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vet 360

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Focus on Wellness

Suicide Ideation in the Veterinary Practice – The Taboo we Never Talk About

Ophthalmology

Managing FHV-1 Ketrao-conjunctivitis in Kittens and Adult Cats

Surgery

Surgical Drains in Small Animal Wound Management

Also in this issue

Setting the Timetable for Sterilizing Pets | Practical Measures to Reduce Antibiotic Resistance

Hill's PRESCRIPTION DIET

Helicopter/Mobility/V360

help pets run, walk and jump more easily in as little as 21 days[1]

SCIENCE DID THAT.

1. 21 days in dogs and 28 days in cats. Hill's data on file.

* Prescription Diet j/d is also available for cats.

Editor's Note

Dear Collegues

A new year is already running away with us. This year I hope to get many more contributions from local experts in their field. South African vets understand our unique challenges and need for adaptability.

Our opthalmology article is by an Onderstepoort graduate who specialised in the UK - a nice concise guide to the treatment of feline herpes virus.

And then the ever practical and no-nonsense Marijke Henton has written our CPD article which touches on aspects of antibiotic stewardship and the development of antibiotic resistance.

Good for our planet, good for humans and still managing your patient appropriately without the unnecessary use of antibiotics.

I hope you enjoy the read.

Liesel

vet360

VET360 aims to be a leader in the field of continuing veterinary development in Southern Africa by providing veterinary professionals from diverse disciplines with tools to help them meet the challenges of private practice. The magazine aims to make information accessible, both paper and electronic, and provide clinical, business and other veterinary information in a concise form to enable the practitioner to rapidly acquire nuggets of essential knowledge

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SAVA South African Veterinary Association Suid-Afrikaanse Veterinêre Vereniging

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Striving Towards Wellness:

Suicide Ideation in the Veterinary Practice – the Taboo we Never Talk About

Retha Watson
(MA Industrial Psychology)

"The expectation that we can be immersed in suffering and loss daily and not be touched by it is as unrealistic as expecting to be able to walk through water without getting wet."

~ Dr Naomi Rachel Remen

One would never have met a veterinarian or someone dreaming of becoming one that is not a passionate and dedicated animal lover. You get to work with what you love, it should be a dream occupation, right? Yet, within this sub-population, suicide rates are significantly higher locally and internationally, above police officials, fire fighters and paramedics. **Research shows that suicides in the veterinary profession population is 17% higher than the larger general South African population.**

I am sure you get the clichés of: "You get to work with puppies every day, I wish I could do that" ,"you are so lucky to work as a Vet, you get rich and do what you love."

When, that animal comes through the practice door, a patient that cannot communicate with you and a family desperately needing you to be a super hero, a whole array of emotions, stress and trauma may confront you.

An ideal workplace it is surely not. The perception that it is a win-win to work with what you passionately love is not true as it means that you are confronted with the negative and sometimes horrific side of with what you are passionate about.

It is important that within veterinary practices, a supportive culture is created. Suicide ideation, depression and anxiety has no discrimination, and can take hold of any person.

- Make time to socialise, have coffee and debrief or ventilate. If that is not the organisational culture, change the culture, it may just save a life.
- Communication helps, and if you do not have a supportive circle, make use of professional support.
- Work on emotional competence, we will discuss this in a future article, but try and regulate your emotions, find a way to ventilate and not suppress.
- Get a hobby or exercise routine outside of work, never allow that your own healing time be swallowed up by work.
- Mindfulness – be in the moment, thankful for those tangible and not-tangible things in your life.
- Follow up on those patients that you did manage to give a second chance to, it is important to hear the good news and observe the happiness of your patients. Make time for that.
- Reach out and get help, even if it is on behalf of a colleague that you are concerned about.

Table 1:

Reasons for suicide ideation in the veterinary environment?

- The **personality** of a high performing individual leans naturally towards depression and anxiety – what gives them the ability to perform academically is the very same reason that a person is susceptible to psychological illness.
- **Occupational stressors** – such as a toxic working environment, high workload, under staffing, poor work cultures, a culture of blaming between colleagues, unhealthy focus on animal welfare at the cost of personal welbeing and long working hours.
- Being confronted with distressing situations such as **animal abuse and neglect.**
- Pet owners having to make life and death **decisions** about their pet and are depending on you to make recommendations.
- Chronic **fatigue** and exhaustion.
- Outstanding student debts and **financial stressors.**
- Experiencing moral distress and **ethical conflicts** on a daily basis.
- Unrealistic client **expectations**.
- Risks associated with patient procedures and possible **negative outcomes**.
- Exposure to frequent euthanasia and the associated trauma and emotions..
- Being directly traumatised or affected by the injury or death of the patient and then the **vicarious traumatisation** of witnessing the distress of family and young children.
- **Professional isolation.**
- Rising **veterinary costs** affecting clients ability to have treatable conditions treated.
- The routine communication of **bad news** to client.
- Interpersonal **conflicts.**
- **Generational disconnect** – older professionals do not understand the younger generations and vice versa.
- Lack of support from senior professionals.
- **Poor work-life balance** which may influence not only professional but also social relationships.
- **Emotional toll** – being exposed to the negative emotions of clients and having to supress your own emotions due to professional expectations and ethics. The suppression of negative emotions makes individuals physically and psychologically ill.
- **Stigma** around talking about experiences and **seeking professional support.** Professional credibility is questioned when help is sought.
- **Compassion fatigue** and burnout.

Warning Signs of Suicide

Many readers may identify with some or all of the reasons in Table 1. Now we need to know what the warning signs are. How can I equip myself to suspect or know if I or a colleague may be at risk?

With suicide, warning signs may be subtle, but are always there. (Table 2) We need to create an internal awareness system of listening to others, even if they do not say a word. This may be easier said than done, especially if you suffer from compassion fatigue or burnout yourself.

Table 2:

Red Flags for Suicide

- Talking about suicide, making statements such as "I am tired, I do not want to live anymore"; "I wish I was never born".
- Preparing the means to take your life, such as purchasing a gun, buying/stockpiling pills.
- Being inquisitive of suicide methods.
- Self isolation from support structures social activities.
- Preoccupation with death, violence and dying.
- Extreme mood swings
- Feeling hopeless and helpless
- Increase use of alcohol and/or drugs
- Changing normal routine, including eating and sleeping habits
- Productivity and concentration at work severely compromised.
- Doing high-risk or self-destructive activities.
- Giving away prized possessions or talking about "if I am not here anymore, you must have ...."
- Saying good-bye to people or sending messages as if they will never see you again.
- Urgency to write a will.
- Decreased interest in personal appearance and hygiene personal hygiene.

Myths about suicide

Specific myths exist about suicide, one is "they are only joking". Nobody has ever joked about taking their own life. Take it seriously and get support for the person. The sad thing is that people in the practice which make the most jokes are often, is often in the most pain. Be aware that sometimes we must ask some serious questions such as "How are you really doing?"

Retha is an Industrial Psychologist and Director of Watson Corporate Consulting since 2017,consulting companies on wellness, corporate social responsibility and human resources. She was a part time lecturer in counselling for the master's degree students in Industrial and Organisational Psychology for 10 years and the national trauma and suicide prevention manager for the South African Police Service for 18 years. She has consulted in Lesotho for three years and finds meaning and purpose in her work, walking the walk with people.

Even the smallest act of caring for another person is like a drop of water – it will make ripples throughout the entire pond
-Jessy and Bryan Matteo

Another myth is that a person who has tried to commit suicide in the past, was only seeking attention. Previous suicide attempts are a big risk factor. Suicide is never impulsive, it is always planned and thought of, there may be a trigger event which may escalate or bring the planned date forward, but it has been carefully thought through.

Suicide is not a wish to die, it is the desperate need to make the emotional pain go away.

Suicide of a colleague, friend or family member is probably one of the most devastating losses and bereavement processes one can face. In general grieving, guilt forms part of the process, but in suicides, the guilt is intensified as one feels that it could have been prevented. "If only they said something." So many times, we hear "He/she was so happy...they were okay, they even made holiday plans". Unfortunately, this is one of the major red flags of suicide. Once a person has a plan, date, and method, they become optimistic and feel as if their problems have been solved.

Suicide ideation in depressed people depletes a persons decision making, suicide ideation depletes a person's decision making and problem solving, they are not able to see beyond the pain that is overwhelming them. They will communicate future plans, but in their minds, they have a cognitive dissonance that nobody cares, and they will not be missed.

Additional risk factors are, family history of suicide, family history or own history of mental illness, homosexual/bi-sexual or transgender people in an unsupportive environment and a chronic or terminal illness, especially there is a lot of pain involved.

In this challenging world with external stressors and socioeconomic, political, and environmental challenges, we have little time for colleagues and friends, we do not even have time for self-care.

This is a plea to each person reading this article, to make your own mental health a priority and to be aware of those around you and that they are okay.

All the information has been factually and scientifically sourced and available on request

.WCC has established a service of online counselling after hours in order to provide support with long working hours in mind.

You are welcome to email: rethaw@watsoncorporateconsulting.co.za for further enquiries.

Crisis calls: 0646865905

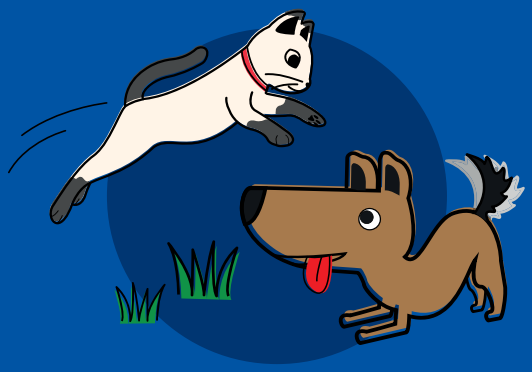
PAWPEDIA

for pet parenting peace-of-mind

In today's hyper-connected world pet parents often search online for information about their pets, but it can be difficult to validate information and while some of it may sound believable, some of it might even be dangerous.

Hill's Pet Nutrition believes in helping enrich and lengthen the special relationship between people and their pets and one of the best ways to do just that is by enhancing the understanding of our pets' needs and wellbeing.

This is why they created Pawpedia Pet Parent Academy: a trusted and free resource that helps pet parents upskill themselves to better care for their pets.



Pawpedia has launched with 15 courses: 8 for dogs and 7 for cats.

Visit www.pawpedia.co.za to see what's available.

Cat and dog parents can complete courses containing information about pets, their various lifestages, as well as their unique and special needs.

