VET nuus•news

Maart / March 2026

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



THEME

Biodiversity

CPD

Nutritional disorders of backyard poultry

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Access to CPD Articles:

CPD CONTINUING PROFESSIONAL DEVELOPMENT

https://www.sava.co.za/vetnews-2026/



Dagboek • Diary

Ongoing / Online 2026

SAVETCON: Webinars
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corne@savetcon.co.za / https://app.livestorm.co/svtsos

SAVA Johannesburg Branch CPD Events
Monthly - please visit the website for more info.
Venue: Johannesburg Country Club
Info: Vetlink - https://savaevents.co.za/

CPD Course: Introduction to Animal Welfare Science
Online - self paced.
Info: https://scientificveterinaryconsulting.com/courses/animal-welfare-online-short-course/

CPD Course: Animal Research Ethics
Online - self paced.
Info: https://scientificveterinaryconsulting.com/courses/essence-of-the-sans-10386-2021-online-short-course/

March 2026

Wildlife Group of the SAVA Congress 2026
12 - 14 March
Venue: 26° South Hotel , Muldersdrift, Gauteng
Info: https://vetlink.co.za/wildlife-group-2026/

NVCG: The Veterinary Masterclass: Neurology
17 - 18 March
Venue: Protea Hotel Stellenbosch (Techno Park)
19 - 20 March
Venue: Johannesburg, Midrand Premier Hotel
Vetlink: https://vetlink.co.za/nvcg-roadshow-march/
or +27 12 346 1590

April 2026

SAVA Oranje Vaal Congress
17 - 18 April
Venue: Khaya Ibhubezi, Parys
Info: conference@savetcon.co.za

May 2026

UP: Beyond Basics: Mastering the Cardio-respiratory Patient: A Structured Clinical Approach
11 - 12 May
Venue: Premier Hotel, Midrand, Gauteng
Info: https://vetlink.co.za/beyond-basics/

June 2026

13th Int Crustacean Society Mid-Year Meeting
01-04 June
Venue: STIAS – Stellenbosch
Info: https://tcs2026.com/

NVCG Bush Break
06-07 June
Venue: Skukuza, Kruger National Park
Info: Vetlink:
https://vetlink.co.za/nvcg-bush-break-2026/

RuVASA Congress 2026
08 - 10 June
Venue: Champagne Sports Resort, Drakensberg, KZN
Info: https://vetlink.co.za/ruvasa-congress-2026/

July 2026

56th Annual SASAS Congress
07 - 09 July
Venue: Lagoon Beach Hotel, Cape Town
Info: https://www.sasascongress.co.za/

SAVA Eastern Free State Congress
10-11 July
Venue: TBC, Clarens
Info: conference@savetcon.co.za

Integrative Veterinary Medicine Conference
31 July - 02 August
Venue: Protea Hotel, Stellenbosch
Info: conference@savetcon.co.za

August 2026

Hill's Nurses Hybrid Weekend
01-02 August
Venue: TBC, Gauteng
Info: corne@savetcon.co.za

23rd Annual SASVEPM Congress
19 - 21 August
Venue: Sun City Resort, Rustenburg, North West
Info: https://sasvepm.org/23rd-annual-sasvepm-congress/

54th Annual PARSA Conference
31 August – 02 September
Venue: Klein-Kariba, Bela-Bela
Info: corne@savetcon.co.za

SAVE THE DATE

- **Eastern Cape and Karoo Branch of the SAVA Congress: 15 & 16 May**
- **KwaZulu-Natal Branch of the SAVA Congress: 30 & 31 May**
- **Western Cape Branch of the SAVA Congress: 31 July & 01 August**

INFO:
www.vetlink.co.za

VET nuus•news

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Dear members,

Vets at work, focusing on sustainable ecosystems



This edition of Vetnews focuses on three critically important and interconnected themes within the veterinary and environmental health space — biodiversity, animal poisoning, and tuberculosis (TB). These issues highlight the essential role veterinarians play in protecting ecosystem health, safeguarding animal welfare, and advancing public and environmental health within an increasingly complex and interconnected world. The veterinary profession remains central to the One Health approach, working at the interface between animals, people, and the environment.

The past month marked an important milestone for the South African Veterinary Association (SAVA), as we convened our first strategic planning session to advance collaboration through Memoranda of agreement with our affiliate organisations. These discussions represent meaningful progress toward building a unified, sustainable, and responsive professional community. We also engaged constructively with the Executive of the South African Association of Animal Health Technicians (SAAHT), with encouraging progress made toward strengthening cooperation and alignment between veterinarians and para-veterinary professionals in support of accessible and effective veterinary services.

The South African Veterinary Association extends its congratulations to the World Veterinary Association and the Japan Veterinary Medical Association as they prepare to host the 41st World Veterinary Association Congress in Tokyo, Japan, from 21–24 April 2026, under the theme "Veterinary Medicine for One Health". The Congress remains a key global platform for advancing veterinary science, professional collaboration, and One Health leadership. SAVA wishes the organisers every success in delivering a successful and impactful Congress. We further thank V-Tech for their continued sponsorship and support in enabling participation in these important international engagements and strengthening SAVA's marketing initiatives.

We further extend our warmest congratulations to Dr Olatunji Nasir on his historic election as President-Elect of the World Veterinary Association (WVA). This marks a proud milestone for the global profession, as it is the first time the Association will have an African President-Elect. His election reflects the growing leadership and influence of African veterinarians internationally, and SAVA looks forward to working closely with Dr Nasir in advancing shared continental and global veterinary priorities.

Foot-and-Mouth Disease (FMD) remains a priority animal health concern nationally, with continued efforts underway to stabilise and contain the outbreak. The government received additional vaccine supplies during the past month, with further vaccine orders anticipated over the coming weeks to sustain the national response. Provinces that had previously exhausted vaccine stocks have now resumed vaccination campaigns, largely implemented on a risk-based approach targeting high-risk areas and susceptible livestock populations.

An important development is the inclusion of private veterinarians in the vaccination programme. Permission will be granted for private practitioners to undertake vaccinations in closer cooperation with State Veterinary Services, while State Veterinarians retain oversight to ensure appropriate implementation, traceability, and alignment with national disease control measures.

These developments reinforce the importance of coordinated action between government, private veterinarians, industry, and livestock owners in achieving sustainable disease control.

This month, we will once again recognise excellence within the profession during the Faculty Prize Giving Day, celebrating the academic achievement and dedication of veterinary professionals who nurture the future leadership of veterinary science in South Africa.

Looking ahead, the Association enters an active governance period, with upcoming EXCO, FINCO, and FEDCO meetings, where strategic, financial, and organisational priorities will continue to be advanced in support of a resilient and member-focused SAVA.

We are equally pleased to announce that the call for nominations for the SAVA Awards has been circulated. These awards provide an important opportunity to recognise excellence, leadership, and outstanding contributions within our profession, and members are encouraged to participate actively in acknowledging colleagues who continue to elevate veterinary science and service in South Africa.

As we move forward, SAVA remains committed to strengthening professional unity, advancing scientific leadership, and ensuring that the veterinary profession continues to contribute meaningfully to biodiversity protection, animal health, and societal wellbeing.

Together, the real work continues.

Groetnis!
Ziyanda

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Editor's notes / Redakteurs notas

As we bid farewell to the month of love, we also hopefully bid farewell to the heat of summer. In many places, the colours of autumn are already showing in preparation for the big leaf drop. I hope that it rained where it was so bitterly dry.

In the first week of March, we are celebrating World Wildlife Day with a bit of a peculiar topic: *"Medicinal and Aromatic plants"*. The complete theme is: *"Medicinal and Aromatic plants Conserving Health, Heritage and Livelihood "*, but how do you even connect that to wildlife and veterinarians in particular? I found an article on Biodiversity and pathogens. A very interesting piece of research to show how the two fit into each other. How well do you know your Medicinal plants?

Most veterinarians can identify poisonous plants when animals get sick, but do we know what plants are beneficial to our clients? An estimated 60,000 plant species are used globally for medicinal and related purposes. Our world heals through plants. Just look at the cycle of an overgrazed piece of land. How, by different species, the plants protect and heal the soil. Dr Willem Schultheiss presented a talk that I attended on farming micro-organisms. Micro-organisms are the building blocks for healthy plants, and healthy plants are the building blocks for healthy consumers, including our animals, whether raw (on the hoof) or processed. May we delve a little into the healthy plants we can offer our clients?

On that topic, another issue is touched on, and that is Poisoning. Whether plant origin or otherwise. Lookout for the article on the perceptions of recreational drug users and the discrimination feared at the veterinary practice after a pet may or may not have ingested such drugs.

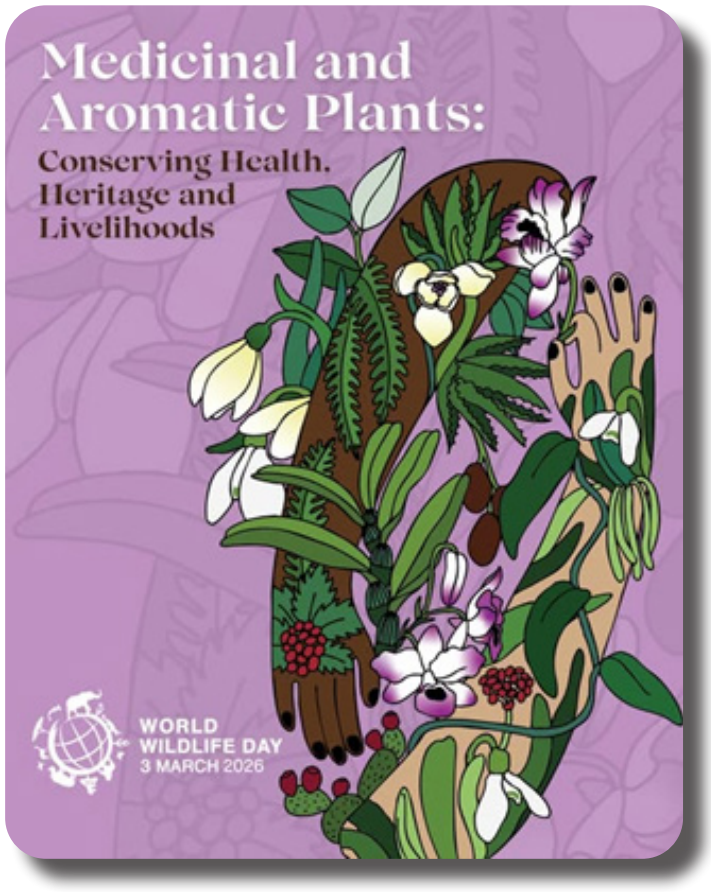
The Lincoln Institute Veterinary Resiliency program is winding down, and I followed it on the side.

The feedback has been fenomenal and I wish every veterinarian over the entire practice scope could have done it. I hope that the people who completed the program will be the yeast to 'infect' others with good practice, great resiliency, better relationships and the best self-care there is. Talking of which, the article by Dr Matts Abadsidis expertly drives that point home in his piece on "The Balance that is Illusive", taking it from being elusive to making it practical for each day. It starts with drinking a glass of water every morning. Now, how difficult can that be? See the article for a host of ideas on how to balance work and private life and how to implement self-care.

We mourn the untimely passing of two veterinarians: Dr Estian van As and Dr JW Eksteen. Our sincere condolences to the families.

I hope that this month treats you well. If you celebrate World Wildlife Day in a special manner, please send some photos to us at Vetnews. We would love to see what you do.

Andriette V



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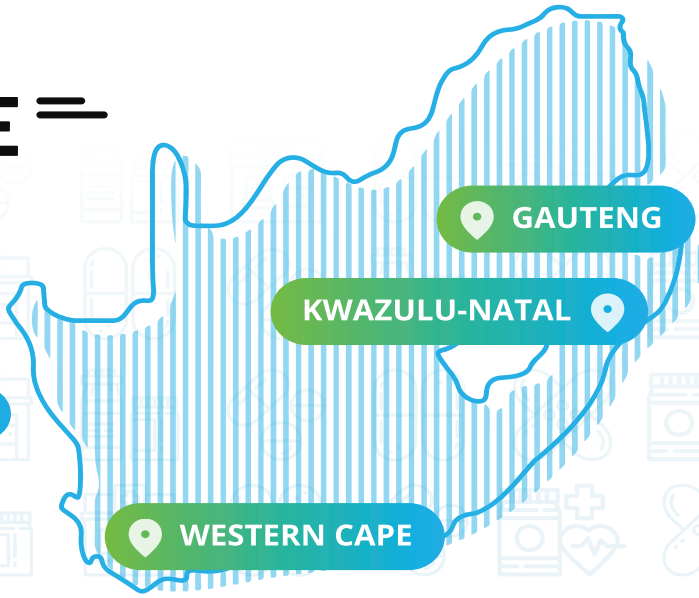
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17 - 18 APRIL

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CONFIRMED SPEAKERS



Prof. Francois Deacon
University of the Free State



Dr Ryan Walton
BVSc PgCertSAS
Bryanston Vet Clinic Surgical Resident



Dr Izak Venter
Digital Veterinary Ophthalmology Services



Dr Jarred Morris
Octavoscene



Dr Shaun Morris
Octavoscene

Registration Fees

Full Congress		
SAVA Members		R2,850.00
Non-members		R3,650.00
Veterinary Nurse/ Technician/ Retired Veterinarian		R2,050.00
Students		R2,050.00
Day Attendance	**17 April**	**18 April**
SAVA Members	R1,100.00	R1,750.00
Non-members	R1,300.00	R2,350.00
Veterinary Nurse/ Technician/ Retired Veterinarian	R900.00	R1,150.00
Students	R900.00	R1,150.00
Accompanying Persons	**17 April**	**18 April**
Full Congress		R1,500.00
Day Attendance	R850.00	R1,000.00
Social Function		
Social Dinner attendance (all)		R550.00

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** Inclusive of all meals, dinner & full congress attendance.*

Programme

Friday, 17 April 2026

12:00	Registration & Arrival refreshments
13:00	Welcome and introduction
13:05	Cutting edge Research on giraffes
14:05	Hemorrhagic tendencies in cattle with emphasis on neonatal calves
14:45	Sponsor Showcase
15:00	Afternoon refreshments
15:30	Wound Management in Small Animals
16:10	The corneal ulcer is not healing, what now?
16:50	Review on Cruciate Disease
17:30	Close of Day 1
18:15	Congress Dinner

Saturday, 18 April 2026

08:35	Rumen hypoplasia in South African feedlot lambs
09:30	MSD Animal Health
10:15	Mid-morning refreshments
10:45	Branch AGM
11:45	Ocular ultrasound
12:30	FMD Update
13:15	Sponsor Showcase
13:30	Lunch
14:30	Canine mast cell tumors - an update on diagnosis, histology and prognosis
15:15	Bovine respiratory disease with focus on pre-weaning calf immunology, metaphylaxis and therapeutic options
16:00	Close of congress

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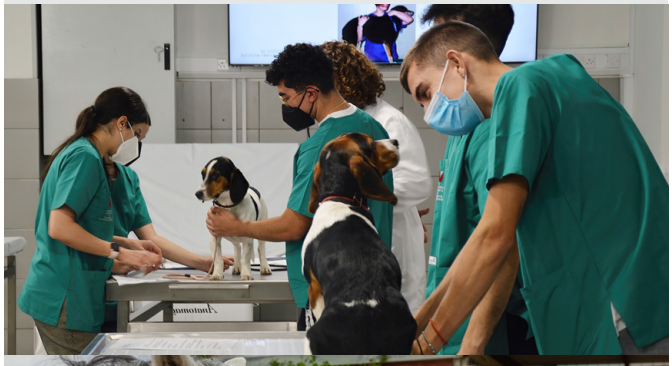
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"The South African Veterinary Association aims to serve its members and to further the status and image of the veterinarian. We are committed to upholding the highest professional and scientific standards by utilising the professional knowledge, skill and resources of our members, to foster close ties with the community and thus promote the health and welfare of animals and mankind".

