

VET

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The Monthly Magazine of the SOUTH AFRICAN VETERINARY ASSOCIATION
Die Maandblad van die SUID-AFRIKAANSE VETERINÊRE VERENIGING



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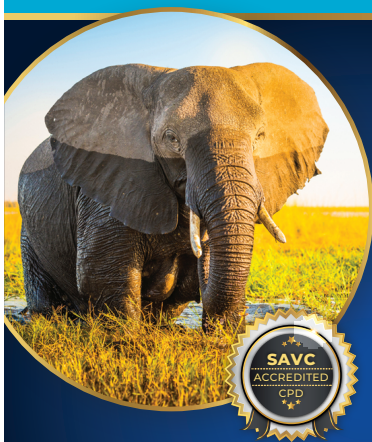
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SAAVT Biennial Congress

30 September - 01 October
Venue: Krystal Beach Hotel – Gordon's Bay
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From the President

Dear members,

What a year!

I trust that members have had a fruitful year, and as we approach the close of 2025, may we all find renewed purpose and pride in the vital role we play in society. This season in the life of our profession reminds us that veterinary service in South Africa is both a privilege and a profound responsibility. Each month brings new challenges and opportunities, and with them, renewed appreciation for the contribution veterinarians make in safeguarding animal health, public health, food security, and the trust our society places in us.

Over the past month, several important engagements took place, including the SAVA Annual General Meeting. At the AGM, the SAVA financial statements were formally presented, and more importantly, SAVA received a clean audit opinion. My sincere thanks go to the team from our accounting firm who worked tirelessly to ensure that all required information was provided to the auditors within the agreed timeframes. Receiving a clean audit report affirms our commitment to transparency, accountability, and sound governance — principles that remain central to the confidence our members place in both the SAVA Board and the Association.

We also welcomed new members to the SAVA Board:

- Dr Melvyn Greenberg, President-Elect
- Dr David Pretorius, Finance Director
- Dr Jana Prinsloo, Elected Member
- Dr Didi Claassen, Elected Member
- Dr Erik Verreyne, Elected Member

I extend my warmest congratulations to each of them and look forward to the leadership, insight, and energy they will bring. At the same time, we express deep gratitude to our outgoing members — Dr Jono Savadier, Dr Tom Spencer, Maryke Badenhorst, and Dr Paul van der Merwe. It has truly been a pleasure serving alongside you. Your dedication, wisdom, and commitment have strengthened the Association in immeasurable ways.

Notably, certain amendments to the Memorandum of Incorporation (Moi) of the Association were adopted, while others require further engagement. These will be discussed and refined for presentation either at a Special General Meeting or at the next AGM. The relationship between SAVA, its Special Interest Groups, and its branches once again came into strong focus, a reminder of the importance of cohesion, clarity, and collaboration within our organisational structures.

I must share, however, that it has come to my attention that some groups and branches have recently used the SAVA letterhead in communications on matters that were neither discussed with nor endorsed by the SAVA leadership. This practice undermines the democratic processes, accountability structures, and the spirit of openness and governance-conscious leadership on which SAVA is built. I wish to gently but firmly remind all structures that the SAVA letterhead represents the official position of the Association, and its use must reflect duly authorised communication channels and decisions.

That said, we continue to battle a protracted Foot-and-Mouth Disease (FMD) outbreak, which has placed immense pressure on veterinarians, farmers, and provincial veterinary services alike.

The recent press statement issued by the Minister of Agriculture signals a significant policy shift, endorsing mass vaccination of cattle beginning in the affected provinces: North West, KwaZulu-Natal, Free State, Gauteng, and Mpumalanga.

As SAVA, we welcome the ongoing evaluation of national disease-management policy and trust that the weeks ahead will bring further engagement and clarity on the pathway South Africa will adopt regarding FMD control.



It remains our hope that this direction will align with the WOAHP Progressive Control Pathway for FMD, ensuring an evidence-based, sustainable, and internationally credible approach that focuses on enabling industry growth and sustainable enterprises for both the commercial and emerging sector.

Rabies also remains a serious scourge in our country, continuing to claim preventable human and animal lives. Let us continue to encourage our clients, communities, and the broader public to adhere to essential control measures — most importantly the vaccination of pets, early reporting of suspicious cases; and rapid response to potential exposures. The recent detection of rabies in Cape Fur seal populations remains a major concern, highlighting the evolving nature of this disease and reinforcing the need for sustained surveillance, intersectoral collaboration, and strong public awareness.

This issue of Vetnews places special focus on small animals, spotlighting the critical work being undertaken across companion-animal practice, community outreach, and welfare organisations. Small-animal clinicians play an indispensable role in strengthening the bond between people and their animals, improving public health, and contributing to the broader One Health agenda. Their work is often deeply personal, profoundly impactful, and at the heart of many communities — and we are proud to highlight their contributions in this edition.

I would like to extend my sincere appreciation to the SAVA personnel. Your professionalism, resilience, and commitment have carried the Association through an exceptionally busy and demanding year. Despite the challenges of recent years, you have continued to serve our members with dedication and excellence. Thank you for your hard work, patience, and unwavering support to the Board and the broader profession.

I would also like to thank the Pig Veterinary Society leadership for their generous donation of an overhead projector for the SAVA Boardroom — a gesture that is sincerely appreciated.

As we approach the festive season, I wish all our members, partners, and their families a peaceful and restorative holiday period. May it bring rest, joy, and meaningful time with loved ones.

May the close of 2025 be marked with gratitude, and may 2026 greet us with strength, clarity, and shared purpose. **V**

Groetnis!
Ziyanda

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This month's Vetnews' has a very exciting article on the midterm results of the resiliency program presented by The Lincoln Institute Of Veterinary Business from Australia. Late last year, 65 participants were recruited from SAVA members. In February the program kicked off with weekly assignments and deep-dive sessions every three months. This month the halfway point results were received. The program focusses on the development of veterinary soft skills. It aims to enable the veterinarian to firstly care for him/herself, better the relationship with colleagues and to better the relationship with clients.

Editor's notes / Redakteurs notas

Have a look at the great feedback from some of the participants and what the statistics are showing.

Further, find an interview with Dr (Prof) Cindy Otto. Prof Otto was one of the veterinarians at Ground Zero after the 911 attacks in America. Subsequently she started up a working dog training and treatment centre in Pennsylvania. It is fascinating to read the work she has done and the rewards she has achieved.

We have a look at the AMR profile of *S. pseudintermedius* isolated in dogs with Otitis Externa and Healthy dogs, as well as the role of mobile apps in Veterinary Medicine.

December is a time of celebration for most. But there will always be the veterinarian, the nurse, the technician, the kennel hand, the receptionist and related personnel that will keep the ship afloat. We see you, we salute you. We honour your dedication. For the rest of us who will be enjoying some time off, going away or staying home, being alone or entertaining friends or family, please drive safely, enjoy your time off and be mindful of yourself and others.

May you enjoy your Christmas time!

Andriette 



Death leaves a heartache no one can heal, love leaves a memory no one can steal.

Maria Elizabeth (Elize) Nicholas
06 Maart 1950 – 30 November 2025

May her soul rest in peace.



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SCIENCE DOES MORE

Antimicrobial Resistance Profile of *Staphylococcus pseudintermedius* Isolated from Dogs with Otitis Externa and Healthy Dogs: Veterinary and Zoonotic Implications

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Abstract

Background/Objectives: *Staphylococcus pseudintermedius* (*S. pseudintermedius*) is an opportunistic pathogen frequently isolated from dogs, involved in a wide range of infections, particularly otitis externa. Increasing antimicrobial resistance (AMR), including methicillin-resistant *S. pseudintermedius* (MRSP), poses significant challenges for veterinary and potentially human health. This study aimed to assess the prevalence and antimicrobial resistance profiles of *S. pseudintermedius* in dogs with otitis externa compared to clinically healthy dogs.

Methods: Between 2022 and 2025, samples were collected from 400 dogs with otitis externa and 360 healthy dogs in veterinary clinics from Timisoara. Ear swabs were processed by conventional microbiological techniques and confirmed using MALDI-TOF MS. Antimicrobial susceptibility was tested using the VITEK[®] 2 Compact system, following CLSI VET01, Fifth Edition (2018) standards. Fourteen antimicrobials from 11 classes were evaluated.

Results: *S. pseudintermedius* was isolated in 40% of dogs with otitis externa and in 21.1% of healthy dogs. The highest resistance in both groups was observed to tetracycline (37.5% and 25%, respectively). No resistance was recorded to linezolid, vancomycin, teicoplanin, tigecycline, or fusidic acid. MRSP strains were identified in 1.2% of dogs with otitis, displaying multidrug resistance (MDR). MDR strains were also detected in 8.7% of diseased and 4% of healthy dogs, indicating the potential for subclinical reservoirs.

Conclusions: The findings highlight the notable prevalence and AMR of *S. pseudintermedius* in both symptomatic and asymptomatic dogs. The detection of MRSP and MDR strains emphasises the need for prudent antibiotic use and continuous AMR surveillance in veterinary medicine to mitigate zoonotic risks and preserve antimicrobial efficacy.

1. Introduction

S. pseudintermedius, an opportunistic pathogen, is commonly isolated from clinically healthy dogs and is notably involved in a wide spectrum of animal infections [1]. This bacterium can colonise between 46% and 92% of healthy dogs [2]. *S. pseudintermedius*

is recognised as a key pathogen in dogs, has also occasionally been linked to cases of human infection [3,4], while it also plays a significant role in infections among cats [4]. The growing identification of *S. pseudintermedius* isolated from canine cases of otitis externa and soft tissue or skin infections represents a rising concern in the veterinary field, primarily due to its considerable resistance to antimicrobials and a broad range of virulence factors [5]. Antimicrobial resistance (AMR) has become a major global health issue, widely recognised as one of the most critical threats of this century, with implications for both human and animal health [6–9]. In recent years, there has been an observed increase in the frequency of methicillin-resistant *S. pseudintermedius* (MRSP) strains, both in sick dogs and in clinically healthy ones [10]. The spread of MRSP has come to represent a major issue in veterinary practice [11].

MRSP resistance is determined by the presence of the *mecA* gene, integrated into a mobile genetic element known as the staphylococcal chromosomal cassette *mec* (SCC*mec*). This gene confers resistance to most beta-lactam antibiotics, except for ceftaroline and ceftobiprole, which are part of the fifth generation of cephalosporins [11,12]. The *mecA* gene encodes a structurally altered penicillin-binding protein with low affinity for nearly all beta-lactam antibiotics [10,13]. Consequently, these antibiotics no longer represent a barrier to bacterial cell wall synthesis, unlike under normal circumstances when beta-lactams bind to the penicillin-binding protein and thereby inhibit the bacterium's ability to construct its cell wall [13].

In addition, the SCC*mec* acquired by MRSP is a mobile genetic element [10–13] that may also carry other resistance genes, contributing, along with other mobile genetic elements, to multidrug resistance patterns (MDR) [12]. Resistance of MRSP strains has also often been observed within other classes of antimicrobials, namely: aminoglycosides, fluoroquinolones, macrolides [11,12], trimethoprim–sulfamethoxazole, lincosamides, tetracyclines, and chloramphenicol [12].

S. pseudintermedius can be transmitted to humans, particularly those in close contact with dogs, potentially causing zoonotic infections such as abscesses, infected bite wounds, pneumonia, bloodstream infections, and septic arthritis [10]. Consequently, MRSP has become an increasingly significant concern in veterinary as well as human medicine, due to the limited treatment options available [14].

The objectives of this study were to determine the prevalence of *S. pseudintermedius* in dogs with otitis externa compared to clinically healthy dogs, to characterise the antimicrobial resistance profiles of the isolates against both veterinary and human-use antibiotics, to identify MRSP and MDR strains, and to assess their potential zoonotic implications. These aims were designed to provide a clearer understanding of the epidemiological role of *S. pseudintermedius* in canine populations and to support strategies for prudent antimicrobial use in veterinary medicine.

2. Results

2.1 Prevalence of *S. pseudintermedius* Isolated from Dogs with Otitis Externa and from the Ears of Healthy Dogs. Out of 400 samples collected from dogs diagnosed with otitis externa, *S. pseudintermedius* was isolated in 160 cases, representing a prevalence rate of 40%. From the ears of clinically healthy dogs, the bacterium was identified in 76 out of 360 samples, corresponding to a prevalence of 21.1%.

2.2 Antimicrobial Resistance of *S. pseudintermedius* Strains Isolated from Dogs with Otitis Externa. Among dogs with otitis externa, *S. pseudintermedius* showed the highest resistance to tetracycline (37.5%, n = 60). No resistance was observed to linezolid, teicoplanin, vancomycin, fusidic acid, and tigecycline, with 100% susceptibility (n = 160) (Table 1).

Antimicrobial Class	Antimicrobial	Number of Strains Tested	Susceptible, n (%)	Resistant, n (%)
Beta-lactams	Penicillin	160	123 (80.3)	37 (19.7)
	Oxacillin	160	158 (98.7)	2 (1.3)
Aminoglycosides	Gentamicin	160	158 (98.7)	2 (1.3)
Tetracyclines	Tetracycline	160	100 (62.5)	60 (37.5)
Fluoroquinolones	Ciprofloxacin	160	158 (98.7)	2 (1.3)
	Moxifloxacin	160	158 (98.7)	2 (1.3)
Macrolides	Erythromycin	160	158 (98.7)	2 (1.3)
Lincosamides	Clindamycin	160	125 (78.1)	35 (21.9)
Oxazolidinones	Linezolid	160	160 (100)	0 (0)
Glycopeptides	Teicoplanin	160	160 (100)	0 (0)
	Vancomycin	160	160 (100)	0 (0)
Fusidans	Fusidic acid	160	160 (100)	0 (0)
Glycylcyclines	Tigecycline	160	160 (100)	0 (0)
Sulfonamides + Pyrimidines	Trimethoprim + Sulfamethoxazole	160	154 (96.2)	6 (3.8)

Table 1. Antimicrobial resistance of *S. pseudintermedius* strains isolated from dogs with otitis externa

2.3 Antimicrobial Resistance of *S. pseudintermedius* Strains Isolated from the Ears of Healthy Dogs. Additionally, *S. pseudintermedius* isolated from samples collected from the ears of healthy dogs exhibited the highest resistance to tetracycline as well, at a rate of 25% (n = 19) (Table 2).

Antimicrobial Class	Antimicrobial	Number of Strains Tested	Susceptible, n (%)	Resistant, n (%)
Beta-lactams	Penicillin	76	61 (80.3)	15 (19.7)
	Oxacillin	76	76 (100)	0 (0)
Aminoglycosides	Gentamicin	76	76 (100)	0 (0)
Tetracyclines	Tetracycline	76	57 (75)	19 (25)
Fluoroquinolones	Ciprofloxacin	76	76 (100)	0 (0)
	Moxifloxacin	76	76 (100)	0 (0)
Macrolides	Erythromycin	76	76 (100)	0 (0)
Lincosamides	Clindamycin	76	59 (77.6)	17 (22.4)
Oxazolidinones	Linezolid	76	76 (100)	0 (0)
Glycopeptides	Teicoplanin	76	76 (100)	0 (0)
	Vancomycin	76	76 (100)	0 (0)
Fusidans	Fusidic acid	76	76 (100)	0 (0)
Glycylcyclines	Tigecycline	76	76 (100)	0 (0)
Sulfonamides + Pyrimidines	Trimethoprim + Sulfamethoxazole	76	76 (100)	0 (0)

Table 2. Antimicrobial resistance of *S. pseudintermedius* strains isolated from the ears of healthy dogs

Leading Article

Antimicrobial Resistance Profile of *Staphylococcus pseudintermedius* <<< 7

Analysis by antimicrobial class revealed that the most frequent resistance in both groups occurred within the tetracycline class. In isolates from dogs with otitis externa, 37.5% were resistant to tetracyclines, 23.1% to β -lactams, and 21.9% to lincosamides. In isolates from the ears of healthy dogs, the corresponding resistance rates were 25%, 19.7%, and 22.4%, respectively. All isolates were fully susceptible to glycopeptides, oxazolidinones, fusidanes, and glycolcyclines (Table 2).