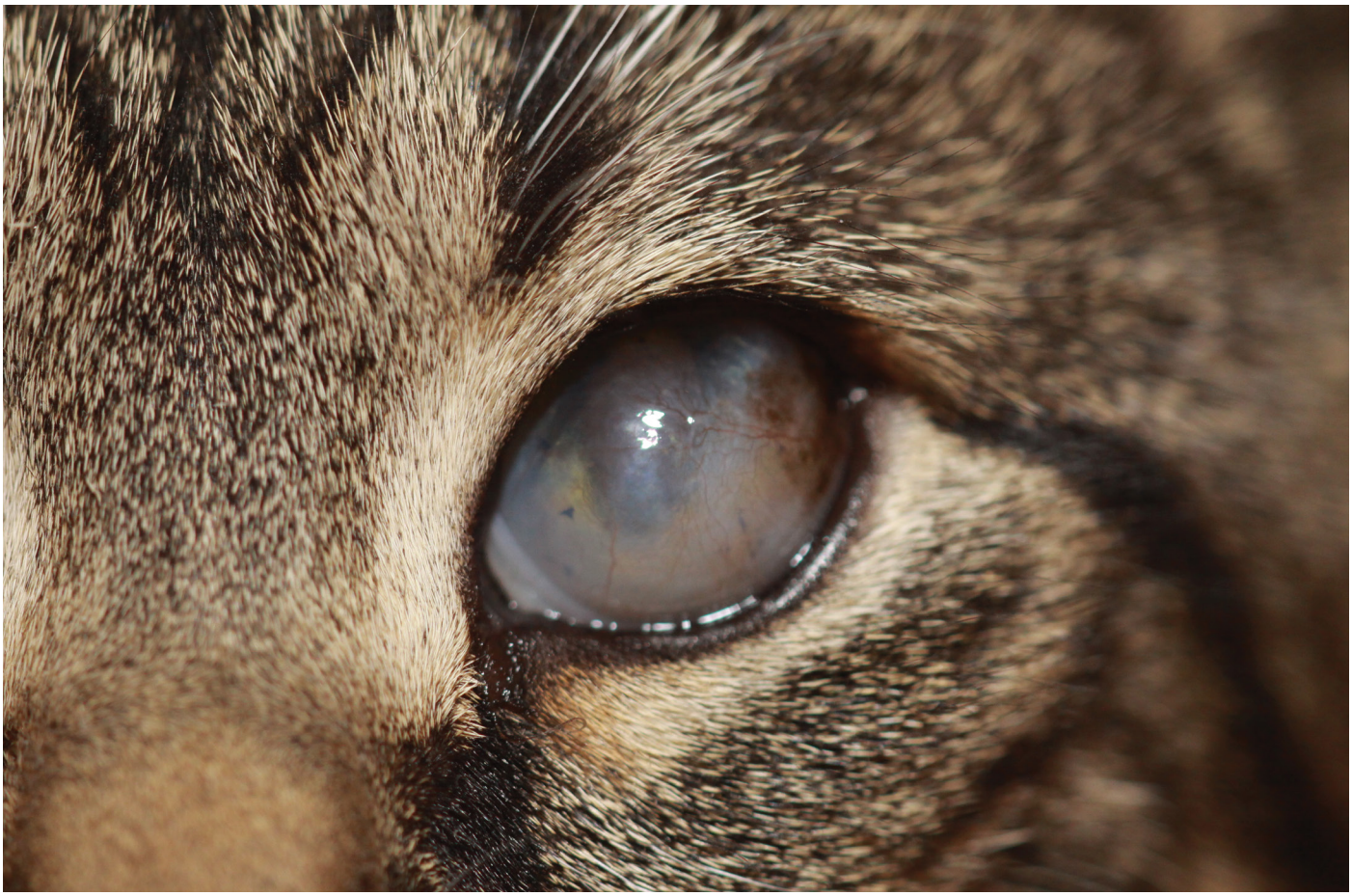
Content is created by **independent and trustworthy experts**, including vets, veterinary behaviourists, , physiotherapists, bereavement counsellors, cat experts, and even legal counsel.

Courses are made up of a few lessons each, and each **lesson takes 5 - 15 minutes** to ensure topics are covered effectively.

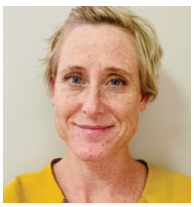
It is completely **FREE** and available on **desktop** as well as **mobile devices.**

Start at any point and follow the journey that suits you.

The lessons are easy to learn on the go and are set up as **podcasts, videos, and printouts.**



Protocols for the Management of FHV-1 Kerato-Conjunctivitis in Kittens and Adult Cats and 'What to tell the Owners'



Dr Janine Ryan
BVSc CertVOphthal MRCVS

Important Key Facts:

- Feline kerato-conjunctivitis (KC) is infectious until proven otherwise.
- FHV-1 is a ubiquitous virus with a prevalence of >50% in healthy cats.
- Testing is rarely worthwhile! A positive test requires active viral replication at the time of sampling. A negative test does not exclude FHV-1 as the cause of disease. Diagnosis is made on history and symptoms.
- Other infectious agents causing KC include Chlamydia, Mycoplasma and Calicivirus in kittens. These, however, do not cause recurrent ocular symptoms in adult cats.
- Herpes is 'for life'.
- Managing the cat's stress in the quiescent phase remains the hallmark of managing FHV-1 recrudescence.

How do I know its Herpes?

Kittens are usually infected by their dam or cattery mates. 'Flu-like' symptoms ensue, of which most kittens recover uneventfully. A carriers state will occur in 80% of infected animals, of which approximately half will go on to develop recrudescent disease or ocular symptoms of varying severity throughout their lives.

If a kitten or litter is presented with 'flu-like' symptoms and there is ocular, especially ocular surface involvement, FHV-1 is involved. If an adult cat presents with kerato-conjunctivitis and anywhere in the history there is an indication that previous episodes, no matter how mild, have occurred, or if the kitten or cat has been rescued with an unknown history, FHV-1 can generally by implicated. A recent episode of a stressful incident or vets visit prior to developing ocular symptoms is highly suspicious of FHV-1 recrudescence.

DD's for infectious kerato-conjunctivitis (KC)

- Allergic (hypersensitivity can develop to Chlortetracyclines)
- Foreign body
- Kertaoconjunctivitis sicca (KCS) (rare)
- Eosinophilic KC
- Lymphoma
- Secondary to Entropion, Uveitis or Glaucoma

FHV-1 KC in Kittens

Key Facts:

- More severe if dam is unvaccinated
- Highly contagious

Figure 1: *Typical appearance of a kitten with 'flu-like' symptoms and ocular involvement*

Figure 2: *Neonatal opthalmia.*

Kittens present with an upper respiratory syndrome or 'flu-like' symptoms (Fig 1). Whole litters can be affected. If FHV-1 is involved, conjunctivitis, corneal ulceration and even perforation in addition to the URT signs are usually present. More than one agent can be involved concurrently. Treatment is largely symptomatic. Neonatal ophthalmia is part of this syndrome and refers to the build-up of purulent material behind still-closed eyelids (Fig 2).

Table 1: *Management of kittens with FHV-1 KC*

Management of kittens with Kerato-conjunctivitis
• Barrier nursing
• Frequent removal of ocular and nasal discharge o For neonatal ophthalmia, removal of pus by massage/flushing of pus from inner corner of eyelid and gentle (not forceful) eyelid opening if they allow it.
• Topical broad-spectrum antibiotics QID
• Topical lubrication QID
• Syringe feeding, IV fluids and systemic antibiotics if severe disease
• Enucleation if globe rupture

FHV-1 KC in Adult cats

Key Facts

- Cats present with unilateral recurrent conjunctivitis with or without corneal ulcers.
- Careful questioning invariably reveals recurrent episodes of varying degrees of ocular disease ranging from an intermittently weepy eye or self-limiting blepharospasm to recurrent ulceration.
- A history of 'Snuffles' as a kitten or adopted from a rescue centre or breeding colony.

Once infected the FHV-1 virus is harboured in the Trigeminal nerve (CN5) in its latent phase.

Recrudescent disease, often exacerbated by stress or immune-suppression, activates the virus which then 'travels' along the nerve to the more distal nerve fibres innervating the ocular surface, amongst others. Here, active viral replication takes place.

The clinical signs are as a direct result of the cytopathic effect of viral replication. Mild symptoms include epiphora as the only sign or a mild conjunctivitis. Moderate to severe symptoms include severe chemosis, muco-purulent ocular discharge and corneal ulceration.

Two types of pathognomonic ulcers occur: Dendritic ulcers (literally following the course of the nerve endings) (Fig 3) and 'Indolent-like' ulceration (Fig 4) .

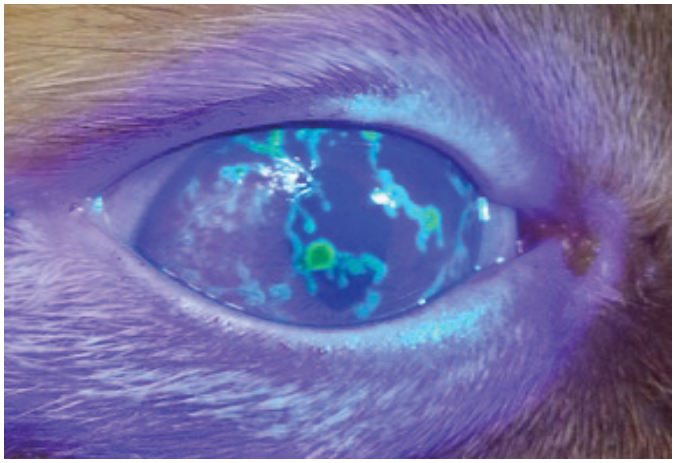


Figure 3: *Typical dendritic ulcers on a cats cornea due to active FHV-1*

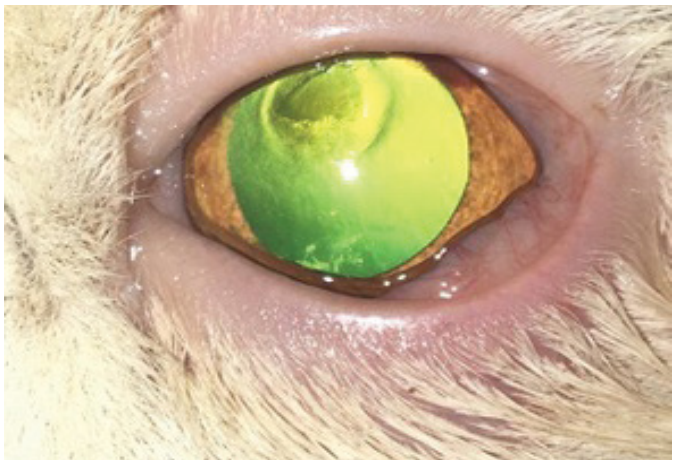


Figure 4: *'Indolent-like' ulcers on a cats cornea*

Table 2: *Management of FHV-1 KC in adult cats.*

Acute flare up WITHOUT corneal ulceration
• Analgesia - parenteral Meloxicam for 5-7 days
• Cidofovir® drops BID 5-7 days
• *Topical lubrication up to QID
• **L-lysine supplementation

Acute flare up WITH corneal ulceration
As for 'without ulceration' PLUS:
• Broad spectrum topical antibiotics eye drops QID
• Once off ***Cyclopentolate® eye drop topically in consult
• ****Famciclovir® - an antiviral medication used to control feline herpesvirus (FHV-1). Its use in cats is 'off-label'. ****
• For 'Indolent-like' ulcers - under topical local anaesthetic e.g Novescien Wander®, debride the ulcer with a sterile cotton bud and place a bandage contact lens(Fig 5))***** and elizabethan collar.
• **NOTE:** NEVER PERFORM A STRIATE OR GRID KERATOTOMY IN CATS!

*If the cats gets stressed out by topical medication, keep it to an absolute minimum
**Inhibits viral replication in vitro.
***Cyclopentolate is a shorter acting cycloplegic to overcome reflex - ciliary spasm and anterior uveitis. It is not bitter and is better tolerated in cats over atropine
****Dose is 90mg/kg! Famciclovir is extremely unstable when compounded.
*****Human disposable contact lenses with 0.00 refractory power, a 8,6base curvature and 14Diameter are used as a 'one size fits all'

Figure 5: *A "bandage" contact lens in place on a cats eye.*

Sequestrums and Chronic Keratitis in cats

Any chronic irritation to the cornea can lead to sequestrum formation in cats, this includes recurrent corneal ulceration due to FHV-1.. Corneal sequestrums (Fig 6) need to be managed surgically. Chronic keratitis refers to a perpetuating corneal stromal inflammatory reaction which is usually unilateral and can be ulcerative or non-ulcerative (Figs 7, 8). A cell mediated immune response to viral particles is suggested. Medical management is frustrating. Surgical management is aimed at removing the unhealthy stroma and therefore reducing viral particle load, with or without grafting.