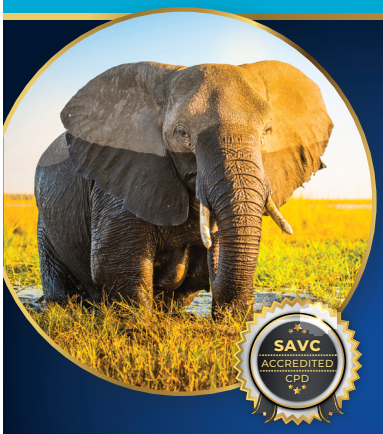
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26° South Hotel, Muldersdrift

12-14 March 2026

https://vetlink.co.za/wildlife-group-2026/

Theme:

FMD et al. Risks to Wildlife



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Pensioners (retired | not active) Full Programme: Inperson/Online	R2,400.00	R2,950.00
Post-Graduate Students Full Programme : Inperson/Online	R3,200.00	R3,750.00
Pre-Graduate Students Full Programme: Inperson/Online	R2,000.00	R2,550.00
International Full Programme : Inperson/Online	R7,700.00	R8,250.00
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Leveraging Small Biodiversity Reserves to Prevent Zoonotic Disease: Insights from Dilution Effect and Pathogen Adaptation Theories

Audrey Arnal, Rodolphe Elie Gozlan, Nathalie Charbonnel, Marie Bouilloud, Andrea Chaves, Manon Lounnas, Michel Gauthier-Clerc , Ana L. Vigueras-Galván, Céline Arnathau, David Roiz, Ana I. Bento, Serge Morand, Chris Walzer, Gerardo Suzán, Rosa Elena Sarmiento Silva, and Benjamin Roche

Abstract: In today's landscape of zoonotic pathogen outbreaks, the dilution effect theory, i.e., the theory that greater biodiversity can help curb pathogen transmission among wildlife, has gained significant attention. However, the positive link between animal diversity and pathogen richness urges us to apply this concept with caution. It is crucial to explore how conservation biology can safeguard human health by preventing the emergence of zoonotic diseases. By investigating the implications of conservation strategies on animal communities and pathogen transmission as well as the adaptive capabilities of pathogens, we propose that biodiversity conservation based on small reserves can effectively reduce pathogen spread in wildlife, provided certain measurable conditions are met. Given the urgent need to tackle both zoonosis disease emergence and biodiversity loss, these interventions should be prioritised and implemented without delay.

Introduction

The urgency to reverse the loss of biodiversity [1] has increased societal interest in environmental conservation, pushing it onto political agendas. However, many decision-makers remain hesitant to implement sustainable conservation programs [2]. The COVID-19 pandemic, driven by SARS-CoV-2, has highlighted the global threat of zoonotic diseases, which jump from animals to humans, causing significant health, social, and economic disruptions. No longer just a topic for debate, the emergence of zoonoses is now clearly linked to humaninduced changes in our natural environments [3].

While geopolitical factors and financial resources often dominate discussions on international policies, short-term economic costs tend to overshadow the long-term impacts of these decisions. A key barrier is the lack of demonstrated synergies among crises that would maximise investment. To tackle this, we need a comprehensive cost-effectiveness analysis of how different habitat conservation strategies can mitigate disease emergence, encouraging authorities to engage more actively. Since the groundbreaking research by Ostfeld and Keesing (2000), numerous studies have highlighted the potential prophylactic effects of biodiversity conservation on infectious disease transmission [4]. This is evidenced by a frequent negative correlation between species richness and pathogen transmission [5–7].

However, the so-called 'dilution effect' is often non-linear and predicting the impact of biodiversity protection on zoonosis emergence in humans remains complex [8]. Thus, leveraging conservation biology tools to reduce the risk of emerging infectious diseases [9] demands a deeper understanding of how the dilution effect applies across various ecosystems [10–12] and processes, such as those involved in biodiversity loss [13]. Most studies focus on transmission dynamics within ecosystems, particularly whether altered pathogens are zoonotic [13,14].

However, pathogen circulation among animals is just the initial step toward spillover, overlooking critical animal-human interactions that biodiversity protection could influence. To safeguard human health, we must examine both the biological and sociological links between biodiversity loss and human exposure to zoonotic diseases, including direct human-animal interactions.

Recent studies linking conservation strategies and infectious diseases highlight a significant dependence on local contexts and the specific pathogens involved [15]. It is important to point out here that we use the term "pathogen" to represent any kind of parasitic microbe. Obviously, the host spectrum and its adaptive potential (which are key components for a potential dilution effect) will be extremely different according to the kind of microbes considered (e.g., viruses, bacteria, helminths, etc.). This variability of contexts and community assemblages complicates efforts to identify universally applicable win-win solutions for environmental protection and public health. Unlike research on the dilution effect, these studies often prioritise human disease burden [16].

Since human disease burden depends on pathogen circulation, socio-economic factors, and pathogen adaptation (whether partial or complete), this perspective falls short in explaining how biodiversity conservation reduces spillover risks [17]. While the general applicability of the dilution effect has garnered considerable support [6,8,12,13,18], it is evident that policies rooted in this effect cannot be universally applied across all diseases and contexts.

A deeper mechanistic understanding is essential. Additionally, pathogens play a pivotal role in maintaining both vertebrate and invertebrate biodiversity—aligning with the Janzen-Connell hypothesis [19,20], which underscores the need for a multi-pathogen approach to this issue. In this light, it becomes crucial to identify the specific conditions and settings where broad-scale policies can effectively impact local ecosystems. This study explores how conservation biology can reduce pathogen transmission among wildlife, ultimately lowering spillover risks to humans. Instead of focusing on direct human transmission, which is influenced by socio-economic and behavioural factors beyond this study, we concentrate on enzootic pathogen circulation, the early stage of potential epidemics. Our investigation examines global conservation strategies and their impact on wildlife pathogen transmission, pinpointing critical knowledge gaps for designing strategies with dual benefits for biodiversity and public health. By assessing the risks and rewards of each approach, we identify strategies that offer the safest public health co-benefits while minimising zoonotic risk.

Potential Impacts of Landscape Conservation Strategies on Pathogen Transmission — The Role of Pathogen Adaptation and Habitat Connectivity

Since early research on the dilution effect [21,22], using conservation biology to reduce the risk of emerging infections has been considered. However, our understanding of the dilution effect, its mechanisms, and applicability was then underdeveloped. Since then, knowledge in conservation biology has significantly grown, highlighting the need to merge these fields. Many reviews have outlined the conditions under which a dilution effect can be observed—such as significant variability in host competence, horizontal transmission, a link between host abundance and competence, and frequency-dependent transmission. Similarly, conservation strategies have been extensively explored, from identifying key species to target, determining the optimal size of protected areas, and ensuring connectivity between habitat patches [23]. Rather than delving into an exhaustive review of this literature here, more detailed discussions are available in the supplementary materials. What remains clear is the pressing need to align these advances in conservation and disease ecology, paving the way for strategies that not only protect biodiversity but also mitigate the risk of pathogen spread. In this study, we focus on the potential effects of concrete conservation strategies on host communities and, consequently, the expected circulation of pathogens within ecosystems (results are summarised in Table 1). To do so, we consider the balance between hazard (pathogen diversity, defined by the number of pathogen species, as a potential source of harm) and risk (actual exposure to a given pathogen through circulation), as described by Hosseini et al. (2017) [24].

Our focus is specifically on landscape selection strategies, particularly the debate over whether a single large reserve or several small reserves (i.e., the SLOSS debate) is more effective. It is important to note that we centre our analysis on pathogens with minimal virulence in their wild hosts. We define here "virulence" as the infection cost for the host, for which a "minimal virulence" has a negligible impact on host abundance. As such, they do not significantly disrupt host community diversity or assembly — to avoid introducing complex host-pathogen dynamics. Additionally, we have chosen to maintain a broad perspective rather than focusing on a single pathogen to keep our findings widely applicable (for specific examples of how conservation strategies affect pathogen transmission, see Lambert et al., 2020) [25].

Conservation Strategies	Consequences on Animal Communities		Ref	Consequences on Pathogens Communities on the Ecosystem A	Consequences on Pathogens Communities on the Ecosystem B
Several Small Reserves **Maximize regional diversity by combining small patches with several different species.**	**Many patches, inter-connected,with low species richness in each**		**[26,27]**	**Rapid pathogen adaptation: high pathogen transmission within each reserve, which may lead to different pathogen adaptation within each patch (local speciation). Slow pathogen adaptation: hot and cold spots of transmission and adaptation. Strong genetic drift effects may limit adaptation if interconnectivity between patches is strong.**	
Intermediate Strategy **Maximize the time to population extinction**	**Few patches with a reasonably high species richness**		**28,29]**	**Medium level of transmission. Determining the ideal patch size could be considered by looking at the pathogen communities.**	
Single Large Reserves **Larger areas contain more species than smaller areas (species-area relationship theory and equilibrium theory of island biogeography). This decreases the probability of species extinction.**	**Classic Reserves**	**One patch with high species richness**	**[30,31]**	**More pathogens but less transmission (dilution effect)**	**More pathogens species and more transmission (amplification effect)**
	Biodiversity Hotspots	**One patch with high species richness**	**[32,33]**	**More pathogens but less transmission (dilution effect)**	**More pathogens species and more transmission (amplification effect)**
	Key Biodiversity Areas (KBAs)	**Case-by-case**	**[34,35]**	**Host communities being heterogeneous between KBAs, it is difficult to extrapolate for pathogen communities**	

Table 1. Summary of different conservation strategies, their impact on animal communities, and their potential impact on pathogen transmission. We assume the conditions necessary for a dilution effect: (1) horizontally transmitted pathogen (i.e., no vertical transmission), and (2) animal communities with a high probability of extinction for low-abundance species. As shown in Figure 1, ecosystem A assumes a perfect positive correlation between competence and species abundance (a perfect context for a dilution effect). Conversely, in ecosystem B, we assume a perfect negative correlation between competence and species abundance (a perfect context for an amplification effect).

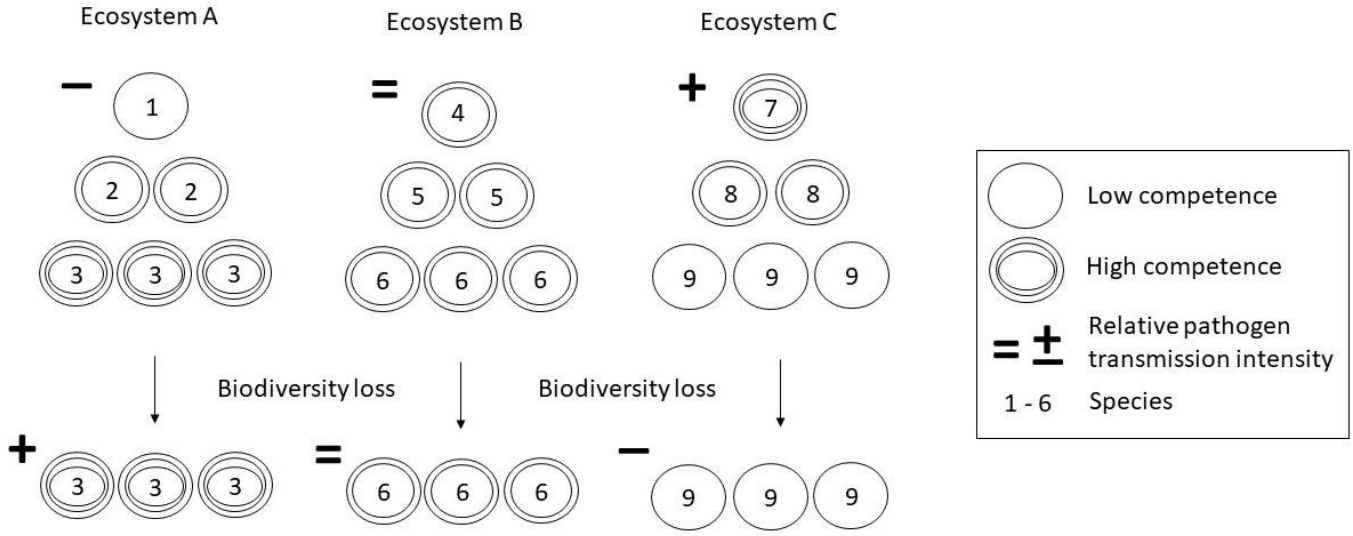


Figure 1. Examples of dilution and amplification effect. The competence (number of circles) and abundance (number of individuals per species) within animal communities, and their influence on pathogen transmission. Both ecosystems show a perfect positive (Ecosystem A), null (Ecosystem B) and negative (Ecosystem C) correlation between competence and abundance of each species (species 1 to 9). A dilution effect is expected in Ecosystem A, an amplification effect in Ecosystem C, while no impact on pathogen transmission is expected in Ecosystem B.

In a landscape-scale conservation strategy using multiple small reserves, two critical factors come into play: the adaptive capacity of pathogens and the connectivity between patches [36,37]. It is worth pointing out that pathogen adaptation is always challenging to forecast and can take many different forms. Nevertheless, the likelihood of pathogen adaptation (i.e., increased transmission in this case) is linked to its adaptation potential, which is the quantity that could be directly measured (e.g., pathogen mutation rate, pathogen substitution rate, etc.). When inter-patch connectivity is low, patch sizes are reasonable, and pathogens adapt quickly to their environment, this approach can foster local pathogens' adaptation. In other words, each patch would host its own strain (i.e., a genotype), leading to low pathogen diversity at the patch level but high diversity across the entire region. Pathogen transmission would likely be high within individual patches, but low between them [38,39]. While the pathogen hazard remains high due to its wide geographical distribution, the risk of widespread transmission would be more contained.

On the other hand, if a pathogen adapts more slowly to its environment, we would expect a mosaic of 'hot' and 'cold' spots of adaptation [40]. In hotspots—where pathogens are well adapted—transmission would be high. But in cold spots, where environmental changes outpace pathogen adaptation, transmission would be low, possibly even leading to local pathogen extinction. Compared to fast-adapting pathogens, this scenario would see a decrease in overall transmission and pathogen diversity at the landscape level. As a result, both the hazard and the risk of the remaining pathogens would likely be lower.

These impacts can be significantly influenced by increasing patch connectivity. When patches are fully connected, the dynamics resemble those of a single large population, where high pathogen adaptation and transmission are favoured—though predicting exact outcomes becomes more challenging (see Table 1). On the other hand, with low or intermediate connectivity, pathogens may struggle to adapt due to conflicting pressures between local and regional environments [38]. This tension limits a pathogen's ability to thrive in both contexts, potentially resulting in a global reduction in both hazard and risk. However, if connectivity becomes too strong, it can create a complex mosaic of adaptive responses, especially under high genetic drift, making patterns of pathogen adaptation difficult to predict.

To leverage this type of conservation strategy for reducing pathogen transmission, it is essential to strike the right balance—determining the ideal patch size and connectivity level to maintain this local-regional adaptation conflict. Doing so could help minimise transmission levels [22] and offer a clear benefit in terms of the hazard-risk trade-off. Such a threshold, when identified, can become a key tool to develop win-win strategies between biodiversity protection and human health.

This approach contrasts with the design of traditional large reserves, which are often based on specific conservation needs, such as protecting biodiversity hotspots or preventing area-sensitive species loss. While large reserves may offer ecological benefits, they often result in high species and pathogen richness, making their impact on pathogen circulation harder to predict. These areas might target Key Biodiversity Areas (KBAs), but due to the diversity of host communities within and between KBAs, the effects on pathogen dynamics remain uncertain. Some conservation strategies focus on specific species, like keystone species, to maintain high species richness.

In these cases, the outcome for pathogen transmission depends heavily on the makeup of surrounding animal communities—particularly the ratio of competent versus non-competent species in the ecosystem. Similarly, focusing on flagship species may boost conservation efforts but have little impact on pathogen dynamics unless that species plays a pivotal ecological role. Translocation strategies are also unlikely to affect pathogen transmission unless they significantly alter the structure of animal communities. In summary, developing large reserves to mitigate zoonotic risks may produce highly variable results, making it a less reliable option for protecting human health from zoonoses.

Discussion and Perspectives

In this analysis, we explored the potential impact of conservation strategies on the enzootic circulation of pathogens, which is the critical first step before pathogens spillover into human populations. We highlighted that conservation strategies can have a broad range of effects on pathogen transmission—some positive, some negative. Notably, while some of these impacts may be anticipated, others remain unpredictable, raising concerns about the safety of their implementation. From our current understanding, establishing several small reserves with moderate interconnection between patches seems to offer the most reliable outcome. This approach hinges on the adaptive capacity of pathogens, a factor that can be measured, making it a more manageable strategy. Today, our knowledge is not sufficient to model quantitatively and provide a forecast on the impact of conservation biology on the reduction of pathogen circulation. Therefore, it's essential to quantify both host species' competence, their evolution and patch connectivity to fine-tune the optimal reserve size, striking a balance between species richness and low pathogen transmission. Conceptually, a win-win scenario appears achievable with this strategy of several small reserves.