2.4 Distribution of MDR and MRSP Strains. Regarding MDR, 14 strains (8.7%) were isolated from samples collected from dogs with otitis externa (Table 3), while 3 strains (4%) were isolated from samples taken from the ears of healthy dogs (Table 4).

Antimicrobial Resistance	Number of Strains and Percentage
Susceptible to all tested antimicrobials	61 (38.1%)
PEN	14 (8.8%)
TET	37 (23.1%)
CLI	25 (15.6%)
TET + PEN	9 (5.6%)
PEN + TET + CLI	8 (5%)
PEN + TET + SXT	4 (2.5%)
PEN + OXA + GEN + TET + CIP + MXF + ERY + CLI + SXT	2 (1.2%)

Table 3: Antimicrobial resistance profiles of *S. pseudintermedius* strains isolated from dogs with otitis externa (distribution according to the resistance profile of each strain)

Legend: PEN—penicillin; OXA—oxacillin; GEN—gentamicin; TET—tetracycline; CIP—ciprofloxacin; MXF—moxifloxacin; ERY—erythromycin; CLI—clindamycin; SXT—trimethoprim + sulfamethoxazole.

Antimicrobial Resistance	Number of Strains and Percentage
Susceptible to all tested antimicrobials	31 (40.8%)
CLI	14 (18.4%)
TET	16 (21.1%)
PEN	12 (15.8%)
PEN + TET + CLI	3 (4%)

Table 4. Antimicrobial resistance of *S. pseudintermedius* strains isolated from the ears of healthy dogs (distribution based on resistance profile of each isolate)

Legend: PEN—penicillin; CLI—clindamycin; TET—tetracycline.

Additionally, two MRSP strains (1.2%) were isolated from samples collected from dogs with otitis externa (Table 3). Regarding the MRSP strains, in addition to resistance to β -lactam antibiotics, they also exhibited resistance to antimicrobials from the following classes: aminoglycosides, tetracyclines, fluoroquinolones, macrolides, lincosamides, and sulfonamides + pyrimidines (Table 3). A comparative statistical analysis of *S. pseudintermedius* prevalence and antimicrobial resistance between isolates from dogs with otitis externa and those from clinically healthy dogs is presented below (Table 5). This analysis includes *p*-values, false discovery rate (FDR)-adjusted *q*-values, risk differences (RD), and relative risks (RR) with 95% confidence intervals, providing an inferential assessment of the significance and magnitude of the observed differences.

Antimicrobial/Parameter	Otitis Externa (n/N, %)	Healthy Dogs (n/N, %)	<i>p</i> -Value	<i>q</i> -Value (FDR)	Risk Difference (%), 95% CI	Relative Risk (95% CI)
Prevalence (<i>S. pseudintermedius</i>)	160/400 (40.0%)	76/360 (21.1%)	<0.0001	—	18.9% (12.2%, 25.6%)	1.90 (1.52–2.36)
Penicillin resistance	37/160 (23.1%)	15/76 (19.7%)	0.5712	0.6614	3.4% (–8.4%, 15.2%)	1.17 (0.67–2.04)
Oxacillin resistance (MRSP)	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	3.39 (0.17–66.7)
Gentamicin resistance	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	3.39 (0.17–66.7)
Tetracycline resistance	60/160 (37.5%)	19/76 (25.0%)	0.0714	0.1429	12.5% (–1.1%, 26.1%)	1.50 (0.96–2.33)
Ciprofloxacin resistance	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	3.39 (0.17–66.7)
Moxifloxacin resistance	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	3.39 (0.17–66.7)
Erythromycin resistance	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	3.39 (0.17–66.7)
Clindamycin resistance	35/160 (21.9%)	17/76 (22.4%)	0.9284	0.9284	–0.5% (–12.8%, 11.8%)	0.98 (0.58–1.64)
Trimethoprim–Sulfamethoxazole resistance	6/160 (3.8%)	0/76 (0.0%)	0.1832	0.3664	3.8% (–0.9%, 8.4%)	6.15 (0.35–107.8)
MDR (≥ 3 classes)	14/160 (8.7%)	3/76 (4.0%)	0.2845	0.4735	4.7% (–3.9%, 13.3%)	2.17 (0.64–7.31)
MRSP (oxacillin-resistant)	2/160 (1.3%)	0/76 (0.0%)	0.5303	0.6614	1.3% (–1.3%, 4.0%)	1.39 0.17–66.7)

Table 5. Statistical comparison of antimicrobial resistance rates in *S. pseudintermedius* isolates from dogs with otitis externa and from clinically healthy dogs

Note: p -values < 0.05 were considered statistically significant. False discovery rate (FDR)-adjusted q -values were calculated using the Benjamini–Hochberg procedure and are presented for comparisons involving multiple antimicrobial resistance outcomes. The prevalence comparison was not included in the multiple testing correction as it represents a single test; therefore, only the raw p -value is reported for this parameter. Risk difference (RD) and relative risk (RR) are provided with 95% confidence intervals (CI). RD represents the absolute difference in resistance proportions between the two groups, whereas RR reflects the relative likelihood of resistance in isolates from dogs with otitis externa compared to those from clinically healthy dogs.

3. Discussion

The prevalence of *S. pseudintermedius* in this study was 40%, which is consistent with findings reported by Hassan et al. [15] (41.6%) and Penna et al. [16] (38.4%), and somewhat higher than the 31.5% reported by De Martino et al. [17]. These similarities may reflect broadly comparable epidemiological conditions and sampling strategies across studies, such as targeting clinical isolates from companion animals with similar clinical presentations. However, slight differences in prevalence could stem from geographic variability, including differences in population density, pet ownership practices, and local veterinary diagnostic capacities. Moreover, differences in study design, such as sample size or inclusion criteria, could also influence prevalence rates and partially account for the variability observed across studies.

AMR profile revealed a predominance of tetracycline resistance (37.5%) (Table 1), consistent with De Martino et al. [17] (35.5%) and Rosales et al. [18] (41.7%). The slightly lower or higher values observed in these studies likely reflect variations in local antimicrobial usage patterns. For example, tetracyclines remain widely used in veterinary medicine due to their broad-spectrum activity and affordability, which may contribute to a sustained selective pressure favouring resistant strains. The even higher resistance rate reported by Tesin et al. [19] (52%) may be influenced by regional overuse or misuse of tetracyclines, as well as the inclusion of isolates from animals with recurrent infections, where resistance is typically higher.

Resistance to penicillin was observed in 23.1% of isolates. This rate is considerably lower than the values reported by Bourély et al. [20] (68.5%), Rosales et al. [18] (69%), and Scherer et al. [21] (77.3%), but higher than the 7% reported by Rubin et al. [22]. Several factors may account for these discrepancies. First, methodological differences, such as the antimicrobial susceptibility testing method employed (e.g., disk diffusion vs. MIC determination), the inclusion or exclusion of intermediate isolates, and the interpretive criteria applied (e.g., CLSI vs. CA-SFM), can significantly influence reported resistance rates [22].

Second, the studies differ in the bacterial populations analysed: while our study focused exclusively on *S. pseudintermedius*, others may have included mixed staphylococcal species or isolates pre-selected based on methicillin susceptibility, which could introduce selection bias. Third, regional variation in antimicrobial stewardship strategies, veterinary prescribing behaviours, and regulatory frameworks likely contributes to differences in resistance patterns. Given these substantial methodological and epidemiological differences, direct comparisons across studies should be interpreted with caution.

Clindamycin resistance was observed in 21.9% of isolates, aligning with Rosales et al. [18] (29.4%) but higher than the 9% reported by Norström et al. [23]. These differences may reflect variation in the therapeutic use of lincosamides across regions. Moreover, Norström et al. [23] isolated *S. pseudintermedius* from both otic and skin infections, and it is possible that site-specific differences in bacterial populations or exposure to clindamycin contributed to the lower resistance observed.

Gentamicin resistance was low (1.3%) in our study, which matches the 1% reported by Bugden [24] and is notably lower than values from De Martino et al. [17] (11.1%), Bourély et al. [20] (13.5%), and Rosales et al. [18] (17.6%). This finding may suggest that aminoglycosides are either used sparingly or mainly in severe infections where culture and sensitivity testing are performed, limiting their contribution to resistance selection.

Similarly, erythromycin resistance was very limited (1.3%), in stark contrast to the much higher rates reported by Rosales et al. [18] (29.7%), Bourély et al. [20] (29.8%), and especially Penna et al. [16] (80%). These discrepancies likely reflect regional differences in antimicrobial policies and prescription behaviours, and possibly different exposure histories of the bacterial populations sampled.

Trimethoprim-sulfamethoxazole resistance was found in only 3.8% of isolates, consistent with Rubin et al. [22] (5%), but considerably lower than rates reported by Rosales et al. [18] (18%) and De Martino et al. [17] (46.6%). The low resistance rate observed in our study may indicate either limited use of this antibiotic in clinical veterinary practice or its continued efficacy due to stewardship efforts. It is also possible that local veterinary guidelines prioritise other antimicrobials, thus reducing the selective pressure for resistance to this compound.

In the present study, the susceptibility of *S. pseudintermedius* isolates was assessed with respect to several antimicrobials reserved solely for human use. This included linezolid, vancomycin, tigecycline, and teicoplanin—agents classified as important and reserved for the treatment of human infections. Additionally, moxifloxacin, a fluoroquinolone approved for human use, was tested [25]. All isolates were susceptible to antibiotics reserved for human use (linezolid, vancomycin, tigecycline, and teicoplanin), demonstrating 100% susceptibility ($n = 160$) (Tables 1 and 2).

In contrast, a resistance rate of 1.3% ($n = 2$) was observed for moxifloxacin (Table 1). The monitoring of AMR should extend beyond agents exclusively used in veterinary medicine, given the zoonotic threat posed by MRSP and its capacity to spread AMR genes via horizontal gene transfer [26].

Regarding MDR strains, they were isolated at a rate of 8.7% in this study (Table 3). Our findings differ from those reported by Viegas et al. [11], who documented an MDR prevalence of 14.5% among *S. pseudintermedius* strains isolated from canine external otitis cases.

The proliferation of MDR bacterial strains constitutes a critical threat to global health, as underscored by the World Health Organisation.

The rising incidence of infections attributable to MDR organisms, alongside the dwindling efficacy of current therapeutic options, is projected to contribute to increased fatality levels among animal and human hosts affected by such diseases. MDR is generally defined by resistance to antimicrobial agents spanning a minimum of three distinct antimicrobial classes [27]. Regarding the MRSP strains, they were isolated at a rate of 1.2% in this study (Table 3).

Our results differ from those reported by Viegas et al. [11], who found MRSP strains in 17.6% of dogs with external otitis. According to the literature, the prevalence of MRSP among canine populations shows wide variation, with reported values spanning from 0% to 60% [11]. It is important to note that drawing direct comparisons across studies can be challenging, as MRSP prevalence is influenced by multiple factors, including the study population, sample type, geographic location, and methodological approach [11].

According to CLSI guidelines, staphylococci showing resistance to oxacillin are interpreted as resistant to each class of β -lactam antibiotics. In antimicrobial susceptibility testing, methicillin was substituted with oxacillin due to its greater stability [28]. Beyond their resistance to β -lactam antibiotics, MRSP strains commonly possess resistance to several other antimicrobial drug classes [13].

Regarding penicillin resistance among *S. pseudintermedius* strains isolated from the ears of healthy dogs, the prevalence observed in this study was 19.7% (Table 2). This value is lower than the 39.9% reported by Rubin and Chirino-Trejo [29], who analysed isolates from nasal, pharyngeal, and rectal sites. One possible explanation for this discrepancy is the anatomical site of sampling, as microbial populations and resistance profiles can vary significantly between different body regions due to differences in local microenvironments and antimicrobial exposure. In addition, geographic variation and differences in antimicrobial use practices between populations or regions may also contribute to this divergence.

Similarly, the tetracycline resistance rate in our study was 25%, closely aligning with the 23.5% reported by Rubin and Chirino-Trejo [29]. This consistency might suggest a more stable pattern of tetracycline resistance across different body sites and potentially across different geographical regions. However, the similarity could also reflect the widespread and long-term use of tetracyclines in veterinary medicine, which may have exerted consistent selective pressure over time.

Regarding MRSP, no strains were identified in our study. This is consistent with the findings of Rubin and Chirino-Trejo [29], who also reported no MRSP in clinically healthy dogs. The absence of MRSP in both studies could indicate a relatively low prevalence of methicillin resistance in *S. pseudintermedius* among healthy canine populations, at least in the sampled regions. It may also suggest that MRSP carriage is more closely associated with clinical infections [30] or prior antimicrobial exposure, which were not present in the healthy dogs studied.

The current understanding of the epidemiology, zoonotic potential, and antimicrobial resistance patterns of *S. pseudintermedius* in healthy canine carriers remains limited. Given the implications for both veterinary and public health, further investigations are essential to better characterise and address these critical areas [29].

In this study, the *S. pseudintermedius* strains isolated from dogs with otitis externa exhibited a more diverse and extensive antimicrobial resistance profile compared to those isolated from clinically healthy dogs. Although the proportion of strains susceptible to all tested antimicrobials was relatively similar between the two groups (38.1% in dogs with otitis externa vs. 40.8% in healthy dogs), resistance to tetracycline, penicillin, and clindamycin was more frequently observed among pathogenic strains. Notably, MRSP strains were exclusively isolated from dogs with otitis externa. All isolates were susceptible to antibiotics reserved for human medicine—such as linezolid, teicoplanin, vancomycin, and tigecycline—which were included in the testing panel due to the zoonotic potential

of *S. pseudintermedius*. No resistance was observed to fusidic acid either. These findings support the notion that *S. pseudintermedius* strains isolated from both healthy and diseased dogs may harbour antimicrobial resistance and pose potential risks for zoonotic transmission, although strains associated with otitis externa tend to exhibit more frequent and complex resistance patterns.

Recent research has shown that *S. pseudintermedius*, particularly methicillin-resistant strains (MRSP), may pose a zoonotic risk.

Sequence types such as ST45, ST71, and ST121 were detected in both companion animals and human clinical samples, and whole-genome comparisons revealed high similarity between isolates, suggesting possible recent interspecies transmission [31].

Genomic analysis revealed notable diversity, including 23 STs among animal-derived strains and ten novel variants. Most isolates carried common resistance genes like *mecA* and *blaZ*, along with others conferring resistance to aminoglycosides, macrolides, and tetracyclines. Virulence factors such as *sps*, *ica*, and *leukotoxin* genes were also present and appeared to vary by sequence type, suggesting host adaptation [31].

While no direct correlation between host and ST was found, the genetic overlap between isolates from animals and humans highlights the zoonotic potential of MRSP and supports the need for One Health surveillance strategies [31].

Mobile genetic elements, such as SCCmec types III, IVg, V, and VII, were identified across MRSP isolates and played a key role in the dissemination of resistance genes, particularly *mecA*. Specific point mutations associated with fluoroquinolone resistance (e.g., *grlA* S80I and *gyrA* S84L) were frequently observed, especially in ST71 and ST339. These genomic features, alongside the presence of biocide resistance and virulence-associated genes, underline the adaptability of *S. pseudintermedius* and its potential to persist in both veterinary and human environments [32].

