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Veterinary Protocol for

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Editor's Note


Dr Liesel van der Merwe

Well, the long awaited second issue has arrived. Thank you for the positive feedback received from many of you. We apologise for the delay in getting the printed edition out - but remember that you can access the information online - see the link below. We will distribute future editions by the middle of the month. Thanks to Lakato for assisting us with distribution in September 2014 and again this month. Virbac has offered to assist with distribution from March. To ensure you receive your copy by post and access all the benefits of Vet360 membership, follow the link below.

Sterilisation practices feature quite strongly in this edition and coincides with International Spay month in February. We would welcome any comments regarding content and outlay - both complimentary and critical as we strive to be as relevant and accessible as possible.

The Vet360 app has been updated and is now available with full functionality. Madaleen is very excited about this and hopes you will all take use of this opportunity to streamline and simplify your lives. All the Vet360 and Livestock Review content as well as extracts from the Equine Health Update are also available on the App and on the internet if you follow the link **http://vet360.vetlink.co.za/**

Regards

Liesel

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Cover Photo: Photo Dollar Club

Veterinary Protocol for Client Care
During the Consultation

By Dr Pere Mercader (DVM, MBA, DEA)

According to some, the consultation is the temple of veterinary medicine. The client's perception of our service will largely depend on what happens during the consultation and on the manner in which it is conducted. That is why it is very important to develop a client and patient care protocol for the consultation. This will help our clients to have a consistent experience in our consultations, regardless of the day of the week they come or the vet on our team who sees them. It is disturbing to see the lack of consistency in both the physical examination of patients and the treatment given to clients in many veterinary practices. It is therefore highly significant that one of the most prestigious medical textbooks[1] devotes its first chapter to the proposition of a detailed protocol to follow during the consultation, including very specific recommendations about how to address the client. What is also significant is the large number of vets who quietly skip over this chapter in order to focus directly on those chapters that they perceive to be properly clinical.

In our case we propose the following customer care protocol during consultations:

1 **Present a professional appearance**
Remember that our client is unable to judge the quality of our medical procedures and therefore seeks external signs to reassure themselves. A clean uniform with the appropriate identification and an immaculate, discrete and smart appearance all project a professional image in a medical environment.

2 **Greet the client in a professional but friendly manner**
Introduce yourself, giving your name and position at the practice. Smile and shake hands with the client.

3 **Interact with the pet from the start**
Greet the pet by name, establish physical contact with it and make a friendly comment to relax the owner.

4 **Apologize if we are running late**
Praise clients that arrive on time. As well as a gesture of courtesy, these practices send a clear message both to the client and the rest of the team regarding the value of their time and ours. In the same vein, it is also advisable to call those clients who have not turned up for their appointment 20 minutes after the time agreed. The call must be polite and friendly, but it will help us to remind the client that a vet at our

practice has spent several minutes waiting for them.

5 Use the name of the owner and the pet at least once during the consultation

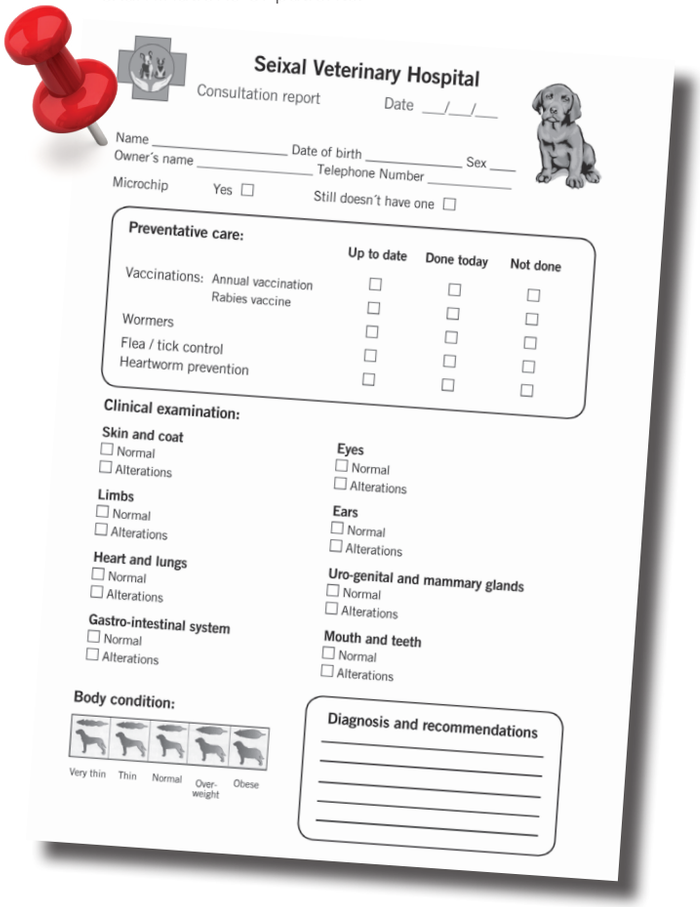
This will improve interaction and demonstrate a service orientation. Even the most skeptical clients who think we pulled their name from the clinical record a few minutes before they arrived will positively appreciate our efforts as a sign of professionalism.

6 Perform a thorough physical examination, always explaining to the owner what we are doing and what our findings are

We often forget that what seems obvious to us is a mystery to our clients, especially if we do not exteriorise it. Half a minute spent in silence inspecting the inner ear of the pet can be an eternal wait for an apprehensive client.

7 Always provide some written information

This improves customer understanding, makes sure clients remember our veterinary practice and, in short, increases the perception of value regarding the service received. The consultation report (figure 1) is an excellent educational tool for clients. Furthermore, the report's use has a valuable secondary purpose: to provide standard and systematic guidelines for all the vets at the practice when carrying out physical examinations of patients.


Seixal Veterinary Hospital

Consultation report Date ___/___/___

Name _____ Date of birth _____ Sex ___

Owner's name _____ Telephone Number _____

Microchip Yes ☐ Still doesn't have one ☐

Preventative care:

	Up to date	Done today	Not done
Vaccinations: Annual vaccination	☐	☐	☐
Rabies vaccine	☐	☐	☐
Wormers	☐	☐	☐
Flea / tick control	☐	☐	☐
Heartworm prevention	☐	☐	☐

Clinical examination:

Skin and coat ☐ Normal ☐ Alterations

Eyes ☐ Normal ☐ Alterations

Limbs ☐ Normal ☐ Alterations

Ears ☐ Normal ☐ Alterations

Heart and lungs ☐ Normal ☐ Alterations

Uro-genital and mammary glands ☐ Normal ☐ Alterations

Gastro-intestinal system ☐ Normal ☐ Alterations

Mouth and teeth ☐ Normal ☐ Alterations

Body condition:

Very thin Thin Normal Over-weight Obese

Diagnosis and recommendations

Figure 1. Consultation report (copyright of HV do Seixal, www.hospitalveterinariododeixal.com).

8 Make eye contact with the client, especially when we are delivering an important message

It is important to avoid writing or staring at the computer when we are making a health recommendation to a client.

9 Combine verbal explanations with visual media whenever possible

It has been demonstrated that the use of drawings, illustrated atlases, articulated models, videos, etc. significantly improves levels of client understanding (and therefore the likelihood that they will accept and remember what is being said). Nowadays there are a number of high quality communication tools accessible to those vets who want to use them.

10 Use layman's terms but without lapsing into trivialities or inaccuracies

A common mistake among younger vets is to try to impress clients with sophisticated terminology in the false belief that this will reflect positively on their professional image. On many occasions however, the result is that the client clams up, feels intimidated and remote from the vet and, with luck, will end up asking the nurse or the receptionist to repeat "the vet´s explanation".

11 Summarise key information for the client and ensure they have understood everything

The prestigious English veterinary consultant John Sheridan (www.veterinarybusinessbriefing.com) uses a methodology that shows to what extent client communication is a challenging task for many vets. The method consists of the following: over a period of three or four consecutive days, a questionnaire with three questions will be handed out after each appointment to both vets and clients for each to fill in figure 2.

Questions for the Vet

In this consultation that has just finished...

- What has been the most important message that you gave the pet owner?
- What have you asked the pet owner to do from now on?
- When did you ask them to return to the practice with their pet?

Questions for the Client

In this consultation that has just finished...

- What has been the most important message that the vet has given you?
- What has the vet asked you to do from now on?
- When has the vet said that you should return with your pet to the veterinary practice?

As the reader will probably guess, the vets had a great surprise when checking what their clients had understood...

An effective technique to minimise this problem is to summarise the most important points at the end of each consultation:

- What have we found out?

- What does the veterinary practice have to do from now on?
- What should the pet owner do from now on?
- When should the patient return to the practice?

Also, it is advisable to close the conversation with the pet owner with a twofold question:
"Mr. Jones, have we made everything clear? Would you like us to go over any of the information again?"

These two questions will clear up many misunderstandings, avoid clients calling with queries and will significantly improve compliance and ability to follow our health recommendations.

NURTURING THE RELATIONSHIP:
The follow-up after the consultation

It is not uncommon to find veterinary practices that lose between 20 and 40% of their patients from one year to the next. This means a real "hemorrhaging" for any business and severely limits growth potential, putting even its very survival at risk.

What are the most common causes of patient (client) loss for a veterinary practice?

Figure 3 below ranks these causes according to the ability of the practice to influence them with their management systems:

Reasons outside the practice's control

- Patient deaths (between 8 and 12% annually)
- Clients moving house (change of address) 1-2 % annually
- Losing a pet, donating it to someone else or to a rescue center (2-3 % annually.)

Reasons within the practice's control

- Customer dissatisfaction, resulting in an intentional change to another veterinary practice (from 2 % to 5 %)
- Lost clients due to poor communication by the practice (up to 20% annually)

These figures are approximate and are based both on the author´s personal experience as a veterinary practice consultant and on several published studies2. The practices that have been concerned enough to ring those clients that had stopped coming to their veterinary practice for more than a year have discovered, to their surprise, that a significant percentage of them were not aware that they "were no longer clients".

Bearing this in mind, it is highly recommended that a sequencial protocol for vaccination reminders is routinely followed. The following procedure is recommended:

1. First letter (or email or text message to a mobile) 11 months after the last vaccination.
2. Second communication (by letter, email or text message to a mobile) to those clients who received the first communication a month ago and who have neither turned up at the practice or asked for an appointment.
3. Telephone call. For those clients who have also not responded to the second communication. This call ought to follow a structured protocol and always begin by showing interest and concern for the health of the pet. The purpose of the call must be to gather information about the status of the pet and, whenever possible, generate an appointment for its return to the veterinary practice.

"Good morning (afternoon), Mr/Mrs. (client name), my name is (name of the caller) and I´m calling from the ABC Veterinary Hospital. Following a review of our patient records we have realised that (name of the pet) has not been to the practice for the last 12 months and so we are calling, firstly to confirm that (name of pet) is well and secondly –just in case you had forgotten– to remind you that the last vaccination (name of the pet) had has already expired and unless it has been given again over the past 12 months..."

A thoughtful touch, surgical follow-up calls

Various studies have been carried out on the marketing activities of veterinary practices[3] and it has been discovered that one of the actions that had the most positive impact on clients was an unexpected call from the veterinary practice to find out how the pet was recovering after surgery.

The veterinary practice should establish a specific policy for these types of calls, clearly defining the following issues:

- For which kinds of procedures (it is suggested that they are limited to surgery).
- When (it is suggested they are made 48 hours after the surgery was done).
- What is said (show interest in the recovery of the patient and anticipate any possible concerns the owner might have, take advantage of the call to remind the owner of the date of the follow-up visit).

These calls can (and should) be made by non-veterinary practice staff. They provide an excellent public relations exercise that most clients do not expect and also help to identify and proactively resolve any possible concerns or worries. In the event that any of these calls result in concerns of a medical nature that require discussion with a vet, the person in charge of making the calls will take the responsibility to gather together all the relevant information and call the client back. It is advisable to create a monitoring report where the person in charge of making the calls systematically records the calls made, the calls to be made, the comments received from clients and any action required.

Managing MRSA, MRSP, and MRSS dermatologic infections in pets

By Kimberly S. Coyner, DVM, DACVD

In Part 1 of this series ("The emergence and prevalence of MRSA, MRSP, and MRSS in pets and people" in the September 2014 issue), we took a look at how methicillin-resistant *Staphylococcus aureus* (MRSA), methicillin-resistant *Staphylococcus pseudintermedius* (MRSP), and methicillin-resistant *Staphylococcus schleiferi* (MRSS) strains have become an increasing problem and the risk factors for infection with a resistant staphylococcal strain.

Here is what to do if you think one of these stubborn strains has taken hold in one of your patients.

DIAGNOSIS

Clinical presentation

Although some of the photos in this article show dramatic lesions, it is important to remember that in most cases methicillin-resistant staphylococcal infections in animals present no differently than methicillin-susceptible infections. Clinical signs of superficial pyoderma include papules, pustules, crusts, scaling, erythema, and hair loss. Patients with deep pyoderma may have nodules or bullae, thick crusts, or ulcerated areas.

A methicillin-resistant infection should be suspected whenever there is poor response to empiric antibiotics, especially if a patient has a history of treatment with multiple prior antibiotics or a previous methicillin-resistant infection.

Cytologic examination of lesions should be performed to document the presence of bacteria and to aid in interpretation of culture results. Prompt sample submission for bacterial culture and sensitivity testing should be performed rather than an empiric antibiotic change.[1]

Fig 1. Deep pyoderma on the nose secondary to actinic dermatitis

Fig 2. A daschund with periocular and perioral pyoderma due to underlying atopic dermatitis

Photos: Courtesy of Dr Heidi Schroeder

Culture

Methicillin-resistant infections are diagnosed by bacterial culture and antimicrobial susceptibility testing of appropriate samples submitted to a veterinary reference laboratory. Depending on the clinical presentation of the infection, culture samples can be obtained

by sampling otic exudate or an intact pustule with a culture swab, by rubbing a sterile saline-moistened culture swab under crusts or scaly rims of epidermal collarettes, or by obtaining a punch biopsy of a lesion for macerated tissue culture (especially recommended for deep pyoderma).