Our findings present a more optimistic perspective compared to earlier work, yet align with studies suggesting that the dilution effect often arises in the context of biodiversity loss [13]. The difference likely stems from the metrics we employed. Our focus was on enzootic circulation of pathogens, whereas the link between enzootic transmission, human exposure, and subsequent human-to-human spread involves distinct processes that require separate, careful consideration. While our study addresses a crucial gap by assessing how specific conservation strategies may affect pathogen transmission within animal communities, it does not provide direct recommendations for public health policy. However, we believe that fully understanding the mechanisms at play in each stage of pathogen transmission—from wildlife to humans—will be key to developing successful, win-win strategies that benefit both biodiversity and human health.

Indeed, the success of conservation approaches in supporting public health hinges on carefully balancing the risks, benefits, and hazards they introduce [24]. Achieving an ecosystem with high biodiversity, which also implies greater pathogen diversity, but low pathogen transmission—the ultimate goal—requires a delicate balance. While this approach reduces risk (by preventing pathogen amplification), it increases hazard (more pathogens within the ecosystem [24]). Managing these hazards effectively calls for a better characterisation of the interface between enzootic circulation and human exposure. It is also important to recognise potential tensions between the most ecologically beneficial conservation strategies and those aimed at reducing pathogen transmission. Identifying and navigating these trade-offs is essential to designing sustainable, locally tailored solutions that engage all stakeholders.

Conservation strategies are not solely about maximising species richness; they may prioritise preserving genetic diversity or species' evolutionary potential [41]. In addition, social or ethical objectives often influence these strategies, such as reintroducing iconic species or eradicating invasive ones [42]. Socio-economic factors, like indigenous land rights or sustainable food production, also play a crucial role [43]. Reducing pathogen transmission is not without trade-offs either, as pathogens play a crucial role in shaping biodiversity [44] and habitat quality [45]. Therefore, efforts to limit pathogens should focus on those with zoonotic potential.

Meanwhile, certain conservation strategies, like managing habitat matrices or establishing ecological corridors, are too context-dependent to predict their broader impact on pathogen transmission accurately. Strategies aimed at promoting the dilution effect or mitigating pathogen amplification could offer pathways to reducing pathogen transmission.

Targeting species that contribute to dilution could help manage zoonotic outbreaks [46]. Ecological traits also matter: fast-living species, which often serve as disease reservoirs [47], tend to thrive in degraded landscapes, potentially increasing their number and elevating transmission risks. Developing surveillance systems in areas where human-wildlife interactions are frequent, like urban parks, could provide crucial insights into zoonotic pathogens transmission [18].

In conclusion, exploring 'win-win-win' strategies benefiting public health, biodiversity, and the economy is both feasible and essential. Mathematical models exist to test these ideas, and further research based on local data is needed to understand their effectiveness in diverse environments. While more data is required for safe application of large reserves, our study demonstrates the potential of conservation strategies based on small reserves to limit pathogen circulation and reduce human exposure safely. However, caution is necessary, as pathogen transmission effects can be complex. Now more than ever, integrating conservation with public health strategies is crucial. V

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POISONING

By Steve M. Ensley, DVM, PhD, Department of Anatomy and Physiology, College of Veterinary Medicine, Kansas State University

Introduction to Poisoning

Poisoning occurs when a toxic substance is swallowed, inhaled, or absorbed after coming in contact with the skin, eyes, or mucous membranes. Poisoning is also called toxicosis or intoxication. Because pets are unable to tell whether a substance is poisonous or not, they are often poisoned by eating something toxic, such as antifreeze or a poisonous plant. Pets can also be poisoned by a sting or bite from a venomous insect or snake, or even by a well-intentioned owner giving human drugs that are poisonous to animals.

An animal can be poisoned after a single exposure (with effects most pronounced during the first 24 hours) or after repeated or prolonged exposure to a poison. All toxic effects depend on the dose—the amount of poison present—and on the species. A small dose may be undetectable and have no harmful effects, while a large dose can be fatal.

Metabolism of Poisons

Poisons can be absorbed via the digestive tract, skin, lungs, eyes, mucous membranes (such as those of the nose or eye), mammary glands, and uterus, as well as from sites of injection. Toxic effects may be local, or the poison can be absorbed and spread by way of the bloodstream. Some poisons are excreted by the kidneys. Others are excreted in the bile and collect in fat deposits. Still others are excreted in milk. In most cases, the body attempts to detoxify the poison. The liver does most of the metabolic processing that turns compounds into forms the body can use or excrete. This includes the detoxification of some substances. Unfortunately, when some poisons are metabolised, the new compounds created are more toxic than the original compound.

Factors Affecting the Activity of Poisons

The consequences of poisoning can depend on more factors than the toxicity of the poison itself. The dose (amount of the compound per unit of body weight) of poison is a primary concern, but the exact amount of poison an animal has been exposed to is seldom known. The number of times the animal is exposed and the length of time over which the exposure has occurred are important. The way in which the animal is exposed affects how much of the poison is absorbed, how it spreads through the body, and possibly how it is metabolised. The condition of the animal at the time of intake of the poison can also be a factor.

For example, if the stomach is empty when an animal eats a poisonous substance, vomiting may occur. If the stomach is partly filled, the poison may be retained and lead to toxic effects. Environmental factors, such as temperature and humidity, affect rates of consumption and even whether or not some toxic agents are present. For example, many plant poisons are associated with seasonal or climatic changes, such as winter cold and rainfall.

Different species of animals can react differently to a particular poison because of variations in absorption, metabolism, or elimination. For example, species unable to vomit, such as horses or rabbits, can be poisoned with a lower dose. The age, size, nutritional status, stress level, and overall health of an animal are important factors. In young animals, metabolism is compromised by underdeveloped systems.

The chemical nature of a poison determines its ability to dissolve into different materials (water vs oil, for example). Poisons that dissolve in water spread through the body more easily than those that do not. Substances added to the active ingredient, such as binding agents, outer coatings, and sustained-release preparations, also influence absorption. Generally, as absorption is delayed, toxicity decreases.

Droplet size is an important consideration in sprays and dips, because the dose increases when the droplets are larger. This is one of many reasons to closely follow label instructions and recommended applications. Only formulations intended for animals should be used.

Diagnosis of Poisoning

Diagnosis of poisoning is based on history, signs, tissue changes, and laboratory examinations. Giving your veterinarian a complete history is important to help him or her make an accurate diagnosis and begin appropriate treatment.

You should have the following information available: 1) sex, age, weight, and number of exposed or sick animals; 2) a list of signs of illness in the order they appeared; 3) any prior disease conditions; 4) any medications the animal is receiving; 5) possible related events, for example, change in diet or water source, other medications, feed additives, or pesticide applications; 6) description of the environment, including access to garbage, machinery, or vehicles; and 7) recent past locations and when a geographic move happened (if applicable).

General Treatment of Poisoning

Immediate, life-saving measures may be needed initially. Beyond this, treatment consists of preventing further absorption of the poison, providing supportive treatment, and administering specific antidotes, if available.

Thorough washing with soap and water can usually prevent further absorption of poisons on the skin. If the animal has a long or dense coat, the hair may need to be clipped. For some poisons that have been ingested, vomiting may be induced in dogs and cats. However, vomiting is not recommended if the suspected poison could damage the stomach or oesophagus on its way up, if more than a few hours have passed, if the swallowing reflex is absent, if the animal is convulsing, or if there is a risk of aspiration pneumonia (vomited material being inhaled into the lungs). If the animal is unconscious, the stomach may be flushed with a stomach tube, or surgery on the stomach may be needed. Laxatives and medications used to empty the bowels may be recommended in some instances to help remove the poison from the gastrointestinal tract.

If the poison cannot be physically removed, sometimes activated charcoal can be administered by mouth to prevent further absorption by the gastrointestinal tract.

Supportive treatment is often necessary until the poison can be metabolised and eliminated. The type of support required depends on the animal's condition and may include controlling seizures, maintaining breathing, treating shock, controlling heart problems (for example, irregular heartbeats), and treating pain.

In some cases, there is a known antidote for a specific poison.

Algal Poisoning

Algal poisoning is a severe and deadly condition caused by heavy growths of toxic blue-green algae in water, including drinking water and water used for agriculture, recreation, and aquaculture. Deaths and severe illnesses of livestock, pets, wildlife, birds, and fish occur worldwide. Poisoning usually occurs during warm seasons when the algal water blooms are larger and last longer. Most poisonings are seen among animals drinking algae-infested fresh water. Animal size and species sensitivity influence the degree of poisoning. Depending on bloom densities and toxin content, animals may need to ingest only a few ounces or up to several gallons of water to be poisoned.

More than 30 species of blue-green algae, producing a number of different toxins, have been associated with toxic water blooms. Some species of algae produce toxins that damage nerve tissue. Others produce toxins that damage the liver, and others damage both nerve tissue and the liver. Death occurs within a few hours when the nervous system is affected because animals stop breathing. Liver failure causes death within a few days.

An affected animal may have muscle tremors, watery or bloody diarrhoea, difficulty breathing, and go into a coma before death. A greenish algal stain may be seen on the mouth, nose, legs, and feet. When nerve tissue is affected, signs progress from muscle spasms to decreased movement, abdominal breathing, a bluish tinge to the skin and mucous membranes, convulsions, and death. Signs in birds are similar and also include spasm of the back muscles, which causes the head and legs to bend backwards and the trunk to arch forward. In smaller animals, leaping movements often occur before death. In horses that survive sudden poisoning, the nose, ears, and back become sensitive to light, followed by hair loss and skin sloughing.

Affected animals should be moved to a protected area out of direct sunlight, away from the contaminated water supply. Ample quantities of water and good-quality feed should be made available. Surviving animals have a good chance of recovery. Activated charcoal slurry may be beneficial if given shortly after toxin ingestion.

Keeping animals away from the affected water supply is essential. If no other water supply is available, animals should be allowed to drink only from shore areas kept free (by prevailing winds) of dense surface scums of algae. Cyanobacteria can be controlled by adding copper sulfate or other algicidal treatments to the water. Copper sulfate is best used to prevent bloom formation, and care should be taken to avoid water that contains dead algae cells, either from treatment with algaecide or natural ageing of the bloom. This is because toxin is freed into the water after breakdown of the intact algae cell walls. Algaecide use should comply with local environmental and chemical registration regulations.

Arsenic Poisoning

Arsenic poisoning is caused by several different types of arsenic compounds. Poisoning is relatively infrequent due to the decreased use of arsenic compounds as pesticides, ant baits, and wood preservatives. Arsenic compounds are used in some dips for tick control. Drinking water containing more than 0.25% arsenic is considered potentially toxic, especially for large animals. Cats may be more sensitive than other animals to arsenic poisoning.

Arsenic compounds that dissolve in water are well absorbed after ingestion by mouth. After absorption, most of the arsenic is bound to red blood cells and distributed to body tissues, with the highest levels found in the liver, kidneys, heart, and lungs. In longterm exposures, arsenic accumulates in skin, nails, hooves, sweat glands, and hair. Generally, the gastrointestinal tract, liver, kidneys, lungs, blood vessels, and skin are considered more vulnerable to arsenic damage.

Signs of poisoning are usually sudden and severe, developing within a few hours (or up to 24 hours). Arsenic poisoning has major effects on the gastrointestinal tract and cardiovascular system. Loss of blood and shock may occur. Large amounts of watery diarrhoea, sometimes tinged with blood, are characteristic, as are severe colic, dehydration, weakness, depression, weak pulse, and collapse of circulation. The course may run from hours to several weeks, depending on the quantity of arsenic ingested. In very severe poisoning, animals may simply be found dead.

In animals that have been recently exposed and are not yet showing signs, vomiting may be induced (in species that can vomit), followed by activated charcoal and a medication that causes emptying of the bowels. In dogs and cats, this may be followed 1 to 2 hours later by a medicine that prevents damage to the gastrointestinal tract, such as kaolin-pectin. Fluids are given as needed.

In animals already showing signs of poisoning, fluid treatment, blood transfusion (if needed), and dimercaprol (an antidote to arsenic) are recommended. Severely affected animals need

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supportive treatment, including intravenous fluids to restore blood volume and correct dehydration. Kidney and liver function should be monitored during treatment.

Bracken Fern Poisoning

Bracken fern is widely distributed in open woodlands with sandy soils and disturbed (clear-cut or burned) areas throughout North and South America, Europe, Australia, and Asia. Ingestion of a large quantity of bracken fern results in signs of poisoning related to thiamine deficiency. The toxic effects appear to be cumulative and may require 1 to 3 months to develop, depending on the species of animal, quantity consumed, time of year, and other factors. Both leaves and roots may be toxic. Most severe poisonings are seen after periods of drought when food is scarce. However, the plant is toxic even when present as a contaminant in hay, and cases have occurred in stabled animals. Horses seem to be particularly susceptible.

In horses, signs of bracken-induced thiamine deficiency (bracken staggers) include loss of appetite, weight loss, lack of coordination, and a crouching stance with the back and neck arched and the feet placed wide apart. When the horse is forced to move, its muscles may tremble. In severe cases, the heartbeat is very rapid and irregular. Death (usually 2 to 10 days after onset) is preceded by convulsions, muscle spasms, and spasms of the back muscles that cause the head and lower limbs to bend backwards and the trunk to arch forward. The rectal temperature is usually normal but may reach 104°F (40°C).

Plants other than bracken fern, such as horsetail and turnip, can also cause thiamine deficiency. In horses, the condition must be distinguished from other nervous system disorders, including rabies or poisoning from Crotalaria species or ragwort. Blood tests can confirm the diagnosis.

Treatment is highly effective if thiamine deficiency is diagnosed early. Injection of a thiamine solution followed by oral supplementation is suggested. Animals similarly exposed but not yet showing signs should also be treated with thiamine, because signs can develop days or weeks after the source of bracken has been removed.

Bracken is usually grazed when more suitable food is not available, although individual animals may develop a taste for the plant, particularly the young, tender shoots and leaves. The problem most often shows up in early spring (tender bracken shoots) or late summer (poor pasture conditions). The disease has been prevented in horses by improving pasture management and fertilisation or by alternating bracken-contaminated and non-contaminated pasture at 3-week intervals.

Bracken fern growth can be hindered by close grazing or trampling in alternate grazing pasture systems. In time, bracken can be eliminated from a pasture using this approach or by regular cutting of the mature plant or, if the land is suitable, by deep ploughing. Herbicide treatment using asulam or glyphosate can be an effective method of control, especially if combined with cutting before treatment.

Cantharidin Poisoning (Blister Beetle Poisoning)

Cantharidin is found in more than 200 species of beetles throughout the continental USA. Beetles of the genus Epicauta are most often associated with toxicosis in horses. The striped blister beetles are particularly troublesome in the southwestern US.

Blister beetles usually feed on various weeds and occasionally move into alfalfa fields in large swarms. These insects live in groups and may be found in large numbers in hay when it is baled.

One flake of alfalfa may contain several hundred beetles, but a flake from the other end of the same bale may have none. Animals are usually exposed to eating alfalfa hay or alfalfa products that contain blister beetles.

Cantharidin is odourless, colourless, and highly irritating. It causes blisters when in contact with skin or mucous membranes. As little as 0.1 to 0.2 ounces (4 to 6 grams) of dried beetles may be deadly to a horse. The toxicity of cantharidin does not decrease in stored hay, and cantharidin is also toxic to people, dogs, cats, rabbits, rats, cattle, sheep, and goats.

The severity of signs associated with cantharidin poisoning varies according to dose. Signs can range from mild depression or discomfort to severe pain, shock, and death. Common signs include abdominal pain, depression, loss of appetite, frequent attempts to drink small amounts of water or submerge the muzzle in water, and frequent attempts to urinate.

Signs can last from hours to days. Affected horses always have dark, congested mucous membranes, even if other signs are barely noticeable. Horses that ingest a large amount of toxin may show signs of severe shock and die within hours.

Laboratory tests can detect cantharidin in stomach contents or urine. The amount of cantharidin in urine becomes too small to be detected in 3 to 4 days, so urine should be collected early in the course of the disease for analysis. Microscopic evaluation of stomach contents of fatally poisoned horses may reveal fragments of blister beetles.

There is no specific antidote for cantharidin, and supportive treatment must be prompt to be successful. Administration of mineral oil helps flush the gastrointestinal tract, and repeated treatments may be recommended. Activated charcoal may be helpful if given early. Calcium and magnesium supplementation for prolonged periods is almost always recommended.

Other supportive treatment includes the administration of fluids, pain relievers, and medication that increases urine output. The outlook for affected horses improves daily if no complications occur.

