suppression and skin barrier dysfunction should be carried out. It is beyond the scope of this article to discuss the investigation of all primary causes of RBP, but the majority of cases in young animals will be the consequence of allergic skin disease. The same applies to older animals; although diseases causing immune suppression should also be considered and investigated as appropriate and based on concurrent clinical signs.

Maintenance therapy

Once the primary underlying disease has been identified, a treatment programme should be instituted to establish control and reduce the risk of RBP. For cases of atopic dermatitis this will involve multimodal therapy to:

- improve skin barrier function – using essential fatty acids and topical moisturisers
- reduce skin inflammation – with corticosteroids and immunomodulators
- reduce skin inflammation associated with exposure to environmental allergens – allergen avoidance and allergen specific immunotherapy
- manage flare factors such as ectoparasitic disease.

Control of skin inflammation is a particularly important component of the management of RBP as it has been shown that bacteria bind more easily to inflamed skin. Topical and/or anti-inflammatory doses of systemic corticosteroids can be used to resolve acute flares of pruritus and skin inflammation and, if used promptly, may prevent the development of bacterial pyoderma.

It is rarely possible to achieve perfect control of life-long diseases and, therefore, most cases of RBP will benefit from some level of regular preventive antimicrobial treatment. This is usually in the form of the previously discussed topical antiseptic shampoos, wipes, sprays and gels. These products can be applied to known sites of RBP on a weekly or twice-weekly basis – whether lesions are present or not – in order to control surface bacterial populations and prevent overgrowth and infection.

Pulse dosing with systemic antimicrobials is not recommended owing to the potential for selection of resistant bacteria. Commercially available staphylococcal bacterins can be considered for cases that are not fully controlled by management of the primary disease and preventive topical antimicrobial therapy.

In cases of superficial wounding and bacterial contamination, healthy skin retains the capability of dealing with most infectious organisms without the use of antimicrobial agents. This means that all cases of recurrent bacterial pyoderma (RBP) are the result of an underlying disease that interferes with skin barrier function and/or suppresses the immune system.

Focus on the resolution of individual episodes of bacterial pyoderma will have no impact on the frequency of future episodes and could promote the development of antimicrobial resistance through the overuse of antimicrobial agents.

These issues have been tackled in some detail in recently published expert panel reviews aimed at improving antimicrobial stewardship and management of cutaneous bacterial infections (Beco et al, 2013, Hillier et al, 2014).

In addition, a newly published 'UK One Health' report, summarised in the Veterinary Record [177(5): 111-112], brings together data on antimicrobial resistance in people and animals. It also gives details of the amount of antibiotics prescribed for human use and sold for animal health and welfare purposes. ■

PPD Questions

1. Select the most appropriate first-line diagnostic technique for investigation of a pustular skin disease

   A. Acetate tape impression cytology
   B. Culture and susceptibility of a skin swab
   C. Aseptically prepared skin biopsy for histopathology and tissue culture
   D. Aseptic rupture and direct impression smear cytology

2. Select the most appropriate diagnostic technique for investigation of bacterial involvement in a draining fistula

   A. Acetate tape impression cytology
   B. Culture and susceptibility of a skin swab
   C. Aseptically prepared skin biopsy for histopathology and tissue culture
   D. Aseptic rupture and direct impression smear cytology

3. Select the most appropriate treatment for a dog with atopic dermatitis and skin fold intertrigo, where large numbers of rod-shaped bacteria have been identified on direct impression smear cytology of the affected skin folds

   A. Oral cephalexin 22mg/kg twice daily for three weeks
   B. Combined topical fucidic acid and betamethasone twice daily for 10 days
   C. Oral prednisolone 0.5mg/kg once daily for seven days plus topical chlorhexidine twice daily for 14 days
   D. Oral enrofloxacin 5mg/kg once daily for four weeks

4. Select the most appropriate treatment for a dog with atopic dermatitis and RBP, presenting with an acute flare of pruritus and numerous epidermal collarettes affecting the ventral abdomen and medialpelvic limbs. Cytology of the epidermal collarettes reveals numerous neutrophils with intracellular cocci bacteria

   A. Oral cephalexin 22mg/kg twice daily for three weeks
   B. Combined topical fucidic acid and betamethasone twice daily for 10 days
   C. Oral prednisolone 0.5mg/kg once daily for seven days plus topical chlorhexidine twice daily for 14 days
   D. Oral enrofloxacin 5mg/kg once daily for four weeks

Answers
1.D 2.C 3.C 4.C

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**Suggested Personal & Professional Development (PPD)*

Veterinary physiotherapy for osteoarthritis

This article will look closely at osteoarthritis and its clinical signs, its effects on lifestyle, and conservative treatment options. Close attention will be paid to its effect on small animals, and in particular, dogs. The author will aim to improve knowledge relating to physiotherapy assessment and treatment techniques and enable veterinary professionals to identify cases that will benefit from physiotherapy intervention.

Physiotherapy is defined as a 'science-based profession which helps to restore movement and function when someone is affected by injury, illness or disability' (Chartered Society of Physiotherapy, 2013). The benefits of physiotherapy are evidenced in both human and animal trials. The Chartered Society of Physiotherapy (CSP) has published evidence-based briefings pertaining to a variety of conditions – such as musculoskeletal disorders, stroke and critical care – where physiotherapy is effective (CSP, 2015).

How does osteoarthritis affect dogs?

Osteoarthritis (OA) is characterised by progressive loss of articular cartilage and by reactive changes at the margins of the joints and bones. It can affect skeletally mature animals at any age. Conformation, obesity, previous injury and the animal's exercise regimen may also predispose it to an increased risk of OA; and it is believed that 20 per cent of the adult canine population and 80 per cent of the geriatric dog population in North America are affected by the condition (Johnston, 1997).

Clinical signs usually include discomfort that worsens with excessive activity and is relieved by rest (Edge-Hughes, 2007). Many owners will report that their dog has started to 'slow up' and needs 'longer rest periods between exercise'.

Table 1 lists common adaptive changes that a dog suffering from OA may be exhibiting.

Dogs that have either single joint involvement, or multiple joints affected, will have compensatory movement patterns that affect other soft tissues and joints. Left untreated, these stresses to other structures can cause lameness and have the potential to increase the further risk of OA in unaffected joints.

'Off-loading' the affected or painful limb will also cause long-term problems, because muscle bulk and neuromotor control will diminish, leaving less support for the affected joint(s) and less proprioceptive control.

Table 1. Common adaptations made by dogs suffering with osteoarthritis

Clinical signs
Reluctance to tackle steps or stairs
Reluctance or inability to get in/out of car
Stiff on rising after rest
Low-grade lameness of one or more limbs
Increased stiffness in cold weather
Reluctance to exercise

Benefits of physiotherapy

The benefits of physiotherapy for human patients suffering from osteoarthritis are widely documented (Pinto et al, 2013; Bennell et al, 2014). To:

- relieve pain and associated muscle spasm
- maintain and regain joint range of motion
- strengthen supporting musculature
- address proprioceptive deficits
- improve the quality of life of the animal
- advise on lifestyle modifications.

By working in collaboration with the referring veterinary surgeon, physiotherapists can provide pain relief to arthritic joints in a number of ways.

Thermotherapy

Heat has been used over centuries to manage the pain and stiffness brought on from arthritic joints. Short-term reductions in pain were evidenced by French et al (2006) and improvements in stiffness levels following heat treatment were demonstrated by Robinson et al (2002). Owners can easily be instructed on how to apply heat as part of the day-to-day management of arthritic joints.

Where multiple joints are affected, keeping the animal warm in cold weather may be of benefit. Coats can assist in maintaining circulation around muscles and joints, especially if the animal is only able to exercise at a slow pace. Warm, soft bedding may also reduce stiffness on rising.

Cryotherapy

Ice therapy may be used effectively for pain relief in 'flare ups' of arthritic joints. Reviews have shown that ice can provide clinical benefits in terms of swelling and range of motion (Brosseau et al, 2003).

Therapeutic laser

Low-level laser therapy (LLLT) uses light energy to promote tissue repair and provide pain relief. Correct parameters can enhance the biosynthesis of arthritic cartilage and result in the improvement of arthritic histopathological changes (Lin et al, 2006).

***Figure 1**. Passive ROM is achieved by the therapist to maintain range at each joint.*

***Figure 2.** Home exercises can be utilised to practise active ROM exercises.*

***Figure 3**. Isometric exercise concentrating on postural muscle strengthening.*

***Figure 4.** Strengthening work utilising a foam roller.*

Transcutaneous electrical neuromuscular stimulation

Transcutaneous electrical neuromuscular stimulation (TENS) may be used to provide pain relief by virtue of two mechanisms – segmental inhibition and descending inhibitory mechanisms.

Animal models have produced studies that demonstrate TENS to be effective in creating analgesia at a variety of frequencies (Sluka and Walsh, 2009). TENS can be applied locally to the joint affected by OA, or can be used over appropriate dermatomes and myotomes (Edge-Hughes, 2007).

Joint mobilisations

These specific mobilisation techniques involve low-velocity passive movements within – or at – the limit of joint range of motion, and they aim to reduce pain by modulating the nervous tissues and increasing joint motion (Maitland, 2005).

Massage

Massage has been shown to reduce pain, increase pain tolerance and stimulate a release of endorphins, if regular sessions are administered (Plews-Ogan et al, 2005). Dogs that are showing symptoms of OA often love this treatment regime, because tight and sore muscles – that are over-compensating for weakness elsewhere – are addressed. Owners can be taught massage techniques to use on a daily basis as part of a home-exercising regime.

Joint range of motion

Maintenance of joint range of motion (ROM) is important in the management of osteoarthritic joints. Pain and a loss of end-range extension is a frequent finding in early OA of many canine joints (Olmstead, 1995). Physiotherapists are often best placed to detect early changes in these joints, and can commence treatment strategies in the early phase of the disease process.

Maintenance of ROM of the joint will help to ensure adequate nutrition and joint health, and reduce excess loads being placed on compensatory joints or limbs. Passive and active ROM exercises can be advised by the physiotherapist to maintain joint movement and examples of these are shown in **Figures 1** & **2**.

Strengthening supporting musculature

Appropriate exercise has been shown to improve the condition of osteoarthritic joints (Bird et al, 1998). It is believed that exercise enhances the supply of nutrients to the joint and stimulates its general maintenance. Strengthening the surrounding soft tissue structures will also reduce the load on the joint and increase its resilience. Furthermore, it has been documented that exercise can reduce the sensation of pain (Kovar et al, 1992).

Therapeutic exercises can be prescribed by the physiotherapist as part of a home exercise programme. These often target areas of poor muscle bulk and/or control, with the aim being to improve the support surrounding the affected joints. These exercises often commence with isometric exercises, where the muscles contract, but do not change in length. These are useful for weak muscles and postural muscle groups, where exercises are gentle but effective in regaining muscular control.

Progressing from these isometric exercises, the physiotherapist will advise on using concentric and eccentric exercises, where muscles contract to shorten or lengthen respectively. These require more strength and support from the muscles in question, and are often coupled with movement patterns to address balance and co-ordination concurrently. Examples of these exercises are shown in **Figures 3**, **4** & **5**.

Proprioceptive exercise

Proprioception is defined as the 'ability to sense stimuli arising within the body regarding position, motion, and equilibrium' (MedicineNet.com, 2015). Exercises to improve proprioception and neuromotor control will aid the use of arthritic joints and reduce the risk of injury to these structures. Exercises to address proprioceptive gain involve the use of different surfaces – long grass, sand, rubber mats, for example – as challenges to balance and co-ordination, together with sensory stimuli applied to the limb in question.

***Figure 5.** Exercises utilising changes of direction around cones – passive and active ROM exercises can be advised to maintain joint movement.*

Quality of life

An improvement to their dog's quality of life is often the main goal for owners who bring their dogs to therapy. Dogs are happiest when they are pain-free, able to exercise and maintain their independence. Many of the treatment modalities above will give an improvement to the animal's quality of life. Further help may be given by lifestyle modifications that are recommended by the physiotherapist.

Regular exercise

Advice may be given on how much exercise the dog should be getting. In cases of OA, regular exercise that adopts the 'little-and-often' principle may suit the dog best. Owners are advised to build up exercise gradually and to avoid long or strenuous exercise for which the dog is unprepared. It may be advisable to avoid ball throwing or exercises where the dog is encouraged to stop or turn at speed, because these activities place unnecessary strain through joints and limbs.

Home modifications

The physiotherapist may advise on the use of car ramps, raised food bowls, stair gates, non-slip flooring, bedding and the use of coats. These modifications aim to reduce the risk of injury to the dog and reduce clinical signs, whilst maintaining the dog's independence.

Weight loss

Some dogs suffering from OA will benefit from weight loss and physiotherapists can advise on appropriate exercise to aid weight reduction and build fitness.

Conclusion

Dogs with mild, moderate or severe OA can benefit from physiotherapy interventions to reduce pain, maximise their functional abilities and maintain their independence. Long-standing conditions, such as OA, are best managed by a positive approach to maximising the animal's potential for maintaining fitness and quality of life.

To find an ACPAT physiotherapist near to you, visit www.acpat.org and click on 'Find a Physio'.

Physiotherapy training

The benefits of physiotherapy are evidenced in both human and animal trials. The Chartered Society of Physiotherapy (CSP) has published evidence-based briefings pertaining to a variety of conditions – such as musculoskeletal disorders, stroke and critical care – where physiotherapy is effective.

Human physiotherapists can undertake further training at MSc or PGDip level to gain qualifications allowing them to treat animals. The Association of Chartered Physiotherapists in Animal Therapy (ACPAT) allows these chartered physiotherapists to become Category A members and use the abbreviation ACPAT Cat A after their name.

The considerable experience gained in the human field develops skills which are largely transferable to animal physiotherapy. Handling, palpation and movement assessment skills are very well developed by the time that the physiotherapist completes his or her animal training. ACPAT physiotherapists experience and specialities are diverse and, therefore, treatment programmes may be highly specialised. Many ACPAT members also continue to work in human physiotherapy alongside their animal referrals. ■

PPD Questions

1. What do the letters ACPAT stand for?
2. In a North American study, what percentage of the geriatric canine population were affected with OA?
3. What physiotherapeutic modalities can help reduce pain in animals suffering with OA?
4. What type of exercises are usually prescribed to strengthen postural muscles?
5. Give three examples of different surfaces that may enhance proprioceptive awareness

Answers

1. The Association of Chartered Physiotherapists in Animal Therapy
2. 80 per cent (Johnston 1997)
3. Thermotherapy, cryotherapy, Low-level laser therapy, TENS, joint mobilisations and massage
4. Isometric exercises
5. Long grass, sand, rubber mats

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**Suggested Personal & Professional Development (PPD)*

POISONS

Dangers of detergents

Our homes, gardens, garages and general surroundings are full of detergents of varying types, and, companion animals are at risk of exposure from many different sources of these chemicals.

It is surprising, when we stop and look around, to see just how many sources of detergent are to be found. The more common examples include:

- bubble or foam bath
- carpet shampoo
- dishwasher rinse aid (not the liquid, powder or tablets)
- fabric conditioner
- fabric washing liquid and powder
- floor cleaner
- general purpose cleaner
- hair shampoo and conditioner
- hand washing soaps (liquid and bar soaps)
- washing up liquid
- toilet freshener.

Particular problem

Detergent capsules have become more commonplace during the last few years. These unit dose items (15-32ml) are a pouch of concentrated liquid laundry detergent in a water-soluble polyvinyl alcohol membrane that can be placed directly in washing machines. In Europe, they most commonly contain anionic surfactants (20-35% per capsule), non-ionic surfactants (10-20%), propylene glycol (8-20%) and ethanol (2-5%) and have a pH of 7 to 9.

They are especially problematic because cats and dogs have a tendency to play with them – the capsules are then prone to burst and cats, in particular, will groom what is essentially a highly concentrated detergent from their fur, which can result in buccal and mucosal irritation, as well as skin issues.

Some background information

Detergents are essentially 'cleansers'; although their type, formulations and uses vary widely and there is a corresponding difference between the toxicities and risks associated with the different preparations. The formulation of a particular product will relate directly to the use for which it is intended, and the chemistry of detergents and their continuing evolution is a highly specialised and complex area.

Fortunately, from a practical view point, there are only a few specific categories of detergent exposure in animals that will present problems; and, despite their enormous chemical complexity, they can be classified into four main groups.

Anionic detergents (e.g. sodium lauryl sulphate, alkylbenzene sulphate)

These dissociate in aqueous solution to form an anion which is responsible for the surface activity. The

cation also produced in this reaction has no such properties. They are used for general cleaning, particularly in laundry and dish-washing detergents, and are effective in removing grease and stains from natural fibres, and excellent for cleaning glass. They are not used in personal hygiene products because they are too powerful and remove much oil from skin and hair.

Non-ionic detergents (e.g. polyoxyethylene alkyl ethers)

These differ from anionic and cationic surfactants in that they do not ionise easily or carry a charge. They act through hydrophilic and hydrophobic regions and produce less foam than other detergents. As such, they find use in applications where low foam is desired, such as dish-washing liquids.

They can be added to other detergents to provide greater stability, and are used in applications such as paints, adhesives, pesticides and cosmetics, where improved contact between polar and non-polar substances is required.

