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Veterinary PracticeToday
THE JOURNAL FOR PERSONAL & PROFESSIONAL DEVELOPMENT

Bond-centered veterinary practice

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UP FRONT...

On following the crowd...

Lemmings have become the subject of a widely popular misconception that they commit mass suicide by jumping off cliffs. It is in fact not a mass suicide but the result of their migratory behaviour – driven by strong biological urges, some species of lemmings may migrate in large groups when population density becomes too great.

The 'lemming' entry in *Wikipedia* states, 'They can swim and may choose to cross a body of water in search of a new habitat. In such cases, many may drown if the body of water is so wide as to stretch their physical capability to the limit. This fact, combined with the unexplained fluctuations in the population of Norwegian lemmings, gave rise to the misconception'.

One of the more striking images from this year's BSAVA Congress was the sight of hundreds of delegates streaming, lemming-like, across the canals as they scampered to and from the commercial exhibition, in between scientific lectures. Heads down, besporting the bright red backpacks of the species and chattering intently, they followed one another blindly as they migrated from hall to hall.

Photo: Steve Burden

As far as we know, no-one perished in the canals in Birmingham; but one senses that many of the delegates were in danger of drowning from the sheer volume of CPD that they encountered. And one does wonder how much of the information through which they swam, was actually retained.

This observation is not in any way to denigrate the content or value of this congress or the many others that occur during the veterinary year; but rather to sound a cautionary note. All veterinary professionals are being put under increasing pressure to fulfil their statutory obligation to complete prescribed hours of CPD, and they may find themselves, heads down, stampeding on a pathway towards quantity rather than quality.

The lemming metaphor can be extended to wider aspects of veterinary professional life too. There are questions of ethics to be addressed with respect to the headlong rush towards new surgical techniques and their real effects on the well-being of the patient and the values of the human-animal bond; the constant introduction of complex medicines means that it is more important than ever to understand the fundamental principles of pharmacology and pharmacokinetics; and to what extent is the rising clammer for more flexible hours and better work/life balance clouding the more altruistic aspects of a vocation as a veterinary professional?

So slow down, put your feet up, pour yourself a glass of wine and read about these three issues – along with many more – in this edition of *Veterinary Practice Today*.

David Watson
Editor

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Elmtree Business Park
Elmswell
Bury St Edmunds
Suffolk IP30 9HR

Tel: 01359 245310
Fax: 01359 245253
veterinarypracticetoday.com

Subscriptions
subscriptions@veterinarypracticetoday.com
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Tel: 01359 245310

Editorial
Editors
Maggie Shilcock
maggie.shilcock@visionline.co.uk
Tel: 01359 245310

David Watson
david.watson@visionline.co.uk

Associate editor
Sarah Kidby
sarah.kidby@visionline.co.uk
Tel: 01359 245310

Design
Graphic designers
Gemma Baker
Melody-Anne Neville
Bradley Young
designer@visionline.co.uk

Production
Publications manager
Clara Heard
clara.heard@visionline.co.uk
Tel: 01359 245310

Marketing
Media and marketing co-ordinator
Sarah Bosher
sarah.bosher@visionline.co.uk
Tel: 01359 245310

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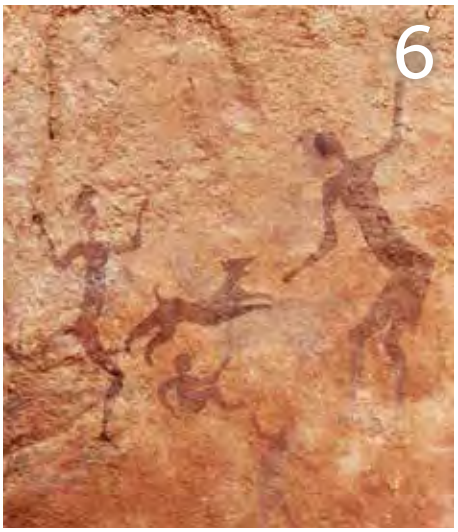

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Featured contributors

Russell Fuller
MA VetMB MRCVS

Russell graduated from Cambridge in 2003. He currently works in a 12 vet farm animal only practice based in Gloucestershire. His main interest lies in the interactions between nutrition and fertility and is currently studying for the Diploma in Bovine Reproduction.

Ian Wright
BVMS BSc MSc MRCVS

Ian is a practising veterinary surgeon at the Withy Grove Veterinary Clinic and co-owner of The Mount Veterinary Practice in Fleetwood. He has a Master's Degree in Veterinary Parasitology, is an editorial board member for the *Companion Animal* journal and is head of the European Scientific Counsel of Companion Animal Parasites (ESCCAP UK & Ireland). Ian is regularly published in peer-review journals and carries out research into companion animal parasites, including work on intestinal nematodes and tick-borne diseases.

Bettina Dunkel
DVM PhD Dip ACVIM Dip ECEIM Dip ACVECC FHEA MRCVS

After a fellowship, internship and a large animal internal medicine and an emergency and critical care residency (alternate track) in the USA, Bettina attained her PhD from the University of London in 2008. Since then she has been employed as a senior lecturer in equine medicine at the Royal Veterinary College. Her main clinical and research interests are equine platelets, neonatology, respiratory diseases and all aspects of equine critical care.

Victoria Bowes
RVN Dip. RSA MIfL QTLS

Victoria is a qualified veterinary nurse with 15 years' experience in both small animal and emergency practice environments. She has been a lecturer at Warwickshire College for the past 10 years and is currently course manager for veterinary nursing. As a practical examiner for the RCVS, Central Qualifications and City and Guilds she also has the pleasure of assessing the next generation of veterinary nurses.

Bond-centred veterinary practice: the way forward

Elizabeth Ormerod
BVMS MRCVS FRSA

Following qualification from Glasgow veterinary school, Elizabeth ran the Cargill Clinic, the University of Glasgow's inner city charity clinic. In 1984, she and her vet husband, Edward, purchased their small animal practice and adopted a comprehensive, bond-centred approach.

A Churchill Fellow, Elizabeth has travelled widely to visit HAB programmes in institutions, community settings and animal shelters. She writes, lectures and broadcasts on the HAB and is a visiting lecturer to veterinary schools.

People have enjoyed living in association with animals for millennia and close relationships tend to develop, with animals viewed as companions. The term for such relationships is the human-animal bond (HAB), often referred to as 'the bond', and denotes a dynamic and mutually beneficial relationship.

The field of anthrozoology, the study of human-animal relationships, began in the 1960s with the work of Professor Boris Levinson, an eminent psychologist who observed that the presence of his companion animals greatly facilitated his counselling sessions. He documented his findings and encouraged others to study the phenomenon.

Levinson (1962) postulated that those who would benefit most from the presence of animals would be the most vulnerable individuals and groups, including children, older people and those incarcerated in prisons. Since then, researchers and practitioners from a wide range of disciplines have studied the effects of human-animal interactions (HAI) for diverse client groups in all kinds of settings.

The Society for Companion Animal Studies (SCAS), a multidisciplinary membership association, was founded in 1979 for the study of the bond and was the first organisation of its kind. In 1990, SCAS was a founder member of the International Association of Human-Animal Interaction Organisations (IAHAIO).

THE BOND

Health and social benefits

A plethora of significant health and social benefits deriving from human-animal interaction has been documented for people of all ages and in all circumstances. Planned interventions are termed animal-assisted interventions (AAI) and these are now becoming more commonplace in institutions – hospitals, nursing homes, schools, psychiatric facilities and prisons.

In 2013, SCAS produced its AAI: *Code of Practice for the UK* and in 2014 IAHAIO published its White Paper Definitions for AAI and guidelines for the wellness of animals involved (Ormerod, 2013). The human-animal bond is an important aspect of 'One Health' (Day, 2012).

Veterinary professionals wishing to better understand and harness the power of the human-animal bond should aspire to create a bond-centred veterinary practice (BCVP). In a BCVP the practice team, as well as addressing any companion animal health issues, aim to understand each client's relationship with their animal(s), assess the quality of these relationships and intervene to strengthen the bond, if required (Ormerod, 2007 & 2008).

Turning point

Following qualification from Glasgow veterinary school, I was appointed to run the Cargill Clinic, the University of Glasgow's inner city charity clinic. I became frustrated – sometimes angry – and was very concerned by the high numbers of animals suffering from preventable disease and injury.

Dr Ian Lauder – my teacher and mentor – counselled me to get to know and understand my clients better. He advised that the care animals receive reflects that of the wider family and that most people were doing their best. So throughout the following three years, I endeavoured to learn about my clients' relationships with their animals, something of their lives, and to discover what they knew about preventive medicine for people and animals. Frustration and anger turned to shock.

Many children in the community were unvaccinated and there was little understanding of nutrition. Some clients had serious symptoms, including those of cancer, yet had not seen their GPs. Most clients were retired or unemployed, many were chronically ill or disabled and they lived in the most deprived and dangerous areas of the city. I came to realise how vital were strong HAB relationships in helping clients cope in such adverse circumstances – the strong bonds of affection with their animals provided immeasurable social support.

This was a turning point – no longer would I just focus on the patient. It was equally important to determine my clients' understanding of conditions and then explain how such problems might be avoided. Whereas previously I had been annoyed at the clients' lack of knowledge about animal care, I now appreciated there was also usually a concurrent absence of understanding regarding basic aspects of human health. It was important to use words that people understood and to avoid the use of medical terms.

The effectiveness of this BCVP approach was demonstrated by high levels of compliance and in the extent to which advice was shared with others. Information given to a single client would ripple across the city, resulting in earlier presentations. For example, clients began to present animals with barely detectable skin masses; whereas previously animals were presented with sizeable masses, some of which were inoperable. Following our advice, animals and children were vaccinated, animals were neutered and self-neglecting clients attended their GP surgeries, some undergoing cancer treatment.

However, one-on-one teaching is time-consuming. It would have been more effective to visit primary schools, targeting those in the most deprived areas, to teach comparative preventive medicine and safety. With hindsight, I realise I should have discussed this possibility with the Faculty. But a greater opportunity arose a few years later...

Extending the principle

Just over 30 years ago, my husband, Edward, and I purchased a companion animal practice in Fleetwood, Lancashire, with the aim of exploring fully the concept of BCVP, while also introducing veterinary led community outreach programmes.

The small community was recognised as having poorer health and more social problems than surrounding towns. Additional programmes and elements were introduced and refined in our BCVP. Key aspects included: pet selection counselling, puppy development and monitoring, client education, animal behaviour advice, the provision of emotional support, client advocacy, an ethical euthanasia policy and multidisciplinary working.

People were encouraged to attend the practice *before* acquiring animals in order to be advised of species and breeds suited to their experience, ability, family situation, lifestyle, time and financial constraints. Clients were directed to reputable breeders and animal shelters and warned about puppy farms and back street breeders.

Weekly puppy and kitten development clinics allowed us to monitor growth, development, behaviour, the strength of each bond and owner compliance with preventive protocols. Controlled growth prevented developmental joint disorders and alerted clients to the importance of weight management. Unwanted behaviours were identified and addressed. Clients requiring more help were recognised and supported.

Client education was a key element of consultations. In addition to providing information about preventive medicine, we also offered behavioural advice and shared information about benefits accruing from their HAB relationships. Such information strengthened their bonds with animals and with the practice. Emotional support was provided to clients whose animals, for example, were seriously injured, terminally ill, were missing or had died.

As a result of work by SCAS, most veterinary practices do now understand the importance of client bereavement support. Its members developed the Pet Bereavement Support Service – now operated by Blue Cross – and this provides client support, at no cost to the client or to the practice.

Sharing the load

Inter-agency working is an important component of BCVP and we created a multidisciplinary professional network (MDPN) involving colleagues from the other caring professions. Our MDPN included colleagues from all the health and allied professions, education, social work, probation, police, judiciary, prison staff, animal welfarists and journalists. We provided them with advice on the HAB and on various aspects of animals in society. Then, when faced with difficult and challenging situations, we sought advice from them.

In most instances we would describe scenarios in general terms, without breaking client confidentiality. Although we developed links with GP practices and worked with GP colleagues in community task forces, their input to BCVP was rarely required. Advice was most often sought from colleagues in social work, mental health, teachers and police. Collaborative working with journalists was employed to raise awareness of HAB issues and to assist with rehoming animals. Social work input was especially useful in many situations.

As veterinary professionals we are not required to make a diagnosis of animal or child abuse, but suspicions of non-accidental injury (NAI) and other forms of abuse should be raised with our colleagues in the SSPCAs and Child Protection. Some veterinary colleges in the USA and the Animal Medical Center in New York have social workers on staff and attest to their value in supporting clients and also in training and supporting students and staff.

Ours is a very challenging profession; we often consult in highly charged situations and we would all benefit enormously from being able to access social work input.

Skills required for BCVP

- Good communication skills
- Active listening
- High level of empathy
- A team approach
- Knowledge of the human-animal bond
- Expertise in animal behaviour
- Knowledge of pets in housing issues
- Provision of pet loss support
- Recognition of at-risk HABs and the ability to intervene
- Understanding of The LINKS, the cycle of abuse and NAI
- Inter-agency working, including cross reporting of concerns

It is important to continually assess human-animal bonds and to intervene to strengthen these as necessary. Behaviour issues are common. They are a frequent cause of weakening bonds and without early intervention often escalate, leading to the animal being rehomed or euthanised. Sometimes healthy animals are presented for unwarranted euthanasia, also called 'convenience killing'.

These consultations are highly complex, require time and a careful approach. It is important to determine the real reason for the request and to find a satisfactory solution. Our ethical euthanasia policy did not allow the euthanasia of healthy animals – individuals that could be rehomed.

Unwarranted euthanasia consultations

Although such cases were not frequent, how they were handled had a major impact upon practice staff and on perception of the practice by the local community. We allocated 30 minutes

for such cases, which were always planned to coincide with a tea break. Clients were invited to have a 'cuppa' with me and we would sit and chat on general topics, building a rapport.

Once this was achieved, the reason for their visit was broached, gently coaxing them to explain their decision. The strength of their bond was assessed. If the client was bonded to the animal, I would determine the best solution and how we could achieve it. This might involve, for example, behaviour therapy, finding a dog walker for a less able client, providing information on zoonoses or allergy management, acting as advocate for vulnerable clients and – especially for older people – if they had difficulties in finding pet-friendly accommodation.

If the bond was poor and deemed irretrievable, we would undertake to rehome the animal. Clients who could be trusted would keep their animals until there was a vacancy in an animal shelter or until we identified a suitable adopter from our client base. If circumstances dictated that the client could no longer care for the animal and – on the rare occasions that we could not trust them – they were asked to sign a consent form, transferring ownership to us.

Failure to obtain written consent can result in the animal being reclaimed in the future. On transfer of ownership, clients normally paid a fee to contribute to the animal's care and this was equivalent to the cost of euthanasia and cremation.

These are very difficult, emotionally charged consultations that must never be rushed. It requires a high level of skill to reach a satisfactory outcome. A condition known as perpetrator-induced traumatic syndrome (PITS) has been diagnosed in people whose occupation requires them to kill others, including veterinary surgeons required to kill healthy domestic animals (Whiting and Marion, 2011).

Our ethical euthanasia policy was another of the elements of BCVP that enabled us to deliver a higher level of service, while also safeguarding animals and reducing stress levels for all practice staff. We typically rehomed between 50 and 100 companion animals every year. The majority were cats found as strays, many of which were presented ill or injured. Following a period of quarantine and rehabilitation, they were cared for in the cat sanctuary we built adjacent to the practice until they were matched with a suitable adopter.

The benefits of a BCVP far exceeded our expectations. The practice was a 'safe place' for people and animals and an important community resource. Operating with an empowered practice staff, working in partnership with our clients and with the occasional support of our MDPN proved a less stressful, happier and more effective way to work.

Reasons for unwarranted euthanasia requests

- As an act of revenge
- Moving home (landlord doesn't allow pets)
- Supported living settings operating pet bans
- Animal hair showing up against new furnishings
- Misunderstandings about zoonoses (e.g. when client pregnant)
- Suspected allergy to the animal
- Puppy 'nipping'
- Mental illness affecting owner (e.g. could be a precursor to suicide)
- Misunderstanding over an animal health problem
- Behaviour issue that can be addressed
- Partner jealous of animal

Some benefits of BCVP

- High level of client bonding to practice
- Very high levels of trust and compliance
- Higher standards of treatment
- Raised status of animals, fewer animal welfare problems
- Early intervention regarding HAB issues
- The creation of the invaluable MDPN
- Fewer requests for unwarranted euthanasia
- Reduced practice stress
- Higher practice income

Summary

My deep understanding of the bond has enabled me to deliver a higher standard of patient care and I strongly encourage other practices to adopt a bond-centred approach.

Once a BCVP has been created, veterinary professionals can consider whether to share their HAB knowledge to develop AAI community outreach programmes. Our profession has a key role to play in this new and exciting aspect of 'One Health'. ■

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Laura Buckley
BVetMed CertVD DipECVD MRCVS
European Specialist in Veterinary Dermatology

Laura graduated from the Royal Veterinary College in 2003. She spent six years in general practice where she achieved her RCVS Certificate in Veterinary Dermatology. In 2012, Laura completed a three-year residency in veterinary dermatology at the University of Liverpool and was subsequently awarded the European Diploma in Veterinary Dermatology.

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)*

OTITIS

Managing chronic otitis – targeting primary, predisposing and perpetuating factors

The short-term management of chronic otitis and long-term control of recurrent disease can seem an impossible task owing to the presence of severe otic inflammation, multidrug-resistant bacterial infection, otitis media and primary underlying diseases contributing to disease recurrence. Part one of this two-part series described how primary, predisposing and perpetuating factors are identified for individual cases (*VPT* 3(2): 8-13); this article describes how to use this information to formulate a targeted management plan.

Unfortunately, evidence-based recommendations for otitis treatments cannot be made because of inconsistencies in the evaluation of outcomes in clinical trials (Nuttall and Cole, 2007). However, successful medical management of chronic otitis is possible, provided a treatment plan is established that targets the factors contributing to disease pathogenesis.

Managing the three 'P's

Successful management of chronic otitis requires treatment that targets the primary, predisposing and perpetuating factors contributing to the pathogenesis of the disease. Initial treatment will focus on resolution of the perpetuating factors and this often takes priority over the final diagnosis of primary factors – in dogs with chronic otitis caused by atopic dermatitis, for example.

Once the perpetuating factors have been resolved, primary factors can be fully investigated and their treatment – along with therapy for any predisposing factors contributing to otitis – can be incorporated into a long-term management plan.

Resolving perpetuating factors

In the majority of otitis cases, the perpetuating factors are the reason that the animal has been presented for treatment. They cause considerable irritation and/or discomfort and therefore require prompt resolution as follows:

- Elimination of microbial infection (external ear canal, middle ear +/- inner ear)
- Resolution of inflammation/progressive pathological change

Elimination of microbial infection

It is important to remember that the reason the microbial infection is present is the altered otic environment and loss of self-cleaning mechanism. Therefore, resolution of progressive pathological change with anti-inflammatory treatment is likely to assist in the elimination of any microbial infection. Otic lavage will also hasten the resolution of infection and is of particular importance in the management of otitis media (OM).

The necessity and choice of antimicrobial agent should be determined by cytological assessment of the otic discharge. If no microbial agents are identified, then treatment should focus on resolution of the inflammatory changes. As discussed in the previous article, culture and susceptibility testing is not useful for confirming the presence of infection owing to the possibility of propagation of insignificant commensal flora and/or numbers of transient bacteria and should only be used to identify the species of bacteria involved and their susceptibility to antibiotics where systemic treatment is required.

In vitro susceptibility testing is not useful for selecting topical antimicrobials. When *Malassezia* species are seen on cytology, topical antifungal therapy should be instituted. All proprietary topical otic combinations contain effective antifungal agents.

Where bacterial infection is identified cytologically, antimicrobial agents should be used to hasten resolution. In order to limit the development of antimicrobial resistance, systemic antibiotics should be avoided in cases where topical antimicrobials are likely to

> "Otic lavage will also hasten the resolution of infection and is of particular importance in the management of otitis media"

be efficacious. This is the principle for most bacterial otitis cases.

If systemic antibiotics are required, those with the narrowest spectrum necessary to treat the infection (based on in vitro susceptibility testing) plus an effective dose, dose frequency and duration of treatment for the site and severity of infection should be used (see further reading).

Topical antimicrobial therapy is likely to be more effective for bacterial otitis externa and uncomplicated OM than systemic antibiotics because of the ability to achieve 100 to 1,000 times the concentration within the ear canal (Morris, 2004). Topical antimicrobials also have the potential to exceed minimum inhibitory concentrations (MICs) for bacteria showing in vitro resistance to systemic antibiotics – acquired resistance to fluoroquinolones and gentamicin seen with *Pseudomonas aeruginosa* infections, for example (Buckley et al, 2013).

Tris-EDTA is useful for the management of chronic otitis externa and media complicated by Gram-negative bacteria such as *P. aeruginosa* because it damages the bacterial cell wall making it easier for antimicrobials to penetrate (Gray, 1965). Tris-EDTA has been shown to reduce the MICs of marbofloxacin and gentamicin for multidrug-resistant *P. aeruginosa* in vitro (Buckley et al, 2013) and those of neomycin and gentamicin for *P. aeruginosa* growing in a biofilm (Pye et al, 2014).

In a recent study, a commercially available combination of tris-EDTA and 0.15% chlorhexidine (Otodine, Vetruus, UK) demonstrated in vitro efficacy for all pathogens most commonly involved in canine otitis, including *Malassezia pachydermatis*, *P. aeruginosa* and methicillin-resistant *Staphylococcus pseudintermedius* (Guardarbassi et al, 2010); suggesting that antiseptic agents could be used instead of topical antibiotics for the management of microbial otitis.

Where topical antibiotics are used, selection should be guided by the presence of cocci (staphylococci, streptococci) or bacilli (*P. aeruginosa*, *Proteus mirabilis*, *Escherichia coli*) cytologically. Systemic antibiotics are only usually required for OM complicated by osteomyelitis, otitis interna and para-aural abscessation. They may have to be used for cases that will not permit topical therapy, but as the animal becomes more comfortable following treatment with anti-inflammatory agents, topical therapy can sometimes be introduced.

Otitis media has been reported to be present in 82.6 per cent of chronic canine otitis cases (Cole et al, 1998). There is no treatment licensed for use in otitis cases with a ruptured tympanic membrane. However, anecdotally, water-based products appear to be well tolerated. Tris-EDTA is available commercially as crystals for reconstitution (TrizAural, Dechra Veterinary Products). Homemade recipes combining tris-EDTA and water-based antimicrobial and corticosteroid preparations can, therefore, be used for management of otitis media cases.