Prevention is aimed at feeding beetle-free hay. The hay field must be scouted before it is cut and during baling, because the insects can be crushed during cutting, crimping, or baling of hay. Areas of the field that contain swarms of beetles must be avoided for a few days because most of the insects will leave. Once the beetles have left, these areas can be harvested.

First-cutting hay is almost always free of blister beetles, because the insects overwinter as subadults and usually do not emerge until late May or June in the southwestern US. Likewise, the last cutting of hay is often safe, because it is usually harvested after the adult insects are no longer active. V

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Day 1

07:30	Registration
08:30	Welcome & Opening
08:40	What is the nervous system and what happens if it doesn't work
09:30	How to do a neuro exam in practice
10:20	TEA
10:50	How to recognise the most likely diagnosis without expensive diagnostics
11:40	How to approach the dog with acute hind limb paralysis in practice
12:30	LUNCH
13:30	Welcome Hill's
14:00	Spinal disease in cats
14:50	The ABCs of epliepsy - what, when and how to treat
15:40	TEA
15:55	Why do the seizures don't stop - the most common challenges in epilepsy treatment

Day 2

07:30	Registration
08:00	Welcome Boehringer Ingelheim
08:30	The acute brain - head trauma and status epilepticus
09:20	How to approach vestibular syndrome in practice?
10:10	TEA
10:40	Interactive video based case discussions part I
11:30	LUNCH
12:30	Interactive video based case discussions part II
13:20	TEA
13:20	Quiz (with some small prizes from sponsor, organisation,...)
14:10	Close and thank you

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SUSPECTED GLYPHOSATE POISONING IN A DOG

Ana Flávia Machado Botelho, Rayanne Henrique Santana Da Silva, Sara Sueli Ferreira De Almeida , Cilho Gabriel Rodrigues Leopoldino, Ana Gabriela Rodrigues Leopoldino, Pedro Henrique De Miranda Passos, Luiza Gabriella Ferreira De Paula, Daniela Melo E Silva, Danieli Brolo Martins, Marcelino Benvindo-Souza



Abstract

Glyphosate is a widely used pesticide that has been associated with poisoning in both humans and animals. Its toxicity remains a topic of controversy, particularly regarding its carcinogenic potential. This study aimed to investigate a suspected case of glyphosate poisoning in a dog, providing a detailed account of the case history, clinical evolution, laboratory findings, and genotoxic assessment.

A seven-month-old dog was referred to the Veterinary Hospital, presenting with mental confusion and ataxia. The pet guardian reported altered consciousness and incoordination twelve days after Roundup® was applied to the farm's grass.

A complete blood count revealed normocytic normochromic anaemia, a packed cell volume of 20%, thrombocytopenia (50,000/µL), and severe leukocytosis (447,200/µL), with 95% of the white blood cells consisting of blasts of unidentified origin and 5% segmented neutrophils. Myelogram analysis showed a moderately cellular bone marrow sample with a predominance of primitive cells of undetermined origin (>95%), suggesting a diagnosis of leukaemia. To further investigate the potential link between leukaemia and glyphosate exposure, whole blood was collected in a heparinised tube for a comet assay. The test indicated moderate DNA damage.

Chemotherapy was recommended; however, treatment was not pursued for personal reasons, and the patient died five days after the consultation. A necropsy was not authorised. This report contributes to the understanding of glyphosate poisoning and its potential health consequences, particularly its association with hematologic malignancies in canines.

Introduction

Glyphosate is the most widely used herbicide in the world, applied in both agricultural and domestic settings. Accidental poisonings have been reported in both animals and humans (DAWSON et al., 2010; KARTHIKRAJ et al., 2019; KUNAPAREDDY; KALISETTY, 2021). Previous studies indicate that dogs and cats exposed to glyphosate-based products exhibit gastrointestinal and respiratory effects, primarily due to the surfactants used in these formulations (BATES; EDWARDS, 2013).

Additionally, clinical signs such as vomiting, diarrhoea, and lethargy have been observed. In humans, evidence suggests that glyphosate has potential carcinogenic and immunogenic effects (PEILLEX; PELLETIER, 2020; RANA et al., 2023); however, these findings have yet to be confirmed through large-scale cohort studies (ANDREOTTI et al., 2018).

In other mammalian species, such as pigs, glyphosate exposure has been shown to impact the number of galaninergic neurons in the intestine and alter the expression of galanin receptors in the small intestinal wall (PALUS et al., 2024). In rodents, exposure has been linked to impairments in spatial orientation, navigation, learning, and memory (CHÁVEZ-REYES et al., 2024; 2025).

The debate surrounding glyphosate toxicity has intensified over the years. In 2015, the International Agency for Research on Cancer (IARC) classified glyphosate as "probably carcinogenic to humans." However, a joint evaluation by the WHO and FAO in 2016 concluded that glyphosate was not carcinogenic in rats but could not rule out carcinogenic potential in mice at very high doses. In the same year, a systematic review found insufficient evidence to support an association between Roundup® exposure and lymphohematopoietic cancers (CHANG; DELZELL, 2016).

It is crucial to consider several factors when assessing glyphosate poisoning. Some studies on the compound have been met with controversy due to methodological limitations, lack of scientific rigour, and conflicts of interest, particularly regarding funding sources. Nonetheless, animal exposure to glyphosate poses a potential health risk. Thus, this study aims to report a clinical case of suspected glyphosate poisoning in a dog in Brazil. To investigate this case, we conducted a comprehensive evaluation, including physical, neurological, and genotoxic examinations.

Material and Methods

Case study

A seven-month-old, 10.2 kg male, mixed breed canine, was referred to the Veterinary Hospital of the Federal University of Goiás, presenting mental confusion and imbalance.

During the anamnesis, the guardian reported changes in consciousness plus uncoordinated head and hind limb movements. It was also reported hyporexia and normodipsia, with no history of diarrhoea, fainting, epileptic seizures, trauma, or previous illnesses.

The patient lived in a rural environment, and when asked about access to toxic products, it was reported that twelve days before the consultation, they had used the product Roundup® in the grass of the farm to kill weeds. The animal had access to the grass area and the street and was fed only homemade food.

Clinical exams

A depressed state of consciousness and reactive superficial mandibular and cervical lymph nodes were observed on physical examination. Mucosal staining, capillary filling time, skin turgor, temperature, and cardiac and pulmonary auscultation were normal. The neurological examination revealed a reduced response to threat in both eyes, preserved facial sensitivity, normal to reduced swallowing and jaw tone, and preserved withdrawal reflex and superficial pain in the four limbs. When assessing the patient in motion, proprioceptive ataxia, broad-based station, and head tremors when moving around were observed.

Based on history, anamnesis, and clinical signs, some infectious diseases, such as distemper, ehrlichiosis, toxoplasmosis, leishmaniasis, and herbicide poisoning, were suspected. To better understand this case, a rapid test for distemper (Alere®), Complete blood count (CBC), search for Lentz corpuscles, creatinine, and alanine aminotransferase (ALT) were requested.

Comet Assay

The comet assay was performed on peripheral blood as a biomarker of genotoxicity. The alkaline assay was based on Singh et al. (1988), with some modifications (RAMOS et al., 2021). A total of 15 µL of blood was homogenised in 120 µL of low- melting-point agarose. This sample was placed on slides, and after solidification, the slides were immersed in a cold lysis buffer in a light-protected chamber, where they remained for 15 hours. After this period, the slides were removed from the lysis solution and placed in a horizontal electrophoresis tank, where they were incubated in an alkaline buffer at 4°C for 30 minutes. Electrophoresis was then performed for 30 minutes at 25 volts and 250 mA, maintaining a temperature of 4°C.

The slides were neutralised using a Tris solution, repeated three times at 5-minute intervals. After neutralisation, the slides were washed with distilled water and then fixed by immersion in absolute ethanol for 10 minutes. Once dried, the DNA was stained with 100 µL of SYBR® Green I solution. A total of 100 cells per slide (two slides in total) were analysed using an Axio Imager D2® fluorescence microscope (Carl Zeiss, Berlin, Germany) by a single observer, using a 20x objective. Three genomic damage parameters were assessed: tail length, percentage of DNA in the tail, and Olive tail moment.

Data Analysis

The data from this case are presented in absolute and relative frequencies, as well as compared to findings from other studies analysing the same parameters/biomarkers. Furthermore, for the Comet Assay, the data are presented as mean ± standard deviation (SD).

Results and Discussion

This study highlights a fatal case of suspected glyphosate poisoning in a dog. The rapid test result was negative, and the CBC showed normocytic normochromic anaemia, packed cell volume (PCV) of 20%, with the slight presence of codocytes and thrombocytopenia (50.000/µl). Anaemia is characterised by a reduction in red blood cells or in the blood's ability to transport oxygen, due to decreased packed cell volume, red blood cell count, or haemoglobin concentration below reference values (PADALINO et al., 2016). In this context, some studies indicate an association between anaemia and exposure to pesticides (YUSHANANTA et al., 2020; ASIF SYED et al., 2021).

It was also possible to observe intense leukocytosis (447.200/µl), composed of 95% of blasts of unidentified origin and 5% of segmented neutrophils. The observed blasts showed mild to moderate anisocytosis and pleomorphism, mild to moderately basophilic cytoplasm, and mild to moderate vacuolization in all cells. Its nucleus/cytoplasm ratio varied from mild to moderate; the nuclei had moderate anisocariosis, moderate pleomorphism (round, oval, and monocytoid), possible figures of aberrant mitosis, and rare binucleations. The nucleoli, possibly prominent, rounded, or angular nucleoli, were observed, sometimes multiple, with discrete anisonucleolysis. Rare lymphoglandular corpuscles were present, mild to moderate cell fragility and recurrent cell apoptosis (Figure 1).

Based on the patient's history and complementary exams, leukemia was investigated. Leukemia is a clonal proliferation of hematopoietic stem cells in the bone marrow (DAVIS et al., 2014). Thus, for further clarification, the patient was directed to perform the myelogram. Optical microscopy showed a moderately cellular sample, with a high predominance (more than 95%) of primitive cells of undetermined origin isolated in cell islands. Cellular characteristics included mild to moderate anisocytosis, high to medium nucleus/cytoplasm ratio, and intense cytoplasmic and nuclear basophilia. There was intense cellular fragility and rare lymphoglandular corpuscles; some cells had a morphology similar to "hand mirror." Rare myeloid precursors and possible mature neutrophils, very few erythroid precursors, and no megakaryocytic precursors were observed (Figure 1). Such findings indicated an exacerbated proliferation of the blast population with a break in the expected proportionality of the medullary compartments, confirming the suspicion of leukemia. Leukemia is a complex neoplasia that is often associated with previous exposure to toxic components such as benzene (SNYDER, 2012). Acute myeloid leukemia is a rare and progressive cancer in dogs. Recent studies revealed that diagnosis can be based on more than 20% blasts in bone marrow, as described in the present report (DAVIS et al., 2018). The most common clinical signs are inappetence, lethargy, and lymphadenopathy, and clinical pathology findings suggest an increase in blast circulation, anemia, and thrombocytopenia, also corroborating our findings. The mean survival time was 19 days, ranging from 1 to 121 days.

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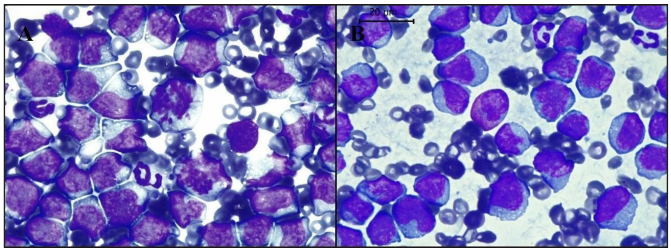


Figure 1. Microscopic evaluation of cells from a dog suspected of glyphosate poisoning. A) Photomicrograph of blood smear of intense cellularity composed of 95% of blasts of unidentified origin and 5% of segmented neutrophils. 100x. B) Cytological sample of moderate cellularity, with predominance of primitive cells of undetermined origin

In an attempt to elucidate the origin of the leukaemia, corroborating the patient's exposure to glyphosate, whole blood was collected in a heparin tube for the comet assay (HALDER et al., 2002). For the comet assay (Figure 2), the results indicate moderate damage (x±SD), as observed across all parameters, such as Tail Length (10.06±7.14), Olive Tail Moment (2.25±2.01), and %DNA in the tail (21.51±15.36). In this regard, in at least one of the parameters, the mean was consistent with other studies that demonstrated significant DNA damage due to pesticide exposure (HONG et al., 2017; KWIATKOWSKA et al., 2017; LOPES et al., 2021). Furthermore, DNA fragmentation may also indicate cytotoxic potential, as previously described (ESCOBAR et al., 2007). Other studies also highlight the genotoxicity attributed to herbicides in dogs.

Both glyphosate and 2,4-D were genotoxic to canine cells at concentrations of 0.10 µM and above (TINDLE et al., 2025).

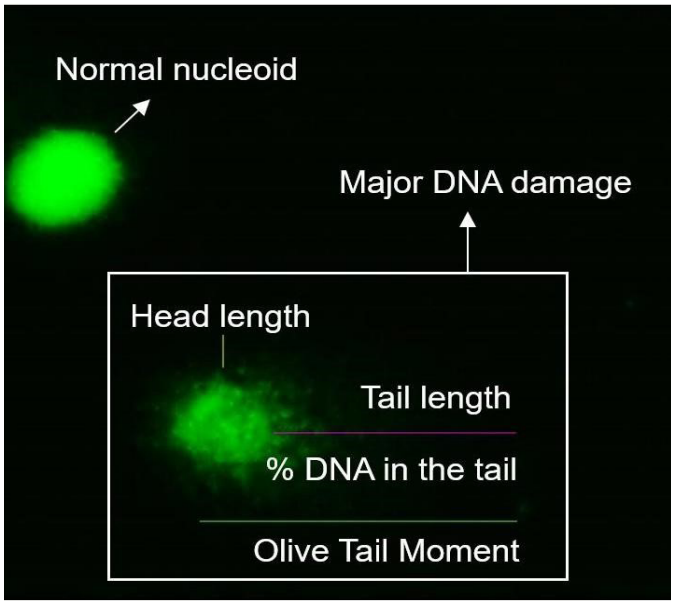


Figure 2. Photomicrograph of the Comet Assay showing one normal nucleoid and another fragmented in a dog suspected of glyphosate poisoning.

Glyphosate exposure, as previously stated, may be cancerous, particularly regarding the surfactants used in the current formulation of the product (GASNIER et al., 2009). Its full toxic potential, especially regarding cancer presentations (CHANG; DELZELL, 2016; DAVOREN; SCHIESTL, 2018), is yet to be established in both humans and animals.

The dog reported in the present document was young, with no previous conditions and a recent exposure to a supposedly large amount of glyphosate in its environment. Both haematology and myelogram support the diagnosis of leukaemia, and the comet assay further suggests a toxic agent as a possible factor in the cancer development.

Among herbicides, glyphosate has been reported as the main culprit in poisoning cases involving domestic animals such as dogs, cats, horses, goats, and sheep (CALONI et al., 2016). However, acknowledging some limitations of this study, it is important to highlight the financial constraints that prevented additional investigations using flow cytometry and immunocytochemistry to determine the cellular origin.

Furthermore, chemotherapy was recommended; however, the treatment was not carried out for personal reasons, and the patient died five days after the consultation. Necropsy was not authorised. Further toxicological analysis from serum samples was attempted, but was not successful due to the difficulty in glyphosate detection and the lack of specialised services in Brazil.

Considering the susceptibility of domestic animals to contact with pesticides and other xenobiotics, this study highlights the risks of intoxication. Exposure to household xenobiotics may occur through oral ingestion or inhalation, although some pesticides are not volatile due to their molecular weight. However, inhalation of glyphosate surfactant herbicide by a dog has been documented, resulting in hypersalivation, tremors, and hyperthermia, followed by death (CORTINOVIS et al., 2015). In the present study, it was not possible to determine the route and duration of exposure.

Finally, environmental contamination by household chemicals represents a global challenge, and bioindicators such as pets can be essential tools for effective monitoring and risk assessment (BERTERO et al., 2020).

Conclusion

In this study, we report a case of suspected glyphosate poisoning in a dog. Although the data indicate a severe acute response of leukaemia and DNA damage, further studies are still needed in the future. The findings contribute to the understanding of glyphosate poisoning and its consequences in canines.

This case reinforces the importance of implementing biosecurity measures in rural areas and training veterinarians to recognise early signs of pesticide poisoning in domestic animals.