Cationic detergents (e.g. benzalkonium chloride)

These compounds are more problematical. They are biocides and their antiseptic properties are useful in household disinfectants and sanitisers – mouthwashes and antiseptic soaps, for example. They are also the major component of products such as patio cleaners and antiseptic/disinfectant cleaners for use in the bathroom or kitchen.

Traditional soap bars

These are based on fatty acids (from animal or vegetable sources), which are 'saponified' by reaction with alkali – there is some residual alkali in soap that may enhance irritation. This will be more marked with 'household' soaps – toilet soaps are less alkaline. Anyone who has ever had soap in their eye will know the pain and irritation associated with this type of exposure.

Anionic and non-ionic detergents are generally considered to be of low toxicity (Calandra and Fancher, 1969; Petersen, 1989; Repetto, 1996). They are irritant and the main risk following ingestion is aspiration of the foam produced during vomiting or when large volumes are ingested.

Cationic disinfectant detergents can be very irritant and, although systemic effects are uncommon, they may cause significant local irritant effects, particularly in cats (Bates and Edwards, 2015), where the grooming issue again comes into play.

Clinical effects of anionic and non-ionic detergents

With the anionic and non-ionic detergents, gastrointestinal signs can occur within a few minutes, respiratory signs within a few hours and recovery in severe cases can take several days. Dermal signs may be delayed by several hours and recovery can take up to a week or more.

The severity of effects will depend on the quantity, concentration, duration of contact and type of detergent involved. Non-ionic detergents are generally less irritating than anionic detergents (Gloxhuber, 1974). Toiletry products containing detergent products will be less irritating than detergent-containing cleaning products.

Cats appear to be much more likely than dogs to develop respiratory complications and dermal effects.

Ingestion

Detergents are irritant to the gastrointestinal tract and may cause hypersalivation, frothing/foaming at mouth, retching, vomiting (more common in dogs), diarrhoea, inappetence, abdominal discomfort and hyperthermia.

The aim of treatment of ingestion is to control and prevent vomiting to reduce the risk of aspiration and to manage clinical signs; thus emesis and gastric lavage are contraindicated owing to the risk of foam aspiration. Activated charcoal is not of benefit as these compounds do not bind to charcoal and its use is, therefore, not recommended.

It may be necessary to give an antiemetic to prevent/control vomiting and hypersalivation, and an antifoaming agent, such as simeticone, may be helpful – Infacol 40mg/ml is readily available from supermarkets and pharmacies and commonly used for babies with colic.

Further management is largely supportive through the encouragement of rehydration, if required. In dogs, limit exercise for 12 to 24 hours to prevent excitement and vomiting. If there are signs of possible aspiration of product – coughing, wheezing, for instance – auscultate the lung sounds. A baseline chest X-ray should be performed too if indicated, and any aspiration problems treated conventionally.

Dermal contact

These products can cause skin irritation, with erythema, inflammation and dermatitis. In severe cases there can be burns, alopecia (more common in cats), oedema and skin sloughing. This is seen particularly with the laundry detergent capsules, because of the high concentration of the detergent involved. If the product is not removed adequately, continued contact with the skin can lead to de-fatting complications.

The skin and fur should be rinsed thoroughly with water to ensure prompt

decontamination and a collar should be considered to prevent grooming. Any signs of irritation should be managed conventionally.

Ocular contact

Ocular contact results in irritation with subsequent conjunctival hyperaemia and, in severe cases, corneal oedema and ulceration. Again, the severity of injury depends on the concentration of the product. Non-ionic detergents are generally less irritating than anionic detergents (Grant and Schuman, 1993).

Treatment would consist of irrigating the affected eyes thoroughly with saline or water and staining with fluorescein to assess any injury. Again, treatment is otherwise symptomatic and supportive.

Clinical effects of cationic detergents

With cationic detergents, the primary effects are a consequence of their irritancy. Systemic effects are uncommon.

The onset of clinical effects is often delayed and animals can present hours later. In the experience of the Veterinary Poisons Information Service (VPIS), the mean onset of effects was approximately 11 hours. Time to recovery is variable and in VPIS cases the mean time to recovery was 4½ days (range 24 to 360 hours).

Ingestion and buccal exposure

As would be expected, common signs are hypersalivation or drooling, buccal irritation, tongue and oral ulceration, hyperthermia and inappetence. Other effects include lethargy, depression, vomiting and glossitis (swollen tongue). Sloughing of the tongue or oral mucosa may also occur.

Respiratory signs may occur with cough, respiratory distress, dyspnoea, tachypnoea, abnormal lungs sounds and shallow or laboured respiration.

Dermal exposure

Following skin exposure, there may be erythema, inflammation, ulceration, hair loss and contact dermatitis. Concentrated solutions may cause chemical burns and paw oedema may occur.

Ocular exposure

Ocular exposure will lead to irritation and inflammation with conjunctivitis, blepharospasm and the risk of burns, particularly with concentrated solutions.

The prognosis of cases involving cationic detergents is generally good (Bates and Edwards, 2015).

Treatment should be as prompt as possible, and include decontamination and supportive care. With decontamination, emesis is best avoided because these products are usually foamy and there is a risk of foam aspiration if vomiting occurs.

The animal should be thoroughly washed and then 'collared' to limit self-grooming and further ingestion of the agent, often benzalkonium chloride. If there is suspected ocular exposure, the eyes should be irrigated and then stained with fluorescein to assess for injury.

Supportive care measures should include administration of atropine for hypersalivation, rehydration and gastro-protectants – H2 blockers, sucralfate and a bland diet are recommended. Analgesia should be given as required, as the animal may be experiencing severe pain. Syringe or nasogastric feeding may be necessary in severe cases, and endoscopic evaluation of injury to the gastrointestinal tract may be required in animals with severe gastrointestinal signs. ■

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AT VETERINARY SYSTEMS

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Nursing the equine colic patient

Colic is a serious disorder that is encountered relatively often in equine practice. Along with the correct diagnosis and treatment, specialist nursing care is required to give patients the best chance of recovery. The registered veterinary nurse (RVN) caring for these patients must have a good knowledge of equine behaviour, the anatomy of the gastrointestinal (GI) tract and of the presenting condition.

The term colic refers to abdominal pain and is not a specific diagnosis. **Table 1** displays the various causes of colic in the horse. Initial assessment aims to separate the alimentary causes from the non-alimentary causes (Slater and Knowles, 2012).

Most colics occur as a consequence of alimentary disease and the majority (approximately 90 per cent) do not require surgery. These are called medical colics and they require only medical management. Clinical signs for medical colics tend to be – but are not always – less severe than those for surgical colics (Slater and Knowles, 2012).

Medical colic cases

Hospitalised horses are at particular risk of developing colic and should be monitored very carefully even if they have been admitted for an unrelated disorder. It is very important that the RVN takes details of the current diet from the owner, as dramatic changes in feeding can cause an impaction colic to occur.

Horses that are on 'box rest' are also at risk of developing an impaction colic, as a result of decreased gut motility; and those that have undergone a general anaesthetic for orthopaedic surgery present a particularly high risk of developing a caecal impaction (Barr and Jones, 2012).

With any medical colic, the horse should not be allowed to become too violent in its movements or to roll frequently because this may result in injury to both the horse and its handlers (Slater and Knowles, 2012).

Spasmodic colic

Spasmodic colic is the most common type of medical colic. The pain is the result of intestinal spasm, so horses have intermittent bouts of moderate to severe pain and yet are often normal or quiet between episodes.

Treatment includes the administration of analgesics and spasmolytics and diet should be restricted – the

Table 1. Causes of colic in the horse (Slater and Knowles, 2012)

Alimentary tract	Non-alimentary tract	Conditions resembling colic
Spasmodic colic	Peritoneal pain (peritonitis, abdominal abscess)	Myopathies (rhabdomyolysis)
Tympanic colic	Liver disease (ragwort poisoning, cholelithiasis)	Laminitis
Colonic impactions	Urinary (renal calculi, pyelonephritis, bladder calculi)	Other orthopaedic conditions (e.g. bilateral flexor tendon rupture)
Small intestinal obstruction (e.g. torsion, herniation, intussusception, pedunculated lipoma)		
Large intestinal obstruction (e.g. torsion, displacement, entrapment)		
Gastroduodenal ulcers and neoplasia		
Grass sickness		
Proximal enteritis		
Other causes of severe enteritis (e.g. *Salmonella*)		

**Suggested Personal & Professional Development (PPD)*

COLIC

patient being fed bran mashes, grass and hay only for 24 hours (Slater and Knowles, 2012). These cases are rarely admitted into an equine hospital and are usually resolved in the yard.

Tympanic/flatulent colic

This type of colic is caused by gut distension with gas – usually in the caecum and colon – following feeding on highly fermentable feeds. Pain is intermittent to moderate, becoming more severe and continuous (Slater and Knowles, 2012) and treatment is the same as for spasmodic colic.

These patients often benefit from a ride in a trailer/horsebox as this often stimulates elimination of the built-up gas from the GI tract, such that the colic has resolved once they arrive at the hospital.

Colonic impactions

Patients with colonic impactions are more commonly admitted into the hospital for treatment and nursing care. The impactions usually occur at the pelvic flexure and are predisposed by situations that result in decreased gut motility, such as:

- decreased water intake – a frozen water trough, for example eating bedding or sand
- diet change when the horse is stabled for the winter
- poor dentition
- inactivity – box rest, for example parasitism.

The pain is progressive, initially vague and intermittent, becoming mild/moderate and continuous. Horses lie quietly, occasionally roll and become more active as the gut distends (**Figure 1**). Faecal production is commonly reduced (Slater and Knowles, 2012).

Treatment includes:

- analgesics
- turning the horse out or lungeing to promote gut activity and relieve the impaction
- restriction of further feed intake
- intravenous (IV) and oral fluids
- stomach tubing with laxatives, such as paraffin or Epsom salts.

The RVN should monitor these patients on a regular basis in order to ensure that any complications or deterioration is identified and treated in a timely manner. The important clinical factors to assess and monitor for colic patients are set out in **Table 2**.

Auscultation of the equine abdomen

To auscultate the abdomen, the stethoscope is placed on the four major sites that include the left and right lower and upper paralumbar regions (**Figure 2**). Borborygmi give an indication of the status of the GI system.

The sounds should be heard in all four quadrants and will be more frequent on the left side, where most of the large colon is located. The right upper quadrant is dominated by sounds from the caecum, which makes gentle mixing sounds interspersed about every two minutes by a sound similar to a flushing toilet.

Quiet borborygmi may be indicative of decreased motility, abdominal pain or abdominal disease; whereas very active borborygmi may be indicative of pending diarrhoea or spasmodic type abdominal pain. (Rowe et al, 2008; Snalune and Paton, 2012)

Most colonic impactions can be treated successfully with medical interventions. However, a small number can require surgical intervention.

Surgical colic cases

Table 3 shows the different types of surgical colic encountered in equine patients. Information that will be useful from a nursing perspective can be gleaned from the case veterinary surgeon, including findings on rectal examination, abdominal ultrasonography and paracentesis (Boys Smith and Millar, 2012).

Colic surgery preparation

RVNs play a significant role in the preparation of equine colic patients for surgery.

The horse should be weighed or its weight estimated and the shoes should be removed, if it is safe to do so. This will help to prevent damage to the horse, operatives and the 'knock-down' box.

An (IV) catheter should be placed in either the left or the right jugular vein using sterile techniques (**Figure 3**) and broad-spectrum antibiotics should be administered.

If the horse is severely dehydrated, pre-operative treatment with hypertonic saline may be required.

While the horse is sedated, a stomach tube should be passed and attempts made to decompress the stomach from fluid and gas. This tube is often left in place during the surgery. The mouth must be thoroughly rinsed out to enable clear passage of the endotracheal (ET) tube.

If time permits, the horse should be brushed and the ventral abdomen clipped to decrease the preparation time once anaesthesia has been induced (Boys Smith and Millar, 2012).

Postoperative care

Following recovery from anaesthesia, the horse requires intensive medical therapy and very close, regular monitoring in order to identify complications early on. Any case can develop complications and all require a dedicated team of vets and nurses – often working anti-social hours – to care for them properly (Boys Smith and Millar, 2012).

Critical care monitoring (24-hour commitment)

Record sheets are essential in systematically recording the physical and laboratory data

***Figure 1**. Horses with colonic impactions lie quietly, occasionally roll and become more active as the gut distends.*

***Figure 2**. To auscultate the abdomen, the stethoscope is placed on the four major sites that include the left and right lower and upper paralumbar regions.*

***Figure 3**. IV catheters should be placed using sterile techniques in either the left or the right jugular vein.*

Table 2. The most important clinical factors to consider when investigating a horse with colic (Boys Smith and Millar, 2012)

Clinical factor	Clinical significance
Pain attitude and response to medication	A horse that continues to be in pain despite adequate analgesia requires further investigation. A sudden reduction in pain observed with depression, a rapid increase in heart rate and profound sweating may indicate intestinal rupture
Heart rate (HR)	Mainly influenced by hypovolaemia and endotoxaemia. Pain has a small, direct effect on HR, which varies during the course of the disease. Generally, the higher the HR, the more serious the disease: ■ <40 beats per minute (bpm): very mild disease ■ 40-60 bpm: mild to moderate disease ■ 60-80 bpm: moderate (be concerned) ■ >80 bpm: serious
Respiratory rate (RR)	The RR increases and the breaths become shallower with an increase in disease severity. The RR is also increased by excitement, metabolic acidosis and pain. Respiratory embarrassment can also occur with severe abdominal distension
Rectal temperature	Generally not affected by the degree of pain. Often increased by infection (e.g. *Salmonella*, peritonitis, anterior enteritis) and can be decreased with advanced ischaemic conditions
Mucous membrane colour	Varies with hydration and physiological status: ■ pale: simple dehydration ■ congested/hyperaemic (vasodilation): endotoxic ■ cyanotic (vasoconstriction): advanced endotoxic shock
Capillary refill time	A measure of perfusion, determined by how long it takes for a depression in mucous membrane to return to normal colour. normal: 1-2 secs mild to moderate dehydration: 3-4 secs severe dehydration: 5-6 secs
Systemic haematology: packed cell volume (PCV), total protein (TP), lactate biochemistry	PCV and TP are important factors in measuring the hydration status but also give information regarding prognosis. Both are increased by dehydration and PCV is influenced by splenic contraction. TP can also be increased during chronic inflammation. Intestinal hypoperfusion increases lactate levels owing to anaerobic metabolism. ■ mild dehydration (6%): 43-50 PCV (%): 80-82 TP (g/l) ■ moderate dehydration (8%): 50-55 PCV (%): 83-90 TP (g/l) ■ severe dehydration (10%): >55 PCV (%): >90 TP (g/l)
Hydration status	Skin tenting is a crude indication of hydration status and varies with age
Abdominal auscultation (gut sounds)	All four quadrants should be auscultated. Normal or increased sounds are a good sign. Persistently decreased or absent sounds are a poor sign
Abdominal distension	Gross abdominal distension is sometimes evident when the intestine, particularly the large intestine, is distended
Appetite, thirst, faecal and urine output	A normal appetite, thirst, faecal and urine output are all good signs. Appetite and faecal output are often the first two signs that a complication is developing
Results of nasogastric intubation	Obtaining more than 2-3 litres of nasogastric reflux indicates either an obstructive or functional obstruction of the small intestine. Surgery is commonly required

collected at each examination. The RVN should monitor the following parameters in the postoperative colic patient (Boys Smith and Millar, 2012):

- evidence of pain – obvious or subtle (abdominal guarding, for example, temperature, pulse and respiration
- PCV, TP and blood lactate levels
- circulating white blood cell count
- defaecation – amount, consistency and frequency
- urination – volume, colour and frequency
- presence of gut sounds
- appearance and integrity of surgical wound – oedema, discharge or breakdown
- nasogastric intubation – checking for reflux
- abdominal distension
- ability to ambulate and general demeanour
- heat and digital pulses in the feet.

All treatments must be recorded, including the amount of fluids administered. The frequency of checks is decided by the case veterinary surgeon. Normally a horse recovering from colic surgery would benefit from critical care checks every two to three hours until its condition stabilises and improves (Boys Smith and Millar, 2012).

IV catheter care

Catheter care is of the utmost importance in enabling efficient fluid therapy, drug administration and intravenous access in an emergency.

Patients suffering from a condition that causes a hypercoagulable state – such as endotoxaemia or large intestinal disease – are more likely to develop thrombophlebitis (Dolente et al, 2005). Thrombophlebitis is one of the most frequently reported catheter site complications in horses and is recognised as thickening within or around the vein, pain, discomfort, heat and swelling at the catheter site (Geraghty et al, 2009).

Meticulous care of IV catheters is essential and daily monitoring includes (Boys Smith and Millar, 2012):

- checking vein patency
- observing for heat, pain, swelling or exudate
- checking catheter patency
- flushing the catheter with heparinised saline at least every six hours (**Figure 4**)
- checking for leaks, clots,

Table 3. Types of colic seen in equine patients (Boys Smith and Millar, 2012)

Area of GI affected	Simple lesion	Strangulating lesion
Stomach	Impaction, pyloric stenosis	
Small intestine	Non-strangulating lipoma, hernia, impaction, intussusception, stenosis, adhesions, neoplasia, abdominal abscess, equine grass sickness, muscular hypertrophy of the ileum	Strangulating pedunculated lipoma, volvulus, internal hernia (epiploic foramen, gastrosplenic, mesenteric/omental/broad ligament defect, diaphragmatic), external hernia
Large intestine	Impaction, enteroliths, left dorsal displacement (nephrosplenic entrapment), right dorsal displacement, <270° colon torsion	Colon torsion (>270°), intussusception (caeco-colic), hernia
Caecum	Impaction, infarction	Intussusception, hernia
Small colon	Impaction	Strangulating lipoma, mesocolonic tear/rupture, hernia

missing sutures, damage to – or kinking of – the catheter
- wiping the catheter cap with surgical spirit prior to any injections
- changing the injection cap every 24 hours
- changing giving sets and extension sets if damaged or contaminated
- changing protective bandage/dressing every 24 hours
- removing the catheter if any adverse signs are identified.