Resolution of progressive pathological change

For most cases, progressive pathological change consists of epithelial and glandular inflammation (hyperplasia). More severe pathology, such as epithelial fibrosis and extensive mineralisation of the external ear canal (EEC) may require surgical management.

Non-steroidal anti-inflammatory agents are poor at resolving chronic cutaneous inflammation and are rarely useful for the medical management of chronic otitis cases – corticosteroids are the anti-inflammatory drug of choice in this situation. They decrease glandular secretions and epithelial exudation, reduce scar tissue and proliferative changes and are anti-pruritic.

> "Otitis cases should be checked every two weeks to assess response to both antimicrobial and anti-inflammatory treatment"

For minimally inflamed ear canals, topical corticosteroids can be administered and are commonly incorporated into proprietary otic medications. For moderate to severe or chronic inflammation, systemic corticosteroids should also be used. They can also be considered for mildly inflamed, pruritic ear canals in order to prevent self-trauma.

Prednisolone (or methyl-prednisolone) is administered at 0.5-1mg/kg (or 0.4-0.8mg/kg) once daily until otic inflammation has resolved. Less severely inflamed ears may only require a five-to seven-day course, which does not usually necessitate tapering. Severe, chronic inflammation requires the use of doses at the higher end of the anti-inflammatory dose range – prednisolone at 1mg/kg once daily, for example. Daily dosing should be maintained until otic inflammation is resolved then the dose or dose frequency can be tapered by 25 to 50 per cent every two weeks.

For animals that develop unacceptable adverse effects, the dose can be reduced earlier. Ciclosporin is effective for the long-term control of inflammation associated with atopic dermatitis (AD) and may, therefore, be useful as part of a management plan for control of cases where this is a primary factor. However, it is less useful for resolving chronic otic inflammation and, owing to its slower onset of action, is inferior to corticosteroids for management of mild otic inflammation.

For chronic otitis cases that require analgesia, paracetamol at 10mg/kg twice daily for five to seven days can be used alongside systemic corticosteroids.

Otitis cases should be checked every two weeks to assess response to both antimicrobial and anti-inflammatory treatment. Repeat cytology should be performed to check for the presence of microbial infection and, when absent, topical therapy can be switched to maintenance cleaning.

The potential adverse effects of medical therapy include ear canal and/or tympanic membrane trauma, vestibulitis, Horner's syndrome with deafness following otitic lavage, and irritation, sensitisation and ototoxicity following the use of topical agents.

Addressing predisposing factors

Predisposing factors – such as swimming/bathing and pendulous pinnae – can be managed on a long-term basis by means of ear cleaning. In the case of regular swimmers, their ears should be dried and cleaned with an antiseptic cleaner to prevent microbial overgrowth. For hairy ear canals, the hair can be removed by plucking; although, again, regular

cleaning may be sufficient for long-term management. Disease-free, hairy ear canals do not require hair removal.

Long-term control of primary factors

This is an essential part of the management of chronic otitis that is commonly overlooked. Following resolution of perpetuating factors, the primary factor is responsible for disease recurrence. Management of primary factors varies widely depending on the disease and, again, it is beyond the scope of this article to cover the management of all possible primary factors contributing to otitis.

The majority of unilateral feline otitis cases presenting to the Small Animal Teaching Hospital at the University of Liverpool result in surgical management for removal of polypoid tissue within the middle ear and most bilateral canine otitis cases receive management for allergic skin disease (most commonly atopic dermatitis, including the food-induced form).

Maintenance therapy is important

Unless the primary factor that initiated otitis can be cured with medical or surgical management – usually only foreign bodies, otic parasites, polyps and neoplasia – physical ear cleaning to assist the self-cleaning mechanism within the ear canal is important for limiting disease recurrence and is essential for recovering chronic otitis cases.

Cleaning physically removes debris and microbes and most cleaning agents have antimicrobial properties that help to prevent microbial overgrowth. There are a large number of proprietary ear cleaners available. Most contain ceruminolytic and antimicrobial agents; or substances, such as propylene glycol, that are both. There are also a small number of water-based ear cleaners, which have superior flushing properties but reduced ceruminolytic activity.

Table 1 summarises the broad indications for making a choice of ear cleaner.

Cleaning can be performed every one to two weeks – or more frequently in some cases. However, if administration is required daily or every other day, then the primary factor(s) may not be controlled sufficiently and global case management should be reviewed.

Surgical management of chronic otitis

In some chronic otitis cases, the severity of progressive pathological change is such that surgery to remove the ear canal is indicated. It is difficult to provide guidelines as to what level of change warrants surgical intervention – some animals with severe and chronic otic inflammation will show a good response to medical management. The decision may be influenced by the owners' ability to medicate the animal and their financial status, but should be influenced primarily by prognosis.

Complete loss of pliability on external palpation and/

***Figure 1**. Dorsoventral radiographic image of a canine skull showing extensive mineralisation of the external ear canals.*

or extensive mineralisation on diagnostic imaging of the ear canal cartilages (**Figure 1**), severe epithelial and/or ceruminous gland hyperplasia and fibrosis, severe bony destruction or proliferation of the bulla(e) on diagnostic imaging or cases with cholesteatoma or para-aural abscessation, carry a poorer prognosis for response to medical treatment.

Surgery should be considered for first-line management of acute or chronic otitis where nasopharyngeal polyps or neoplasia have been identified as primary factors, or in cats where otitis media has been identified as a perpetuating factor and involves the ventral compartment of the tympanic bulla.

Surgery should also be considered in cases that have not responded to appropriate medical management. However, care should be taken to ensure that owners are administering therapy correctly – and that all primary and perpetuating factors have been identified and managed appropriately – before this decision is made.

It should be remembered that most of the primary factors contributing to recurrent otitis will require long-term management following surgical treatment of otitis. Some dogs with atopic dermatitis will continue to have skin inflammation and pruritus affecting the pinna (+/- the rest of their skin) following surgery. The risk of surgical complications should also be considered and discussed with the owner.

It is beyond the scope of this article to cover surgical management of otitis, but for disease affecting the EEC (+/- middle ear), total ear canal ablation and bulla osteotomy is generally indicated. For disease restricted to the middle ear – cats with otitis media involving the ventral compartment, for example – ventral bulla osteotomy is indicated.

Resection of the lateral wall of the EEC is not recommended for the management of otitis. For any animal whose disease

Table 1. Ear cleaner properties and indications for their use

Otic environment	Properties of ear cleaner
Dry cerumen and *Malassezia* prone ears	Ceruminolytic and antimicrobial, e.g. propylene glycol
Moist ears and those prone to bacterial infection	Less viscous cleaners for improved flushing (i.e. those that are predominantly water-based) and antimicrobial (e.g. containing chlorhexidine)
Prone to regular inflammation secondary to allergic skin disease	Anti-inflammatory (no specific product available but topical corticosteroid can be added to a cleaner)

extends beyond the lateral wall of the EEC (approaching 100 per cent of chronic otitis externa cases), this surgery results in the bulk of diseased tissue being left behind and renders the otitis more difficult to treat because the ear canal no longer retains topical medications.

Conclusion

Sadly, it is not possible to make evidence-based recommendations for the use of specific products in the treatment of otitis. However, successful medical management of chronic otitis is possible, and setting out a treatment plan which targets the three areas of pathogenesis is more likely to bring about a favourable outcome.

A surgical approach is required for the successful management of a small number of primary factors; although in the majority of cases, this should be only be used as a salvage procedure for cases with severe, end-stage progressive pathological changes or those that fail to respond to appropriate medical management.

Poor treatment response is most likely to arise from failure to use topical therapy, inadequate treatment duration, failure to fully resolve chronic inflammatory change and failure to identify and manage primary factors. Once chronic otitis has resolved, ongoing control of primary factors and establishing a long-term ear cleaning regimen will serve to reduce the frequency and severity of disease recurrence. ■

PPD Questions

1. Which two of the following primary factors would warrant consideration of surgical management of otitis?

   A. Ear canal neoplasia
   B. Primary secretory otitis media
   C. Atopic dermatitis
   D. Inflammatory polyp
   E. Foreign body

2. How does tris-EDTA potentiate the effect of antibiotics on Gram-negative bacteria?

3. Which of the following would require treatment with systemic antibiotics?

   A. Otitis media
   B. Mineralisation of the ear canal cartilages
   C. Para-aural abscessation
   D. Ceruminal gland hyperplasia
   E. All of the above

4. Which of the following agents is suitable for first line treatment of *Malassezia* otitis?

   A. Topical clotrimazole
   B. Systemic ketoconazole
   C. Topical nystatin
   D. A & C
   E. A, B & C

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Nuttall T and Cole LK (2007). Evidence-based veterinary dermatology: a systematic review of interventions for treatment of Pseudomonas otitis in dogs. Veterinary Dermatology 18: 69-77.

Pye CC et al (2014). Evaluation of the impact of tromethamine edetate disodium dehydrate on antimicrobial susceptibility of Pseudomonas aeruginosa in biofilm in vitro. Veterinary Dermatology 25: 120-123.

Further reading (guidelines for antimicrobial use)

Responsible use of antimicrobial agents and PROTECT poster, www.BSAVA.com
Responsible use 8-point plan poster, www.BVA.co.uk
Recommendations for appropriate antimicrobial therapy, www.FECAVA.org

Beco L et al (2013). Suggested guidelines for using systemic antimicrobials in bacterial skin infections: Part 1 – diagnosis based on clinical presentation, cytology and culture. Veterinary Record 172: 72-78 (open access).

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Answers
1. A&D
2. Damages bacterial cell wall making it easier for antibiotics to penetrate
3. C
4. D

Helen Ballantyne
BSc(Hons) PGDip RN RVN

After graduating with a Degree in Pharmacology in 2002, Helen qualified as a RVN in 2005 and has worked in a variety of settings nationally and internationally. She has been on the BVNA Council for three years and is currently editor-in-chief of the Veterinary Nursing Journal.

In September 2013, she qualified as a 'human' nurse from Sheffield Hallam University and currently works in the Critical Care Unit at Papworth Hospital, the UK's largest specialist cardiothoracic centre.

Helen remains a registered veterinary nurse, working shifts in emergency and critical care to keep her skills and knowledge up to date. She has developed a strong interest in the idea of sharing medicine, applying concepts used by medical staff to the veterinary profession and vice versa. Her friends and family take great delight in asking her, as she goes to work, "Is it humans or animals today?'

*Suggested Personal & Professional Development (PPD)

PHARMACOLOGY

Pharmacology should hold no fears for veterinary nurses – you are already doing it!

In my experience, pharmacology is a subject that people don't like much. It's very useful, essential even, but rarely embraced. The key to understanding – and even enjoying – pharmacology is to link it to real life, real patients and real actions because we veterinary nurses use it every day, sometimes without even realising we are doing so.

The main problem, as I see it, is that pharmacology is linked to chemistry, and many people switch off at the prospect of chemistry. Having studied chemistry for many years at different levels, I can sympathise. It seems to me that the subject is largely a 'manufactured' science that changes at each level at which you study it.

When you start GCSE chemistry, they tell you to forget what you learnt before; when you start your A-levels they tell you to forget what you learnt at GCSE; when you start your Degree, they tell you to forget what you learnt at A-level. Really, what sort of subject is that!?

However, if we look at the average day of a RVN, many of us will have used chemistry and pharmacology before we even start a shift. Think about what happened when you arrived at work this morning. On the doorstep was the daily delivery of drugs, equipment, food, an essential part of the day. The first thing you do is unpack the drugs that must be stored in the fridge, that done, the rest of the order is usually abandoned and you continue upstairs to put the kettle on.

So why do some drugs have to go in the fridge? It's down to chemistry. Consider an egg, when heat is applied to its raw form, it changes colour, shape and texture. The protein in the egg, when combined with heat changes its entire structure – it is denatured. It is the same with some drugs, they are made from protein and if they have heat applied to them, they change, losing their function. Therefore, they won't work and you might as well chuck them out. That's the reason you put those drugs in the fridge. It's chemistry, it's pharmacology.

Pharmacology is much simpler than many people realise. It is a study of the effects of a drug, what drugs do, and the examination of the uses of the drug, describing why we use them. The subject is split broadly into two aspects: pharmodynamics, the power of the drug on the body; pharmokinetics, the movement of the drug through the body.

Pharmacodynamics

Pharmacodynamics examines the actual power of the drug – what the thing is actually going to do. Essentially, any drug has three main functions. It may be an antagonist, so it stops something from happening. It may be an agonist, so it will make something happen. Alternatively a drug may change the chemical environment in the body such that an action is started or stopped. Next time you look up a drug, try and work out into which category it falls.

Pharmacokinetics

Knowing and understanding the movement of a drug through the body is helpful, to ensure it performs the desired action. This process can be broken down into four key aspects: absorption (how it gets into the system), distribution (how it moves around the body); metabolism (how it changes); elimination (how it gets out of the body).

Absorption

Absorption is directly linked to the route by which we give the drugs and again we can link back to our day at work. The owners of a diabetic dog call you because they are struggling with giving their dog injections. "Why can't we just squirt the stuff into Daisy's mouth?" they ask.

Instead of simply saying "No", if you have an understanding of the structure of the drug, you can apply that knowledge to provide a clear reason as to why the insulin must be administered via injection. The reason we cannot give insulin by mouth is because the usual digestive processes of the gut will stop it from working and it will be useless. And that's pharmacology.

Distribution

Knowledge of the distribution of a drug in the body is another aspect of pharmacology that is used regularly in practice. In fact, every time an emergency case comes through the door. All good veterinary nurses know that on being presented with a patient that needs drugs quickly, they reach for

needle, syringe, 'prep' solution and clippers, preparing for intravenous administrations.

Drugs need a moving blood stream in order to be distributed around the body to reach their target organ. So, in an animal that is collapsed, their body is sending all its blood to the main organs and not wasting any on 'useless things' such as the skin or paws. So, injecting a drug into the skin – where there is no blood to take it anywhere else – will be futile. Instead the drug must go into the vein – a vein that is part of a circulatory system working hard to pump blood to the organs.

Metabolism

As with the food we eat, drugs are not used in the body in the form they are taken in. Think about a slice of toast – our teeth break it down, enzymes in the saliva act on it. There are multiple actions that result in the bread being converted to glucose so that the body can absorb it. It is exactly the same with medicines. They need to be changed to enable them to work and enzymes – specific catalytic chemicals in the body – are the secret weapons that convert drugs to useable forms.

Let's return to practice and take another telephone call. This time it is the owner of an unwell cat – a bit lethargic, off colour and not keen on eating. The owners can't bring her in as they haven't the time. They ask, can they just give her a paracetamol tablet? The simple answer is "No". But isn't it better to be able to explain your answer?

Paracetamol is not active in 'tablet form', it must be combined with enzymes and broken down into a 'useful' substance. During the process of being broken down, paracetamol forms a toxic intermediary substance that needs more enzymes to convert it to a safe form. In human paracetamol overdose cases, people have taken so much paracetamol that this enzyme is all used up, so the toxic form of paracetamol is allowed to move around the body, slowly destroying the liver.

In cats, this enzyme is missing altogether, so they are not able to break the drug into a safe form. It is this knowledge of pharmacology that means we can prevent cats dying from paracetamol poisoning.

Elimination

Finally, all drugs that we have given to our patients must be eliminated from the body; again, knowledge of this process is useful. Drugs are usually removed from the body by the kidneys or the liver. So, if you find a normal drug regimen is altered by the veterinary surgeon in charge of the case, it is likely the animal in question might have liver or kidney damage – a situation that would mean they were unable to excrete drugs.

Why should you care?

It is clear that many aspects of pharmacology come into play every time you pick up a syringe, or packet of tablets. However, some of you out there might be thinking … what does it matter? I will just give the medicine and be on my way.

That is not enough. A knowledge and understanding of pharmacology is essential, not just for passing exams, but for three key reasons: for patient safety, for owner compliance and for your own professional conduct.

Drugs may pose a risk to our patients in three possible ways – they may experience an unpleasant side effect or adverse reaction and may suffer at our hands if we make an error in our choice and administration (drug error).

Side effects

Side effects to drugs are common. They are defined

by the World Health Organisation (WHO) as 'any unintended effect of a pharmaceutical product, occurring at a dose normally used, which is related to the pharmacological properties of the drug'.

We don't really want these effects to happen; however, we know they might happen and, most importantly, we can warn people that they might happen. Additionally, we can avoid a drug altogether if the side effect might cause more problems than the medicine itself may solve. The key point is that these side effects are predictable and, therefore, we can plan and care for our patients accordingly.

A common side effect that springs to mind is with the use of medetomidine, a frequently used alpha agonist. One of its side effects can be diuresis; so, knowing this means you can make your patients' lives much more comfortable by taking them out to empty their bladder as soon as they have recovered.

Adverse reactions

Adverse reactions are different. Again, they are clearly defined by the WHO – 'an adverse reaction is a response to a drug which is noxious and unintended and which occurs at doses normally used for the prophylaxis, diagnosis or therapy of disease or the modification of physiological function'.

Put simply, this is a bad reaction that we don't want to happen and one we cannot predict. Importantly, we need to ensure that if it happens, we treat the patient appropriately and once they are safe, ensure that the adverse event is reported so that others may learn from our experience.

Drug errors

Errors in drug dosing can be catastrophic and they should not happen. The way

we administer medications now comes directly under the RCVS *Code of Conduct for Veterinary Nurses*, which states, 'Veterinary nurses who supply and administer medicines must do so responsibly' (RCVS, 2012). But what does this mean?

If we look towards 'human-centred' nurses and borrow guidance from their regulatory body, the Nursing and Midwifery Council (NMC), they are clear about the way nurses should purport themselves when giving medications. They state, 'the administration of medicines is not solely a mechanistic task to be performed in strict compliance with the written prescription of a medical practitioner. It requires thought and the exercise of professional judgement' (NMC, 2010).

Figure 1 lists the points that the NMC demands are addressed each and every time a medicine is given.

Using a simpler model, the Institute of Healthcare Improvement cites The Five Rights of Medication (**Figure 2**). This highlights the five key checks required before a medicine is given. Each and every time, ask yourself: Have I the right drug? The right patient? The right dose? The right route and the right time? If you can answer positively to each of those questions, go ahead, give the medication.

Figure 1. *Standards for the practice of administration of medicines (NMC, 2010).*

As a registrant, in exercising your professional accountability in the best interests of your patients, you must:

- Be certain of the identity of the patient to whom the medicine is to be administered
- Check that the patient is not allergic to the medicine before administering it
- Know the therapeutic uses of the medicine to be administered, its normal dosage, side effects, precautions and contra-indications
- Be aware of the patient's plan of care (care plan or pathway)
- Check that the prescription or the label on medicine dispensed is clearly written and unambiguous
- Check the expiry date (where it exists) of the medicine to be administered
- Have considered the dosage, weight (where appropriate), method of administration, route and timing
- Administer or withhold in the context of the patient's condition, (for example, digoxin not usually to be given if pulse below 60) and co-existing therapies, for example, physiotherapy
- Contact the prescriber or another authorised prescriber without delay where contra-indications to the prescribed medicine are discovered, where the patient develops a reaction to the medicine, or where assessment of the patient indicates that the medicine is no longer suitable
- Make a clear, accurate and immediate record of all medicine administered, intentionally withheld or refused by the patient, ensuring the signature is clear and legible

It is also your responsibility to ensure that a record is made when delegating the task of administering medicine.

It's a clear and easy way to prevent simple drug errors that can, otherwise, have catastrophic effects.

So, by ensuring we have an understanding of the pharmacology of the drugs we give, we are doing our best to work according to our professional code of conduct and, through that working in as safe a way as possible to the benefit of our patients.

As was the case with reference to insulin and paracetamol administration mentioned earlier in this article, knowledge can be used to reinforce a point of instruction with an owner which, in turn, can prevent problems with non-adherence to instructions regarding medication.

Again, extrapolating from human clinical guidelines provided by the National Institute for Health and Care Excellence (NICE, 2009), we are informed that, 'Non-adherence should not be seen as the patient's problem. It represents a fundamental limitation on the delivery of health care, often because of failure to fully agree the prescription in the first place, or to identify and provide the support that patients need later on'. So NICE is telling us that if the owners of our patients do not follow our instructions, it is our fault, until proven otherwise!

So, we need to check our own understanding regarding the 'pills and potions' we hand out. The dispensing of a simple instruction is easy. However, a simple instruction of 'give with food' accompanied by the reason we need to 'give with food' may strike a chord, clang a great bell or knock sense into an owner and ensure that their pet receives its medication under optimal conditions.

Kauffman and Birks (2009) follow up the points made by NICE and tell us to 'encourage questions and follow up treatment plans, providing information in small amounts with regular checks in comprehension. Dowell (2007) explains that the optimal conversation regarding medication involves trying to reach a common understanding about the condition and its treatment.

Figure 3 displays a model outlining all aspects of drug prescriptions that should be discussed with an owner (Lewis, 2004). It encourages us to ensure that we share information about why the patient needs the drugs, as well as adverse reactions and side effects. It also reminds us to think about what we are saying, and try to consider a simple way to explain things.

Conclusion

So, as you can see, pharmacology is important. Remember too that you are

Figure 2. *The Five Rights of Medication (Institute for Healthcare Improvement, 2014)*

Right drug
Right patient
Right dose
Right route
Right time

Figure 3. *No Tears (Lewis, 2004)*

Need and indication
Open questions

Tests and monitoring
Evidence and guidelines
Adverse events
Risk reduction
Simplification

already doing it. But you can do it better – in a professional environment there must always be room to improve. Taking steps to improve your pharmacological knowledge – even if they are small incremental steps – are steps towards promoting patient safety, better drug adherence and professional working.