References available on request







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ZOONOTIC DISEASES

Zoonotic Tuberculosis: Emerging Species, Diagnostic Approaches and One Health Implications

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ABSTRACT

Zoonotic tuberculosis (zTB), a form of human tuberculosis caused by animal-adapted members of the *Mycobacterium tuberculosis* complex (MTBC), poses unique challenges for clinical diagnosis, surveillance, and public health control. Traditionally associated with *Mycobacterium bovis* and transmitted through the consumption of unpasteurized milk or direct contact with infected animals, zTB is now increasingly attributed to emerging MTBC species, such as *Mycobacterium orygis* and *Mycobacterium caprae*, especially in South Asia and Europe. Current diagnostic tools, ranging from microscopy and culture to molecular assays, often lack routine species-level resolution in most clinical settings, contributing to underreporting and mismanagement, particularly in extrapulmonary TB cases.

This review aims to explore the diagnostic landscape of zTB, outlining the limitations of conventional methods and highlighting the potential of emerging technologies, including polymerase chain reaction (PCR)based region-of-difference (RD) typing, line probe assays, next-generation sequencing, and clustered regularly interspaced short palindromic repeats (CRISPR)-based diagnostics. The review also underscores the importance of integrating human, animal, and environmental data within the One Health framework. It advocates for expanded molecular speciation in clinical workflows and improved coordination between veterinary and human health systems. Recognising the full zoonotic spectrum of tuberculosis is essential for achieving accurate surveillance, informed treatment decisions, and meaningful progress toward global TB elimination.

INTRODUCTION

Zoonotic tuberculosis (zTB) is a form of human tuberculosis caused by animal-adapted members of the *Mycobacterium tuberculosis* complex (MTBC) (1). Historically, *Mycobacterium bovis* has been regarded as the principal agent of zTB, with transmission primarily occurring through the ingestion of unpasteurized dairy products or direct contact with infected animals (2). However, recent molecular and genomic studies have revealed that other MTBC members, particularly *Mycobacterium orygis* and *Mycobacterium caprae*, also play important roles in zoonotic transmission, especially in geographically and ecologically distinct regions such as South Asia and parts of Europe (3).

These findings underscore the need to re-examine current diagnostic and surveillance strategies. Unlike *M. tuberculosis*, which is primarily transmitted from person to person via aerosols, zoonotic MTBC species are typically transmitted through ingestion, occupational exposure, or environmental contact (4). Their clinical presentations often involve extrapulmonary manifestations, affecting lymph nodes, the gastrointestinal tract, or bones, and may be clinically indistinguishable from disease caused by human-adapted *M. tuberculosis* (5).

According to the World Health Organisation (WHO) estimates, zTB due to *M. bovis* accounts for approximately 1.4% of the global human TB burden, equivalent to over 140,000 new cases annually, with the highest proportions reported in Africa and parts of South-East Asia. These figures likely underestimate the true magnitude due to underreporting and limited species-level identification (6). Conventional tools, such as smear microscopy and culture, do not differentiate among MTBC species (3). Even advanced diagnostics, such as molecular line probe assays (LPAs) and whole-genome sequencing (WGS), are not routinely available in resource-limited settings, where the risk of zTB may be highest (7,8). Moreover, current WHO diagnostic guidelines for tuberculosis do not mandate species-level identification of MTBC in clinical practice, further compounding this diagnostic blind spot (9). Given the shared ecology of humans and animals in many parts of the world, zTB represents not only a clinical challenge but also a public health concern requiring integrated, cross-sectoral approaches (10). The One Health framework, which emphasizes collaboration between human, veterinary, and environmental health sectors, offers an ideal platform for improving surveillance, diagnosis, and control of zTB.

This review provides a comprehensive overview of laboratory methods for diagnosing zTB, highlighting both conventional and emerging technologies. Special attention is given to their utility in low-resource settings, the role of species-level identification, and the importance of aligning laboratory practices with One Health objectives.

ETIOLOGICAL AGENTS AND TRANSMISSION

Zoonotic tuberculosis is primarily caused by *M. bovis*, a slow-growing, acid-fast bacillus and a key member of the MTBC, which also includes *M. tuberculosis*, *Mycobacterium africanum*, *M. orygis*, *M. caprae*, *Mycobacterium canettii*, *Mycobacterium pinnipedii*, and *Mycobacterium microti*, as well as the vaccine strain *M. bovis* bacillus Calmette-Guérin (BCG) (Table 1). While *M. bovis* is the classical etiologic agent of bovine tuberculosis, it can infect a wide range of domestic and wild animals, including goats, pigs, deer, badgers, and non-human primates, and is capable of crossing the species barrier and causing disease in humans (8).

Among zoonotic MTBC members, *M. bovis* is intrinsically resistant to pyrazinamide (PZA), a key anti-tuberculosis drug. Its growth is inhibited on glycerol-containing media but is supported on media supplemented with pyruvate (4). Mycobacterium *orygis*, originally isolated from African antelopes, is increasingly implicated in human tuberculosis in South Asia. Clinical isolates, often associated with extrapulmonary disease, have been reported in India, Bangladesh, and Nepal (1,3). Genomic features distinguishing *M. orygis* include deletion of region of difference (RD) 12 and specific single-nucleotide polymorphisms (SNPs) in genes such as *PPE55* and *Rv2042c* (1). Mycobacterium *caprae*, once considered a subtype of *M. bovis*, is now recognised as a distinct species, primarily affecting goats but also occasionally infecting cattle and wildlife. Human infections have been reported in Europe and are frequently resistant to PZA (11). Distinction from other MTBC species can be achieved through *gyrB* polymorphisms and RD-based analysis.

Species	Human pathogen	Year of description	First isolation source
M. tuberculosis	Frequent	1883	Mainly humans
M. bovis	Frequent	1907	Cattle (Bos taurus) Greater kudu (Tragelaphus strepsiceros) Common duiker (Sylvicapra grimmia)
M. bovis BCG	Rare	NA	-
M. africanum	Frequent	1969	Castets and colleagues in 1968 based on isolates from human tuberculosis patients in Senegal.
M. caprae	Occasional	2003	Goats (Capra aegagrus hircus)
M. microti	Rare	1957	Field voles (Microtus agrestis)
M. pinnipedii	Rare	2003	Seals and sea lions (e.g., South American sea lion, Otaria flavescens; hooded seals, Cystophora cristata)
M. mungi	No	2010	Banded mongooses (Mungos mungo)
M. suricattae	No	2013	Meerkats (Suricata suricatta)
M. orygis	Rare	2012	East African oryx (Oryx beisa)
M. canetti	Rare	NA	-

Table 1. Summary of the known MTBC members, their pathogenicity in humans, first isolation sources, and key differentiating features (adapted from reference 11).

Unlike the person-to-person aerosol transmission of *M. tuberculosis*, zoonotic MTBC species are typically acquired through ingestion of contaminated dairy products or through occupational exposure to infected animals or aerosols, often resulting in extrapulmonary disease (5).

The zoonotic potential of animal-adapted MTBC species, such as *M. orygis* and *M. caprae*, remains underrecognized due to diagnostic limitations and the lack of routine species-level identification in clinical laboratories (12).

Furthermore, wildlife reservoirs, including deer, badgers, elephants, and non-domesticated bovines, contribute to complex transmission dynamics, posing challenges for both human and veterinary health sectors (4,10). Understanding the transmission ecology of zTB is crucial for implementing effective surveillance and control measures within the One Health framework (13). Accurate identification of zoonotic MTBC species in both human and animal hosts is a prerequisite for tracking transmission pathways and preventing further spillover events.

CONVENTIONAL LABORATORY DIAGNOSTIC METHODS

Zoonotic tuberculosis is clinically indistinguishable from tuberculosis caused by *M. tuberculosis*, presenting with similar granulomatous pathology across affected organs (5).

However, the route of infection—most commonly ingestion or occupational exposure—predisposes zTB to extrapulmonary manifestations, such as gastrointestinal, lymphatic, or skeletal tuberculosis (8).Consequently, clinical suspicion alone rarely prompts species-level identification, and diagnosis relies heavily on laboratory investigations. A range of diagnostic options, including microscopy, culture, matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry (MALDI-TOF MS), molecular approaches, and serological methods, have been applied in the diagnosis of zTB (4). These methods differ substantially in diagnostic performance, availability, and level of validation. For rare conditions such as zTB, robust evaluation data are often limited due to the scarcity of well-characterised samples.

Moreover, culture-based methods require biosafety level 3 (BSL-3) laboratory infrastructure, which is not universally available. In such settings, serological and molecular assays performed on inactivated samples may represent practical alternatives (10).

Multiple subsequent tests using various diagnostic platforms in a stepwise approach may improve overall sensitivity and specificity.

Rapid diagnostic tests (RDTs), which are inexpensive and easy to use, may support disease control efforts; however, their implementation should not preclude access to state-of-the-art diagnostic technologies in low- and middle-income countries (10).

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In routine practice, conventional diagnostic methods for zTB largely mirror those used for *M. tuberculosis*, but they lack sufficient discriminatory power to differentiate MTBC species.

These methods include the following:

Smear Microscopy

Smear microscopy is widely used due to its rapid turnaround time and low cost. However, its sensitivity is reduced in extrapulmonary disease, and it does not allow species-level differentiation within MTBC.

Culture

Culture remains the reference standard for tuberculosis diagnosis, as it enables downstream species identification and drug susceptibility testing. Nevertheless, it is limited by long turnaround times (3–8 weeks), the requirement for BSL-3 facilities, and reduced sensitivity in paucibacillary specimens.

Although automated liquid culture systems shorten detection times, variable growth patterns of species such as *M. bovis*, *M. caprae*, and *M. orygis* may lead to misclassification or non-detection unless appropriate media modifications, such as pyruvate supplementation for *M. bovis*, are used (11).

Biochemical Tests

Historically, biochemical assays were employed to differentiate MTBC species based on metabolic characteristics. *Mycobacterium bovis* is negative for niacin production, nitrate reduction, and catalase activity at 68°C, and is resistant to pyrazinamide, whereas *M. tuberculosis* typically exhibits the opposite profile (4).

More recently, detection of the MPT64 antigen—present in most MTBC members except BCG—has been incorporated into rapid immunochromatographic assays to confirm MTBC identity from culture isolates, replacing older biochemical workflows. While valuable in the past, conventional biochemical tests are labour-intensive, have limited discriminatory power for closely related species, and have therefore largely been replaced by molecular techniques.

Histopathology

In suspected cases of extrapulmonary tuberculosis, histopathological examination of tissue biopsies may demonstrate granulomatous inflammation with caseating necrosis, findings that are characteristic but not pathognomonic of TB.

Ziehl-Neelsen (ZN) staining can reveal acid-fast bacilli (AFB); however, species-level identification is not possible. Histopathology thus serves as an adjunctive tool, facilitating early presumptive diagnosis but remaining insufficient for definitive species confirmation.

MOLECULAR DIAGNOSTIC METHODS

Molecular diagnostics have revolutionised tuberculosis diagnosis by enabling rapid detection and speciation of members of the MTBC. These tools are particularly valuable in the context of zTB, where differentiation between *M. tuberculosis* and animal-adapted species such as *M. bovis*, *M. orygis*, and *M. caprae* is crucial for clinical management, surveillance, and epidemiological understanding.

Nucleic Acid Amplification Tests: GeneXpert® and TrueNat® Platforms

Widely deployed nucleic acid amplification tests (NAATs), including GeneXpert® (Cepheid, Sunnyvale, CA, USA) and TrueNat® (Molbio Diagnostics, Goa, India), enable rapid detection of MTBC DNA and rifampicin resistance from a range of clinical specimens. However, their principal limitation in the context of zTB is the inability to differentiate among MTBC species.

An important advantage of the semi-closed TrueNat® platform is that the extracted DNA eluate can be retained and used for downstream species-level polymerase chain reaction (PCR) assays. This feature supports integrated diagnostic algorithms for zTB surveillance, particularly in resource-limited settings.

Polymerase Chain Reaction and Real-Time PCR

Polymerase chain reaction-based assays remain central to MTBC detection, targeting genomic elements such as *IS6110*, *IS1081*, *16S rRNA*, *mpb64*, *rpoB*, *katG*, and *inhA*. Real-time PCR (qPCR) platforms enable rapid and quantitative detection and can be applied to both pulmonary and extrapulmonary specimens.

Species differentiation is achieved using two principal molecular strategies. The first involves RD analysis, in which the presence or absence patterns of specific genomic regions (e.g., RD1, RD4, RD9, and RD12) are used to distinguish MTBC members (Table 2). The second approach relies on SNP-based typing, targeting genes such as *PPE55*, *Rv2042c*, and *gyrB*, which are particularly useful for differentiating *M. orygis* and *M. caprae* (1).

Masanga et al. (14) demonstrated a novel target specific to animal-adapted MTBC strains; however, this marker does not allow discrimination between *M. bovis* and the *M. bovis* BCG strain. Despite its diagnostic utility, PCR-based testing has several limitations. Only a limited number of commercial kits are available for MTBC species differentiation, restricting standardisation across laboratories. In addition, open PCR systems carry a risk of contamination, highlighting the importance of appropriate laboratory infrastructure and trained personnel. These requirements are often difficult to meet in peripheral or rural laboratory settings.

Nonetheless, PCR remains a practical and adaptable approach for zTB detection when integrated into referral laboratory workflows, particularly in settings using the TrueNat® platform, where extracted DNA can be repurposed for downstream speciation assays.

Line Probe Assays

Line probe assays, such as the GenoType® MTBC VER 1. The X system (Bruker-Hain Lifescience, GmbH, Nehren, Germany) enables rapid, culture-based identification and differentiation of MTBC species via reverse hybridisation of species-specific genetic targets. These assays can distinguish several MTBC members, including *M. tuberculosis*, *M. bovis*, *M. caprae*, *M. africanum*, *M. microti*, and *M. canettii*. In addition to speciation, LPAs can detect PZA resistance via *pncA* mutations and identify resistance-associated mutations related to multidrug-resistant TB, particularly in the *rpoB*, *katG*, and *inhA* genes.Although LPAs provide rapid and reliable speciation from culture isolates, their performance depends on the availability of pure mycobacterial cultures.

Species	RD1	RD4	RD9	RD12
M. tuberculosis	+	+	+	+
M. bovis	+	–	–	–
M. bovis BCG	–	–	–	–
M. caprae	+	+	–	–
M. orygis	+	+	–	–
M. africanum	+	+	–	+
M. canettii	+	+	+	–
M. microti	–	+	–	+

Table 2. Region-of-difference (RD) presence/absence signatures are commonly used to differentiate members of the M. tuberculosis complex (RD1, RD4, RD9, RD12). Presence (+) and absence (–) patterns shown are the expected signatures for typical representatives of each species; exceptions and atypical RD sizes occur (adapted from reference 1).

Moreover, current platforms do not include specific targets for *M. orygis*, limiting their utility in regions where this species is prevalent. The relatively high cost and infrastructure requirements further constrain their routine use in low-resource or decentralised laboratory settings (8).

Whole Genome Sequencing and Targeted Next Generation Sequencing

While LPAs represent a significant advance in MTBC speciation, WGS and targeted next-generation sequencing (tNGS) offer the highest resolution for species identification, antimicrobial resistance prediction, and molecular epidemiology.

Given their technical complexity and specific applications, these approaches are discussed in detail in the Advanced Diagnostic Approaches and Emerging Technologies section of this review.

Emerging Molecular Tools

Loop-mediated isothermal amplification (LAMP) is a field-adaptable molecular method with high specificity, endorsed by the WHO for MTBC detection. However, species-level differentiation remains limited unless lineage- or species-specific primers are employed.

Clustered regularly interspaced short palindromic repeats (CRISPRs)-based diagnostic platforms, including specific systems such as SHERLOCK and DETECTR, represented promising ultra-sensitive nucleic acid detection technologies.

Although these methods have potential for species-specific applications, they are still under development and not yet widely implemented in routine diagnostics.

Spoligotyping and MTBC Lineages

Spoligotyping (spacer oligonucleotide typing) is a genotyping technique that differentiates MTBC strains based on the presence or absence of unique spacer sequences within the direct repeat (DR) region of the genome. It is widely used for lineage determination, molecular epidemiology, and surveillance.

Each MTBC species or lineage is associated with a characteristic spoligotype pattern. For instance, *M. bovis* typically lacks spacers 39 to 43, a signature feature that facilitates its identification (1,11). *Mycobacterium orygis* displays a unique spoligotype profile and is frequently associated with ancient or unclassified lineages. In contrast, *M. caprae* shares overlapping spoligotype patterns with both *M. bovis* and *M. microti*, which may complicate definitive identification when spoligotyping is used alone.