Here are a few tips to keep in mind once you receive a result from your laboratory:

- If a methicillin-resistant infection is identified, and if the laboratory does not automatically test sensitivities to chloramphenicol, amikacin, and doxycyline, call the laboratory to make sure these antibiotics are added to the sensitivity panel.
- If a coagulase-positive Staphylococcus species is identified but not speciated, call the laboratory to make sure this essential test is done.
- If a coagulase-negative Staphylococcus species is cultured as the only organism from a suspected resistant infection but is not speciated or tested for antibiotic sensitivities, call the laboratory and request that the bacteria be fully speciated and that an antibiotic sensitivity panel be performed

Advice to owners

- Advise owners of pets with MRSA of the potential for zoonotic transmission Although the risk of clinical disease is probably low for immunocompetent people, reports of community-acquired MRSA in immunocompetent people are on the rise.[2] Additionally, the concern for transmission is greater if a pet is exposed to immunosuppressed people or when household members are in contact with higher-risk people (i.e. healthcare workers).[3] Involvement of physicians in these cases is prudent because veterinarians should not make specific recommendations for preventing or diagnosing disease in people.
- Also advise owners of pets with MRSP and MRSA infections that, for most pets, the prognosis for cure is good with appropriate therapy and monitoring and, in cases of recurrent skin or ear infections, if the underlying cause is identified and addressed.[4,5]

Colonized animals

- As discussed in last month's article, some animals are not infected with but instead are colonized with — or are carriers of — methicillin-resistant staphylo-coccal strains.
  Management recommen-dations for pets colonized by methicillin-resistant staphylococcal bacteria are unclear, but most references recommend practicing good hygiene (washing hands or using hand sanitizer frequently after touching the pet, not allowing a pet to lick or sniff at people, frequent washing and disinfection of pet bedding and housing surfaces) and isolating colonized or infected pets from immunocompromised people and pets.
- Systemic antibiotics are not recommended to eliminate colonization. Topical antimicrobial shampoos and conditioners (i.e. those containing chlorhexidine) may be helpful but have not been specifically studied in animals. In one study in people, chlorhexidine bathing and intranasal mupirocin application in a 16-bed intensive care unit caused a 48% decrease in MRSA colonization and infection[6] However, topical use of mupirocin in the nasal cavity is unlikely to be successful as monotherapy in MRSA-colonized pets—as studies have shown identical MRSA carriage from the nares, mouth, anus, groin, and head.[7]
- Mucosal carriage of *S. pseudintermedius* was shown to be significantly decreased in healthy dogs when fusidic acid was applied to the eyes, nostrils, anus, and vulva.[8] However, in the absence of any controlled studies on spontaneous decolonization and long-term efficacy of antibacterial therapy for decolonization, it remains controversial whether decolonization of animals is necessary or warranted. If this measure is under consideration, it should involve collaboration between and advice from veterinary and medical infection-control experts and would need to include all in-contact people, in-contact animals, and their environments.[1]

Infected animals

Routine infections. Localized methicillin-resistant infections may be treated with topical medications such as chlorhexidine sprays or flushes, fusidic acid, or mupirocin applied twice daily until resolution. In cases of generalized pyoderma caused by methicillin-resistant staphylococci, always use aggressive topical antimicrobial therapies; in some cases, frequent (every one to two days) antibacterial (i.e. chlorhexidine) shampoos or conditioners and twice-daily antibacterial sprays (chlorhexidine, hypochlorous acid [Vetericyn—Innovacyn Inc.]) can resolve infection. A recent study comparing in vitro efficacy of antimicrobial shampoos found chlorhexidine to be superior in killing bacteria compared with benzoyl peroxide, ethyl lactate, and chloroxylenol.[9]

Refractory or severe infections. In refractory or severe pyoderma cases, systemic antibiotic therapy is used in combination with topical therapies. Because of the variability of methicillin-resistant isolates, antibiotic choice should always be based on in vitro antibiotic susceptibility testing.[10]

Never treat methicillin-resistant infections with beta-lactam antibiotics (penicillins and cephalosporins), even if in vitro testing implies susceptibility. This is because methicillin resistance means resistance to all beta-lactams, but laboratory reporting errors can occur and erroneously imply sensitivity where it does not exist.[11]

For superficial pyoderma (whether methicillin susceptible or methicillin resistant), antibiotics are required for at least three weeks (one week beyond complete healing); for deep pyoderma, antibiotics may be needed for four to eight weeks or longer (or two to three weeks beyond complete healing). Re-examinations every two to four weeks are important to evaluate response to treatment, make treatment modifications if needed, and evaluate when antimicrobial therapy can be stopped. Depending on the bacterial strain, antibiotics that may be effective in methicillin-resistant infections include

- Chloramphenicol
- Aminoglycosides
- Potentiated sulfonamides
- Clindamycin (only use if sensitivity to erythromycin is also indicated or a test for inducible clindamycin resistance has been performed)
- Doxycycline (but if sensitivity testing indicates resistance to tetracycline, then doxycycline may not be effective in vivo even if in vitro sensitivity is indicated[1])
- Minocycline
- Rifampin
- Fluoroquinolones

Use of fluoroquinolones for the treatment of methicillin-resistant pyoderma is not recommended except as a last resort since, with the exception of moxifloxacin, they have the potential to select for high-level methicillin-resistant mutants (which are not only resistant to fluoroquinolones but also to other antibiotics).[12,13] If fluoroquinolones are used, then veterinary-labeled products (which have near complete bioavailability)[14] are recommended to be used at the high end of the label dose range.[15] Use of ciprofloxacin may lead to treatment failure because of inconsistent absorption of this drug in dogs (in one study the oral absorption of ciprofloxacin in dogs varied from 28% to 98%),[16] thus it is not recommended. Additionally, the use of vancomycin (administered intravenously only since oral vancomycin is not systemically absorbed) or linezolid for treating methicillin-resistant infections in animals is controversial and not recommended, as these drugs are often the last resort in human medicine.[1]

Finally, drugs for treating MRSA in human medicine include the streptogramins (quinupristin and dalfopristin), daptomycin, tigecycline, and ceftaroline fosamil; all are administered intravenously, and their use in animals has not been reported.[17]

Environmental control

Pets treated for a methicillin-resistant infection in a hospital environment must be treated as infectious and isolated from the general hospital population. Do not allow outpatients with suspected or known methicillin-resistant infections to contact other patients in the waiting room, but immediately usher them into an examination room. Use gloves and gowns or dedicated laboratory coats when handling the animals or any in-contact items such as bowls or bandages. Pens and stethoscopes must also be dedicated to the patient. Use disposable thermometer covers, or discard digital thermometers after the animal is discharged.

In people, the most critical step for reducing MRSA transmission is hand hygiene[18] ; frequent hand washing was shown to reduce MRSA colonization in equine veterinarians,[19] and the same likely applies to small-animal veterinarians. Perform hand hygiene, whether done by hand washing or alcohol-based hand sanitizers, before patient contact, before aseptic procedures, after contamination of the hands, after removing gloves, and after patient contact.[20] MRSA can survive up to months on inanimate surfaces, depending on environmental conditions,[21] and long-term survival of MRSP is also likely, as MRSP was isolated over a six-month period from household environmental sites and, in some households, beyond resolution of MRSP infection in the pet.[22]

Fig 3 A & B: Deep pyoderma in a Bulldog secondary to immunosuppression by chronic cortisone use to treat an pemphigus foliaceous
Photos: Courtesy of Dr Heidi Schroeder

After discharge, just as with any patient, disinfect all examination room tables, floors, door and sink handles, light switches, scale surfaces, cage items, and medical equipment used on animals with methicillin-resistant infections. Use appropriately diluted disinfectants allowed to contact surfaces for the time listed on the product label (typically five to 10 minutes or longer), after removal of any organic debris that could potentially inactivate disinfectants. Staphylococci, including methicillin-resistant staphylococci, are susceptible to most commonly used disinfectants.[20]

The importance of environmental cleaning was highlighted by the finding that MRSA carriage in a kennel of rescue dogs resolved spontaneously with regular kennel cleaning alone.[23] The development of a good general infection control program in the hospital (rather than focusing solely on methicillin-resistant staphylococci) is probably the most important factor for reducing methicillin-resistant staphylococcal transmission[20]

(see "Avoid the spread: Methicillin-resistant staphylococcal infection control" below in this article for helpful guidelines).

CONCLUSION

Methicillin-resistant infections in pets are an increasing problem in veterinary medicine and are driven by antibiotic pressure. In patients with recurrent skin and ear infections, evaluation and treatment of the underlying disease is essential to reduce the need for antibiotic treatment of secondary infections. Increased use of topical antiseptics, basing treatment decisions on bacterial culture and antimicrobial susceptibility testing as much as possible, and clearly communicating with clients about the need for full treatment compliance may help reduce selection pressure.20 Additionally, veterinarians must ensure, via frequent hand sanitation and effective hospital infection control programs, that the risk of interpatient spread of infection or colonization is minimized.

Also see Checklist: Environmental control of infectious disease to download a list of measures you can take to precent the spread of infectious disease in your practice.

GUIDELINES

Avoid the spread: Methicillin-resistant staphylococcal infection control

Useful recommendations for methicillin-resistant infection management can be found in the following online resources:

- Infection prevention and control best practices for small-animal veterinary clinics from the Canadian Committee on Antibiotic Resistance
- Information sheets for pet owners from the University of Guelph Centre for Public Health & Zoonoses
- Information on MRSA infections from the Centers for Disease Control and Prevention
- The British Small Animal Veterinary Association's online guidelines for MRSA management in veterinary hospital
- Responsible use of antimicrobials in veterinary practice: the 8-point plan, from the British Veterinary Association

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A Review of Sterilisation
Practices in Dogs and Cat and
Impact on the Individual Animal

By K. De Cramer and K. May
Article reviewed by Dr Stephen Hughes (BVSc, MMed (Vet), (Gyn)

Introduction

Gonadectomy or neutering refers to the removal of the gonads (testis or ovaries). The words spaying and castration refers to gonadectomy of the female and male domestic animal, respectively. Gonadectomy is the most common surgical procedure performed in small animals worldwide, it is thus important that veterinary surgeons acquaint themselves with the advantages and possible adverse effects of gonadectomy in order to make recommendations and assist pet owners in making informed decisions. These recommendations may differ depending on country, cultural perception, the species, gender and age of the pet and the preferences and skill of the veterinary surgeon.

Clients expect us to base our recommendations on science, rather than on anecdotal evidence or tradition [1]. Within local context, the majority of veterinary surgeons recommend sterilisation at the age of 6–12 months for all pets not intended for breeding. The purpose of this article is to help the veterinarian make the most appropriate recommendation for pets on an individual basis.

Benefits of gonadectomy in domestic, feral and wild dogs and cats

Although the primary intention of a gonadectomy is to sterilize the pet, there are numerous health and other benefits.

Bitches that have been spayed do not attract males, are less likely to fight or cause fights, do not roam in search of a breeding partner and no longer exhibit "in-season" vaginal bleeding which can be a nuisance to owners. The medical benefits of sterilisation in bitches include a decrease in the incidence of mammary neoplasia. Mammary neoplasia is the second most common tumour type reported in female dogs after skin tumours with an incidence of 27.1% [2]. The greatest benefit occurs if the bitch is spayed before her first oestrus, in which case the risk of mammary neoplasia is reduced to 0.05%, 8% when performed after the first oestrus, and 26% after the second oestrus [3]. Ovariohysterectomy also prevents ovarian and uterine neoplasia and pyometra [4].

For owners of queens, the signs of oestrus such as increased vocalisation, rolling and a short inter-oestrous interval prompt the owner to seek a method of oestrus control [5]. The health benefits of sterilisation in queens include a decreased incidence of mammary, ovarian and uterine neoplasia as well as pyometra [4]. Mammary neoplasia is the third most common tumour of female cats, with a reported incidence of 2.5%. The incidence of mammary neoplasia increases with the number of oestrous cycles in the cat's life [6].

In male dogs, castration has numerous advantages in addition to sterilisation, mainly related to removal of the main source of testosterone. Castration controls urine marking in most males and reduces the tendency to roam in search of in-season bitches[7]. A common misconception is that castration is highly effective in reducing aggressive behaviour in male dogs. Castration may ameliorate the aggression slightly but other methods such as behavioural modification and training need to be explored [8].

The health benefits of castration are mainly due to a decrease in circulating testosterone and include a decreased incidence of benign prostatic hyperplasia (BPH), testicular neoplasia and perianal adenomas[68]. BPH is the most common of these conditions, with a reported incidence of 75-80% in uncastrated dogs, 6 years and older [9]. Michell reported that castration in dogs may be associated with an increased lifespan, but whether this is directly related to the health benefits of castration or the altered behaviour reducing the risk of fighting and roaming, is currently unknown[10].

Few doubt the necessity of neutering tomcats which are kept as pets. Intact tomcats are very unsociable due to their persistent habit of urine spraying, roaming and fighting, leading to treatment for abscesses and an increased likelihood of contracting infectious diseases [11]. There is no health condition reported to increase

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or decrease in association with gonadectomy in male cats. Numerous studies have evaluated the effect of castration in male cats at various ages with urethral diameter and the incidence of urinary tract obstruction and none have documented a correlation [12].

Cat and dog breeders will often elect gonadectomy of their breeding stock they no longer wish to breed with and to enforce breeding restrictions on puppies and kittens they sell to new owners.

Epidemiologists have an interest in population control of stray and feral dogs and cats as they act as reservoirs of zoonotic diseases such as rabies and pose a threat to other animals and mankind [13]. Populations of stray and feral dogs and cats are also of interest to environmentalists as they threaten certain species with extinction through hybridization e.g. the Ethiopian wolf or through predation e.g.100 million birds and mammals per annum are predated on by dogs and cats in the United Kingdom [14;15].

Adverse effects of gonadectomy

The reported incidence of post-surgical complications in cats is 2.6%, with most complications being mild and self-resolving [16]. The incidence of obesity in cats after spaying is high and is due to the decreased metabolic rate post-gonadectomy. However, this can and should be controlled by a proper feeding regimen [17]. There is a reported increase in the incidence of both feline lower urinary tract disease (FLUTD) (0,6%) and diabetes mellitus (0.5%) in spayed queens [18]. A very small number of queens may develop urethral sphincter incompetence (USI) but the correlation to spaying is unclear [11].