It's time to dust off that textbook and sign up for that webinar... ■

PPD Questions

1. The study of the action of a drug on the body is called:

   A. Pharmacodynamics
   B. Pharmacokinetics
   C. Pharmacology
   D. Pharmaceutical science

2. The way veterinary nurses supply and administer medications is directly guided by which organisation?

   A. The Nursing and Midwifery Council
   B. The Royal College of Veterinary Surgeons
   C. The British Small Animal Veterinary Association
   D. The Royal Society of Prevention of Cruelty to Animals

3. On discovering non-adherence to medication prescriptions, veterinary nurses should:

   A. Blame the owners, they are too lazy to give the medication as instructed
   B. Tell the veterinary surgeon to call the owners up and threaten them
   C. Talk to the owner and offer support in the form of verbal or written instructions
   D. Assume that the pet in question will not take the medication

4. What kind of reaction to a drug can be described as 'noxious and unintended'?

   A. Adverse reaction
   B. Side effect
   C. Allergy
   D. Intolerance

5. Which process describes the breakdown of drugs into a useable form in the body?

   A. Absorption
   B. Distribution
   C. Metabolism
   D. Elimination

Answers
1.A 2.B 3.C 4.A 5.C

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Common intestinal nematodes of UK cats and dogs

Intestinal nematodes (Phylum Nematoda) are common parasites of UK cats and dogs despite widespread availability of anthelmintics effective against them. Although they rarely cause significant pathology, they can when present in sufficient numbers. *Toxocara* species also have zoonotic potential, making control vital for human health. Human cases of toxocarosis occur in the UK year on year despite repeated efforts to control it. This article reviews the epidemiology of intestinal nematode infections endemic in the UK, the zoonotic risk they represent and their diagnosis, treatment and control.

Ian Wright
BVMS BSc MSc MRCVS

Ian is a practising veterinary surgeon at the Withy Grove Veterinary Clinic and co-owner of The Mount Veterinary Practice in Fleetwood. He has a Master's Degree in Veterinary Parasitology, is an editorial board member for the Companion Animal Journal *and is head of the European Scientific Counsel of Companion Animal Parasites (ESCCAP UK & Ireland).*

Ian is regularly published in peer-review journals and carries out research into companion animal parasites, including work on intestinal nematodes and tick-borne diseases.

*Suggested Personal & Professional Development (PPD)

PARASITOLOGY

Clinically significant intestinal nematodes

With the exception of whipworms (*Trichuris vulpis*), intestinal roundworms of veterinary importance in UK cats and dogs are either ascarids or hookworms. Some have simple direct life cycles with immature and adult worms all within the intestine; others are more complex, having migratory life cycles.

Significant pathology and clinical signs in cats and dogs are rare and, with the exception of *Ancylostoma caninum*, even large worm burdens can be well tolerated. Eggs passed in the faeces develop into embryonated infective eggs or hatch with infective L3 larvae developing in the environment. It is these infective environmental stages that pose the greatest zoonotic risk and control of human disease consists of limiting exposure of people to these stages.

The following are the most common and clinically important intestinal nematodes in the UK.

Toxocara species

Toxocara species are a group of intestinal nematodes infecting dogs (*T. canis*) and cats (*T. cati*). They are the most common nematodes seen in small animal practice.

The life cycle of *T. canis* is complex involving hepatic and pulmonary migration. Adult worms live in the small intestine (**Figure 1**) and eggs are passed into the environment via the faeces of the host. The eggs, when first shed, are unembryonated and not infective (**Figure 2**).

"Without anthelmintic intervention transmammary infection ensures a high prevalence of infection in both puppies and kittens"

Progression to the embryonated L3 stage is required for infection and so fresh faeces do not present a zoonotic risk. Under optimum conditions, embryonation takes place in two to seven weeks. Although dogs may be infected by ingesting embryonated eggs, the most important route of canine infection is transplacental. As a result, prevalence of infection in pups, born to untreated dams, is close to 100 per cent.

Dogs may also become infected by transmammary infection or consuming paratenic hosts, such as rodents. Paratenic host consumption is more important in *T. cati* transmission, where hunting by the feline host is more frequent and transplacental transmission does not occur. Without anthelmintic intervention transmammary infection ensures a high prevalence of infection in both puppies and kittens.

As cats and dogs reach maturity, they develop a degree of immunity to *Toxocara* species which reduces the numbers and reproductive capacity of worms in the intestine. As a result, the prevalence of patent infection in adult pets is frequently less than 20 per cent. This can vary substantially, however, with stray, feral and hunting

Figure 1. *Toxocara species adults.*

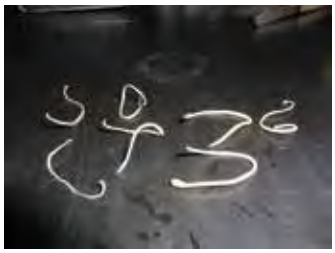

Figure 2. *Toxocara species egg.*

Table 1. Routes of embryonated egg infection in human toxocarosis

Route of transmission	Description
Geophagia	Embryonated eggs may be present in the soil of gardens, parks and children's play areas. Soil provides a more suitable environment than fresh faeces for the embryonation process as eggs need to be shielded from UV light and desiccation. Sand pits may also be contaminated by *T. cati* eggs, presenting a potential risk for children playing in these areas.
Pica	Embryonated eggs may be transferred on to objects such as fruit and vegetables that are subsequently ingested; or on to garden toys that are placed into children's mouths.
Direct dog contact	Embryonated *Toxocara* species eggs have been found in the coats of dogs (Wolfe A and Wright I, 2003) making direct contact dogs a possible route of transmission. While it is unlikely the level of contamination and embryonation rate will be as high as in soil, the presence of embryonated eggs in dog fur means that prolonged direct contact and poor hygiene around dogs represents an unquantified transmission risk.

populations having a higher prevalence.

Prevalence in western Europe has been recorded as high as 34 per cent for *T. canis* and 76 per cent for *T. cati* (Overgaauw & Van Knapen, 2013). The prevalence in a population is also not static – with shedding of ova being intermittent – so the total reservoir of infection should not be underestimated.

Toxocara species infection is well tolerated in cats and dogs, with clinical signs only developing in puppies and kittens, immunocompromised adults or with concurrent disease. Heavy infections can lead to loss of body condition and failure to thrive.

Pulmonary migration can also lead to acute respiratory signs or chronic pulmonary damage.

The single largest concern with *Toxocara* infestation is the zoonotic risk it poses. Although people can be infected by eating the undercooked meat of paratenic hosts, such as wild game (Sturchler et al, 1990), the most common route of human infection is by the ingestion of embryonated eggs. The eggs of both *T. canis* and *T. cati* are involved in zoonotic transmission (Fisher, 2003).

The various routes by which these infective eggs are ingested are summarised in **Table 1.**

A combination of these routes has led to significant numbers of people being exposed to the parasite – between two and 31 per cent of people having *Toxocara* antibodies on serology. The incidence of disease, however, appears to be relatively low. Currently approximately two cases per million people are reported in the UK each year; although this is likely to be a significant underestimate.

The disease takes a wide variety of forms and so may remain undiagnosed. Even if recognised, cases may not be reported as toxocarosis is not a notifiable disease in England and Wales and national data rely on voluntary reporting of infections to the Health Protection Agency (HPA). Although human adults are affected, the most 'at-risk' group is children aged between two and four years of age. This may be a consequence of poorer personal hygiene than in adults, increased pica and geophagia in this group or a greater susceptibility to infection generally.

Human toxocarosis is considered to consist of four different manifestations summarised in **Table 2.**

There have also been associations made between *Toxocara* species infection and asthma, dermatitis and epilepsy, with a particularly strong association being made between *Toxocara* seropositivity and epilepsy (Pinelli et al, 2008, Quattrocchi et al, 2012).

Toxascaris leonine

This ascarid of cats and dogs is much less common and pathogenic than *Toxocara* species owing to its non-migratory life cycle. The life cycle is direct, with infection occurring through ingestion of embryonated eggs or paratenic hosts. It is rarely seen at levels of infection capable of causing clinical signs, other than as part of mixed intestinal infections, and is not thought to be a significant zoonosis.

> "Human toxocarosis is considered to consist of four different manifestations"

Table 2. Clinical phenomena arising from human *Toxocara* species infection

Condition	Description	Examples of clinical signs
Visceral larva migrans	Larvae migrate through the lungs or liver leading to respiratory and/or hepatic signs. The heart may also be affected leading to myocarditis.	Weight loss, anorexia, abdominal pain, lethargy, fever, respiratory and cardiac signs.
Ocular larval migrans	Migrating larvae in the eye set up granulomatous reactions.	Progressive visual loss, strabismus, blepharospasm.
Neurological larva migrans	Migrating larvae in the nervous system. This can lead to infarction and menigioencephalitis.	Changes in mentation and sleep patterns, seizures.
Covert toxocarosis	Seropositive patients with mild or moderate clinical signs that may or may not be caused by migrating larvae.	Abdominal pain, lethargy, headache, cough, dermatitis.

Ancylostoma species

Two species of *Ancylostoma* infect dogs, *A. caninum* and *A. braziliense*; but only *A. caninum* is endemic in the UK. It is currently uncommon and mostly limited to foci in the south of the country; although this is likely to change as climate change and pet travel increase.

Ancylostoma tubaeforme infects cats and is thought to be present at low prevalence in pockets across the UK. The life cycle of *Ancylostoma* species is direct, with eggs passed in the faeces hatching and developing into infective L3 larvae. This can occur in as little as five days in warm humid conditions. Infection then occurs either by active skin penetration by the larvae or by ingestion.

Larvae penetrating the skin migrate via the bloodstream to the lungs, where they are coughed up and swallowed. Maturation to adulthood then occurs in the small intestine. Ingested larvae may cross the buccal mucosa and migrate to the lungs or be swallowed and develop to patency without migration.

A proportion of migrating larvae arrest in muscle and this provides the potential for transmammary infection of puppies. This is an important route of infection for *A. caninum* leading to heavy burdens in affected puppies. Evidence for transmammary infection with *A. tubaeforme* is, however, lacking.

A. caninum is the most pathogenic hookworm in dogs. It is a veracious bloodsucker leading to haemorrhagic anaemia, often with melaena. In more chronic infections, weight loss, lethargy and dermatitis are the predominant presenting signs. *A. tubaeforme* rarely causes significant pathology in UK cats owing to low worm burdens, but it may contribute to chronic disease in mixed infections. Age-resistance and acquired immunity mean that clinical signs are less common in older individuals, although dermatitis can occur in dogs of any age.

A. caninum has zoonotic potential as a cause of the syndrome known as cutaneous larval migrans. Migrating larvae rarely penetrate through the skin in human infections but wander across it. This is associated with an inflammation known as a 'creeping eruption'. Although cases caused by *A. caninum* have been reported internationally, there has never been a case that has originated in the UK.

Uncinaria stenocephala

The life cycle of *Uncinaria stenocephala* is similar to that of *Ancylostoma* species, except that oral ingestion of the L3 larvae (without pulmonary migration) is the primary route of infection. Although the larvae can penetrate the skin of canids, the larvae rarely progress to migration and maturity. Infection by the transmammary route has not been demonstrated.

> "Dogs in kennelled areas have been found to have a higher level of infection of *U. stenocephala*"

U. stenocephala is endemic in domestic dogs in the UK with prevalence having been estimated in the domestic dog population at between one and four per cent by using faecal flotation (Wright and Wolfe, 2007). Wolfe et al (2001) found faecal flotation underestimated the prevalence of *U. stenocephala* by 30 per cent, so the actual number of dogs infected may be much higher. This is supported by Wolfe and Wright (2004) who found 33 per cent of dogs examined had strongyle eggs in their coats. Although some of these will have been environmental contamination with ruminant and equine strongyles, it is likely that at least some of these eggs were *U. stenocephala*.

Dogs in kennelled areas have been found to have a higher level of infection, with a prevalence of 18 per cent in kennelled dogs in Ireland (O'Sullivan, 1997).

The lack of migration also limits its zoonotic potential to relatively mild dermatological signs. *U. stenocephala* nematodes are not veracious bloodsuckers and clinical signs in dogs tend to be more chronic in association with heavy burdens, particularly in puppies and kennelled dogs. A low-grade anaemia, lethargy, anorexia, weight loss and diarrhoea are all possible clinical signs. In kennelled dogs, pedal dermatitis is a common clinical sign of uncinariosis where larvae attempt to penetrate the feet.

Trichuris vulpis

This Trichurid nematode is uncommon in the UK and rarely present in sufficient numbers to cause clinical problems, except for occasional outbreaks in kennelled dogs. The life cycle is direct, with infection occurring through consumption of embryonated eggs. Adult worms live in the large intestine and large numbers can lead to diphtheritic inflammation and associated diarrhoea. There is no significant zoonotic risk.

Diagnosis and treatment

Diagnosis of intestinal nematode infections relies on identification of adult worms – which may be passed in the vomit or faeces – and identification of ova using faecal flotation methods.

Adult hookworms are easily identified by their small size (1-2cm) compared with *Toxocara* species and *Toxascaris leonine* which are much larger (up to 10cm). *Trichuris vulpis* has a very distinctive appearance with a thin anterior end and larger posterior end forming a 'whip' shape. Hookworms have a characteristic 'hook-like' posture from which their name is derived (**Figure 3**).

Microscopically *Ancylostoma* species and *Uncinaria stenocephala* can be differentiated by their buccal capsules. *A. caninum* has three pairs of cutting teeth and *U. stenocephala* has two

Figure 3. *Adult Uncinaria stenocephala.*

Figure 4. *Larvated hookworm egg.*

Figure 5. *Typical strongyle egg.*

Table 3. Identification of intestinal nematode ova.

Roundworm species	Ova size (approx)	Ova morphology
Toxocara	75 x 90µm	Ovoid, dark brown and thick pitted shell.
Toxascaris leonine	75 x 85µm	Ovoid, thick smooth shell.
Ancylostoma	65 x 40µm	Typically strongyle (**Figure 5**).
Uncinaria stenocephala	80 x 45µm	Typically strongyle (**Figure 5**).
Trichuris vulpis	80 x 40µm	Lemon-shaped with bipolar plugs.

cutting plates, with a small pair of teeth.

Roundworm eggs found on faecal 'floats' may be identified to genus from their size and morphology (**Table 3**). Diagnosis by faecal flotation, however, may miss roundworm infections as shedding of ova is intermittent, standard flotation techniques may be insensitive at detecting patent infection (Wolfe et al, 2001) and disease may be caused by non-patent infection. If faeces are not refrigerated or examined immediately, hookworm eggs will larvate and hatch leading to further decreased sensitivity (**Figure 4**).

Given these diagnostic limitations, therefore, if non-specific gastrointestinal signs – with or without anaemia – are present in a cat or dog that is not receiving routine anthelmintic prophylaxis, then treatment with an anthelmintic is justified. Suitable compounds for treatment and prophylaxis of intestinal nematodes are summarised in **Table 4**.

Control

Disease in cats, caused by intestinal nematodes, is a function of numbers; while complete elimination of all intestinal nematodes is not always practical – or even desirable – limiting their numbers will improve pet health. In addition to this, *Toxocara* species have zoonotic potential. Although the incidence of clinical toxocarosis is low, there is potential for serious consequences of infection and the tragedy when these complications occur is that with adequate control measures they might well have been prevented.

Control strategies for human toxocarosis involve the following measures.

Regular deworming of cats and dogs

Puppies and kittens provide the largest potential source of infection. Treatment of puppies should start at two weeks of age, repeated at two-weekly intervals until two weeks after weaning, then monthly until six months old. This will also prevent clinical disease. Kittens should be treated in the same way, but the first treatment can be given at three weeks old as there is no transplacental transmission.

It has been demonstrated that use of an effective anthelmintic every three months significantly reduces *Toxocara* species ova shedding (Wright I & Wolfe A, 2007) and so this frequency should be a minimum recommendation in dogs and cats. Use of a monthly anthelmintic will reduce egg output by over 90 per cent; although overall effectiveness will vary depending upon whether the pet hunts, is in contact with young children, immune-suppressed individuals or in situations where there is poor hygiene.

Anthelmintic regimens carried out at these frequencies will also control disease caused by other intestinal nematodes.

Minimising environmental contamination with cat and dog faeces

UK county councils have instituted a number of measures including imposing fines for dog fouling, providing clearly visible convenient disposal bins, banning dogs from children's playgrounds and sports fields – as well as covering sand pits when not in use – to try and prevent faecal contamination from cats.

Hygiene

Washing hands after handling cats and dogs and after playing/working outside is essential to help block transmission of a number of zoonotic pathogens. Washing of fruit and vegetables intended for raw consumption before eating is also important.

Conclusions

Intestinal nematode burdens are common in cats and dogs with the potential for mixed or heavy infections to contribute to disease. *Toxocara* species also present a significant zoonotic risk to the UK public.

"Control measures should be considered as a part of an overall parasite control programme for pets to reduce disease and zoonotic risk"

Table 4. Classes of anthelmintic suitable for intestinal roundworm treatment and prophylaxis

Anthelmintic class	Examples (in class)	*Toxocara* species	*Toxascaris leonine*	*Ancylostoma* species	*Uncinaria stenocephala*	*Trichuris vulpis*
Macrocyclic lactones	Eprinomectin, milbemycin oxime, moxidectin, selamectin	Yes	Eprinomectin, milbemycin oxime, moxidectin	Yes	Moxidectin only	Milbemycin oxime, moxidectin
Tetrahydropyrimidines	Febantel, pyrantel	Yes	Yes	Yes	Yes	Yes
Benzimidazoles	Fenbendazole	Yes	Yes	Yes	Yes	Yes
Octadepsipeptides	Emodepside	Yes	Yes	Yes	No	No

Intestinal nematodes should be considered as a differential diagnostic feature for cats and dogs presenting with gastroenteritis, loss of body condition, anaemia and failure to thrive.

Control measures should be considered as a part of an overall parasite control programme for pets to reduce disease and zoonotic risk. ■

PPD Questions

1. What life stage of *Ancylostoma* species is passed in the faeces of dogs?
   A. Unembryonated eggs
   B. Embryonated eggs
   C. L1 larvae
   D. L2 larvae
   E. L3 larvae

2. What is the most important route of *T. canis* transmission in dogs?
   A. Transplacental
   B. Transmammary
   C. Ingestion of embryonated eggs
   D. Ingestion of paratenic hosts
   E. Fresh dog faeces

3. Which of the following route of *Toxocara* species transmission is not significant in cats?
   A. Transplacental
   B. Transmammary
   C. Ingestion of embryonated eggs
   D. Ingestion of paratenic hosts
   E. Fresh cat faeces

4. Which of the following groups of people are most likely to contract human toxocarosis?
   A. The elderly
   B. 2-4 year olds
   C. 7-10 year olds
   D. Men
   E. Women

5. How many cutting pairs of teeth does *Ancylostoma caninum* possess?
   A. 0
   B. 1
   C. 2
   D. 3
   E. 4

Answers
1. A 2. A 3. A 4. B 5. D

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BAYER
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LUNGWORM
Lungworm (Angiostrongylus vasorum) can be fatal to dogs.
Advocate is a routine flea product that treats and prevents the lungworm Angiostrongylus vasorum
• Licensed to kill L4 larvae in addition to L5 larvae (immature adults) and adults
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Ivan Crotaz
BVetMed MRCVS

Ivan graduated from the Royal Veterinary College and has been working in general practice in the UK for the last 15 years. He developed a large rabbit caseload made up of first-opinion, second-opinion and rescue work. He also designs and develops a variety of veterinary products.

Ivan is recognised as an international teacher on rabbit airway management and anaesthesia, as well as maintaining his general practice and second-opinion rabbit work.

*Suggested Personal & Professional Development (PPD)

RABBITS

Practical approach to neutering rabbits

Neutering is the most common surgical procedure in rabbit general practice. It has immense welfare value and is not technically difficult. This article describes simple surgical methods for rabbits and some tips and tricks for dealing effectively with surgery in this species*. It supposes that the reader is familiar with dog and cat neutering procedures; similar basic techniques are used.

** Some drugs used in the neutering operation are not licensed for use in rabbits. Care should be taken to use these agents under the provisions of the 'cascade'. Please note that all pictures in this article have been arranged with the cranial end on the left.*

Before tackling the practicalities of neutering in rabbits, it is worth considering the 'pros' and 'cons' of the procedure.

Advantages include that it:
- Reduces fighting and aggression, especially with female rabbits
- Prevents uterine adenocarcinoma – very common in middle-aged rabbits
- Is a simple procedure that brings a new client base to the practice

Disadvantages include that there is:
- Potential for weight gain – although this is not an issue if the diet is hay-based (as it should be!)
- Potential surgical risk – tissue is friable and vessels tear more easily in this species
- Published evidence that anaesthetic risks are higher in rabbits than in many species – 1:139 in healthy rabbits (Brodbelt et al, 2008). Careful monitoring and attention to detail will reduce this risk.

The author normally considers neutering rabbits from four months of age onwards. Small female rabbits of this age can have an underdeveloped uterus which is easily ruptured during surgery and looks very similar to the ureters. If the rabbit is very small, it is wise to wait several months before considering surgery.

Catgut is broken down by phagocyte activity rather than hydrolysis and can give rise to sterile abscess formation around ligature sites (Hanke et al, 1994). Synthetic suture materials are preferred.

Anaesthesia process

Anaesthesia protocols will be discussed in a later article. There are no proven 'safer' protocols; safety comes from attention to detail before, during and after the anaesthetic.

Respiratory monitoring is especially important in rabbits – most will hypoventilate and hypercapnia is common. The routine use of a capnograph is highly recommended.

Preoperative period

Correct any husbandry issues ideally six to eight weeks prior to surgery. If this is not possible, then maintain the status quo at the time of surgery and correct these issues gradually after full recovery. Keep rabbits with a 'bonded partner' rabbit to reduce stress while in hospital. In such cases, it is a good idea to clip some hair from one ear of the rabbit to be operated on in order to avoid mistakes!

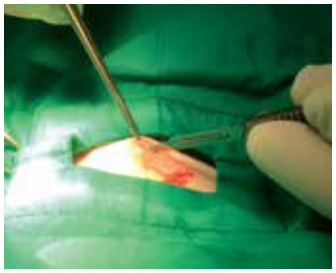
Do not starve rabbits preoperatively. Thirty minutes of food withdrawal, plus a gentle 5-10ml water mouth wash while still conscious and an oral/pharyngeal exam once under anaesthetic, minimises the risk of aspiration of food.

Reduce stress and pain during the induction period. Alternatives should be sought to intramuscular (IM) injections if possible, and mask inductions are highly stressful – better alternatives are available. Subcutaneous (SC) routes or intravenous

Figure 1. *Small battery powered clippers used to clip rabbit hair.*

Figure 2. *The green line shows the incision site for rabbit spay, between the caudal pair of nipples.*

Figure 3. *'Tent' the muscle well away from the abdominal contents before entering the abdomen.*



(IV) routes (+/- topical EMLA ointment) are considered to be less stressful.

Capnography and ventilation (IPPV) reduce the risk of hypercapnia which is very common in this species, frequently resulting in morbidity and mortality. Airway management can be performed using small face masks, rabbit V-gel devices or endotracheal tubes. The pros and cons of each technique will be covered in a later article.