Spoligotyping has contributed substantially to understanding the geographic distribution, host associations, and evolutionary relationships of MTBC species. In the context of zTB, it supports tracing infection sources and identifying potential animal reservoirs or spillover events. Although it offers lower discriminatory power than WGS, spoligotyping remains a valuable and cost-effective tool for lineage assignment in settings where advanced sequencing technologies are unavailable. When combined with RD analysis or SNP-based typing, it can enhance strain differentiation and strengthen regional zTB surveillance within a One Health framework.

IMMUNOLOGICAL METHODS

Immunological methods detect host immune responses to MTBC antigens rather than the organisms themselves. Although widely used for TB screening and surveillance, these assays lack the ability to differentiate among MTBC species, which limits their role in the definitive diagnosis of zTB in humans.

Tuberculin Skin Test

The tuberculin skin test (TST), including the Mantoux test in humans and the single intradermal comparative cervical tuberculin (SICCT) test in animals, measures delayed-type hypersensitivity to purified protein derivative (PPD). These tests remain central to surveillance programs but cannot distinguish between MTBC species. In addition, they are prone to false-positive results from BCG vaccination or exposure to environmental mycobacteria (4).

Interferon-Gamma Release Assays

Interferon-gamma release assays (IGRAs), such as QuantiFERON-TB Gold (Qiagen, Hilden, Germany) for human use and BOVIGAM™ (Thermo Fisher Scientific, Waltham, MA, USA) for animals, offer improved specificity by incorporating antigens such as early secreted antigenic target 6 (ESAT-6) and culture filtrate protein 10 (CFP-10), thereby avoiding cross-reactivity with BCG vaccination (4). Despite this advantage, IGRAs are primarily designed to detect latent TB infection and, like TSTs, do not allow differentiation between MTBC species.

Enzyme-Linked Immunosorbent Assays

In animals, enzyme-linked immunosorbent assays (ELISAs) are used to detect circulating antibodies against mycobacterial antigens and are particularly valuable for herd-level screening and in surveillance efforts targeting wildlife reservoirs (4). However, their diagnostic accuracy can vary widely, depending on the antigens used in the assay and the host species being tested.In humans, ELISAs play a limited role in the routine diagnosis of tuberculosis due to their relatively poor specificity and sensitivity. Nevertheless, they may serve a niche function in sero-epidemiological studies or in specific research contexts aimed at understanding immune responses to mycobacterial infection.

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Antigen Detection Tests

Lipoarabinomannan (LAM), a glycolipid component of the mycobacterial cell wall, can be detected in urine using rapid antigen-detection assays such as AlereLAM® (Abbott Diagnostics, Chicago, IL, USA) and FujiLAM® (Fujifilm Corporation, Tokyo, Japan). These tests are primarily used in human populations, especially among HIV-positive or immunocompromised patients with advanced tuberculosis, where non-sputum-based diagnostics are critical.

However, the relevance of LAM-based assays to zTB remains unclear. These tests have not been validated specifically for detecting *M. bovis*, *M. orygis*, or *M. caprae*, and their performance in extrapulmonary or zoonotic cases has not been well established (10). Further studies are therefore needed to clarify their diagnostic utility in such contexts.

DIAGNOSIS IN HUMANS VS. ANIMALS

The diagnostic approach to TB differs substantially between the human and animal health sectors, reflecting differences in sample types, clinical presentations, surveillance priorities, and available laboratory infrastructure. These differences become especially relevant in the context of zTB, where effective control depends on harmonised detection strategies across species within a One Health framework.

Diagnosis in Humans

In humans, the diagnostic workup for pulmonary tuberculosis typically begins with smear microscopy of respiratory specimens, which allows rapid identification of AFB. Culture remains the gold standard for confirming infection and performing drug susceptibility testing, although it requires longer processing times. Nucleic acid amplification tests, such as the GeneXpert® and TrueNat® platforms, enable rapid detection of MTBC along with rifampicin resistance and are widely used in national TB control programs.

In extrapulmonary TB, particularly cases involving lymph nodes or tissue biopsies, histopathological examination provides valuable diagnostic insights (5). Additionally, advanced molecular methods— including conventional PCR, line probe assays, and WGS—are increasingly employed in research or reference laboratory settings, particularly when species identification or drug resistance profiling is required.

Although these tools are effective for identifying *M. tuberculosis*, they do not routinely distinguish zoonotic MTBC species. As a result, cases of zTB, especially those presenting with extrapulmonary disease, may remain unrecognised. This diagnostic gap is particularly problematic in settings where close contact with livestock or consumption of unpasteurized dairy products is common (14).

Diagnosis in Animals

In animals, particularly livestock, tuberculosis diagnosis focuses on identifying infected individuals or herds to control disease transmission and mitigate economic losses (15). The most widely used methods are skin tests, with the single intradermal test (SIT) and the SICCT test remaining the standard approaches in cattle. These tests assess delayed-type hypersensitivity reactions to PPD tuberculin and are central to herd-level surveillance programs Interferon-gamma release assays are used in some countries as adjuncts or alternatives to skin testing, particularly when the sensitivity of the SICCT test is suboptimal (4). Serological assays, including ELISAs, are also used for herd-level screening and in wildlife species such as deer and elephants, where they are most effective in chronic or advanced stages of infection. Post-mortem examination plays an important diagnostic role within abattoir surveillance systems (12), where lymph nodes and organs are inspected for TB-compatible lesions and subjected to culture or molecular confirmation when indicated.

Culture-positive animal isolates may undergo molecular typing using PCR-based assays, spoligotyping, or whole genome sequencing. However, species-level identification is not routinely performed in many veterinary laboratories, especially in resource-constrained settings, underscoring the need to strengthen diagnostic capacity for zTB surveillance.

Bridging the Gap: Consequences of Diagnostic Fragmentation

The stark differences between human and animal diagnostic strategies represent a fundamental barrier to effective zTB control. In human health systems, reliance on sputum-based NAATs and culture confirms MTBC infection but rarely identifies the infecting species, leaving the zoonotic origin unrecognised. Conversely, veterinary surveillance relies heavily on herd-level screening through skin tests and IGRAs, with limited routine use of culture or species-level molecular confirmation.

As a result, cross-species transmission—such as transmission from cattle to humans via unpasteurized milk or occupational exposure—is frequently suspected but rarely confirmed microbiologically (13). Human and animal cases are managed within separate silos, using different tools, protocols, and reporting systems. This fragmentation prevents the establishment of integrated surveillance systems and makes it impossible to connect a human case of *M. bovis* or *M. orygis* back to its animal source.

Overcoming this challenge requires coordinated One Health-oriented strategies. Key steps include establishing referral networks for confirmatory speciation, training veterinary staff in molecular techniques, the use of cartridge-based NAATs or TrueNat® platforms in the veterinary sector, and integrating species-level identification into routine clinical TB workflows. Such integration is essential for the accurate detection of zTB and for timely, species-specific public health responses.

Advanced Diagnostic Approaches and Emerging Technologies

Advancements in molecular diagnostics have expanded the capacity for species-level identification within the MTBC. These developments are particularly promising for detecting zTB, where conventional methods fall short. Despite their potential, accessibility, cost, and operational complexity continue to limit widespread implementation, especially in low-resource and rural settings.

Whole Genome Sequencing

Whole genome sequencing is the most definitive and comprehensive method for MTBC species identification, lineage classification, drug resistance prediction, and transmission

mapping (3,12). In the context of zTB, WGS enables precise discrimination among *M. bovis*, *M. orygis*, *M. caprae*, and other MTBC members; detection of PZA resistance by identifying mutations in the *pncA* gene, a critical capability for managing *M. bovis* infections; and high-resolution phylogenetic analysis to trace cross-species transmission and investigate outbreaks, providing crucial data for public health interventions (4).

Whole genome sequencing offers the most comprehensive resolution for MTBC analysis. However, widespread implementation remains constrained by the need for BSL-3 culture facilities, sequencing platforms, skilled personnel, and bioinformatics capacity, which may limit its feasibility in routine programmatic settings.

Targeted Next-Generation Sequencing

Targeted next-generation sequencing (tNGS) platforms, such as Deeplex® Myc-TB (Genoscreen, Lille, France), provide a focused and efficient alternative to WGS by amplifying and sequencing specific genomic regions of interest (1). These platforms are capable of detecting mutations associated with drug resistance, identifying MTBC species and sub-lineages, and generating results more rapidly and cost-effectively than conventional WGS. As such, tNGS holds promise for expanded use in both clinical and surveillance settings, particularly where comprehensive yet resource-conscious diagnostics are needed.

High-Resolution Melt Analysis and Digital PCR

High-resolution melt (HRM) analysis differentiates MTBC species based on the melting profiles of amplicons. It is simple, rapid, and relatively cost-effective, but may lack sufficient discriminatory power for closely related species like *M. bovis* and *M. caprae*.

Digital PCR (dPCR) provides enhanced sensitivity and quantification compared to traditional real-time PCR. Its role in zTB diagnosis remains experimental, though promising for use in extrapulmonary specimens or samples with low bacillary load.

Nanopore Sequencing

Nanopore sequencing platforms, such as MinION™ (Oxford Nanopore Technologies, Oxford, United Kingdom), provide portability and real-time sequencing potential. While accuracy and validation are still being optimised compared to Illumina platforms, these technologies hold promise for decentralised molecular surveillance of zTB in the future.

CHALLENGES AND THE NEED FOR ONE HEALTH INTEGRATION

Despite growing recognition of zTB as a public health concern, multiple diagnostic, surveillance, and policy-related challenges continue to hinder its effective detection and control. These gaps are particularly pronounced in high-burden, resource-limited settings, many of which are characterised by close human–animal interfaces and unregulated dairy or meat supply chains.

Underreporting and Lack of Routine Speciation

Most clinical laboratories diagnose tuberculosis using smear microscopy, NAATs, or culture, none of which routinely differentiate MTBC species (8). As a result, infections caused by *M. bovis*, *M. orygis*, and *M. caprae* are frequently misclassified as *M. tuberculosis*, particularly in extrapulmonary presentations.

The lack of routine species-level identification within the MTBC has several important consequences. Misclassification of zoonotic species, such as *M. bovis*, distorts national TB surveillance data and hampers accurate epidemiological assessment (2). From a clinical perspective, patients infected with *M. bovis* may receive standard first-line regimens that include PZA, to which the organism is intrinsically resistant, resulting in suboptimal treatment outcomes. Furthermore, the inability to detect zoonotic transmission chains means that public health authorities miss critical opportunities to investigate sources of infection and implement targeted control measures.

Gaps in Veterinary Surveillance

Veterinary diagnostic infrastructure in many low- and middle-income countries, including India, is not equipped for molecular species-level testing (13). Bovine TB control programs are often inconsistent, underfunded, and vary widely by region. Key challenges include the absence of routine testing in livestock and wildlife reservoirs, poor coordination between public health and veterinary authorities, and a lack of enforceable policies for mandatory milk pasteurisation or testing in many endemic areas (10).

Diagnostic Fragmentation and Lack of Intersectoral Collaboration

Currently, human and animal TB cases are typically diagnosed, managed, and reported independently, with limited information exchange between sectors. This fragmentation highlights the gap between current practices and the One Health framework, which emphasises collaborative surveillance and shared responses. For instance, confirmation of *M. orygis* infection in a human case may not prompt investigation of local livestock or wildlife populations, even in regions where cross-species transmission is suspected.

Infrastructure and Capacity Limitations

The tools required for species-level diagnosis, e.g., line probe assays, real-time PCR, and WGS, are typically restricted to national or academic reference laboratories. Peripheral and district-level facilities frequently lack essential resources, including molecular platforms, trained personnel, BSL-3 containment facilities, and dedicated funding for zTB surveillance. Moreover, zTB is not yet prioritised within global TB elimination strategies, despite its implications for disease persistence, antimicrobial resistance, and vulnerable populations.

Lack of Data on Emerging MTBC Species

Growing evidence points to the increasing relevance of less recognised MTBC species. *Mycobacterium orygis* is being increasingly reported in South Asia, including in pediatric extrapulmonary TB cases and across various animal reservoirs, indicating a broader zoonotic potential than previously appreciated (3,12). Similarly, *M. caprae*, frequently reported in Europe, is likely underdetected in other regions due to diagnostic limitations and the absence of routine speciation in many laboratories. These observations underscore the need for expanded molecular surveillance to better understand the epidemiology and clinical significance of emerging zoonotic MTBC species.

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ONE HEALTH AS THE PATH FORWARD

Integrating One Health principles into tuberculosis control strategies is essential for addressing the diagnostic and surveillance gaps associated with zTB. This integration requires coordinated, cross-sectoral efforts that go beyond traditional siloed approaches. Joint surveillance initiatives should be established to enable simultaneous testing of livestock and human contacts during outbreak investigations (13). Additionally, national databases should be expanded to include zoonotic MTBC isolates, facilitating real-time data sharing between veterinary and public health sectors.

Building capacity for molecular diagnostics is another key priority. This includes training personnel and equipping both human and veterinary laboratories with the necessary infrastructure to perform species-level identification and drug resistance testing. Policy frameworks must also evolve to mandate routine MTBC speciation—particularly for extrapulmonary TB—and to address risk factors, such as the consumption of unpasteurized dairy products, and the need for wildlife TB surveillance.

CONCLUSION AND RECOMMENDATIONS

Zoonotic TB represents a growing yet underrecognized facet of the global tuberculosis burden. While historically attributed to *M. bovis*, recent evidence implicates other animal-adapted members of the MTBC, including *M. orygis* and *M. caprae*, that also contribute to human disease (3). These species are particularly relevant in regions with high human-livestock interactions, unregulated dairy consumption, and limited veterinary oversight (14).

The inability of routine diagnostic algorithms to distinguish MTBC species leads to underreporting, inappropriate treatment regimens—such as the use of PZA in *M. bovis* infections—and missed opportunities for targeted public health interventions (4). Although advanced molecular tools, including real-time PCR, line probe assays, and WGS, offer accurate species-level identification, their deployment remains limited to a few research or reference laboratories. Veterinary diagnostic infrastructure faces similar constraints, further hindering intersectoral response to zTB.

Addressing these gaps requires the deliberate integration of the One Health principles into national and global TB strategies (10,13). To improve recognition and control of zTB, several key actions are recommended. First, MTBC speciation should be incorporated into routine diagnostic workflows, especially for extrapulmonary and pediatric TB cases. Second, veterinary surveillance systems should be strengthened through the implementation of routine MTBC testing in livestock and relevant wildlife reservoirs. Third, laboratory capacity should be expanded through infrastructure development and workforce training in both human and animal health sectors. Fourth, data integration should be promoted, with mechanisms to support joint outbreak investigations and information sharing between public health and veterinary authorities. Finally, focused research efforts are needed to better define the epidemiology, transmission dynamics, and resistance profiles of underrecognized MTBC species, including *M. orygis* and *M. caprae*.

Zoonotic TB challenges traditional assumptions about TB transmission, diagnosis, and control. Recognising its complex ecology and embracing cross-sectoral collaboration are essential steps toward comprehensive TB elimination and global health security.

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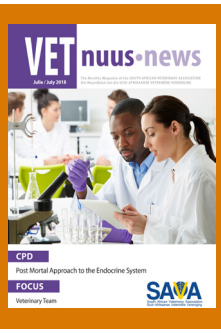
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The SAVA Stress Management Hotline is there to assist members who are experiencing personal problems by offering access to professional counselling/advice.

The hotline can assist with referrals or simply offer much needed emotional support when anxiety, depression, anger, grief, lonelinessand 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.

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

THE CLICKING HEART

Steve Wimberley



We were young, very enthusiastic and very innocent. For four and a half years, we had memorised facts until our brains were full to bursting. Now that we were in our final year, we could actually get to be vets, albeit very inexperienced ones.

We had read all about how to use a stethoscope to listen to heart and lung sounds, how to take temperatures, how to do a full clinical examination and how to use an otoscope to look into ears. At last, we could physically do all those things and more. It was very exciting and somewhat intimidating.

One morning, six of us piled into a mobile ambulance and set off on some farm calls. The clinician in charge of us was at the wheel. During the drive, he recapped the finer points of how to do a full clinical examination on a cow. We were primed and rearing to go.

When we arrived at the farm, we were greeted by the farmer, who showed us to his sick cow. She was a very large Brahman cow with the typical zebu hump between her shoulders. She was loosely tethered to a stake but was too sick to move much. She had a very mournful look in her eyes, almost begging us to help her.

The six of us swarmed around her and began with our clinical examination. One student lifted the tail and inserted the thermometer, another tried to feel her pulse, and two looked in her mouth and eyes.