Managing the Quiescent Patient

Stress is the foremost catalyst for recrudescence of FHV-1. Careful owner questioning on the patients' home environment and behaviour might indicate if the cat is experiencing stressful episodes. The stress of a simple vets visit can induce recrudescence.

Recognising potential stress factors in e.g. multicat households, ensuring that the '5 basic needs' of cats are met or anticipating stressful episodes such as going into the cattery, having house guests or getting a new pet can help limit and alleviate stress.

In affected cats, feeding a diet with stress relieving additives (alpha-1 casozepin and/or L-tryptophan) or herbal calming supplements prior to and during a potential stressful episode can be extremely useful as is Pheromone therapy (transport spray or plug in diffusers). In the select patient, on-going preservative free lubrication is beneficial. Recent studies show a FHV-1 induced KCS in cats with recurrent and/or chronic disease stress.

The vet can dispense medication for the owners to manage flare-ups at home rather than have stressful vet visits. The owner is encouraged to seek vet advice if initial home management fails.

Figure 6: *Corneal sequestrum*

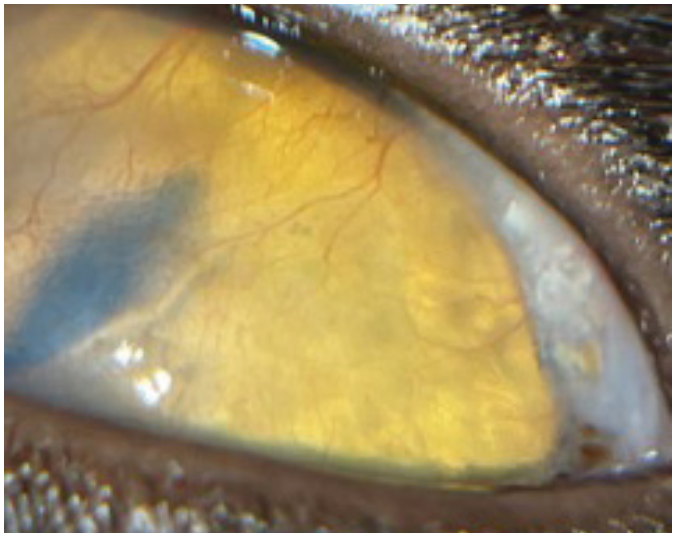


Figure 7: *A cloudy cornea and persistent vascularization in a cat with chronic keratitis.*

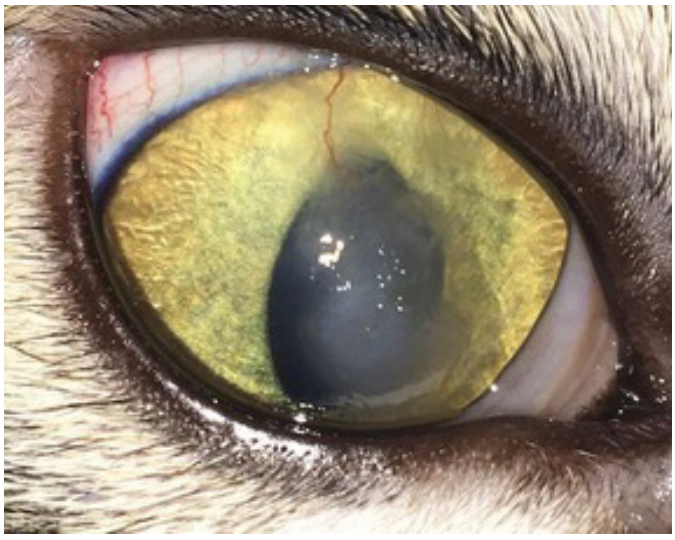


Figure 8: *Chronic keratitis in a cat*

Table 3: *Management protocol for cats with chronic FHV-1 disease*

Quiescence:
• Reduce, anticipate and manage any stressful factor or episode
• Ensure the '5 basic needs'* are met

During a flare-up:
• Lubricate as frequently as tolerated without increasing stress levels
• Oral meloxicam SID 3-5 days
• Topical Cidofovir® BID 3-5 days
• Oral Famciclovir® 10 days - costly/stress
• L-lysine supplementation if cat tolerates - optional/evidence unsupportive
• Seek vet advice if clinical signs not resolving within 5-7days

*THE 5 BASIC NEEDS OF CATS

1. Resources: food, water, litter box, shelter.
2. Safe access to resources.
3. Appropriate company or human interaction including any requirements to be housed with/ apart from , other animals.
4. Opportunity to behave normally e.g. scratch posts and predatory (play) behaviour.
5. Protection from pain, suffering, injury and disease.

Advice for cat owners

Protocols for breeders

- Vaccinate any new additions prior to introduction to the cattery
- Strict barrier nursing of affected litters!
- Avoid breeding with dams of infected litters
- Treat all affected cats and outbreaks as for SOP for Owners above

Owners can be briefly educated on the nature and route of transmission of the virus and that carrier status cannot be eliminated. Refer owners to a good website e.g. https://www.icatcare.org and https://www.abcdcatsvets.org/, so that they can familiarise themselves with the condition.

Managing the cat's stress in the quiescent phase remains the hallmark of managing FHV-1 recrudescence. Empower owners to recognise and manage a flare-up at home in a 'stress free' manner as a starting point. Arming the owner with an arsenal of medication for 'home management' is extremely helpful in managing these patients.

Reference reading:

1. Sally M Turner, Small Animal Ophthalmology Saunders Solutions in Veterinary Practice Elsevier 2008
2. O'Leary LM, Allbaugh RA, Schrunk DE, Olsen TE, Sebbag L. Variable accuracy, precision, and consistency of compounded famciclovir formulated for management of feline herpesvirus-1 in cats. Vet Ophthalmol. 2021 Nov;24(6):627-638. doi: 10.1111/vop.12910. Epub 2021 Jun 12. PMID: 34117694.
3. Bol S, Bunnik EM. Lysine supplementation is not effective for the prevention or treatment of feline herpesvirus 1 infection in cats: a systematic review. BMC Vet Res. 2015 Nov 16;11:284. doi: 10.1186/s12917-015-0594-3. PMID: 26573523; PMCID: PMC4647294.
4. BSAVA Manual of Canine and Feline Ophthalmology, 3rd Edition by David Gould, Gillian McLellan
5. spca.org.uk

CANINE VETMOTL Available Q3 2024

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VetMotl: A better way to prepare bovine and equine sperm for veterinary reproductive procedures.

DELIVERS THE HIGHEST QUALITY SAMPLES:
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OPTIMISES LAB PROCESSES:
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- No special media required
- Reduced sample handling

Bovine product use cases

IVF upgrade	Research has shown differences between bulls in the proportion of oocytes that became blastocysts when their sperm was used in IVF[1]	→	VetMotl prepared spermatozoa induced a significantly higher blastocyst rate (49% vs 34%) at Day 7 and a significantly higher percentage of hatched blastocysts on Day 9 (35% vs 22%) compared to density gradient[2]
Screen Young bulls	Discard rates average more than 20% in beef and dairy bulls < 13 months of age compared with discard rates of ~5% for mature dairy sires[3]	→	Optimise samples from superior genomic bulls into saleable product vs discarding or as a screening tool to increase confidence and accuracy of decisions for individual bulls
Fertility boost	There is more than 10% difference in conception rate between high and low fertility bulls measured by sire conception rate (SCR)[4]	→	Help boost sire fertility in lower SCR sires or older bulls with decreased production by isolating the most progressively motile sperm for various ART procedures

Equine product use cases

Wash Failure	With previous OPU-ICSI method, utilising a simple wash failed to result in a viable embryo	→	The same stallion–mare combination that failed previously resulted on average of 2 embryos per OPU session with the VetMotl device vs simple wash[2]
Stallion fertility	When ICSI is chosen and you have one straw, one shot and know nothing about the stallion's fertility	→	The VetMotl device increased recovery percentage of progressive motility along with sperm membrane integrity (MI), sperm membrane functionality (MF), and mitochondrial membrane potential (MMP)[5]
Equine athletes	When offspring of high-valued equine athletes are greatly sought after, and ART procedures are necessary	→	Increase the effectiveness of ICSI leading to successful conception and pregnancy of elite performance horses

Sources: [1]Hansen PJ; [2]Lorenzen, *et al.*; [3]DeJarnette; [4]Butler, *et al.*; [5]Vigolo, *et al.*

CONTACT:
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Setting the timetable for Sterilizing Pets

The timing of spay/neuter surgery—the first major milestone veterinarians must guide a puppy or kitten through—is a big decision for most pet owners. But there is no one-size-fits-all schedule for this procedure. When to sterilize depends on species, gender, and breed, and vets should customise their recommendations to accommodate individual pet needs.

In the United States, the traditional age for sterilizing dogs and cats has hovered between 6- and 9-months old. This norm had little medical reasoning behind it but possibly arose in the early 1900s in response to high anaesthetic mortality in younger animals.[1] But anaesthetic protocols have advanced, rendering surgery in very young animals safe. In shelters, puppies and kittens routinely lose their gonads before they've lost their "milk" teeth. However, for animals acquired intact, owners have a choice to make.

But the lack of universally accepted rules leaves most generally confused. In a 2011 PetSmart study surveying owner attitudes about sterilization, three out of four survey respondents either did not know when to "fix" their pet or pegged the best age at 6 - 9 months old or beyond[2]

Only in the last decade has the question of "best timing" been addressed systematically. Multitudes of studies have set out to link sterilization age with the later onset of

various diseases and also protective benefits. One thing investigators found is that what works best for kittens isn't necessarily the gold standard for puppies.

In fact, they've shown that there is no gold standard for puppies. The rules that apply to most small dog breeds don't hold fast for larger ones.[3] Similar inconsistencies also exist between different breeds of similar size and different size categories of mixed-breed dogs.[4]

The choice of when to spay or neuter is nuanced and best incorporates many factors unique to a particular animal. Even the American Veterinary Medical Association (AVMA) stays mum on timing and states, "Veterinarians should use their professional judgment to determine the optimal time for sterilization."[5]

A harsh reality

The health advantages of delaying spaying or neutering in a particular animal must be balanced against the backdrop of pet overpopulation.

"Spay and neuter services are a critical piece of continuing efforts in population control and informed decision-making by owners in the care of their pets," said Brittany Watson, VMD, PhD, MS, BS, associate professor of clinical shelter medicine at the University of Pennsylvania School of Veterinary Medicine.

Some 2 million healthy cats and dogs are euthanized annually in the USA because the shelters are overrun. Although still a tragic number, it's at least down from about 15 million a few decades back, primarily because of the newer practice of sterilization before adoption.[6]

Rescue programs that incentivise adopters to alter their pets after bringing them home, either through contracts with local veterinarians, bonds, or deposits for later spay-neuter, have been largely ineffective. Certainly, the best chance for an animal to be sterilized is before it leaves the shelter, prompting many jurisdictions to require surgery before adoption.

If it is an animal who does not have a dedicated owner or guardian, we should make sure it cannot reproduce.

Is early sterilization safe?