Moreover, the recent literature provides additional context that complements our findings. Regional studies have highlighted the clinical relevance of *S. pseudintermedius* and other staphylococcal species isolated from cutaneous and mucosal infections in companion animals [33,34]. Comprehensive reviews have described major epidemiological shifts in MRSP prevalence and explored alternative therapeutic strategies to address emerging resistance patterns [35]. Large-scale surveillance investigations from European veterinary clinics have further reported substantial MDR prevalence and complex co-resistance profiles among *S. pseudintermedius* isolates [36]. In addition, meta-analyses of canine otitis externa and pyoderma cases confirm a wide range of prevalence values across geographical regions [37], while recent studies emphasise the influence of host-related and management-associated factors on the development and spread of antimicrobial resistance in canine populations [38]. The statistical analysis further reinforces the robustness of our findings, demonstrating significant differences in prevalence and antimicrobial resistance between isolates from diseased and clinically healthy dogs. The inclusion of *p*-values, FDR-adjusted *q*-values, and relative risk estimates provides quantitative evidence of these differences, underscoring their clinical and epidemiological relevance.

3.1 Limitations. This study has some limitations. The sampling was restricted to a single urban area, which may affect the generalizability of the findings. Furthermore, genetic characterisation of resistance determinants was not performed.

3.2 Strengths. By documenting the presence of methicillin-resistant and multidrug-resistant *S. pseudintermedius* in dogs, this study highlights the zoonotic risks and reinforces the importance of prudent antimicrobial use within a One Health perspective.

4. Materials and Methods

4.1 Study Design. The study was conducted between 2022 and 2025 and involved the collection of samples from dogs diagnosed with otitis externa, as well as from clinically healthy dogs presented for routine procedures (such as sterilisation, vaccination, or deworming) at various veterinary clinics in Timisoara, Romania.

4.2 Sample Collection Samples were collected from 400 dogs presenting clinical signs of otitis externa and from 360 clinically healthy dogs. Bilateral ear swabs were taken using sterile cotton swabs, which were immediately placed in Amies (Oxoid, Basingstoke, UK) transport medium and stored at 4 °C for a maximum of 24 h before processing.

Samples were collected from 400 dogs presenting clinical signs of otitis externa and 360 clinically healthy dogs. Bilateral ear swabs were obtained using sterile cotton swabs, placed in Amies transport medium, and stored at 4 °C for a maximum of 24 h before processing. Although samples were collected from both ears, only one *S. pseudintermedius* isolate per dog was included in the final analysis. This methodological choice was made to prevent pseudoreplication and overrepresentation of clonal isolates from the same individual, which could bias prevalence and antimicrobial resistance estimations. By focusing on a single representative isolate per host, the study ensured that epidemiological comparisons between diseased and healthy dogs reflected true host-level dynamics rather than intra-individual variability.

In cases where multiple *S. pseudintermedius* isolates displaying identical antimicrobial resistance profiles were recovered from the same animal, only one representative isolate was retained to avoid data duplication and potential overestimation of strain prevalence. While this approach may have limited the detection of intra-host diversity and potential strain coexistence, it provided a more robust and accurate assessment of *S. pseudintermedius* occurrence and resistance patterns across the study population. This strategy aligns with standard epidemiological practices for prevalence and resistance studies, emphasising comparability between clinical and healthy cohorts.

We acknowledge that phenotypic similarity does not necessarily imply clonal identity, as horizontal gene transfer or convergent evolution may result in similar resistance phenotypes among distinct strains. Therefore, future research incorporating molecular typing techniques, such as multilocus sequence typing (MLST), pulsed-field gel electrophoresis (PFGE), or whole-genome sequencing (WGS), is warranted to explore intra-host diversity and confirm genetic relatedness among *S. pseudintermedius* isolates.

4.3 Bacterial Isolation and Species Identification

Ear swab samples were cultured on two types of media: Columbia agar supplemented with 5% sheep blood ((Oxoid, Basingstoke, UK), a non-selective enriched medium that allows hemolysis evaluation, and Chapman agar (Mannitol Salt Agar; bioMérieux, Marcy-l'Étoile, France), a selective and differential medium for the isolation of halotolerant staphylococci and their differentiation based on mannitol fermentation.

The plates were incubated aerobically at 35 °C for 18–24 h. Suspected colonies were selected based on characteristic morphology and subjected to Gram staining, catalase testing, and, when appropriate, coagulase testing. Suspect colonies were subcultured to obtain pure isolates, which were subsequently identified using MALDI-TOF mass spectrometry.

Before antimicrobial susceptibility testing, presumptive *S. pseudintermedius* isolates were identified using MALDI-TOF MS (matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry; Bruker Daltonik, Bremen, Germany). Bacterial protein extracts were prepared following a standard ethanol/formic acid protocol.

A volume of 1 µL from the prepared sample was placed on a MALDI target plate and subsequently layered with 1 µL of matrix solution composed of α -cyano-4-hydroxycinnamic acid (10 mg/mL), prepared in 50% acetonitrile mixed with 2.5% trifluoroacetic acid. Spectra acquisition was performed using a Microflex™ mass spectrometer (Bruker Daltonik GmbH, Bremen, Germany), and data were processed via MALDI BioTyper™ 3.0 software (Bruker Daltonik GmbH, Bremen, Germany). Species determination was based on spectral comparison against the manufacturer's database.

According to the scoring criteria provided by Bruker, values ≥ 2.0 were accepted as reliable species-level identification, whereas scores ranging from 1.7 to 1.99 were interpreted as indicative of genus-level classification [39].

Quality control (QC) for MALDI-TOF identification was initially performed using *Staphylococcus aureus* ATCC 25923 as a general control strain, in accordance with manufacturer recommendations. To further ensure the accuracy of species identification, a representative subset of isolates was re-analysed using the well-characterised *S. pseudintermedius* DSM 21284 reference strain as a species-specific QC.

The results confirmed the identity of all isolates originally included in the study, thereby reinforcing the robustness of the identification procedure. Moreover, the Bruker Biotyper database used in this study contained manufacturer-validated protein spectra for *S. pseudintermedius*, ensuring accurate and reliable identification.

The Biotyper database used included manufacturer-validated protein spectra for *S. pseudintermedius*.

4.4 Antimicrobial Susceptibility Testing (AST)

Antimicrobial susceptibility was assessed with the VITEK® 2 Compact system (bioMérieux, Marcy-l'Étoile, France), in line with the manufacturer's recommendations. Initially, pure bacterial colonies were isolated, and suspensions were made in sterile saline, with turbidity adjusted to correspond to the 0.5 McFarland standard. To evaluate resistance, specific cards for Gram-positive strains (VITEK® AST-GP79; bioMérieux, Marcy-l'Étoile, France) were employed [40].

Antimicrobial susceptibility profiling was performed using 14 antimicrobial agents belonging to 11 different classes. The tested substances included: penicillin and oxacillin (β -lactams); gentamicin (aminoglycosides); tetracycline (tetracyclines); ciprofloxacin and moxifloxacin (fluoroquinolones); erythromycin (macrolides); clindamycin (lincosamides); linezolid (oxazolidinones); teicoplanin and vancomycin (glycopeptides); fusidic acid (fusidanes); tigecycline (glycylcyclines); and trimethoprim–sulfamethoxazole (sulfonamides + pyrimidines).

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Calibration and quality control of the VITEK® 2 Compact system were performed daily according to the manufacturer's instructions, using the quality control strain *Staphylococcus aureus* ATCC 29213.

Interpretation of susceptibility results was carried out in accordance with the CLSI

VET01, Fifth Edition (2018) standard, which is specifically designed for bacterial isolates from animals [41].

4.5 Ethical Approval

Ethical approval for this study was granted by the Bioethics Commission of the University of Life Sciences "King Mihai I" in Timisoara (Approval No. 592, dated 9 September 2025). The research was conducted without involving experimental procedures on live animals and complied with all relevant ethical standards for animal research.

Statistical analyses were conducted using Chi-square or Fisher's exact tests for proportions, with significance set at $p < 0.05$; false discovery rate (FDR) adjustment, risk difference (RD), and relative risk (RR) with 95% confidence intervals were reported.

5. Conclusions

S. pseudintermedius was identified with a significant prevalence in both dogs with otitis externa (40%) and clinically healthy dogs (21.1%), highlighting its role as a relevant pathogen and a potential community reservoir. The antimicrobial resistance profile revealed a notably high resistance to tetracyclines in both groups, indicating a selective pressure associated with the frequent use of this antibiotic class.

MRSP was detected at a low rate (1.2%) among dogs with otitis externa; however, MRSP strains exhibited multidrug resistance, including resistance to other critically important antimicrobial classes. This raises concerns regarding the therapeutic challenges posed by these infections and the potential for dissemination of resistant strains.

Moreover, MDR isolates were present in both diseased and healthy dogs, suggesting that clinically healthy animals may act as important reservoirs of resistant bacteria with potential zoonotic implications.

These findings underscore the urgent need for robust antimicrobial resistance surveillance strategies and the prudent use of antibiotics in veterinary medicine to limit the spread of resistant strains and safeguard both animal and public health.

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Abbreviations

The following abbreviations are used in this manuscript:

<i>S. pseudintermedius</i>	<i>Staphylococcus pseudintermedius</i>
MRSP	Methicillin-resistant <i>Staphylococcus pseudintermedius</i>
AMR	Antimicrobial resistance
SCCmec	Staphylococcal chromosomal cassette mec
MDR	Multidrug resistance
CLSI	Clinical and Laboratory Standards Institute
MALDI-TOF MS	Matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry
BTS	Bacterial Test Standard
AST	Antimicrobial susceptibility testing

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References available on request

Mobile Apps in Veterinary Medicine: Literature Review on Opportunities and Benefits for Veterinarians, Animal Owners and Animal Welfare

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Introduction

Similar to human medicine, veterinary medicine faces similar opportunities and challenges regarding digitalisation (Diez, 2020). In particular, the use of telemedicine is regarded by pet owners as a relevant service, for example, to reduce waiting times and expose pets to less stress (Diez et al., 2023). Given the widespread use of smartphones, it is logical to implement digitalisation in general and telemedicine in particular through app-based solutions. Studies in the context of health insurance apps in human medicine show that patients expect a broad range of functionalities (Lange & Wohllebe, 2025). Other studies also consider mobile apps in the healthcare sector from the perspective of physicians or medical staff in general (Gagnon et al., 2016; Wozney et al., 2015). In veterinary medicine, however, it is not sufficient to adopt only the perspectives of pet owners and veterinarians. It is also essential to consider the impact on the pets themselves as recipients of care.

Studies show that mobile apps have a wide range of applications for healthcare professionals (Mosa et al., 2012; Ventola, 2014). Other studies highlight specific smartphone applications for treating exotic pets, such as for diagnosis or in endoscopy (Huynh, 2019). There are also application cases in veterinary medicine for treating specific diseases, such as bovine fasciolosis or in dermatology (Brewer et al., 2013; Haubold et al., 2024). In addition, apps aid with diagnosis or medication (Mosa et al., 2012). Telemedicine, teleconsultations and remote monitoring using wearable devices also represent opportunities to use smartphone apps in veterinary medicine (Teller & Moberly, 2020). The emergence of artificial intelligence brings additional momentum and opens up new possibilities to use mobile apps in veterinary medicine (Owens et al., 2023).

Against the backdrop of the numerous application possibilities of smartphone apps in veterinary medicine and regarding the three perspectives of veterinarians, pet owners, and the pets themselves, this paper therefore investigates the following research questions:

- What opportunities and benefits do mobile apps in veterinary medicine offer for veterinarians?
- What opportunities and benefits do mobile apps in veterinary medicine offer for pet owners?
- What opportunities and benefits do mobile apps in veterinary medicine offer for animal welfare?
- What challenges and risks are associated with the use of mobile apps in veterinary practice?

The research questions are answered in a structured manner on the basis of the same and through a literature review. In particular, papers published in the last 10 years (2015 to 2025) in a scientific journal of the Scimago ranking Q4 or better are used.

Literature Review

Opportunities and Benefits of Mobile Apps in Veterinary Medicine for Veterinarians

Mobile applications and digital technologies are increasingly transforming the field of veterinary medicine, offering a wide array of opportunities and tangible benefits for practitioners. One of the most significant advantages is the enhancement of patient care through real-time data access, streamlined diagnostics, and improved treatment planning. Mobile apps facilitate more effective communication with clients, enabling timely updates, remote consultations, and better overall transparency in veterinary services (Andrews et al., 2015). These tools also provide veterinarians with convenient access to current clinical data and peer-reviewed medical literature, thereby supporting evidence-based decision-making.

In addition to their communicative and informational utility, mobile applications can function as powerful decision-support tools. For instance, Haubold et al. (2024) demonstrated the successful use of a mobile app for guiding strategic control measures in the management of bovine fasciolosis. This illustrates the potential of mobile platforms in improving disease control protocols and advancing herd health management. Likewise, Fejzic et al. (2019) emphasise the efficiency gains and improved quality of veterinary consultation made possible through the integration of mobile and digital health technologies. Educationally, mobile apps have been shown to enhance student engagement and preparedness. Hannon (2017) highlights the utility of mobile tools in veterinary anatomy education, where interactive and visual learning resources contribute to more effective knowledge acquisition. The use of smartphones in clinical practice extends to specialised imaging modalities, including endoscopy, infrared thermography, and ultrasonography, particularly within exotic animal medicine (Huynh, 2019). These devices support diagnostic versatility and portability, which are crucial in field and emergency settings.

Moreover, the advancement of telemedicine - encompassing services such as teleradiology and telecardiology - has enabled low-cost and scalable healthcare delivery models. These applications increase access to veterinary expertise in remote or underserved areas while reducing overhead costs (Hassan et al., 2024). Artificial intelligence (AI) has further contributed to improvements in diagnostic accuracy, standardisation, and clinical efficiency, particularly in the analysis of imaging data (Owens et al., 2023). Finally, microfluidic technologies represent an emerging frontier in veterinary diagnostics. As noted by Busin et al. (Busin et al., 2016), the miniaturisation and automation offered by microfluidic systems promise significant advances in point-of-care testing, enabling rapid, accurate diagnostics with minimal resource input.

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Key opportunities and benefits for veterinarians include:

- Enhanced diagnostic and treatment support through real-time data, AI, and mobile imaging applications.
- Improved communication with clients and access to expert consultation via telemedicine platforms.
- Advanced educational tools and point-of-care technologies that support clinical decision-making and student training.

Opportunities and Benefits of Mobile Apps in Veterinary Medicine for Pet Owners

Mobile applications in veterinary medicine present a range of significant benefits for pet owners, facilitating improved access to healthcare services, disease prevention, and communication with veterinary professionals. These digital tools enable pet owners to conveniently locate nearby veterinary clinics, schedule appointments, and engage in real-time online consultations, thereby reducing logistical barriers to veterinary care (Llaneta et al., 2022). Particularly in urgent or remote situations, such functions enhance responsiveness and support more proactive animal health management.

Beyond administrative convenience, mobile apps assist in the continuous monitoring of pet health and the early detection and prevention of diseases. They may include functionalities such as vaccination reminders, nutritional tracking, symptom checkers, and emergency guidance systems (Jiwane et al., 2023; Kumar et al., 2017). These features empower pet owners to take a more active role in the day-to-day care of their animals and to recognise early warning signs before conditions escalate. In certain domains, mobile apps also serve as decision-support systems for the management of specific diseases. Although the study by Haubold et al. (Haubold et al., 2024) focuses on bovine fasciolosis, it illustrates the broader applicability of mobile tools in supporting evidence-based veterinary decisions. While such functionality may currently be more developed for livestock, it signals future developments in companion animal care as well.