Unbeknownst to us, Herman had gone round to the other side and started to percuss her chest. He started to tap on a flat piece of perspex held against the chest, listening for a change in sound intensity. This could indicate lung consolidation or pneumonia.

I decided to use my stethoscope to listen to the cow's heart. I plugged it into my ears and placed it on my chest over the area where the heart should be and listened. Instead of hearing the typical lub dub heart sounds I expected, all I could hear was a strange clicking sound. I was totally confused and called our clinician.

"Hey doc – come listen to this weird heart!"

Our clinician calmly strolled over and placed his stethoscope on the cow's chest. He listened for a long time, and his expression changed from one of initial mild boredom to puzzlement, to total bewilderment. He, too, had never heard a cow's heart sound like that. He suggested we all have a turn in listening to this strange heart. He looked around to see where we all were and caught sight of a pair of boots on the opposite side of the cow. The penny dropped.

He jumped up against the cow and looked over her hump – there was Herman blissfully unaware of his surroundings, happily percussing away on the chest.

We were slightly less innocent after listening to the four-letter words that erupted from our clinician's mouth, as he shouted at Herman to go sit on the bus and not be a total imbecile for just one morning.



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Ruminant Veterinary Association of South Africa

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DVM, MSc, PhD

Prof. Jo Leroy is a full Professor of Veterinary Sciences at the University of Antwerp (UA), Belgium, with a distinguished career in reproductive biology and animal health. He earned his MSc in Veterinary Medicine, Magna Cum Laude, from Ghent University, where his award-winning research focused on subclinical mastitis in heifers. He subsequently completed a PhD on metabolic changes in high-producing dairy cows and their impact on oocyte and embryo quality, publishing seven peer-reviewed articles during his doctoral studies.

Prof. Leroy heads a renowned research program exploring maternal health, oocyte and embryo quality, and postnatal outcomes, using innovative in vitro and in/ex vivo models across multiple species. He also bridges science and society, translating research into practical applications for veterinarians, farmers, and clinicians, and has founded the Camelid Immunisation Facility to advance veterinary biotechnology



BVSc MMedVet (Therio) DiplACT

Dr Staley graduated from the Faculty of Veterinary Science, University of Pretoria, South Africa as a veterinarian in 1984. After two years of compulsory military service, joined the Faculty of Veterinary Science (Univ. Pretoria) as a lecturer in reproduction. While on staff, completed a M.Med.Vet in Reproduction and qualified as a Veterinary Specialist (Theriogenology). After 6 years in academia, joined the largest dairy practice (Howick Veterinary Clinic) in South Africa in 1993 as a partner, with dairy and equine focus. He emigrated with his family to the USA in 1998 and joined a dairy practice in Door County, Wisconsin. While in practice in Wisconsin, qualified as a Diplomate of the American College of Theriogenologists (2001). Relocated to the Central Valley of California in 2003 and has worked in industry for past 22 years in Technical Services positions. Dr Staley has presented at most of the national US dairy meetings and is a well-recognized consultant in the US dairy industry. He is known as a thought leader, identifying and addressing several key issues in the dairy industry. Particular interest in dairy record evaluation, heifer maturity and dairy productive life.



PhD

Peter Sutovsky earned his PhD degree from the Czech Academy of Sciences in 1994. He was a Postdoctoral Fellow at the University of Wisconsin, Madison WI, and Staff Scientist at the Oregon Health; Science University, Portland OR, before his 2001 faculty appointment at the University of Missouri, Columbia MO, where he is currently a Professor of Animal Science, and Obstetrics, Gynecology and Women's Health. He is recognized for his studies of mammalian gametogenesis, fertilization, and embryo development with emphasis on the gametic and zygotic ubiquitin-proteasome system (UPS). He was the first to describe the role of UPS in the regulation of mitochondrial inheritance and introduced the concept of extracellular UPS and its role in sperm maturation and fertilization. In his career, Peter received numerous national and international awards and honors, including an honorary doctoral degree, several honorary professorships, and membership in the National Academy of Inventors. He is an elected Fellow of American Association for the Advancement of Science (AAAS) and Distinguished Fellow of The Society for The Study of Reproduction (SSR). He has an extensive record of publications, citations, patents, grant awards and senior level editorial appointments. His most recent work focuses on biomarker-based flow cytometric semen analysis, semen nanopurification, sperm genome-to-phenome research, and sperm capacitation studies aimed at improving conception rates in livestock and assisted reproductive therapy (ART) humans.

https://vetlink.co.za/ruvasa-congress-2026/

SAVA AWARDS

Who would you like to add to the list of distinguished recipients?

South African Veterinary Association
Suid-Afrikaanse Veterinêre Vereniging

Nominate a person you think excelled in these categories.

*In the Category of the **Gold Medal of SAVA**, which is the flagship award, SAVA bestows on worthy recipients who excelled in outstanding and sustained scientific achievement, with a major impact in the field of veterinary science in South Africa. The medal will only be awarded once to a particular person, and there will be one award per year; a person may only receive this award once. The award requires a very comprehensive Curriculum vitae and motivation. The award may be awarded to any person in the field of veterinary science. Your well-motivated nomination can add the name of a worthy person to this list of distinguished recipients.*

Previous worthy recipients of this award are:

Prof Henk Bertshinger: 2022



Prof Fred Reyers: 2023-2024





Gold Medal of SAVA continued:

2023	Dr R Bengis
2019	Dr SH O'Grady [USA]
2017	Dr JA van Wyk
2015	Prof GE Swan
2009	Prof BL Penzhorn
2005	Dr MD Soll
1999	Dr GR Thomson
1997	Prof JAW Coetzer
1996	Prof I Horak
1995	Dr PA Basson
1994	Dr RD Bigalke
1992	Dr TS Kellerman
1991	Prof JMW Le Roux
1990	Prof DR Osterhoff
1988	Dr BJ Erasmus
1987	Dr A Polson
1986	Prof RK Reinecke
1985	Dr DW Verwoerd
1984	Prof WH Gerneke
1983	Dr BC Jansen
1982	Prof HPA de Boom
1981	Prof CFB Hofmeyr
1980	MC Laubscher
1979	Dr LW van den Heever
1978	Dr EM Robinson
1977	Dr JHR Bisschop
1976	Dr JH Mason
1975	DG Steyn
1974	Dr JG Boswell
1973	Dr SWJ van Rensburg
1971	Dr WO Neitz

The President's Award is awarded to any South African Veterinary Association's registered veterinarian in recognition of outstanding service to and advancement of the veterinary profession in South Africa. The award will only be bestowed once on a particular person, and there will be one award per year. The award requires a very comprehensive curriculum vitae and motivation. Do you know of the person just right for this award? Then nominate and motivate them before the deadline of **31 July 2026**. Take a good look at previous recipients and see if your person will be a worthy addition to the list.

Prof Gareth Bath: 2023-2024



President's Award continued:

2017	Dr CP Marwick
2012	Dr A Erasmus
2009	Prof RM Kirberger
2008	Dr FS Malan
2007	Dr CM Cameron
2005	Dr G Brückner
2003	Dr RG Bengis
2001	Dr PC Ardington
1999	Dr PP Bosman
1998	Prof RI Coubrough
1996	Prof SS van den Berg
1995	Dr J van Heerden
1994	RK Loveday
1993	HP Steyn

Silver Medal [Changed To President's Award]

1992	Dr DJ Schneider
1991	Dr V de Vos
1990	Prof CM Veary
1989	Prof TW Naudé
1988	Dr A Immelman
1987	Dr L Coetzee / Dr JM Hofmeyr [Posthumously]
1986	Dr JC Austin
1985	Dr EM van Tonder
1984	Dr FJ Veldman

SAVE THE DATE!

UPCOMING EVENTS

SAVE THE date

1-4 JUNE 2026

13th International Crustacean Society Meeting

STIAS, Stellenbosch

The Crustacean Society Mid-Year Meeting

SAVE THE date

10-11 JULY 2026

SAVA Eastern Free State Branch Congress

Clarens

SAVA South African Veterinary Association Suid-Afrikaanse Veterinêre Vereniging

SAVE THE date

31 JULY-2 AUG 2026

Hill's Pet Nutrition Nurses Hybrid Weekend

Gauteng

Hill's SCIENCE DOES MORE

SAVE THE date

30 AUG-2 SEPT 2026

54th Annual PARSA Conference & Awards

Klein-Kariba, Bela-Bela

PARSA

SAVE THE date

AUGUST

SAVA Northern Cape & Free State Branch Congress

Bloemfontein

SAVA South African Veterinary Association Suid-Afrikaanse Veterinêre Vereniging

SAVE THE date

30 SEPT-1 OCT 2026

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(South African Association of Veterinary Technologists)

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SAVETCON EVENT MANAGEMENT

South African Veterinary Association
Suid-Afrikaanse Veterinêre Vereniging

CALL FOR NOMINATIONS FOR SAVA AWARDS AND HONORARY MEMBERSHIP 2026

DEADLINE: 31 JULY 2026

Nominations for the SAVA Awards are invited. These awards are conferred on persons who have made exceptional and significant contributions in the fields of Veterinary Science, or the Veterinary Profession and they serve as a prestigious form of recognition of distinguished service. They require sufficient but concise justification for the nomination in the category selected, as outlined in the criteria listed for each category. The presentation of awards will be made at a suitable venue and occasion identified by SAVA and this usually occurs every second year to coincide with the Gala Dinner of the SAVA Biennial Congress. Please adhere to the nomination guidelines as set out below.

1. GOLD MEDAL OF THE SAVA

Awarded to any person, in recognition of outstanding and sustained scientific achievement, with a major impact in the field of veterinary science in South Africa. The medal will only be awarded once to a particular person, and there will be one award per year. The award requires a very comprehensive curriculum vitae and motivation.

2. PRESIDENT'S AWARD

Awarded to any veterinarian registered with the SAVC in recognition of outstanding service to and advancement of the veterinary profession in South Africa. The award will only be bestowed once on a particular person, and there will be one award per year. The award requires a very comprehensive curriculum vitae and motivation. .

3. BOSWELL AWARD

Awarded to any member of the SAVA for eminent service rendered to the profession through the SAVA. The award may be bestowed upon more than one person in a particular year.

4. CLINICAL AWARD OF THE SAVA

Awarded to any veterinarian or group of veterinarians who are registered with the SAVC and have excelled in applied veterinary practice. There is a limit of one award per clinical discipline per year. Past recipients become eligible for another award after a period of five years, for a different contribution.

5. RESEARCH AWARD OF THE SAVA

Awarded to one or more veterinarians for a body of research related to Veterinary Science, and published in scientific journals, that has made an important contribution to a particular field of study. Recipients of this award may be eligible for nomination for new original research. Submission to the Awards Committee may be made by candidates themselves.

6. YOUNG VETERINARIAN OF THE YEAR AWARD

Awarded to one veterinarian registered with the SAVC per year, younger than 35 years of age or who has not been registered for longer than 10 years and who has made a significant contribution to veterinary science in his / her work sphere.

7. SOGA MEDAL

Awarded in recognition of exceptional community service rendered by a veterinarian registered with the SAVC or a veterinary student enrolled at a South African veterinary faculty. In addition to veterinary-related services, other forms of community service may be considered to support the nomination.

8. CITATION OF THE SAVA

The SAVA may bestow a citation upon one or more persons, including non-veterinarians, in recognition of specific achievements and / or meritorious contributions to the veterinary profession or the SAVA. More than one citation may be bestowed per year.

9. HONORARY LIFE MEMBER

Any SAVA member who has rendered long and outstanding service to the veterinary profession may be awarded Honorary Life Membership. Honorary Life Membership will not be granted to more than three people in one year.

10. HONORARY ASSOCIATE LIFE MEMBER

Any person who is not a veterinarian and who has rendered outstanding service to veterinary science, or the veterinary profession may be awarded honorary associate life membership. Honorary Associate Life Membership will not be granted to more than three people in one year.

All nominations must be supported by:

- Submissions must be made on the official nomination form available from the SAVA office.
- A brief motivation in terms of the conditions of the specific award, including the impact the work of the nominee has had. Evidence supporting the motivation, such as testimonials, may be included.
- A full *curriculum vitae* of the nominee, including a list of publication(s) where applicable and all the contact details of the nominee.
- Copy (ies) of the relevant publication(s) in the case of the Research Award.
- It should be clearly understood that all SAVA Awards are conferred for contributions that have been made specifically in a South African context and not elsewhere.

Please note that:

- Any member of the SAVA may submit nominations, while others making nominations must include the support and signature of a SAVA member. Nominators are encouraged to channel their nominations via a SAVA Group or Branch.
- Non-SAVA members may be nominated for all categories except the Boswell Award and Honorary Life Membership.
- Unsuccessful nominations of previous years may, at the discretion of the Awards Committee, be held over for consideration in the following year.
- Where the nominator and seconder have indicated their permission, award categories of nominations could be changed by the Awards Committee.
- Members of the Awards Committee are permitted to propose or second candidates for awards, on condition that they recuse themselves when such nominations are discussed.

The onus is on members to submit appropriate nominations by the due date.

Failure to comply with the above will lead to disqualification of the nomination.

All nominations, in electronic format, marked for the attention of Prof G Bath, Chairperson, Awards Committee of the SAVA, must reach the SAVA office, Debbie Breeze by

FRIDAY, THE 31ST JULY 2026

Nomination forms may be obtained from Ms Debbie Breeze 012 346 1150 or please send an email to debbie@sava.co.za

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Joining the Community: A Step-by-Step Guide

Prerequisites:

- Ensure you have WhatsApp installed on your device.
- Please add/save SAVA's WhatsApp number to your contacts: 081 849 6088.
- 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!

CREDO

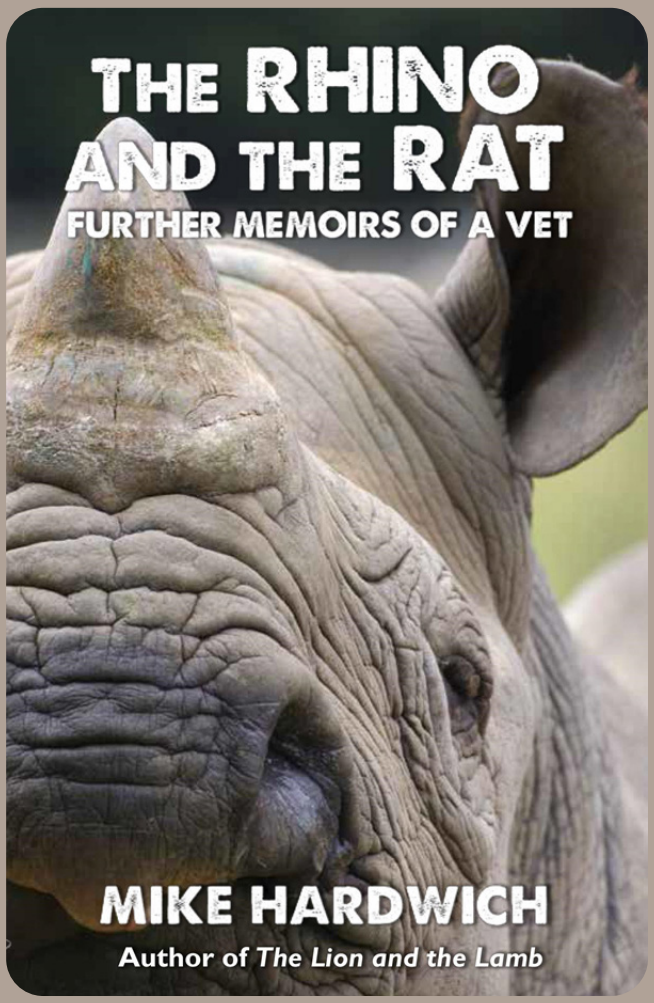
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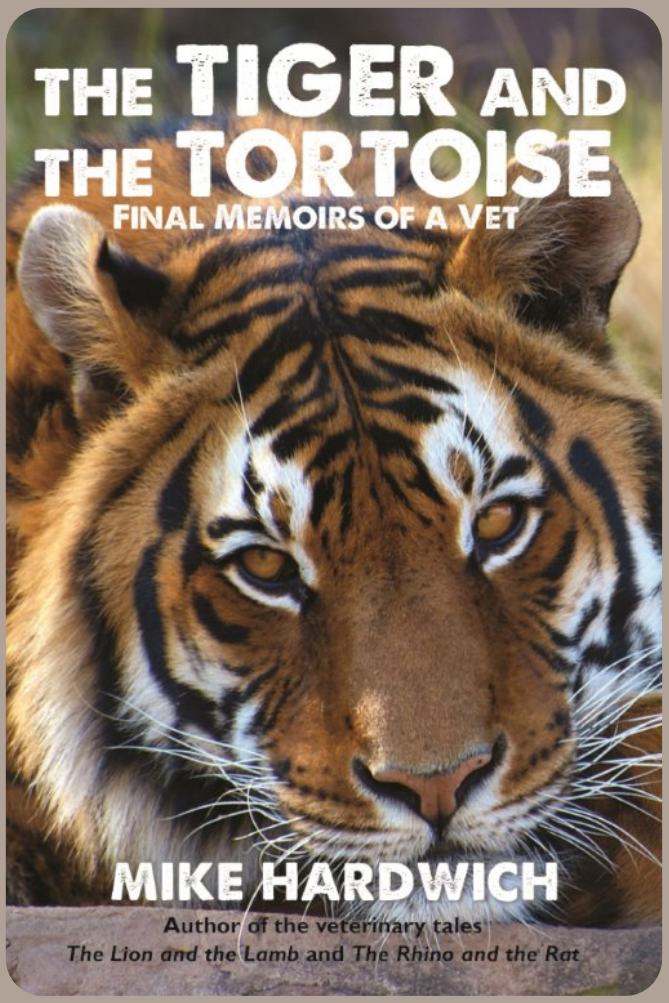
We, the members of the Association, resolve at all times:

- 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.