The incidence and morbidity of mammary gland neoplasia and pyometra are much higher than the incidences of FLUTD and diabetes mellitus and therefore the recommendation for early routine sterilisation of cats not intended for breeding is justifiable [12].

Adverse conditions reported following castration in male dogs include complications of surgery [16] as well as a very small increased risk of neutered dogs to develop cancer of bladder and prostate with an odds ratio of 3.56 (3.02–4.21) for urinary bladder TCC, 8.00 (5.60–11.42) for prostate TCC, 2.12 (1.80–2.49) for prostate adenocarcinoma, 3.86 (3.13–4.16) for prostate carcinoma, and 2.84 (2.57–3.14) for all prostate cancers (n = 2219) [19]. The latter risk varies by breed suggesting that genetics play a role in the development of these diseases [20]. A twofold excess risk for osteosarcoma was observed among neutered dogs [21]. The prevalence of anterior cruciate ligament rupture in all dogs is 3.48%. Sterilised male dogs had a higher (2.1-fold greater) prevalence of anterior cruciate ligament rupture than the sexually intact dogs [22]. An increased tendency towards obesity and obesity related conditions exists [23;24] with 32% of neutered male dogs being obese as opposed to 20% of intact males [25]. Similar increases have been reported for male cats [26]. USI in male dogs (intact and neutered) is very rare (exact numbers not reported but Boxers and castrated males were over-represented) [27;28].

The possible complications of surgery that may occur during sterilization of bitches are much more severe that those seen in male dogs [16]. These may include haemorrhage, ovarian remnant syndrome, stump pyometra, stump granuloma, fistulous tracts, eunuchoid syndrome and accidental ureteral ligation [29]. As with male dogs, there appears to be an increased incidence in certain neoplasms in some breeds following spaying of bitches. A twofold increased risk for osteosarcoma was observed among spayed bitches [21]. The prevalence of anterior cruciate ligament rupture in all dogs is 3.48%. Sterilised Bitches 2.1-fold greater prevalence of anterior cruciate ligament rupture than the intact dogs [22]. Compared with sexually intact females, spayed females were at increased risk for developing splenic haemangiosarcoma (odds ratio , 2.2; 95% confidence interval, 1.2-4.1) [30]. An increased tendency towards obesity and obesity related conditions exists in spayed bitches [23;24] with 32% of spayed bitches being obese as opposed to 23% of intact bitches [25].

In addition, the bitch may have a possible increase in aggression, an effect proven in the English Springer Spaniel [31]. If a bitch is spayed in late dioestrus, transient lactation and mammary development may occur due to a drop in circulating progesterone levels triggering an increase in prolactin secretion [29].

An adverse effect of spaying that requires in depth discussion is USI. This is a very common sequel to spaying bitches and may greatly influence the decision to spay by owners with prior experience of a pet with urinary incontinence. Spayed bitches may develop urinary incontinence within days of the surgery or more commonly, several years later (average 2–3 years). Although any size bitch may be affected, large and giant breeds appear to have a higher risk of developing USI, with the principal affected breeds in one study, including Doberman, Old English Shepherd dogs, Rottweilers, Weimaraners, Springer Spaniels and Irish Setters [32-34]. Within local context, Boerboel bitches appear to be over-represented (personal observation, De Cramer).

Reports on the incidence of USI vary between 4–20% [35;36] in spayed bitches and (0–1%) in intact bitches [36]. Ovariohysterectomy (OVH) in bitches significantly increases the risk of USI. Although many bitches will respond to life-long oestrogen replacement therapy or alpha-adrenergic agonist therapy, certain cases may be difficult to control and may require alternative therapies such as surgery, injection of bulking agents or a combination of the two modalities. Also based on cases presented in one study, large and giant

breeds appear to suffer from more severe leaking and are more likely to be unresponsive to treatment and present for surgical treatment for USI more frequently than do smaller breeds [37]. Obesity can worsen urinary incontinence and it is important to note that that obesity is also linked to gonadectomy.

Although there are potentially severe consequences of spaying female dogs which should be discussed with the owner, in these authors' opinions, the medical benefits with regard to the decreased incidence of mammary neoplasia and pyometra and ultimately the longevity of the bitch, behavioural benefits and guaranteed prevention of unwanted pregnancies, justifies the recommendation of early routine sterilisation of bitches not intended for breeding, in our society.

Resistance to sterilizing pets

Despite the numerous benefits, many dog owners are still hesitant to have their pets sterilised. These owners are often influenced by the host of on-going studies regarding possible adverse effects of sterilising pets as well as anecdotal and unsubstantiated reports gleaned from the internet, friends and family. With regards to sterilisation of pets, it is fair to state that the advantages on both the pet's long-term health and behaviour far outweigh the disadvantages in most instances and most breeds. This is particularly true where the owner cannot guarantee the prevention of unwanted pregnancies in female pets. Veterinary surgeons should have the up-to-date knowledge to be able to guide these unconvinced owners into make an informed decision both for the benefit of their pet and the community as a whole.

Dog owners and breeders often put a great deal of time and commitment, both personal and financial, into showing and working their dogs in various arenas and are therefore understandably concerned regarding the effects of sterilization on their animal's behaviour. These effects are difficult to measure due to the non-objective parameters with which they are measured. It is therefore not surprising that there is no clear consensus on what the real effects are. It is also important to realise that breed, gender and individual differences will also have an effect on the manifestation of behavioural changes following gonadectomy. The effects that have been studied by Duffy and Serpell (2006) include: stranger directed aggression, owner-directed aggression, dog-directed aggression, trainability, excitability and the effect on the energy levels of a dog. The results of this study suggested that spayed females tend to be slightly more aggressive or assertive toward their owners and strangers than intact females and that both genders have slightly reduced energy levels and drive following sterilisation. This is generally the main reason why some owners are reluctant to sterilise competition and working dogs.

Certain Scandinavian countries either prohibit the routine surgical sterilization of dogs or strongly discourage sterilization of pets unless there is a valid medical reason. Their rationale is that routine sterilisation exposes them to an increased likelihood of adverse effects associated with gonadectomy and that, in their opinion, the prevention of these effects outweighs the known reproductive health benefits offered by gonadectomy. They further support their argument by showing that the failure to routinely sterilise animals does not lead to pet overpopulation and unwanted litters in their society and that they generally have a much lower number of abandoned pets requiring euthanasia as opposed to those countries that are strong proponents of routine pet sterilisation. Veterinary surgeons should understand that there are pet owners who share the views of these Scandinavian countries. These owners also recognise the importance of preventing unwanted litters from

their pets and are willing to either ensure that their bitches are not mated or to explore contraceptive alternatives that do not require surgical intervention and possible subsequent adverse effects.

In some countries, certain dog owners (mainly men), find the emasculated look of an empty scrotum on their male dogs almost too much to bear and refuse to have the dog castrated, although this sentiment is often not carried over to their female dogs! For these owners, the option of Neuticles® (www.neuticles.com) was developed. Neuticles® are prosthetic testicular implants for neutered dogs. Opinion is divided regarding their use: Some are of the opinion that they serve no purpose other than to entertain human vanity and therefore question the ethics of their use. It is not clear what the stance of our local veterinary regulatory body's (SAVC) stance is on the use of this prosthesis.

In certain societies, cultural perceptions and the value of the role (hunting or guarding) that dogs fulfil in the community may act as obstacles to efforts to convince dog owners to sterilise their pets. These dog owners may wish to replace their dog by breeding another one themselves from the original pet, rather than having to buy one if they had had their dog sterilised.

Surgical sterilization

Despite many advances in contraceptive techniques, permanent and irreversible surgical sterilisation by removal of the reproductive organs is still by far the most common method [1;29]. In bitches and queens, surgery can be performed conventionally through a surgical incision in the abdominal wall (mid-line or flank) or via laparoscopy [4]. Laparoscopic ovariohysterectomy and ovariectomy have been described in dogs [38;39] and wildlife [40] and are becoming much more widespread and acceptable techniques in veterinary practice. Laparoscopic surgery is gaining popularity due to its less invasive nature but the equipment is considered too costly for general practice by many practitioners. Increases in both surgical time and complication rates with laparoscopic surgery are stumbling blocks which are likely to improve with increasing expertise [4]. In the hands of experienced surgeons, surgical time is shortened for laparoscopic gonadectomy in bitches [39]. The main advantage is the decrease in post-operative pain associated with laparoscopic spay patients [41;42]. Laparoscopic surgery is by far the preferred method in human patients and this trend is likely to become true for pets as well in the years ahead.

Ovariohysterectomy versus ovariectomy

The method traditionally recommended to spay queens or bitches is ovariohysterectomy (OVH) [29]. An advantage of performing an OVH is that it completely eliminates the risk of these cystic endometrial hyperplasia pyometra complex and uterine neoplasia abnormalities [43]. Bitches that have been spayed by ovariectomy (OVE) will only develop a pyometra if they are exposed to the effects of exogenous sources of progesterone.

It has been calculated that the true overall incidence of malignant uterine neoplasia in dogs is very rare (approximately 0.003%) [44] and uterine neoplasia has never been reported in a dog that has had its ovaries removed before 2 years of age, regardless of whether the uterus was left in situ [45].

Progesterone-containing products are becoming less readily accessible and there are fewer indications for their use, therefore, ovariectomised bitches should not inadvertently be exposed to sources of progesterone.

OVE, especially in pre-pubertal bitches is less invasive, less time-consuming and achieves the same goal and is therefore likely to gain in popularity over OVH [45]. In one study, it was concluded that there is no indication for removing the uterus during routine spaying in healthy pre-pubertal bitches and that OVE is the procedure of choice for this purpose [43]. OVH is technically more complicated, time consuming and is associated with greater complications due to larger incisions, more intra-operative trauma and increased discomfort when compared with OVE [4;46]. No significant difference between techniques was observed in respect of incidence of long-term urogenital problems, including endometritis, pyometra and urinary incontinence. Both OVE and OVH vastly reduce the risk of mammary adenocarcinoma if performed early (pre-pubertal) [29]. Therefore it may be safely concluded that OVE is the preferred method of gonadectomy in the healthy pre-pubertal bitch [44]. In older bitches with possible uterine pathology (cystic endometrial hyperplasia induced by prior progesterone priming during oestrus), OVH may be a better choice.

Age of sterilization

The optimum age for early gonadectomy in puppies is one of fierce debate, with veterinarians concerned about the long term health risks such as risk of infectious diseases, immune suppression, long bone growth, oestrogen responsive urinary incontinence and obesity [29]. For the purpose of this article, "early age neutering" is defined as the neutering of animals at the age of 6–12 weeks, "pre-pubertal neutering" refers to neutering at 3–5 months of age before puberty is expected a months or more later and "traditional age neutering" refers to neutering around 6–12 month of age when the bitch or queen may or may not have cycled.

Early age neutering is becoming increasingly popular all over the world. Enforced sterilisation in animal shelters prior to rehoming has been the main driving force behind early age sterilization. This stems from the fact that new owners of adopted pets seldom

fulfil the terms of adoption and fail to present the pet for sterilization when it comes of age. In order to enforce breeding restrictions, some breeders insist on puppy or kitten sterilization after weaning and prior to sale. The increasing popularity is also a result of the accumulation of data regarding the safety of the procedure and the lack of long-term adverse side effects when compared to animals which are gonadectomised at traditional ages.

As veterinary surgeons become more comfortable and familiar with the procedure, they are likely to encourage more clients to consider early-age neutering. Puppies which are neutered at an early age have a shorter recovery period as opposed to those neutered at a more traditional age. Mortality and morbidity rates are also reported to be lower [12] and it has been categorically proven that the pre-pubertal spaying of bitches reduces the incidence of mammary neoplasia to almost zero [3].

Two long term studies (48 month and 54 month median follow-up) showed that, on a short term basis, early age gonadectomy did result in an increased incidence of parvoviral enteritis, therefore it may be prudent to postpone sterilisation until one week after the completion of the vaccination regimen if non-exposure to an infectious virus cannot be guaranteed. Another disadvantage is a moderately increased risk of cystitis in early-neutered relative to late-neutered bitches (12.9% for bitches gonadectomised before 3 months of age and 5.0% for those gonadectomised at ≥ 3 months of age [12].

A study of the effects of pre-pubertal gonadectomy on skeletal growth showed that, rather than being 'stunted,' the growth period and radial/ulnar length was in fact, extended, resulting in the animals being slightly taller, determined using radiographs, than animals neutered at the traditional age [47].

Concerning obesity, the same study showed that the proportion of overweight dogs was actually lowest in the early aged gonadectomised group, as opposed to the traditional aged dog group.

The anaesthesia of very young puppies requires extra care to prevent hypoglycaemia and hypothermia. The use of modern and safe anaesthetic agents is imperative. If these principles are observed, there is no increased risk of surgical or anaesthetic complications [48].

Consistent with the findings of Spain et al., (2004), Thrusfield et al., 1998 reported a twofold increase in risk of urinary incontinence in females neutered early. In contrast, [49] and others found no evidence that suggests that the incidence of urinary sphincter incompetence which leads to urinary incontinence is higher in bitches which were spayed at an earlier age. More research is required before a convincing recommendation can be made regarding USI and age of gonadectomy. However, considering that those that did find a correlation, was associated only with early age gonadectomy (6–12 weeks of age), it may be safer to recommend that female puppies (of particular at risk breeds), not undergo OVH or OVE until the age of 3–5 months.

Although there are no reports investigating whether gonadectomy affects incidence of canine hip dysplasia (HD), it has been reported that the age of neutering may affect the incidence of HD. It was shown that in dogs gonadectomised before 5.5 months of age, 6.7% developed hip dysplasia, whereas among those gonadectomised at ≥ 5.5 months of age, 4.7% developed the condition [12] (n = 1842).

The vulvas of puppies neutered prior to puberty appear smaller when compared to intact bitches. Peri-vulvar dermatitis has been associated with weight gain and

recessed vulvas following ovariohysterectomy, there is no information to suggest that the occurrence is higher in bitches spayed at early ages over those neutered at traditional ages [12].