Routine use of local analgesia will improve outcomes noticeably, with less depression and ileus (gut stasis) seen postoperatively. Generally one-third to one-half of the total calculated dose is drawn up in a sterile manner for use by the surgeon (lidocaine 1-3 mg/kg, BSAVA *Small Animal Formulary*, 7th edition).

Good results are seen if lidocaine is placed between secure double ligatures. It is likely – although still unproven – that this gives an extended period of analgesia. Splash blocks can be used during muscle and skin closure.

Clippers should be small, with fine sharp blades (**Figure 1**). The clippers need to be aimed at the point where the hair shafts leave the skin and precise, small areas should be clipped at a time. Any lacerations are easily managed with topical cleaning and closing using tissue glue.

Small surgical kits, such as those suitable for a cat spay, are appropriate, and a small spay hook and sharp iris type scissors are very useful additions. Minimise the use of traumatic instruments, such as rat-toothed forceps. Tissue forceps, stay sutures and sterile cotton buds soaked in sterile saline are useful for tissue retraction.

Remember too that the rabbit abdomen contains a relatively large amount of peritoneal fluid and should be kept moist during surgery.

"In young rabbits the uterus can be very small – 2-3mm is not uncommon"

Rabbit spay technique

The rabbit should be positioned in dorsal recumbency. A 2-4cm midline incision is made between the last pair of nipples, with about two thirds of the wound cranial to this point and one third caudal (**Figure 2**). This positioning is vital as it allows perfect access to the uterus and ovaries without exposing the majority of intestine.

The linea alba can be hard to identify in younger rabbits. Fascial outlines can mimic the linea alba and it is helpful to identify three lines – the lateral ones being outlines of the fascia, the central one being the linea alba.

The caecum sits directly dorsal to the linea alba and care needs to be taken to 'tent' the abdominal muscle properly before making a small stab incision to enter the abdomen (**Figure 3**). This incision should be extended cranially and caudally using blunt-ended scissors – again while tenting the abdominal muscle.

In adult rabbits, the broad ligament will be full of fat and sits directly dorsal to the abdominal incision. Simply elevate the fat to find the uterine horn and follow it to the ovary.

In young rabbits, the uterus can be very small – 2-3mm is not uncommon. It is vital to avoid handling a uterus of this size with toothed forceps or sharp instruments as it ruptures easily. It is also vital to identify the uterine bifurcation and the ovaries because the uterus and ureters look almost identical. A small uterus can lie dorsal to the caecum and colon, but the bifurcation sits dorsal to the bladder, as would be expected. A blunt-ended spay hook can be useful for atraumatic handling.

One horn of the uterus should be followed to the ovary. The fallopian tube tracks cranially past the ovary (normally 10-15mm) then returns caudally to the ovary (**Figure 4**). It is vital to exteriorise both the ovary and this flap of tissue before clamping and ligation. The right ovary can be more difficult to exteriorise as it tends to sit dorsal to a loop of large intestine. Gentle retraction of the abdominal muscle should allow access to the ovary (**Figure 5**).

A one-or two-clamp double ligation technique is then used (**Figure 6**), preferably with a small depot of lidocaine placed between the ligatures as described above (**Figure 7**). When reflecting the broad ligament, any large vessels should be ligated separately.

Large, fragile vessels are present running laterally either side of the cervix. The author ligates these separately (without crushing) before working on the cervix (**Figure 8**). It is best to 'tunnel' between the cranial cervix wall and vascular tissue using needle holders to place the suture material. If large amounts of fat are present, then this can be dissected away to isolate vessels before ligation.

Each uterine horn possesses its own cervix. Ligatures are

"Take care not to allow the ligatures to slip into the vaginal tissue as this occasionally results in urine leakage and peritonitis"

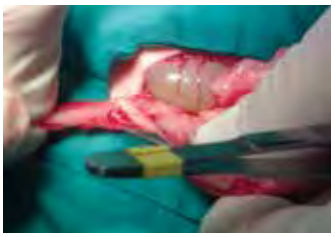


Figure 4. *The fallopian tube looping cranial to the ovary.*

Figure 5. *Gentle retraction of the abdominal muscle should allow access to the ovary.*

Figure 6. *Create a window and place a clamp to include all tissue cranial to the ovary.*

Figure 7. *A small depot of lidocaine is placed between the ligatures.*

Figure 8*. Large, fragile vessels run laterally either side of the cervix. The author ligates these separately (without crushing) before working on the cervix.*

Figure 9. *Ligatures are best placed just cranial to the cervix to avoid the ureters and common blood supply to the bladder.*

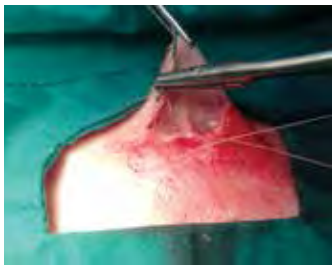


Figure 10. *Skin retraction assists in the accurate placement of the subcuticular suture.*

Figure 11*. A small amount of tissue glue is used to finish the skin surface.*

Figure 12. *Testicle being milked into area of skin incision.*

best placed just cranial to the cervix to avoid the ureters and common blood supply to the bladder (**Figure 9**). Take care not to allow the ligatures to slip into the vaginal tissue as this occasionally results in urine leakage and peritonitis. The use of the double ligation and lidocaine technique here gives effective postoperative analgesia.

The operation site should be gently flushed with warm sterile saline to remove blood clots and ensure that the peritoneal mucosa remains moist. This helps reduce the risks of postoperative adhesions and also reduces postoperative pain.

The abdomen should be closed with simple interrupted or continuous suture patterns in the abdominal muscle, fat and subcuticular skin as would be done with a dog or cat. Gauge 4/0 polyglactin is an appropriate suture choice for both muscle and skin sutures, but bear in mind that monofilament knots do not conform well to body tissue and might increase postoperative discomfort.

Skin retraction assists in the accurate placement of the subcuticular suture (**Figure 10**) and an Aberdeen knot is useful to create a neat finish to the subcuticular continuous suture. Lidocaine splash blocks should be placed at the muscle and subcuticular layers. A small amount of tissue glue is used to finish the skin surface (**Figure 11**), ensuring any excess is removed with a swab to prevent skin damage.

Rabbit castration technique

Both scrotal and pre-scrotal techniques can be used; although the author prefers a closed pre-scrotal approach for simplicity and minimal wound size.

A skin clip encompassing several centimetres around the wound and scrotum is performed. Care needs to be taken – scrotal lacerations are common and these should be cleaned and then closed with a simple application of tissue glue.

A 5-10mm incision is made in the pre-scrotal area, immediately cranial to the scrotum. This incision is then extended through the subcutaneous tissue (sharp iris scissors are useful here). When the testicle is milked cranially (**Figure 12**) from the scrotal sac, the depth of the tunica vaginalis covering the testicle is obvious. The overlying tissue is dissected one layer at a time until the testicle can be visualised within the tunica. The tunica containing the testicle is then dissected free from the scrotum using a combination of blunt and sharp dissection (**Figures 13 & 14**). Again, small sharp iris scissors are very useful.

The testicle and sac are drawn upwards as shown and then clamped and tied off in a similar fashion to a closed dog castration (**Figure 15**). Lidocaine should be placed between the double ligatures (**Figure 16**).

If the tunica is accidentally penetrated, then the testicle should be double-clamped and tied as for an open castration. The tunica should then be clamped separately and over-sewn to prevent herniation of abdominal contents. Excess tissue can then be removed.

The wound should be closed using a suture (simple interrupted or simple continuous pattern) in the subcutaneous layer, followed by a subcuticular suture with a buried Aberdeen knot (**Figures 17 & 18**) plus surgical glue. Lidocaine should be used as a splash block between the muscle and subcuticular layers.

Postoperative care

Non-steroidal anti-inflammatory drugs (NSAIDs) – generally meloxicam – and opioids should be used routinely. Ileus is far more likely to be caused by pain than opioids and these drugs should not be avoided in rabbits.

Remember postoperative Elizabethan collars prevent ingestion of caecotrophs and their use can be avoided in most cases. Good analgesia and surgical technique generally prevents rabbits interfering with wounds.

Meloxicam should be administered orally postoperatively for three to five days – the author achieves

Figure 13. *Iris scissors being used to separate tissue layers.*

Figure 14. *The testicle is elevated while tissue layers are separated.*

Figure 15. *Double ligations are tied into crush marks.*

Figure 16. *Lidocaine should be placed between the double ligatures.*

Figure 17. *Vicryl being used to suture the wound.*

Figure 18. *A subcuticular suture with an Aberdeen knot.*

good results with a dose of 0.1mg/kg PO BID, which conveniently matches the 'kg' dose on the dispensing syringes. Meloxicam is highly palatable for rabbits. It should not be used, however, if shock, dehydration or renal, gastric or hepatic disease is suspected.

The author does not use prokinetics, such as ranitidine or additional fluids, routinely on healthy rabbits; instead reserving them for sick patients or rabbits that are slow to eat after surgery. This is much debated but good analgesia and stress reduction appears to prevent the majority of ileus cases.

Routine postoperative checks should always be made the day after surgery – to assess pain, ileus, appetite and wound appearance.

Summary

Spaying and castration procedures in rabbits are simple to perform. Attention to detail on instrument choice, wound positioning, tissue handling and analgesia will reduce complications and improve the quality of recovery significantly. ■

PPD Questions

1. What is the value of placing local anaesthetic blocks during surgery?

   A. Improves analgesia in the postoperative period
   B. Anaesthetic sparing drug for intra-operative period
   C. Reduces risk of ileus postoperatively
   D. Improves postoperative mobility
   E. All of the above

2. What is the main value of placing warmed crystalloid fluid in the abdomen of a healthy rabbit after a spay, before closing the abdomen?

   A. To prevent hypovolaemic shock
   B. To prevent hypothermia
   C. To reduce pain and ileus
   D. To make it easier to squeeze the intestines back in

3. Which of the following is an appropriate landmark for centring a rabbit spay incision?

   A. The umbilicus
   B. Between the caudal pair of nipples
   C. Pre-scrotal area
   D. Lateral flank

4. Which of the following instruments or handling methods would be inappropriate for tissue handling in basic rabbit surgery?

   A. Saline-soaked sterile cotton buds
   B. Stay sutures
   C. Allis tissue forceps
   D. Gentle manipulation with gloved fingers

5. Which of the following is not likely to substantially reduce the risk of postoperative ileus in rabbit patients?

   A. Hospitalising with partner rabbit
   B. Multimodal pain management
   C. Syringe feeding
   D. Using sevoflurane rather than isoflurane
   E. Use of atraumatic surgical techniques

Answers
1.E 2.C 3.B 4.C 5.D

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Victoria Bowes
RVN Dip. RSA MIfL QTLS

Victoria is a qualified veterinary nurse with 15 years' experience in both small animal and emergency practice environments. She has been a lecturer at Warwickshire College for the past 10 years and is currently course manager for veterinary nursing.

As a practical examiner for the RCVS, Central Qualifications and City and Guilds she also has the pleasure of assessing the next generation of veterinary nurses.

*Suggested Personal & Professional Development (PPD)

NURSING

Nursing care plans – background and development

The use of nursing care plans in veterinary practice is paramount to ensure that animals and owners receive the highest possible levels of attention and that the animal receives consistent, holistic, individualised care. To be able to understand nursing care plans and how they can be applied, we first need to understand how the term veterinary nurse has evolved and the intricacies of the nursing process itself. A second article in *Veterinary Practice Today* later this year will discuss delivery and implementation of the different models available.

It is essential for veterinary nursing care plans to be tailored to the needs of the individual animal, rather than creating a care plan based on assumptions – including the assumption that all animals can have the same treatment based upon obvious similarities, such as species and breed.

Florence Nightingale, the founder of modern nursing, raised awareness of the difference between nurses and doctors. This has subsequently underpinned the evolution of the role of the veterinary nurse. Originally the title 'Nurse' was protected so veterinary nurses were referred to as Registered Animal Nursing Auxiliaries (RANA). Changes in legislation and years of raising awareness have now allowed veterinary nurses to carry the formally recognised title of Registered Veterinary Nurse (RVN).

The medical model

This is the 'organised' model of nursing care. According to Aggleton and Chambers (2000), the medical (biomedical model) sees patients as a complex set of anatomical landmarks and physiological systems. It is a model based on nursing the disease of the patient rather than the individual animal.

The signs and symptoms are categorised into patterns which, in turn, form the basis for diagnostic labelling (McKenna, 2000). Chapman (1985) suggested that such labelling can have the effect of causing the animal to become considered as little more than a disease entity. The identification by nurses that this model does not truly reflect nursing care is what prompted the development of nursing theories.

Nursing process

The nursing of an animal is delivered via the nursing process – a problem-solving method of nursing rather than a disease-oriented approach. Any actions that are carried out by nursing staff are based on assessment of the patient and its situation. It also key to professional nursing because it enables – and – recognises nurses as being able to provide organised, structured and holistic care to patients (Jeffery, 2012).

The nursing process is a cyclical approach that ensures nursing care is ongoing (**Figure 1**). As nursing staff have been active proponents of the development of nursing theories, it is incumbent upon them to implement them in practice and to ensure that their purpose and application is understood by everyone.

Veterinary nurses should also understand why they are delivering the nursing techniques. Walsh (1998) points out that if we are to argue for nursing as a profession in its own right, then as veterinary nurses we should be able to work out the boundaries such that we can recognise our field of expertise or practice, but also understand our limits. If nurses wish to be able to deliver the quality care that they feel patients deserve, then they must know what the care is and how it should be delivered.

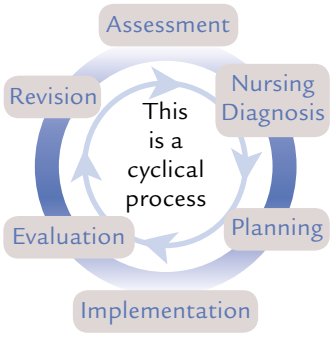

Figure 1. *The Nursing Process.*

Harnessing the nursing process effectively and efficiently will ensure that the animal is cared for as an 'individual' rather than as a 'disease' or 'condition' that requires treatment. The nursing process now contains an element entitled nursing diagnosis/nursing decision, which relates to the care that the animal should be given (Jeffery, 2012).

By using this concept of the nursing process, the veterinary nurse is enabling care based on assessment of individual needs (**Figure 1**).

Following the nursing process will ensure that the

veterinary nurse can deliver a systematic, individualised and holistic approach to the individual patient.

Nursing assessment

The assessment component of the nursing process is the most influential (**Figure 1**). If any parts of this assessment are inadequate or ineffective it will affect all the other stages of the nursing assessment (Maughan, 2013).

Nursing assessment requires input from a variety of sources, not just from the veterinary nurse (**Figure 2**). The veterinary nurse must use both objective and subjective observations to assess nursing requirements and patient disease state (Maughan, 2013).

Some veterinary practices have developed their own nursing assessment/admission sheets, so that they can discuss requirements with owners prior to the admission of their animals. For example, a key question that could be asked at the nursing assessment stage is, "What cat litter does your cat use at home?" Cats generally have a specific litter preference and this may affect their activities and sense of well-being during their stay in the hospital.

When carrying out an assessment of nursing the Subjective, Objective, Assessment and Planning (SOAP) method may be used (Maughan, 2013):

Subjective – personal assessment of immeasurable observations (patient's behaviour, for instance)
Objective – factual assessment of the patient (temperature, pulse and respiration, for example)
Assessment – an exercise using both sets of information gained from the subjective and objective assessments
Planning – the individual plan of care for the patient

Nursing diagnosis

Everyone must remember this is not a 'veterinary' diagnosis. At this stage we are not diagnosing treatment or medication, but planning for nursing interventions. The veterinary nurse will need to identify potential and actual problems for the individual patient. This component requires knowledge and experience of veterinary nursing to ensure an adequate and complete nursing diagnosis.

Planning

Jeffery (2012) states that before a care plan is produced, a planning stage should occur, which often begins with outlining aims. A nursing care plan should outline the aims of the care for the animal – meaning that both veterinary professionals and owners are able to work to achieve the best possible outcome for the patient (**Figure 3**).

This can be achieved because individual requirements and treatments are clearly established from the commencement of the care plan – allowing for every person involved to be aware of their role in caring for the animal.

The veterinary team must set a goal for each of the problems identified from the nursing assessment. These should be separated into short-term and long-term goals (Jeffery, 2012). However, there should also be acknowledgment for areas that cannot be resolved – sensory impaired patients, for example. The goals must be measurable to ensure that they can be identified when they have been met.

The nursing plan

A nursing plan should be completed using the information gained from the initial assessment, nursing diagnosis and goal setting. It should be written with enough detail and information that any nurse taking on the care of the patient is able to deliver the individual's needs.

There are three main recognised models of veterinary nursing practice. These are the:

- Orem 8 Self-care Requisites Model
- Orpet and Jeffery Ability Model (Orpet and Jeffery, 2007)
- 12 Activities of Living Model (Roper et al, 2002)

These will all be discussed in a second article

Implementation

This is the 'doing' part of the nursing process. It is the part the veterinary nurse carries out on a daily basis by providing recognised and recognisable individual care for the patient. It can also be referred to as the nursing intervention (Jeffery, 2014). It is paramount that veterinary nurses clearly justify the procedures and decision-making that they have carried out; this information should all be recorded on each patient's record sheet/nursing care plan.

Reflection

This is an essential part of the nursing process. Without reflection it is hard to justify the time devoted to planning or to decide whether nursing interventions have met the required needs of the patient or owner (Jeffery, 2012). Evaluation is key to the nursing process and requires the nurse to review the actions, assess their level of success and, in the event of

***Figure 2**. Nursing assessment requires input from a variety of sources, not just the veterinary nurse.*

***Figure 3**. A nursing care plan should outline the aims of the care for the animal.*

poor response, see what could be changed to facilitate better patient recovery and healing.

Reflection can be an extremely difficult process, and it must be carried out appropriately. As a veterinary nurse we would like to think that all goals are achievable; but sometimes they are not and will require a different technique or procedure.

If the goal is not achieved, suitable questions will need to be asked including (Luker, 1989):

- Was the original goal achievable?
- Is more information needed?
- Has the problem degenerated?
- As the veterinary nurse, do you require additional help from members of the wider team?

By using the questions and carrying out appropriate reflection, re-evaluation of the patient is taking place. This may lead to a revision of the original nursing care plan or completion of a new plan. Any changes or amendments must be documented on the plan; always remember, what is not written or recorded, did not happen!
So as veterinary professionals, always ensure paperwork is objective, comprehensive and accurate. ■

PPD Questions

1. Who is recognised as the advocate of nursing?

A. Florence Nightingale
B. Mother Teresa
C. Saint Agatha
D. Saint Francis

2. Which is the correct cyclical format for the nursing process?

A. Diagnosis, assessment, plan, evaluation, implementation
B. Assessment, plan, diagnosis, evaluation, implementation
C. Assessment, diagnosis, plan, implementation, evaluation
D. Evaluation, diagnosis, implementation, plan,assessment

3. Which component of the cyclical process of nursing is considered the most influential?

A. Diagnosis
B. Assessment
C. Evaluation
D. Planning

4. Which nursing care plan is based on the concepts of the 12 Activities of Living?

A. Gibbs
B. Orem
C. Ability model
D. Roper, Logan and Tierney

5. Which nursing care plan is based on the concepts of 8 Self-care requisites?

A. Gibbs
B. Orem
C. Ability model
D. Roper, Logan and Tierney

Answers
1.A 2.C 3.B 4.D 5.B

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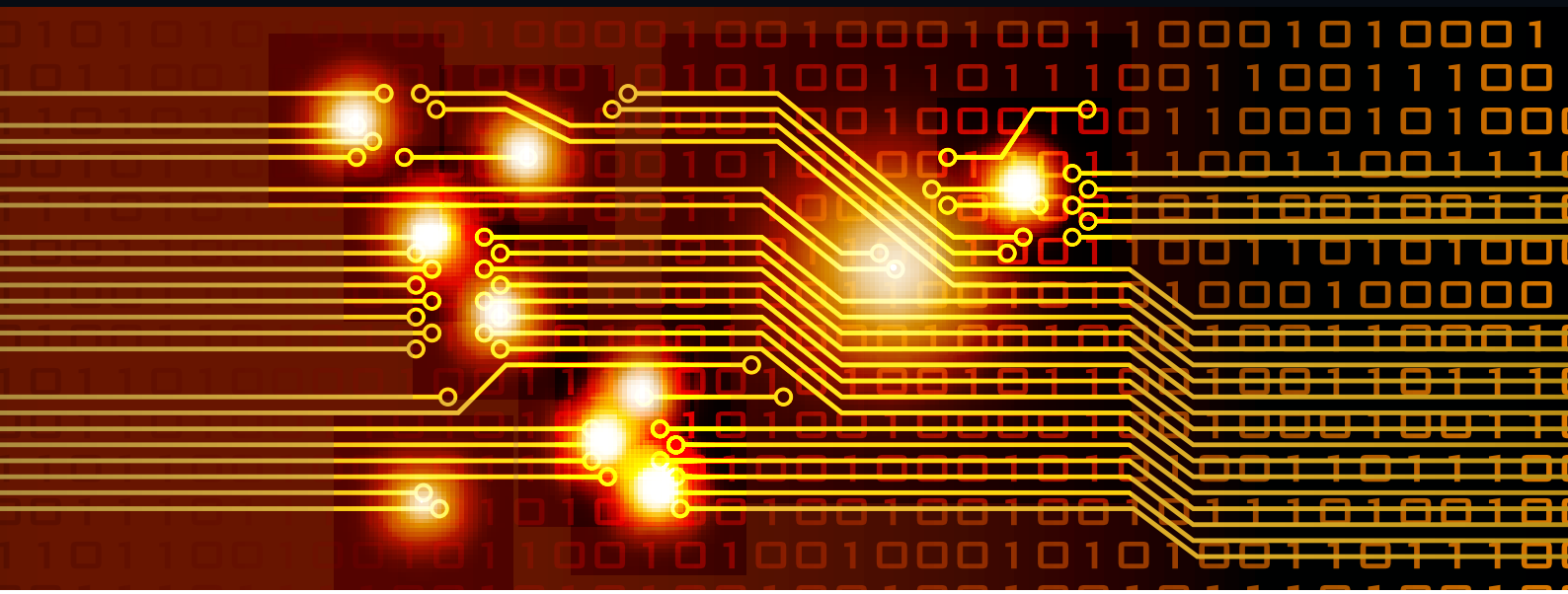

efficiency throughout the whole practice. Spectrum's large range of applications, the result of over 25 years of development, is truly staggering.

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Elizabeth Willcocks, Veterinary Surgeon at GKG Vets, Newbury.