Veterinarians generally regard mobile technology as a driver of improved patient outcomes, better client communication, and enhanced access to relevant clinical data (Andrews et al., 2015). These improvements directly benefit pet owners, who receive more transparent, timely, and informed care for their animals. Furthermore, mobile devices such as smartphones and tablets are increasingly being used for specialised diagnostic procedures, especially in the care of exotic pets. Techniques such as smartphone-based endoscopy and infrared thermography expand diagnostic capabilities outside traditional clinic settings (Huynh, 2019).

Although the adoption of mobile health applications in veterinary practice remains in an early phase, current research suggests their growing importance in supporting veterinary decision-making and improving client engagement. As Johnson et al. (2021) note, these tools hold considerable potential to reshape veterinary-client interactions and elevate the overall standard of care.

Key opportunities and benefits for pet owners include:

- Improved access to veterinary care through online consultations, appointment scheduling, and clinic location services.
- Enhanced involvement in pet health monitoring and disease prevention via mobile alerts and educational tools.

- Better communication with veterinarians and quicker emergency response options through real-time digital platforms.

Opportunities and Benefits of Mobile Apps in Veterinary Medicine for Animal Welfare

Mobile applications in veterinary medicine present considerable potential for advancing animal welfare across diverse contexts, ranging from individual clinical care to population-level health management. One of the most impactful features of these technologies is the facilitation of telemedicine services, which enable remote consultations, ongoing health monitoring, and follow-up care. This digital infrastructure broadens access to veterinary expertise, especially in rural or underserved areas, thereby improving timely interventions and continuity of care (Hassan et al., 2024).

In addition to enhancing accessibility, mobile applications serve as valuable decision-support tools for veterinarians involved in disease prevention and management. For instance, apps developed for the control of bovine fasciolosis illustrate how digital systems can provide evidence-based recommendations for specific health issues, contributing to more effective treatment protocols and, ultimately, better animal health outcomes (Haubold et al., 2024).

The integration of wearable sensors and Internet of Things (IoT) devices into mobile systems further expands the scope of animal welfare monitoring. These technologies facilitate real-time data collection on various physiological and behavioural parameters, offering continuous insights into animal well-being that were previously difficult to obtain outside clinical settings (Kaplan et al., 2019). Such data can inform early interventions, minimise stressors, and improve the living conditions of animals in both companion and production environments.

Moreover, mobile tools support surveillance efforts through functionalities such as disease reporting, geo-referenced mapping, and the identification of vectors, thereby aiding in the early detection and containment of infectious diseases. These capabilities contribute not only to individual animal welfare but also to broader public and environmental health (Madder et al., 2012).

In herd management contexts, mobile apps can enhance veterinary advice, streamline communication between veterinarians and producers, and facilitate collaborative decision-making processes. This can lead to more efficient resource allocation, targeted treatments, and welfare-optimised management strategies (Hayes et al., 2020; Johnson et al., 2021). However, the effective implementation of such technologies requires careful attention to user needs, usability, and trust. The success of mobile solutions is closely linked to their acceptance by end users, particularly farmers, animal caregivers, and veterinary staff (Hayes et al., 2020).

To ensure these technologies reach their full potential in advancing animal welfare, veterinary professionals must be equipped with competencies in animal welfare science and ethics. Additionally, they should play an active role in the design and refinement of digital tools to ensure they are aligned with the practical realities of animal care and ethical standards (De Paula Vieira & Anthony, 2020).

Key opportunities and benefits for animal welfare include:

- Broader access to veterinary expertise and timely interventions through telemedicine and remote monitoring.

- Continuous assessment of animal health and behaviour via wearable technologies and real-time data collection.
- Enhanced collaboration, disease surveillance, and welfare-oriented herd management supported by mobile apps.

Challenges and Risks Associated with Using Mobile Apps in Veterinary Practice

While mobile applications in veterinary practice offer substantial benefits - such as immediate access to clinical data and medical resources at the point of care - they also introduce a range of significant challenges and potential risks that must be critically assessed. One of the foremost concerns is related to data security and privacy. Mobile apps can exhibit vulnerabilities that allow unauthorised access, data breaches, and even remote control of devices. Such incidents pose substantial threats not only to the integrity of veterinary records but also to the safety and welfare of animal patients (Quirolgico, 2014; Quirolgico et al., 2011). The absence of standardised regulatory frameworks and comprehensive governance structures for the development and deployment of veterinary medical apps exacerbates these risks. Without clear guidelines, the quality, reliability, and security of these digital tools may vary widely, leading to inconsistent clinical outcomes and legal uncertainties for practitioners (Lindley & Fernando, 2013). This regulatory gap is especially critical given the growing reliance on mobile technology for decision support and diagnostics in veterinary settings (Lewis & Wyatt, 2014).

To address these concerns, the establishment of robust app vetting systems has been proposed. These systems would be responsible for assessing the security, functionality, and clinical relevance of mobile applications before their adoption in veterinary practices. Effective vetting procedures can significantly mitigate the likelihood of deploying flawed or harmful software, thereby protecting both practitioners and patients (Quirolgico, 2014). Despite the technical and regulatory hurdles, mobile technologies continue to demonstrate considerable promise in veterinary contexts. They have been successfully applied to monitor animal health, facilitate disease surveillance, and enable real-time information sharing among veterinary professionals. For instance, the deployment of a mobile application in the management of bovine fasciolosis illustrated its utility as a decision-support tool, contributing to more informed and timely clinical interventions (El Idrissi et al., 2021; Haubold et al., 2024).

Nevertheless, healthcare and veterinary organisations must approach the implementation of mobile technologies with caution. A comprehensive risk assessment should precede deployment, incorporating evaluations of potential security vulnerabilities, data integrity risks, and end-user needs. As emphasised by Sajedul (2020), such due diligence is essential to ensure the safe integration of mobile applications into clinical workflows and to maintain trust in digital veterinary care systems.

Key challenges and risks associated with mobile apps in veterinary practice include:

- Data security vulnerabilities can lead to breaches of patient confidentiality and loss of control over clinical information.
- Lack of regulatory oversight creates inconsistencies in app quality, safety, and reliability.
- Healthcare organisations must proactively evaluate and mitigate technical risks before integrating mobile tools into practice.

Summary and Conclusion

This paper examined the opportunities, benefits, challenges, and risks associated with the use of mobile applications in veterinary medicine from three perspectives: veterinarians, pet owners, and animal welfare. The findings show that mobile apps offer a wide range of advantages for all stakeholders.

For veterinarians, they enhance diagnostic accuracy, streamline communication, and support decision-making and education. Pet owners benefit from improved access to veterinary services, greater involvement in their animals' health monitoring, and better communication with veterinary professionals.

For animal welfare, mobile technologies contribute to earlier interventions, continuous health monitoring, and more effective herd management. Figure 1 summarises the opportunities and benefits of mobile apps in veterinary medicine.



Figure 1: Summary of opportunities and benefits of mobile apps in veterinary medicine

However, these benefits are accompanied by substantial challenges. Chief among them are data privacy and security concerns, a lack of regulatory standards, and the absence of systematic app vetting processes. These issues may lead to inconsistent clinical outcomes and pose risks to both patient safety and professional integrity.

On a practical level, these findings underscore the need for the veterinary sector to develop clear regulatory frameworks, security standards, and usability guidelines for mobile applications. From a theoretical perspective, this study highlights the importance of adopting a multi-perspective approach to digital veterinary medicine, considering the needs of veterinarians, pet owners, and animals alike.

Further research should explore longitudinal effects, user adoption factors, and the ethical implications of AI in veterinary apps. **U**

References available on request



Dr Cynthia Otto, DVM, PhD

The American Veterinary Medical Association (AVMA) named Dr Cynthia Otto, DVM, PhD, professor of working dog sciences and sports medicine at the University of Pennsylvania School of Veterinary Medicine (Penn Vet) and founding executive director of the Penn Vet Working Dog Centre, as the winner of the 2025 AVMA Career Achievement in Canine Research Award in July 2025.

This award honours an AVMA member's long-term contribution to the field of canine research. The AVMA Council on Research selects the recipient.

"I am deeply honoured and humbled to receive this award," said Dr Otto. "Throughout my veterinary career, it has been a true privilege to advance canine knowledge and care—especially the extraordinary working dogs—to support their human partners, and to educate and inspire those whose lives are touched by these remarkable dogs."

A dual board-certified specialist in veterinary emergency and critical care, canine sports medicine and rehabilitation, Dr Otto has authored or co-authored over 150 publications and received more than \$6.9 million in research support. Her contributions span a wide range of canine-focused research areas, including scent detection, occupational hazards and working dog health and welfare.

Dr Otto first came to national attention following the September 11, 2001, terrorist attacks in the United States, when she deployed with FEMA's Pennsylvania Task Force 1 to care for search-and-rescue dogs at Ground Zero. That experience inspired a two-decade-long research program to study the long-term health of these canine heroes, which continues to produce valuable scientific insights.

In 2012, Dr Otto founded the Penn Vet Working Dog Centre, a national model for interdisciplinary canine research, training, and education. The Centre's dogs are trained in life-saving roles, from urban search-and-rescue and narcotics detection to public health applications such as identifying diseases like cancer, COVID-19, and chronic wasting disease through scent detection. Of the nearly 200 dogs raised and trained through the centre, 93% have gone on to successful working careers in detection and service.

Under Dr Otto's leadership, the Working Dog Centre has become a world-renowned hub of canine science, advancing knowledge in exercise physiology, behaviour, training, health monitoring, and One Health applications. She has also helped develop standards for detection dog training and care through her work with the National Institute of Standards and Technology.

From her first clinical trial for dogs with parvovirus to her current collaborative NIH-funded study examining a heparin-like molecule for the treatment of canine septic peritonitis, she has been committed to changing the trajectory of care available to critically ill canine patients and translating these findings to advance human health care. Her commitment to a One Health approach was crucial to the development of the Veterinary Clinical Investigation Centre at the University of Pennsylvania.

She has also passed along her passion for this approach to a multitude of veterinary students and residents, including formal mentorship of four veterinarians who completed their Master's in Translational Research at Penn's Medical School.

Her extraordinary impact has been recognised with numerous awards, including the AVMA Bustad Companion Animal Veterinarian of the Year Award (2018), the Asa Mays Excellence in Canine Health Research Award from the AKC Canine Health Foundation (2021) and the Kennel Club Charitable Trust's International Canine Health Special Award (2024).

"Dr Otto's career reflects an extraordinary dedication to advancing the health, performance, and welfare of working dogs," said Dr Sandra Faeh, president of the AVMA. *"Her pioneering research in canine scent detection, trauma care, and sports medicine has had a profound impact on veterinary medicine and public safety alike."*

I had the privilege to meet Dr Otto while in South Africa, and after she was awarded the winner of the 2025 AVMA Career Achievement in Canine Research Award, I spoke to her about herself and her career.



Germany 1980

Editor: I see that you obtained your Bachelor's in Science and Doctor of Veterinary Medicine in 1984 and 1986, respectively. Tell us a little about Dr Otto growing up and what inspired you to become a veterinarian:

Dr Otto: *"I had wanted to become a veterinarian since I was about 12 years old. As such, I chose a high school with a strong science curriculum and participated in a summer science program. I went to The Ohio State University and studied Animal Science with a focus on nutrition for my undergraduate degree. During that time, I was lucky enough to participate in an international agriculture program in which I worked on a dairy farm in Bavaria for a summer. I applied to veterinary school after 3 years of undergraduate study and was lucky enough to be admitted to The Ohio State University College of Veterinary Medicine. During that time, I finished up a few classes to complete my BS. During veterinary school, I was very interested in dairy medicine (I have to confess that animal behaviour was not an interest at that time), and I continued my international interest, spending time in the South of England with a mixed animal practice. In my final year of veterinary school, I decided that herd health was not the direction I wanted to go and completed a small animal rotating internship at the University of Pennsylvania. That experience sparked my love for veterinary emergency medicine! In 1987, there was no advanced training in emergency medicine, so I pursued small animal internal medicine and a PhD in physiology at the University of Georgia. During my residency, I was always drawn to emergency medicine and critical care, and as a result of that interest, I was tasked with following up on a call requesting veterinary support for a search and rescue team. This was my first exposure to search and rescue dogs, and I was intrigued!"*



Editor: Where did your new qualification take you? Tell us about your early years and what prompted your interest in dog behaviour.

Dr Otto: *I joined the faculty at the School of Veterinary Medicine at the University of Pennsylvania in 1991. I had a clinical appointment in the Emergency Service and spent the majority of my time running a research lab focused on the molecular mechanisms of inflammation. In Pennsylvania, I joined the Federal Emergency Management Agency's Urban Search and Rescue Task Force (PA-TF1) in 1994 to provide field medical care for the search dogs. This "hobby" turned out to be pivotal in my career. My scientific curiosity, paired with my expertise in emergency medicine, led me to start asking questions about how to help the dogs stay safe and work more effectively. In addition, I was introduced to how amazing dogs could be, traversing ladders,*

>>>18

Editorial Piece

rappelling off buildings, and finding lost people. This was inspiring, and I wanted to understand how dogs could do these things. During this time, I continued my paid job performing research and clinical care. I started to ask more applied questions about how we could improve our care of our patients, which led to several clinical trials.

Editor: I know you were heavily involved in the rescue and recovery operations in 2001 after the attack on the Twin Towers. What would you like to share with us regarding your experience?

Dr Otto: *On September 11, 2001, I was deployed with PA-TF1 to Manhattan and spent 10 days at Ground Zero. Again, my combination of research inquiry and clinical care led to a longitudinal study of the health and behaviour of the search dogs that deployed to 9/11. This experience also inspired me to develop first aid courses for canine handlers and first responders and create the Penn Vet Working Dog Centre (www.vet.upenn.edu/wdc).*

The more I became immersed in the care and abilities of these dogs, the more I realised I needed to develop my skills in Canine Sports Medicine. I eventually achieved board certification in Canine Sports Medicine and Rehabilitation.



Editor: In 2011, you visited South Africa as a delegate to the International Working Dog Association's meeting at Sun City, as well as the World Veterinary Association Congress in Cape Town shortly after. What was your impression of South Africa?

Dr Otto: *I was privileged enough to have visited South Africa twice and have been impressed with the country and even more impressed with the people (and I love the wine 😊).*

In 2011, I was included in a bus trip from Johannesburg to Cape Town, which provided a deep dive into the country and its inhabitants. I will always have a special place in my heart for South Africa.

Editor: In 2012, you founded the Penn Vet Working Dog Centre. Can you please elaborate on some of your success stories and what prompted you to start the Dog Centre?

Dr Otto: *The inspiration for the Centre is above. The success stories could fill a book! We have had over 200 puppies enter the program to date. They come in at 8 weeks of age, come to "school" 5 days a week and live with foster families evenings and weekends. They come in and start detection training from the beginning. They will continue their training until they graduate at 12-18 months.*

They enter careers in search and rescue, law enforcement, or some other scent detection career (drugs, bombs, conservation, arson detection, etc). Ninety-three per cent of dogs in the program have graduated into detection careers!

The dogs are only one side of the coin. The people who spend time with us as interns, volunteers, veterinary students, staff, handlers, and customers are the other big success. We have inspired and taught so many people new and effective ways to work collaboratively with their dogs. We are advocates for cooperative veterinary care, positive reinforcement, and physical fitness for the dogs.



Editor: During COVID and the resulting lockdown, you did a very interesting project with some vultures. Would you like to elaborate on what you did and what the result was? I believe one was called Sirius.