If a jugular vein is showing signs of thrombophlebitis, it must no longer be used – so the lateral thoracic vein is the next choice for catheter placement. Jugular veins can be monitored with ultrasound to help identify the early signs of thrombus and thrombophlebitis (Rippingale and Fisk, 2013). RVNs can carry out these ultrasound examinations.

Fluid therapy

As most postoperative colic patients require limited oral fluid intake, the initial daily fluid requirement must come from intravenous fluid administration. The total volume and rate of fluids administered to the patient must be documented accurately by the RVN.

Daily serum electrolyte tests may indicate the need for supplementation. Adjustments to fluid rates should coincide with the progress of the patient and haematology findings (Boys Smith and Millar, 2012).

Medication

Medication is essential in preventing and treating postoperative complications uniquely associated with the critically ill colic patient. It is usually commenced before surgery.

Non-steroidal anti-inflammatory drugs (NSAIDs) – most commonly flunixin meglumide and phenylbutazone – are used frequently in the management of postoperative surgical colic patients. They are administered in small doses to reduce the effects of endotoxaemia, provide analgesia, reduce inflammation and to prevent the depressive effects of endotoxins on gut motility.

The RVN must monitor signs of pain in the postoperative surgical colic patient and update the case veterinary surgeon regularly on progress (Boys Smith and Millar, 2012).

When antimicrobial therapy is employed, the RVN should ensure that an accurate weight and dose rate is obtained for the patient. Injections of – or a combination of – aminoglycosides, penicillins and cephalosporins are most commonly used. Metronidazole is used to treat suspected anaerobic infections.

Other specialist medication includes pro-kinetic drugs, such as lidocaine, metoclopramide and erythromycin, to help stimulate gut movement; together with anti-endotoxic therapy, such as plasma and polymixin B. Anti-thrombotic drugs, such as heparin and aspirin, are also administered, and amounts and frequency of dosing must be recorded by the RVN (Boys Smith and Millar, 2012).

Abdominal support bandage ('belly band')

A 'belly band' can be applied to support an abdominal wound. The RVN should change the belly band twice daily and more often if there is a copious amount

***Figure 4**. IV catheters should be flushed with heparinised saline at least every six hours.*

***Figure 5**. Daily grooming can significantly improve the demeanour of an equine colic patient.*

of drainage. Care should be taken in geldings/stallions that urine does not contaminate the belly band and, therefore, the abdominal wound (Boys Smith and Millar, 2012).

General nursing duties

Some simple procedures carried out by the RVN can significantly improve the demeanour of an equine colic patient (Boys Smith and Millar, 2012). These include:

- daily grooming (**Figure 5**)
- periodic rinsing out of the mouth with fresh water (flavoured with mints) if the horse is being starved for any length of time
- walking out to encourage interest in surroundings
- use of rugs, sheets and heat lamps to help retain body heat
- provision of a clean, deep-bedded, well-ventilated stable at all times
- provision of plenty of TLC (**Figure 6**).

Dedicated equine nursing opportunities

Monitoring and treating equine colic patients requires specialist knowledge and skills. The RVN must be able to identify complications early on and instigate treatment to prevent patient deterioration.

Although nursing the equine colic patient is a serious commitment, it is also an incredibly rewarding process. Knowledge and skills gained during this process can be used to enhance care and recovery for future patients.

RVNs who wish to develop their careers along the equine pathway will benefit from the special nurse membership of the British Equine Veterinary Association (BEVA), which is available to all veterinary nurses with an interest in equine practice. It includes:

- subscription to Equine Veterinary Education (EVE) and the option of including the Equine Veterinary Journal (EVJ)
- exclusive online access to all back issues of EVE, including full use of the EVE App
- member rates for all BEVA CPD courses, meetings and its annual congress
- access to the BEVA Member's area in order to access journals, latest news and register for CPD
- practice portfolio items providing relevant, important and current information
- access to all BEVA webinars and the BEVA Apps available for both iPhone and Android
- 10% discount at the EVJ bookshop
- receipt of the fortnightly BEVA E-News and biannual newsletter.

The Royal College of Veterinary Surgeons (RCVS) can offer guidance on colleges that offer courses in equine nursing and a list of equine nurse training practices. ■

Figure 6. *TLC is an important component of nursing care for colic patients.*

PPD Questions

1. Why are horses on box rest more likely to develop an impaction colic?
2. Where in the GI tract is an impaction colic most likely to occur?
3. What do very active borborygmi (gut sounds) indicate?
4. Name three clinical signs of thrombophlebitis
5. Name three simple nursing procedures that can significantly improve the demeanour of an equine colic patient

Answers

1. Box rest causes a decrease in intestinal motility in horses
2. At the pelvic flexure
3. Pending diarrhoea or spasmodic type abdominal pain
4. Thickening within or around the vein, pain, discomfort, heat and swelling at the catheter site
5. Daily grooming; periodic rinsing out the mouth with fresh water (flavoured with mints); walking out to encourage interest in surroundings; use of rugs, sheets and heat lamps to help to retain body heat; provision of a clean deep-bedded, well-ventilated stable; plenty of TLC

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Wendy worked in the equine and veterinary industries before graduating as a veterinary surgeon from Massey University in 1990. Employment in various roles (including veterinary nursing and lecturing) led to an interest in education and she gained a Graduate Diploma with an endorsement in distance education in 2008. This was followed by a Masters in Equine Science from Aberystwyth University in 2010.

Wendy's major interests include equine behaviour and education within the animal industry, and she currently divides her time between freelance work within these fields and writing fiction and non-fiction.

**Suggested Personal & Professional Development (PPD)*

EQUINE STRESS

Eustress versus distress – is there a difference and does it matter?

Veterinary surgeons and registered veterinary nurses (RVNs) are in the unparalleled position of being licensed legally to engage in procedures that cause pain and stress, on the assumption that any such procedures will ultimately benefit patient health. However, these actions can also cause adverse physical and mental stress, without an animal having the option of giving 'informed consent' (Väätäjä & Pesonen, 2013).

Increasing emphasis is being placed on how stress affects animal welfare, but there is limited research on specific signs and long-term effects. Although there is a legal requirement to protect animals from 'suffering' (Crown, 2006), difficulties arise in distinguishing between 'good' and 'bad' stress, particularly in horses, meaning that stress can compromise welfare.

What is stress?

'Stress' is a commonly used term with no agreed definition. It has the popular connotation of being 'bad', and something to be avoided. However, it is readily acknowledged that stress has both positive and negative effects, and that a lack of stress can be equally as damaging (by reducing coping) as excess. Stress, therefore, can be regarded as a continuum, producing varying effects on welfare (**Figure 1**) and the terminology for different types of stress varies (**Table 1**). The convention adopted in this article is subdivision into 'eustress' and 'distress'.

Eustress

Eustress is 'good' stress, with either beneficial or harmless effects. The stressors are usually acute (seconds to hours) and the horse is able to cope or adapt, resulting in a return to normal state within a short period of time (**Table 2**).

***Figure 1**. Stress represented as a continuum, indicating harmful extremes.*

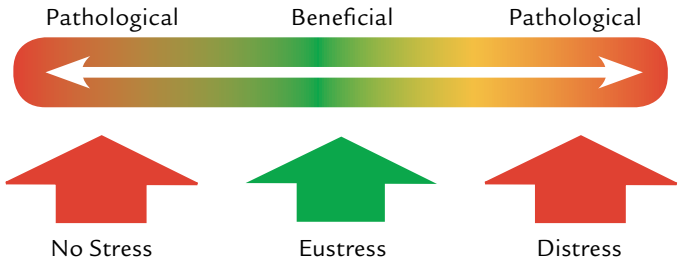


Table 1. A sample of variations used in stress terminology

Term	Description
No stress/under-stressed	Insufficient arousal or stimulation to meet needs or motivations (e.g. captive equids)
Physiological/neutral stress	Response neither harmful nor beneficial – animal adapts
Eustress	■ disturbs equilibrium, but harmless ■ challenging but not threatening; disturbs homeostasis but benefits the animal ■ pleasant stressors that animal wants, but includes addiction
Overstress	Medium level, between eustress and distress (e.g. anxiety)
Distress	■ failure to cope, resulting in mental and/or physical damage ■ may refer to a stressful period while the animal is adapting (e.g. anxiety) ■ may be reserved for pathological stress only
Pathological stress	Stress that results in pathological changes
Distress	Welfare issue, either under- or over-stimulated – sometimes used to refer to physical stress, with distress reserved for use with mental stress

Table 2. Examples of stressors that can be beneficial or harmless = 'eustress'

Stressor	Reference
Exercise (which would include play)	NRC, 2008; Dhabhar, 2008
Learning; novelty; sex; pleasure; gratification; uncertainty	Clark et al, 1997
Anticipation of competition; competition; transport	Peeters et al, 2013
Arousal; excitement; anxiety; fear	McVicar, 2003
Short-term restraint or confinement	Dhabhar, 2008
Adaptive activities that trigger stress responses (e.g. fear, struggling, diarrhoea, defensive aggression)	Bayne, 2000

Distress

On the other hand, distress is considered to be 'bad' stress, with temporary or permanent effects on welfare. The horse is unable to cope or adapt, but may return to normal after the stress has been removed.

Experiencing stress is a natural part of existence that prepares a horse for challenges, and enhances memory for future reference. Animals have evolved to cope with both pleasant and aversive stressors occurring in the environment (NRC, 2008) and aversive stimuli (the approach of predators, for example) are considered essential for long-term adaptation and survival (Clark et al, 1997).

As well as normal environmental challenges, animals (and humans) will actively seek 'eustress' (such as 'play', for example) to obtain an emotional reward (Moberg, 2000).

Physiological pathways and effects

Stress triggers various systems within the body, including the fight/flight response and mobilisation of reserves (**Figure 2**).

In eustress, the response is short-acting, either because the stressor ends quickly, or because the horse adapts.

However, chronic stress results in a prolonged change in the hypothalamo-pituitary-adrenal (HPA) axis output and hypersecretion of cortisol (NRC, 2008), as well as long-term effects on other hormones and the immune system (Moberg, 2000).

The interactions involved in the stress responses are complex, and not fully understood, but this complexity means there are no universal behavioural or physical changes that apply to all stressors and all individuals (NRC, 2008).

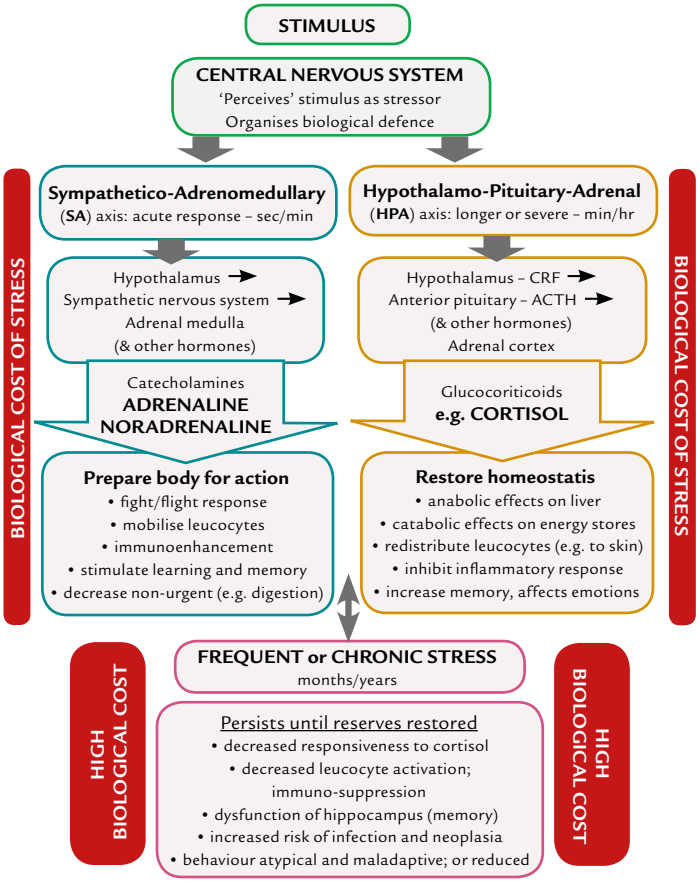
Identifying distress

Various physiological and behavioural parameters are used to measure stress in horses. Physiological changes may be clinical or subclinical, and behavioural changes may be overt or subtle – self-mutilation versus learned helplessness, for instance. Actual diagnosis can be difficult even in humans (McVicar, 2003), and although the *cause* of stress is often recognised in horses – during transport or weaning, for instance – its magnitude and long-term effects are more difficult to define.

Other problems include (**Table 3**):

- the degree of stress, and distress threshold, varies between individuals and parameters do not directly correlate with the actual effect on welfare (Clark et al, 1997)
- in horses, the signs are not specific for eustress or distress – cortisol and heart rate can be the same for mating as for psychological stress (Schmidt et al, 2010), while behavioural signs do not always correlate with physiological ones (Mendonça, 2014)
- any interpretations of behaviour are subjective – movement may be the consequence of nervousness, exploration, or locomotion, with a mixture of motivations at the time (Rushen, 2000)
- the impact from the animal's point of view is unknown (Bayne, 2000).

***Figure 2**. Simplified representation of stress pathways and effects*.*



** CRF = Corticotropin-releasing factor; ACTH = Adrenocorticotropic hormone.*
Adapted from: Clark et al, 1997; Moberg, 2000; Dhabhar, 2008; NRC, 2008; Stern, 2011.

Despite these issues, it is important for veterinary professionals to evaluate stress in horses. A combination of behavioural and physiological parameters is considered the most accurate method of identifying distress (NRC, 2008); however, behavioural evaluation is likely to be the primary indicator for many veterinary situations.

Behavioural signs may include (but are not limited to):

- increased or decreased normal activity – vigilance, movement
- absence of normal socialisation – withdrawal
- aggression, particularly defensive – threats to personnel
- atypical, maladaptive behaviour – self-mutilation.

Table 3. Advantages and disadvantages of some parameters

Parameter	Advantages	Disadvantages	Main reference
Cortisol	■ recognised measure for the HPA axis ■ salivary and faecal samples non-invasive	■ can have stress without activating HPA ■ sampling can be a stressor ■ stress levels can = diurnal peaks	NRC, 2008
		■ salivary cortisol in horses increases with competition and anticipation ■ variation with age/gender and health	Peeters et al, 2013
Adrenaline Noradrenaline	Indicates activation of the SA system	■ difficult to measure ■ exercise can cause same levels as aversive stressors (ditto for cortisol)	NRC, 2008
Heart rate variability (HRV)	■ non-invasive ■ balance of sympathetic vs parasympathetic systems	Doesn't distinguish aversive from positive stressors	Mengoli et al, 2014
		In horses, can't distinguish physical activity from other stress	Schmidt et al, 2010
Other hormones (e.g. reproductive)	Parameters change with stress	Variations occur with normal patterns and physiology anyway	NRC, 2008
Immune response	Parameters change with stress	Need more research to identify 'distress'	Moberg, 2008
Behavioural signs	Least invasive	■ multiple causes and multiple behaviours (including subtle) ■ subjective interpretation	Bayne, 2000
	Some are indicative of stress (e.g. avoidance, vigilance)	But not limited to distress in horses	Mengoli et al, 2014
Other (e.g. eye position, thermography)	Correlation between physiological and behavioural parameters in horses	But research identifies stressors (change in equilibrium) without distinguishing eustress from distress	Various
Bioacoustics – vocalisations	In horses, suggests differences in positive (eustress) and negative (distress) stress (Pond et al, 2010)	■ can decrease with chronic stress ■ over-simplified (Rushen, 2000) ■ individual variation in horses (Le Blanc, 2013)	

Although stereotypy is considered to be caused by stress (or its lack), stereotypic behaviour can be regarded as a means of coping (Cooper and McGreevy, 2007). It is not, therefore, necessarily an indicator of *current* distress.

Accuracy is enhanced by expertise, knowledge of the individual (Bayne, 2000) and a team approach to monitoring (Väätäjä and Pesonen, 2013), suggesting that input from all staff, as well as the owner, is needed. Critical anthropomorphism may also be of value, in that situations stressful to humans are presumed stressful to animals (NRC, 2008). In addition, it must be remembered that evolution favours 'dishonest' behavioural signs in prey species – not reflecting their actual needs and internal state (Rushen, 2000). Communication is more likely to be 'honest' between genetic relatives or similar (*ibid*); therefore, signs may be less reliable in horses separated from herd mates such as when hospitalised, for instance.

Considerations for practice

Poor associations with humans can lead to life-long consequences; and aversive handling (even lasting only seconds) correlates strongly with fear in livestock (Hemsworth, 2000). Therefore, reducing or mitigating stress is crucial.