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Martin Hobbs, Practice Principal, Meopham Veterinary Hospital, Kent.

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Jane Ellison
BSc(Hons)

Jane is an information scientist who has worked for the Veterinary Poisons Information Service (VPIS) and the human poisons service at Guy's Hospital, on and off since 1984, and has also worked in the pharmaceutical industry.

Jane was a founder of the veterinary service in the 1980s and has recently returned to work for the service in the 24-hour rota team.

**Suggested Personal & Professional Development (PPD)*

POISONS

Intravenous lipid infusion

One of the challenges of managing animals suffering from poisoning with agents such as baclofen, permethrin or tremorgenic mycotoxins from mouldy food, is preventing or controlling the associated twitching, tremors or convulsions.

In all cases, it is important to intervene quickly and effectively because uncontrolled muscular activity can lead to hyperthermia, rhabdomyolysis and disseminated intravascular coagulation. Diazepam is often ineffective at treating tremors or seizures from these agents, requiring the escalation to either propofol continuous rate infusions – a treatment which is not without its own problems over a certain duration; or a barbiturate.

The use of intravenous lipid infusion on lipophilic compounds has been shown to be safe, efficacious and cost effective, and is increasingly being used as a first-line treatment in such cases, rather than a last resort. In addition to being an effective treatment in its own right, it is highly likely that its use will decrease the amount of other drugs required, such as methocarbamol, and shorten the duration of any propofol constant rate infusion.

There are many names for this procedure, including lipid rescue, lipid emulsion or intravenous fat emulsion, but it was first proposed by Professor Guy Weinberg as a treatment for the management of severe local anaesthetic toxicity (Weinberg, 2006). Since then, numerous case reports have supported the use of intravenous lipids for severe local anaesthetic toxicity and it has also been used successfully in the management of toxicity from lipophilic and cardiotoxic drugs in both animals and humans.

Likely mode of action

Although the literature on this subject is growing, the exact mechanism of lipid infusion therapy is not fully understood and various hypotheses have been proposed. The lipid component formed in the blood may act as a 'sink' for lipophilic drugs, making them unavailable to act on their target receptors. There may also be redistribution to less vital lipid-rich tissues (Harvey and Cave, 2009a).

In drugs causing cardiac toxicity, lipids may also reduce toxic effects by providing a source of energy to the myocardial cells in the form of free fatty acids (Van de Velde et al, 1996). This overcomes impediments to mitochondrial free fatty acid oxidation.

Lipid infusion is likely to work in cases where the agent is lipophilic – such as permethrin, baclofen, ivermectin or moxidectin or a cardiotoxin – and has a relatively short half-life.

Numerous products are available for parenteral nutrition but the most commonly used in the management of poisoning in human and veterinary medicine is Intralipid 20% (distributed by Fresenius Kabi). The products should be available directly from a wholesaler, from a hospital pharmacy or from the 'ToxBox' scheme (details on the Veterinary Poisons Information Service (VPIS) website, vpisglobal.com).

Relatively safe option

As worldwide use and experience of this technique grows, there seem to be few risks or serious adverse effects, and the treatment is generally well tolerated.

There is the potential for delayed toxicity as the toxin diffuses out of the lipid or as the lipid is metabolised. Recurrence of toxicity has been reported following cessation of lipid administration in human cases (Marwick et al, 2009; McAllister et al, 2012); hence the recommendation for a bolus dose and then an infusion. The disposition of the drug or toxin after lipid infusion is unknown (Weinberg, 2010); there are no studies investigating this issue.

Lipid infusion has been used in pregnancy (Spence, 2007) and extremes of age are not a barrier to its use; it has been used in the management of local anaesthetic toxicity in humans aged two days (Lin and Aronson, 2010) to 92 years (Weinberg, 2012).

There are, however, some adverse effects of which to be aware (**Figure 1**) and despite its safety, there are three main categories of contraindication to the procedure:

- Disorders of fat metabolism
- Liver disease
- Egg allergies, because the preparation contains egg-yolk phospholipids as emulsifiers

Method of administration

The method of administration is straightforward.

Give 1.5ml/kg of 20% lipid emulsion (e.g. Intralipid 20%) intravenously (IV) as a bolus dose. Then start an IV infusion of 0.25ml/kg/min.

The duration of infusion has not been established but it should be given for 30 minutes in the first instance and can be repeated one or two times, if there is no improvement. (In the three canine case reports, it was given for 30, 60 or 90 minutes). If a repeat infusion is required, it is important that the initial bolus dose is also repeated.

Administration of lipid infusion should be followed by monitoring of vital signs – pulse, blood pressure, respiratory rate and oxygen saturation – and ECG. Amylase concentrations should be measured if there is clinical evidence of pancreatitis.

VPIS recommendation

The VPIS has received follow up on numerous cases where intravenous lipid infusion has been used successfully. Our current recommendation is that, with agents known to cause tremors and convulsions, lipid infusion should be considered as a potential option.
Where it is used, treatment should be started sooner rather than later in the management plan to save any unnecessary suffering for the animal involved, hasten its recovery, and reduce the amount of other drugs administered in the situation. ■

Figure 1. *Some adverse reactions of which to be aware.*

- If intravenous lipids are given too rapidly or in too high a dose, they can cause fat emboli
- Pancreatitis can occur from chronic hyperlipidaemia and has been reported to the American Poisons Control Center (APCC) as an adverse effect of intravenous lipid therapy in animals (Gwaltney-Brant and Meadows, 2012) and has been reported in humans (Levine et al, 2012)
- Extravasation has caused painful local swelling that resolved with supportive care (Bates et al, 2013)
- When used chronically in parenteral nutrition, adverse effects usually occur from chronic administration – including allergic reactions (owing to the presence of egg yolk phospholipid), hyperthermia, elevated liver enzymes, steatosis and cholestasis
- Macrovascular embolisation is also possible as lipid droplets >1µm are phagocytosed by the reticular activating system and could cause microvascular blockage resulting in an inflammatory response (Cave and Harvey, 2009a)
- Two animal studies suggest an adverse outcome of resuscitation and lipid infusion in the presence of hypoxia (Mayr et al, 2008; Harvey et al, 2009b). This may be the result of changes in the binding capacity of the lipid. For example, it has been shown that a drop in pH (e.g. hypoxia-associated acidosis) decreases the lipid affinity for ropivacine and bupivacaine (Mazoit et al, 2009).

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Courage needed to banish One Health creative avoidance

The veterinary headlines are buzzing with references to One Health. No organisation or congress presentation can claim proper 'street cred' unless it makes reference to the concept of vets and medics working more closely together to ensure a healthier world. But are we prepared to see it right through to its logical conclusion in small animal practice?

Why don't we stop pussyfooting around and do the job properly? The term One Health – with all its words and proposals and committees – means little to the pet-owning public. So it is time to convert well-intentioned collaborative rhetoric into bricks and mortar.

Enter ITV's 'Supervet', Noel Fitzpatrick of Fitzpatrick Referrals, who has announced the launch of his Oncology and Soft Tissue Hospital in September on the Surrey Research Park, close to the new vet school at the University of Surrey and with connections to the Royal Surrey Hospital which specialises in the treatment of human cancer patients.

Today's crazy ideas...

"My mission is the one medicine philosophy, so I strongly believe we can't move forward on cancer unless we move forward with animals and humans at the same time," said Dr Fitzpatrick in an interview with *Veterinary Times* [April 13, **45**(15): 1-2].

"Today's crazy ideas are tomorrow's routine treatments," added Professor Stuart Carmichael who is managing director of the new venture. "They've got to start somewhere – and this is where they are going to start."

But why stop there? How about establishing 'One Health' health centres in towns and cities across the UK? Human and companion animal medical centres with separate consults at either end but shared diagnostic, imaging and community support services in the middle. Maybe even combined consults?

Oh, but we couldn't do that! Think of the disease risks! But wait a minute, where do most pets live? Oh yes, in the same rooms as their owners – sleeping on their beds for over 65 per cent of them! If we believe that zoonoses are the threats we know them to be, what better way to educate people and communicate them than in a combined centre.

Then there is obesity – a colossal problem in both humans and pet animals and often directly linked to the prevailing shared lifestyle and nutritional habits. And behavioural problems associated with loneliness and separation anxiety in people and pets. The list goes on...

Road part travelled

There are precedents for mixing pets with humans in medical surroundings too. Pets As Therapy (PAT) is a national charity founded in 1983. It provides therapeutic visits to hospitals, hospices, nursing and care homes, special needs schools and a variety of other venues by volunteers with their own friendly, temperament tested and vaccinated dogs and cats.

Since its beginning, over 28,000 PAT dogs have been registered into the scheme, and today there are around 4,500 active visiting dogs and 108 PAT cats at work in the UK. Every week, these calm, friendly dogs and cats give more than 130,000 people, both young and old, the pleasure and chance to share their thoughts with them – that's a staggering half a million bedsides visited every year with no ill effects.

Then there are the Guide Dogs, Assistance Dogs...

Convince the medics

Writing on the subject of One Health in the *Veterinary Record* [April 4, **176**(14): 351-353], Swedish human doctor, Josef Järhult, is upbeat about the concept of much closer collaboration between veterinary professionals and medical doctors. Indeed, his only cautionary note is about the attitude of his own colleagues.

"Although One Health promotes collaboration between the human and veterinary medicine sectors among others," he says, "the concept has generally been embraced more wholeheartedly by veterinarians than medics ... it is crucial for medical doctors to rise above the common anthropocentric viewpoint and to realise that they are only one of many important contributors."

Dr Järhult emphasises the importance of gaining the trust of the general public so that people can relate to it at a personal level and not just a theoretical concept. "Now, when One Health is getting an increasing amount of attention, all involved have a responsibility to make the term One Health substantial, to avoid it being just a buzzword," he says. "Successful One Health projects need to be showcased to demonstrate the positive effects that can be achieved."

What is there to lose?

Vets and vet nurses have never been reluctant to tackle new challenges. Indeed, such is the nature of our work that we have to be innovative and adaptable on a daily basis. Creative avoidance is not an acceptable element in veterinary science.

Surely the One Health health centre idea is worth a try somewhere? Turning the One Health concept into a shared physical community health endeavour? Perhaps it would fit in with the plans of one of the ever-expanding corporate groups? Something to really set them apart? ■

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DVM PhD Dip ACVIM Dip ECEIM Dip ACVECC FHEA MRCVS

After a fellowship, internship and a large animal internal medicine and emergency and critical care residency (alternate track) in the USA, Bettina attained her PhD from the University of London in 2008. Since then she has been employed as a senior lecturer in equine medicine at the Royal Veterinary College. Her main clinical and research interests are equine platelets, neonatology, respiratory diseases and all aspects of equine critical care.

**Suggested Personal & Professional Development (PPD)*

CRITICAL CARE

Critical care for adult horses

Intensive care for adult horses has made significant advances during recent decades. The following article describes some of the procedures that might be performed in critically ill horses.

Intensive care begins when the body of a patient is no longer able to perform basic homoeostatic tasks, such as maintaining normal hydration and electrolyte status, regulating perfusion and having normal intestinal and renal function.

Adult horses may require intensive care for many different reasons – one of the most common conditions being colic. In particular, horses that have undergone complicated colic surgery might require extensive monitoring and 24-hour care to achieve a complete recovery. Other diseases that require intensive care include acute colitis, pleuropneumonia, clostridial myositis, neurological disorders, acute blood loss and some conditions causing respiratory distress.

While intensive care in neonatal foals can be provided at a very advanced level – often comparable to intensive care in small animals – progress in adult equine intensive care has been slower. This is largely a consequence of their large size and the proportionate cost of medication, the difficulties associated with managing recumbent horses for any length of time and the frequent occurrence of laminitis in critically ill equids.

Nevertheless, significant advances in understanding and treating severe illness in horses have been made during recent decades and will certainly continue to be developed.

***Figure 1**. A horse receiving intravenous fluid therapy after colic surgery.*

Cardiovascular support

Many equine conditions requiring intensive care, such as severe colic and colitis, are associated with major electrolyte and fluid losses requiring administration of large volumes of intravenous fluids to ensure that adequate organ perfusion is preserved.

Horses with large amounts of nasogastric reflux, owing to small intestinal dysfunction or diarrhoea, may require up to 100 litres of intravenous fluids, or more, per day. The availability of large-bore – but minimally thrombogenic – catheters and administration sets allow continuous delivery of large volumes of intravenous fluids via gravity flow (**Figure 1**).

Horses suffering from intestinal or 'third-space' protein loss can be supported using commercially available colloids or fresh plasma. Colloids can help to maintain oncotic pressure and prevent, or limit, excessive oedema formation. Owing to their larger molecular size, synthetic colloids have – at least theoretically – the advantage that they remain in the circulation longer than plasma proteins. Fresh plasma, on the other hand, provides essential coagulation factors and anti-inflammatory proteins that may benefit the patient.

"Although horses have different blood groups (similar to humans), a cross match is usually not necessary"

If cardiac contractility is decreased, further cardiovascular support can be provided by use of positive ionotropic drugs – most commonly dobutamine. This is best achieved by using high-precision fluid pumps that can be used to deliver small infusion volumes accurately to the patient.

The response to the drug should be monitored carefully (see below). In rare instances, the peripheral vascular tone might be too low to generate sufficient blood pressure to support organ perfusion. In these instances, pharmacologic manipulation of vascular tone by use of vasoconstricting drugs may be attempted.

Noradrenalin or vasopressin are the drugs of choice; although vasopressin could have more undesirable side effects (Valverde et al, 2006). Their use is reserved for the most severely compromised patients because their effects can be difficult to predict and excessive vasoconstriction in some – but not other – vascular beds could be detrimental.

A blood transfusion may be required if a horse has lost large quantities of blood (≥ 30% of blood volume) either as a result of trauma – for example, rupture of a major vessel, during surgery – or following internal bleeding (**Figure 2**).

Although horses have different blood groups (similar to humans) a cross match is usually not necessary if the horse has not had a blood transfusion before. However, it may become necessary should multiple transfusions be required over several days. Large breed geldings or mares that are free of infectious diseases (most notably equine infectious anaemia), have not had foals and have not received a blood transfusion themselves (to minimise the risk of antibodies against other blood groups being present) are ideal blood donors.

Depending on the size of the donor, up to 20 per cent of the blood volume can be collected from horses with a normal packed cell – thus in a 500-800kg horse with a blood volume of seven to nine per cent of body weight, six to nine litres of blood can be collected safely. Approximately 25 to 50 per cent of the estimated blood loss should be replaced by the transfusion.

If the patient's packed cell volume accurately reflects the blood loss (not after recent acute bleed) the following equation can be used (Mudge, 2014):

Transfusion volume (mL) = bodyweight (kg) x 80mL/kg x [(desired PCV minus actual PCV)/donor PCV]

If large amounts of blood are lost into a body cavity (haemothorax or haemabdomen), an auto-transfusion can be performed; whereby the patient's blood is collected from the cavity and re-administered into the circulation through a blood filter (Finding et al, 2011).

Haemodynamic monitoring

Intermittent or continuous electrocardiogram (ECG) recordings, mean arterial blood pressure (MAP) measurements and blood gas analysis – including determination of electrolytes and lactate concentrations – are performed routinely in most equine hospitals. Central venous pressure measurements and determination of cardiac output may also be carried out in adult horses, but are not yet routine in many equine hospitals.

The development of telemetry units – designed for use in horses and that transmit signals to a distant laptop – have greatly enhanced the ability for 24-hour monitoring of a horse's heart rhythm. Cardiac arrhythmias are not uncommon in critically ill horses and accurate identification of the underlying rhythm is essential for effective treatment (Diaz et al, 2014).

In mares that experience problems during their pregnancies (high-risk pregnancies), this equipment is used to monitor the heart rate of the foetus by placing the electrodes around the abdomen.

Blood pressure measurements using either a cuff placed around the base of the tail or measured directly via an arterial catheter, are essential to determine when further haemodynamic support is indicated and whether interventions are successful. If vasopressors are used, additional indicators of peripheral perfusion – such as blood lactate concentrations – aid in determining whether the treatment goal is being achieved when cardiac output is not monitored.

Cardiac output can be measured by several methods and adds valuable information about the patient's haemodynamic state to direct therapy. As MAP is the product of cardiac output multiplied by systemic vascular resistance,

Figure 2. *A horse receiving a blood transfusion.*

an increase in MAP does not necessarily indicate improved perfusion.

Knowledge of cardiac output greatly enhances the clinician's ability to interpret changes in the patients status and MAP. Unfortunately, all methods require specialist equipment and considerable expertise to provide reliable results (Corley et al, 2003). Furthermore, the invasive nature of most techniques poses a certain unavoidable risk to the patient.

Ultrasonographic estimation of end-systolic and end-diastolic volume can be used to approximate cardiac output; but results correlate less favourably with the established gold standard than invasive and minimally invasive methods (Shih, 2013). However, considering the difficulties associated with other methods, clinically this may be the most applicable method to date.

Nutrition

Nutrition is very important for the recovery of all critically ill patients. Without adequate nutritional support, critically ill patients lose bodyweight quickly and rapidly become debilitated. The caloric needs of critically adult horses have not been determined but are estimated to be between 25 to 40kcal/kg/day (Cruz et al, 2006; Carr and Holcombe, 2009).

In some breeds – particularly ponies, donkeys and miniature breeds – decreased food intake can lead to a life-threatening hyperlipaemia caused by rapid breakdown of fat reserves during periods of stress, disease and starvation. Monitoring of plasma triglyceride concentrations is indicated in any sick pony or donkey, but might also be advisable in other breeds because hyperlipaemia also occurs in full-sized horses and visible plasma discoloration is not always present.

A nutritional plan should be incorporated into any overall treatment programme for hospitalised horses. It may be as simple as providing the feed the horse is normally fed at home or, at the other end of the spectrum, may entail total parenteral nutrition.

Regular assessment of the body condition, ideally by weighing, is essential to ensure that the nutritional plan meets each individual horse's needs.

Horses with abnormal intestinal function may require parenteral nutrition that entails administration of glucose, protein and lipids. Full parenteral nutrition for a 500kg horse is frequently prohibitively expensive but even a simple glucose infusion at 1-3mg/kg/min (5-15kcal/kg/d = approximately 16 to 50 per cent of energy requirements) can help to limit or slow down excessive catabolism.

Patients receiving parenteral nutrition should be monitored carefully to ensure that electrolytes and blood glucose concentrations remain within normal limits. Some patients may even require insulin supplementation to correct blood glucose levels. Hyperglycaemia and hyperinsulinaemia have been associated with development of laminitis. Infusion of 5.6mg/kg/min of glucose induced histopathologic – but not clinical – evidence of laminitis in horses; so the risk of laminitis must, therefore, be kept in mind when designing a nutritional plan (de Laat et al, 2012). ■

PPD Questions

1. The nutritional requirements of horses have been estimated to be:

   A. 1-5kcal/kg/day
   B. 5-15kcal/kg/day
   C. 15-25kcal/kg/day
   D. 25-40kcal/kg/day
   E. 40-55kcal/kg/day

2. Mean arterial pressure (MAP) is determined by which formula?:

   A. MAP = cardiac output x systemic vascular resistance
   B. MAP = stroke volume x heart rate per minute
   C. MAP = systemic vascular resistance / cardiac output
   D. MAP = systemic vascular resistance / central venous pressure
   E. MAP = cardiac output / systemic vascular resistance

3. Which drug is most commonly used as first choice to enhance cardiac contractility in horses?

   A. Dopamine
   B. Dobutamine
   C. Adrenalin
   D. Noradrenalin
   E. Vasopressin

Answers
1.D 2.A 3.B

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Home alone

Recent research at Nottingham Trent University has shown that horses housed individually, having no contact with other equines, showed significant signs of stress when compared with horses kept in more social surroundings.

The horses' behaviour was observed in four types of housing designs – stabled completely alone, kept individually but with a small amount of contact from nearby horses, housed in pairs in a barn, and group housing in a paddock. It was discovered that as housing becomes more isolated, horses show higher levels of faecal corticosterone – a key indicator of stress (Yarnella K, 2015).

Thermal imaging of the eye, another non-invasive measure of stress response, revealed eye temperature to be significantly lower for horses grouped together, showing lower levels of stress. Behavioural analysis also showed horses became increasingly difficult to handle the more restrictive and isolated their housing, while horses kept in groups were more likely to exhibit natural behaviours typical of free-ranging horses.

Commenting on the study, Dr Kelly Yarnell, an expert in equine welfare at Nottingham Trent University, said: "The behavioural and physiological findings of our study show that social housing designs provide a much better standard of equine welfare ... Inadequate housing design potentially causes stress and negative consequences on the health and well-being of horses – despite the fact it can be easily addressed by introducing more windows or shared areas, for instance."

Stress can be defined as the signs resulting from exposure to a situation or environment that is not normal for an animal. Horses are naturally herd animals but the predominant housing used for domestic horses is individual stabling in box stalls with horses often being kept in these stalls for a significant part of each day. It is ironic that in creating what we as humans see as a safe and inviting place of comfort, we are in fact providing a stressful environment for the horse.

Horses naturally live as group animals for safety and even like to have the ability to groom each other on a daily basis. One of the commonest causes of stress in horses is fear and the need to escape from danger. They are experts at spotting threats from a distance – having exceptional long distance vision and an innate ability to run from any perceived danger – and feel nervous about anything that hinders clear vision or the ability to escape.

In the domestic environment, therefore, we often challenge the horse with the very things that it finds most stressful – solitude, plus restricted vision and confinement when stabled. These conditions can result in the following behaviours:

- Aggression
- Irritability
- Submissive body language, such as licking and chewing
- 'Cribbing', 'weaving', box walking
- Extreme fear responses
- Weight loss
- Chronic health problems

A study by Visser et al (2008) in *Applied Animal Behaviour Science* looked at the effect of stabling for the first time on the behaviour and welfare of young horses. The effect of two typical housing systems on the horses subsequent behavioural and physiological responses upon first time stabling were examined.

Half of the horses were stabled in individual stables and the other half in pair housing. At the end of the 12- week study the physiological and temperamental responses of the horses on the different treatments was tested using a corticotropin releasing factor (CRF) challenge test (to assess the hypothalamic–pituitary–adrenal (HPA) axis function) and a novel object test (to assess temperamental differences) respectively.

Stress-related behaviours, such as neighing, pawing, nibbling and snorting, were all displayed significantly more frequently in the individually housed horses and 67 per cent of the individually housed horses were seen performing one or more stereotypies.

This study also provided some support for the notion that social stress in horses may be associated with a blunted adrenocortical response to CRF challenge. ■

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Owen Atkinson
BVSc DCHP MRCVS

Owen has worked in farm animal practice since 1994, mainly with dairy cows. His interests in rumen health, cattle foot care and lameness reduction led him to do an increasing amount of training and advisory work.