Dr Otto: *The "vulture project" was also a hobby project. At the time I started it, I did not have a dog. My long-time canine companion had died, and my foster dog from the Penn Vet Working Dog Centre had graduated to become a police dog. By this time, I had fallen in love with all aspects of operant conditioning and training. I was hoping to train some of the crows in my yard, based on some inspiring YouTube videos, but the crows weren't interested! It happened that a wild black vulture landed in the yard, and with a little patience (and cheese and ham bits), we got to know each other. I introduced him to the clicker, and he really seemed to enjoy the interactions. He was completely wild and came whenever he felt like it, but sometimes he would land on the roof and stomp his feet as if asking me to come out and play. I really enjoyed the time I spent learning about how smart these birds are. Unfortunately, he hasn't been around lately, but who knows, he might just show up again sometime! And yes, I called him, Sirius Black!*

Editor: Which of the many research projects were the closest to your heart and that you think made the biggest impact?

Dr Otto: *It is hard to pinpoint one specific study. We have a couple of areas of high impact. One is canine medical detection. We are not the only ones in this field, but we feel like we bring a rigour to it and that opens doors to all sorts of possibilities – truly a one health impact – human, animal and the environment!*

Our fitness studies are ongoing and robust. Our program initially was called Fit to Work, but now we have renamed it Canimetrics – a measurable way to keep your K9 fit to work.

We firmly believe that comprehensive fitness and strength training reduce injuries and improve recovery from injury.

Our most recent high-impact study has been on cooling after exercise. We have described a novel approach to canine cooling that incorporates cooperative care: The Voluntary Head Dunk.

Parnes SC, Mallikarjun A, Ramos MT, Cappelli TR, Otto CM. Voluntary Head Dunking After Exercise-Induced Hyperthermia Rapidly Reduces Core Body Temperature in Dogs. J Am Vet Med Assoc. 2024 Sep 4;262(12):1613-1621. doi: 10.2460/javma.24.06.0368. PMID: 39293468.

Otto CM, Heyer A, Berkowitz V. Voluntary head dunk: cooperative care for irrigating canine noses and eyes and rapid cooling. J Am Vet Med Assoc 2024 Sep 18:1. Doi: 10.2460/javma.. 24.07.0480. Epub ahead of print. PMID: 39293481. (this is the video showing how to teach it.)

Editor: How did your research impact One Health?

Dr Otto: *The medical detection (see above), but also supporting the human animal bond, the way we raise and train our dogs is based on the partnership between humans and dogs and the mutual benefit.*

Editor: What was the strangest thing you discovered in any of the research projects?

Dr Otto: *To me, the strangest thing is something we have not yet discovered – but how do dogs find concealed live humans in a rubble pile in which they don't know who they are looking for, and there are large numbers of humans in the environment, but not concealed, and they ignore them. Every time I watch them search, it still instils awe and wonder. 🐾*

We thank Dr Otto for her time and dedication to both the animals and humans with the most important work of caring for both.

CREDO

We, the members of the Association, resolve at all times:

- To honour our profession and the Veterinary Oath
- To maintain and uphold high professional and scientific standards
- To use our professional knowledge, skills and resources to protect and promote the health and welfare of animals and humans
- To further the status and image of the veterinarian and to foster and enrich veterinary science
- To promote the interests of our Association and fellowship amongst its members.

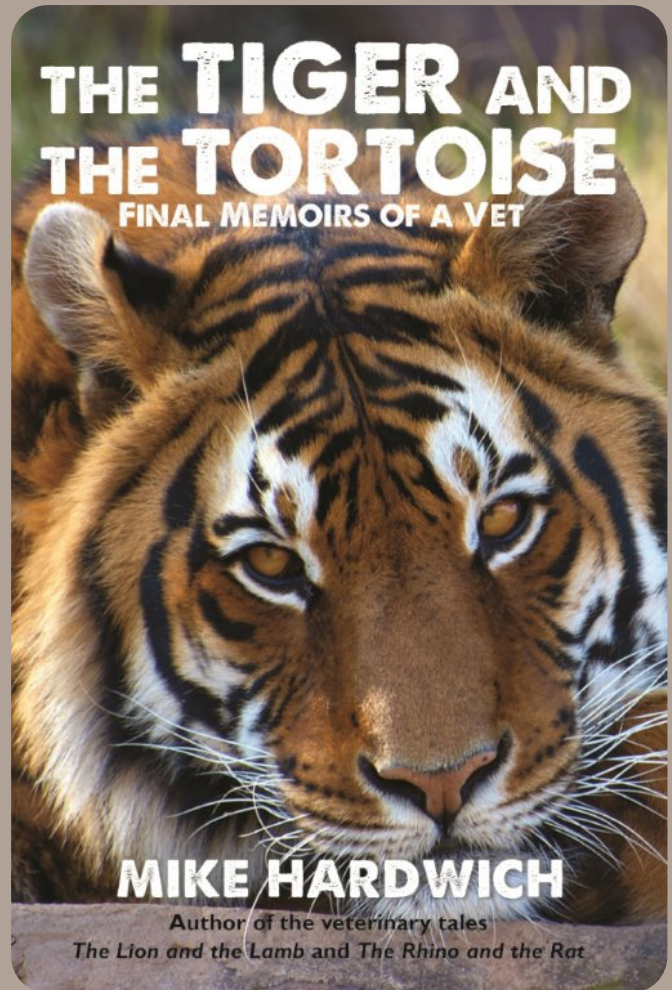
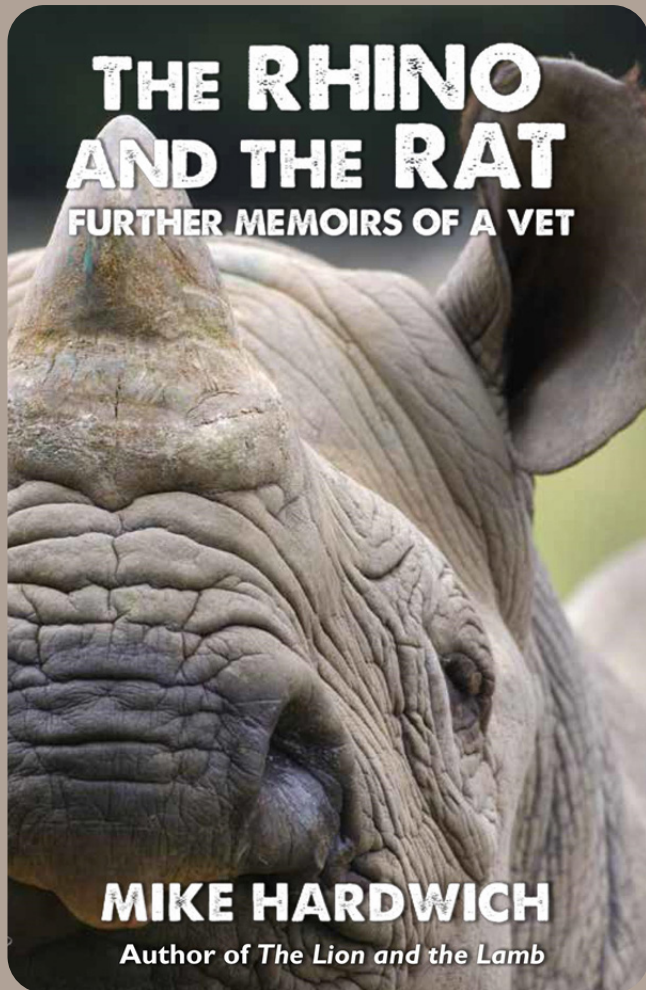
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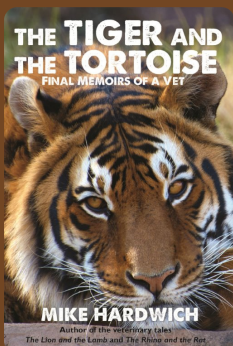




As a country vet whose territory covers the rich valleys and farmland of KwaZulu-Natal, his clients range from cattle farmers to owners of domestic pets, from game ranchers to circuses. The demands on a vet are constant and often arrive at very inconvenient times. Called upon day and night, Mike brings to each case his skills, ingenuity and years of experience, and although he never loses sight of his aim of preserving and improving the lives of the animals he is called upon to treat, sometimes he is sorely challenged by their owners.

Whether he is describing the difficult birth of a two-headed calf, discovering sheep scab on the Isle of Man, caring for Dorothy the elephant in her declining years, or helping Reggie the rat's grieving owner accept his impending demise, Mike's compassion and pragmatic humour never seem to flag.

These enjoyable tales of the trials, tribulations and triumphs of a veterinarian who always sleeps with one ear cocked, will leave you wanting more.....



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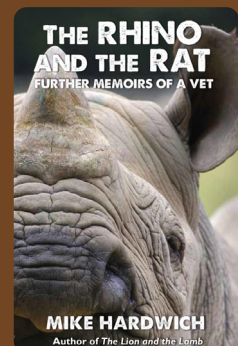
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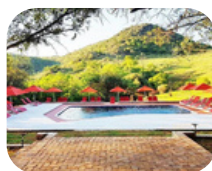
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Encouraging Mid-Point Results from SAVA Resiliency Pilot Signal Hope for South African Veterinarians



The South African Veterinary Association (SAVA) has released encouraging mid-point results from its pioneering *Resiliency Pilot Project*, a national initiative designed to address the escalating well-being crisis facing veterinarians in South Africa.

Launched in **February 2025**, the 12-month pilot will conclude in early 2026 and represents an unprecedented **philanthropic collaboration** between **Lincoln Institute of Veterinary Business**, **Merck**, **Royal Canin**, **MentorVet**, and the **World Small Animal Veterinary Association (WSAVA)**, with **UC Davis** serving as the research partner. This consortium was formed in direct response to SAVA's urgent appeal for help following the alarming mental health findings reported in its 2023 *Vets in Crisis* report.

A Crisis Requiring Immediate Intervention

The *Vets in Crisis* report released by SAVA in 2023 revealed that **38%** of South African veterinarians met the threshold for **probable clinical depression**, with **64%** of that group experiencing **suicidal ideation** or **thoughts of self-harm**. Burnout, anxiety, PTSD symptoms, and sleep disturbance were widespread across all demographics, with younger and female veterinarians particularly affected.

These findings underscored the urgent need for a sustained, evidence-based intervention – one that strengthens veterinarians' wellbeing today while building a more resilient profession for the future.

A Two-Phase Wellbeing and Satisfaction Development Model

At the six-month mark, participants have now completed half of the highly acclaimed **Leading Edge for Veterinarians** program by Lincoln Institute of Veterinary Business - an internationally respected training curriculum focused on communication, leadership, patient advocacy, emotional resilience, and professional self-worth.

In the second half of the pilot, participants will complete the remaining 50 per cent of **Leading Edge** modules while beginning structured **MentorVet training** in parallel, creating a world-first dual track learning experience that blends targeted non-technical competency development with structured wellbeing mentorship and psychological skill-building.

This combined approach is expected to generate new insights that will inform global veterinary wellbeing initiatives.

Mid-Point Results Show Promising Gains

Preliminary mid-point findings – drawn from detailed qualitative research – show overwhelmingly positive shifts in wellbeing, confidence, relationships, and perceived capability.



SAVA RESILIENCY PILOT – MID-POINT QUALITATIVE DATA

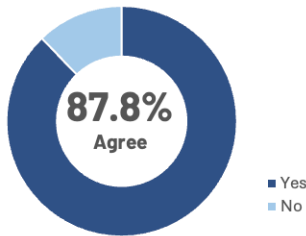


Over 85% respondents believe better outcomes for patients and clients were achieved due to the Leading Edge program so far through fostering better relationships and clear communication.

Effective communication with colleagues has resulted in better teamwork and fewer stressful interactions, while clear communication with clients has enabled collaboration in achieving the best possible outcomes for their pets.

Patient Outcomes

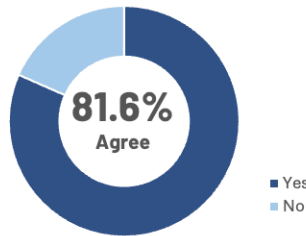
Have you been able to achieve better outcomes for patients and clients because of the training so far?



I have experienced better and more accurate estimates leaving room for unexpected diagnostics.

Workplace Relationships

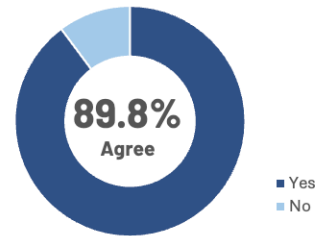
Are you experiencing better relationships with colleagues because of the training so far?



We are making this a team building experience.

Client Relationships

Are you experiencing better relationships with clients because of the training so far?



I engage more with the clients, I have always had good client relationships but managing to do better with the clients that I don't naturally 'gel' with.
Very useful for client and conflict management, think this should be implemented at university level in final year or during com serve year as I felt very unequipped starting my first clinical job and wish I had all this info sooner

Source: Mid Point Questionnaire program study. n=49



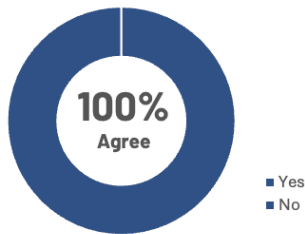
SAVA RESILIENCY PILOT – MID-POINT QUALITATIVE DATA



Overall, around **100% of participants report enhanced professional fulfilment and around 96% improved in confidence.** By equipping participants with the targeted non-clinical skills to better manage areas such as interpersonal interactions, self-care, time management and self-worth, an encouraging **82% feel more resilience to the strains of veterinary practice.**

Fulfilment as a Veterinarian

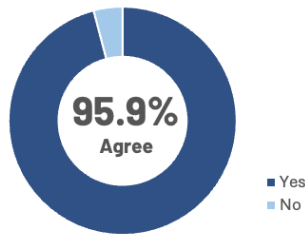
Has your education through the Leading Edge program so far enhanced your professional fulfilment as a veterinarian?



The course has helped me to see my worth as a veterinarian and has helped me to have confidence in my patient advocacy skills. It has helped give me a different perspective

Confidence as a Veterinarian

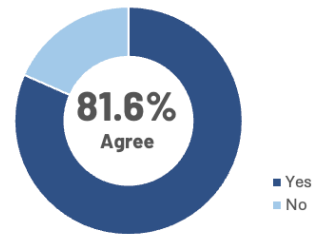
Do you feel more confident as a veterinarian because of the training so far?



The course has helped me to recognise my skill and has given me the communication skills I need to confidently speak to clients about what their animal needs.

Resilience

Has your resilience to the strains of veterinary practice improved because of your training so far?



I am not taking knocks as personally, as I have better self worth. I am also leading my team more **assertively/intentionally** and am more aware of what things I can control and improve on.

Source: Mid Point Questionnaire program study. n=49

Project contributors emphasise these are preliminary mid-point findings without independent UC Davis verification completed, but the early indicators are highly encouraging.



Human Impact: Professionals Rediscovering Their Strength

Much of the extensive participant feedback received has been described as inspiring – reflecting breakthroughs in confidence, clarity, connection, courage, and hope. Many veterinarians noted that the Leading Edge program is giving them the tools, perspective, and support they had never received before their training or professional lives.

Several excerpts reveal the depth of impact:

“This program has made me feel less lonely in the profession. The deep dive webinars have been especially helpful – a platform where vets can share their challenges and realise they are not alone.”

“It has validated my strengths and helped me reframe my self-worth. I am more grateful, more intentional, and more capable in leading my team.”

“I often felt overwhelmed and on the brink of burnout. This course has given me practical ways to manage triggers, find perspective, and rebuild confidence.”

“I am not taking knocks as personally anymore. I’m leading my team more intentionally and focusing on what I can control. My resilience has definitely improved.”