The ovariohysterectomy and castration procedures are themselves safe. It is estimated that they carry less than 0.1 % mortality in dogs and cats.[7] Considering renal and hepatic competence in clearing anaesthetic compounds, the age of the animal plays a role in the outcome. Nephrons are not fully formed in puppies and kittens until 7 - 8 weeks of age. For kittens, the age-weight relationship is more standardised than in puppies, and 1kg of body weight generally indicates mature hepatic function. Even so, there are now anaesthetic drugs that can be used with immature kidneys and livers. Hepatocytes and nephrons aside, the larger the neonate, the better. "The biggest thing that influences morbidity and mortality is the animal's size," said Giacomo Gianotti, DVM, DVSc, associate professor of clinical anesthesiology at the University of Pennsylvania School of Veterinary Medicine. "A young German shepherd that weighs 10 – 13kg is different from a 2kg Yorkshire terrier."

Intravenous catheterisation, endotracheal tube placement, thermoregulation, and glycaemic control are more difficult in smaller animals, and greater is the room for error in drug delivery too. When size is tiny, too much of a drug, too many fluids, too much gas pressure, and too much of a breath are all too attainable, Gianotti warned.

Gianotti added that with these things in mind, the early spay-neuter model seen in the shelter environment is safe because the surgeons who perform them generally do so in a high-volume, rapid-fire way, generally under 20 minutes each. "They are so experienced in doing these surgical procedures fast that the risk is low," he said. "The shorter the event, the less likely you are to have problems with blood pressure, vitals, and perfusion."

Postoperative recovery times are typically shorter in younger animals. In a study that looked at spay-neuter outcomes in dogs and cats, 85 veterinarians unanimously stated that spays and neuters were safer, faster, and easier when performed early than when done after 6 months of age.[8]

Another investigation's results found the incidence of minor complications to be higher for spays and neuters performed after 12-weeks of age than before, with the greatest increase in risk occurring after 24-weeks- of age.[7]

Gonadal hormones: a physiology review

Population control is obviously best accomplished in young animals from both a safety and efficacy standpoint. But sterilizing means turning off a faucet of hormones that modulate normal growth and maturation. For the pet owner whose puppy or kitten has come to them intact, this should be factored into their decision on surgery timing.

Oestrogen and testosterone signal growth plates to close. Removing these hormones can delay physeal closure, possibly resulting in longer bones.[9,10] The potential changes in tibial plateau slopes that can ensue may elevate the risk of anterior cruciate ligament rupture in some dog breeds. And in animals sterilized on the earlier side, bone volume can lessen, likely due to hampered osteoblast function.

The importance of another compound, luteinizing hormone (LH), cannot be overestimated. In the post-pubertal mammal, the hypothalamus secretes gonadotropin-releasing hormone (GnRH). This then spikes a discharge of LH that triggers the release of gonadal hormones, which shuts off the GnRH/LH valve.

Because there is no negative feedback in gonadectomized dogs and cats, these levels remain elevated at

supraphysiologic concentrations. Dogs that have been spayed or neutered have been found to have LH levels 30 times above normal.[11]

LH doesn't just stimulate the gonads. It also interacts with the thyroid and adrenal glands, gastrointestinal tract, ligaments, and lymphocytes. LH receptors pepper the urinary tract, and spayed female dogs with urinary incontinence have been found to have many more LH receptors than those left intact. There are also numerous LH receptors in the thyroid gland, and they reside alongside thyroid-stimulating hormone receptors.

Continuous stimulation of the thyroid LH receptors can interfere with these receptors and contribute to hypothyroidism in dogs. Sterilized dogs have also been shown to have more lymphocytes with LH receptors circulating in the bloodstream and residing in already cancerous lymph nodes. This suggests that LH could affect lymphocytes and play a role in the development and progression of lymphoma.

Cutting cats

Previously, the broadly recommended age for feline spay was after the first litter. Then it changed to after the first heat cycle, and eventually, the profession settled on 6 months or older. But age recommendations have since been lowered to pre-empt feline sexual maturation, which can hit as early as four months. Many shelter veterinarians sterilize cats at 8 weeks or 1 kg. Some will do so even earlier, as long as the kittens appear healthy.

Root says she advocates spaying before the first oestrus, which varies between 4-9 months of age, depending on genetics and geography. Although spaying has been linked to the development of obesity, diabetes mellitus, and feline lower urinary tract disease, it has a protective effect against mammary cancer, which is the third most common cancer in cats, occurring at a rate of almost 3% in intact queens. When performed before the first heat, risk reduction is particularly dramatic.[12]

Around the time of sexual maturity, age 4 - 5 months, toms start to show behaviours undesirable in a pet. These include biting, roaming, and urine spraying. As with the queen, sterilizing lowers metabolic rate, predisposing them to obesity. The belief that neutering male cats prior to sexual maturity results in a smaller penis and a more narrowed urethra that renders them more susceptible to urinary blockages has been shown to be false. Study results have demonstrated no difference in urethral diameter between cats neutered before sexual maturity, after maturity, or not at all.[13]

Several investigations have failed to uncover negative long-term consequences of early gonadectomy in male and female cats. One study followed 263 shelter cats for 3 years after sterilization.[14] Surgery was performed at under 6-months of age in 188 cats and over 6-months in the other 75 cats. The incidences of physical disease and behavioral problems between the two groups were comparable.

The Feline Fix by Five Months campaign promotes spaying and neutering cats at or before 5-months of age.[15] The program, endorsed by the AVMA, American Association of Feline Practitioners, and American Animal Hospital Association, spreads the message to the veterinary community and general public alike.

Desexing dogs

The interplay between reproductive hormones and overall health is generally homogenous among cats. But not so for dogs. There is considerable variation among different breeds and size categories.

For instance, a Doberman Pinscher does not respond the same way an Akita does to the loss of gonadal hormones. And within particular breeds, gender even makes a difference. For instance, altering at the standard 6-months of age does not seem to boost cancer risk in female Boston terriers.[3] However, in male Boston terriers, neutering before 1-year of age is associated with a significant increase in cancers.

Images in this article courtesy of Dr Clifford Bull, Craigview Veterinary Hospital

Research on golden and Labrador retrievers and German shepherds showed a higher incidence of one or more joint disorders in dogs sterilized before 1-year of age.[16,17] In female golden retrievers, spaying appeared to boost cancer risk significantly. Recent study results expanded the database by an additional 32 breeds of dog, including three varieties of poodle.[3] Using retrospective data found in medical records, investigators tracked three joint disorders (hip and elbow dysplasia and cranial cruciate ligament rupture) and cancers that included lymphoma, mast cell tumour, hemangiosarcoma, and osteosarcoma. They also looked at mammary cancer, pyometra, and urinary incontinence in female subjects.

Small-breed dogs, such as Yorkshire terriers, Pomeranians, Chihuahuas, and toy poodles, rarely experience joint problems, nor do they manifest neutering-related increases in joint disorders compared with breeds of larger size, in whom sterilization age seems to have a greater effect on later development of orthopaedic issues.

"Why would an owner want to have a greater risk of a very painful joint disorder?" questioned Benjamin Hart, DVM, PhD, distinguished professor emeritus at the University of California, Davis, School of Veterinary Medicine and the study's lead author.

According to Hart, somewhat spared of cancer in general, small breeds are less vulnerable than large breeds to the effects of sterilization age on neoplasia. Hart is currently investigating the effects of sterilization age on the development of cognitive decline in dogs.

Another study using the same set of data evaluated long-term health outcomes of sterilizing at various ages in mixed-breed dogs of different sizes. Regardless of the weight category, sterilization age did not seem to affect cancer rates.

However, in dogs weighing 20 kg or more, sterilizing before 1-year of age appeared to significantly boost the risk of one or more joint disorders compared with that of dogs left intact; there were gender differences in degrees of severity.

Putting it all together, breed studies aside, a few general rules can be presented to clients. First, neutering male dogs before sexual maturity, sometimes as early as 6-months, can mitigate disruptive behaviours, such as mounting, roaming, barking, inter-dog aggression, and urine marking. Secondly, spaying females before the first heat cycle slashes the risk of mammary neoplasia, with decreasing benefit with each heat cycle the bitch experiences.[19]

Counselling owners

Just as there's no single recommendation appropriate for all dog breeds, every canine and feline gonadectomy decision should be evaluated in a way that balances surgery risk, long-term health benefits and consequences, owner logistics, and population control.

These elements should all be part of the dialogue with pet owners, said Hart. "The new paradigm is 'Have conversations with your clients and show them the data,'" he said.

References

1. Root Kustritz MV. Determining the optimal age for gonadectomy of dogs and cats. J Am Vet Med Assoc. 2017;23(11):1665-1675.
2. PetSmart Charities, Ipsos Marketing Survey. 2012.
3. Hart BL, Hart LA, Thigpen AP, Willits NH. Assisting decision-making on age of neutering for 35 breeds of dogs: associated joint disorders, cancers and urinary incontinence. Front Vet Sci. 2020;7(388):1-14.
4. Hart BL, Hart LA, Thigpen AP, Willits NH. Assisting decision-making on age of neutering for mixed breed dogs of five weight categories: associated joint disorders and cancers. Front Vet Sci. 2020;7(472).
5. Pediatric spay/neuter of dogs and cats. AVMA website. https://www.avma.org/resources-tools/avma-policies/pediatric-spayneuter-dogs-and-cats. Accessed May 10, 2021.
6. Rowan A, Kartal, T. Dog population and dog sheltering trends in the United States of America. Animals 2018;8(5):68.
7. Levy JK, Bard KM, Tucker SJ, et al. Perioperative mortality in cats and dogs undergoing spay or castration at a high-volume clinic. The Vet Jour 2017;224:11-15.
8. Land TW. Favors early spay/neuter. JAVMA 2000;216:659-660.
9. Salmeri KR, Bloomberg MS, Scruggs SL, Shille V. Gonadectomy in immature dogs: effects on skeletal, physical, and behavioral development. J Am Vet Med Assoc.1991;198(7):1193-1203.
10. Slauterbeck JR, Pankratz K, Xu KT, et al. Canine ovariohysterectomy and orchiectomy increases the prevalence of ACL injury. Clin Orthop RelatRes. 2004;429:301-305.
11. Kutzler MA. Possible relationship between long-term adverse health effects of gonad-removing surgical sterilization and luteinizing hormone in dogs. Animals 2020;10(4).
12. Overley B, Shofer FS, Goldschmidt MH, et al. Association between ovariohysterectomy and feline mammary carcinoma. J Vet Intern Med. 2005;19:560-563.
13. Porters N, Polis I, Moons CPH, et al. Relationship between age at gonadectomy and health problems in kittens adopted from shelters. Vet Rec. 2015;176:572.
14. Howe LM, Slater MR, Boothe HW, et al. Long-term outcome of gonadectomy performed at an early age or traditional age in cats. J Am Vet Med Assoc. 2000;217(11):1661-5.
15. Fix by Five awareness. Feline Fix by Five website. https://www.felinefixbyfive.org. Accessed May 10, 2021.
16. Hart BL, Hart LA, Thigpen AP, Willits, NH. Long-term health effects of neutering dogs: comparison of Labrador retrievers with golden retrievers. PLoS One. 2014;9(7).
17. Hart, BL, Hart, LA, Thigpen, AP, Willits, NH. Neutering of German Shepherd Dogs: associated joint disorders, cancers and urinary incontinence. Vet Med Sci. 2016;2(3).
18. Schneider R, Dorn CR, Taylor DO. Factors influencing canine mammary cancer development and postsurgical survival. J Natl Cancer Inst. 1969;43(6):1249–61.
19. Hopkins SG, Schubert TA, Hart BL. Castration of adult male dogs: effects on roaming, aggression, urine marking, and mounting. J Am Vet Med Assoc. 1976;168(12):1108-10.