In 2013, Owen left the practice to found Dairy Veterinary Consultancy Ltd, to better pursue his vision for preventive health management and strategy. Owen's goal is to help farmers make changes on their farms that benefit the cows, their quality of life and the client's bank balance.

*Suggested Personal & Professional Development (PPD)

DAIRY HEIFERS

Feed forwards – a look at the dairy heifer pipeline

Rearing replacement heifers costs around £1 to £1.40 per youngstock unit per day. This typically accounts for around 10 per cent of the costs of milk production. The difference between the most and the least efficient farmers can be profound.

Most progressive dairy producers now accept that aiming to calve heifers for the first time at an average age of around 24 months is most efficient. In very simple terms, for any given replacement rate, this would mean having 50 per cent fewer youngstock to accommodate compared to calving at 36 months – a strong economic incentive for most farmers.

However, it is no good calving a poorly conditioned, half-grown heifer at 24 months, as problems will occur integrating her into the adult herd. The heifer should be around 85 per cent of her mature bodyweight after calving. For a Holstein, that equates to around 570 to 585kg weight and 140 to 147cm tall at the withers. So how can we rise to this challenge?

A good start

The first thing is to get the heifer calf off to a flying start (**Figure 1**). At no other time in her life will she have such efficient food conversion efficiency as while she is still on milk (or milk replacer). This is a consequence of effectively being a 'simple-stomached' animal initially, prior to developing into a ruminant. Therefore, despite the cost of milk replacer, it is – in the long run – more cost effective to aim for high growth rates during the first two months of life.

This means feeding plenty. The traditional advice of two litres twice a day and weaning at six weeks is barely enough to remain static, let alone grow. In this respect, husbandry advice has altered hugely over the last 10 years, and there is a current trend towards 'accelerated growth' of pre-weaned calves.

In fact, 'accelerated growth' is a misnomer given that, if left to nature, suckled calves would be drinking far more than four litres of milk a day, and growing at up to one kilogram daily live weight gain. The current advice is simply to try and match this. As a rule of thumb, this can be achieved with 3-litre feeds of 12.5 per cent milk powder twice a day, or 2-litre feeds at 15 per cent twice a day for the first 14 days; then stepping up a further 30 to 50 per cent for three weeks until solids intakes are high.

At peak intakes (after two weeks), calves will be fed 900g/day of milk replacer, or even more. Automatic feed stations – which spread feeds over smaller volumes throughout the day – are possibly the better way to maximise the benefits of higher rates of milk feeding.

Calves should at least double their birth weights by the time of weaning (around eight weeks old). For Holstein heifers, this means setting a target eight-week weight of 85kg or greater. Some farms are achieving 100kg weaning weights at eight weeks old.

Meeting environmental needs

Calves need three things from their climatic environment – warmth, dry bedding and good ventilation (**Figure 2**). Simple in theory – more difficult to achieve in practice.

Figure 1. *Good hygiene and colostrum management are essential to get off to a good start. This calf is just two hours old but has already been removed into a clean individual pen, and has been fed 4 litres of good quality (tested) colostrum. She has been set up for success in the herd.*

Figure 2. *Calves need warmth, dry beds and fresh air. Calf coats are an increasingly popular way of keeping calves warm – and are a very sensible investment. Plenty of dry straw for nesting, and no draughts at calf level are also important. A nest score of 3 (legs not visible) is the target for calves under three weeks.*

Warmth

The ideal temperature for calves is 15-20°C. As they develop into mature ruminants, this drops to 5-15°C. In fact, even in UK temperatures, adult dairy cows have a greater problem staying cool, than keeping warm! But keeping calves warm is a challenge. In cooler temperatures, not only does their growth rate fall (more energy being used to stay warm), but their immunity is likely to be challenged leading to higher risks of infectious disease, such as pneumonia and scour.

Calves keep warm naturally by nesting. Plenty of deep, dry straw and lack of draught is important for good nesting ability – not rocket science perhaps, but often neglected. A simple nest-score system can be used with farmers to assess their performance in this area (**Table 1**).

Calf jackets are becoming increasingly popular, and deservedly so. It is difficult to find a rational argument against using calf jackets for all calves up to around five to six weeks of age, at least when the ambient temperature is below 15°C (approximately eight months of the year throughout most of UK).

Dry beds

Dry beds are important, not only for warmth and to achieve good nesting scores, but also to reduce the 'ammonia challenge' associated with pneumonia.

Calves produce around four to eight litres of urine and faecal output per day, which is a considerable volume if allowed to soak into the bedded area. As calves do not generate as much heat as older cattle, there will be no 'stack-effect' ventilation or natural drying effect from their body heat, so drainage is the key.

Some calf pens now have slatted floors upon which to place the straw, which can be a good solution. Alternatively, pens should be designed with a five per cent sloping floor towards the front, and well-serviced drains to remove liquid from the building (**Figure 3**). Having a hard-standing area for feeding that is quite separate from the bedded area is also useful, and most 'calf hutches' benefit from this.

Ventilation

Ventilation is difficult for calves. It is paramount that they do not experience draughts or else they become chilled; 'stack-effect' ventilation is not feasible, because they do not generate enough body heat to drive a sufficient volume of air upwards towards roof vents. Igloo-type hutches with roof vents are designed to be ventilated by wind passing over the surface and creating a negative pressure which draws air out of the roof (**Figure 4**).

Carefully designed ventilation tubes can provide positive pressure ventilation in calf houses without draughts at calf level, and are an alternative solution. And for many farms, simply ensuring that housed calves are not over-stocked will be an important aspect to ensure ventilation capacity is

Table 1. Calf nesting scores

Score	Description
1	Lying down, all of calf's legs are visible
2	Lying down, half of calf's legs are visible
3	Lying down, the calf's legs are invisible – entirely covered with bedding

Figure 3. *A well-designed calf shed, which can be disinfected between calves and has good drainage, makes rearing healthy calves more likely. These individual pens have solid PVC sides which can be removed for cleaning and reduce likelihood of spread of disease. The pens have a* five percent *slope to the front and a drainage channel to remove urine from the shed.*

Figure 4. *Igloos beside covered, open-sided straw pens allow calves to regulate their own environment to a large extent. When they are young, they nest inside the igloo, but as they become older and their ideal environmental temperature reduces, they lie more frequently in the open pen. The design of the igloo allows ventilation through the roof vent by negative pressure as wind passes over the curved roof. Stable groups of 12 to 15 calves should be maintained in each igloo and pen.*

Figure 5*. The disease challenges after weaning are primarily pneumonia and coccidiosis. Maintaining good nutrition through and beyond weaning is an important success factor. Rumen development is stimulated by starch. Ensuring good starch intakes at an early age increases the likelihood of effective rumen function by weaning age.*

***Figure 6**. This purpose-built heifer-rearing shed allows stable batches of calves to be reared up to 16 months of age, by which time most have been confirmed pregnant. Investing in heifer accommodation (rather than housing them in assorted 'spare spaces' around the farm) will usually have a positive economic benefit. This shed was costed at £10 per calf space, assuming a 10-year life-span. The farmer estimated his investment was recouped from lower antibiotic treatment costs alone.*

***Figure 7.** These bulling heifers are housed in cubicles, which will acclimatise them to their adult cow accommodation. They are 13 months old and all have withers heights of 125cm or more, so are all suitable for first service.*

not exceeded.

Rumen development and weaning

Weaning can be a great time of stress, leading to an increased risk of disease during this critical stage. Pneumonia and coccidiosis are the two most widespread infectious diseases of dairy youngstock during the peri-weaning period (**Figure 5**). By staging the changes that occur at weaning, much of this stress can be reduced, if not eliminated.

Doing too much all at once, however, is a recipe for disaster. For example, an abrupt diet change, moving accommodation, and management interventions – such as de-budding – should all be avoided at weaning.

Though the obvious effects of disease in weaned calves might materialise as reduced growth rates, higher mortality, and treatment costs, Bach (2011) showed that events in the early phases of a heifer's life can have influences far beyond calf-hood.

Heifers that had no pneumonia as youngstock went on to average 879 days of milk production; while those that had pneumonia, averaged 770 days of milk production. As it is estimated that a cow must have around 660 days in milk before paying back her rearing costs, the ones that had pneumonia are in profit for half as long.

It is good practice to move calves into groups a week before weaning at eight weeks (**Figure 6**), by which time they should be eating at least one kilogram dry matter of concentrate, and preferably more.

Whilst the growing trend for feeding greater volumes of milk is doubtless a good thing, this can pose a greater challenge to encourage good dry matter intakes, as the calves are less hungry. An important aim during the early weeks of life is to help the calf develop into a ruminant, so that by the time she is weaned, her rumen is functioning efficiently and the calf does not suffer a 'growth check'.

It is propionate, a volatile fatty acid product of starch fermentation, that drives rumen development – not fibre. Therefore, encouraging small intakes of starch feed from the very beginning of the calf's life will be beneficial.

Calves are fussy eaters

Any spoilage of feed or bad odours will severely limit their naturally curious desire to nibble and explore new feeds. Small amounts of solid calf feed should be offered from day one or two, and always kept fresh by renewing daily. Saliva contamination of feed and water buckets can be reduced by feeding milk in an adjacent location – for instance, not switching water or feed buckets for the milk bucket at feeding time, as is common practice.

Though intakes are shown to be higher with coarse mix, 'sorting' can be a big problem and can make pelleted feed the more attractive option. Larger pellets (6mm diameter rather than 3mm) may be more attractive to young calves; or providing a mix of coarse feed and pellets initially, gradually reducing the coarse feed, is another way to stimulate early interest in hard feed.

Ad libitum fresh water must always be available from day one. A calf needs to drink approximately 2.5 litres for every one kilogram of dry matter intake. Water not only increases intakes, but for any given intake, it increases growth rate.

It is best practice to provide ad lib chopped (2-3cm) forage in separate feed buckets. Wheat or barley straw is recommended. This can help develop the rumen capacity and actually increase concentrate intakes further. Hay or long straw, however, can reduce concentrate intakes. 'Hay belly' may occur when calves over-feed on palatable long forage that the rumen is – as-yet – unable to digest.

Relying on bedding straw for roughage intake is poor practice, increasing the risk of coccidial infection, for example, and more likely to lead to poor forage intakes, which can be a risk for rumen acidosis in calves every much as it would be in adult cows.

Growing well

It used to be accepted science that heifers should not be allowed to grow unchecked between four and 10 months,

to prevent their laying down excess fat in the udder, which can reduce subsequent yields. In fact, more recent research indicates this risk is over-estimated, and high intakes and high growth rates should be encouraged before heifers are bred at around 13 to 15 months of age.

There is some considerable variety in the way weaned calves are fed, and more than one way to achieve success. Block calving, grass-based herds will teach their calves to graze at a very early age and can rely almost entirely on grazed grass from around three to four months onwards, if the grazing is managed very well. Essentially, this means operating a rotational grazing system, or strip-grazing (not set-stocking) as calves are more fussy grazers than cows, so will limit their own intakes if grass is not always of high quality and fresh.

Holstein herds, however, tend to rely more on bought-in feed during this growth phase – with or without supplementary grazing. Straw-based diets for housed calves have the advantage of drier faeces leading to easier bedding management for loose-housed calves. However, weaned calves can also thrive on a total mixed ration (TMR) type diet – an increasing number of farms are housing weaned calves in cubicle accommodation and feeding a TMR that accustoms the heifers to a diet and housing which mimics later life.

Whichever diet is chosen, an overall crude protein content of around 15 to 16 per cent will ensure that heifers develop muscle and 'frame', not just body fat. Minerals are also important for healthy skeletal development.

Serving

For success during the service phase of the heifer's life, she must be well grown, sexually mature and cycling well. Moving heifers within one month of starting to serve them is likely to adversely affect fertility, so should be avoided.
Good submission rates are more likely when heifers are not over-stocked and have good underfoot conditions to encourage oestrus display – slippery floors and narrow passageways are common failings. Good access and light increases the ability to observe oestrous behaviour, but, as with cows, oestrous detection aids are also invaluable.

Expect conception rates of around 55 to 60 per cent in heifers, which is significantly better than in cows. Conception rates will be reduced slightly with sexed semen, but generally less markedly so than with cows. Sexed semen is a sensible choice for heifers – not only are these animals likely to represent the farm's best genetics, but also a female calf is likely to give an easier calving than a male calf, which is a particularly important consideration for first-calvers.

It is also important to establish targets for size and age at first service. For Holsteins, a minimum withers height of 125cm and weight of 350kg is a rule of thumb. It should not be difficult to achieve this by 13 months of age if earlier phases of the heifer's life are managed well. In fact, most farmers over-estimate the size of earliest suitable service and hold off unnecessarily at the expense of calving older heifers. The economic downside of this is clear; but the additional risk is that heifers calve with greater visceral fat deposits, which are thought to account for the lower survivability and milk yield performance of older calving heifers in high-yielding herds.

To achieve an average of 24 months at first calving, a producer must generally be serving heifers from 13 months of age onwards, and aiming to have at least 60 per cent of all heifers served for the first time by the age of 15 months.

Some producers use synchronisation programmes for heifers and this can be useful to manage calving patterns and as a management tool for heifers reared outdoors at this phase. Running heifers with a stock bull might be attractive from an ease of management perspective, but carries greater risks of injury and difficult calvings, as well as limiting the ability of genetic improvement.

Any heifer that subsequently aborts after service should be considered seriously for fattening for beef. Research would suggest that these individuals have almost three times the chance of not finishing their first lactation, compared to their non-aborting herd mates; an older age at first calving will increase the risk of dystocia, fatty liver disease, ketosis, and other calving-associated disorders (Bach, 2011).

Integrating into the herd

It can be tempting to relax any further management interventions once heifers are

***Figure 8**. Pneumonia is the biggest cause of heifer mortality. It also accounts for the second largest use of antibiotics on dairy farms, after mastitis. Every pneumonia outbreak presents an opportunity to become involved in youngstock management.*

***Figure 9.** Monitoring weights against targets at different ages is an easy starting point for vets becoming more involved in the heifer-rearing process.*

pregnant. For example, it is not uncommon for pregnant heifers to be turned out to graze away from the main herd and only brought back at the point of calving. However, there a few key points to consider in order to integrate individuals successfully into the herd after calving.

The heifer's health status must be matched with that of her future herd mates. For example, if endemic infectious bovine rhinotracheitis (IBR) exists in the herd, she must be fully vaccinated before entering the herd. Heifers entering a herd can pose a biosecurity risk in much the same way as any other 'bought-in' animal, depending on how biosecure her rearing process has been.

Mixing heifers with dry cows six to eight weeks prior to calving – and moving them in at least pairs – can reduce the risk of bullying after calving, and increase the chance of heifers socialising well with the herd, and competing, for example, at the feed barrier. Ideally, cubicle training should have occurred before this stage (if the adult herd is cubicle housed), but as a minimum, heifers should be acclimatised to cubicles several weeks before calving (**Figure 7**).

Bergsten (2010) found some evidence that heifers housed on soft bedding before calving fared less well once moved to concrete flooring and cubicles after calving, than those housed on concrete before calving. Therefore, there may be some direct benefit of acclimatising to concrete floors before calving, and this may possibly arise owing to changes in hoof wear and growth.

Finally, it may be beneficial to perform a pre-calving hoof check on heifers, in much the same way as a drying-off hoof check is commonly performed on dairy cows. The rationale for this would be that by ensuring that heifers calve down with correctly-shaped hooves could reduce the risk of claw horn lesions after calving, and affect their lifelong lameness. However, the practicalities of handling heavily pregnant heifers need to be considered, and the benefits are not proven.

Summary

Vets can have an important influence in heifer rearing. While the farmer might see the vet's role as limited to diagnosis and treatment of youngstock diseases – particularly calf scour and pneumonia – every opportunity should be taken to challenge this assumption (**Figure 8**).

There is much to be gained for all parties by extending clinical input beyond disease control and taking a holistic approach to the entire 'heifer pipeline'.

Monitoring weights at different ages against set targets is a good starting place, and can simply be done using a weigh tape (**Figure 9**).

From there, a review of colostrum management, youngstock housing, nutrition and husbandry may well soon lead to better calf health and welfare, and farm profitability. ■

PPD Questions

1. What stimulates rumen development?

   A. Long fibre
   B. Starch
   C. Water

2. How much milk replacer (in grams) should we be aiming to feed to three-week-old calves per day?

   A. 450g
   B. 750g
   C. 900g

3. What is the target minimum withers height for a Holstein heifer at first service?

   A. 125cm
   B. 130cm
   C. 135cm

4. What is the rationale of calving at around 24 months (rather than older)?

   A. Animals spend a greater proportion of their lifetime in production
   B. Calved heifers have greater longevity and better fertility
   C. Lactation milk yields are higher
   D. Less dystocia

Answers
1.B 2.C 3.A 4.A,B&D

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Russell Fuller
MA VetMB MRCVS

Russell graduated from Cambridge in 2003. He currently works in a 12-vet farm animal-only practice, based in Gloucestershire. His main interest lies in the interactions between nutrition and fertility and he is currently studying for the Diploma in Bovine Reproduction.

**Suggested Personal & Professional Development (PPD)*

SHEEP

Why perform body condition scoring in sheep?

Body condition scoring (BCS) is considered a key tool in the management of sheep flocks throughout the production cycle. Target scores at each time point have been defined, based on the evidence available, in order to maximise performance. However, in all sheep flocks, a proportion of animals will fall outside the target range. What are the potential impacts on flock performance of these outlying animals?

A body condition score (BCS) is a subjective assessment of the fat reserves present in sheep (Russel et al, 1969). Scores range from 1.0 (emaciated) to 5.0 (obese) and are achieved by palpating the dorsal spinous processes and transverse processes of the lumbar vertebrae (**Figures 1-6**).

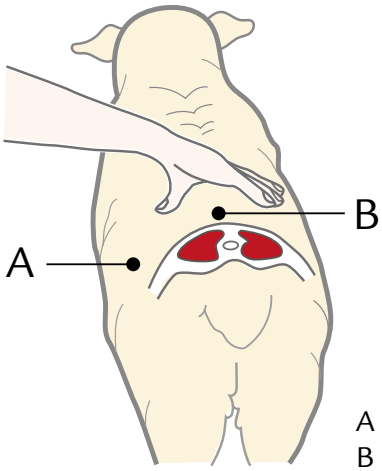
Although each BCS is well defined, the subjective nature of the assessment makes it critical that each score is performed by the same observer. Repeatability of scores by the same observer was greater than 80 per cent but this fell to 70 per cent when different observers were used (Russel et al, 1969).

BCS targets for each stage of the production cycle are given in **Table 1** (EBLEX BRP).

In order to assess a flock, a representative cross-section needs to be assessed (**Table 2**). This should include animals from each separate management group and it is vital that the data gathered are checked for variation. At least 90 per cent of the group should have the target BCS at any given stage in the production cycle (**Figures 7 & 8**).

Flocks that are uniformly under- or over-condition can be managed nutritionally to correct BCS. However, in flocks with high degrees of variability in BCS, different management practices will be needed for the under-, over- and correct condition ewes. For more information

Figure 1. *Where to Body Condition Score.*



A – Transverse processes
B – Spinous processes

Table 1. Target body condition scores during the sheep production cycle (EBLEX Sheep BRP Manual 4)

Production stage	Hill	Upland	Lowland
Tupping	2.5	3.0	3.5
Mid-gestation	2.0	2.5	3.0
Late gestation	2.0	2.5	3.0
Lambing	2.0	2.5	3.0
8 weeks after lambing	2.0	2.0-2.5	2.5-3.0
Weaning	2.0	2.0	2.5

Table 2. Recommended number of sheep to score, according to management group size (Sergeant, 2015). The sample sizes provide 95 per cent confidence that enough ewes are the correct BCS

Number in group	Number to score
50	30
100	43
150	50
200	54
250	57
500	64

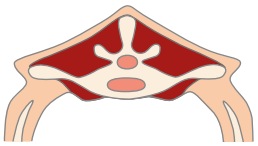


Figure 2. *BCS 1.0 – prominent, sharp spinous and transverse processes. Fingers can be pushed easily below the transverse processes, which are easily felt. The loin lacks muscle, being obviously concave with no fat cover.*

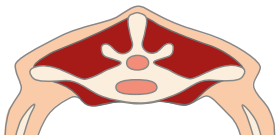


Figure 3. *BCS 2.0 – spinous processes can be felt as 'corrugations'. Transverse processes smooth and rounded but fingers can be pressed underneath. Loin muscle is moderate depth with little fat.*

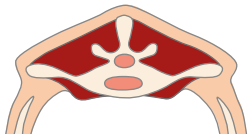


Figure 4. *BCS 3.0 – spinous and transverse processes smooth and rounded. Tips of processes can only be felt with pressure. Loin muscle is full, with moderate fat cover.*

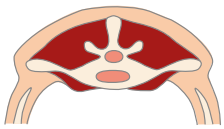


Figure 5. *BCS 4.0 – spinous processes only detectable as a line. Tips of transverse processes cannot be palpated. Loin muscles full and convex with thick fat cover.*

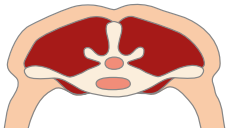


Figure 6. *BCS 5.0 – spinous and transverse processes can only be identified by dimples in the fat cover. Loin muscles very full, with thick fat covering.*

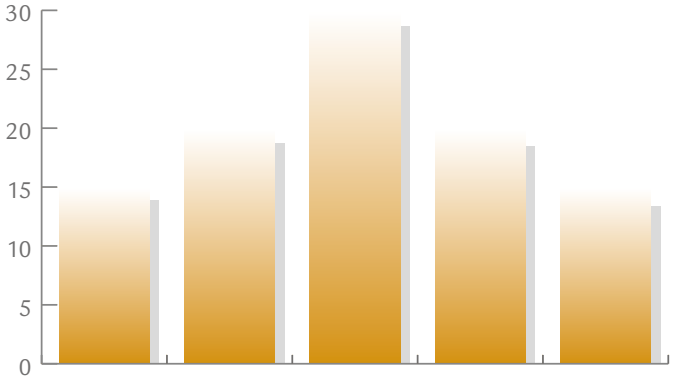


Figure 7. *Example flock A. The mean BCS is 3.0 but the wide spread of scores warrants investigation.*

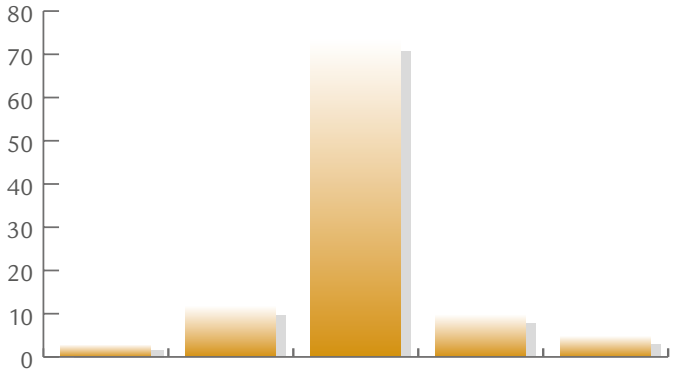


Figure 8. *Example flock B. Although the mean score of 3.0 is the same as Flock A, the spread of scores is much less.*

on manipulation of ewe BCS, refer to the EBLEX Sheep BRP Manual 4.