Ons, die lede van die Vereniging, onderneem om te alle tye:

- Ons professie in ere te hou en die Eed na te kom
- 'n Hoë professionele en wetenskaplike peil te handhaaf en te onderhou
- Ons professionele kennis, vaardigheid en hulpbronne aan te wend ter beskerming en bevordering van die gesondheid en welsyn van dier en mens
- Die status en beeld van die veearts te bevorder en die veeartsenykunde te verryk
- Die belange van ons Vereniging en die genootskap tussen sy lede te bevorder.

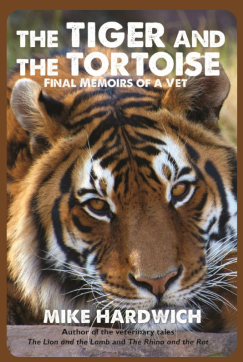




As a country vet whose territory covers the rich valleys and farmland of KwaZulu-Natal, his clients range from cattle farmers to owners of domestic pets, from game ranchers to circuses. The demands on a vet are constant and often arrive at very inconvenient times. Called upon day and night, Mike brings 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.....

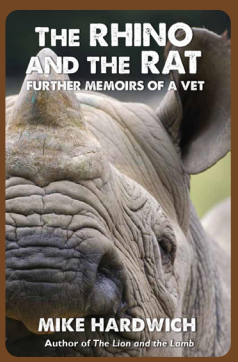


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In Memoriam

Dr Estian van As

07 December 1991 – 18 February 2026



Dr Estian van As was born and raised on a farm in Grootfontein, Tierpoort, near Pretoria, where his parents still farm. Growing up on the farm meant that he was exposed to all kinds of animals, from goats to cattle to horses, etc. This, in turn, nurtured his deep-seated love for all creatures big and small. Fast forward a couple of years, and it would only be fitting that he embark on the journey of studying animal science, where he obtained an honours degree at the University of Pretoria. He then went on to complete his Veterinary degree, also through the University of Pretoria. Since then, he has worked predominantly in mixed animal practice. Dr van As worked as an intern as well as a surgery resident at the equine department of the University of Pretoria. The beach was calling his name, and it was at this time that Dr Estian decided to make the move down to the coast, more specifically, Noordhoek Veterinary Clinic. Nature and the ocean are where he found solace.

The Noordhoek and wider Cape Town community is mourning the loss of Dr Estian van As, a respected veterinarian at Noordhoek Veterinary Clinic, whose death has been confirmed.

His passing has left colleagues, clients, and pet owners in deep sorrow as tributes continue to reflect the profound impact he had through his work and compassion. Dr van As was widely known for his dedication to animal welfare and his calm, reassuring presence with both pets and their owners.

At Noordhoek Veterinary Clinic, he built a reputation for professionalism, empathy, and meticulous care, often going beyond expectations to ensure the well-being of animals entrusted to him.

Clients recall his patience in explaining diagnoses and treatment options, and his genuine concern for every animal that came through the clinic's doors.

Beyond clinical practice, Dr van As was admired as a valued colleague and mentor. Fellow veterinarians and staff describe him as supportive, collaborative, and deeply committed to continuous learning. His passion for veterinary medicine and his respect for life were evident in his daily work, earning him lasting respect within the local veterinary community.

News of his death has prompted an outpouring of condolences from pet owners across Noordhoek and surrounding areas, many sharing stories of lives saved and comfort given during difficult moments. The loss is being felt not only as the passing of a skilled professional but also of a trusted friend to the community.

As the community grieves, Dr Estian van As is being remembered for his kindness, dedication, and the lasting difference he made in the lives of animals and people alike.

Noordhoek Veterinary Clinic

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

Dr JW Esteen: 1974 – 2026

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

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Dr Mats Abatzidis

B.Sc. B.V.Sc.

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

Greetings everyone, and hope that it has been a wonderful and re-energised start to 2026! Veterinary medicine is a calling, not just a career. You show up for animals and their owners on their best days and their worst. You navigate medical uncertainty, emotional clients, long hours, and often, limited resources—whether in private practice, field work, or government roles like state veterinary services.

That sense of duty is powerful, but it also comes with a cost: exhaustion, compassion fatigue, and the quiet feeling that your own life is shrinking around your work.

Self-care and healthy routines can sound like vague buzzwords, especially when your schedule feels out of control. But they are not luxuries. They are practical tools that protect your health, sustain your empathy, and ultimately make you better at your job. Below are concise, realistic strategies tailored to veterinary professionals—along with the benefits of each—to help you build a more balanced, sustainable life.

1. Start with One Small, Non-Negotiable Habit

Instead of trying to overhaul your life, choose one simple daily habit you commit to every day, no matter how busy you are. Examples:

- Drinking a full glass of water first thing in the morning
- Taking a 10-minute walk after lunch
- Doing 5 minutes of stretching when you get home
- Spending 10 minutes reading something non-work-related before bed

Why it helps:

A consistent habit gives structure to your day amid unpredictability, builds a sense of control and competence, and creates a "keystone" behaviour that makes other healthy choices easier.

2. Protect Your Sleep Like a Critical Patient

Sleep often becomes the first casualty of busy clinics, emergency calls, or field inspections. But chronic sleep deprivation erodes medical judgment, reaction time, mood, and immune function. Practical ways to improve sleep:

- Aim for a consistent bedtime and wake time—even on days off
- Create a short pre-sleep routine: dim lights, no work emails, no medical literature
- Avoid screens 30–60 minutes before bed, or use blue-light filters
- Keep the bedroom as dark, cool, and quiet as possible

Why it helps:

Better sleep sharpens clinical reasoning and decision-making, improves patience with clients/colleagues/yourself, and reduces susceptibility to burnout and emotional exhaustion.

3. Build Micro-Breaks into Your Workday

You may not control your caseload or call volume, but you can usually control a few minutes at a time. Micro-breaks—30 seconds to 3 minutes—can make a measurable difference.

Ideas for micro-breaks:

- Take three slow, deep breaths between appointments or calls
- Step outside for 2 minutes between cases to change your environment
- Gently stretch your neck, shoulders, and back at your workstation
- Drink water and do a quick posture check between records

Why it helps:

Short, intentional pauses lower stress hormones and muscle tension, improve focus and reduce errors, and help you "reset" emotionally before the next patient or interaction.

4. Set Boundaries Around "Off-Duty" Time

Work can easily bleed into every corner of your life. Boundaries don't mean you care less—they mean you're preserving your ability to keep caring.

Simple boundary practices:

- Designate specific times you check work emails and stick to them
- Turn off non-urgent notifications during personal time
- If you are on call, define what truly requires immediate attention
- Communicate your availability clearly to colleagues and clients

Why it helps:

Healthy boundaries give your brain a chance to fully rest and recover, reduce resentment and feelings of being "always on", and improve your presence—at work and at home.

5. Move Your Body in Ways That Fit Your Real Life

You spend a lot of time on your feet, lifting, restraining, driving, etc. That's physical, but it isn't necessarily restorative. Structured movement doesn't have to mean a gym membership.

Realistic movement options:

- 10–15 minutes of walking before or after work
- Short body-weight routines at home: squats, wall push-ups, gentle yoga
- Stretching after physically demanding tasks
- Parking a bit farther away or taking stairs when possible

Why it helps:

Regular, gentle movement reduces musculoskeletal pain and injury risk, boosts mood and energy by releasing endorphins, and helps buffer the physical strain of long clinical or field days.

6. Create a Simple Emotional "Decontamination" Routine

Veterinary professionals carry heavy emotional loads: euthanasia, animal cruelty, disease outbreaks, distressed owners, etc. Without a way to process these experiences, they accumulate.

Try one of these short end-of-day practices:

- Write down three things that went well today—no matter how small
- Mentally "hand off" the day by taking three deep breaths at your front door, imagining work staying outside
- Talk briefly with a trusted colleague, partner, or friend about one moment that stayed with you
- Use your commute as decompression time—no work calls, just music or silence

Why it helps:

Regular emotional processing reduces compassion fatigue and cynicism, helps you separate "today's hard cases" from your core identity, and encourages perspective and appreciation of the good moments. Avoid emotional buildup!

7. Invest in Peer Support and Connection

It's easy to feel isolated—even in a busy clinic or office, especially when enforcing difficult decisions.

Ways to build connection:

- Start or join a brief monthly check-in with colleagues focused on well-being
- Share honest, practical strategies that are working for you
- Normalise discussions about stress, burnout, and mental health
- If available, use professional counselling or employee assistance programs

Why it helps:

Connection with peers reduces the sense of "I'm the only one struggling", provides practical coping tools from people who understand your world, and increases resilience and job satisfaction.

Collegial support is absolutely essential.

8. Reconnect with Your "Why"

When days are long and demands are constant, it's easy to lose sight of why you chose this profession.

Short ways to reconnect:

- Keep a folder (paper or digital) of thank-you notes, photos, or positive outcomes
- Once a week, intentionally recall one moment when your work made a real difference
- Reflect for a minute on the broader impact of your role—on animal health, public health, food safety, or community well-being.

Why it helps:

Staying connected to your purpose protects against burnout and moral fatigue, protects your passion, restores a sense of meaning and pride in your work, and helps difficult days feel like part of a larger, valuable mission.

Starting Today

You are used to caring for others with skill and dedication. Extending that same care to yourself is not selfish; it's a professional responsibility.

A healthier routine doesn't require a perfect schedule or ideal circumstances. It starts with one small, consistent action you can do today.

Choose one idea from this article:

- A glass of water in the morning
- A 2-minute breathing break
- A consistent bedtime
- A quick walk after work

Commit to it for the next week. Observe how you feel. Then build from there.

Your patients, clients, communities—and the animals and people who love you outside of work—need you well, not just present.

You deserve a life that includes your profession, but is not consumed by it.

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

How concerned are we with the space left after extraction?

Prof Gerhard Steenkamp, Dr Mareli van de Wetering and Dr Michael Ferreira

As humans, we are understandably concerned about the space left behind after a tooth extraction. An edentulous gap is not just a cosmetic issue; it can lead to drifting of adjacent teeth as they attempt to close the space, or supereruption of the opposing tooth into the void. Both may result in malocclusion and further pathology.

These same principles apply in many animal species.

In non-human primates, equids and artiodactyls, post-extraction space can have significant long-term consequences. Tooth removal in these species should therefore never be considered routine.

In the juvenile chimpanzee shown below (Fig. 1), the abscessed maxillary deciduous incisor presents a clinical dilemma.



Figure 1. Abscessed left maxillary incisor tooth of a juvenile chimpanzee. This is a deciduous tooth, and its extraction of it should be done with care to protect the developing incisor tooth

Extraction of this tooth may not only damage the developing permanent tooth bud but also allow the adjacent deciduous incisors to drift into the space. This narrowing can create a physical barrier to the eruption of the permanent successor. The result may be lifelong malocclusion.

The adult Mona monkey below illustrates what loss of a maxillary incisor can mean functionally (Fig. 2). Loss of the left 1st maxillary incisor tooth has resulted in obvious incisor malalignment. In species that rely heavily on precise incisor tooth occlusion for food prehension and social signalling, this is more than an aesthetic issue.



Figure 2. An adult Mona monkey with malocclusion of the incisor teeth due to loss of the left 1st maxillary incisor tooth

Equine practitioners are well acquainted with similar concerns. Cheek teeth extraction in horses carries recognised risks of drifting, supereruption and secondary occlusal abnormalities. Interestingly, as early as the turn of the 20th century, veterinarians and dentists were already experimenting with bridges to maintain the normal positioning of equine cheek teeth after extraction; a reminder that this is not a new problem.

Carnivores, however, are different.

In domestic dogs and cats, significant post-extraction drifting or supereruption is uncommon. Carnivore dentition is highly specialised for grasping, slicing and crushing. With this specialisation comes relative occlusal stability. The premolar teeth in dogs, and the premolar and molar teeth in cats, function as cutting blades rather than grinding tables. As a result, the occlusal dynamics differ markedly from those of herbivores and primates, and the clinical consequences of extraction are usually less dramatic.

The take-home message is simple: dentition behaves differently across species.

As veterinarians, it is incumbent upon us to diagnose oral disease early and to consider the long-term biomechanical consequences of extraction. This is particularly true in species where tooth loss may compromise eruption patterns, occlusion and ultimately quality of life.

Saving a tooth is not always possible.

But in some species, it may make all the difference.



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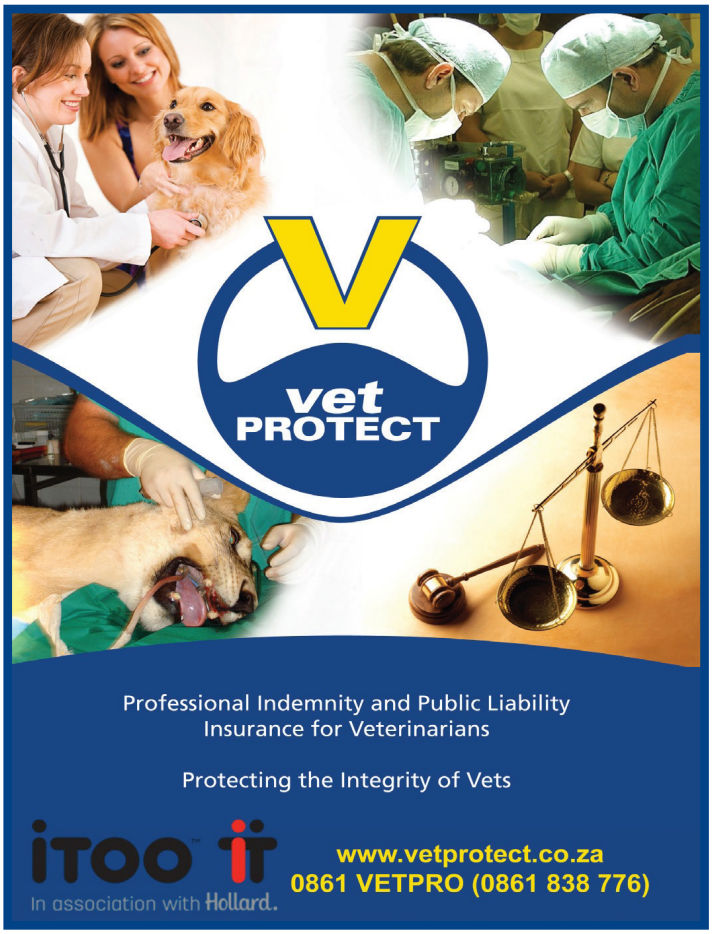
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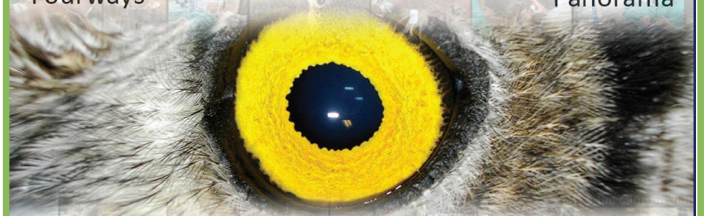
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Katrin Hartmann graduated from the College of Veterinary Medicine at the LMU Munich, Germany, in 1987, completed her Doctoral Thesis in 1990 and her Habilitation Thesis on antiviral treatment of feline immunodeficiency virus infection in 1995. She 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.

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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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