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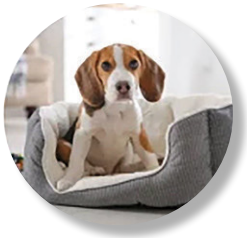

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Antibiotic Resistance

Practical Measures for Maintaining Antibiotic Stewardship Without Compromising Patient Care.

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The article discusses the background regarding current antibiotic resistance from a unique South African perspective.

The deleterious effect of the misuse of antibiotics is clear to everyone. Practical precautions and possible solutions to various antibiotic resistance problems are addressed.

The worldwide rapid increase in antibiotic resistance is of concern, by both veterinarians and medical doctors regarding treating infectious disease. Fewer and fewer suitable antibiotics remain for treating animals, especially those most vulnerable, such as the very young, the old and immune-incompetent.

Bacterial resistance to antibiotics is prevalent and is already a serious problem in man, animals, and the environment in South Africa. Studies by Bosch, 2017 and Malema, 2018, as well as numerous other South African studies, show that antibiotic resistance in environmental bacteria is already high. Bacteria isolated from open waters in Northwest

province harboured bacteria showing over 50% resistance to common antibiotics such as amoxycillin and potentiated sulphas, and *E. coli* from rainwater tanks in the Eastern Cape showed 76% resistance to cephalothin.

Methicillin resistant *Staphylococcus* (MRS) isolated from diagnostic samples submitted to Vetdiagnostix increased from 1.8% in 2016 to 44.3% of all *Staphylococcus* isolates in 2023 and Extended Spectrum Beta Lactamase (ESBL) increased from 19% in 2016 to 46% of all isolates of Enterobacteriaceae during 2023. Diagnostic samples are inherently biased, but these simple statistics show huge increases in only seven years.

Detecting resistance is becoming more complicated, due to new bacterial resistance mechanisms that require sophisticated methods of detection. Many antibiotics are tested, and a high percentage of them require unique laboratory culture and interpretation methods. Reading antibiograms is far more difficult as the recommended interpretive rules per antibiotic and per isolate. Laboratory staff need to keep current with new recommendations.

Preserving the normal bacterial flora of mucous membranes is crucial in disease prevention. Studies in feedlot calves showed that a single antibiotic injection changes the normal respiratory tract flora from few to many pathogens. This probably also holds true for all the normal flora of the body.

Short review of antibiotics

Antibiotics exert their effects on bacteria by targeting different cell components. The cell wall is damaged by penicillins, cephalosporins, bacitracin and vancomycin and the cell membrane by colistin and polymyxin. Proteins are affected by tetracyclines, aminoglycosides, macrolides, and chloramphenicol. Bacterial metabolic processes are affected by sulphas and fosfomycin, and the DNA is affected by quinolones, metronidazole and novobiocin.

Penicillins and cephalosporins are very safe. They were originally developed for treating Gram- positive bacterial infections, but broad spectrum and Gram-negative antibiotics have been developed. They are synergistic with aminoglycosides, penetrate tissues poorly and produce high urinary levels.

Most available veterinary cephalosporins belong to the first generation, usually spelled "ceph" not "cef". Fewer second and third generation cefalosporins are available for veterinary use.

Tetracyclines are relatively safe, but stain teeth, and may damage the liver and kidneys. They are broad spectrum and can also be used for *Mycobacterium* and *Mycoplasma*. Doxycycline has improved penetration of tissues, excluding the CSF and prostate, and is also effective against anaerobes.

Aminoglycosides are used for Gram negatives and *Mycobacterium*. They are ineffective against anaerobes as they need oxygen for uptake. As they are rather toxic, doses should be carefully calculated. The sequence of least to most toxic is amikacin, tobramycin, gentamicin, neomycin, kanamycin and lastly streptomycin. They show poor tissue penetration and perform poorly in pus.

Macrolides, lincosamines (both for Gram positive) and pleuromutalins (Gram negative) are antibiotics such as erythromycin, azithromycin, clindamycin, tylosin, tilmicosin, tiamulin, tildipirosin, gamithromycin and tulathromycin. They are relatively safe and effective against *Mycoplasma* and anaerobes. Although tissue penetration is moderate, some are highly concentrated in the lungs. They act as bacteriocidal antibiotics when given at high doses when few bacteria are present, and for bacteria such as *Streptococcus*. They are bacteriostatic when given at low doses in high bacterial population infections and for bacteria such as *Enterococcus* and *Staphylococcus*.

Amphenicols (chloramphenicol and florfenicol) affect protein synthesis, are toxic to the bone marrow, penetrate well, and are bacteriostatic. They have a very broad spectrum, and are used for chlamydiae, mycoplasmas, rickettsiae and anaerobes. Quinolones affect the articular cartilage, and are broad spectrum, but poor for anaerobes. They are also effective against *Mycoplasma* and *Mcanvaycobacterium*. They are bacteriocidal.

Sulphonamides, which affect bacterial folic acid synthesis are broad spectrum, bacteriostatic, may show idiosyncratic adverse effects and perform poorly in pus. Polypeptides (colistin and polymyxin) are relatively toxic and are generally used for localized treatment of Gram-negative infections. They consist of huge molecules, poorly absorbed, so stay in the area where they are administered.

Metronidazole and ronidazole are for anaerobes and protozoa. They penetrate well and are bacteriocidal. Fosfomycin (Fosbac®, Urizone®) is broad spectrum and safe, but is rapidly eliminated in dogs, necessitating 6-hourly dosing.

Synergistic antibiotics are penicillins and aminoglycosides, rifampicin with the erythromycin group, macrolides with pleuromutalins, and sulphas with polypeptides. Antagonistic antibiotics are chloramphenicol with macrolides, erythromycin and aminoglycosides, older beta-lactams and third generation cephalosporins, rifampicin and quinolones, macrolides and lincosamines, and tetracyclines with antibiotics that affect the cell wall. Antagonistic combinations were classically bacteriostatic and bacteriocidal antibiotics, but this has not always been found to be true. Other incompatibilities are colistin and polymyxin with QAC disinfectants and calcium, sulphas with anticoagulants, NSAIDS and procaine, and oral tetracycline absorption is affected by high levels of calcium in the diet.

Antibiograms

Many years of research and testing have resulted in improved antibiogram predictions regarding efficacy in the animal. Zone or concentration recommendations are made by plotting the zone sizes against disease outcomes. Antibiograms cannot take host defences into consideration,

nor host factors such as the tissue affected, nor any of the other myriad of considerations that veterinarians need to consider when selecting a suitable antibiotic. Most of the recommended zone sizes have been extrapolated from human data.

Veterinary standards are being researched and some recommendations have been made, for example, for well-defined diseases such as feedlot respiratory illness and salmonellosis in animals. These studies result in guidelines by the CLSI (Clinical and Laboratory Standards Institute) and Eucast [Vetcast]. Both are international bodies which determine MIC levels and zone sizes for certain conditions in certain animals, and they also recommend methods as well as checks and balances for all the tests.

The most significant of these are the interpretive rules issued by Eucast, where additional facts need to be considered when antibiograms are read. These rules state that when a resistance mechanism is present, the antibiogram should be modified. The modifications require the support of an expert rule. An example of a rule is "Misleading results for *Salmonella* and *Enterococcus*.

The following antibiotic/organism combinations are not clinically effective and must be reported as resistant, even if the antibiogram shows sensitivity. Examples are given: *Salmonella* and *Listeria* should be reported as resistant to first and second generation cephalosporins and aminoglycosides, and *Enterococcus* should be reported as resistant to aminoglycosides, cephalosporins, clindamycin and potentiated sulphas.

Resistance

International bodies, including the WHO, FAO and OIE have expressed concern about antimicrobial resistance, and regard accurate laboratory results as critically important in helping to combat it. Empirical therapy based on experience and knowledge often fails, because of resistance. Antibiograms should be requested as soon as treatment failure occurs.

Natural antibiotic resistance has always been present, such as that of *E. coli* to penicillin, aerobes to metronidazole and *Streptococcus* to aminoglycosides.

Acquired resistance is linked to antibiotic usage and frequency of use. The refugia concept states that when an effective antibiotic eliminates a susceptible population or normal flora, resistant varieties fill the niche.

This may result in a susceptible *E. coli* being replaced by a resistant *E. coli* or *Staphylococcus aureus* being replaced with *Staphylococcus epidermidis*. It also applies to bacteria that are usually part of the normal flora becoming opportunistic after prolonged antibiotic use.

The rate of resistance acquisition may be rapid or slow. *Staphylococcus* became resistant to beta- lactams within a few years, and such resistance is common. Slow resistance was exhibited by *Enterococcus*, which only became resistant to the beta-lactams in the 1980's, and that resistance is not yet widespread.

As antibiotics target the bacterial molecules that regulate cellular processes, these or their genes can mutate. Bacteria have a naturally high resistance rate (10^{-8} per division) and as they multiply rapidly, there are many possibilities for a mutation to arise. There is however a fitness cost related to the mutant. If the mutation has more than one effect, the bacterium might only grow slowly. In the absence of the antibiotic, the mutant almost disappears, but if antibiotics are present, the mutant multiplies and predominates.

Bacteria can easily acquire resistance genes. Antibiotics are derived from natural products, and so resistance genes to most antibiotics exist somewhere in nature. Bacteria are promiscuous, and pathogens find and acquire these genes, and keep them as plasmids or as part of their DNA.

Bacteria can absorb naked DNA from the environment or acquire them as conjugative plasmids from other bacteria. Plasmids may have a narrow or broad host range, and their transfer frequency may be high (1 hour) or low (24 hours).

DNA can also be transported by bacteriophages, which are viruses affecting bacteria. To overcome resistance, pharmaceutical companies may change the antibiotic molecule somewhat, but bacteria often mutate more rapidly than envisaged to overcome the changed molecule. The original resistance is retained.

Resistance genes act in several ways. They may modify the target molecule, so that the antibiotic cannot attach to the site. They restrict antibiotic access to the cell by closing porins in the cell wall. They change their efflux pumps so that the antibiotic is pumped out as fast as it goes in, or they may change the pH of the target protein so that no attachment can occur. Induced resistance occurs when a silent resistance factor is only activated in the presence of the antibiotic.

Beta-lactams inhibit the penicillin binding proteins (PBP) resulting in interrupted cell wall synthesis. Resistant bacteria may overexpress PBP, acquire foreign PBP or mutate, to become resistant. The different beta lactamases are classified from A –D, or 1 – 4, and include the penicillin and cephalosporin groups. Detecting which one is present

Antibiograms cannot take host defences into consideration, nor host factors such as the tissue affected, nor any of the other myriad of considerations that veterinarians need to consider when selecting a suitable antibiotic

requires molecular tests. The antibiogram may show false sensitivity and the possibility of one of these being present needs to be recognized by a properly trained technician so that further tests to confirm it may be done.

The two most studied groups are ESBL, which are extended spectrum beta lactamases found in Enterobacteriaceae and MRSA/P/E which are methicillin (cloxacillin) resistant *Staphylococcus aureus /pseudintermedius /epidermidis*. These spread more rapidly if third generation cephalosporins are used extensively in a hospital.