Particular care needs to be taken with breeding stock, and the impact of human interaction on foals is often underestimated (Mendonça, 2014). Positive and negative experiences change the ability of young animals to cope with stress as adults (Clark et al, 1997), and chronic stress in early life changes hippocampal function, affecting memory into adulthood (Stern, 2011). Even prenatal stress can cause permanent changes in the physiology of the HPA axis, thereby increasing sensitivity to pain (Lay, 2000).

Novel environments or equipment cause wide individual behavioural variation but are common during veterinary treatment. The perception that something is unsafe, regardless of reality, can result from (Clark et al, 1997):

- lack of information – entering an X-ray room
- excessive stimuli – additional activity or noise
- motivational factors – restricted movement
- lack of enrichment – horse on box rest.

Mendonça (2014) found that, in cognition and memory tests, horses needed a period of adaptation (minutes) to novel stimuli before they demonstrated coping behaviour, and allowing this (where possible) could increase a horse's perception of safety.

History-taking gives useful indicators to both existing and potential stressors – a home-bred horse never transported before, for example – and identification of horses with poor coping skills (in-clinic and at home) ensures ongoing monitoring. In this respect, many medical sheets have little room for behavioural notes but providing written strategies and reviewing cases ensures case continuity as well as reducing legal challenges.

Poor husbandry can cause greater stress than pain (Wolfie, 2000), so holistic advice to owners could improve welfare, as well as the clinic-client relationship. Skilled handling decreases stress and increases safety (Väätäjä and Pesonen, 2013) and can be achieved by training owners if necessary, 'upskilling' staff, and rehearsing infrequent procedures such as 'slinging', for example.

Social interaction is a crucial factor too in stress, and for many species the time spent vigilant is inversely proportional to the size of the social group (Rushen, 2000). Therefore, compatibility and the number of companions should be considered for horses 'in-clinic' or on 'box rest'.

For horses of all ages, minimising the overall stress load or separating out stressors allows reserves to replenish (Moberg, 2000). So resting after transportation, if possible, is an easy example.

Unavoidable stress

Coping ability is increased if unavoidable stress is predictable (NRC, 2008), so simple measures such as ensuring consistent injection or visit times could increase coping in horses. Having a sense of control and/or performing consummatory behaviour also mitigates stress (Clark et al, 1997) – for example, walking circles for a horse anxious to move (if conditions permit) may help.

Alternative rewards following unavoidable aversive stimuli can help some individuals, and positive reinforcement is also useful for any novel stimuli (Väätäjä and Pesonen, 2013). Examples could include allogrooming and treats.

Unlike pain-related stress, psychological stress is not readily ameliorated by drugs (Wolfie, 2000). Neuroleptics and herbal 'calmers' can decrease reflexes, learning and memory, but synthetic equine appeasing pheromone, a semiochemical produced by post-partum mares, may decrease stress and increase coping (Mendonça, 2014). However, whether or not this mitigates stress during veterinary treatment is unknown and, as with other species, pheromone effects vary between individuals. Horses have complex social responses to reduce stress following conflict, involving both aggressor-victim reconciliation and consolation of the victim by a third party, via either contact or even just proximity (Cozzi et al, 2010). Whether reconciliatory or consolatory efforts and proximity by humans would have the same effect in a veterinary situation is unknown, although horses may seek a familiar person when in pain (Gleerup et al, 2015).

Hemsworth (2000) found that brief periods of positive handling decreased fear in livestock, while only five minutes of interaction per week significantly reduced stress in research mammals (Wolfie, 2000). Allogrooming by humans decreases heart rate and stress in horses (Le Blanc, 2013); therefore, although vets have limited time, factoring in short periods of positive interaction before and after treatment could give long-term benefits.

Owners

Clients can be emotional and their perception of their horse's stress links to their perception of the quality of treatment and skill of the veterinary professional staff. This can have financial implications for the clinic, as well as adding to stress for all the clinic staff – the receptionist dealing with the client who does not want *that* vet again, for instance.

In reality, veterinary nursing and reception staff are invaluable for educating owners on stress-effects in horses; as well as limiting owner stress, which in turn reduces both staff and horse stress.

Why it matters

Although it is not possible definitively to identify distress in every horse, significant benefits can be had from addressing stress as a specific part of each clinical case. As well as a legal requirement

to alleviate suffering – and a professional desire to do so – promoting eustress and minimising distress has benefits for the horse in terms of health and welfare, staff in terms of stress and safety, and the clinic in terms of finances and reputation.

Acute stress in humans can also have other benefits; such as improving wound healing (via leucocyte infiltration) and acting as an adjuvant to vaccination, giving immuno-enhancement lasting for months (Dhabhar, 2008). It is not unreasonable, therefore, to suggest that in equine practice an anxious horse may sometimes benefit more than a very placid one.

Distress occurs when an animal (or human) cannot respond or adapt to the stress, and is more likely to occur if stressors are intense, frequent, or chronic (months to years) (NRC, 2008). Adverse effects include dysfunction of metabolism and the immune system – delayed healing, increased infections and neoplasia, exacerbation of allergies (Dhabhar, 2008), as well as altering blood results which affects diagnosis (Wolfie, 2000).

However, variation means that an individual horse may not experience 'distress' even in chronic adverse conditions, while another is distressed by relatively minor circumstances. An individual's 'eustress-distress threshold' is affected by the intensity and duration of the stressor; as well as variations based on age, genetics, past experiences, and social relationships (Moberg, 2000).

In addition, stressors do not need to be tangible – psychological stressors may even have a greater effect on horses than physical stressors (Peeters et al, 2003) and the perception of stress can be more significant than the reality. In evolutionary terms, this prepares the animal for threats, by triggering an immuno-preparatory response (Dhabhar, 2008), but it can also result in distress if the horse does not/cannot adapt. ■

PPD Questions

1. Which one of the following statements is true?

A. Acute stress initially causes immunosuppression
B. Chronic stress acts to mobilise energy reserves
C. The HPA axis triggers the flight/fight response
D. Adrenaline release is triggered by the SA axis

2. List three possible long-term negative effects of pre- or postnatal stress in foals

3. The 'eustress-distress threshold' in an individual horse is best assessed via:

A. Behavioural changes
B. Heart-rate variability
C. Salivary cortisol levels
D. Presence of stereotypy

4. Coping with unavoidable stress is enhanced if the timing of treatment is:

A. Random, to prevent the horse becoming anxious
B. Consistent, so the horse can anticipate and predict it
C. Performed slightly earlier each day, to avoid anticipation
D. Given at variable intervals, to reduce long-term associations

Answers
1. D
2. Impaired memory, reduced coping ability, increased pain sensitivity
3. A
4. B

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Ram preparation and fertility testing

Rams represent a huge cost to the sheep enterprise and this is sometimes forgotten. In 2014, the average price at Kelso ram sales – the biggest one-day ram sale in the world – was £684.17 (*Farmers Weekly*, 2014). Rams sold fat are typically worth £50-£90. Depending on the working life span of up to four years, a ram will depreciate by between £150 and £500 per year. Add to this the cost of a year's keep, feed costs, vaccinations, parasite treatments and losses, and rams become a costly investment.

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Jenny graduated from the Royal Veterinary College, London, in 2007 and joined Alnorthumbria Vet Practice where she has remained ever since. Based at the Rothbury branch as a 'farm vet', Jenny works with both intensive lowland herds and flocks and extensive hill farms amongst Northumberland National Parks remote heather and rocks. Clinical interests include flock and beef herd health planning. At home, Jenny spends her time with her flock of pedigree Zwartbles.

A ram that is put out with 40 ewes and is culled after one year will cost £11.40 per lamb produced (**Table 1**). In order to minimise cost and maximise production – and, therefore, profit – ram health and performance needs to be optimised.

For 10 months of the year, rams lie around doing very little; but for two months of the year, they need to be fertile, virile athletes at the top of their physical performance and at peak fertility. Despite their 'sabbatical', ram health should not be ignored and a proactive approach to management should be adopted – a key role for the veterinary surgeon.

All too often, rams are forgotten about until the week before tupping, which is too late. Written into the flock health plan should be planning and preparation of rams, starting 10 weeks before tupping. For 1 April lambing, rams will go in around the 5 November, so preparation should begin around the end of August.

Newly purchased rams

Newly purchased rams should be bought in plenty of time to allow a three-week quarantine period. Sustainable Control of Parasites in Sheep (SCOPS) guidelines state that quarantine worming should consist of either monepantel (Zolvix, Elanco Animal Health) and moxidectin (Cydectin, Zoetis UK) or deraquantel and abamectin (Startect, Zoetis UK) with animals subsequently held on a concrete yard for 48 hours (SCOPS, 2013).

Table 1. Cost per lamb evaluation

	Number of ewes put to the tup (lambing at 150%)			
Life span	40	60	80	100
1	£11.40	£7.60	£5.70	£4.56
2	£5.70	£3.80	£2.85	£2.28
3	£3.80	£2.53	£1.90	£1.52
4	£2.85	£1.90	£1.43	£1.14

Figure 1. *Over-fed newly purchased ram in poor condition after tupping.*

Figure 2. *Ram in good condition.*

As incoming animals should also receive treatment for sheep scab, where an injectable 3-ML product is used for this purpose, this fulfils part of the quarantine worming protocol. Further to this, rams should be treated for liver fluke, and have their feet thoroughly examined, particularly for signs of contagious ovine digital dermatitis (CODD).

The discussion of problems associated with the trend towards the sale of over-fat rams such as shorter life span, reduced bone density, increased joint deformities, urolithiasis and increased scrotal fat leading to reduced fertility, is beyond the scope of this article (**Figure 1**). We must encourage farmers to buy fit-for-purpose rams that will work longer and be able to serve more ewes, based on estimated breeding values (EBVs).

Feet

Examination of feet should begin at the end of August so that any problems can be treated or corrected and rams have time to become sound before tupping. Use of vaccination (Footvax, MSD Animal Health) should be considered to reduce lameness caused by foot rot and administered at least six weeks prior to tupping. Culling of chronically lame rams and rams with poor foot conformation is strongly advised in order to avoid propagation of poor foot health and to maximise the potential number of services.

Body condition

Rams should register a body condition score (BCS)

**Suggested Personal & Professional Development (PPD)*

TUPPING

3.5-4.0 at tupping (EBLEX BRP) (**Figure 2**). It takes three-and-a-half weeks of supplementary feeding to increase the BCS by 0.5 units; so, ideally, rams should be condition scored when their feet are first examined 10 weeks before tupping.

Rams in correct condition should continue on good grass; whereas thin rams should receive supplementary feeding of 0.5kg cake at 16% crude protein per day.

Trace elements

Correction of trace element deficiencies is very important on sheep farms and rams should not be neglected. Blood sampling of six ewes at weaning gives a good indication of farm status – which is likely to be similar to ram status.

Rams have high nutritional requirements for cobalt, selenium and especially zinc (SAC). Beware of copper toxicity in susceptible breeds, especially those receiving extra feed. Selenium is a critical component of the tail of spermatozoa (Aitken, 2007) and essential for fertility, along with its effects on the immune system.

Very low iodine levels have been associated with poor fertility and loss of libido (Aitken, 2007). Trials carried out in the author's practice have shown Zincosel boluses (Bimeda Animal Health) – which contain selenium, cobalt and zinc – given two months pre-tupping, to be the most effective way of supplementing these essential trace elements.

Parasites

Rams may be at increased risk of 'fly strike' if they stay in the same area for most of the summer. Head flies are often attracted to the wounds that occur when rams fight as the mating season approaches, with trough feeding increasing the risk of wounding. Fly control, therefore, is essential and cypermethrin should be applied to the head monthly for the control of head flies.

Worming depends on the individual farm, with rams in poor condition most likely to benefit from a pre-tupping worming dose. Ideally perform worm egg counts and administer appropriate anthelmintics based on this evidence.

Where liver fluke is present on farm, rams will need treating with triclabendazole in the autumn to control the risk of acute fascioliasis caused by immature stages.

After tupping

After tupping, rams in poor condition should receive supplementary feeding to help them through the rest of the winter and restore body condition. Routine treatments for conditions such as fluke and clostridial diseases should not be forgotten, in line with the rest of the flock.

Fertility testing

On farms where fertility testing is not carried out and rams are used together, a ram can be purchased and kept for several breeding seasons without ever 'leaving' a lamb. This is costly, and inefficient; so fertility testing of newly purchased rams will safeguard investment, and testing older animals will remove sub-fertile and infertile rams from the farm.

In a study of 287 rams, 15 per cent of those semen tested were considered unsuitable for breeding (Lovatt, 2014). Fertility testing is, therefore, good use of 'vet time' on farm – improving production and reducing costs by only keeping and using those rams that are fertile and fit for purpose.

Reproductive examination

A general clinical examination, with recording of information – paying particular attention to body condition, legs, feet, brisket and teeth – is very important as well as the examination of a semen sample. A comprehensive Ram Pre-Breeding Examination (PBE) On-farm Data Collection Form is available for download from the Sheep Veterinary Society website (Sheep Veterinary Society, 2014).

Rams with brisket sores tend to be either very overweight and have spent a lot of time lying around, or, more commonly, have foot problems. Hopefully these problems have been corrected by the time it comes to fertility testing.

After completing the basic physical examination, the reproductive system should be examined. Any abnormalities detected should be recorded at the time of examination, along with their significance in terms of the ram's reproductive potential.

Testicular circumference should be a minimum of 32cm for ram lambs and 35cm for shearlings and older, although some breeds such as Beltex seem to have very small testicular circumferences but are suitably fertile (**Figure 3**).

Testicles should be smooth, firm and of equal size and move freely in the scrotum (**Figure 4**).

The epididymis should feel slightly firmer than testicles, with no lumps, heat, pain, swelling or un-evenness (**Figure 5**). Epididymitis of the head is quite a common finding.

Spermatic cords should be palpated for a mass such as an abscess or varicocele.

The scrotum should be clean with no evidence of *Chorioptic* mange. The effect of a woolly scrotum causing testicular over-heating in a UK climate is debatable.

The prepuce and penis should be examined – a very floppy prepuce can reduce mating ability.

The penis should be extruded and examined for signs of disease such as balanitis or an abnormal or missing urethral process (**Figure 6**). This stage

Figure 3. *Scrotal circumference measurement.*

Figure 4. *Testicles should move freely in the scrotum.*

Figure 5. *Palpation of the head of the epididymis.*

Figure 6. *Check the penis for signs of balanitis.*

Figure 7. *Semen collecting handle with semen collecting bag attached.*

Figure 8. *Lanes Pulsator IV auto adjust with attached ram probe.*

Figure 9. *Lane Ram ejaculator – author's preferred semen testing probe.*

Figure 10. *Use of cattle stocks for semen testing.*

can be left until after the semen evaluation if desired, as turning the ram over to manipulate these structures can make it difficult to successfully collect a sample.

Semen collection and analysis

For rams that pass the physical examination, the next stage is a semen evaluation. In the author's opinion a semen sample should be collected from all rams presented for fertility testing, because sub-fertile and infertile animals can present without any physical abnormalities (**Figure 7**). A recent study suggested that nine per cent of rams with no detectable physical abnormalities were failed owing to a poor semen sample (Lovatt, 2014).

Semen collection is possible using an artificial vagina (AV) but can be difficult and slow in unhandled and stressed rams. It is often simpler to perform semen collection by electro-ejaculation, although the sample collected may not always be representative. Three people are best for electro-ejaculation but it can be managed with just two.

Equipment

There are three commonly available types of electro-ejaculator available for tups:

- Lanes Pulsator IV auto adjust (**Figure 8**)
- Lane Ram ejaculator (**Figure 9**)
- Ruakura-type ram ejaculator.

The 'Ruakura-type' probe has annular electrodes that also stimulate spinal nerves leading to painful back and hind limb muscle stimulation and should not be used on welfare grounds. Its use has been surpassed by the other types of probe.

The 'Lanes Pulsator IV auto-adjust' is commonly used for bull semen testing but can be fitted with a ram probe. In the author's opinion, semen collection is faster with the 'Lane Ram ejaculator'. The ram fertility testing box should contain the same as a bull testing kit except with the addition of a ram probe (**Table 2**).

A cost-efficient way of making a warm box for semen analysis is to use a polystyrene box with four 1-litre bottles filled with hot water in the bottom. It is important to remember that everything that comes into contact with the semen sample must be warm (to prevent cold shock) but not too hot (to prevent heat shock); this includes the use of a heated stage for the microscope. Heated stages can be retrofitted to any microscope.

Procedure

Animals should be either haltered and manually restrained against a solid fence, or a set of cattle stocks can be used (**Figure 10**). The 'Lanes Pulsator IV' can be set to run on an automatic program as for bulls. If using the 'Lane Ram' ejaculator, it is best used following the manufacturer's instructions which involves massaging the prostate 10 times, then administering five seconds of current before massaging the prostate another 10 times and repeating this cycle.

In many cases, a sample is collected after only one or two cycles. If a sample has not been produced after four cycles, the ram should be rested and another attempt to collect a sample made at least 10 minutes later, often at the end of the group.