Key correlations

The liveweight of adult sheep has been shown to be well correlated with BCS (Kenyon et al, 2004; Verbeek et al, 2012). One unit of BCS approximates to 12 per cent of mature adult bodyweight (EBLEX BRP). In order to gain this weight, an ewe needs to spend six to eight weeks grazing good quality grass. Where forage quality is reduced, supplementary concentrate feed will be needed. This is a common occurrence in late summer, where the slow growing grass can have reduced digestibility, thereby reducing the energy available to the ewe.

Subcutaneous fat, as assessed by BCS, provides a reasonable estimate of the reserves of the sheep. However, the metabolic activity of subcutaneous fat is relatively low, meaning that small or early changes in nutritional status may be difficult to detect from body condition score alone (Verbeek et al, 2012).

Leptin is produced by adipose tissue with plasma leptin well correlated with body condition score (r=0.68-0.99, P<0.001) (Delavaud et al, 2000; Kenyon et al, 2004; Verbeek et al, 2012). Leptin concentration is the endocrine signal to the animal as to the adequacy of body fat reserves. The importance of this mechanism becomes apparent when the effects of body fat on voluntary food intake are examined.

Most mathematical models used to predict the feed intake of sheep rely simply on body weight for their predictions (NRC, 2007). However, including BCS in the model improves the accuracy of the prediction (Tolkamp et al, 2006 & 2007).

Timing is important

One of the key times to score sheep is the period before lambing. Rationing a flock of sheep in the approach to lambing needs to be done with reference to the BCS of the flock. Animals that are over-condition are likely to suffer from reduced dry matter intakes. Energy demands are increased in late gestation, with 70 per cent of foetal growth occurring in the last six weeks (Robinson et al, 1977). In over-condition ewes, the increased energy demand, in combination with reduced voluntary feed intake, predisposes to metabolic disease such as pregnancy toxaemia.

When increasing energy density in the ration – by adding more concentrate feed, for example – it is important to increase the protein density at the same time. Increasing the digestible undegradable protein (DUP) supply has been shown to increase colostrum quality, with increases seen in protein and fat content (Amanlou et al, 2011). One other effect observed was increased blood glucose in the high-DUP group. This effect can be attributed to the protein supply, as dietary energy density and dry matter intake were similar between groups, as were BCS.

Effects of BCS and plane of nutrition can be seen at mating and during early to mid-gestation. 'Flushing' has the greatest effect on

" 'Flushing' has the greatest effect on ewes close to target condition score"

ewes close to target condition score (EBLEX BRP). No improvement in conception rate in ewes of BCS 4.0 or greater was observed, which may be attributable to higher embryonic mortality. Ovulation rates, and therefore scanning percentage, was reduced in ewes of all breeds below BCS 2.0.

The effects of liveweight and BCS at mating – and on subsequent scanning results – have been assessed (Kenyon et al, 2004). Ewes conceiving during the first oestrous cycle of the breeding period were significantly heavier than animals not conceiving until the second cycle. Individuals with higher BCS were more likely to conceive during the first cycle.

Increased BCS at mating was also associated with increased scanning percentage and an increased chance of being pregnant. However, in the study, the critical BCS varied between breeds. This suggests sheep farmers should make efforts to ensure that no animals are below the critical breed minimum to ensure optimum reproductive performance.

In female hoggets, increased liveweight and, therefore, BCS were associated with improved reproductive performance (Kenyon et al, 2005, 2006 & 2009). Heavier hoggets were more likely to be mated early in the breeding period and more likely to carry twin pregnancies. Owing to the strong correlation between BCS and liveweight, regular monitoring of body condition scores in a group of hoggets can be used to monitor their growth and suitability for breeding.

Nutritional considerations

Manipulation of the diet during the mating period has been shown to have some interesting effects. Ewes (n=44) were experimentally fed supplementary rumen-protected polyunsaturated fatty acids, or left untreated (Green et al, 2008). In ewes fed supplementary fat, the proportion of male embryos recovered on day 13 after oestrus was 69 per cent – when compared to the expected proportion of 50 per cent, this effect had a significance of $P<0.001$.

Also, interferon-tau production, measured after incubation was shown to be significantly ($P<0.05$) correlated with maternal body condition score. This provides a mechanism to explain the findings of Kenyon et al (2004), where heavier ewes were more likely to conceive on the first oestrous cycle.

During pregnancy, BCS should be monitored as effects of the plane of nutrition have been reported on the placenta and foetal growth (Wallace et al, 2000; Quigley et al, 2008). Both overfeeding and underfeeding have been shown to adversely affect foetal development, with effects becoming apparent during late gestation, because this is the period of maximal foetal growth.

In mature ewes, long-term manipulation of dietary energy intake from 60 to 180 per cent of maintenance had no effect on placental or foetal development during the first two-thirds of gestation. However, in late gestation, foetuses from restricted-intake ewes were observed

to be 19 per cent lighter, with reduced abdominal and thoracic girths. This effect was associated with reduced IGF-1 in foetal plasma (Quigley et al, 2009).

Other work has looked at the effect of overfeeding hoggets during the first two-thirds of pregnancy (Wallace et al, 2000). Placental size was shown to be reduced by 50 per cent, with a corresponding reduction in foetal weight of 37 per cent. When foetal blood parameters were examined, a significant reduction in insulin, IGF-1 and glucose were observed in foetuses derived from overfed dams. Measurements of the foetal tissue showed significantly reduced body protein and fat content.

Ewes of low BCS are also less able to respond to stressful stimuli (Verbeek et al, 2012). Ewes were experimentally exposed to cold, wet, windy conditions – a temperature of 4°C, wind speed 0.5m/s, with misting for five minutes every half hour. Animals with low body condition score were less able to mount an immediate cortisol response.

The mechanism for this is unclear. Either the reduced stress response is an energy saving adaptation in animals with limited reserves or the hypothalamic-pituitary-adrenal (HPA) axis is down regulated in long-term under-nutrition.

Together these studies highlight the importance of controlling the plane of nutrition during pregnancy. Although effects on the foetus are only seen in late pregnancy, the energy demands on the ewe do not permit easy manipulation of body condition score. Therefore, assessing BCS at both mating and scanning will allow any dietary modifications to be made before ewes enter the third trimester.

Effects on lambs

After lambing, it is important to monitor BCS as effects have been observed on lamb growth (EBLEX KPI Project 2013). Associations have been reported between BCS at lambing and lamb weights at both eight weeks and at weaning. Also, increased BCS loss from lambing to weaning has been associated with an increase in lamb weights at weaning.

Where excessive BCS loss is occurring, it is possible to increase supplementary feeding or wean lambs earlier to counteract this; but, owing to the time taken for ewes to gain condition, excessively

"Individuals with higher BCS were more likely to conceive during the first cycle."

thin ewes at weaning will struggle to regain the condition necessary to go to the ram.

The higher body energy reserves present in ewes of higher BCS provide the necessary energy for an increase in milk production, allowing higher lamb growth rates. Similarly, ewes mobilising more condition can also produce more milk, increasing lamb growth. Where ewes are under-condition, increasing the amount of concentrate fed can partially offset the expected decrease in lamb weaning weights.

Conclusion

Regular body condition scoring, carried out at appropriate stages of the sheep production cycle, can be used to identify groups of animals or individual animals whose nutrition requires attention. Dependent on the stage of the cycle, the relative importance of under-condition and over-condition changes. Identifying these high-risk animals early allows time to implement management changes in the flock, before any adverse effects become apparent. ■

PPD Questions

1. What does BCS assess?
2. What structures are palpated in order to assess BCS?
3. How long does it take an ewe to gain one BCS when grazing a plentiful supply of good grass?
4. Irrespective of breed, below what BCS are ovulation rates adversely affected?
5. What effect does poor BCS management of the pregnant ewe have on the newborn lamb?

Answers

1. Fat reserves in the live animal
2. Dorsal spinous and transverse processes of the lumbar vertebrae
3. 6-8 weeks
4. BCS 2.0
5. Reduced birthweight

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Notes on amphibian treatment options

When it comes to treating amphibians, there is little in the way of pharmacokinetic data to back up published doses. This is exacerbated by the fact that this group is far less homogenous than say dogs or cats.

Bruce Maclean
BSc(VetSci) BVM&S MRCVS

Bruce graduated from the University of Edinburgh's Royal (Dick) School of Veterinary Studies in 1992. Following graduation, he spent time in the avian and exotic department at Utrecht University further studying the veterinary care of birds and exotic animals.

On return to the UK, Bruce spent six months in mixed practice and a short period in small animal/exotics practice, before setting up his own dedicated practice 20 years ago. He works exclusively with birds and exotic animals, on both first-opinion and referral bases, and has contributed chapters to BSAVA manuals and several articles in UK- and US-based veterinary publications.

Bruce has been keeping reptiles and amphibians for over 35 years and amphibian medicine is a particular clinical interest.

**Suggested Personal & Professional Development (PPD)*

AMPHIBIANS

In most cases, an individual amphibian species may be very variable given their aquatic herbivorous larval stage prior to becoming a carnivorous terrestrial adult. Extrapolating from one species to another, or even from juvenile to adult, may be risky; environment can also affect dose, as may reproductive status.

Unfortunately, sufficiently detailed information is simply not available at the moment, and in practice a 'one-dose (per bodyweight)-fits-all' approach is used (**Figure 1**). Where a dose range is published, using the lower end for older individuals or more sedentary species (or if the animal is being kept cool, as is not uncommon) seems logical.

Thus the advice would be to use published doses with caution, and certainly be wary of dosing a large group without trying treatment on a sub-population first! Informed consent from the owner is always recommended, of course.

***Figure 1**. A salamander on scales – obtaining an accurate weight is an important part of dosing correctly.*

When treating amphibians, it is also important to bear in mind that their skin is relatively thin and permeable, and topical medications will often be absorbed systemically – which can be desirable or not, depending on the situation.

Treatment routes

The following treatment routes may be considered for amphibia.

Water treatment (long-term)
This is only applicable to aquatic species, or at least those where a totally aquatic environment is a realistic option without undue stress. It is rarely appropriate in the home tank owing to likely interactions with organic matter, filters, ornaments and other occupants, so it will usually require a bare/very simple treatment set-up. This has potential problems of stress with likely necessary frequent water changes, change of environment and so on.

Water treatment (short-term bath)
This option can be very effective because of the relatively thin and permeable nature of amphibian skin, and it can be used in most species.

Most amphibians don't drink; so soaking in an appropriate solution is generally more efficacious than administering oral fluids, and is often more effective than parenteral routes. Note too that some amphibians can drown, so they must be monitored.

Ensure any bathing containers are escape proof, and using well-padded containers for active jumping frogs is advisable. Always use the same type of water/water preparation that the amphibian is used to, and check the pH of the bath and correct it if necessary.

This approach also has the potential safety advantage that if signs of distress are observed, the animal can be removed from the drug (**Figure 2**).

Percutaneous (PC)
This route of administration is probably only effective in terrestrial species, or those which to that can be kept out of water for a reasonable time after dosing. The use of irritant/acidic/alkaline drugs (most enrofloxacin preparations, for example) should be avoided, if possible.

"Most amphibians don't drink, so soaking in an appropriate solution is generally more effective than administering oral fluids"

On the positive side, the PC route is very good from the point of view of minimising stress (unless the drug is irritant); although only effective where the required volume is sufficiently small that excess drug doesn't run off the animal.

It is advisable to tend towards the higher end of dose range for this route; but be ready to rinse off the drug in case the animal shows a severe reaction.

Subcutaneous (SC)
The subcutaneous route of administration is essentially impossible in caudates and caecilians owing to their tightly adherent skin. In anurans, it is important to be aware that some have no – or very reduced – ribs, and intended subcutaneous injections may end up into the dorsal lymph sacs or even become 'intra-coelomic'. This may or may not cause a problem, depending on the drug.

Intralymphatic (IL)
Amphibia have extensive lymph systems – often with large ducts or sinuses – and these provide a very good distribution to the circulation. They are often described/mentioned, but the anatomy of lymphatic ducts varies with species, and (deliberately) accessing the lymph sacs may or may not be feasible in a given species. Intralymphatic injection may also occur accidentally when attempting subcutaneous dosing.

The commonly described example – as in many common anurans (as pets) – is into the dorsal lymph sacs. These are accessible from the flanks by injection at a shallow angle, just lateral to the extent of the ribs/transverse processes.

Intramuscular (IM)
Unfortunately the muscle mass of most amphibia is very small and associated muscle damage may be an issue if the intramuscular route is considered. However, it may be the best available option.

If the IM route is used, epaxial muscles should be used in caudates and caecilians, probably forelimb muscles in anurans.

Intracoelomic (ICOE)
This route may be particularly useful when skin disease is present (chytrid, for example) which might affect absorption of topical or bath drugs. It is best carried out with the individual in the dorsal recumbency, and it is best to inject lateral to midline in order to avoid the ventral abdominal vein.

Intravenous (IV)
The intravenous route is rarely practical in conscious anurans. However, it is generally more achievable in caudates; although, if in doubt, anaesthesia is recommended.

Use the ventral tail vein in caudates and the ventral abdominal vein in anurans. Intravenous injection is not considered feasible in caecilians.

Intracardiac dosing has been recommended, but given that intracardiac injections are considered painful and not acceptable for euthanasia in mammals, this author would strongly discourage such a delivery method.

Local topical
This refers to an 'intended' topical-only effect. It is useful for ulcers/wounds, but systemic absorption and resulting effects are always possible – so for example medicated eye drops may be a problem in smaller amphibians.

Nebulisation
Nebulisation may be used in cases of respiratory disease; although care is needed (avoid irritant drugs) owing to the sensitivity of amphibian skin.

Figure 2. *A firebelly newt in a medicated bath – padding is generally unnecessary for caudates but would be advisable for active jumping anurans. Such animals should be monitored for signs of distress.*

Oral (per os, PO)
The oral route is not without risks of iatrogenic tissue damage, including jaw fractures, particularly in small amphibia. Often it is not easy to perform either, particularly for owners, so compliance can be an issue.

The constraints of this route should be discussed/demonstrated thoroughly, as necessary; the client should feel able to report that they can't do it effectively so that an alternative regimen can be used.

Intraosseus
The intraosseus route has been used in amphibia, but given the range of other options with good rapid absorption, it is not used by this author.

Supportive husbandry

There are several things that can be done to complement the effects of medicines in amphibians.

Temperature manipulation
Temperature manipulation is described frequently in the 'lay' literature as being cooling for caudates in general and axolotls in particular. There seems to be little scientific evidence to support this specifically, but reaction to illness in ectotherms can involve either behavioural pyrexia or anapyrexia.

Conversely, increasing the ambient temperature is sometimes advised. Increasing the available temperature gradient range by up to approximately 5°C above and below the normal range is recommended, though difficult to achieve in practice.

General environment
Optimising the environment will, of course, reduce stress and maximise the animal's chance of fighting off illness. Unfortunately requirements are often not known in sufficient detail.

Strict hygiene has been shown to be as effective as drugs at controlling some parasites. Conversely, encouraging the microbial community of amphibia, an important part of their defences, may

"Strict hygiene has been shown to be as effective as drugs at controlling some parasites"

Table 1. A formulary for medication of amphibians

Drug	Dosage regimen	Notes
Ceftazidime	20-30mg/kg every 48-72 hrs SC, PC, ICOE, IV	▪ Relatively non-toxic, non-irritant ▪ Reasonably broad spectrum ▪ May synergise with fluoroquinolones
Enrofloxacin	5-10mg/kg SID PO, SC, IM 20mg/ml bath for 20mins SID	▪ Broad spectrum ▪ Well distributed in tissues ▪ No significant action against anaerobic bacteria ▪ Many injection formulations are very irritant (high pH)
Marbofloxacin	10mg/kg every other day PO, SC, PC	Similar advantages to enrofloxacin, but less irritant, so generally preferable
Trimethoprim-sulpha	10-30mg/kg (combined substance) SID PO, SC, PC 50µg/ml bath for 60mins SID	▪ Broad spectrum – efficacy against some coccidia and other protozoa ▪ Well distributed in tissues ▪ Much-reduced efficacy in presence of pus ▪ Resistance not uncommon
Amikacin	5mg/kg SID – every other day SC, IM	
Doxycycline	10-50mg/kg SID PO	▪ Very broad spectrum ▪ Bacteriostatic
Metronidazole	50mg/kg SID SC, PC, PO	Generally highly effective against protozoa
Silver sulphadiazine cream	Applied sparingly topically SID - BID	Very broad spectrum and commonly used
F10 barrier ointment	Applied sparingly topically SID - BID	Very broad spectrum
Itraconazole	2-10mg/kg SID PO 0.01% bath for 5min SID for 11 days	▪ Effective against chytrid – bath dose more effective ▪ CARE in larvae/juveniles
Terbinafine	Commercial 1% (Lamisil AT) spray dilute 1:100 in water, bath SID for 15min for 10 days	Effective against chytrid
Fenbendazole	50-100mg/kg weekly PO	▪ Broad spectrum wormer ▪ Generally safe ▪ Efficacy very variable
Levamisole	100mg/l 1hr bath weekly 10mg/kg PC, SC	▪ Broad spectrum versus nematodes ▪ Often more effective than benzimidazoles in the author's experience, although smaller therapeutic index
Ivermectin	0.2-2mg/kg PC weekly 10mg/l 1hr bath weekly	▪ Broad spectrum anti-nematode/ectoparasites ▪ Toxicity can be variable – use with care
Selamectin	6mg/kg PC	
Praziquantel	10mg/l x 3hr bath SID 8-24mg/kg weekly PO, PC, SC, ICOE	Anti-trematode, acanthocephalans
Toltrazuril	10mg/kg orally	Anticoccidial
Meloxicam	0.2-1mg/kg SID PC, SC, PO	
Carprofen	2.5mg/kg SID PC, SC	
Dexamethasone	0.1-0.5mg/kg SID PC, SC, IM, IV, ICOE	
Butorphanol	0.5-1mg/kg BID PC, SC, IM 0.5mg/l water in bath	
Buprenorphine	35-75mg/kg BID-QID PC, SC, IM	
MS222	1-2mg/l bath to effect	Anaesthesia. Build up dose to effect
Vitamin A	1,000-2,000IU/kg every 24-72hrs PO, PC	
Vitamin B complex	0.1-0. 25ml/l in tank water	In tadpoles
Vitamin B1	25mg/kg weekly PC, SC	▪ For deficiency ▪ May be useful adjunct therapy in undiagnosed CNS disease

Drug	Dosage regimen	Notes
Calcium gluconate	100mg/kg SID PC, SC, ICOE 5% bath in water, along with 2–3 IU/ml vitamin D3 (in multivitamin mix seems acceptable) 15-30mins daily	For hypocalcaemic tetany/initial therapy of MBD complex, although oral calcium supplementation usually preferred in long term

SID – Once daily (every 24 hours) *QID – four times daily (every 6 hrs)*
BID – twice daily (every 12 hours) *1% = 10 ml/l = 10 g/l*

"Many amphibians can easily go days to weeks without food"

be beneficial – soil mixes substrate, for example, will promote a 'better' flora than paper towels.

Fluid therapy
The notes above regarding soaking versus parenteral administration of agents apply to fluid therapy. The author's preferred solution is amphibian Ringer's solution, which consists of the following formula:

- 1 litre water
- 6.6g sodium chloride (NaCl)
- 0.15g potassium chloride (KCl)
- 0.15g calcium chloride ($CaCl_2$)
- 0.2g sodium bicarbonate ($NaHCO_3$)

As an emergency alternative, 0.6 per cent saline is considered close to isotonic for amphibia, and mixing Ringer's solution or 0.9 per cent saline with water in ratio 2:1 can be used. Lactated solutions are not recommended on theoretical grounds but have been used.

Mildly hypertonic solutions have been recommended to reduce oedema but, in this author's experience, rarely have any significant effect.

Nutritional support
Many amphibians can easily go days to weeks without food, so this is rarely a priority in acute cases; indeed, the stress and potential risks (see oral dosing above) must be weighed against any benefits.

For adults, carnivore-based supplementary feeds are advised. In nutritional deficiencies, correcting and/or supplementing the diet appropriately is a large part of treatment, but space precludes discussion here.

Formulary
Table 1 provides a useful guide to treatments in amphibians. Please note, however, that this is not a comprehensive list of drugs/doses that have been published; it is simply the most commonly used drugs and/or the ones the author has found most useful.

The following general principles apply:

- There are no published studies of the use of antivirals in amphibians. Extrapolation from the reptile dose (if available) seems the best option
- Since it is reasonably safe to assume that most sick amphibians are immunocompromised to a greater or lesser degree, bactericidal antibiotics are preferred in most cases
- Choice of antibiotic is ideally always based on culture and sensitivity. Pending – or in the absence of – microbiology results, this author would generally use a combination of ceftazidime plus a fluoroquinolone for systemic bacterial disease
- Some presence of gut nematodes and/or helminths may be beneficial to the animal, but in captivity parasites will usually cause much more of a problem than they would in the wild so treatment is invariably indicated
- Owing to the relatively high prevalence of vitamin A deficiency in captive amphibians, supplementary dosing with vitamin A has been suggested for most sick individuals. So, unless you are reasonably sure that the diet is adequate, at least one supplementary dosing is advised. ■

PPD Questions

1. Are oral fluids or soaking more appropriate for most amphibian patients?
2. Why must local topical agents be carefully considered?
3. Which muscles are recommended for intramuscular injections in caudates?
4. Which site is recommended for intravenous injections in anurans?