Others spoke of meaningful professional transformation:

“The techniques I’ve learned have added so much value to my consultations – better communication, improved client relationships, and clearer decision-making.”

“Participating in the program has had a significant impact on my professional development. I’ve applied tools that have improved team communication, workplace culture, and even clinic operations.”

Reflections from the Project Contributors

Director of Lincoln Institute of Veterinary Business and project co-lead, Dr Michael Powell, said: *“We feel truly honoured to be part of this collaboration – working together to create meaningful and lasting improvements in wellbeing and professional satisfaction for veterinarians across South Africa.”*

Encouraging Mid-Point Results from SAVA Resiliency Pilot Signal Hope for South African Veterinarians <<< 24

He noted how the extensive commentary from participants is extraordinarily heartwarming, with veterinarians of diverse backgrounds describing genuine breakthroughs in their well-being, mindset, and capability in practice.

Dr Powell also emphasised the significance of the resilience findings. He said, "While we remain cautiously optimistic, it is profoundly uplifting to witness such encouraging signs of early changes. At just the mid-point of the project, having more than 80 per cent of participants reporting strengthened resilience to the inherent strains of practice is particularly heartening."

Looking Ahead

With six months remaining, the combined impact of the Leading Edge and MentorVet training is expected to deepen participants' resilience, clarity, and professional capability. Final findings – anticipated in early 2026 – will inform future investment, policy, and wellbeing strategies for the profession.

SAVA's immediate past President and project co-lead, Dr Paul van der Merwe, said, "These early results remind us of the incredible progress we can make when the international veterinary community stands together to support those who care for animals. This project is more than a beginning — it's an inspiring step toward a stronger, more resilient profession worldwide."

About the Resiliency Pilot Project

The *Resiliency Pilot Project* is a national philanthropic collaboration designed to address mental health, burnout, and professional sustainability in the veterinary sector. It brings together Lincoln Institute of Veterinary Business, Merck, Royal Canin, MentorVet, WSAVA, UC Davis, and SAVA to deliver structured non-technical competency development, psychological well-being mentorship, and rigorous research into their combined impact on South African veterinarians.

THE FOUR QUADRANT MODEL

MAKE THINGS HAPPEN (top)

LET THINGS HAPPEN (bottom)

LOW REGARD FOR OTHERS (left)

HIGH REGARD FOR OTHERS (right)

- Q1: TELL AND DO
- Q2: ABDICATE AND AVOID
- Q3: SOCIALISE AND PACIFY
- Q4: CHALLENGE AND INVOLVE

SOCIAL STYLES IN YOUR TEAM

MORE ACTIVE/ASSERTIVE (top)

MORE PASSIVE/THOUGHTFUL (bottom)

FACT & TASK ORIENTED (left)

FEELING & PEOPLE ORIENTED (right)

- DRIVER** (Red)
- EXPRESSIVE** (Orange)
- ANALYTIC** (Purple): THOROUGH, ACCURATE, CAREFUL, CONSIDERED; CAUTIOUS BUT CAN COME ACROSS NEGATIVE/SANGASTIC; THEIR NEED IS TO BE CORRECT; NEED FACTS, AND DETAIL IN COMMUNICATION; MOTIVATED BY CLEAR PROCEDURE AND ACCURATE RESULTS.
- AMIABLE** (Blue)

YOUR "WHY" AND GOLDEN CIRCLE THEORY

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STRESS

DEBTS CAREER CHRONIC BILL EXHAUSTED STRUGGLE FINANCE PROBLEMS HEAVY HEALTH EFFORT CHAOS MONEY DEBTS WORRIED COPING FRUSTRATION BUSINESS BILL CONFUSION OVERLOADED

DIET MONEY WORKPLACE SAVING PRESSURE COPING PROBLEMS DEADLINES DIVORCE OVERLOADED CONFUSION DAMAGE FAILURE CAREER

24-Hour Toll-Free Helpline: 0800 21 21 21

STRESS

DEBTS CAREER CHRONIC BILL EXHAUSTED STRUGGLE FINANCE PROBLEMS HEAVY HEALTH EFFORT CHAOS MONEY DEBTS WORRIED COPING FRUSTRATION BUSINESS BILL CONFUSION OVERLOADED

DIET MONEY WORKPLACE SAVING PRESSURE COPING PROBLEMS DEADLINES DIVORCE OVERLOADED CONFUSION DAMAGE FAILURE CAREER



Save the Date

SAEVA CONGRESS 2026

19-22 February 2026

Champagne Sports Resort

Drakensberg KwaZulu Natal

KEYNOTE SPEAKERS



Dr Gemma Pearson



Dr David Bardell



SCAN
ME



SPECIAL GUEST SPEAKER Prof Ann Olivier Carstens

BVSc, MS(Vet physiol), MMedVet(Large Animal Surg), MMedVet(Diagnostic Im),

Dipl. Tertiary Educ., Diplomate ECVDI, PhD



<https://vetlink.co.za/saeva-congress-2026/>



The SAVA Stress Management Hotline is there to assist members who are experiencing personal problems by offering access to professional counselling/advice.

The hotline can assist with referrals or simply offer much needed emotional support when anxiety, depression, anger, grief, loneliness and fear are at their highest.

The following SAVA members are available on the SAVA stress management hotline. If required, they will refer you to professionals.

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Aileen Pypers	072 599 8737	aileen.vet@gmail.com
Willem Schultheiss	082 323 7019	schultheisswillem@gmail.com
Mike Lowry	084 581 2624	mikelowry@sai.co.za
Tod Collins	083 350 1662	todthevet@gmail.com

24-Hour, Toll-Free Helpline

Manned by psychologists, social and frontline healthcare workers: 0800 21 21 21

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Suid-Afrikaanse Veterinêre Vereniging

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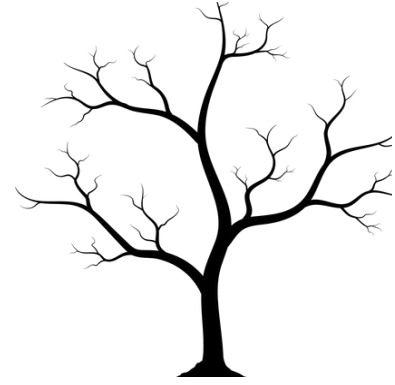
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Bush Break



Continuing Professional Development

NVCG BUSH BREAK 2026

Feline Internal Medicine Update

06 - 07 June 2025

Skukuza Kruger National Park

*Save
The Date*



Dr. Dave Miller



Dr. Rowena Watson

Dr. Dave Miller and Dr. Rowena Watson are both part of the Medical Department at the Johannesburg Specialist Veterinary Centre (JSVC), where they work alongside Dr. Adri Scholtz to provide comprehensive internal medicine services.

Dr. Dave is a specialist physician who qualified from Onderstepoort in 1992 and completed his specialization in 2003. His expertise covers a wide range of internal medicine fields, including dermatology, cardiology, oncology, urology and nephrology, musculoskeletal diseases such as arthritis, endocrine disorders, and the management of critically ill patients with infectious diseases. The department also offers endoscopy, diagnostic radiology, ultrasonography of the heart, chest, abdomen, and glands, as well as chemotherapy. MRI and CT scans are conducted at a nearby human hospital. Dr. Dave and his colleagues collaborate closely with the JSVC surgical section to deliver a complete small animal referral service, supported by a dedicated nursing and veterinary assistant team.

Dr. Rowena Watson has been in practice since 2014, gaining experience in both primary care and 24-hour referral settings. Passionate about feline medicine, she just completed her small animal medicine residency at JSVC and is in the final stages of specialising. She continues to expand her expertise in internal medicine under the mentorship of the JSVC medical team.



<https://vetlink.co.za/nvcb-bush-break-2026/>



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19 - 20 March 2026
Johannesburg



Steven De Decker

DVM PhD DipECVN MvetMed PGCertVetEd FHEA MRCVS

Steven De Decker graduated from Ghent University in Belgium. After graduation, he performed a rotating internship there and undertook a PhD studying 'wobbler syndrome' in dogs. This was followed by a Residency in Neurology and Neurosurgery at the Royal Veterinary College. He is Senior Lecturer and the Head of Service of the neurology and neurosurgery team at the Royal Veterinary College. Although he is interested in all aspects of veterinary neurology, most of his research and publications focus on spinal disorders and neurosurgery.



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Non-profit Organisation: 000-234 NPO
Public Benefit Organisation: 130001321

SAVA-CVC Eastern Cape Rabies Project

By Daniel Campbell

I had the amazing opportunity of joining the SAVA-CVC EC Rabies Project and their team in the field and watching how they operate their door-to-door vaccination approach. It became evident early on that many dog owners would struggle to restrain or transport their dogs the necessary distance to central vaccination points that are often used in other vaccination campaigns and this showed the immense value in the door-to-door approach. It provides a much better vaccination coverage in a very methodical way for the targeted communities. It was also interesting to note the freedom to roam around that many of the dogs had, even though they were owned and cared-for dogs. I was very impressed with the sheer volume of vaccinations completed by the team as well as the data that they collected from each animal they vaccinated.

It was interesting to see the net capture method used quite successfully resulting in many dogs that would otherwise not be vaccinated receiving a dose. The team was very effective and it was nice to see the appreciation and enthusiasm from the community for the work they were doing. I am also grateful for the experience I gained with the short time spent at the animal clinic at TARDI with numerous surgeries and call outs and gaining more insight into the training and roles that animal health technicians play in primary animal healthcare. It was very interesting and impressive to see the geographical database of rabies cases and vaccinations that Dr Emelina has compiled and its potential benefit and use for not only rabies programs but also identifying areas where there is a need and desire from owners for sterilisation programs and other veterinary care.

I thoroughly enjoyed my experience that was sponsored by SAVA-CVC and feel I have a much better understanding of the specific challenges and systems in place for the management of rabies in the Eastern Cape. **U**



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FNB Bank Cheque
Account:
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Branch: Brooklyn:
251345
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No: 1998/016654/08
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To read the monthly publication that keeps you up to date with member news, member activities and current topics in the world of veterinary research and events, go to "Members Menu" and click on the VetNews Tab.



To complete the CPD articles in the VetNews magazine, go to "Members Menu". Click on the VETNEWS tab - all back issues, CPD articles and relevant quizzes are available [HERE](#). Now you can answer the questions and earn your CPD points with ease.

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Members of SAVA can publish in the JSAVA free of charge (non-members to pay a fee).

For more information, please go to www.jsava.co.za

Journal of the South African Veterinary Association



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South African Veterinary Foundation

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Contact us on hello@locumbase.com or visit www.locumbasevets.com

Veterinary Mental Health Wellness Programme

The SAVA stress hotline, where colleagues make themselves available to talk to members in need through difficult situations or to refer them for professional help. For assistance, please contact our hotline on **0800 21 21 21**.



Members can also contact one of our mentors:

Ken Pettey: 082 882 7356, ken.pettey@gmail.com

Aileen Pypers: 072 599 8737, aileen.vet@gmail.com

Willem Schultheiss: 082 323 7019, willem.schultheiss@ceva.com

Mike Lowry: 084 581 2624, mikelowry@sai.co.za

Tod Collins: 083 350 1662, todthetvet@gmail.com



Practice support



SAVA Vaccination Booklets: For more information or to place an order, please contact Debbie Breeze on debbie@sava.co.za

For more information on the purchases of name badges and books contact Sonja van Rooyen on assistant@sava.co.za



WhatsApp Communication Platform



Join our community and stay up to date with important topics in the veterinary industry and relevant matters as they arise.

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For more information, please email Claudia Cloete on: manager@savacvc.co.za

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Support:

If you have any questions or need assistance, please contact
Sonja van Rooyen at assistant@sava.co.za on 012 346 1150

Thank you for your continued commitment to excellence in veterinary care.
We look forward to supporting your ongoing professional development.

Dear SAVA member

Please note that Vethouse will be closed from
12:00pm on Tuesday 23 December 2025 and
will reopen on Monday, 05 January 2026.

**SAVA wishes all its members and their families
a joyful festive season and everything of the
best for the year ahead.**

Kind regards
Sonja Ludik
Interim General Manager

Geagte SAVV lid

Neem asseblief kennis dat Vethuis gesluit sal wees
vanaf 12:00pm op Dinsdag 23 Desember 2025 en
weer op Maandag, 05 Januarie 2026, sal heropen.

**Die SAVV wens alle lede en hul families 'n
vreugdevolle feestyd, en alles van die beste vir
die nuwe jaar toe.**

Vriendelike groete
Sonja Ludik
Waarnemende Algemene Bestuurder

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- To join, you will need an invitation link or an invite from a community admin or an existing SAVA member.

Joining via an Invitation Link:

1. Obtain the invitation link from a SAVA member or community admin.
2. Click the link, which will open WhatsApp and prompt you to JOIN.
3. Tap "Join" to confirm your membership.

Did not receive the link invite? Are you encountering other issues?

Please contact Sonja van Rooyen at +27 (0) 12 346 1150 or at assistant@sava.co.za

We look forward to connecting with our members on this community platform!

VACCINATION BOOKS

The LAST ORDERS for 2025 for vaccination books will be on 30 November.

No orders will be accepted after this – this is to ensure that stock will be dispatched by 15 December 2025.

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To order / for more information contact Debbie Breeze on 012 346 1150 or debbie@sava.co.za

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SAVA Community Veterinary Clinics (SAVA-CVC)

A project of the SAVA which aims to provide primary healthcare to pets owned by owners who cannot afford the services of a veterinarian. Various clinics have been established countrywide. Veterinarians donate their time and skill. Financial support is required, primarily to purchase medication and materials. Registered non-profit company (1998/016654/08) non-profit organisation (000-234NPO) and public benefit organisation (130001321)

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South African Veterinary Foundation (SAVF)

The foundation was established to promote a greater understanding of animals, through promoting research and an informed public. Student bursaries and research grants are awarded; research results are published in national and international journals.

www.savf.org.za, savf@sava.co.za

South African Veterinary Council (SAVC)

The SAVC is the regulatory body for the veterinary profession and veterinary para-professions in South Africa.

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In Memoriam

Clive Peter Marwick – Veterinary Biography



Dr Clive Peter Marwick was born in Cape Town, the second son of Cedric Marwick, whose profession was in Forestry, and Elizabeth (Bessie), a teacher. The family frequently moved, including Knysna, Umtata, Barberton, Sabie, Eshowe and Pietermaritzburg. Clive matriculated at Jeppe Boys High School in Johannesburg in 1963 and spent a year at the South African Air Force (1964) before commencing his university studies at the Pietermaritzburg campus of Natal University (1965-1966) and on to the University of Pretoria, graduating BVSc at Onderstepoort in 1972.

In 1973, he served as State Veterinarian in Durban, where he showed an early indication of his pioneering approach to populations rather than individual animals when he created a Kennel Health Programme for the South African Police Services Dog Unit.

He moved to Clocolan in the Free State Province in 1974 after marrying Hendretia Lombard on 15 December 1973. They had 3 children: Peter, Lizelle and Monique. Clive practised in Clocolan from 1974 to 2015 and was a pioneer in the preventive medicine approach rather than merely a reactive service to livestock owners, particularly in the dairy farming industry. His planned farm visits enabled regular monitoring of performance and identifying emerging problems that could be addressed and prevented or minimised. Appreciating the value of routine monitoring for mastitis, he recruited his clients for the Allerton Mastitis Scheme, overcoming the logistical problems of distance to the laboratory.

In 1981, he attended 3 Embryo Transfer courses in Denmark, Belgium and England to enable him to offer his clients this emerging technology for obtaining superior offspring. He quickly saw the potential of ultrasound evaluations for reproductive health and was a pioneer in this field.