There are two basic methods for doing antibiograms: minimum inhibitory concentration (MIC) and agar diffusion. MIC is the gold standard, and is better for measuring serum levels, for antibiotics with large molecules and for research purposes. The correct interpretation of a MIC is difficult, and fewer antibiotics can be tested as it is expensive.

Agar diffusion is far more flexible, more cost effective, more rapid, more antibiotics can be added if needed, and the results are better for testing tissue levels. Agar diffusion gives superior results for detecting cloxacillin and clindamycin resistance.

Antibiograms are reported as bacterial reactions, and do not take factors such as better uptake of an improved molecule in an animal into consideration. Veterinarians need to interpret antibiograms using all their veterinary pharmaceutical knowledge before selecting a suitable antibiotic.

Often only a single, internationally specified antibiotic, needs to be tested [it acts as a surrogate in the test] and the result is then valid for others in the same class.

Valid extrapolations are:
The ampicillin result is valid for amoxicillin, most cephalosporins only need to have one tested example per generation, erythromycin is a surrogate for azithromycin and clarithromycin, clindamycin is valid for lincomycin, tetracycline is usually valid for doxycycline, and usually only one veterinary quinolone needs to be tested.

When an organism is sensitive, but there is a poor outcome, one must consider whether the antibiotic reached the bacterium or not, whether the animal has a functioning immune system, or whether there may be other organisms present, such as anaerobes or fungi.

Veterinarians play an important additional role in the recognition of these difficult to detect resistance

Practical steps include:

1. Restrict routine antibiotic use.
2. Only use fully **effective doses of an appropriate antibiotic**
3. The correct **dosing intervals** must be adhered to
4. Owner education about compliance
5. Select narrow spectrum antibiotics specific for the significant isolates. Switch to a simpler antibiotic once the antibiogram is available.
6. Isolate referred patients and those on long term therapy, keeping them apart especially from others with serious disease.
7. Select antibiotics not prone to rapid resistance.
8. Restrict indiscriminate antibiotic use.
9. Asymptomatic urinary tract infections are monitored, not treated.
10. Use topical or local treatment, if possible, primarily for conjunctivitis, otitis and superficial pyoderma.
11. Hand wash and disinfect between patients.
12. Use gloves for any body fluids or secretions.
13. Select effective disinfectants and rotate them.
14. Cloths and blankets should be washed using a hot water cycle and/or bleach and other disinfectants.
15. Effective cleaning of water sensitive equipment, including keyboards and telephones.
16. Develop protocols to limit inappropriate and indiscriminate antibiotic use.
17. Limit hospital stays, and especially intensive care stays.
18. Prevent biofilm formation by treating correctly.
19. Choose easy to administer antibiotics to increase owner compliance.
20. All personnel should be trained in the above, and compliance must be ensured.
21. Do not use antibiotics for possible side-effects such as an anti-inflammatory effect.
22. Dispose of unused antibiotics responsibly and offer the safe disposal of unused antibiotics to clients.

mechanisms, by providing an adequate history including antibiotic usage before sampling, and/or discussing treatment failure when it occurs.

Very resistant bacteria, many of which can be zoonotic, are defined as MDR – Multiple Drug Resistance - resistant to 3 or more classes of antibiotics, and XDR – Extreme Drug Resistance - resistant to all suitable antibiotics for that specific condition/animal species. Very resistant bacteria are often isolated from chronic conditions, with otitis externa and biofilms being the prime source. Very resistant bacteria are also present in chronic pyoderma, non-healing wounds and recurrent cystitis. Those sites may become the source for bacteria causing post-operative infections and other critical medical conditions. Disinfectants are strongly recommended for all superficial infections. Resistance to disinfectants is rare at present. One could explore other alternatives, such as plant-based alternatives, honey or salt.

Preventing resistance development

International recommendations emphasise enhancement of surveillance and reporting, antimicrobial stewardship, which includes following prudent use guidelines, and the prevention of disease.

Decreasing the need for antibiotics relies on strict hygiene, especially of discharges, using disinfectants and mechanical removal of bacteria, controlling flies and rodents, and implementing biosecurity. Bacteria need a minimum population before they can multiply easily. Lavage and debridement of infected areas mechanically remove a large portion of the bacterial population.

Keeping a record of antibiogram results, and regularly reviewing them, by classifying them by organism, referred client or regular client, hospital patient vs outpatient, and so on, would also be a helpful way of monitoring the build-up of bacterial resistance.

Identify sources of resistant bacteria such as otitis externa, owners that are not loyal to a practice, immune deficient animals and their owners and referred patients (specialist practices are most at risk) and take extra precautions with those cases.

Problems and solutions

If the isolate was sensitive to the antibiotic used, but treatment was ineffective, then consider whether the antibiotic reached the bacterium, whether the animal's immune system is working, whether anaerobes, viruses, or fungi (culture not requested) were present, whether one of the new resistance mechanisms was not recognized or whether the antibiotic was indeed effective but resulted in the release of massive amounts of endotoxin.

Multi-bacterial infections such as skin infections, infections of the feet and ears, wounds, gingivitis and anal sac infections are invariably due to Gram-positive and Gram-negative bacteria together. It is then rare to find a single effective antibiotic. Utilize antibiotic synergism and avoid antagonism.

When one encounters multi-resistant isolates one should consider local treatment and increase susceptibility by utilizing Tris-EDTA, acetic acid, and surfactants. Change the environment by flushing, removing foreign bodies such as implants, suture material, calculi, biofilms, and necrotic tissue.

Remember that antibiotic resistance and virulence are not related. They are genetically distinct. A very resistant bacterium may only be environmental, possessing no virulence factors at all. Conversely, Pasteurella multocida, which is a virulent pathogen of many species of animals, remains sensitive to most antibiotics.

To summarise, request antibiograms as soon as empiric selection fails. The overuse of antibiotics, especially third generation cephalosporins, can select for plasmids carrying resistance for many other antibiotics as well. Explore other options such as disinfectants. Virulence and antibiotic resistance are not related. Antibiotics destroy normal flora. Hygiene is crucial in combatting the problem.

References and further reading

1. Bosch, J. 2017. Antimicrobial resistant bacteria and genes in selected water bodies in North West Province. Dissertation. Potchefstroom University.
2. Malema, M S, Abia, A L K, Tandlich, R, et al, 2018 Antibiotic resistant pathogenic E. coli isolated from rooftop rainwater-harvesting tanks in the Eastern Cape, South Africa. International Journal of Environmental Research and Public Health, 15 (5), 892
3. Clinical and Laboratory Standards Institute (CLSI), 3rd ed. 2008. Performance standards for antimicrobial disk and dilution susceptibility tests for bacteria isolated from animals; approved standard. CLSI, M31-A3, Vol 28, no 8
4. Greene, C E. 2006 Infectious Diseases of the Dog and Cat. 3rd Ed. Saunders, Elsevier: Missouri
5. Murray, P R, Baron, E J, Landry, M L, Jorgensen, J A and Pfaller, M A. Manual of Clinical Microbiology, 9th ed, vol 1. 2007. ASM Press; Washington
6. Apley, M, 2017. Antimicrobial Workshop notes. Kansas State University
7. Leclercq, R, Canton, R, Brown, D F J, et al, 2013. EUCAST expert rules in antimicrobial susceptibility testing. Clinical Microbiology and Infection, 19:141-160
8. Murray, P R, Baron, E J, Landry, M L, Jorgensen, J A and Pfaller, M A. Manual of Clinical Microbiology, 9th ed, vol 1. 2007. ASM Press; Washington
9. Pfaller, M A & Herwaldt, L A, 1997. The clinical microbiology laboratory and infection control: emerging pathogens, antimicrobial resistance and new technology. Clinical Infectious Diseases, 25:858-870
10. Toutain, P-L, Bousquet-Melou, A, Damborg, P, Ferran, A A, et al.2017. En route towards European clinical breakpoints for veterinary antimicrobial susceptibility testing: a position paper explaining the VetCAST approach. Frontiers in Microbiology 8:2344
11. Van der Merwe, L, 2023. Topical skin antibacterial therapy for superficial pyoderma. 360, 5, p13-14
12. Confer A W and Taylor, JD, 2020. Pneumonic pasteurellosis of Cattle. In: Infectious Diseases of Livestock. Editors Coetzer, J A W and Oberem P. Anipedia.

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Question 1

Which one of the following statements regarding antibiotic effects is INCORRECT?

a. Penicillins damage the cell wall.
b. Penicillins and cephalosporins are very safe.
c. Penicillins affect the metabolic processes of the bacteria.
d. Penicillins are effective against gram positive and gram negative bacteria.
e. Penicillins penetrate tissues poorly.

Question 2

Which one of the statements below regarding tetracyclines is INCORRECT?

a. Cellular proteins are targeted by tetracyclines.
b. Tetracyclines stain tooth enamel.
c. Tetracyclines can be used for Mycoplasma species.
d. Doxycycline has better tissue penetration than tetracycline.
e. Doxycycline has good penetration in the CSF and prostate.

Question 3

Which one of the statements below regarding aminoglycosides tetracyclines is INCORRECT?

a. Aminoglycosides are used for Gram negatives and Mycobacterium.
b. Aminoglycosides are relatively toxic.
c. The sequence of most to least toxic is amikacin, tobramycin, gentamicin and neomycin.
d. Aminoglycocides are ineffective against anaerobes.
e. They show poor tissue penetration.

Question 4

Which one of the statements below regarding sulphonamides is INCORRECT?

a. Sulphonamides affect bacterial folic acid synthesis.
b. Sulphonamides performs well in pus.
c. Sulphonamides are bacteriostatic.
d. Sulphonamides may show idiosyncratic adverse effects.
e. Sulphonamides are bacteriostatic.

Question 5

Which one of the following antibiotics is does NOT have efficacy against anaerobe bacteria?

a. quinolones
b. macrolides
c. amphenicols
d. metronidazole
e. ronidazole

Question 6

Which one of the following pairs of antibiotics are NOT synergistic?

a. penicillins and aminoglycosides
b. rifampicin with the erythromycin group
c. macrolides with pleuromutalins
d. tetracyclines and penicillins
e. sulphas with polypeptides

Question 7

Which one of the statements below regarding resistance genes in bacteria is INCORRECT?

a. They may modify the target molecule, so that the antibiotic cannot attach to the site.
b. They select for a different target molecule by altering DNA expression of the cell.
c. They restrict antibiotic access to the cell by closing porins in the cell wall.
d. They change their efflux pumps so that the antibiotic is pumped out as fast as it goes in.
e. They may change the pH of the target protein so that no attachment can occur.

Question 8

Which one of the statements below, regarding very resistant bacteria, is INCORRECT?

a. MDR – Multiple Drug Resistance - resistant to 3 or more classes of antibiotics.
b. XDR – Extreme Drug Resistance - resistant to all suitable antibiotics for that specific condition/ species.
c. Pyoderma and otitis externa is are commonly caused by very resistant bacteria.
d. Biofilms protect against development of resistant bacteria.
e. Resistance to disinfectants is rare at present.

Question 9

Which one of the reasons listed below is not a credible action to consider if a patient response to antibiotics is poorer than expected?

a. Make sure the antibiotic selected could penetrate the affected tissue.
b. Consider a staged intervention for the Gram-positive and Gram-negative bacteria in multi-bacterial infections
c. Check if concurrent infections of anaerobes, viruses, or fungi (culture not requested) were present.
d. Consider a poorly functioning patient immune system.
e. Consider local treatment: debridement, flushing, removing foreign bodies and topical products such as tris-EDTA.