Answers
1. Soaking
2. Significant systemic absorption is a real risk
3. Epaxial
4. Ventral abdominal vein

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James Yeates
BVSc CertWEL DWEL MRCVS

Dr James Yeates is chief veterinary officer of the RSPCA, RCVS Registered Specialist in Animal Welfare Science, Ethics and Law, editor of the Journal of Animal Welfare Science, Ethics and Law *and previously chair of the BVA Ethics and Welfare Group and honorary secretary of the SPVS.*

**Suggested Personal & Professional Development (PPD)*

ETHICS

Pro bono animalium?

'Pro bono' is short for *pro bono publico*, meaning 'for the good of the public'. It's nothing to do with U2, Band Aid – vocals notwithstanding! The phrase usually refers specifically to volunteering by professionals, using their particular professional skills.

Sometimes this urge to volunteer may be because those professionals are, by nature, public-spirited. Many starry-eyed students choose their future professional career based on their passion to alleviate suffering or end injustice. Such well-motivated people may choose to volunteer of their own volition, and their personal concerns and skill sets invariably mean that employing their professional skills is the best outlet for the expression of their altruism.

Although this activity is to be encouraged, facilitated and lauded; it is, however, hard to argue in its favour. Frankly, you are either that kind of generous person or you are not. Yet you can become one.

Perhaps, more commonly, providing some 'free' assistance is often seen as "putting something back". The ability and facility to practise offers many professionals a comfortable – if not excessive – standard of living and these professionals may want to ensure that they are not exploiting their professional status.

While being a professional is, per se, not a bad thing, it is hard to claim it is a good thing if one always receives a reasonable recompense for the work – that is no different to any other trade or service. One can perhaps only be (and legitimately feel) 'good' if one puts in more than one takes out.

We can add a stronger moral argument to this. The ability to work as a professional is, in many countries, a privilege.

> "The ability to work as a professional is, in many countries, a privilege"

Indeed, it is an exclusive privilege insofar as permission to perform professional work is limited to only those professionals. This means other people cannot give professional care to needy animals or people – free or otherwise.

So when there is a problem needing professional assistance – but where there are no available funds – the societal system of having professions effectively prevents that problem from being resolved. Indeed, it could be argued that it 'causes' further suffering. Put this way, the moral duty to provide a reasonable level of unpaid professional services is a *quid pro quo* for the legal privilege to provide paid professional services.

Following a precedent

Often, the idea of pro bono work is associated with lawyers. In a previous article [*Veterinary Practice Today* **3** (1), Jan/Feb 2015] comparisons were made between veterinary and legal professions and it was noted that the latter ostensibly perform more pro bono work than we do – as, perhaps, do many medical, IT and strategy consulting businesses.

Furthermore, the legal profession seems to consider it more of a duty. For example, in the USA, lawyers' ethical rules state that every lawyer should aspire to render at least 50 hours of pro bono publico legal services per year (APA, 2014). This should include:

- Free legal services to persons of limited means or charitable, educational or other organizations helping such persons
- Additional free – or reduced-cost – legal services to help uphold public rights, to assist charitable and other organizations or persons of limited means
- Participation in activities to improve the legal system or legal profession
- Additional voluntary financial contributions to charitable and other organizations

What *could* veterinary professionals do?

For those veterinary professionals who are minded to provide pro bono service – be that altruistically or morally – what could pro bono veterinary services involve?

Some veterinary surgeons and nurses might want to help humans – especially underprivileged owners or farmers – to keep their animals. However, this runs the risk of encouraging clients not to take responsibility for their animals – and their bills. If done within the practice structure, it actually risks subsidising some owners through charges to other clients. This might seem unfair. (Lawyers could face the same charge but they might defend it by claiming they are upholding a basic human right to fair legal process).

"This can form a corporate social responsibility, as well as increasing staff morale"

Other veterinary professionals might think their responsibility to provide pro bono services should aim primarily to help animals. Using the above as a model (on the assumption that we would not want to seem less ethical than lawyers!), each veterinary surgeon and veterinary nurse might:

- Give at least 50 hours/year of free veterinary treatment to animal welfare charitable, educational or other organisations
- Participate in activities to improve animal welfare on a societal level – campaigning on issues, for instance
- Participate in activities to improve the veterinary profession
- Contribute financially to charitable and other organisations

What *do* veterinary professionals do?

Do veterinary professionals do pro bono work? Most assuredly we do. Some even gain awards for it from organisations such as the RSPCA, Ceva and Vet Nurse Online. And I strongly suspect that many veterinary professionals provide free or low-cost services almost every day – when owners' budgets are stretched and we don't charge for a full consultation or allow debts that we don't expect to be paid off. These eat into the practice budget while helping animals and people.

There are, however, three issues with this 'everyday' approach.

Firstly, this is hidden. Most practices don't advertise it as they don't want to encourage it. So the rest of the world doesn't see it and the veterinary professionals involved don't receive the recognition they deserve. In fact, many people still see veterinary surgeons as "in it for the money", "out to charge full whack" even to impoverished owners and charities.

Secondly, we do it with 'bad grace'. Helping animals should be enjoyable and make us feel good; but we tend to feel pressured into a corner by irresponsible owners or the failings of society.

Thirdly, it is not organised. This means that it is not necessarily the most needy animals that receive the benefit – except those who happen to present at the practice or those with the 'pushiest' owners.

What *next* for vets?

So what should be done? Individual veterinary professionals can volunteer on a personal basis, and welfare charities organise neutering and health events. Animal centres also need veterinary procedures and expertise, helping to make decisions or writing protocols; and one can do something independently – although that always runs the risk of appearing primarily self-promoting!

Practices can allocate resources – designating particular funds (emergency care funds, for example), facilities (boarding kennels, for instance) or staff time (by 'lending' employees). This can form a corporate social responsibility, as well as increasing staff morale. By working with charities, practices can avoid encouraging owners not to pay their bills, such that these collaborations can be marketed unashamedly.

These activities need not eat into practice budgets or individuals' holiday allocation. Much pro bono care can be done at weekends, when the practices are invariably quieter and it feels less like 'work' and more like a 'carnival' – or maybe a 'marathon'!

If budgets are tight, work might also aim to cover variable costs, such as drugs from charities – although completely 'free' care is obviously a greater contribution and a higher degree of generosity. To support this, veterinary organisations can help promote and support pro bono work.

Copying the example set by lawyers, we might choose to establish a national 'Pro bono week' (Dyer, 2006), a database for pro bono providers (Dowell, 2008) or a Pro Bono Group to support and link up providers and needs (LawWorks, 2014).

Final word

I would encourage all those interested in pro bono initiatives to contact animal charities with any offer of help. ■

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Help, I've been promoted! What to do when your 'patient' is your team

Whenever a practice owner is looking for a new boss of something, it's quite likely that he or she will take their chances with the best vet or best nurse on the team. After all, with management qualifications often few and far between in the veterinary world, sometimes all you have to judge a person by is their technical skills.

Mark Hedberg
DrMedVet MRCVS

Mark began his veterinary professional career in Saudi Arabia in a small animal/exotic veterinary hospital in Jeddah. Following this he spent two years in mixed practice in Dover where, in addition to his clinical work, he served as regional secretary for the BSAVA Kent region.

He currently runs a CPD programme for the College of Animal Welfare, and completed a Certificate in Leadership and Management in 2014. He has written extensively on new and recent graduate support, as well as personal development, and has given presentations at the BSAVA, LVS and NAVC conferences.

**Suggested Personal & Professional Development (PPD)*

PROMOTION

There is some obvious logic behind that line of thought. Someone who demonstrates focus, dedication, intelligence and success in their current job, may do well in charge of other people doing that same job. Sadly, however, many'star performers' struggle as managers.

There's a big reason for that. You've probably spent years learning how to be good at your job, and you never learned how to manage a team in vet school or nurse college. So it's easy to feel like a fish out of water when you have to learn such things 'as you go along'.

Getting to grips with a supervisory job is just like coming to terms with any new job. If you are very lucky, you've picked up some CPD or accredited learning on how to run a team or a small operation. But, unfortunately, the majority of management training in small business is in the form of 'learning on the job' (McBain et al, 2012). Worse, sometimes we have very strange ideas of what makes good management.

So how do you cope with getting thrown in the deep end as a new boss? You may feel as if you don't have a clue, and you certainly don't have time to gain an MBA – it's overkill for your first management job anyway. So can you use your existing skills to be an effective manager? Can clinical skills become management skills? In a word – Yes!

Rule 1: Your team is your patient

So always take a good clinical history and carry out a thorough clinical exam.
This is one of the most vital things a new manager needs to do when taking on a management job. Just how broken is the system you're inheriting? Are things badly broken, or are they even broken at all? What's the main presenting complaint of the team or practice you're trying to run?

Look at your processes, how you and your team do your everyday work. Every bottleneck you have causes work to back up just as blood does in a constricted artery – and causes the work pressure to rise along with everyone's blood pressure.

Do your team members need additional training to do a particular job correctly? Does a process need to be updated to make your work proceed more efficiently? Are your ops and consults taking too long? That doesn't mean that your team is incompetent – it may simply be that they need training on the practice management system to write up their cases faster, or a frequently used piece of kit needs to be in the consulting room rather than in the broom cupboard under the stairs.

If you're a newly hired head nurse, vet, or receptionist in a practice, it is important that you familiarise yourself with the existing systems before you create new ones. You may be lucky if you've been promoted internally – because you've probably had time to get to know your workplace and your colleagues, and you'll probably have a good handle on the strengths and weaknesses of the current team.

You may even have been doing the work anyway, and are only now getting the 'clout' and the title to improve things. In

"Unless things are in crisis mode, there will be time to adjust and modify things when you're a little more comfortable in your new job"

this situation, it's still a good idea to take a hard look at how things are working *before* you start tinkering. What can seem a simple solution when you are 'in the trenches' can be more complicated when you have to juggle responsibilities with limited resources.

Unless things are in crisis mode, there will be time to adjust and modify things when you're a little more comfortable in your new job. Your boss didn't necessarily hire you to reinvent everything – he or she hired you to make sure things are running smoothly. If your workplace is a disaster area, you may need to engage in drastic action. On the other hand, if nothing is, figuratively, bleeding to death, it's OK to take a deep breath and gather more information if you need it.

Find out what has happened in the past, and what has worked well – especially find out what worked spectacularly badly, and make a note of that as a 'drug reaction'!

So don't forget to assimilate a good clinical history and examine the patient.

Rule 2: Clinical pathology

Treat your key performance indicators (KPIs) as if they were a clinical parameter. Basically, that is what KPIs are – clinical parameters for your business.

There are myriad places in a veterinary business where things may be done better. Many practices evolved from small one-man-band shops, or partnerships, performing surgery and medicine in converted or modified buildings. While growth is everyone's goal, there comes a time when you start to outgrow your facilities and your team's capabilities (Carter and Jones-Evans, 2006).

It is very easy for a workplace to develop bad management and organisational habits to compensate for not having enough time, money, or people. Failing to update employee skills to reflect best practice can also cause your practice team a plethora of problems. The end result is that you fall further and further behind in your business, or simply fail to grow because you haven't the resources to expand.

So what kind of KPIs – clinical parameters – can your practice have? Essentially, it's anything you can measure that indicates how healthy your 'patient' – the vet practice – is. For example, if cash is your practice's life blood, profit is your practice's PCV – a practice that doesn't have any money can't survive; any more than a dog with a hematocrit of zero. (Have you ever wondered why they say a money-losing business is 'bleeding red ink'? Well, now you know).

Taking the money analogy further, bad debt is like blood that's in a transfusion bag in your refrigerator – you can see it, count it, and admire it, but you can't make use of it easily, and if it's stored for more than six weeks, it spoils and you probably won't be able to use it.

Of course, vet practice management isn't all about money. Are your clients complaining more frequently than you would like? Dig into those complaints and see if there are any common threads – cleanliness, waiting times, quality of service, and so on. How about your clinical work? A high number of postoperative complications will obviously have an impact on your bottom line, as well as affecting your patient's welfare. It is well worth using medical performance as well as business performance in veterinary practice planning.

Rule 3: Having trouble making a diagnosis?

Why not call an expert!? Just as is the case in clinical medicine, there is no shame in not knowing the answer, as long as you do your best to find it. You wouldn't think twice about calling a cardiologist to seek advice about a strange heartbeat, so why not call an accountant to ask about money matters, or a more experienced manager when there is a management question?

The veterinary world is a small one, and you'll often find practice managers very willing to help you with a knotty problem. Most vets and nurses who have an interest in management are more than happy to help you with your issues – if nothing else, you'll receive the help and support they may never have had!

One of the easiest mistakes to make as a new manager is to assume that your problem is unique, and has never been encountered before in all the history of veterinary medicine. Fortunately for you, that is not the case, and you will rarely have to reinvent the wheel.

Go online and find associations such as SPVS and VPMA. Attend their business/management-focused events or the practice management streams at congresses organised by the BSAVA or the London Vet Show. There is even a congress specifically for head nurses. You'll find subjects and speakers at these events who have been dealing with problems like yours for years – and while complex help may cost you money, a kind soul might help you with something simple for the price of a cup of coffee or a lunch!

If the headaches in your practice are completely out of your comfort zone or things are actually a complete 'train wreck', consider referring the problem. Hire a veterinary business consultant to come in and go over things with you, and work with him or her to find the solution to your problem – or even identify the problem in the first place. More and more pharmaceutical companies are offering business help – ask your visiting company reps if they can offer you any solutions.

Rule 4: Make a treatment plan

And follow it!

Once you have identified your main problem, it is time to create a treatment plan for it. You wouldn't treat a patient without a plan, so why treat your management issues by 'winging it'?

Plan your actions and changes, and make sure you – or someone you trust – is delegated to do them. You might even adapt one of your nurse team's nursing care plans to do this, if you're intent on taking the clinical/manager comparison to the very limit.

The reason for this is simple; many things not written down are not done, and you end up running into the same issues again and again. So treat your workplace's issues as you would a clinical presentation, and ensure you have a written plan. Then follow up what you need to complete it.

Invite your team on board – just because you are the manager doesn't mean you are the only one allowed to do anything managerial. Your nurses are a key part of patient care, and your receptionists are a key part of customer care. Use their skills to help you with your work and, at the same time, to make their workplace better.

Take notes! Case notes are vital; write down how things are going – if your productivity is improving, or if despite your best efforts, something's still going wrong. That way, just as with any sick pet, you can revisit things to see if it's the treatment that was at fault, or if there are compliance issues under the surface.

Rule 5: Make a follow-up appointment

After making changes in your workplace, you are going to want to come back after a few days to check on your patient's progress.

Is your team more productive, and absenteeism down? Has the training you asked for taken place? Are the original symptoms in your workplace still there? If things are doing better, keep it up and move on to tackle the next issue.

Ideally, once things are on an even keel, you can start using 'preventive medicine' in your veterinary practice and try to head off problems before they start. Run employee surveys, informally ask your team's opinion, and check with clients on how they rate their experience. Keep an eye on your practice KPIs and improve things wherever you can.

Whatever you do as a clinician manager, always keep things professional, and always be respectful to everyone with whom you deal – whether it's the boss or the new work experience kid. Sometimes your problems will be caused by a process, and sometimes they will be caused by a person. You may even end up having to perform an 'employee-ectomy'.

While some parts of being a manager are unpleasant, courtesy is the grease that lubricates the machinery of a team. A huge part of that is being polite and respectful to the people with whom you work and work for. Yes, nice people can finish first; so with apologies to Dr Andy Roark: "Let's be the managers our practice deserves!" ■

"Your boss didnt necessarily hire you to reinvent everything – he or she hired you to make sure things are running smoothly"

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Industry Profile

Your name: Gudrun Ravetz, BVSc MRCVS
Position: Small animal practitioner
Company: Veterinary consultant for Pet Health Plans from Denplan and past-president of the Society of Practising Veterinary Surgeons

What are the most significant changes to the profession you have witnessed since qualification?
The fundamentals have not changed – to diagnose, treat, educate, research, and maintain and improve welfare, while still being a 'people person'.

The practicalities of the job, however, have evolved; the expectations of clients and the expectations that vets place on themselves are greater. Matching these expectations is as much about the art of veterinary practice as it is about the science. We are extremely good at learning the science of our profession, but a little slower sometimes about learning the art of it and how these two go together.

Another huge change that we have all seen is the development of 'ownership models' of practices. This alters the career prospects and working relationships of vets – whether they want to be employees or owners. Change on this scale is never easy and can seem unsettling; although there are often enormous opportunities presented with change. Our task is to grasp these opportunities and make them work for us as a profession in an evolving demographic, while always maintaining our priorities to our patients and society.

What do you think are the most critical issues facing the profession today? How should they be tackled?
If we look at the wider picture, as with any profession in any time period, there are always critical issues – whether that be bovine TB, antimicrobial resistance, avian flu, puppy imports and many more. Our challenge is determining how we meet them. We need to be united with one voice to promote ourselves and be the voice of the expert.

To this end, we have a number of excellent divisions of the British Veterinary Association (BVA) that offer experts in their field. I think the way that we see the divisions working together with each other and the BVA shows that we are fit to tackle critical issues and that we are the professionals to do it. However, we do need to be better at self-promotion.

We need to make sure that those outside of the profession see vets as the most important and knowledgeable people when it comes to anything to do with animals and that we are a vital part of 'One Health'. We need to shout more about why to trust us, be really proud that we are the professionals.

> "We are extremely good at learning the science of our profession, but a little slower sometimes about learning the art of it and how these two go together"

We perhaps have too strong a focus on practice as a career choice for veterinary students. Practice is certainly a rewarding and valid career choice, but vets can – and do – play a vital role in a number of animal health and related jobs. Vets being celebrated in wider roles can only enhance the standing of the profession, as well as offering a rewarding career.

How do you rate the present status of women in the profession?
A difficult question. Personally, I think I have achieved what I wanted to achieve; but if you look at the statistics for the number of women in leadership roles and the fact that there is a 'pay gap' – with women earning less – then the status doesn't look great. Yet there are female vets achieving brilliant things and male vets who have been superb role models for female vets.

There is a problem in some areas and we can, as a profession, do more to bring about equality. But equality will only happen with input and change from male and female vets together. So in a nutshell, we certainly could – and should – be doing better. To paraphrase the president of the British Veterinary Nursing Association: "Ninety-eight per cent of veterinary nurses are female and we are not talking about that!"

What needs to change to improve the situation?
We need to see beyond gender and avoid any polarisation. If we look at other industries, there are novel ways of working that are being adopted. We must not forget that the clients using our practices face the same dilemmas and are often trying to juggle, work, family and a trip to the vets; so perhaps our traditional ways of working and opening times don't work for them either. Most of all, there needs to be dialogue and fairness.

> "We need to see beyond gender and avoid any polarisation"

Ultimately, market forces will improve the situation because those veterinary jobs and organisations that see past gender will succeed. We need to act now, however, and not wait for market forces. I am fortunate in that I have had good veterinary role models and incredible support from a husband who doesn't see gender as an issue and views child care as an absolute equal.

I realise that not all female vets have had this positive experience and that is why I think we need to try and put things in place to support them – although this should also apply to male vets too. Both male and female vets need to be realistic, especially around the subject of child care – sometimes sacrifices have to be made. For my part, I hope I am a good veterinary professional; but my husband and son are more important than anything else and I am realistic that this might limit some of the things I want to do.

My challenge to the profession is for it to show true equality. A vet is not a female vet or a male vet; they are just a vet, and

"Accepting and managing flexible working patterns – for all vets who desire it – will really help..."

should be given the same opportunities no matter what their gender. Let's aim for equal opportunities and then outcomes can be left to the individual.

Do women bring particular qualities to the veterinary profession? If so, what?
As you can probably deduce, I am very wary of saying women are this and men are that. A veterinary professional is a veterinary professional. But, a little tongue in cheek, I do think that women multi-task a whole lot better! Oh, and they listen more.

Why, given their numerical ascendancy, are there so few women in leadership roles in the veterinary profession?
In a small way, I do think that there has previously been a degree of benign sexism. People generally tend to go for people like themselves and traditionally the leadership positions have been male. When you hear the comment that "the problem with the profession is women having babies" you do suddenly realise that there is a bit of work to do.

However, I also think that sometimes women don't have the same confidence as men to push themselves forward or to believe in their abilities. This is something that we can help positively by offering mentors to both male and female vets.

What is being done to address the issues?
At least we are talking about it, which is always the first step. The BVA is actively engaging with this issue and it has become part of the 'Vet Futures' initiative. If you look across the divisions of the BVA, there are more and more women fulfilling leadership roles. Accepting and managing flexible working patterns – for all vets who desire it – will really help and there are some successful businesses doing this.

Ultimately, members of the profession – both male and female – have to see each other as equal. Sometimes that just needs to start with the individual.

How can vet professionals become involved in turning things around?
Well, we can either want to do it because it is the right thing to do or be pushed into it by market forces. As a proactive, liberal person, I hope that we can do it because it is the right thing to do and we want to make it work.

One of the best managers with whom I have ever worked is female with three children. She manages a very busy job with amazing success and is incredibly good at her job. She is supported by an excellent company that encourages all of its employees to succeed, no matter what their gender.

In a way, it is up to the veterinary businesses, organisations and universities to see that equality and treating employees of all sexes fairly can bring loyalty and huge benefit and unlock talents that may otherwise have been missed. It just makes good business sense. It is for the organisations to support, mentor and guide vets along the way.

What will be the effects in practice (if any) of the formal recognition of the veterinary nursing profession through the Royal Charter?
Recognising veterinary nursing as a profession is hugely important. Veterinary nurses are an integral part of the veterinary practice and perform a professional job; so it is only right that they are recognised as such. The next step is to protect their title.

As well as all the work behind the scenes, those who also do 'nurse consults' are hugely valuable to practices. Nurses can be great educators – often better at client education than vets – so nurse consults can be a valuable income stream for practices. I hope that this will give practices a boost to promote the role of their nurses and, for those not yet using nurses in a client-facing role, to begin to see them as valuable professionals.

We now know where you are now; but how did your career evolve?
My career path started evolving during my fourth and final year as a student, when I became interested in the business side of practice. Throughout my EMS, I was made more and more aware of how good business knowledge and practice could hugely affect the way clinical practice happened; and I was lucky enough to be supported by Liverpool University to set up – and run – a business elective as a student.

After qualification, I went into small animal practice and studied for the postgraduate Certificate in Business with the Open University. I subsequently worked for a large American group of veterinary practices, where I saw a very different model of veterinary practice done very well. Following this, I worked in industry and practice.

Most significantly, I became involved in veterinary politics with the Society of Practising Veterinary Surgeons. For me this was hugely rewarding and allowed me to meet a variety of interesting people and become involved in other parts of the profession. ■

Gudrun at the end of a 10.5-mile swim of the length of Lake Windermere. Very tired but happy.

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