The perception that male cats are predisposed to obstructive lower urinary tract disease by neutering is not borne out by the scientific evidence. In a retrospective survey, cats castrated at an early age, had no greater incidence of obstructive urinary tract disease than did cats castrated at traditional ages [50].

Behaviour appears not to be influenced by early age gonadectomy as dogs and cats showed no difference in urinary or aggressive behaviours. Dogs neutered pre-pubertally have a higher success rate in becoming guide dogs [48].

Hysterectomy, hemi-ovariohysterectomy and ovarian tissue transplant

Because of the disadvantages of gonadectomy, numerous workers experimented with only removing the uterus (hysterectomy) and part removal of the gonads (partial spay) in order to prevent or ameliorate the many adverse effects of gonadectomy yet rendering the bitches infertile.

Hemi-ovariohysterectomy, also known as partial spay, refers to removal of one ovary and usually the entire uterus [51] whereas the ovarian tissue transplant refers to complete ovariohysterectomy followed by re-implantation of ovarian tissue beneath the stomach serosa or spleen. All these procedures involve leaving one or both ovaries or remnant ovarian tissue (ROT) which in turn leaves potential for oestrogen production and may lead to authentic signs of oestrous and pseudopregnancy [52;53]. Whilst some pet owners would be happy to live with these symptoms in order to avoid the adverse effects of gonadectomy, there are serious health risks to consider with ROT. These undisputedly include mammary tumours and although more research is required with larger sample sizes, there appears to be increased risk for granulosa cell tumours [54], cystic ovarian disease and other reproductive tumours [55;56] and diabetes [23]. Neutering procedures that leave ROT are therefore ethically questionable. However, there might be owners of predisposed breeds that might be more concerned about the risk for urinary incontinence, osteosarcoma or other tumours associated with gonadectomy and for these owners leaving ROT may be an option. For these owners of such pets, an individual risk benefit assessment of all the factors involved should be undertaken and discussed with the owner's veterinary surgeon.

Partial spaying procedures performing unilateral salpingectomy may be of use in wild or captive bred populations where reduced fecundity is desired in preference to sterility without disturbing the dynamics of the population (e.g. lion pride). It is important to note that hemi-ovariectomy may not have the same effect due to potential development of compensatory ovulation by the contra-lateral ovary

Alternatives to gonadectomy

When an animal may be intended for future breeding, when owners are averse to putting their pet through the required surgery or when an animal is a high risk for surgery, effective pharmacological contraceptive alternatives are possible. For the purposes of this discussion, contraception will be defined as a reversible method for blocking fertility [13]. These methods include chemical castration, oestrus prevention, oestrus suppression, pregnancy prevention and termination [57].

Suppression or prevention of oestrus can be achieved through progestins, androgens, GnRH agonists, and GnRH antagonists. Although progestins have been used for many decades for this purpose, there is now considerable evidence that the use of progestins is associated with a high incidence of pyometra, obesity, mammary hyperplasia or neoplasia, fibroadenomatosis and diabetes mellitus [58-61]. In addition, if progestins are administered during pregnancy, they may result in masculinization of female foetuses and may interfere with parturition [29]. Androgens also have a variety of unwanted side effects.

In terms of chemical castration, various products are available, although none are currently licenced in South Africa. The progestin, Delmadinone acetate (Tardak®) is registered in certain countries to control hypersexuality, the treatment of prostatic pathology and peri-anal tumours and aggression. Sterilization by means of permanent testicular damage induced by intra-testicular injection of various solutions is currently receiving a lot of attention in other countries, especially for animal shelters and areas which do not have access to surgical facilities. Current products on the market contain zinc gluconate solutions (TestoblockTM, Neutersol®) which are thought to cause a reaction similar to an auto-immune orchitis [62], causing irreversible sterility.

Although currently not locally available, GnRH agonists (analogues) in the form of subcutaneous implants or depot injections (GonazonTM, Suprelorin®, Biorelease deslorelin) hold great promise for oestrus prevention and suppression in bitches as well reducing circulating testosterone in males therefore causing reversible spermatogenic arrest and the reduction or abolition of testosterone-dependent traits such as libido and urine marking [63]. Their main disadvantage is that they may cause an initial induction of oestrus or "flare-up" in anoestrus bitches, 1–4 weeks after the start of the treatment [64;65]. The somewhat unpredictable duration of effect and return to oestrus may also be of concern in breeding bitches. GnRH agonists are popular where they are available because they result in entirely reversible chemical sterilization in

both males and females with minimal side effects. A novel approach to controlling reproductive function is the concept of immune-sterilization or immune-contraception. This involves the production of vaccines that target reproductive hormones, gamete antigens or the conceptus as an antigen. Depending on the target, the outcome is either suppression of sexual function or of conception. Where overall suppression of sexual function is desired the most successful target for immune-contraception is the hormone, GnRH [5]. Work has been done in wildlife and cervids in particular using Gonacon™ a GnRH-keyhole limpit haemocyanin [5]. Where contraception alone is required, work has been done in elephants and horses using a porcine zona pellucida (PZP) vaccine which targets the oocyte [66]. Research into the development of a new GnRH Rabies-linked vaccine for permanent immunosterilization is ongoing. This would provide the potential for both population control and protection against this important zoonotic disease [67] but would still be at risk for uterine disease and neoplasia as discussed before.

Summary of recommendations regarding gonadectomy

1. **Method of sterilisation**
   Once the decision has been made to permanently sterilise the pet, surgical sterilisation is recommended. This can be done by conventional surgical methods or by laparoscopic surgery. If pre-pubertal sterilisation is practised, ovariectomy should be recommended rather than is ovariohysterectomy.

2. **Age of sterilisation**
   In dogs and cats, male and female, pre-pubertal gonadectomy (3–5 months) has advantages over both gonadectomy at early ages (6–12 weeks) and traditional ages (6–12 months).

3. **Male cats and female cats**
   All cats not intended for breeding should be sterilised as soon as they have completed their primary vaccinations but not later than 5 months of age. This is recommended because there is no evidence of adverse effects of early gonadectomy in cats and the risk of unwanted pregnancies is far greater in cats than in dogs due to the difficulties involved in confining cats.

4. **Male dogs**
   For most owners, the benefits of castration will outweigh the possible disadvantages. However, many dog owners may elect not to castrate their male dog. These owners will assess the individual risk profile of their dogs and discuss with their veterinarian the implications of castration when and if medical or behavioural problems arise. Veterinary surgeons should respect this scientifically sound view.

5. **Bitches**
   Overall, it appears justified to recommend spaying all females not intended for breeding, because the procedure is more likely to prevent rather than cause disease. Therefore, for most owners and most breeds, despite the many possible adverse effects of spaying in bitches, the benefits will outweigh the possible disadvantages. This is due to the fact that most owners cannot guarantee that they will be able to prevent an unwanted pregnancy in their bitch and are not willing to put up with the nuisance of the bitch being "on heat". However, for some owners, the recommendation must be made on an individual case-by-case basis, after evaluating the breed of the dog, the lifestyle of the owner and dog itself. In all cases it might be prudent to include some of the more common adverse effects (particularly USI) in the standard written consent form for surgery. This allows the owner of the pet to make an informed

decision following discussion of the risks and benefits of gonadectomy with their veterinary surgeon.

Conclusion

For most owners and most pets, early gonadectomy is the most appropriate recommendation. However, there are studies that indicate that there may be a very slight increase in certain neoplastic conditions (osteosarcoma, haemangiosarcoma) as well as cranial cruciate ligament rupture. It is important to note that these adverse effects are in many cases affected by breed, age of sterilization and gender. Finally it is important for veterinary surgeons to interpret the results of such studies with circumspection. It would be wrong to interpret the results as saying that sterilization causes neoplasia. A slight increase in a specific neoplasia and a specific breed may be a more appropriate interpretation. Ovariectomy and prepubertal gonadectomy both make sound scientific sense. Laparoscopic surgery in competent hands is less invasive results in quicker recovery and certainly shows potential for the future.

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CPD Questions

AC/1288/14

Question 1
Which of (a-e) is the correct answer to the following statement.
The medical benefits of gonadectomy in the bitch includes.....:
a) Less aggression towards other bitches
b) Decreased risk of mammary neoplasia if sterilised after 2nd oestrus cycle
c) Decreased risk of mammary neoplasia if sterilised before 2nd oestrus cycle
d) Increased basal metabolism
e) Decreased risk of perianal adenoma

Question 2
Castration has numerous advantages in the male dog. Which of the following statements is FALSE.
a) castration of the male dog controls urine marking
b) castration of the male dog reduces the tendency to roam
c) castration of the male dog reduces aggression
d) castration of the male dog reduces the risk for benign prostatic hyperplasia
e) castration of the male dog reduces the risk for perianal adenoma

Question 3
Sterilisation of male dogs increases the risk of certain conditions. Select the statement which is FALSE.
a) Sterilisation in male dogs increases the risk of haemangiosarcoma
b) Sterilisation in male dogs increases the risk or perianal adenoma
c) Sterilisation in male dogs increases the risk of cranial cruciate ligament rupture
d) Sterilisation in male dogs increases the risk of prostatic neoplasia
e) Sterilisation in male dogs increases the risk of osteosarcoma

Question 4
Which of the following statements is true for sterilised tomcats .
a. The incidence of urethral obstruction is increased when sterilised, irrespective of at what age it is performed
b. The incidence of urethral obstruction is increased when tomcats are gonadectomised pre-pubertal
c. Gonadectomised cats have similar incidence of urethral obstruction than intact cats
d. Gonadectomised cats have a decreased risk of urethral obstruction than intact cats
e. None of the above

Question 5
Which of the following statement is TRUE with regards to hemi- ovariohysterectomised dogs
a) hemi- ovariohysterectomised dogs are at increased risk of ovarian neoplasia
b) hemi- ovariohysterectomised dogs do not come into season
c) hemi- ovariohysterectomised dogs may still produce litters albeit smaller litters
d) hemi- ovariohysterectomy is the only procedure performed in Scandinavia
e) none of the above

Question 6
Which of the following statements is true with regards to alternatives to surgical sterilisation.
a) Immuno-contraception is currently the most used alternative to contraception in small animal practice
b) Progestogens should not be overlooked and should be considered first choice
c) Intra-testicular injection of zinc gluconate solutions causes reversible sterility
d) GNRH analogues hold the most promise
e) All of the above

Question 7
Which of the following statements relating to ovariohysterectomy before the second oestrus cycle is FALSE
a) Complete ovariohysterectomy before the second oestrus cycle in the bitch eliminates the risk of pyometra
b) Complete ovariohysterectomy before the second oestrus cycle in the bitch decreases the risk of mammary neoplasia
c) Complete ovariohysterectomy before the second oestrus cycle in the bitch decreases the risk of urethral sphincter incompetence
d) Complete pre-pubertal ovariohysterectomy before the second oestrus cycle in the bitch increases the risk of weight gain
e) None of the above

Question 8

Which of the following statements applicable to early age neutering compared to prebural and traditional age neutering is FALSE

a) The term early age neutering is applied to animals sterilised between 6 – 12 weeks of age
b) Early age neutering is advocated by many humane pet shelter societies
c) Early age neutering had no long term physical or medical effects on the animal
d) Animals undergoing early age neutering have a longer recovery period.
e) Animals undergoing early age neutering are less inclined to obesity in later life

Question 9

Which of the following statements is FALSE

a) Sterilisation techniques which can be applied without affecting group dynamics include unilateral ovariectomy to reduce litter size
b) Sterilisation techniques which can be applied without affecting group dynamics include unilateral salpingectomy to reduce litter size
c) Sterilisation techniques which can be applied without affecting group dynamics include immunocontraception targeting the conceptus to inhibit pregnancy
d) All of the above
e) None of the above

Question 10

GnRH hormone is a target of studies in various aspects in theriogenology. Which of the following statements is FALSE

a) GnRH is a target hormone for immune contraception and suppression of sexual function.
b) GnRH agonists (analogues) hold great promise for oestrus prevention and suppression in bitches
c) GnRH agonists reducing circulating testosterone in males causing reversible sterilisation
d) GnRH agonists reduce the incidence of mammary and prostatic neoplasia in dogs
e) All of the above

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SAVC Policy on Early Sterilisation in Dogs and Cats

VC/13/1 Policy
There is no position statement *per se*. There is however a decision the Register of Decisions, copied below , for ease of reference.

"28.31 Neutering of Animals at early age

The Council accepted the following principles relating to the proposed neutering of puppies and kittens at an early age by the SPCA:

- Early neutering was not unacceptable to the Veterinary Council;
- There were no data to suggest that early neutering was improper, or to prove the viability thereof on a scientific basis;
- The Council could not condone or oppose neutering at an early age;
- The decision whether or not to carry out such an operation should be left to the judgement of the individual veterinarian; and
- The Council could not take a definitive stand because of the lack of scientific data currently available

29-07-1992 p4)
The Council would have no objection to any procdure provided that it was carried out professionally and could not be shown to be harmful to the welfare of
the animal.

(02-08-1993 p3)
It was resolved to advise the SPCA that following a thorough investigation the Council was of the opinion that early-age neutering of animals at a young age was not unethical

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SOUTH AFRICAN VETERINARY COUNCIL

Sterilisation

A Behaviourist Point of View

Dr Frederique Hurley , Behavivet

Castration of male dogs and cats has valuable behavioural benefits. Castration can decrease unacceptable sexual behaviour, aggressiveness, urine marking, and prevent breeding. With respect to behaviour, it should be clearly understood that the only behaviours affected by castration would be those that are influenced by male hormones. Thus, castration effects sexually dimorphic behaviours, those seen predominantly in males.

The undesirable behaviours that decrease with castration are[1, 2, 4]:

Undesirable sexual behaviour

- Can reduce attraction to females, roaming, mounting and masturbation
- Roaming in cats can be reduced in over 90% of cases and 70-80% of dogs have a reduction in roaming but only about 40% are completely resolved[4]
- Mounting of other animals, people or inanimate objects in dogs is reduced in 70-80% of cases but resolved in only 25%[4]

Marking

- Marking with urine is a common territorial behaviour in dogs and cats
- Castration reduces marking in about 70-80%of dogs but only about 40% are completely resolved. Marking by spraying urine is reduced in 90% of cats[4]

Aggression

- Intermale aggression can be reduced in about 60% of dogs and 90% in cats[4]
- Aggression towards family dogs and family members may be reduced in about 30% of dogs[4]
- Aggression toward unfamiliar dogs and intruders may be reduced in 10-20% of dogs[4]

Since castration can help curtail roaming, castrated dogs and cats are less likely to be endangered by viral, bacterial, parasitic or environmental dangers.