Question 10

Which one of the following statements listed below is INCORRECT?

a. Acquired resistance is linked to antibiotic usage and frequency of use.
b. Pathogens find and acquire resistance genes and keep them as plasmids.
c. There is generally a fitness cost related to a bacterial mutation - causing slower bacterial growth.
d. Extended spectrum beta lactamases (ESBL) and MRSP spread less rapidly if there is extensive third generation cephalosporin use in a hospital.
e. When an effective antibiotic eliminates a susceptible population or normal flora, resistant varieties fill the niche.

Harnessing AI to Combat Veterinary Burnout in South Africa

By Ryan Leech
Senior Director of Strategic Partnerships at Digitail

The integration of AI is not just about embracing new technology; it's about redefining how veterinary professionals approach their work — working smarter, not harder.

The field of veterinary medicine in South Africa is experiencing an unprecedented surge, fueled by the growing number of pet owners who increasingly consider their furry companions as family members.

However, this spiral in demand for veterinary services has inadvertently placed tremendous pressure on veterinary teams, leading to burnout and concerns about the overall well-being of these dedicated professionals. A recent study by the *Journal of Veterinary Medical Education* titled, *"Exploring the Factors that Affect the Happiness of South African Veterinarians,"* found that nearly 1 in 5 South African veterinarians (19%) reported feeling burned out at work, with high workloads and long working hours being the key drivers of this exhaustion.

How Work Overload Triggers Burnout

Work overload is a significant burnout trigger, as identified by Dr. Christina Maslach, a distinguished American social psychologist and Professor Emerita of Psychology at the University of California, Berkeley. She dedicated decades to investigating occupational burnout, and her groundbreaking contribution, the Maslach Burnout Inventory, has since become the benchmark for evaluating burnout within the healthcare industry.

Work overload in the veterinary profession can manifest in various dimensions:

Mental Demands: Working in veterinary medicine requires significant mental effort, including decision-making, diagnosing, memorizing patient histories, and calculating treatment plans. This cognitive load can become overwhelming, leading to burnout.

Physical Demands: Veterinary professionals often engage in physically demanding tasks like lifting animals, restraining them during examinations, and performing surgeries. The intensity and duration of these physical activities can contribute to exhaustion.

Temporal Demands: The veterinary profession operates within specific timeframes and paces. Emergencies, appointments, and surgeries must be managed efficiently. When the workload exceeds the available time or when the pace is unmanageable, it can lead to stress and burnout.

Performance Demands: Veterinary professionals are expected to perform their duties at a high standard and meet patient care expectations. If job responsibilities consistently exceed an individual's capacity, it can lead to

feelings of professional inefficacy and, ultimately, burnout.

Subjective Experiences: The emotional toll of caring for sick or injured animals, dealing with distressed pet owners, and making difficult decisions can result in high levels of anxiety and stress. Over time, these demands can contribute to emotional exhaustion and compassion fatigue.

Given the staffing and time shortages, and a limited ability to hire more staff members, veterinary practices should take advantage of every opportunity to improve efficiency and reduce the administrative burden for their team. Imagine a world where you could complete tasks 40% faster and 18% more accurately, affording more quality time to focus on what matters the most — patient care. Artificial Intelligence (AI) can do just that.

AI Entering the Clinic Workflow

In South Africa, the field of veterinary medicine is experiencing a notable transformation, driven by the rapid evolution of AI technologies. AI is making significant strides in the country, reshaping how veterinary professionals deliver care to their animal patients. Here's a closer look at some of the key applications of AI that can make a significant impact on the clinic workflow and give veterinary teams some of their time back.

Prescreening and Triage: Advanced AI algorithms can assist in prescreening and triage by analyzing symptoms and assigning levels of urgency to cases. This helps prioritize critical cases, ensuring that the veterinary staff can focus their immediate attention where it's needed most.

Clinical Signs and Patient History: AI-driven image recognition systems can rapidly identify clinical signs from radiographs, ultrasounds, or photographs. This saves time for veterinarians who would otherwise need to manually analyze images.

AI-driven Electronic Health Record systems can automatically extract and summarize pertinent patient history, allowing veterinarians to quickly access relevant information during consultations.

Voice-to-Text Transcription: AI-based voice recognition tools can transcribe verbal notes and conversations into text. This eliminates the need for manual note-taking, enabling veterinarians to focus on patient care instead of documentation.

Differential Diagnosis: AI can assist veterinarians in generating lists of potential diagnoses based on clinical data and symptoms, helping narrow down possibilities more efficiently.

Confirmatory Tests: AI-driven laboratory equipment can process and analyze samples, reducing the time required for diagnostic tests. These systems can also automatically interpret results and flag anomalies for further review by veterinary professionals.

Treatment Plans: AI algorithms can suggest treatment plans based on a patient's condition, medical history, and best practices. Veterinarians can use these recommendations as a starting point for personalized treatment plans.

Client Education: AI-powered systems can generate personalized educational materials for pet owners, providing them with information specific to their pet's condition and treatment plan. This helps ensure that clients are well-informed and can better care for their pets at home.

Writing Patient Records: AI can assist in automatically populating patient records with relevant data, reducing the time spent on administrative tasks and allowing veterinarians to focus on clinical care.

Post-visit Patient Follow-up: AI-driven systems can send automated post-visit follow-up messages to pet owners, reminding them of upcoming appointments and medication schedules, and providing resources for ongoing care.

Conclusion

Incorporating these AI applications into veterinary practice not only streamlines workflows but also alleviates the burden of administrative tasks, enabling veterinary professionals to dedicate more time and attention to their patients. And this is not theory anymore — as Digitail introduced the first-ever built-in AI-powered virtual assistant called Tails. We have been receiving incredible feedback from veterinary professionals. Data from hospitals reveals that completing pre-visit paperwork and automating scheduling using AI can save up to 5 minutes per patient, and an additional hour per day interpreting lab work and creating client-friendly summaries.

As AI continues to advance, it holds the promise of further reducing the workload and burnout risk for veterinary professionals while elevating the standard of care for our animal companions. So, let's embrace AI and work smarter, not harder!

> "I used to get up at 6 a.m. to review the diagnostics that laboratories sent me overnight. Before my first appointment, I needed to read through the materials and write emails to clients, letting them know about the results and next steps. With Tails, I can quickly create short and empathetic summaries that pet owners can easily digest. This saves me an hour every morning.

WoofDoctor on Wheels
Dr. Douglas Cifranick

Explore what AI can do for your veterinary practice.

Surgical Drains are Useful in Small Animal Wound Management

Content submitted by Thrive Pet Healthcare, a dvm360® Strategic Alliance Partner

The use of surgical drains in small animals has been an extremely useful, dependable method that allows uncomplicated wound healing. There are 2 basic types of drains most used in small animals: passive and active. Additionally, negative pressure wound therapy (NPWT) has become a reliable and more readily available tool for small animal practitioners. The use of drains and NPWT aid the practitioner in removing fluid and air between tissues.

The beneficial evacuation of serum, blood, and inflammatory debris and the reduction of swelling and pain can be better managed in many cases. A strict adherence to Halsted principles is advised when considering drain use and any form of wound closure.

In some cases of contaminated wounds, daily management and serial debridement likely are necessary to achieve an environment suitable for final wound closure and drain placement.

Drain types

Drain materials are of varying types and may predicate use in certain situations. Common drain materials include latex rubber, polyethylene, polyvinyl chloride, silicone rubber, and red rubber.

Of these, the inflammatory response created by latex and red rubber must be considered when rationalising its use.

Latex is softer, may be more comfortable, and may cause less tissue damage. Polyvinyl chloride drains should not be sterilized by use of ethylene oxide due to the binding of ethylene oxide and resultant haemolysis that may occur. Silicone is highly biocompatible and can be steam sterilized.[1,2]

All drains, regardless of composition, are recognised by the body as foreign material and will initiate an inflammatory response. Furthermore, drains require an exit from tissues and skin.

Therefore, natural host defences are compromised, albeit minimally, during drain use. This must be appreciated in the maintenance and care of drains to prevent migration of nosocomial organisms into the tissue being drained.

Drain mechanism

Active drains create pressure gradients allowing exudate to flow into and through the lumen of the drain. Collection of exudate in passive drains is typically done via an aseptically applied bandage, whereas collection when using active drains occurs in a reservoir. This reservoir is likely the portion of active drains that is used to create the pressure gradients promoting exudative flow.

Passive drains

In veterinary medicine, the most-used open, passive drain is the Penrose drain. Penrose drains are made of soft, pliable latex that is radiopaque. These drains are inexpensive and available in a variety of sizes. They are tubular in design, but drainage occurs on the outer surface area of the drain.[1]

The mechanism for drainage involves factors such as capillary action, gravity, overflow, and body movement or pressure between tissue layers. Consequently, Penrose drains should not be fenestrated nor should they be used in conjunction with suction. They are also not suitable for use in the thoracic or abdominal cavities because of the potential for retrograde flow of air and other fluids into the cavities.

Typically, a Penrose drain is placed by positioning its deepest portion in the deepest aspects of the tissue defect or wound bed and exiting the distal aspect of the wound drain in a ventral gravity-dependent location (Figure 1). The exit hole of the Penrose drain should be large enough so the drain does not create an obstruction of exudate flow out of the wound.

The drain is kept in place through proper tissue layer closure over the latex, and 1 or 2 simple, interrupted, nonabsorbable sutures are placed through the drain and into the skin at the exit hole.[1] Tacking the proximal aspect of the Penrose drain should be considered with caution, as this can create a natural tension causing potential for drain breakage deep inside the wound. Placing a Penrose drain and a loop with double exit holes on either end of the drain is unlikely to increase drainage significantly. This also creates an additional potential site for the entry of bacteria while the drain is in place.

Absorbent sterile dressings and aseptic technique should be utilised over the external portion of the drain so that exudate can be evaluated to potentially reduce migration of bacteria into the wound bed. In addition, excoriation of skin around the drain exit is minimised. These dressings and the gauze used at the exit site can be secured by a variety of bandage techniques depending on the anatomical location of the drain.[3]

All active drains are closed

Closed active (or active suction) drains consist of a tube with a suction device attached to the exterior end of the drain. This suction device creates a vacuum or pressure gradient that allows fluid to be pulled into the fenestrations typically located on the end of the drain located within the wound bed. The exudate then travels into the tube lumen and is finally collected into the suction device or reservoir. The reservoir is used for collecting fluid, maintaining suction, and allowing for quantification of exudate and characterization of fluid.

Closed active drains are preferable to passive drains for preventing bacterial migration into the wound bed and surrounding tissues. Due to the pressure gradients created by closed active suction drains, tissue adherence is improved compared with passive drains.[1] Some examples of drain reservoirs may include the compressible "grenades" of Jackson-Pratt drain systems: vacutainers for homemade petite wound drains, syringes with needles passed through the plunger as desired suction was achieved, and rigid spring-loaded collection systems (Figure 2).

The fenestrated components of these closed active drain systems are available commercially or can be created using other readily available items (eg, butterfly catheters). If creating fenestrations in a drainage tube, the fenestrations should measure less than one-third of the tube diameter to prevent breaking or kinking of the drain tube.