Once collected, the sample is then immediately analysed for the following:

- gross density – visual assessment of the density graded 0 to 5, 0 being water, 5 being thick cream (**Figure 11**)
- gross motility – under the microscope, at low power, gross motility is assessed looking at wave motion, again graded 0 to 5, 0 being no activity, 5 looks like a pint of Guinness settling (**Figure 12**)

Table 2. Fertility testing box contents

Cold box	Warm box
▪ tup probe ▪ gloves ▪ collection handle ▪ 'lube' ▪ paper towel ▪ clipboard and tup evaluation forms ▪ tape measure ▪ microscope ▪ heated stage	▪ microscope slides ▪ microscope slide cover slips ▪ 'Sharpie' pen ▪ pipettes ▪ warm phosphate-buffered saline (PBS) ▪ warm Nigrosin-eosin stain ▪ slide containers ▪ plastic collection bags (230 x 50mm) ▪ insulin syringes

Figure 11. *Visual assessment of semen density.*

- progressive motility – one drop of semen is then diluted with warmed phosphate buffered saline (PBS) and covered with a cover slip to assess the percentage of sperm actively going forwards. This should be performed under medium or high power
- morphology – one drop of semen is added to two drops of Nigrosin-eosin stain on a microscope slide and spread similar to a blood smear. Once dry, morphology is assessed under oil immersion by counting 100 sperm and noting the number of deformities such as detached or deformed heads, retained midpiece cytoplasmic droplets and bent or coiled tails (**Figure 13**). The sample should also be checked for the presence of white blood cells. A sample with a minimum score of density 3, gross motility 3, 60% progressive motility and 70% morphologically normal is a pass (Sheep Veterinary Society, 2014).

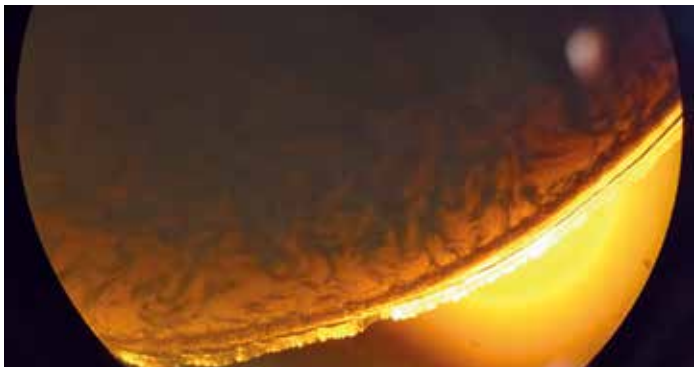

Figure 12. *Gross motility or wave motion (Score 5 – a pint of Guinness settling).*

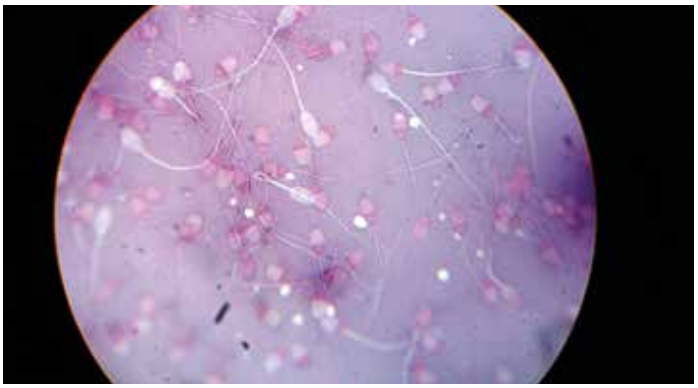

Figure 13. *Nigrosin-eosin stained semen slide to assess morphology.*

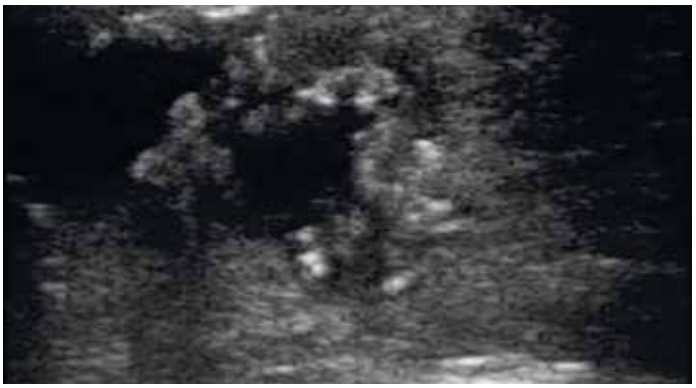

Figure 14. *An ultrasound scan of a varicocele in the spermatic cord of a shearling ram.*

Further investigation

Rams that fail to generate a semen sample or produce a poor sample that has no physical abnormalities found, should be re-tested a minimum of two weeks later. Masses should b e further investigated using ultrasound and ultrasound guided needle aspiration. Varicoceles, abscesses, and spermatoceles can be diagnosed by ultrasound (**Figure 14**).

Libido

Fertility testing is not a diagnosis of libido and farmers should be warned of this. The prevalence of homosexually orientated tups is estimated at eight per cent (Roselli, 2009). Where mating ability of rams is not assessed, this should be recorded on the pre-breeding examination form.

Sheep worrying

A growing problem for sheep farmers is sheep worrying by dogs that are not under the proper control of their owners. A recent letter in the *Veterinary Record* [**177**(5): 131] draws attention to the issue. Its authors, from the National Sheep Association and the Sheep Veterinary Society, write: 'We would like to draw the attention of companion animal practitioners to what appears to be a growing problem with dogs in the vicinity of sheep farms, and to call on all vets to do what they can to increase the awareness of dog owners to help improve the welfare of a fellow animal species, the sheep'.

The letter mentions the physical injuries – including death – caused by dogs and the huge problems resulting from stress, abortion and damage to fences. It also points out the potential for owners to be prosecuted and their dogs legally shot; together with increasing evidence, emerging from sheep farmers and abattoirs, of tapeworm infestations in carcases as a consequence of canine tapeworm eggs being deposited on pasture.

The National Sheep Association and the Sheep Veterinary Society, supported by the *Farmers Guardian*, have provided a poster and they are inviting practising veterinary professionals (and anyone else with direct contact with dog owners) to download and display in their surgeries and waiting rooms.

Perhaps this should be a routine component of any pre-tupping programme? ■

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Making the cattle farm a fortress – keeping disease at bay

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**Suggested Personal & Professional Development (PPD)*

Disease represents a huge cost to the UK cattle industry. In a world market exposed to the harsh economics of market volatility, reducing disease represents an opportunity to remain profitable. Environmental impacts of livestock farming, such as those from greenhouse gases (GHG) are also hugely mitigated by reducing the waste of disease. Methane contributes most to the global warming impact of milk production (52 per cent of the GHG emissions from both developing and developed countries). Disease reduces production of milk or beef and so increases the impact of cattle farming on the environment relative to food output, as well as threatening food security in an increasingly hungry world.

Disease losses are highly significant economically for cattle farming. The two main categories are major single-agent infectious diseases, which may result in losses independently of management or environment; and multifactorial diseases, such as calf pneumonia, that can be controlled to some extent by management changes.

Major single-agent infectious diseases

The major endemic infectious cattle diseases in the UK include:

- bovine viral diarrhoea virus (BVDv)
- infectious bovine rhinotracheitis (IBR)
- leptospirosis (*Leptospira hardjo*)
- Johne's disease
- *Neospora caninum*
- tuberculosis (TB).

These are all included in the Cattle Health Certification Standards (UK) – abbreviated to CHeCS – which is a self-regulatory body for cattle health schemes in the UK (www.checs.co.uk). It is a non-trading organisation established by the British cattle industry for the control and eradication of non-statutory diseases by using a set of standards to which all licensed Cattle Health Schemes must adhere.

It addresses control of BVD, IBR, leptospirosis, Johne's disease and, recently, *Neospora caninum* and bovine TB.

Bovine viral diarrhoea virus

BVDv is caused by a pestivirus and has been estimated to cost the UK industry up to £31 million in direct costs. BVD virus is endemic in cattle herds in the UK and Ireland and is a cause of animal health, welfare and economic losses on infected farms. Many UK herds have been infected with BVD virus – or are at constant risk of re-introduction of disease – as the result of unknowingly moving persistently infected animals, infection from neighbouring farms or contact with infected animals at markets and shows.

National eradication schemes are underway in Ireland and Scotland and a national eradication strategy was published in England and Wales in January 2015.

Infectious bovine rhinotracheitis

IBR is caused by bovine herpesvirus-1(BoHV1). Incursion into a naïve population of adult dairy cows typically leads to a variety of clinical syndromes that may include respiratory, ocular and nervous signs, accompanied by pyrexia, infertility and abortions and an associated sudden decrease in milk yield.

However, in previously exposed groups with recrudescence of virus from latently infected cattle, or in new infections of naïve animals, BoHV-1 may instead lead to subclinical disease and insidious production losses, rather than overt clinical signs.

The intractable nature of BoHV-1 contributes to potentially serious economic consequences and an adverse impact on animal welfare. Co-ordinated control and trade restrictions have been implemented at a national level in six European countries to make IBR a notifiable disease and to legislate to cull infected cattle from herds.

Based on the presence of specific antibody in bulk milk, the incidence of dairy herds infected endemically with BoHV-1 in England and Wales has seemingly increased in recent decades and completely naïve UK dairy herds are probably uncommon in cattle dense regions. Estimates of the direct costs of IBR to the UK farming industry have been put at up to £4 million per annum.

Leptospirosis

Leptospirosis caused by *Leptospira hardjo* can generate costs through infertility and reduced milk yield. These have been estimated to be in the order of £70 per cow per year or 0.6p per litre (ppl) in chronically infected herds. The seroprevalence in UK

herds has been estimated at around 50 per cent, although the pathogenicity of different serovars complicates interpretation.

In addition to cattle costs, this disease is a zoonosis and represents a risk to human health.

Johne's disease

This disease is caused by *Mycobacterium avium paratuberculosis* (MAP) and it has been estimated to result in losses of around £17 per cow per annum in the beef sector and relatively greater losses of £26 per cow per annum in the dairy sector.

Herd prevalence of MAP was estimated at around 20 per cent in the dairy herd, but may be much higher. Anecdotal evidence indicates that there is a significant problem in beef herds in the UK, particularly pedigree herds, and this is reflected in problems created by stock bulls developing disease after purchase.

Neospora caninum

Clinical disease caused by the protozoan parasite, *Neospora caninum*, has been estimated to cause 6,000 abortions a year in the UK – 12.5 per cent of total infections and 35 per cent of all abortions. Estimates of national dairy herd seroprevalence vary from around six to 10 per cent.

Tuberculosis

Tuberculosis caused by *Mycobacterium bovis* remains hugely challenging. There has been an overall long-term upward trend in the incidence of TB in cattle herds in Great Britain over the last 20 years; although the incidence rate is lower now than it was at its peak in 2008.

An unusual 'spike' in incidence was observed during most of 2001. This was an anomaly caused by the suspension of TB testing during the foot-and-mouth disease (FMD) outbreak of February to October 2001.

The provisional incidence rate for January to February 2015 was 3.8 per cent compared to 4.1 per cent for January to February 2014. The number of cattle compulsorily slaughtered as reactors or direct contacts was 5,931 during January to February 2015, compared with 5,924 during January to February 2014.

In England, there are wide geographical variations in the incidence of bovine TB (bTB). This is reflected in the division of the country into three different epidemiological areas, with different disease control strategies herd testing regimens applied in each of them.

In the 'low risk area' of the north, east and south east of England, the incidence of bTB is very low and stable and most cattle herds are tested routinely every four years. As is the case in Scotland, the majority of breakdowns in the low risk area can be linked to movements of undetected infected cattle from other areas of Great Britain.

Multifactorial diseases

The multifactorial or management diseases of note include mastitis, lameness, infertility, calf pneumonia and calf scour. Although less commonly associated with the risks of purchasing or straying stock, they represent significant costs for both the dairy and beef industries.

Mastitis

Clinical mastitis incidence was estimated to be at between 41 and 70 cases/100 cows/year in the UK in 2007. The range in financial losses caused by clinical mastitis is vast, ranging from less than 0.6ppl to greater than 6ppl. Pathogens such as *Staphylococcus aureus* are principally spread by contagious behaviour at milking time and can be introduced to herds through the purchase of chronically infected, carrier cows.

Lameness

The incidence of lameness in the UK dairy industry has been estimated at around 25 per cent – with the top quartile at 5.8 per cent compared with 50.3 per cent in the bottom sector. Lame cows represent lost production through poor reproductive performance and reduced feed intake. Lameness may be caused by claw horn lesions, such as solar ulcer and white line disease; or by infectious causes, such as digital lameness, that may be imported via purchased stock.

Calf pneumonia

The cost of a pneumonia outbreak has been estimated at £30 per calf in dairy herds. The total cost of respiratory disease to the UK cattle industry is estimated at £60 million per annum. Although a complex triangle of immunological and environmental factors are associated with pathogens in causing pneumonia, herds are vulnerable to the entry of a new viral or bacterial pathogen introduced with an incoming animal.

Calf scour

Diarrhoea is the commonest disease in young calves and the greatest single cause of death. It affects over 30 per cent of all calves born alive and causes al
most 50 per cent of calf deaths. Calf diarrhoea is one of the costliest diseases affecting suckled calf production – average losses may be in the order of £33 per calf at risk.

As is the case with calf pneumonia, multifactorial causes of calf scour include the risk of purchasing carrier animals.

Transmission routes

Two major factors to consider in the context of disease transmission on cattle farms are purchased stock and boundaries. This means that livestock movements are, therefore, one of the biggest factors in the spread of infectious disease in cattle.

All too often, herd-keepers are unaware of the health status of animals being bought and moved. It is challenging to ensure adequate quarantine periods apply, especially in milking cows; although maiden heifers and beef animals can be more easily tested in quarantine to reduce the risks of introducing disease.

Poorly maintained boundaries, however, can allow animals to introduce disease to a herd, often completely unknown to herd-keepers.

Infectious diseases can be introduced and spread by:

- diseased animals
- animals incubating disease
- apparently healthy animals that have recovered from disease but are now carriers
- vehicles, equipment, clothing and footwear of people such as vets, contractors, other farmers and salesmen, who move between herds
- feedstuffs, especially those which could be contaminated with faeces
- contaminated water – from surface water, streams and rivers
- manure handling, especially by outside contractors
- other species such as dogs, cats, wildlife, rodents, birds and insects.

Prevention

Biosecurity is the means by which the introduction of new diseases onto a farm from outside sources is reduced or prevented, and is the first line of defence. It includes both purchased stock controls as well as boundary biosecurity and control of other vectors, such as contaminated vehicles or equipment.

Biocontainment measures aim to limit the spread of disease within a herd if biosecurity has been breached and a new disease has been inadvertently introduced onto the property. Careful stock grouping and building construction can reduce the spread of disease after such a breach.

Principles of biosecurity

Control of disease by means of biosecurity involves four major components:

- incoming stock
- isolation
- boundary control
- hygiene.

Incoming stock

Select all necessary purchased animals from 'known' sources that have a health status equal to – or higher than – the existing herd. Always take steps to 'know' the health history of the herds from which cattle are purchased and the specific health status of animals brought on to the farm. Never bring in animals without knowing their vaccination history.

Do not use hired bulls from other farms, always limit purchases to maiden heifers and bulls, and do not 'impulse buy' animals from unknown sources at market or dispersal sales – they may bring new and devastating disease onto the farm.

Isolation

Implement strict isolation procedures to prevent contact between animals after their arrival on the farm in order to reduce the risk of the spread of infectious agents.
If possible, quarantine all new arrivals for at least 30 days.

Cattle must not share common pastures or ccommunal grazing, including adjacent fence lines with each neighbour's cattle.

Boundary control

Boundary control should encompass all vehicular, animal and people traffic that could introduce infection to the farm. It is a wise precaution to record all visitors to the farm – both human and domestic animals – and to keep cattle separate between neighbouring farms by means of adequate fencing.

Hygiene

This broadly addresses the disinfection of materials, people and equipment entering the farm and the cleanliness of the people and equipment on the premises.

Key hygiene measures aim to prevent manure from contaminating food and feeding equipment by using different equipment to feed and muck out pens, disinfection between use, and by avoiding driving through – or stepping into – feed areas.

Animals should always be transported in spotlessly clean vehicles and loading areas should be sited at the perimeter of the farm. Disease can be spread by manure brought in from other farms, so avoid unloading muck where cattle will graze.

Other steps to maintain biosecurity include maintaining a closed herd wherever possible by using artificial insemination to introduce new inherited traits, and the control of diseases

by vaccination. Genuine team work between farmers and veterinary practices will make steady progress in keeping disease out.

Herd health and production management

Herd health and production management (HHPM) describes a process of:

- measuring – using good record keeping
- managing – through treatment and prevention strategies
- monitoring of health and reproductive performance – to ensure the welfare of animals and support the profitability of the farm business.

A herd health plan (HHP) is a document that describes HHPM (sometimes known as health planning) on a particular farm. The HHPM process should be dynamic and evidence-based, with its primary purpose being to prevent disease and improve animal health and production by introducing long-term strategies focusing on the whole herd.

Biosecurity is central to HHPM – so planning should be designed to reduce the losses from disease and reproductive failure. This can be achieved for diseases caused by a single pathogen by preventing the entry of the infection into the herd and by controlling and eradicating the disease, where present. Reducing the risk of multifactorial diseases may require changes to the management and the environment and the use of vaccines, where appropriate.

Although the component parts are often familiar clinical procedures, genuine HHPM is differentiated by this long-term, 'whole herd' approach, and by taking ownership of the process through an effective 'vet-farmer' partnership. HHPM offers an opportunity for veterinary practitioners to engage with their farm clients in a proactive fashion and to deliver genuinely preventive medicine at the hub of the farm team.