Promoting the implementation of Herd Health and Production required much research, development and experience. The accumulation of huge datasets in dairy herds led to the development of his computerised analysis programs, enabling accurate and rapid identification and quantification of the production situation in large dairy farms. His expertise was recognised by invitations to present lectures to farmer groups and radio interviews, as well as many presentations to vets at scientific Congresses. He also gave presentations in Namibia and Zimbabwe. Clive willingly mentored and guided many new veterinary graduates to the benefit of the livestock industries.

Further evidence of recognition is his appointment as Guest Lecturer in Preventive Medicine in Dairy Cattle (1983-1986) and External Examiner (1986-1989) at the Faculty of Veterinary Science at Onderstepoort, and subsequently on the Faculty Advisory Board (2009-2016?).

In spite of the demands of his private practice, Dr Marwick found time to participate in and contribute to many veterinary organisations. His leadership role is evident in the many positions that he held over the years: He was the second Chairman of the Rural Practitioners Group (later LHPG and now RuVASA) from 1981 to 1985 and Chair of the Embryo Transfer Group (1984-1986), as well as a Founder Member of the Eastern Free State Branch of the SAVA in 1992, and its Chairman from 1996 to 1998. He served as an elected member of the SAVA Federal Council from 1983 to 1987, on its Executive from 2003-2009, as a Board Member from 2009-2011, and as President of the SAVA from 2007 to 2009. He also served as the SAVA representative on the SAVC from 2003 to 2007, and the International Veterinary Officers Council from 2007-2009, as well as Chairman of the Animal Health Forum from 2006-2011, and as a member of the SAVA Awards Committee from 2022-2025.

In 2009, he was elected to the Executive Committee of the SA Veterinary Council and served as a member and Chair of its Finance Committee from 2011-2016, the Inspections Committee from 2013-2015, the Food Safety and Security Committee in 2013 and as SAVC President from 2015 to 2019.

Internationally, Clive Marwick served in 2018 as an Executive Member of the African Association of Veterinary Statutory Bodies and on the World Veterinary Association as the Council Member for Africa 2011-2014, on its Finance Committee 2011-2016, as Chair from 2017, on the Constitution and Bylaws Working Group 2011-2013, and Congress Rules and Amendments from 2011 to 2014.

Clive made time to contribute locally as a Town Councillor in Clocolan for 16 years and as a member of the Finance Committee of the Setsoto Municipality.

>>>39

In Memoriam: Dr Clive Marwick <<< 38

His contributions were recognised by RuVASA's Ricky Wilson Award in 2015 and SAVA's President's Award in 2017. Over his professional lifetime, Clive showed a consistent attitude to everything he did – with vision, determination, thoroughness, energy and integrity. He worked with people with consideration, inclusiveness and helpfulness. If time allowed in his busy life, he enjoyed playing squash, going diving and doing carpentry.

In 2016, Clive and Hendretia retired to Jeffrey's Bay after a long and productive life of service, where he died at peace on the 25th of July 2025. He was deeply respected and is fondly remembered by his family, friends, colleagues and clients. **U**

Prof Gareth Bath

Jeanne Giselle Vigeé-Le Brun Mattheus

Dr Jeanne Giselle Vigeé-Le Brun Mattheus, 44, BSc-Agric (Cum Laude) UFS and BVSc UP, passed in the early hours of 11 March 2025 due to a lung embolism.

Jeanne was born on 30 September 1980 in Bloemfontein as the daughter of André and Ella Mattheus.

Jeanne was always a sensitive soul, an artist and an animal lover to her core.

She played the violin and viola, sketched and painted beautifully. She rode horses, competed in dressage and was a member of the Free State & Northern Cape Junior Equestrian Team that competed in the SA Junior Championships more than once.

Studying veterinary science, the heavy workload and the trauma she later experienced in some practices caused infinite damage to her health. Little time remained for leisure.

Despite health challenges, she excelled as a veterinarian, obtaining support when necessary.

At the time of her passing, she had a tremendous job offer in Hong Kong, was successfully registered with the HK Veterinary Council and was awaiting her work visa.

Jeanne will be missed by all who knew her. **U**

Prof Ken Pettey



We honour and remember the contributions made by our colleagues who recently passed away.

Dr Brian Easton 1940 – 2025

Dr Bill Jenkins 1937 – 2025

We honour their contribution to our profession and society in general and pray that their families and loved ones will find the strength to carry them through these times of bereavement.

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MISPERCEPTIONS PART 2



Dr Mats Abatzidis

B.Sc. B.V.Sc.

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<http://www.life-coach-directory.co.za/mats-abatzidis>

I hope this article finds you and your families well and safe!!! Last month, we looked at certain misperceptions that we sometimes subscribe to, mostly because it is convenient. Now we look at some more!

I have heard so many people in my time say, "It's just not worth the risk!" and then they give up. I have done it too. I think we all have! However, "**There is always risk, so learn to manage risk instead of avoiding it.**" – Robert T Kiyosaki. This is further reiterated by Nelson Mandela's words – "There is no passion to be found playing small and settling for a life that is less than the one you're capable of living." I believe most of us are underperforming and avoiding risks as much as possible. I have taken my fair share of risks in my life so far. In life, we must take calculated risks, which is when even the worst outcome is manageable.

I remember growing up and sitting in on my dad's conversations with his adult friends and visitors at home. On a few occasions, I was told "to make sure you have something to fall back on." Always have a safety net. The counterargument to that is **learning to fail forward**.

A very worthy investment in this regard is John C Maxwell's book – "Failing Forward," where he reveals how several noteworthy individuals developed the ability to take risks, learn from their mistakes, and profit from their failures. Famous sports stars have failed more than they have succeeded, but we do not hear about their missed shots and failures, just their scoring and their wins.

Thomas Edison conducted more than a thousand failed experiments until he managed to get a light bulb to work. Subsequently, everybody is now using the light bulb. Every "No" brings you closer to a "yes." Every failure brings you closer to success. If you are not failing, you are not even trying to succeed.

One of the many things people do to protect themselves against failure is to always perform without absolute clarity about what they are trying to achieve. "One day I will have a nice car" or "One day I will have a nice house." There is no clarity about when that "One day" will be, and there is no detail provided for what the car or the house will look like. Then they try a couple of things half-heartedly, and they fail.

Then they rationalise that failure by saying that it was not what they really wanted or needed, or they held back on the effort to preserve themselves, and maybe if they had gone all in, they would have achieved their goal.

That way, they cannot be too hard on themselves for failing. What is wrong with attempting things half-heartedly and thinking this way? If we sit on the fence by setting up vague "goals" and lack commitment, we then move from risking the possibility of failure and engage in a life where we ensure the absolute certainty of failure. That means, **we owe it to ourselves to try our absolute best and go all in** when we are working towards each of our goals, to ensure that we do not ensure failure.

Do regrets come from failures? Imagine a person on their deathbed and standing all around that bed are ghosts that represent the patient's unfulfilled potential, ideas the person never acted on, and the talents that were not used. Those ghosts would be angry and disappointed. The patient could have brought them to life. How many ghosts would be standing around our beds when our time comes?

The pain of not having done something often lasts far longer than the pain of having taken the wrong action or made the wrong decision. We waste so much time looking at the door that has closed on us that we miss the doors that have opened for us. **We should have no regrets in our lives;** we should just **take the lessons** out of failed attempts and take the chances that are being offered to us.

Setting the right benchmark to measure yourself against is fundamentally important. There are so many celebrities out there today, and influencers, mentors, etc. Are they the ones we should be comparing ourselves to and striving to be like? You have a certain set of talents, possibilities, limitations, and tragedies that are truly unique to your life, your time on this earth, which makes you an absolute individual human being.

So, comparing yourself to someone else on some dimension because you have identified a few similarities, but ultimately their talents, opportunities, limitations, and tragedies or equally unique in their life, which then means our comparison is a completely unreasonable one. So, what is the most appropriate comparison to make? **The proper comparison to make is you yesterday**, as the background to you yesterday is the same and thus makes the comparison appropriate.

All the best for the festive season! Enjoy and be safe!

*Next month, we will continue looking at more ideas for improving our quality of life and overall performance, both at work and at home. **I***

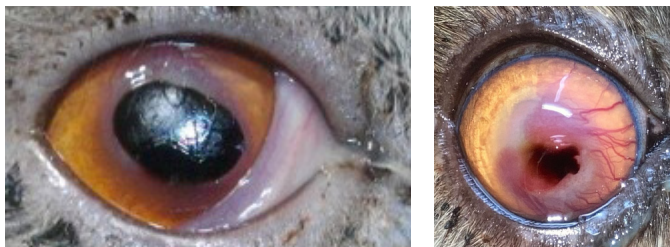
Corneal Sequestrum

Dr Anthony Goodhead
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 Johannesburg and Cape Animal Eye Hospitals
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Since this month is themed cats and dogs, we shall discuss a prevalent and important cat eye condition that causes both owners and vets grief, namely **Corneal Sequestrum**.

Definition:

Corneal sequestrae are common lesions seen in cats. A similar type of lesion is rarely described in dogs and horses. The sequestrum is characterised by a brown discolouration of the corneal stroma. In addition to the term sequestrum, this condition has also been referred to as corneal mummification, corneal nigrum, and corneal necrosis.



Causes: The exact cause is unknown, but there seems to be an association with Feline herpesvirus Type 1 infections. Other known causes include corneal ulceration, traumatic corneal lesions and chronic corneal abrasion & irritation, as seen in cases of entropion in cats.

Predisposed breeds: Although a sequestrum can occur in any cat breed, we certainly encounter them more often in brachycephalic breeds such as Persians and Himalayans. Other breeds commonly affected include Burmese, Siamese, Sphinx and the Oriental breeds. It is not unusual for a Maine Coon to have a lower lid entropion with associated developing sequestrum.

The condition occurs in cats of all ages, with the apparent exception of neonates, and exhibits no gender predilection. Reported ages range from 5 months to 18 years

with a mean age of 5.2–5.6 years.

Pathogenesis and Clinical Appearance:

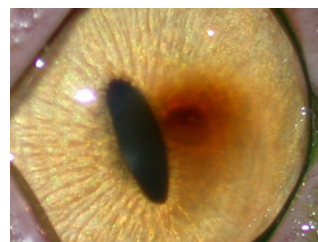
The exact etiopathogenesis of sequestrum formation remains unknown. It is widely accepted that some form of chronic corneal insult needs to occur to initiate the process. Early reports speculate causes to include apoptosis and ultrastructural changes in keratocytes, which include clumping and margination of chromatin and shrunken cytoplasm, a local metabolic defect, a hereditary basis in colourpoint breeds, or a primary stromal

dystrophy. The host of different brachycephalic breed-related adnexal abnormalities (brachycephalic ocular syndrome or BOS), including macroblepharon, lagophthalmos, entropion, and medial canthal trichiasis, are repetitively linked with corneal sequestration. Corneal sensitivity, particularly that of the central cornea, is known to be poorer in healthy Persians than in healthy DSH cats, but no statistical difference was found in the central corneal sensitivity of normal Persians versus those with sequestrae. Conjunctival goblet cell atrophy and an accelerated tear film break-up time [TFBUT] have also been presented as a potential cause of corneal sequestrae. There appears to be a possible correlation between decreased goblet cell/epithelial cell ratios in the conjunctiva and an accelerated TFBUT. Tear film dysfunction remains an emerging focus of investigation in this and other ocular surface diseases.

A slight but statistically insignificant increase in tear protein concentration occurs in affected cats. Total tear lipid content appears significantly lower in affected eyes than in control eyes when evaluated with high-performance liquid chromatography.

Iatrogenic sequestration has been reported following debridement or grid keratotomy of non-healing corneal ulcers. A sequestrum developed in 10% of eyes following debridement alone and 31% of eyes treated by grid keratotomy. It is for this reason that we do not perform a striate keratotomy in cats. Chemical cauterisation has also been incriminated as an iatrogenic stimulus. Despite all these potential causes, FHV-1 is still strongly implicated as a factor in sequestrum formation. Chronic corneal ulceration frequently precedes sequestration in many cats, and the most common cause of feline corneal ulceration is FHV-1 unless proven otherwise.

FHV-1 DNA has been identified in experimentally induced and naturally occurring sequestra. Historically, it was hypothesised that upregulation of pro-inflammatory cytokines following keratocyte infection could explain the similarity in histologic features between a sequestrum and the collagen damage seen in herpes-induced stromal keratitis. Interestingly, the prevalence of FHV-1 DNA is greater in sequestra from domestic breeds than in Persians, lending support to the fundamental role of conformation in sequestrum formation in the brachycephalic breeds of cat.



Early sequestrum is seen as a light brown, tan area on the cornea

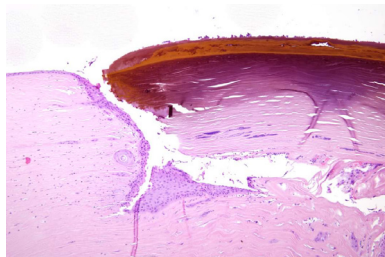
The clinical appearance of a corneal sequestrum is unmistakable. The lesion usually develops unilaterally. Bilateral lesions can arise simultaneously or sequentially but tend to occur most often in Persians or other brachycephalic breeds. An oval to circular pigmented lesion commonly develops in the central or paracentral cornea, its colour progressing from translucent amber to darker bronze, then to an impervious jet black with chronicity. The location may vary depending on the inciting cause. The margins of the discolouration are typically ill-defined in the early stages but become more distinct over time. A subtle bronze tint often extends peripherally into the stroma surrounding a discrete sequestrum.

The size of the sequestrum varies, with diameters ranging from 1 to 10 mm. The depth of the lesion also varies and can extend from the superficial stroma to Descemet's membrane. As the sequestrum progresses and opacifies, lesion depth becomes increasingly difficult to determine without the benefit of advanced imaging modalities such as ultra-high-resolution ultrasound. This makes it difficult to speculate how effective a keratectomy surgery may be. The lesion may also appear raised above the surrounding cornea as corneal epithelium can migrate beneath the sequestrum, separating it from the deeper stroma. There are certainly reports of where the sequestrum may slough off in this manner, but this would be rare.

Because the sequestrum lesion is uncomfortable, other clinical signs can include blepharospasm, ocular discharge, and conjunctival hyperaemia. The corneal epithelium is usually absent over and immediately surrounding the sequestrum, but uptake of fluorescein may be limited by the stromal necrosis, which may form a moat depression around the sequestrum or may be difficult to visualise over the sequestrum itself. Although corneal ulceration is common, corneal perforation is rare. Corneal vascularisation varies from mild to severe.

Histology:

Histologic features include a loss of keratocytes with stromal hyalinization and an amber-pink colouration on hematoxylin and eosin-stained sections. The corneal lesion commonly involves the anterior stroma, but full-thickness lesions, including Descemet's membrane, occur. The sequestrum itself is characterised by coagulation necrosis and lacks keratocytes, inflammatory cells, and blood vessels. Its lamellar structure is still discernible, but indistinct. Often bordering the stromal necrosis is a foreign body-like reaction, with lymphocytes and plasma cells in early lesions, macrophages, neutrophils, and giant cells in more chronic cases and considerable karyorrhexis and karyolysis at the junction of diseased and normal tissue. Vascularisation or granulation tissue commonly encompasses or undermines the sequestrum. With chronicity, stromal vascularisation and inflammatory infiltrates encompass the sequestrum.



As the stromal collagen degeneration progresses, it is distinguished clinically by discolouration of the affected corneal stroma, its colour progressing from subtle amber and bronze to jet black over time.