Bitches and queens may show altered behaviours with oestrus, including increases in some forms of aggression, and bitches may show nesting and mothering behaviours and lactation with false pregnancies. Maternal aggression refers to aggressive behaviour directed toward people or other animals that approach the bitch with her puppies. Bitches that experience pseudocyesis (false pregnancies) may also display maternal aggression despite the lack of puppies. Sterilisation will prevent maternal aggression.

It must be kept in mind that there may be other reasons for the behaviours mentioned above. These should be diagnosed and treated. Therefore sterilisation is often an adjunct to behavioural modification, management, environmental enrichment, pheromone treatment, neutraceutical treatment and behavioural medication and it should not be thought that sterilisation will provide the 'quick fix' (excuse the pun) on its own.

The likelihood of a behavioural response to castration is not associated with the age at castration or duration of the behaviour prior to castration in male dogs or cats[3]. However, if the behaviour has been present for a longer duration, the benefit of sterilisation may decrease as the stimulus that started the behaviour may not be the same as the stimulus that maintains the behaviour. This implies that the current behaviour may not be driven by the sex hormones anymore.

Since animals may have a genetic predisposition for undesirable behaviour, sterilisation should be considered in animals displaying behaviour problems, if not to resolve the behaviour problem, then to prevent passing it to the offspring.

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Studies Call Neutering of Pets Into Question

Research highlights sterilization downside, spurs discussion in veterinary community.

By Heather Biele, DVM, DVM360 MAGAZINE, Jun 01, 2013

For many veterinarians, recommending spaying and neutering comes so easily it hardly merits a second thought. But recent studies out of the University of California Davis and the University of Georgia have challenged that autopilot approach.

In February, researchers at UC Davis published a study in the online journal PLOS ONE that observed the effect of spaying and neutering on the development of certain cancers and joint diseases in golden retrievers. The medical records of 759 client-owned intact and neutered female and male dogs between the ages of 1 and 8 were examined for the diagnosis of hip dysplasia, cranial cruciate ligament tear, lymphosarcoma, hemangiosarcoma and mast cell tumor. The dogs were classified as intact, early-neutered (before 12 months old) and late-neutered (at or after 12 months old). All five diseases were found to be significantly higher in the neutered population. One of the most dramatic findings was that 10 percent of early-neutered male dogs were diagnosed with hip dysplasia, twice the percentage seen in intact males. Early neutering was also associated with an a greater incidence of cranial cruciate ligament tear and lymphosarcoma in male dogs and cranial cruciate ligament tear in females. There was also a greater occurrence of mast cell tumor and hemangiosarcoma in late-neutered compared with intact females.

Comparatively, the study out of the University of Georgia, also published in PLOS ONE, looked at a sample of more than 40,000 canine death records to determine the effect sterilization may have on both lifespan and cause of death, while controlling for the effects of age. The results showed that while sterilization increased the lifespan of dogs, it also increased the risk of death from cancer or autoimmune diseases. However, researchers recognized that a direct link between sterilization and the study outcomes could not be made, as a number of unknown factors, including the age at which the animal was sterilized, potentially added bias to the results.

Neuter or not?

Given the results of these studies, some veterinarians are wondering if they should alter their message promoting spaying and neutering of dogs and cats. Karen Overall, VMD, PhD, DACVB, a well-known author and speaker on behavioral medicine, was immediately concerned upon seeing the results of the UC Davis study. "Now everybody is going to stop neutering their dogs," she thought.

But after reviewing the study results and consulting with colleagues about it, Overall isn't wavering in recommending spaying and neutering to pet owners. She will, however, continue to emphasize the importance of treating each pet as an individual case. "If an animal is going to go out and get into fights because it's intact, that case requires intervention. That animal is going to roam and fight and get hit by a car. We've done that animal no favors by not neutering it," she says. "On the other hand, if that animal doesn't display any of those behaviors, then we should go through the relative risks and medical concerns of not neutering with the owner."

Jessica Vogelsang, DVM, a veterinary blogger and contributing author for a number of publications, also pored over the study results and came to a similar conclusion—each case should be considered individually. Vogelsang notes in her blog, http://pawcurious.com/, that while many intelligent, educated pet owners will make an informed decision whether or not to neuter, there are pet owners who make less informed if not poor decisions about pet care. If an owner isn't interested in basic preventive care and training, she's concerned that this person won't be responsible with an intact pet. For those owners, her recommendation to spay or neuter the pet is a given.

Stay on task

Although Overall's and Vogelsang's approaches to spaying and neutering won't be affected by the results of the UC Davis study, Overall is concerned that the study outcomes may leave many veterinarians on unsteady ground with regard to their recommendations. "What worries me is that veterinarians aren't going to have good answers for pet owners and clients," she says. "I'm worried this study is going to take a lot of energy out of the conversation that we've worked so hard to deliver."

Concerns aside, Overall stresses that veterinarians should focus on each animal individually and take quality of life, safety and public responsibility into account as they evaluate and make recommendations. With this mindset, they really can't go wrong.

Butorphanol vs. Buprenorphine for Postop Pain Control in Cats

Warne LN, Beths T, Holm M, et al. Evaluation of the perioperative analgesic efficacy of buprenorphine, compared with butorphanol, in cats. J Am Vet Med Assoc 2014;245(2):195-202.

Summary by Jennifer L. Garcia, DVM, DACVIM
From: VETERINARY MEDICINE, Nov 05, 2014

Why they did it

A variety of pain management options are available to ease pain in our feline patients. These researchers sought to compare the efficacy of butorphanol and buprenorphine in providing postoperative pain control as assessed by a validated pain scale.

What they did

As part of a randomized and blinded study, researchers evaluated 39 healthy female cats that were admitted for routine ovariohysterectomy. The cats were divided into two groups. One group received 0.02 mg/kg of buprenorphine intramuscularly, and the other received 0.4 mg/kg of butorphanol intramuscularly.

In phase 1 (n=10), the agents were given only as part of the premedication protocol before surgery.

In phase 2 (n=29), the agents were included as part of the preanesthetic protocol and were also administered at the same dose at the time of wound closure. Signs of pain were monitored in both groups beginning 20 minutes after extubation and continuing for up to 360 minutes. The same veterinary anesthesiologist performed all of the pain assessments and was blinded to the treatments administered.

What they found

Phase 1 was discontinued because nine of the 10 cats required rescue analgesia at the time of the first pain assessment. Among the cats in phase 2, pain scores for the buprenorphine group were significantly lower compared with cats receiving butorphanol ($P < 0.001$), and the analgesic effects appeared to last for six hours after surgery. All cats in the butorphanol group required rescue analgesia at the time of the first pain assessment, whereas none of the cats in the buprenorphine group required rescue pain control at any time point.

Take-home message

Butorphanol should not be used alone for management of postsurgical pain in cats undergoing ovariohysterectomy. Buprenorphine given before surgery and during wound closure is preferred to provide appropriate pain control.

Upper Thoracic Disease (T1-T9) in Large-Breed Dogs

Haeron K, Berg J, Bonczynski, J, Suarez C, and Bergman P. Upper Thoracic Disc Disease (T1-T9) in Large-Breed Dogs. Journal of the American Animal Hospital Association 2014 (50):105-111

Summarised By Dr Liesel van der Merwe BVSc MMedVet(Med)

Why they did it.

IVDD is one of the the most common neurological disease in dogs. The cervical , caudal thoracic and lumbar discs are most commonly affected. Little data exists on IVDD in large breed dogs. According to the data available thoracolumbar involvement is most common in large breed dogs with multiple sites affected. German shepherd dogs were most commonly affected (33%)n=99.

The authors practice diagnosed several large breed dogs, predominantly GSD, with upper thoracic IVDD, thus prompting a proper retrospective review.

What they did

The authors reviewed the medical records of all dogs with a neuroanatomic diagnosis clinically and an IVDD confirmed on MRI between 2008 and 2011. Cases were excluded if any other concomitant spinal disease was thought to be the primary problem: such as caudal cervical spondylomyelopathy, discospondylitis. Dog breeds were separated into small and large breed categories, with 22.7kg as the cut-off point.

What they found

723 dogs from 97 different breeds were diagnosed with IVDD and met inclusion criteria in the review period. There were 196 (27.1%) large breed dogs of which Labrador retrievers (n=41) and German Shepherd dogs (n=37) and mixed breed dogs (n=29)were most common. Also included were American pitbull terriers (n=15) and doberman pinschers (n=9). The mean age of small breed dogs was 7 yrs (1 yr – 19yr) , which was significantly lower than that of the large breed dogs; 8.6yrs(6m-14 yrs). The least common lesion location was T1-T9. No small breed dogs had a lesion in T1-T9, but 21 large breed dogs (10.7%) had a lesion in this region : and it was even more prevalent in the German Shepherd dog (29.7%) and the Labrador Retriever (28.6%). Large breed dogs were also significantly more likely to have multiple sites affected than small breed dogs. Multiple sites were also more common in

the T1-T9 affected group - the majority outside the thoracic region.

Take Home Message

Historically it was thought that the T1-T10 region was resistant to IVDD due to the extra stability provided by the intercapital ligament. In this study 10.7% of all large breed dogs diagnosed with IVDD had upper thoracic (T1-T9) lesions. Most of these were Labrador Retrievers and German Shepherds.

Because Upper thoracic (T1-T9), thoracolumbar (T9-L4) and degenerative myelopathy all have chronic and progressive signs with similar neuroanatomic localisations, diagnostic imaging of the entire region should be recommended in all cases.

Case-control study of the effects of pimobendan on survival time in cats with hypertrophic cardiomyopathy and congestive heart failure

Reina-Doste,Y, Stern,J et al Case-Control study of the effects of pimobendan on survival time in cats with hypertrophic cardiomyopathy and congestive heart failure, JAVMA 2014 (245) 534-539.

Summarised by Dr Marlies Bohm BVSc DSAM, MMedVet(Med), DipECVIM.

Why they did it

Pimobendan has been shown to improve survival time in dogs with dilated cardiomyopathy (DCM) and myxomatous valvular degeneration by improving systolic function and acting as a balanced vasodilator. It also has anti-platelet properties. Pimobendan has been used in cats with a variety of cardiac diseases but there is a theoretical concern that this drug could worsen the dynamic left ventricular outflow tract obstruction (LVOTO) that is observed in some cats with hypertrophic cardiomyopathy (HCM). Dynamic LVOTO develops when the section of interventricular septum just under the aorta hypertrophies and / or when the anterior mitral valve leaflet is sucked into the outflow tract just under the aorta during systole. This means that the hole through which the blood leaves the ventricle is narrowed resulting in turbulent blood flow in the aorta, an audible murmur and increased work for the LV myocardium to empty blood out of the chamber through this narrowed exit. If Pimobendan increases the LVOTO, its use could accelerate the progression of HCM by encouraging myocardial hypertrophy and could potentially decrease cardiac output. In addition, cats with HCM have normal systolic function so shouldn't really need inotropic support.

What they did:

They identified 2 groups of 27 cats retrospectively. All had HCM and 5 in each group had dynamic LVOTO. All were in congestive heart failure (CHF) at the start of treatment. They were matched according to age and weight. Cats with fixed outflow tract obstruction were excluded. All were treated with frusemide and most with an ACEI (24/27 in each group). More control cats received atenolol (9/27 vs 3/27) while more pimobendan treated cats received anticoagulant treatment (25/27 vs 19/27 in the control group). Pimobendan dose was 0.15 – 1.0 mg/kg/d in 2-3 divided doses.

What they found

The median survival time (date at which the 14th cat in each group died or was ethanased aro cardiac disease) was 626 days in the group treated with pimobendan and 103 days in the control cats. There were too few cats with LVOTO to come to any firm conclusions about the effect of pimobendan in this subset of cats.

Take home message

Pimobendan does not seem to be harmful to cats with HCM and CHF. There may be a survival benefit in using pimobendan in cats with HCM. Ideally, this should be confirmed with a prospective study performed in a larger group of cats.

Characterisation and Outcome Following Excision of Masses in the Nictitating Membranes of Horses: 50 cases (1998 - 2012)

Summarised by Liesel van der Merwe BVSC (MMedVet(Med)

JAVMA , Vol 245(7):812 -815 Scherrer, NM et al

Determined the histiologic findings associated with masses in the 3rd eyelid of horses to identify prognostic factors associated with outcome

Why they did it.

The nictitating membrane (3rd eyelid) is an important site of peri-ocular neoplasia with squamous cell carcinoma (SCC) being most prevalent. The 3rd eyelid of horses, in contrast to that of dogs, does not play a significant role in tear film production. Complete excision is believed to be curative, but lymphnode and bone involvement may occur if delayed. There is increased risk of SCC in horses with no or slight pigmentation and a breed predisposition in Drafts, Appaloosas and Haflingers.

What they did:

This article is a retrospective evaluation of medical records of all horses admitted to University of Pennsylvania New Bolton Centre between 1998 - 2012. Inclusion criteria were a mass removed from 3rd eyelid and at least 1 years follow up information (indirect from veterinarians or owners). Excision was classified as complete or partial. Signalment, eye involved, duration, prior treatment, post-operative chemotherapy and histopathological parameters were analysed. Topical application of 1% 5 – fluorouracil and 0.04% mitomycin-C ophthalmic ointment was performed based on clinician preference. Histopathology was classified for diagnosis and to evaluate surgical margins (pos/neg) and vascular invasion (yes/no). In patients with ocular SCC a surgical margin of 2-3mm is recommended.

Fifty horses were included: 54% male and 46% female. Draft horses were overrepresented (16% in study group vs 2.7% in general hospital population), half of these draft horses were Belgians, thus SCC was probably related to reduced pigmentation.