Reducing GHG emissions and climate change impacts both offer another key role for herd health. A holistic herd health programme that incorporates biosecurity is likely to have a significant effect on reducing the environmental impact of milk production. Improving health and fertility to reduce the environmental impact of cattle farming has the substantial advantage that it is also beneficial for cow welfare and farm financial returns – in this respect it is a potential 'win-win' situation. This is an area in which the veterinary herd health adviser can – and should – take a lead.

'Cattle Health UK'

Current drivers for change can and must provide the impetus for a 'true' new industry partnership. A not-for-profit industry body overseeing animal health and welfare for England and wider across the UK has been proposed, with a strategy for long-term delivery of improvement. Such partnerships are being successful in Ireland, Australia and New Zealand.

A proposal was initially pitched at England – specifically to cattle issues, such as the lack of an English BVD programme. However, it should rightly be expanded to include both other devolved regions and other species. A proposal for such a partnership body, called Animal Health UK rather than Animal Health England, has been shared between government and relevant stakeholders with discussions ongoing.

The three main starting points are BVD eradication, risk-based trading and a national cattle database. Infectious disease does not respect political boundaries and the need for joined up thinking in cattle movements and trade across boundaries is greater than ever. ■

PPD Questions

1. What are the two main types of disease that challenge UK cattle?
2. What are two main routes of cattle disease transmission?
3. How can disease transmission risks be reduced?
4. What are the four main areas of biosecurity?
5. What concept may be applied to limit the impact of disease in a herd once biosecurity has been breached?

Answers

1. Single-agent infectious and multifactorial disease
2. Purchased stock of unknown health status and failure of boundary fencing
3. By purchasing animals of known health status from known sources
4. Incoming stock, isolation, boundary control and hygiene
5. Biocontainment

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Tom Dutton
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Tom is a 2011 graduate of the University of Edinburgh. After finishing his veterinary degree he completed a one-year rotating internship at Northwest Surgeons in preparation for his residency training. He started his European College of Zoological Medicine (ECZM) residency training in avian medicine and surgery at Vets Now Referrals in May 2012.

**Suggested Personal & Professional Development (PPD)*

INVERTEBRATES

Back to basics – insects and arachnids

Invertebrates are an incredibly diverse group of animals; encompassing the smallest single cell protozoa through to the more complex metazoa (multi-cellulared animals) such as arthropods. This article focuses on the terrestrial insects and arachnids.

Even for a dedicated exotic animal clinician, invertebrates are unlikely to make up a high percentage of the annual case-load. However, in our clinic the invertebrate case-load has steadily increased over the years with dedicated and committed owners expecting a high level of service for their fascinating and sometimes, very valuable, pets. Some species of invertebrates are long lived (for example tarantulas) and owners can form strong emotional attachments to these pets.

It is easy for a clinician to feel out of his or her depth treating species that differ so greatly in anatomy and physiology from traditional companion species. With little or no curriculum time at university dedicated to invertebrates, it is hardly surprising that few vets feel comfortable treating them; although it is the author's opinion that standards of husbandry and veterinary care for invertebrate species should be equal to that of vertebrate species.

Basic husbandry considerations

The husbandry of invertebrates varies with the species being kept – some are terrestrial and others arboreal; and species may be from arid, temperate or tropical environments. A close examination of the species' natural history will give useful clues as to their likely husbandry. Temperature, humidity, substrate and diet are all important factors that need to be considered. In clinical cases, husbandry should always be fully evaluated and critiqued. Owners should be encouraged to take and record temperature, relative humidity, food consumption and 'shed dates' on a regular basis. It is important to use dechlorinated, reverse-osmosis water or distilled water with invertebrates.

While captive breeding of invertebrates is now common, many species are still 'wild caught' and imported. These specimens may carry parasitic diseases and are more susceptible to stress and may not adapt well to captivity.

Handling and restraint of invertebrates should always be performed with due care to prevent injury to either the specimen or the handler. Invertebrates can be fragile and iatrogenic injury may occur if this care isn't provided.

It is important to recognise that restraint does not necessarily involve physical contact between the clinician and the patient. Transparent containers and bags can be used to temporarily house invertebrates for examination (**Figure 1**), and hypothermia (cooling the patient to 4°C - 5°C) can facilitate handling and restraint – although it provides no analgesia and should not be used for invasive or potentially painful procedures.

Some invertebrates, such as spiders and scorpions, are

Figure 1. *Hands-free examination of the ventral aspect of a tarantula using a plastic bag for restraint.*

Figure 2. *Emperor scorpion (*Pandinus imperator*) following an assisted moult.*

venomous (**Figure 2**). Certain spiders (including many commonly kept 'tarantula' species) have urticating satae (hairs) on their abdomen that can be irritating to the skin, eyes and mucous membranes. Gloves and protective goggles, therefore, can be worn to prevent contact with the satae.

When threatened, arachnids will 'flick' the hairs in the direction of the potential attacker. Arachnids can sometimes present for suspected 'alopecia' – this is generally a result of stress causing the tarantula to flick large numbers of satae (**Figure 3**). Husbandry

improvements to resolve the stress will prevent progression and the satae will return following the subsequent moult.

Good husbandry practices are important for preventing common diseases. Good management, effective hygiene, quarantine of new animals and prompt isolation of sick subjects is also important.

Clinical symptoms of disease

Common signs of disease – whether infectious or non-infectious – include:

- weight loss
- anorexia
- lethargy
- changes in integument
- discharges
- dysecdysis
- behavioural changes, including neurological signs, incoordination.

History and clinical examination

The assimilation of clinical history can be based around that used for traditional companion animal vertebrates.

Specific questions, relevant to invertebrates, should include:

- the animal's origin ('wild caught', captive bred)
- its length of time in captivity/collection
- communal housed or single – is the animal part of a group where a 'flock medicine' concept is required or treated as an 'individual pet'?
- a full husbandry examination – photos or even direct examination of the housing can be beneficial.

Diagnostic procedures

Many clinical cases will require some diagnostic procedures to formulate a diagnosis and allow effective treatment to be initiated. Post-mortem examination of dead animals, shed skin examination, cytological examination of swabs and scrapings as well as fungal/bacterial culture and sensitivity are all commonly performed.

The majority of invertebrates are ectotherms with a lower body temperature than mammals. The standard bacterial incubation temperature of 37°C may not be optimum when culturing invertebrate samples.

Owing to the small size of many invertebrate patients, magnification is a great advantage when examining specimens. In this respect, magnification loops are very useful, although even a basic hand-held magnifier can be of benefit. Good lighting is also very important.

Figure 3. *Area of alopecia on opisthotoma following flicking of satae.*

Specific techniques

Haemolymph collection

One can safely sample up to 10 per cent of the patient's bodyweight in most invertebrates. In arthropods, haemolymph can be sampled from either the cardia, haemocoel or limbs, by using a 27-gauge needle.

Cutaneous diagnostic sampling

Modified mammalian sampling techniques can be used in arthropods; although their fragile exoskeletons mean that care is required while carrying out such procedures. Impression smears, skin scrapes and biopsies can all be taken for histopathology.

Common infectious disease problems

Fungal infection

These infections are often seen as lesions on the integument. Mycelia may be visible to the naked eye or under magnification and internal lesions revealed on post-mortem specimens. Individuals may be ill-thriving and mortality is often the 'presenting' sign.

Fungal disease is very commonly associated with husbandry derangements – in particular temperature, relative humidity and hygiene.

Bacterial infection

As with fungal disease, integument changes are commonly seen and liquifaction of the skin may occur. Affected individuals may be anorexic, have faecal changes or regurgitate. Mortality may be seen. Haemolymph should be sampled and examined for evidence of bacteraemia.

Haemocytes can be examined for poikilocytosis and vacuolisation which may suggest reactive changes to infection. The normal bacterial flora of the skin and GI tract of invertebrates is not known and the significance of findings is often a subject for debate. Bacteria in the haemolymph, however, should always be considered significant.

Parasitic infection

Parasitic infections are commonly seen in imported specimens – often involving nematode species. Oral nematodes can be diagnosed following cytological examination of swabs, and *Panagrolaimidae* species of nematodes are a possible zoonosis, so euthanasia should be considered on human health grounds.

Stress and poor husbandry can exacerbate asymptomatic infection. Treatment with benzimidazole anthelmintics is generally not effective and potentially toxic.

Mites are commonly seen in arachnid enclosures. Small numbers are often considered to be non-pathogenic; whereas large burdens are thought to cause irritation, stress and, potentially, respiratory compromise at the 'book lungs'. The use of 'predatory' mites is a good non-chemical method of control, and manual removal from the arachnid under anaesthesia can also be attempted.

Hymenopterous and dipterous larvae infection

These infections may present as weight loss and, often, death. It is possible to visualise larvae or emerging adult insects directly on the patient and infestation is prevented by good hygiene and insect-proof housing.

Common non-infectious disease problems

Dehydration

Dehydration can lead to weight loss, desiccation and dysecdysis and may be associated with high temperature or low relative

humidity. Dehydrated individuals will often be lethargic, anorexic or have a shrivelled opisthosoma or abdomen.

Fluids can be administered by injection parenterally into the haemocoel or heart. Lactated Ringer's solution or normal saline are both suitable fluid choices for parenteral administration. As a general rule, 10 per cent dehydration equates to approximately two-to-four per cent of bodyweight of fluid in most commonly kept arachnids. Increasing environmental humidity can help.

Encouraging weak arachnids to drink is possible by submerging their mouths in a shallow water dish. You cannot rely on dehydrated tarantulas to find water, as they are reliant on sufficient haemolymph pressure for movement. Hypovolaemia caused by dehydration results in a drop in pressure and an inability to move. Care is required not to submerge the book lungs.

Dysecdysis

This is a common cause for presentation of pet arthropods, so in order to be able to recognise dysecdysis, it is important that the clinician is familiar with normal moulting in arachnids (**Figure 4**). Prior to moulting, a tarantula will be found in dorsal recumbency for 12 to 24 hours, and to allow it to slough, the exoskeleton splits in two on the dorsal surface of the abdomen.

The prognosis following dysecdysis is poor. Its causes are varied and include: husbandry factors, infections, lethargy, trauma and injury – all of which can cause shedding difficulty. The underlying exoskeleton is soft and easily injured, leading to complications when removing the 'stuck' shed. Atraumatic forceps (Harris ring-tip), cotton buds and careful

***Figure 4**. Dysecdysis in a emperor scorpion (*Pandinus imperator*).*

dissection of the stuck shed with fine scissors can help release the patient.
If skin softeners, such as glycerin, are to be applied topically then care must be taken not to cover the book lungs or spiracles. In cases where shed is only stuck to limbs, amputation may be performed. Retained shed can eventually cause a constriction – damaging the exoskeleton, leading to haemorrhage. If infection is suspected, then topical treatment may be required, based on cytology and culture results.

Nutritional deficiencies

Nutritional deficiencies may present as weight loss, ill-thrift and susceptibility to secondary infections. A varied diet should be fed, with 'gut-loading' of feeder insects, if required. Molluscs require calcium supplementation in most situations.

Toxins/poisoning

Captive invertebrates are commonly susceptible to the same toxins and poisons as those used to control pest invertebrate species, so application of insecticides and pesticides in the house may lead to large losses. Flea medications can be particularly toxic.

Reptiles and invertebrates are frequently kept in the same room, and accidental death in invertebrates when

***Figure 5.** Induction of anaesthesia in a scorpion using isoflurane in oxygen under a mask.*

treating mite infections in reptiles is reported. In cases where exposure has not caused death, treatment via nutritional support, fluid therapy and decontaminating the environment will be supportive.

Trauma

Trauma results in physical damage to the exoskeleton, with crushing, loss of appendages and wounds resulting in haemolymph haemorrhage. Freshly shed specimens are particularly susceptible to damage following trauma to their soft exoskeleton. Trauma can occur as a consequence of moving cage furnishings, handling or as a result of dysecdysis.

In the case of limb injuries, amputations can be performed and integument repaired using tissue adhesive. In arthropods, it is often possible to induce autotomy – in young animals, still actively shedding, limbs will often regrow. Most invertebrates have a relatively open circulatory system, which means that haemorrhage is potentially very serious.

Most invertebrates have a haemocoel – a single cavity containing visceral organs which is continuous with the circulatory system. The heart is contractile and directs the flow of haemolymph through the haemocoel and body. Where minor injuries occur, particularly in freshly moulted specimens, placing them in a dark container with no cage furnishing and leaving them undisturbed for 12 to 24 hours, allows the exoskeleton to harden. In some cases adding a thin layer of damp paper towel helps increase the relative humidity reducing the rate of evaporation of fluid from the animal.

If active haemorrhage of haemolymph is occurring, then pressure may be applied using cotton swabs or cotton buds. Cyanoacrylate tissue glue can be used to repair the defect. Supportive care – including fluid therapy – may be required, depending on the level of haemolymph loss.

Anaesthesia

It is not acceptable to perform invasive procedures in invertebrates without anaesthesia; and hypothermia is *not a suitable or ethical alternative* to anaesthesia. Anaesthesia can also be used to facilitate safe examination in potentially dangerous or delicate specimens.

Terrestrial invertebrates can be anaesthetised using halogenated ethers commonly available in companion animal

Figure 6. *Pericardial injection in a Chilean rose (*Grammostola rosea*) using restraint inside a plastic bag.*

practice. It is important, however, to consider the relevant respiratory physiology – the respiratory openings in arthropods are located on the body rather then the head – so appropriately sized induction chambers, to allow the whole specimen to be exposed to the anaesthetic agent, are required (**Figure 5**).

Either isoflurane or sevoflurane can be used by inhalation. Carbon dioxide, ether or methoxyflurane have also been used successfully but are unlikely to be readily available. The author's preference with the majority of arthropods is to induce anaesthesia with 5% isoflurane; then, following induction, the concentration can be titrated down to effect.

Anaesthetic monitoring is challenging. Asystole is a common result of anaesthesia but is usually temporary – resolving after removal from the anaesthetic chamber. In the majority of invertebrates, respiration occurs passively so respiratory movements cannot be monitored.

Euthanasia

In terrestrial invertebrates, anaesthesia should always precede euthanasia and should be induced as above. Following induction of anaesthesia, the author's preferred technique is to inject pentobarbital by either the intracardiac route or into the haemocoel. Immersion in ethanol, or freezing following anaesthesia, are also reported techniques.

If post-mortem examination is required, then immersion in ethanol preserves tissues for examination without inhibiting histopathology.

Medication routes

It is possible to apply oral medication to the mouthpiece of invertebrates using either a syringe or a dropper. However, ensuring complete ingestion is difficult such that dosing compliance can be problematic.

Careful injection of medications either directly into the haemocoel or heart can be performed. Small insulin syringes with 27-gauge needles can be used to prevent the creation of large defects in the exoskeleton that lead to haemolymph haemorrhage. Appropriate injection sites are:

- pericardial/cardial – introduce the needle on the dorsal midline of the opisthosoma at a 45 degree angle from the vertical (**Figures 6** & **7**). Anaesthesia is required to reduce the risk of cardiac laceration in the event that the patient should move
- intracoelomic – injection is administered along the transverse plane, in the lateral opisthosoma
- ventral joint membrane of the limbs – does not require anaesthesia; but only very small volumes of fluid can be administered by this route and it does risk limb damage and autotomy.

Figure 7. *Sealing the injection site with tissue adhesive following injection.*

Topical medications, such as topical antimicrobials and antifungal ointments can be used, with the proviso that care must be taken not to cover the book lungs or spiracles.

Insects and arachnids in schools

Invertebrate pets will hold a particular fascination for schoolchildren and there will inevitably be occasions on which these animals are taken to school. Indeed, some schools may keep them for educational purposes on either a permanent or temporary basis. In all these instances, it is vital that their welfare is accorded paramount importance.

The National Union of Teachers (NUT) publishes some excellent guidelines entitled, *Animals in Education – Health, Welfare and Legal Notes* which will also be useful for veterinary professionals faced with the prospect of introducing delicate pet animals to groups of young people.

In its section on animal handling, the NUT notes comment:
'Pupils will naturally wish to handle animals, but certain considerations need to be addressed in advance of any such activities. In particular, it should be checked that:

- the animal is used to being handled
- the animal is not likely to be stressed by excitable children
- where there is a correct way to hold any animal, this must be taught to children from the outset
- handling of small animals should be carried out over a table or preferably some form of soft surface to minimise the risk of injury caused by falling or being dropped.'

Importantly, the guidelines add:

- 'The handling of certain animals should be avoided altogether. Those which are nervous, nocturnal or prone to biting or scratching,

should be observed and not touched.

- 'Other creatures, such as invertebrates, are too fragile to be handled any more than absolutely necessary. Sometimes any handling of a pet should be limited to the owner, who will have the necessary expertise to do it properly.'

Sound advice indeed. ■

Further reading

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Are you making the most of Twitter?

With 284 million monthly active users, there's no doubt that the social networking site Twitter is an easy, cheap and effective way to promote your practice and get people talking about your business. However, Twitter doesn't come with a handbook and it's easy to make mistakes that can be costly.