Additionally, to ensure appropriate function of the active system, all fenestrations should be in an airtight portion of the wound or tissue layers being drained. The exit of the drain should also be airtight to avoid air leakage or entry into the wound. Occasionally, bandages may help support

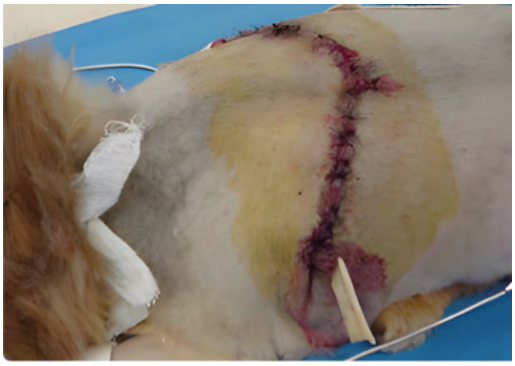

Figure 1: *Example of a Penrose drain exit in a gravity-dependent area separate from the suture line.*

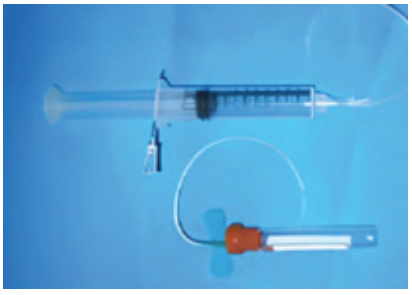

Figure 2: *Examples of the vacutainer with butterfly catheter and syringe with hypodermic needle in the hub and butterfly catheter to create a petite wound drain.*

Figure 3: *Example of exit creation and tunnelling by use of forceps for active drain tubing.*

this airtight seal along the closed wound margin, incision, or drain exit.[2]

When placing the drain tubing during wound or incision closure, the exit of a closed active system should be near the incision or margin of the wound closure (Fig 3). It should not exit along the lines or within the plane of wound closure, as this may provide an entry point for bacteria or may result in dehiscence and additional drainage along the suture line.[2]

Because pressure gradients created along the length of the drain exit points are not gravity dependent (Fig 4), these exits can be made in locations that may facilitate drain maintenance and bandaging.[1]

To place these drains, often Halsted or Kelly forceps are tunnelled from the surgical wound subcutaneously to the planned exit point. A small stab incision is then created over the tip of the forceps such that only the tip of the forceps and the diameter of the drain can be passed through the incision.

Instead of passing the drain in retrograde fashion, a second similarly sized forceps can be passed in retrograde fashion, and the distal end of the drain is grasped and pulled from the wound to the outside to prevent contamination by natural flora and the skin surface. Commercially available drains may provide a trochar on the distal end, which facilitates tunnelling through tissues for drain tube placement.

As with passive drains, securing the most proximal aspect of the drain tube in the wound or to the skin surface is not recommended. This may compromise the function of an active drain by allowing air into the wound as well as creating an opportunity for drain breakage. I prefer to secure the drain by using a purse string suture at the location of the drain exit along with a finger trap suture using nonabsorbable monofilament suture material.

Following drain tube placement, closure of the wound or incision is performed before attaching the reservoir so that active suction can be created. Dressings can then be applied to secure excessive tubing and the reservoir. Bandages may also protect against bacterial exposure and migration into the wound. Ideally, the veterinarian or staff performs management of the drain to avoid contaminating the drain tube and reservoir.[1,4]

Monitoring and removal

Many factors may determine how frequently dressings or bandages need changing. Initially, passive drain dressings and bandages may need to be changed once to twice daily to prevent skin maceration around the drain exit from the exudate. Similarly, closed active systems may require reservoir emptying every 1-2 hours prior to achieving decreases in the exudate collected.

As tissues heal, exudate should become more serosanguineous and decrease in volume. Closed active systems will allow for the collection of fluid and for serial cytology to be performed to further evaluate changes in wound exudate.[1] This may allow for the refinement of antimicrobial selection (Fig 5) if needed. Wound exudate eventually plateaus but is unlikely to cease entirely because the materials for any drain, active or passive, will still likely incite a fundamental inflammatory response due to the foreign material within the body.

When removing drain sutures, holding drains at the site of the exit wounds are typically cut, and the drains are removed aseptically and slowly. The most proximal end of the drains can be cut and provided for culture, should this be considered necessary. The drain exit sites are considered contaminated wounds and therefore are allowed to heal by secondary intention.[4]

Negative Pressure Wound Therapy

Negative pressure wound therapy (NPWT) is a more elaborate form of a closed active drain system that uses precisely controlled intermittent suction to provide sub-atmospheric pressures at the wound surface.[5]

NPWT provides wound drainage but also may enhance the development of early granulation tissue by stimulating fibroplasia and fibroblast migration along with enhanced angiogenesis in the wound bed.[5]

A commercially available coarse, open cell foam is applied directly to the wound surface. This is coupled with a specialised collection disc and wound suction tubing overlaid by an occlusive wound dressing to form an airtight seal (Figure 6). Suction is created by using commercially available suction pumps with various settings.

The reservoir is attached to the tubing and to the NPWT suction pump. Pump settings are considered most ideal from -65 mm Hg (for use in wound grafting) to -125 mmHg for general wound suction.

Because of the foam's unique nature and occlusive dressings, a variety of anatomical locations are suitable for NPWT (Figure 7). It is contraindicated for use in wounds with copious amounts of necrotic or devitalised tissue, in patients with coagulopathies, in thoracic wounds, or directly over neoplastic tissue, joints, or major vessels.[5]

Additional considerations

Drains may be beneficial but are fundamentally foreign materials placed in wounds and healing tissue. When using drains, care must be taken to avoid opportunities for wound contamination. To reduce risk, use the fewest number of drains and exits (ideally one exit per drain) possible, adhering to Halsted principles when debriding and closing wounds.

Appropriately manage drains following placement and remove them as soon as drainage is minimised. Care should also be taken to avoid placement of drains directly onto or immediately near healing hollow structures, neurovascular structures, or any tissue that may be damaged throughout drain use or removal.

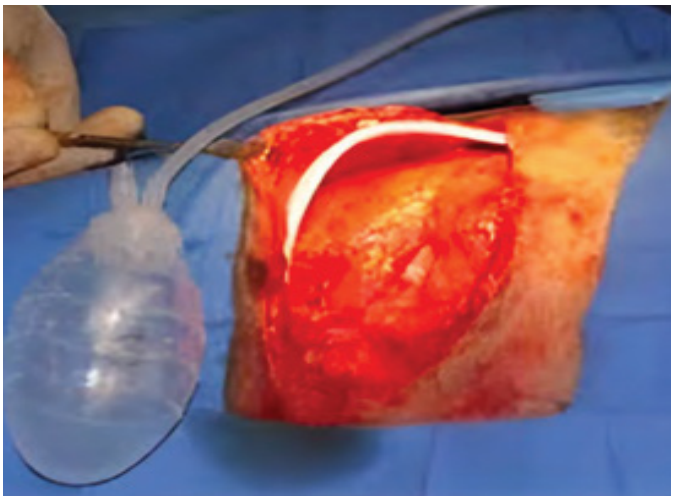

Figure 4: *Example of non–gravity-dependent exit near the dorsum of an active drain.*

Figure 5: *"Grenade"-style collection reservoir for active drains.*

Lastly, drain placement in association with the resection of neoplasms or undiagnosed masses would be considered a potential risk for tumour seeding along the drain path. This, however, remains to be proven.[1] In my opinion, if the benefits of drain placement outweigh the risks of tissue closure without a drain, then drain placement may be a viable option.

Conclusion

Drain use, being mindful of the benefits and contraindications of drain type, are helpful in small animal surgery. Veterinary practitioners can leverage the benefits of drain use to provide successful outcomes with challenging wound closures when fluid accumulation and tissue adherence could be detrimental. By minimising complications and promoting the aseptic management of drains along with careful monitoring, drains can provide additional utility in wound management.

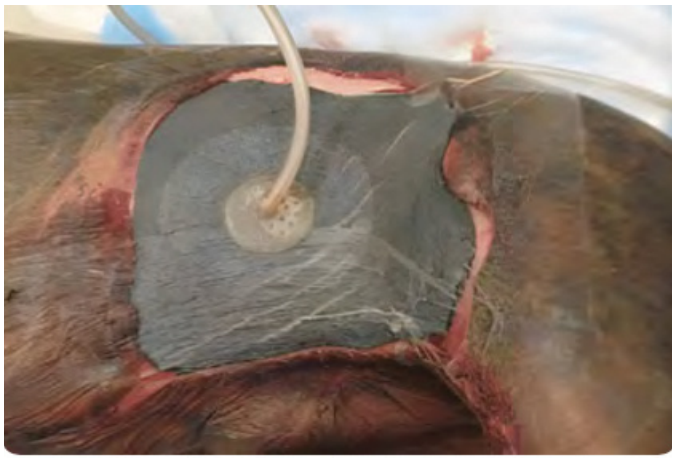

Figure 6: *Occlusive bandage with foam and tubing used for negative pressure wound therapy.*

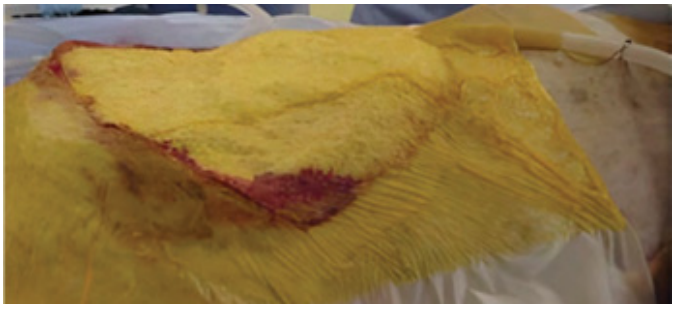

Figure 7: *Occlusive bandage for negative pressure wound therapy in a freshly debrided wound bed.*

References

1. Campbell BG. Bandages and drains. In: Tobias KM, Johnston SA, eds. Veterinary Surgery: Small Animal. 2nd ed. Elsevier; 2018:221-230.
2. Miller CW. Bandages and drains. In: Slatter DH,ed. Textbook of Small Animal Surgery. 3rd ed. Elsevier; 2003:244-249.
3. Pavletic MM. Wound drainage systems. In: Pavletic MM. Atlas of Small Animal Wound Management and Reconstructive Surgery. 3rd ed. Wiley-Blackwell; 2010:52-60.
4. Bristow PC, Halfacree ZJ, Baines SJ. A retrospective study of the use of active suction wound drains in dogs and cats. J Small Anim Pract. 2015;56(5):325-330. doi:10.1111/jsap.12339
5. Stanley BJ. Negative pressure wound therapy. Vet Clin North Am Small Anim Pract. 2017;47(6):1203-1220. doi:10.1016/j.cvsm.2017.06.006

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References: 1. Miarikova, M., 2017. The capacity and effectiveness of diosmectite and charcoal in trapping the compounds causing the most frequent intoxications in acute medicine: A comparative study. *Environmental Toxicology and Pharmacology*, 52:214-220. 2. 2009. As many as 1 000 dogs poisoned per week in SA. *Infurmation*. Available at: https://www.infurmation.co.za/home-page/1000-dogs-poisoned-per-week/.

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Reference 2 A pilot Trial Assessing the Efficacy of GlycOmega-PLUS® [Green-Lipped Mussel Powder] for Osteoarthritis of the Knee, S. Coulson et al, University of Queensland, Brisbane, June 2011.
Reference 3 Collagen Supplementation for Joint Health. Martinez-Puig et al. Nutrients 2023,15,1332: https://doi.org/10.3390/nu15061332
Reference 4 RevitaCOL® Collagen COA - Available from Kyron Laboratories office, on request.
Reference 6 Effect of a diet enriched with green-lipped mussel on pain behaviour and functioning in dogs with clinical Osteoarthritis. Railand P et al. Canadian Journal of Veterinary Research, 2013; 77:66-74

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