What they found:

Neoplasia was confirmed in 45 horses (90%) : SCC in 37, lymphosma in 5 and sarcoma, haemangiosarcoma and adenosarcoma in one horse each. Non-neoplastic lesions included epithelial dysplasia in 2 horses, one of which developed SCC one year later, conjunctivitis in 2 horses and adipose tissue in 1 horse.

Recurrence rate was 19% (7 of 37) in horses with SCC and 20% (1 of 5) in horses with lymphoma and one horse with epithelial dysplasia and 1 horse with sarcoma initially diagnosed. The mean duration before recurrence was 2.25 years (median 1.5 yrs) post excision. Recurrence resulted in euthanasia in 6 of 10 horses. A negative outcome was significantly associated ($p=0.007$) with partial excision of the third eyelid prior to referral.

Type of excision performed at the University hospital was not significantly associated with recurrence ($p=0.21$), neither were positive margins ($p=0.27$) or vascular invasion ($p=0.25$).

Cancer returned in 3 of 19 horses (16%) where no topical therapy was used, in 0 of 5 horses in with mitomycin C was used and 6 of 25 horses (24%) where 5-fluorouracil was used. The use of topical chemotherapeutics was not associated with recurrence ($p=0.3$). However it must be noted that Mitomycin-C performed well in the small group in which it was used. There was no difference in outcome is surgery was performed on a standing sedated horse or on a horse under full GA. Animals with extensive lesions remain candidates for GA.

Take home message

It is the authors opinion that complete removal of the nicititaing membrane should be performed in all cases because of low risks and increased likelihood of removing the entire neoplasm. This view is supported by the finding that partial excision of mass prior to referral had a significant negative effect on outcome. The prolongerd period in which recurrence was seen (< 2yrs) emphasized the importance of long term monitoring.

Wound Repair Techniques: Single Pedicle Advancement Flaps

Consider this skin reconstruction technique in patients with square or rectangular defects. This method is especially advantageous when there is skin available on only one side of a wound.

By Steven F. Swaim, DVM, MS
VETERINARY MEDICINE, Sep 01, 2014

A skin flap is a segment of skin and its underlying connective tissue or panniculus muscle (e.g. cutaneous trunci) that remains attached to a blood supply during its placement into a skin defect. A single pedicle advancement skin flap is a flap that is mobilized by undermining and advancement into a defect without altering the plane of the pedicle.

This technique can be considered for use in repair when there is skin available on only one side of a wound. Basic square or rectangular defects lend themselves well to single pedicle advancement flaps (Figures 1A-1D).

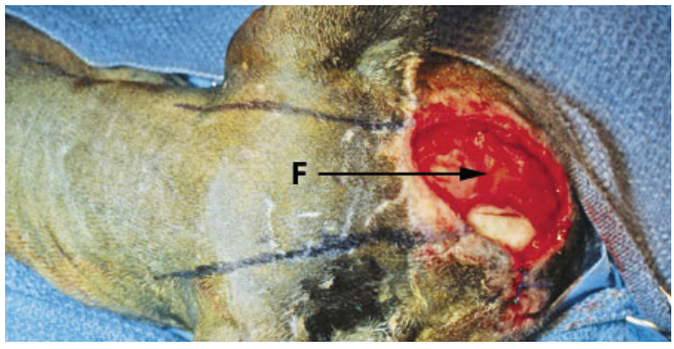
Preoperative wound treatment

A wound should be treated as an open wound until contamination is eliminated, infection is controlled, and nonviable tissue is removed. Examples are a contaminated traumatic wound or an infected wound.

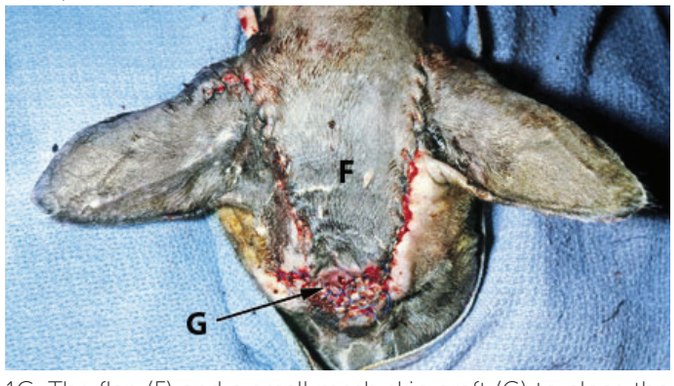
Use staged débridement and lavage. Remove definitely nonviable tissue and debris at each bandage change. Such tissue is white, dark, or not attached and has no blood supply. Leave tissue with questionable viability, and re-evaluate it the following day.

Along with débridement, perform wound lavage by using either physiologic saline solution or a 1:40

1A. A large wound on the rostrodorsal aspect of a cat's head.



1B. A single pedicle advancement flap drawn on the caudal cranial and cranial cervical skin (F) (arrow indicates direction of flap movement).



1C. The flap (F) and a small mesh skin graft (G) to close the rostral-most part of the wound (graft made from dog ear after its removal near the base of the flap).

1D. The healed flap and graft.

dilution of 2% chlorhexidine diacetate or gluconate solution in sterile water at about 7 to 8 psi of pressure. This can be achieved with a 30-ml syringe and 18-ga needle to deliver the solution.

If you think there is need for topical antibacterial medications (e.g. silver sulfadiazine or nitrofurazone), they can be applied to the wound. However, they are not always necessary or indicated.

Although some topical medications can have a negative effect on certain stages of wound healing (e.g. the negative effect of nitrofurazone on epithelialization1), the primary concern at this point is controlling infection. Systemic antibiotics may also be indicated to treat infected wounds.

Wound healing stimulants can also be applied topically. These stimulate the repair process of healing, which includes early appearance of granulation tissue. Stimulants include an acemannan-containing gel (Carravet Acemannan Wound Gel—Carravet), a maltodextrin NF D-glucose polysaccharide (Intracell—MacLeod Pharmaceuticals), and a tripeptide copper complex (Iamin Hydrating Gel Wound Dressing—Folica).

Advantages and disadvantages

Because flaps have the advantage of carrying their blood supply with them to maintain viability, they can be placed over less-than-optimal wound beds, including exposed bone or irradiated tissue. However, if a healthy bed of granulation tissue can be developed over such tissue, additional vascularization can invade the flap from its dermal surface.

The single pedicle advancement flap is the simplest of local flaps to design and create. However, there is more tension associated with this type of flap than other flaps. This should be kept in mind when considering a single pedicle advancement flap in areas such as eyelids where tension could cause distortion of structures. As with other types of reconstructive surgery, this procedure requires creating a wound to correct a wound.

How to perform a single pedicle advancement flap

After anesthetizing the patient, position it so that the wound and a large area of surrounding skin can be clipped and prepared for aseptic surgery. It is better to err in favor of preparing too large of an area rather than too small of an area. If an insufficient area is prepared, unprepared skin may be pulled from under the surgical drapes during wound closure.

To protect the wound from hair clippings and preparation solutions, sterile lubricant (Surgilube—Savage Laboratories) and a protective gauze can be placed over the wound surface. The wound in this demonstration is in the rostral mandibular area of a cadaver.

Step 1

When appropriate, the skin around the wound can be undermined. To determine whether there is sufficient skin to use for a single pedicle advancement flap, evaluate the wound and area around it by measuring the wound:

Also, measure and manipulate the skin adjacent to the wound:

Step 2

With a sterile surgical marker, draw parallel or slightly divergent incision lines on the skin from two adjacent corners of the wound onto skin from which the flap will be created. The edge of the wound between these lines will be the leading edge of the flap. The length of the flap

needs to be to be at least the length of the wound:

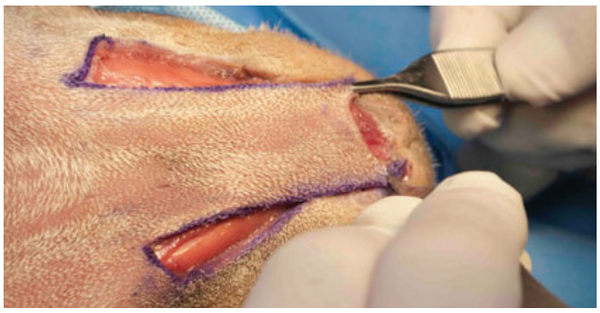
Thus, the initial incision to create the flap are made this lenght. In general these incisions will be lengthened in creating the lfap (see step 4)

Step 3

Make incisions along the drawn lines, and undermine the skin between them such that subcutaneous tissue or any underlying panniculus muscle is retained with the flap. In the presence of a panniculus muscle, undermining should be deep to this muscle to ensure adequate blood supply to the flap. You will notice that the flap undergoes primary contraction because of contraction and relaxation of collagen and elastin fibers in the dermis. The flap shrinks:

Step 4

Grasp the corners of the flap, and place tension on the flap in an attempt to advance it over the wound:



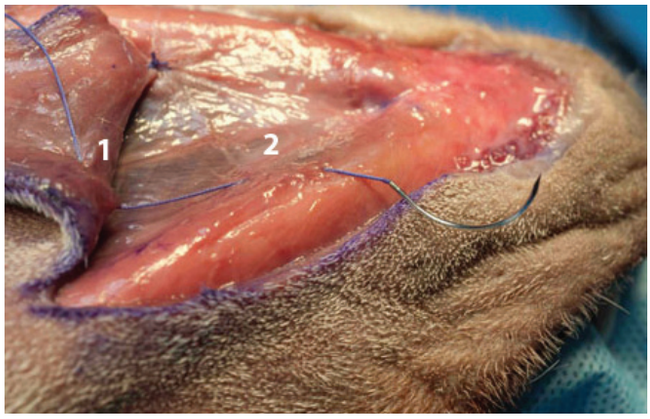
If the flap is long enough, suturing can be done. However, if there is too much tension and the flap will not extend to the furthest edge of the wound, the original incisions can be extended incrementally, combined with undermining, until the flap can be advanced to cover the wound. Keep in mind that as the length of the flap increases, the chance of vascular insufficiency and necrosis of the leading end of the flap increases.

If you want to enhance the blood supply to a flap to help ensure its survival, consider the delaying technique. Incise the flap, but do not transfer it over the wound. Suture it back in its original position and leave it for about three weeks. At this time, reincise it and transfer it to the wound. Initially, the blood supply to the flap decreases, but it increases to 120% to 150% of normal over the three weeks.[2] Thus, 21 days after the initial incision appears to be the optimal time for moving the flap over the wound. The decrease in blood supply at the second incision is much less than after the first incision, resulting in a better chance of flap survival.[2]

Step 5

Advance the flap in place by using walking sutures of 2-0 or 3-0 absorbable sutures (get a step-by-step of this technique at dvm360.com/WalkingSutures). Suturing begins at the base of the flap, with sutures being placed in rows.

Take the first bite of each suture through the subcutaneous or panniculus muscle into the deep part of the dermis, without penetrating the full thickness of the flap skin (see "1" in photo below). Take the second bite rostral to the first bite in the underlying muscle and fascia of the wound bed (see "2" in photo below).



Take care when placing the sutures not to incorporate any large vessels that are supplying the flap. While an assistant surgeon holds the two suture bite areas in apposition, you can tie the suture. The result is advancement of the flap toward the far edge of the wound. After you have placed the necessary number of walking sutures to advance the flap into position, the leading edge of the flap should almost be in contact with the far edge of the wound:

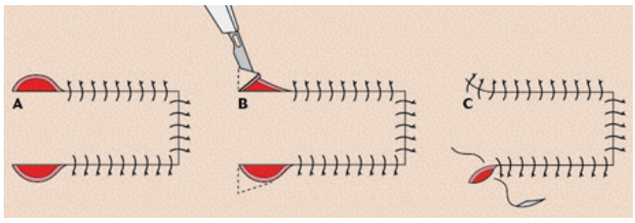
Use walking sutures judiciously, using as few sutures as necessary to advance the flap into position and, thus, helping to avoid any compromised blood supply. There is generally no indication for placing a drain under the flap to avoid serum accumulation. Flap tension and the walking sutures under the flap usually obliterate any dead space in which serum could accumulate.

Step 6

Use simple interrupted sutures of 2-0 or 3-0 non-absorbable monofilament suture material for final apposition of the skin edges. However, depending on the thickness of the subcutaneous or panniculus layers, an additional deeper layer of sutures may be required around the flap edges before the apposition sutures are placed.

The flap is under tension, and the skin on either side of the flap is relaxed. Thus, when the suturing is completed, there will be two "dog ears" in the skin adjacent to the base of the flap (see arrows in the left photo below)

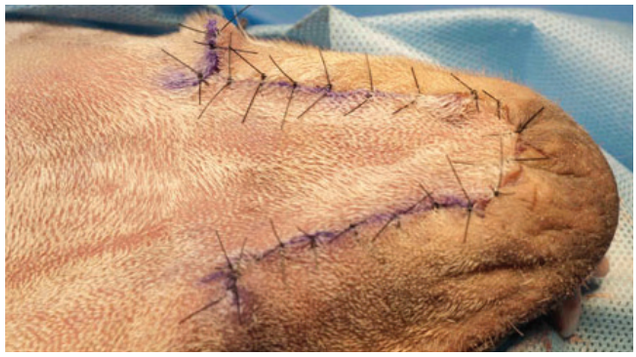
These dog ears can be surgically removed (Figure 2).



If you choose to remove them at this time, it is important to make cuts outside of the base of the flap and not into the base of the flap, which could compromise the flap's blood supply. However, I prefer to suture the edges together and evaluate them in about two weeks to determine whether they need to be surgically corrected:

2. Dog ear removal from the base of a single pedicle advancement flap. (A) The dog ears adjacent to the base of the flap. (B) Incising the dog ear skin. The broken lines indicate incision lines. (C) Closure of the defects after dog ear removal.

If you choose to remove them at this time, it is important to make cuts outside of the base of the flap and not into the base of the flap, which could compromise the flap's blood supply. However, I prefer to suture the edges together and evaluate them in about two weeks to determine whether they need to be surgically corrected.



The dog ears generally regress over this time and do not need correction.

Postoperative care

If there is concern about the animal molesting the surgical area, it can be covered with a bandage if it is in an area amenable to bandaging. A bandage is also indicated if a drain has been placed under a flap. The amount and nature of drainage can be assessed at bandage change. The drain should be removed when drainage has decreased to a small amount, generally in three to four days. If the surgical site is in an area that cannot be bandaged, wound molestation can be prevented by use of an Elizabethan collar.