Clara Ashcroft
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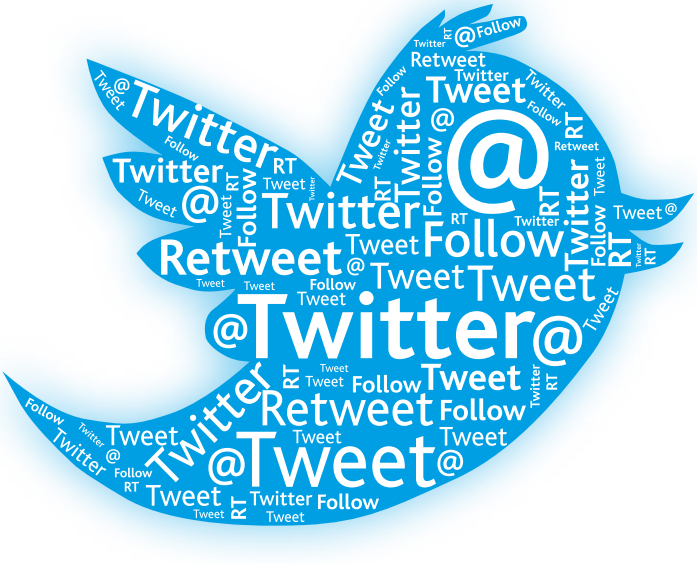
Clara writes for Vision Media – a media agency specialising in marketing, communications and design services for the veterinary industry, and a publisher of veterinary websites, news websites and consumer magazines.

According to digital marketing expert, Shea Bennett, in her article on striving for the perfect tweet, only two things really count – maximum readability and maximum 're-tweetability'. Together these elements are essential. One does not favour the other and, for maximum benefit, both need to be perfect every single time. So, how can this be achieved?

A good place to start is your own Twitter feed. Take a few moments to scroll through other people's tweets – particularly those from other veterinary practices – and note what stands out to you, and why. Is it the way the tweet is worded? Or perhaps it is accompanied by an eye-catching image? Experts say that if the tweet is good, we make a subconscious note about the user, particularly their name and profile picture, and are more likely to notice them the next time they tweet. Likewise, if the quality dips, we'll start to pay less attention and may eventually 'unfollow' them.

Next, make a plan. Decide on how many posts you are going to make each day and who in your practice is the best person for the job – taking into consideration skills, passions, interests, as well as who you think has time to do it. Somebody who is very busy, but is enthusiastic about Twitter, might write more interesting tweets than somebody who has a lot of time but lacks the genuine passion.



Finally, think about what sort of content you'd like to share. Keep a balance between informal/funny messages and portraying your practice as a responsible health care provider. For veterinary practice, the possibilities are endless – you'll never be short of animal content to link to on the internet. You could also tweet about open days, or link to handy 'how to' guides on your website. You could even use Twitter as an outlet to promote your practice healthcare plan. Be careful with self-promotion though – do it too much and your practice will very quickly start to be overlooked.

Writing a tweet

When writing a tweet, think carefully about the wording. You only have 140 characters to make your point, so take your time and keep it focused. It's important to be 'human' too, so don't be afraid to write in a friendly tone and have a sense of humour. In 2014, social media scientist, Dan Zarrella, put together a list of the top 20 most re-tweetable words and phrases. Interestingly, 'please' came third as the most re-tweetable word, suggesting that tweets are more likely to be retweeted if you're polite. 'Click here', 'free' and 'how to' were also high on his list.

To make sure that your clients are left with a good impression of your practice, it is important to take care with punctuation. Use full stops, commas and apostrophes

"... only two things really count – maximum readability and maximum re-tweetability"

*Suggested Personal & Professional Development (PPD)

TWITTER

"The time of day that you send a tweet is important too"

appropriately, and read tweets aloud to check that pauses are in the right place. Bad spelling and poor grammar will reflect negatively on your practice. Although it may seem unnecessary, you should consider writing tweets in a word processor first – even the most practised writers can make mistakes.

Lastly, don't forget to use adjectives or verbs. Appealing, thought-provoking adjectives such as 'trendy', 'irresistible' or 'shocking' can enliven your tweet and encourage people to learn more about what you are telling them. Similarly, the use of strong action verbs, such as 'discover' or 'overcome' will encourage your clients to leap into action, click your link and follow the advice you are offering them.

Retweets

Retweets come with many benefits, but to gain them you need to know how. A retweet is when someone on Twitter re-posts one of your tweets to their own followers. This is good because it means that your name will be seen by a whole new audience.

One way to encourage retweets is to use images. According to marketing platform Socialbro, tweets with images are 94 per cent more likely to be retweeted. Our brains process visuals 60,000 times faster than text, so attaching an image is more likely to draw attention and earn retweets.

The length of the tweet matters too. Twitter already restricts you to 140 characters but, researchers have worked out an optimal length to maximise engagement. The golden number falls between 71 and 100 characters – leaving just enough space for any comments your clients want to add.

Another way to encourage retweets is to include #hashtags. The hashtag symbol is used before a relevant keyword or phrase (no spaces) to categorise tweets and help them show up more easily in search results. Clicking on a tagged word shows the user all the other tweets marked with that keyword. In a study of 1.2 million tweets, it was found that a few relevant hashtags can increase your retweets by 55 per cent. Try not to overdo it though – one or two hashtags per tweet is more than enough!

Timing

A great deal of research has been carried out by web experts as to the best time of day to send a tweet in order to establish the most engagement with an audience. However, because the internet is still relatively new, much of the available information is conflicting. While some researchers have suggested that engagement rates are 18 per cent higher on Thursdays and Fridays, others have argued that engagement rates are better (32 per cent) at weekends. Although this still isn't very clear, what it does suggest is that the end of the week is probably a good time to start.

The time of day that you send a tweet is important too. According to statistics published by social media blogger, Belle Cooper, retweets are highest around 5pm and the best time for 'click-throughs' is around noon and 6pm. This is when most people are on their lunch break, or looking for something to do while on their commute home from work.

Just because the best time of the week to tweet might be at the weekend, it doesn't mean that you need to stay in the office past your regular working hours. Web platforms such as Hootsuite and Buffer allow users to schedule tweets to be published at a time that suits them. These useful websites also allow you to monitor exactly who is looking and clicking through your tweets so that you can measure their effectiveness.

On the whole effectiveness comes down to a variety of factors, so it is a good idea to test out and see when your audience is most responsive. Whilst research may suggest that weekends are a good time to tweet, you may find that your clients are least responsive at this time – it's really all about trial and error.

Other hints and tips

Placing a number at the start of a headline is said to be a successful formula that induces people to click to read more. For example: '5 ways to care for your dog this summer...' This formula is perfect for web audiences. Psychologically it gives the reader the idea that the article won't be a heavy read and suggests that it will be easy to scan through.

Stirring a sense of intrigue is another way to encourage clients to click your link and visit your website. A sentence such as: 'What you need to know about our practice health care plan', can entice clients to click the link to find out more. This is less pushy than: 'Click here for information about our practice health care plan'.

Make time for Twitter

Twitter is supposed to be fun, so following rules can make the process seem like a chore. But, if you really want your practice to stand out from the crowd, then it is important to spend time on it. Once you start to see the benefit that great content, accurate punctuation and selective images have on your Twitter presence – as well as your website visitors and client numbers – you will never settle for anything less than a perfectly written tweet. ■

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"... researchers have worked out an optimal length to maximise engagement. The golden number falls between 71 and 100 characters..."

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He currently works as a regional health and safety manager for Citation Professional Solutions.

*Suggested Personal & Professional Development (PPD)

HEALTH AND SAFETY

Health and safety – who takes responsibility?

All employers have a legal duty of care for the health, safety and welfare of employees whilst they are at work. There is also a duty to protect non-employees from risk arising out of their work activities. This is enshrined in the Health and Safety at Work Act 1974 and associated legislation. Employers have ultimate responsibility for all aspects of Health and Safety within their business.

All organisations should ensure that they have access to competent health and safety advice in order to implement safety procedures successfully and to fulfil their legal responsibility. Health and safety responsibility can be delegated to competent persons within the business; however, responsibility will always remain with the head of the organisation.

Whilst responsibilities can be delegated in respect of your organisational structure, there are some basic principles that employers must cover, irrespective of the level of risk within their particular business.

Displayed notices

There is a legal duty to display a health and safety law poster ('What you need to know'). This must be placed in a prominent position in the workplace; alternatively, employees can be issued with a leaflet or a pocket card that outlines the basic principles of the Health and Safety at Work Act.

Insurance

It is a legal requirement for all employers to have Employer's Liability Compulsory Insurance in place; this protects employees if they are injured as a result of an accident at work or in the case of becoming ill as a direct result of their work. If an employer is found to be negligent and responsible for an accident and compensation is required to be paid, then the insurance company will provide the necessary funds to meet the liability as well as covering any legal costs arising out of the claim.

Safety documentation

If your business has five or more employees (including owners/partners) you should have a written health and safety policy in place. This document should set out the company's health and safety management strategy, as well as outlining details of key employees' responsibilities and details of arrangements of how safety is implemented. It is important to ensure that the policy document is reviewed at least once a year.

Management system

A formal management system or framework can help you manage health and safety. This can rarely be achieved by 'one-off' interventions, and it is important to have a systematic approach in place. Employers should develop and implement a suitable system that includes adequate effective arrangements with appropriate monitoring procedures.

If you employ five or more employees, it is important that these procedures are documented. Plan, Do, Check, Act, helps you achieve a balance between the systems and behavioural aspects of management. It also treats health and safety management as an integral part of good management generally, rather than as a stand-alone system.

General statement

If your organisation employs more than five employees, you must prepare a written policy statement that outlines the arrangements that are in place to ensure the health and safety of employees and others who may be affected by your operations. It is important to bring this document to the attention of all employees.

Consultation

Employees should be consulted on anything that affects their health and safety whilst at work. This would include any significant changes that may affect them – for example, introducing new procedures or equipment and associated new systems of work, provision of competent persons, health and safety training.

Accident reporting

Under the Reporting of Incidents Dangerous Diseases Occurrence Regulations (RIDDOR), you must report and record certain specified injuries and incidents, including work-related health diseases.

Fire and emergency contingency arrangements

Employers must ensure that they have adequate emergency arrangements in place; and these must include suitable procedures for the workforce to report any serious and dangerous situation.

In addition, adequate and suitable precautions should be taken against the risk of fire and explosion. This will include ensuring that there is an accessible, effective means of escape in place, as well as the provision of suitable portable fire-fighting equipment.

Regulatory Reform Order 2005

The main law covering fire safety is the Regulatory Reform (Fire Safety) Order 2005. It applies across England and Wales and came into force on 1 October, 2006. Similar legislation exists in Scotland and Northern Ireland under the Fire (Scotland) Act 2005, the Fire Safety (Scotland)

Regulations 2006 and the Fire and Rescue Services (Northern Ireland) Order 2006.

The reform order places the emphasis on risk reduction and fire prevention. If you are the 'responsible person' as defined by the order for any commercial premises – the employer, owner, landlord or any other person who has control of the premises – you are legally required to carry out a suitable and sufficient fire risk assessment identifying the fire risks and hazards within the premises. This must be recorded (if you employ five or more people) and the responsible person is required to:

- examine who may be especially at risk
- eliminate or reduce the risk from a fire as far as is reasonably practicable and ensure the provision of general fire precautions to control the risk
- ensure that adequate measures are undertaken regarding the storage and use of explosive or flammable materials
- ensure that plans are in place to deal with emergency situations
- maintain the general fire precautions and any associated facilities provided for use by fire fighters
- keep significant findings of the fire risk assessment under review.

It is worth pointing out that any fire certificates that were issued under the old Fire Precautions Act 1971 legislation, are no longer valid. However, it is advisable not to discard them because they are still useful and normally a good starting point when undertaking a fire risk assessment.

First aid provision

The Health and Safety (First Aid) Regulations 1981 require employers to provide adequate and appropriate first aid equipment, facilities and people, such that your employees can be given immediate help if they are injured or taken ill at work. What is 'adequate and appropriate' will depend on the circumstances in your workplace and you should assess what your first aid needs are.

> "Employees have a legal duty to take care of their own health and safety and that of others who may be affected by their acts or omissions whilst at work"

Risk assessments

It is a legal requirement to carry out suitable and sufficient risk assessments to identify any possible safety hazards and implementation of appropriate risk control measures. The person undertaking risk assessments should be competent to do so; and if you employ more than five people, you must record the assessment – along with the controls – and ensure they are reviewed and revised at least annually or following an accident.

Information, instruction and training

Employees must be provided with the information, instruction, training and supervision necessary to ensure their health and safety and that of others.

Hazardous substances (COSHH)

Any potential exposure to hazardous agents – such as chemicals, medicines, dust, fumes, noise, vibration or harmful micro-organisms – must be either eliminated or controlled. These are covered by various regulations including the Health and Safety at Work Act, Control of Substances Hazardous to Health, Noise at Work Regulations, Ionising Radiations Regulations, Control of Asbestos at Work, Control of Lead at Work.

What about employees' health and safety responsibilities?

Employees have a legal duty to take care of their own health and safety and that of others who may be affected by their acts or omissions whilst at work. They must also co-operate with their employers and co-workers to help everyone meet their legal requirements to:

- take care of their own health and safety and that of others
- co-operate with the employer and help comply with applicable health and safety legislation
- adhere to instructions or the provision of health and safety training
- inform the employer on any unsafe acts or practices that could present a serious risk
- inform the employer about any identified failings within the health and safety arrangements.

Self employment

Health and safety responsibilities regarding self-employed persons are broadly similar to those of employees – they must co-operate with employers and other self-employed persons to meet the objectives of health and safety law.

Manufacturers and suppliers

Designers, manufacturers, importers, suppliers, erectors or installers of any plant, machinery, equipment or appliances for use at work – together with manufacturers, importers and suppliers of substances for use at work activities – have extensive duties to ensure the safety and absence of risks to health, to carry out research and testing and to provide adequate information.

Manufacturers of machinery have to ensure that any equipment they supply meets EC essential safety requirements and bears the CE mark Supply of Machinery (Safety) Regulations. In addition to these statutory duties, all parties have significant duties under civil law and any injury as a result of a failure of the standards may result in a successful legal claim in a civil court.

Who enforces health and safety laws?

Health and safety is enforced by officers from the Health and Safety Executive (HSE) or by inspecting officers from the local authority. They have the right to enter your premises and to talk to your employees, and they can exercise their powers within their role. These are to:

- investigate following an accident or any complaints that are made
- require employers to take action properly to control risks within their business
- provide advice and guidance to help employers comply with health and safety laws and avoid injuries and ill health whilst at work.

Enforcement officers also have powers in relation to any statutory breach of legislation using a range of options – from provision of advice through to potential prosecutions depending on the level of risk involved. Those found guilty (in a Magistrate's Court) of health and safety offences could face fines of up to £20,000 and/or up to 12 months in prison. Conviction in a Crown Court could result in an unlimited fine and/or up to two years in prison.

The HSE operates a Fee for Intervention cost-recovery scheme that was implemented on 1 October, 2012. The regulations place a duty on the HSE to recover their costs if you are found to be in material breach of health and safety law, at a rate of £124 per hour for the time and effort spent assisting you to comply with the law. ■

Debtors and creditors – a balancing act

Management of debtors and creditors within a practice is key to ensuring good cash flow. Getting it wrong can mean that you have a headache when it comes to making the big payments; but get it right and you will have the funds available at the right times and will be able to ensure the efficient running of your practice.

Mark Harwood
BSc ACA CTA

Mark has been with Hazlewoods since 2003 and works solely with veterinary practices and their owners. He enjoys advising on a wide range of business and accounting matters, helping veterinary practices make the most of their opportunities to be successful.

In his spare time, Mark is a keen runner, cyclist, tennis player and is also a fan of motorsport.

**Suggested Personal & Professional Development (PPD)*

FINANCE

This article will take a look at various aspects of debtors and creditors. Not everything discussed will work for everyone, because this depends on the nature of your practice, the mix of your work and what you are striving to achieve.

Debtors

Expectations

Setting out what your expectations are when you first meet a client is crucial. If they understand the terms under which they are going to use your services, then there is less likelihood of there being an issue in the future regarding agreement of invoices and payment.

Whilst it might sound relatively basic, ensuring that you have clear and up-to-date payment terms on your website, notice boards and in your literature – including any in your waiting room – is important to set up client expectation in a friendly way.

Be careful not to make an assumption about a client and what you think they can afford or how they are going to pay – they may surprise you! It is important to communicate fully about what treatment is recommended and estimated costs, as this avoids any misunderstanding which can also lead to late payment of invoices, or its turning into a bad debt.

For small animal and equine clients, discussing insurance with them at an early stage of their pet's life is also important as this, again, can prevent issues arising later.

> "Be careful not to make an assumption about a client and what you think they can afford or how they are going to pay – they may surprise you!"

Staff may find it difficult to communicate about fees in a confident way and can even come across to clients as being apologetic about them. If a fair pricing structure has been presented in a hesitant manner, such an approach can lead to clients feeling that they are being overcharged, even when this is not the case.

Some practices find that involving staff in the 'price-setting' process can be invaluable here because it helps to build team confidence that the prices are appropriate. For more complicated cases – where there might not be a fixed pricing structure – it might be worth the veterinary professionals involved discussing these instances to identify where different fees might have been charged and an element of consistency is required.

Invoicing

Typically between five to 20 per cent of income is 'lost' to the veterinary profession through 'under-charging' for work – that is the non-charging for work that has been carried out and could be legitimately (and correctly) invoiced to the client. Capturing this lost income is key to improving cash flow.