The nature of the stromal discolouration remains a mystery. Melanin was proposed based on spectroscopic identification of chromophores with similar light absorption and microscopic detection of melanin-like particles, but a subsequent electron microscopic study failed to identify melanin granules. Another theory implicated tear-derived porphyrins in the stromal discolouration, based on their role in murine chromodacryorrhea, but no porphyrins were found in normal feline lacrimal glands, corneas, or corneal sequestra to support that hypothesis. Traces of iron, copper, and other metals have been found in the necrotic tissue. Feline tear composition remains an area of interest as a source of the discolouration, suggested by the brown colour of affected cats' ocular discharge and the staining of contact lenses, conjunctival grafts, and small intestinal submucosal grafts that occurs during treatment.

Treatment options:

When examining a corneal sequestrum case, it is essential to perform a thorough ocular examination, paying particular attention to the adnexa conformation and any mechanical causes of irritation. In such instances, a partial permanent tarsorrhaphy or correction of medial entropion [medial blepharoplasty] may minimise corneal damage in brachycephalic patients. Because a superficial sequestrum may eventually slough as the corneal epithelium undermines the necrotic tissue, some clinicians advocate a conservative medical approach that combines a topical prophylactic antibiotic, a topical hyaluronan-based lubricant, and a topical or oral antiviral if herpesvirus is suspected. This conservative approach may be adequate, but the concern is if the lesion progresses to a very deep sequestrum that involves concurrent malacia [melting] and near perforation.

If the sequestrum is starting to slough already, then it may be possible to try and debride the loose tissue with scissors or a diamond burr following topical anaesthesia, repeating the process in subsequent visits until the removal is complete.



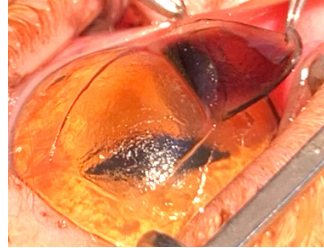
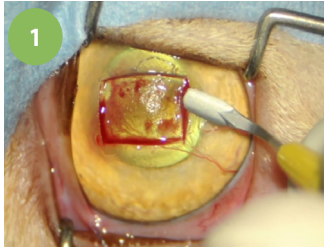
Raised sequestrum starting to slough with undermining epithelium and granulation tissue

Definitive removal of the sequestrum is indicated in persistent or deep lesions, especially as corneal inflammation progresses and pain increases. These options include a **lamella keratectomy** to remove the sequestrum as best as possible and retain as much healthy cornea as possible.

The accepted concept is that covering the keratectomy site with something like a bandage contact lens, third eyelid flap, temporary tarsorrhaphy, cyanoacrylate adhesive, conjunctival pedicle graft, corneal-conjunctival transposition, small intestinal submucosal graft, amniotic membrane transplant, and bovine pericardial graft can all potentially assist with reducing recurrence. There are, however, variable success rates with these techniques. Conjunctiva, corneal-conjunctival transposition and amniotic membrane seem to be the most successful.

Transplantation of equine amniotic membrane results in good corneal transparency 12–20 weeks postoperatively following regression of secondary granulation tissue.

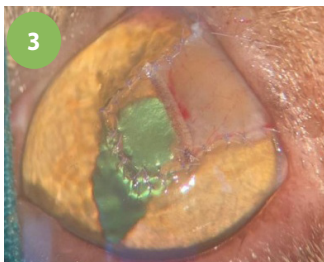
All these procedures require good magnification and involve microsurgical techniques and equipment, and should probably be reserved for the referral situation.



Lamella Keratectomy



Keratectomy and conjunctival pedicle graft



Keratectomy and clear corneal translocation [CCT]



Keratectomy and amniotic graft. Completely visual eye after 3 months

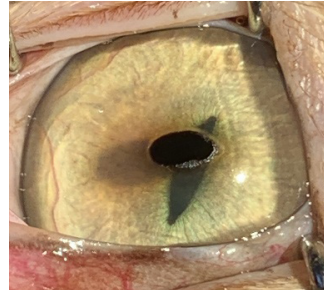
In one study, the presence of residual pigmentation following keratectomy is thought to increase the risk of sequestrum recurrence, with a 38% recurrence following incomplete keratectomy.

It is for this reason that it is preferred that a keratectomy surgery be considered earlier rather than later, as the lesion is generally more superficial in the cornea, and a clearer keratectomy can be achieved.



Even after multiple keratectomies, residual pigment may still be present in deep-seated lesions

One also needs to be cautioned against transection of conjunctival pedicles in grafted eyes, as corneal abscess or recurrence of sequestration seems to be more common.



A small superficial sequestrum that has a high surgical success rate following superficial keratectomy

In conclusion, affected cats should be examined carefully to ensure no mechanical irritation, and if so, this should be corrected as part of the sequestrum treatment. The treatment plan should be discussed carefully with the owner, and if surgery is going to be performed, then success rates are higher if a keratectomy can be performed on a small or superficial sequestrum versus managing a deep-seated sequestrum complicated by deep neovascularisation and malacia of the cornea.



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Understanding Gastrointestinal Ulcers in Small Animals: Aetiology, Pathophysiology, and Clinical Management

Dr. Julian Kampman (BSc)(BVSc)(MRCVS)

Gastrointestinal (GI) ulcers are a significant concern in small animal practice, often presenting a diagnostic and therapeutic challenge for veterinarians. While the true incidence in dogs and cats remains unknown, GI ulceration is recognised as more common in dogs and can lead to serious complications if not promptly identified and managed. This article explores the aetiology, pathophysiology, clinical presentation, diagnosis, and treatment of GI ulcers in small animals, providing practical insights for veterinary professionals.

The Gastric Mucosal Barrier: Nature's Defence

The stomach and proximal duodenum are constantly exposed to a harsh chemical environment, including gastric acid, bile acids, and digestive enzymes. To protect itself, the GI tract relies on a sophisticated mucosal barrier. This barrier consists of tightly joined epithelial cells, a thick bicarbonate-rich mucus layer, and robust local blood flow. Tight junctions between epithelial cells prevent leakage of luminal contents, while the mucus layer neutralises acid and traps harmful agents. High mucosal blood flow not only clears any acid that penetrates the epithelium but also supports rapid cell turnover and repair. Locally produced prostaglandins E2 and I2 further enhance mucosal defence by increasing mucus and bicarbonate secretion, maintaining blood flow, and stimulating epithelial regeneration¹.

Pathophysiology: When the Balance Tips

Under normal conditions, the aggressive factors in the gastric lumen are balanced by the mucosal barrier's defences. However, this equilibrium can be disrupted by various drugs and diseases, leading to mucosal injury and ulceration. When the barrier is compromised, hydrochloric acid, bile acids, and proteolytic enzymes penetrate the epithelium, causing cellular damage, inflammation, and apoptosis¹. This initiates a self-perpetuating cycle: inflammation leads to further acid secretion (often mediated by histamine release from mast cells), decreased mucosal blood flow, ischemia, and reduced secretion of protective mucus and prostaglandins. The result is progressive mucosal damage, with ulcers exposing the submucosa or deeper layers to the corrosive luminal environment.

Aetiology: Common Causes in Dogs and Cats

Dogs

- **Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):** NSAIDs are a leading cause of gastroduodenal ulceration in dogs. They cause direct topical injury and, by inhibiting cyclooxygenase-1

(COX-1), reduce the synthesis of protective prostaglandins. Even COX-2-selective NSAIDs, though considered safer, can still cause ulceration and perforation.

- **Neoplasia:** Tumours such as lymphoma, adenocarcinoma, leiomyoma, and leiomyosarcoma can induce ulceration through local tissue effects. Paraneoplastic syndromes, especially from mast cell tumours and gastrinomas (e.g., Zollinger-Ellison syndrome), can increase gastric acid production and promote ulcer formation.
- **Hepatic Disease:** Acute hepatic injury and portosystemic shunts are associated with GI ulceration, possibly due to altered acid secretion and mucosal blood flow.
- **Other Causes:** Major trauma, spinal disease, renal disease, hypoadrenocorticism, GI inflammation (e.g., inflammatory bowel disease, foreign bodies), systemic inflammation (pancreatitis, sepsis), and extreme exercise (such as in sledge dogs) are also implicated. Corticosteroid therapy remains controversial, but combining corticosteroids with NSAIDs is contraindicated due to a markedly increased risk.



Cats

In felines, GI ulceration is most often linked to neoplasia (lymphoma, adenocarcinoma) and inflammatory conditions (lymphoplasmacytic or eosinophilic inflammation)¹.

Clinical Presentation: Nonspecific but Important Clues

Most small animals with GI ulcers exhibit nonspecific signs such as vomiting, anorexia, abdominal pain, and weight loss¹. Hematemesis (vomiting blood) and melena (black, tarry stools) may occur but are variable, especially in cats, where overt GI bleeding is rare. Severe ulceration or perforation can lead to acute abdominal pain, weakness, pallor, shock, and signs of sepsis. Notably, some animals may show no clinical signs, underscoring the importance of vigilance in at-risk patients.



Diagnosis: Tools and Techniques

- **Imaging:** Abdominal radiographs are useful for ruling out obstruction or peritonitis but are not sensitive for non-perforating ulcers. Ultrasonography can detect mural lesions or masses but has limited sensitivity for nonperforated ulcers. Detection of free peritoneal fluid or gas suggests perforation.
- **Endoscopy:** GI endoscopy is the gold standard for diagnosing mucosal ulcers, allowing direct visualisation and targeted biopsy. Capsule endoscopy offers a non-invasive alternative for visualising mucosal lesions⁵.
- **Laboratory Testing:** A minimum database (CBC, serum biochemistry, urinalysis) helps differentiate primary GI from systemic disease and identifies metabolic derangements. Additional tests (e.g., liver function, ACTH stimulation) may be warranted based on clinical suspicion.

Treatment: Addressing the Cause and Supporting Healing

The cornerstone of therapy is identifying and removing the underlying cause—discontinuing NSAIDs, treating neoplasia, or managing systemic disease. Supportive care, including fluid therapy, may be necessary to correct metabolic imbalances.

- **Acid Suppression:** Proton pump inhibitors (PPIs) such as omeprazole and pantoprazole are the most effective agents, providing more complete acid suppression than H₂-receptor antagonists (e.g., famotidine). Combination therapy with both classes is not recommended and may reduce PPI efficacy. Tapering is advised after prolonged use to avoid rebound hyperacidity^{2,3,4}.
- **Cytoprotective Agents:** Sucralfate can bind to ulcerated mucosa and promote healing, but offers no additional benefit when used with PPIs. Misoprostol, a prostaglandin analogue, may be helpful in NSAID-induced ulcers, though evidence is limited.
- **Antimicrobials:** Considered in cases of severe mucosal disruption or when bacterial translocation is a concern.
- **Surgery:** Required for perforated ulcers or when medical management fails.

Prognosis: Variable Outcomes

Prognosis depends on the underlying cause, severity, and timeliness of intervention. Mild, promptly treated ulcers have a favourable outlook, while those associated with severe systemic disease, neoplasia, or perforation carry a guarded to poor prognosis.

Surgical intervention for perforation is associated with a high mortality rate (approximately 60%).

Key Takeaways

- NSAIDs, neoplasia, and liver disease are major risk factors for GI ulceration in small animals.
- PPIs are superior to H₂-receptor antagonists for acid suppression.
- Early recognition and intervention are critical, as perforated ulcers have a significantly worse prognosis.

By understanding the complex interplay of factors leading to GI ulceration and applying a systematic approach to diagnosis and management, veterinarians can improve outcomes for affected dogs and cats.

Nutritional Management of Gastrointestinal Disease in Small Animals

Vomiting is the most prevalent clinical sign of gastric disease in companion animals. Effective dietary management aims to minimise gastric irritation, promote gastric emptying, normalise motility, and prevent gastroesophageal reflux. Key nutritional strategies include selecting **lower-fat, low-residue diets** to reduce delayed gastric emptying and reflux. In cases of acute, frequent vomiting, some publications advise fasting for 24 hours; however, the latest school of thought is to begin feeding or re-feeding as soon as possible. This is usually accomplished by offering small, frequent meals (3–6 per day) to facilitate gastric transit.

Veterinary therapeutic gastrointestinal diets are specifically formulated for cats and dogs experiencing GI upset. Highly digestible diets maximise nutrient absorption and minimise gastrointestinal workload. For patients with chronic GI diseases, low-fat formulations are better tolerated and may be indicated for long-term use^{6,7}. Energy-dense diets are available for animals with reduced appetites, allowing them to meet caloric needs with smaller food volumes^{6,7}.

Additional benefits of these diets include being complete and balanced, appropriate for both adults and growing animals, and undergoing clinical and palatability testing to ensure efficacy and acceptance. Many therapeutic GI diets come with a palatability guarantee, providing a practical solution for pets with selective appetites^{6,7}. Royal Canin® ICU liquid diets, such as GI LOW FAT LIQUID and RECOVERY LIQUID, meet several of the above-mentioned criteria, making them outstanding options when selecting an appropriate diet, ensuring prudent nutritional management of small animal patients with gastrointestinal disease.

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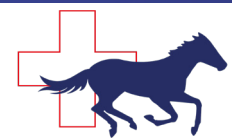
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Prof Katrin Hartmann

Prof. Dr. med. vet., Dr. habil. Hartmann, Katrin, Prof., Dipl. ECVIM-CA (Internal Medicine)

Katrin Hartmann graduated from the College of Veterinary Medicine at the LMU Munich, Germany, in 1987, completed her Doctoral Thesis in 1990 and her Habilitation Thesis on antiviral treatment of feline immunodeficiency virus infection in 1995. She worked as Clinical Instructor and Assistant Professor at the Clinic of Small Animal Medicine until 2001. From 2001 to 2003, Katrin was as Associate Professor of Internal Medicine at the Department of Small Animal Medicine at the College of Veterinary Medicine, University of Georgia, Athens, USA. In 2003, she returned to Germany as Full Professor and Head of the Clinic of Small Animal Medicine at the LMU Munich, Germany. From 2009 until now, she additionally served as Director/Vice Director of the Centre for Clinical Veterinary Medicine at the LMU Munich. Katrin's major research area is infectious diseases in cats and dogs, with a special interest in feline virus infections. She is author of more than 400 research papers, in addition to proceedings, abstracts, and book chapters. She also has lectured at numerous international meetings worldwide.

Save the Date

SPEAKERS



Prof Ralf S Mueller

Prof. Dr. med. vet. Ralf S. Mueller,
DipACVD, FANZCVSc
(Dermatology), DipECVD



Prof Katrin Hartmann

Prof. Dr. med. vet., Dr. habil.
Hartmann, Katrin, Prof., Dipl. ECVIM-
CA (Internal Medicine)

Prof Ralf S Mueller

Prof. Dr. med. vet. Ralf S. Mueller, DipACVD, FANZCVSc (Dermatology), DipECVD

Prof. Ralf S. Mueller graduated in Munich/Germany, completed his doctoral thesis in 1987, and worked in several large and small animal practices before completing a residency in veterinary dermatology at the University of California/Davis in 1992. In 1992 he moved to Melbourne/Australia to work with his partner and wife Dr. Sonya Bettenay. Together, they created the first, purpose-built specialist practice in Australia. During that time, Dr. Mueller was concurrently consulting and teaching at the Veterinary Teaching Hospital/University of Sydney. Ralf and Sonya established (and continue to conduct) the Distance Education Program in Veterinary Dermatology of the Centre for Veterinary Education of the University of Sydney. In 1999, Ralf became Assistant Professor in Veterinary Dermatology at the College of Veterinary Medicine and Biomedical Sciences/Colorado State University. In 2004, he accepted a position as chief of the veterinary dermatology service at the University of Munich/Germany. His main research interests are allergies and ectoparasites. He has published over 250 studies, articles, book chapters and books and given more than twelve hundred seminars, lectures and talks all over the world.



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