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Suggested reading

- Pavletic MM. Atlas of small animal wound management and reconstructive surgery. 3rd ed. Ames, Iowa: Wiley-Blackwell, 2010.
- Swaim SF, Henderson RA. Various shaped wounds. In: Small animal wound management. 2nd ed. Baltimore, Md: Williams & Wilkins, 1997;235-274.

Flap design and suturing modifications

Some modifications can be made in flap design and suturing technique that help relieve tension and that can be

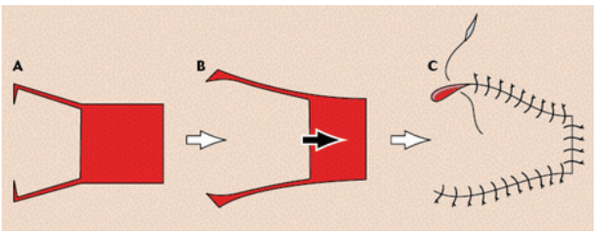
used to move the flap over the wound, respectively.

Designs to help relieve tension

Pantographic expansion.

Pantographic expansion can be used to help get some additional length on the flap and, thus, relieve tension on the flap. Make the sides of the flap slightly divergent to widen the base and ensure that the flap pedicle is not narrowed as it is developed. Small back-cuts can be made from either side into the flap's base.

These open and approach, forming a straight line as the flap is advanced into position, making advancement easier (Figure 3). The longer the back-cuts are made, the easier the flap advances; however, long back-cuts reduce the vascular area at the flap's base. Thus, back-cuts should be made judiciously.

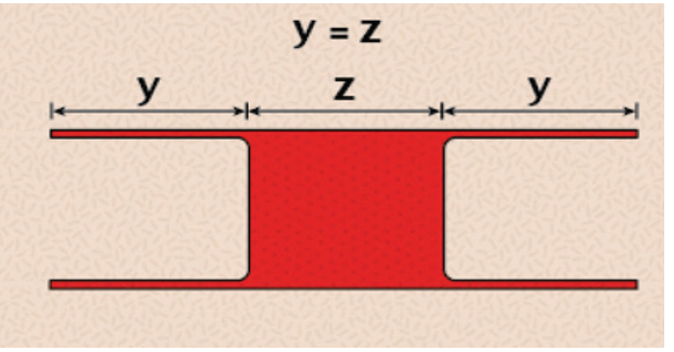


3. Pantographic expansion of a single pedicle advancement flap. (A) The sides of the flap are divergent with back-cuts into the flap's base. (B) As the flap advances, the back-cuts open to approach a straight line. (C) The flap sutured in place.

H-plasty.

H-plasty can be used to reduce the tension that would be present if only one flap were used. With this method, two apposing single pedicle advancement flaps are designed. Each flap covers half of the wound, reducing tension. The technique requires having skin available for reconstruction on two sides of the wound. The resulting suture line as the flaps are sutured together is H-shaped, thus the term H-plasty for the technique.

With this technique, the incisions to create the flaps are made as long as the length of the defect. This helps ensure that the defect closes without tension (Figure 4). If there is any tension at the suture line where the flaps join, some vertical mattress tension sutures can be placed in addition to skin apposition sutures. As an alternative, walking sutures can be used to move the flaps together and overcome tension.



4. H-plasty (a) Each flap is equal in lenght to the width of the defect (Y=Z)

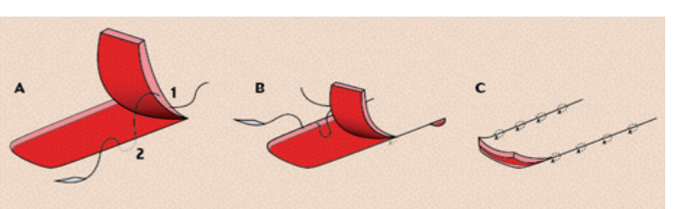
SUTURES TO ADVANCE FLAPS

Modified walking sutures.

When a flap is being advanced to provide coverage over exposed bone, the usual walking suture pattern cannot be used since the second suture bite cannot be taken in bone. Therefore, a modified walking suture can be used to advance the flap into place. This modification can also be used if there is any concern about the first bite of a regular walking suture obstructing the vascularity of a flap.

Beginning at the base of the flap, and using 3-0 absorbable suture, take the first bite intradermally at the edge of the flap and the second bite in an advanced location in the adjacent skin edge. As you tie the suture, you advance a segment of the flap toward the wound. Continue suturing on alternate sides of the flap, gradually advancing the flap over the defect (Figure 5). Final skin apposition is with 3-0 non-absorbable simple interrupted sutures.

With use of the modified walking sutures at the edges of the flap, there may be dead space under the flap. If necessary, a drain can be placed under the flap to allow drainage of any fluid from under the flap.



5. Modified walking sutures to advance a single pedicle advancement flap into position.
(A) The first intradermal bite (1) is in the edge of the flap, and the second intradermal bite (2) is advanced and in the edge of adjacent skin.
(B) The second walking suture being placed in the opposite side of the wound.
(C) Walking sutures have advanced the flap into position.

Get the Most out of Your Laboratory Work

Analyze these pointers about how to not be so routine about this routine form of testing.

By Adam Birkenheuer, DVM, DACVIM, PhD Department of Clinical Sciences College of Veterinary Medicine North Carolina State University Raleigh, NC 27607

You run and review the results of complete blood counts and serum chemistry profiles all the time. But important conclusions may elude you if you rush through your analysis. Here are a few common areas you might overlook.

Have a hypothesis

Always have a hypothesis or prediction about what you will find in the laboratory data. In many ways the laboratory data should be confirmatory, not exploratory. The very best clinicians are thinking two or three steps ahead. Not only do they have a hypothesis about what they will find, they already know what they will do next based on whether or not their hypothesis was correct.

Keep your hypothesis in mind while interpreting the laboratory data. Even if your hypothesis is not true, it helps you understand what you know about your patient and you have important information to communicate to the client.

Don't forget the total protein

Many commercial veterinary laboratories don't include a total protein (or total solids) concentration on a complete blood count (CBC), which makes it difficult to interpret the packed cell volume (PCV) in an anemic animal. I suggest that you determine a PCV and total protein concentration on every sample before you send it to the laboratory.

Run a reticulocyte count

If you follow the advice above and measure a PCV and total protein concentration before you send a sample to the laboratory, you will know to order a reticulocyte count right off the bat.

Another excellent option is reflex testing. This is an option that most commercial laboratories will set up for your hospital. Basically, any CBC you submit that has a PCV below the reference interval (or a PCV value of your choosing) will automatically trigger a reticulocyte count. This may gain you as much as two days' time working up the case. Some reference laboratories already report reticulocyte counts on every CBC.

Never trust a computer

In-hospital analyzers have come a long way since the days of the Coulter counter. But there is no substitute for an experienced technologist or pathologist reviewing your patients' blood smears. In my opinion, on a CBC, an experienced individual should always look at a blood smear in sick patients. In-hospital analyzers can easily miss important clues or even the diagnosis. They can't identify nucleated red blood cells, spherocytes, schistocytes, Babesia species, Cytauxzoon species, Ehrlichia species, bands, immature granulocytes, toxic changes, and much more.

You can train your staff to help in analysis with little effort. You likely send at least one CBC a week to a reference laboratory. Before you send out the sample, have your staff members perform their own white blood cell differential and comment on morphology. When the analysis comes back from the laboratory, make sure you are "giving them a grade" and rewarding good performances, or they won't be invested in getting better. This will be incredibly helpful when you need a sample interpretation immediately.

Get more blood than you think you need

Don't fear the jugular vein (unless a patient has a bleeding disorder). Get an extra EDTA tube and serum in case your empirical treatments don't work. We save every sample for at least seven days. I can;t tell you how many times we have gone back to get a preantibiotic sample for PCR testing or checking something that wasn't on the original laboratory work. It's better to have it and not need it than to need it and not have it.

Don't fear the flow sheet

Take full advantage of technology and critically evaluate laboratory work, especially data collected during wellness evaluations. Trends are often apparent long before your patient shows signs of illness. Decreasing renal function is frequently identified by gradual increases in creatinine concentrations or persistent isosthenuria before it exceeds the reference interval.

Look past the Hs and Ls

Unfortunately, reference intervals can't always tell the entire story. Many reference intervals are created using apparently healthy pets that can have subclinical disease. Some values tend to have wide reference intervals. Examples include serum albumin, globulin, and creatinine concentrations:

- Many albumin reference intervals include values below 30g/L and over 40 g/L. Any albumin concentration below 30 g/L raises a red flag for me and prompts a search for decreased production or loss.
- Globulin intervals are often even wider, and panhypoproteinemia is often missed because the low end of the reference interval is ≤ 20g/L. Any globulin concentration ≥ 36 g/L might indicate an inflammatory or even a neoplastic process.
- Never ignore a high normal or mildly increased creatinine concentration since you have to lose 75% of kidney function before creatinine becomes elevated.

Troublesome reference intervals on a CBC include hematocrit/PCV and platelet counts. When I see a PCV toward the lower end of the reference interval, I think hard about decreased production, destruction, or loss of red blood cells. Some platelet count reference intervals dip below 200,000/µl. Platelet counts ≤ 200,000/µl always raise a red flag for me.

Don't forget the urinalysis

A complete urinalysis can hold a treasure trove of information. A dipstick and specific gravity are great, but sick animals should always have a sediment examination. The urinary tract is a frequent source of inflammation or infection, and the kidneys are common bystanders that can be injured in times of crisis. Examining an air-dried modified Wright's-stained urine sediment increases both sensitivity and specificity of bacterial identification.

Idea Exchange

Reduce fecal fumes with a compost bin

Is your veterinary team's nose out of joint over the aroma of your waiting fecal samples? Here's help.

By dvm360.com staff, Oct 01, 2014.

Our lab area can get pretty stinky when fecal samples sit out on the counter, waiting to be read or to be packaged for the off-site laboratory. So when we know there is going to be a delay between receiving the sample and being able to process it, we place the well-labeled sample into a compost bin with a built-in charcoal filter. The bin sits at a specific place on the counter when empty and is moved next to the microscope when it has a sample in it, so the technician knows to process it. Adding this step to our fecal sample processing routine has substantially cut down on bad smells in the lab area.

The staff at Arbor Animal Hospital
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Doxycycline

So Much More Than Ehrlichia Treatment

Dr OJ Botha (BVSc), VetsBrands

Introduction

Doxycycline is a derivative of Oxytetracycline. By removing the 6-hydroxyl group the unique 6-deoxytetracyclines were synthesized. Doxycycline has unique pharmacokinetic properties and a far wider antibacterial activity when compared to the parent molecule. (Stephens CR et al)

Doxycycline was first registered in 1967 the by the FDA by Pfizer under the trade name Vibramycin (U.S. National Library of Medicine). As such it is one of the older antibiotics. It is however still on the world health organization's list of essential medicines.(WHO Model List of Essential Medicines). Doxycycline is used primarily in Veterinary science as a treatment for *Ehrlichia canis* and other Rickettsia diseases.

Veterinarians tend to be less aware of the other specific indications for the use of Doxycycline. In this lecture the author will attempt to give a thorough review of the judicious use of Doxycycline in dogs and cats.

Chemistry

Doxycycline may be synthesized by many different processes. It is isolated as a solvated hydrochloride salt and has a molecular weight of 513.

Two salts are used in the oral dosage form. Doxycycline hydrochloride (abbreviated as hyclate) is the salt that is used in capsules, tablets and injectables whilst Doxycycline monohydrate is used in oral suspensions.

Mechanism of action

Tetracycline's are classified as bacteriostatic antibiotics and exert there antibacterial action by inhibition of bacterial protein synthesis primarily on the 70S ribosomes. They have to penetrate the bacterial cell wall to exert their bacteriostatic action. Resistance develops when there is alteration to the bacterial ribosome or when there is a plasmid that decreases tetracycline uptake by bacterial cell walls.

Pharmacokinetics

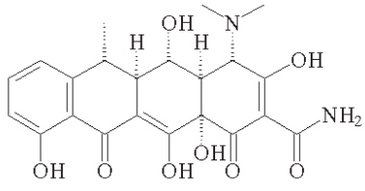
Absorption:

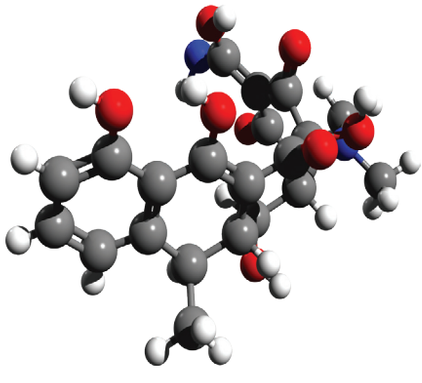
Doxycycline is far more completely absorbed and more slowly excreted than other tetracycline's. (Huber WG). Doxycycline has a serum half-life of 10,36 hours when administered intravenously at 5 mg/kg (Wilson RC et al). Riond and co-workers proved that cats have a shorter serum half-life than dogs possibly due to more extensive protein binding of Doxycycline in cats.(Riond et al). A dosage. Van Gool and coworkers concluded that "

It is concluded that a dosage of 10 mg/kg/day of doxycycline is required to obtain effective plasma concentrations in dogs and cats for 24 hours, when this dose is administered once daily" (Van Gool et al).Absorption of doxycycline is not affected by the concomitant intake of food or even milk. (Saux Mc et al) (Huber WC). When dosing sucralfate in dogs it is recommended that the suspension be used and that administration of Doxycycline not be done for at least two hours of dosing Sucralfate. (Kukanich K, Kukanich B).

Metabolism:

Tetracycline's undergo varying degrees of metabolism after reversible binding to plasma proteins. They are metabolized by the liver and high concentrations are excreted via the bile. Very little urinary excretion





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takes place and subsequently tetracycline's do not accumulate in the blood stream when kidney function is compromised. Doxycycline is excreted in the feces as an inactive conjugate or chelate and as such has little effect on the micro flora of the GIT. (Huber WG) (Gilman AG, Goodman A, Goodman LS) Rashid et al proved conclusively that long term low dose treatment with Doxycycline had no effect on the normal flora of the GIT or oropharynx.(Rashid et al). during another trial where human patients were dosed at low dose Doxycycline treatment for as long 9 months no effect on normal intestinal flora was found.(Walker C). It may thus be concluded that Doxycycline is an extremely safe antibiotic even when used for extended periods of time.