If work is not invoiced, the practice will never be paid for it – some might argue that, even if you do charge, it won't be paid; but that is all down to debt management (see later). There are some immediate measures that can be undertaken.

Consider reviewing invoices for all types of work to see whether what you would expect to be charged *is* being charged. Not only does this help identify lost income, it also points to where systems can be improved or where training is required to ensure losses cannot happen in the future

Consider whether your practice management system makes it as easy as possible for staff to invoice – for example, through ease of navigation, minimal 'clicks' to generate a fee and 'packaged' prices for common procedures.

Some practice management systems are now able to generate 'exception reports' that identify where prices have been overridden and

Table 1. The importance of appropriate invoice 'timing'

			Trade debtors				
	Debtor days (n)	Turnover (£'000)	Total (£'000)	Current (£'000)	31 days (£'000)	61 days (£'000)	92 days (£'000)
Small animal	19	1,475	76	34	15	6	21
Equine	87	1,200	287	114	88	21	64
Farm	94	650	167	64	43	16	44
		3,325	**530**	**212**	**146**	**43**	**129**

Table 2. The effects of reducing 'debtor days'

	1 day	10 days	15 days
	(£'000)	(£'000)	(£'000)
Small animal	4	40	60
Equine	3	33	49
Farm	2	18	27
	9	**91**	**136**

by whom. It might also be worth discussing with your management system provider whether it can help you generate reports to identify occurrences in which it could have been expected that items would have been charged – if, for instance, there is a 'booked' booster visit, you would expect there to be a booster charged.

In the author's view, the use of exception reports is not meant to be a tool to 'name and shame'; but rather, much more positively, to identify where under-charging may be occurring, and then helping to mentor and support staff to improve matters in particular areas. It might be, for example, that a veterinary professional is not confident in a particular area of their clinical work and is nervous about charging for that reason. Having data from the management system might mean that you are able to support this individual at an earlier stage.

Timing

'Debtor days' is a term of which you may or may not be aware. It is a calculation to determine how many days it takes for your debtors to pay and it can be a useful benchmark to monitor over time.

For small animal work, invoicing is generally more straightforward because invoices are often raised at the point of treatment and, in theory at least in most cases (insurance excepted), are due for payment on the same day. However, for equine and farm work, the timing of invoices can make a significant difference to cash flow and, therefore, your 'debtor days' (**Table 1**).

If the debtor days were successfully reduced, by say either one day, 10 days or 15 days, this would result in the cash income set out in **Table 2**.

The same would apply if invoices were issued earlier, even if debtor days remained the same – issuing invoices earlier would result in cash being received sooner. Many equine and farm practices are moving towards more frequent dispatch – whether this is, say, twice monthly, weekly or even daily, which is in stark contrast to the historic once a month invoicing approach of many practices.

You may wish to think about how the improved timing of invoicing and payments could affect your ability to meet *your* 'big payments' such as VAT, wages and drugs invoices.

Payment

Chasing up payment from clients is, perhaps, not everyone's favourite job; but, unfortunately, it is a necessity for those clients who are 'slow payers'. Although sometimes clients genuinely forget, there are others (insurance companies aside) who are just not as speedy as you might like them to be.

A good credit controller can really help in these situations. He or she needs to be understanding, yet firm, and able to come up with good solutions with effective outcomes. Often you can achieve better results by speaking constructively with someone rather than simply sending a letter, email or text – all of which can be misinterpreted, ignored or deleted. Sometimes, however, a carefully chosen mixture of these approaches will be appropriate, depending on the client in question.

Creditors

Ordering processes and stock control

Taking control of amounts owed to suppliers (trade creditors) starts with the initial ordering. Having good processes in place to ensure that relevant and timely ordering is undertaken will help to minimise the level of obsolete stock and reduce unnecessarily high payments to suppliers at a particular point in time.

High levels of stock compared to the level of sales may mean that there is room for improvement. This can help to avoid having to throw away unwanted or outdated stock, thereby also saving cash that could otherwise have been put to an alternative use.

Most practices undertake a 'stock take' at the year end. Some do it more frequently than that, which can be helpful as part of a regular review of the whole stock monitoring and ordering process.

Supplier terms

Make sure you review your supplier terms regularly and ensure you are receiving the best – including payment terms and discount levels.

It might be possible to alter your payment terms and extend the time you have to pay an invoice, which would provide a 'one-off' cash flow advantage. This is something that can generally only happen once and not something to be tried every month!

Your pharmaceutical company representatives should be 'working for you' in securing good deals on discounts too, but it is always worth checking the position.

Some practices are part of buying groups which, owing to their size, are able to offer better terms than if the practice was buying independently.

"Some practices find that involving staff in the 'price-setting' process can be invaluable..."

"High levels of stock compared to the level of sales may mean that there is room for improvement"

However, whilst you might be able to get a better deal on some things, it might not be the case on everything, so make sure you look at all the groups available and pick the one that suits your practice best, considering all the benefits that it may offer.

Buying groups sometimes offer better certainty on when drug rebates will be received as they often pay these on a monthly basis, rather than quarterly or annually. This can help with cash flow. If you are not in a buying group, then it might be worth discussing the payment of rebates directly to see whether a more appropriate payment plan could be agreed.

Spreading the cost

Many of us will use direct debits or standing orders regularly in our personal lives as a means to aid cash flow and provide some certainty as to the balance in our bank account at any point. Why not review your suppliers to see whether it would be appropriate to pay using this method.

Other thoughts

With regard to creditors, we have mainly considered the issues surrounding supplier payments. A creditor, however, is anyone to whom you owe money – HMRC, your bank or the owners of the business (directors or partners). Whilst most of these are reasonably inflexible in respect of payment deadlines – VAT is paid by the 10th of the second month following the end of a quarter, for example – there can still be some scope for change.

For instance, you could be in a situation where you traded as a company and as a result of your year end, you have to pay corporation tax, VAT and directors' personal tax payments all in January. This might prove a real challenge for the person trying to juggle the finances. You could consider changing your VAT quarter and/or company year end so that the VAT and corporation tax payments fall at a different time to alleviate this potential issue.

Regularly review the situation with your creditors to ensure that payments are being made on time and nothing is being missed or forgotten. Ensuring that bookkeeping is undertaken accurately and on a timely basis can be invaluable here, so that you have confidence in the figures that you are scrutinising.

Ensuring you have an appropriate remuneration/drawings strategy for the owners of the practice will help with cash flow as you will be better able to predict the monies being taken from the practice.

Putting together a cash flow projection for the year ahead – taking into account all of the practice's commitments – can help to identify where the 'pinch points' are likely to be in terms of cash. This would enable you plan ahead, perhaps taking proactive steps to alleviate matters in advance.

Final word

Many of the areas that we have considered fall into the realm of common sense. However, it is worth initiating regular reviews and looking at your systems and processes to make sure you have the balance between debtors and creditors in the right place for your practice to run efficiently. ■

The author welcomes questions from readers and can be contacted on 01242 680000 or mark.harwood@hazlewoods.co.uk

The changing face of recruitment

Several recent articles in the veterinary press have highlighted the fact that the BVA's 'Voice of the Veterinary Profession' survey backed up anecdotal evidence that there are widespread recruitment problems in veterinary practices across the UK.

"The vast majority of new and recent graduates do not wish to work out of hours"

Two-thirds of practices looking to recruit veterinary surgeons during the past year took more than three months to fill their vacancies – some taking much longer and with a small proportion withdrawing the vacancy owing to a lack of suitable candidates. The problem is particularly severe in small animal practice where 23 per cent of those recruiting saw posts remaining empty for more than six months.

There were difficulties at every stage of the recruitment process – with 58 per cent of practices receiving three or fewer applications for posts advertised, 55 per cent finding that, of those candidates who did apply, none were suitable at the CV stage; while 30 per cent found no suitable candidate from those they interviewed. A further 18 per cent had their offer of a job rejected by the candidate.

With an increasing number of veterinary schools and, soon, in the region of 1,000 students a year graduating as veterinary surgeons, it is difficult to understand why we have this recruitment problem. However, look more deeply and there are a number of issues that have served to change the face of veterinary recruitment and pose big questions for the future.

The vast majority of new and recent graduates do not wish to work out-of hours. Although many practices now use out-of-hours services, there are still a significant number who require their veterinary surgeons to carry out out-of-hours duties. Indeed, there are now practices who use the fact that they provide their own out-of-hours service as a 'selling point' to clients.

Work-life balance is very high on the agenda for today's graduates seeking employment and is very much in the forefront of any potential employee's job requirements – making them highly selective in the jobs for which they would choose to apply. Especially in the case of recent graduates – both professional and emotional support are important job requirements. It is interesting that in the RCVS 'Survey of Recent Graduates, 2013', when asked about how well a first position fitted a new graduate's requirements, lack of both sufficient professional and emotional support from employers and colleagues was cited by 22.8 per cent and 17.4 per cent respectively of respondents to the questionnaire.

Although both male and female vets look for more flexibility in their job, as the proportion of female vets increases, the need for greater flexible working and breaks from the practice will inevitably increase. This, by default, is likely to increase the number of available part-time and temporary jobs that are not always what new or recent graduates are seeking, yet that are likely to be attractive to female vets returning to work after breaks.

There was a 12 per cent rise in the number of veterinary premises between 2010 to 2014 (numbers increasing from 4,740 to 5,321). Many of these new premises are likely to have been small one- or two-vet practices opened by young but experienced veterinary surgeons – just the type of candidates practices would like to recruit. An increasing number of veterinary professionals see their way forward as opening their own practices – albeit sometimes under a corporate umbrella – and this inevitably removes them from the jobs market too.

There are increasing opportunities for veterinary professionals to move into industry and associated businesses, rather than working directly in veterinary practices – becoming a locum is an attractive proposition for those vets who wish to experience seeing a variety of practices as well as having the freedom to take breaks and travel when it is convenient for them.

In the recently published Vet Futures survey although 37 per cent of graduates reported that their working lives had met their expectations, and a further 13 per cent said it had exceeded them, 50 per cent said they were partly or wholly unsatisfied with their careers. Furthermore, 10 per cent said they were considering leaving the profession entirely. Vets who have been qualified for five years or more were least optimistic about the future, rating their opportunities for career progression less positively than more recent graduates, and were also least likely to feel that their degree had prepared them for their current work.

When seeking a role, the three factors that both graduates and students agreed would have the greatest influence on their choice of career were intellectual satisfaction, location and a supportive environment.

There is a new and changing structure to the veterinary workforce. The profession is no longer seen as one where the newly qualified veterinary surgeon will necessarily work in practice for the rest of their life. Some will leave, some will retrain or move into related or unrelated industries. It is a different outlook on the profession and is bound to affect overall recruitment.

Yes the proportion of female vets is, of course, having an impact on ways of working, but this is only a small part of the whole. Employees generally – not just within the veterinary profession – are more demanding of employment packages that provide a good work and lifestyle balance and consider employee well-being as an integral part of the employment contract.

Clearly there are numerous issues that affect the recruitment of veterinary surgeons and it is likely that, put together, they contribute significantly to the problems now being experienced by veterinary practices when trying to fill vacancies. It will be interesting to read the results of the *Veterinary Times* jobs survey, completed in July of this year, which aimed to discover the reasons behind recruitment problems. ■

Industry Profile

Your name: Fiona Andrew
Position: President
Company: British Veterinary Nursing Association

What first attracted you to the veterinary nursing profession?
I am sure I am the same as most people who consider veterinary nursing – caring for animals and their needs was the main attraction.

However, I was initially attracted to working with animals when I was at school, but was turned off it by teachers and parents as it was felt that my grasp of the sciences was never going to be good enough for me to be a veterinary surgeon; so there was little consideration of other options at the time and I allowed myself to be guided in a different direction.

Subsequently, I considered veterinary nursing on several other occasions and was even offered a place to study the subject, but I couldn't afford to go back into full-time education on a self-funded basis at the time. Then I eventually took on a maternity cover animal nursing assistant position in a local practice and never looked back.

How did your career evolve after qualification?
Well, it took me a long time to qualify! I had to wait until the practice I worked with was in a position to offer me training and then there were issues with a lack of a clinical coach and other challenges that meant it took me five years to be entered on the RCVS *Register*.

After qualification, I worked at my training practice, then another couple of practices before moving on to education for a year and finally into my current position as a business development manager for Purina Petcare. Nutrition is an area of clinical practice in which nurses excel.

What are the most significant changes to the veterinary nursing profession you have witnessed since qualification?
I clearly remember when I was 'seeing practice', a couple of years before I took my first job in practice, a care assistant telling me that there was little point in putting myself through the training process because "nurses never got to do the things they were trained to do anyway". I think this is the main thing that has changed.

"I know of many people who would like to train as a registered veterinary nurse (RVN) but who have little or no option to do so unless they are self-funded – and very few people are in a financial position to do this"

"We needed the Charter to put the foundations in place for the recognition of RVNs as chartered professionals; we now need to lead RVNs in what this means for them and how they can use this to their advantage"

Yes, there are still those practices that do not fully utilise their nurses; however, I now see many more nurses used to their full potential and carving out different specialisms within their chosen field.

What do you think are the most critical issues facing the profession today; and how should they be tackled?
The critical issues are undoubtedly the lack of nurses. We simply are not training enough for our needs and no one is tackling this as a problem. Integral to this is also the lack of 'gender balance' in the profession and the low wages.

As is the case in many other industries, we are suffering from the lack of funding for training anyone who is not aged between 16 to 21 – an issue created by successive governments. I know of many people who would like to train as a registered veterinary nurse (RVN) but who have little or no option to do so unless they are self-funded – and very few people are in a financial position to do this.

Men are not well represented in the veterinary nursing profession. This is not something we can change overnight and we have to find role models within the profession and also market the profession for the highly technical role that it can be.

It still makes me mad when successive practices show images all over social media of their patients getting a cuddle from the nurse, with no mention of the incredibly challenging radiograph they have just produced, the hours they have spent in surgery or the smile on the nurse's face when they successfully tempted an in-patient to eat.

We need to market *all* the opportunities open to RVNs across the whole range of different fields of the veterinary world.

Give us a brief thumbnail sketch of the British Veterinary Nursing Association.
The BVNA is made up of up to 12 council members who come from many different fields of veterinary nursing – we currently have industry nurses, practice nurses, business owners, business managers, a human nurse (RN) and a zoo vet nurse.

We work on everything from producing our own journal (the *VNJ*), organising CPD events and our annual congress, to providing the views of veterinary nurses on controversial issues of the day, projects run by the RCVS and other veterinary representative bodies.

Last – and by no means least – we provide a comprehensive range of support services for all our members.

During your years of association with the BVNA, what are the most significant changes you have seen in the organisation?
I think the most significant change is the attitude of other veterinary representative bodies and organisations towards the BVNA. We are now approached to be involved in so many more projects and consultations than ever before, as the role of the veterinary nurse in practice is more widely accepted and readily recognised.

What have been the highlights of your presidential year?
This year has been amazing! Celebrating 50 years of the BVNA has coincided with the new Royal Charter and the presentation of a bill to parliament to protect the title of veterinary nurse. On a personal front, being at the House of Commons when the Charter was presented was undoubtedly the highlight of my year.

What are the association's priorities?
At the moment, the BVNA's priorities are to continue to offer low-cost, high-quality CPD to our members, to develop the *VNJ* to be the premier journal for veterinary nursing research and to continue to press for protection of the title of veterinary nurse.

Why so few male veterinary nurses?
There is a lack of awareness of how technical and physical the role of the qualified RVN really is. Nurses are still portrayed as cuddling animals and cleaning; this needs to change. We also need to market those incredible veterinary nurses who happen to be male and the diverse range of roles that they fulfil.

Interestingly, the percentage of male RNs who are currently working in the NHS is just over 10 per cent. Caring professions are still perceived as 'feminine' – and it is interesting that veterinary surgeons' own regulatory and administrative bodies are now asking why so many entrants to veterinary degree courses are female.

Isn't it time for a less 'fluffy', more hard-nosed approach to animal welfare from veterinary nurses?
I believe that RVNs should be recognised more in the public eye as being advocates for high standards of animal welfare, alongside their veterinary surgeon colleagues. The public should recognise and respect the professional status of the RVN and know that they have important information and advice to provide about animal welfare.

Has the formal recognition of the veterinary nursing profession through the Royal Charter really made any difference to nurses at a grass roots practice level?
I think it would be incredibly naïve to think that we would have a new Charter and RVNs would wake up the next morning with everything having changed. We needed the Charter to put the foundations in place for the recognition of RVNs as chartered professionals; we now need to lead RVNs in what this means for them and how they can use this to their advantage.

What next for the veterinary nursing profession?
Undoubtedly protection of the title of veterinary nurse has to come next. The introduction of the Charter gave us the *foundation* to build on, protection of the title *safeguards the status* of the veterinary nurse.

Secondly – and most importantly – it protects animal welfare, gives the role clarity and reassures the public. This can only strengthen the profession and raise awareness of what veterinary nurses can do.

Veterinary nurses are already developing specialisations. These will become more formalised as they develop, and wider recognition and better remuneration for these roles will help with the overall challenge of RVN retention. ■

"It still makes me mad when successive practices show images all over social media of their patients getting a cuddle from the nurse, with no mention of the incredibly challenging radiograph they have just produced..."

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