Distribution:
Doxycycline attains high tissue levels in the liver, spleen, lung and kidney. (Huber WG). Therapeutic levels of Doxycycline is also reached in difficult to treat organs such as the prostate , sinus cavities and the aqueous humor. (Cunha BA et al), (Mathisen W et al). Excellent tissue levels of Doxycycline is found in skin and soft tissue as result of the superior tissue penetration of Doxycycline as result of its high lipid solubility. (Cunha et al)

Excretion:
Doxycycline is excreted primarily in the feces via biliary excretion. When excreted in the feces it is however excreted as an inactive conjugate and chelate and thus has far less effect on the intestinal micro flora. (Huber WG), (Walker C).

Side effects
In a retrospective study on the side effects reported in 386 dogs treated with Doxycycline vomition was reported in 18.3 per cent of dogs, 7.0 per cent developed diarrhoea and 2.5 per cent developed anorexia. (Schulz BS et al). Vomition after ingestion of Doxycycline is caused by a chemical esophagitis in the middle to distal third of the oesophagus as result of capsule adhesion and disintegration in the oesophagus. (Dag MS et al). Cats are particularly sensitive to doxycycline induced esophagitis and in many cases this may lead to oesophageal strictures (Frowde PE).

Doxycycline does not cause tooth staining in children (VolovitzB et al) and this observation is mirrored in the treatment of very young puppies and kittens treated routinely for more than a decade with Doxycycline in a large small-animal practice (Botha OJ)

Toxicity
Doxycycline is an extremely safe antimicrobial with an LD50 of 1700 mg/kg in the rat. Aside from the side effects reported above no reports of acute toxicity in small animals could be found. In a single report of a dog that developed severe gastric ulceration and renal failure post Doxycycline treatment it is mentioned that the dog was initially treated intravenously for 7 days with Tetracycline that is known to cause renotoxicity. (Banga HS et al).

The gastric ulceration reported in this case may be ascribed to the Tetracycline and other concomitant treatment and not to the Doxycycline treatment.

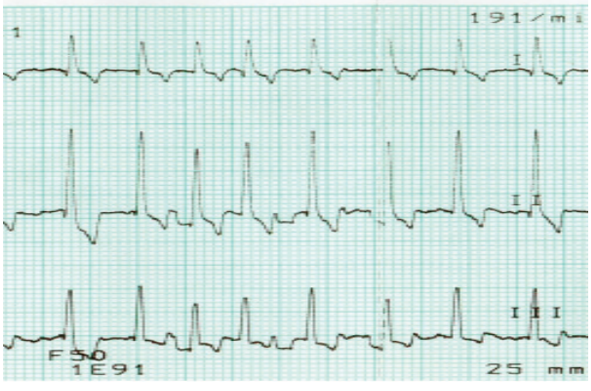
To be continued – Next issue will discuss Antimicrobial indications of Doxycycline. References will be publshed in the last section. Full article available on Vet360 App or http://vet360.vetlink.co.za/

INTERESTING E C G

By Russel J Leadsom BVSc CertVC MRCVS

Signalment and history
Sasha is a 6year old female German shepherd dog, she presented in a collapsed state with a history of developing excessive panting and coughing over the previous month. The owner had also noted a progressive loss of exercise tolerance.

Interpretation
Atrial Fibrillation (AF).
Note the totally irregular rhythm of the ventricular QRS complexes, together with the absence of any (atrial) P waves. AF is commonly associated with diseases that cause atrial enlargement such as mitral and tricuspid valve disease, and cardiomyopathies. Echocardiography confirmed Dilated Cardiomyopathy, and she was treated with standard therapy of frusemide, benazapril, pimobendan, and spironolactone.



Digoxin was introduced to reduce the ventricular response rate – it is important to reduce the resting rate to below 160bpm to minimise further myocardial damage and failure.

She survived a further 15 months.

Veterinarians should alert clients to the top 5 toxins in companion birds

These common household items could put your clients' pets at risk of illness - or even death.

By Brynne Stumpe and Ahna Brutlag, DVM, MS, DABT, DABVT
Jun 30, 2014, DVM360 MAGAZINE

Toxins can be a serious problem in companion birds due to several factors, including their size, efficient respiratory system and curious nature. In addition, many pet owners are unaware that certain substances can be toxic to their birds. The following is Pet Poison Helpline's list of the five most common toxins to be aware of for these pets.

Lead

Lead poisoning has historically been the most common metal poisoning in caged birds, but due to increased knowledge of the human health problems caused by lead, its use in the home has significantly decreased.

Sources

- Lead-based paint
- Foil wrap on some champagne and wine bottles
- Curtain weights
- Bells with lead clappers
- Imported bird toys
- Stained glass.

Clinical signs

- Depression
- Weakness
- Anorexia
- Weight loss
- Vomiting or regurgitation
- Polyuria and polydipsia
- Seizures
- Hemoglobinuria
- Diarrhea.

Clinical pathology findings

- Heterophilia
- Hypochromic regenerative anemia
- Cytoplasmic vacuolization of RBCs
- Increases in hepatic enzymes (lactate dehydrogenase [LDH], aspartate transaminase [AST]), muscle enzymes (creatine phosphokinase [CPK]) and uric acid (indicator of renal function).

Diagnosis

- History
- Clinical signs
- Clinical pathology
- Blood lead concentration
- Evidence of radiopaque material in the gastrointestinal (GI) tract.

Treatment

- Remove lead object via crop lavage, cathartics or

endoscopy.
- Perform chelation therapy with succimer or calcium EDTA.

Public health considerations
Pets have long served as sentinels for lead poisoning in people, especially children. If a bird or any pet in the home is diagnosed with lead poisoning, always recommend that people in the home—especially the children—be tested too.

Zinc
Zinc poisoning is now the most common metal poisoning in caged birds and occurs after ingestion of zinc-containing items.

Sources
- Galvanized products, such as wire cages, mesh, staples, nails and toys. (Galvanization is the process of coating a metal with an alloy containing more than 98 percent zinc. This is done to protect the metal against rusting.)
- Fertilizers
- Some paints
- Zinc pyrithione shampoos
- Zinc oxide
- Pennies minted after 1982.

Clinical signs
- Similar to those seen with lead poisoning, but hemoglobinuria has not been reported.

Clinical pathology findings
Blood samples should be collected in royal-blue-top tubes to avoid zinc contamination leaching into the sample.
- Elevated zinc concentrations may be found in serum, plasma or tissues.

Diagnosis
- History
- Clinical signs
- Radiographs
- Clinical pathology.

Treatment
- Removal of zinc from GI tract is typically sufficient, provided the animal is still relatively stable. If the zinc cannot be removed promptly, chelation with calcium EDTA can be performed.

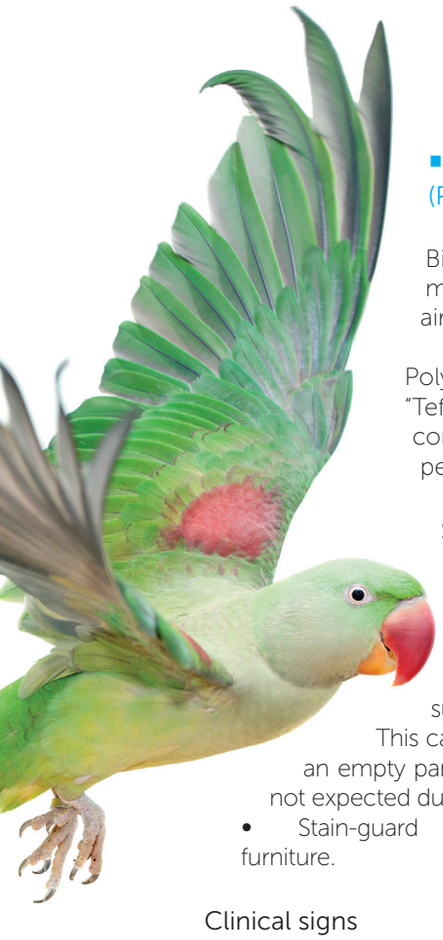
Avocado
All owners of caged birds must be advised never to feed avocado, as it is extremely poisonous and can result in sudden death. Clinical signs are believed to be caused by the compound persin, which is found in all parts of avocados in the Persea genus (the most available genus for human consumption) and in the leaves and bark of their trees.

Clinical signs
- Agitation
- Feather-pulling
- Lethargy
- Food refusal or anorexia
- Dyspnea
- Pericardial effusion
- Pleural and hepatic congestion
- Death.

Diagnosis
- History
- Clinical signs.

Treatment
- No antidote exists. Supportive care includes oxygen, fluids, sedatives and removal of avocado from the crop or proventriculus with lavage and activated charcoal.

Lethal doses
The lethal dose in budgerigars is 3.5 g in an average 35g bird. The lethal dose in cockatiels is 20 to 30g in an average 80 to 100g bird.



■ Polytetra-luoroethylene (PTFE) or "Teflon toxicity"

Birds' unique respiratory system makes them more sensitive to airborne toxins than mammals

Polytetra-fluoroethylene (PTFE) or "Teflon toxicity"is one of the most common airborne poisonings in pet birds.

Sources

- Nonstick surfaces on Teflon cookware, drip pans, heat lamp covers, irons and ironing board covers. Toxic particulates and gases are produced when the surface is heated to 280 C (536 F). This can occur when a pan boils dry or an empty pan is heated on high (poisoning is not expected during routine cooking).
- Stain-guard treatments for upholstered furniture.

Clinical signs

- Acute death due to respiratory failure
- Dyspnea, ataxia, depression or anxious behavior in cases of mild exposure.

Diagnosis

- History
- Clinical signs
- Pathologic lesions (fluid- and blood-filled lungs).

Treatment

- No antidote exists. Supportive care includes oxygen, anti-inflammatory drugs, diuretics, analgesics, bronchodilators, antibiotics and topical ophthalmic ointment (if ocular irritation has occurred). Prognosis is guarded to poor.

OTHER INHALED TOXINS

Birds have a very efficient system for gas exchange. Compared to mammals, more oxygen is transferred into the blood with each breath. Unfortunately, this means more toxins are also transferred into the bird with each breath, making them more sensitive to harm from inhaled toxins. This is the reason canaries were historically used in coal mines to warn of the presence of carbon monoxide and other noxious gases.

Sources

The following can all be harmful when they are found or used in close proximity to birds. However, with appropriate ventilation and use, these substances may not be toxic.

- Carbon monoxide and other harmful gases
- Smoke from tobacco products
- Fumes from new carpets and furniture
- Air fresheners and scented candles
- Paints
- Glues
- Household cleaning products
- Mothballs
- Hair spray and nail polish.

Clinical signs

Signs are variable based on source and level of exposure.

- Acute death
- Dyspnea
- Ocular and nasal passage irritation
- Possible immunosuppression.

Diagnosis

- History
- Clinical signs.

Treatment

- Similar to the treatment for PTFE toxicosis.

HOW TO PROTECT COMPANION BIRDS

When using products that give off strong fumes, it's best to move the bird to a separate room in the home and open windows to ensure plenty of ventilation. Place a towel under the door of the bird's room to help reduce exposure to fumes. When painting walls in a home, use VOC (volatile organic compound)-free paints. Alternatively, consider boarding birds off-site during construction, remodeling or intense whole-house cleaning until odors have dissipated.

Brynne Stumpe is a 2015 DVM candidate at the University of Minnesota College of Veterinary Medicine and an extern at Pet Poison Helpline. Dr. Brutlag is the assistant director of veterinary services with SafetyCall International and Pet Poison Helpline.

FOR FURTHER READING

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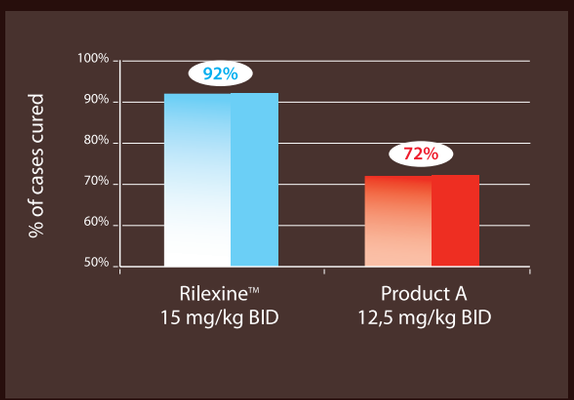

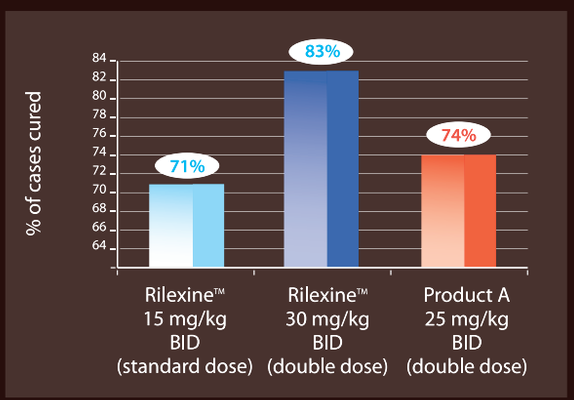

Reference1: Gauguère E. et al. Proceedings of the 3rd World Congress of Veterinary Dermatology, Edinburgh, 1996.

Reference2: S4 Rilexine™ 75 Palatable Tablets – Reg. No. A04/21.9/02. Each tablet contains Cephalexin monohydrate equivalent to 75 mg Cephalexin. S4 Rilexine™ 300 Palatable Tablets – Reg. No. A04/21.9/03. Each tablet contains Cephalexin monohydrate equivalent to 300 mg Cephalexin. S4 Rilexine™ 600 Palatable Tablets – Reg. No. A04/21.9/04. Each tablet contains Cephalexin monohydrate equivalent to 600 mg Cephalexin. For full product information refer to pakage insert.

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