



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2025; SP-11(4): 202-208

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www.veterinarypaper.com

Received: 04-02-2026

Accepted: 06-03-2026

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Pentoxifylline in the era of one health: Versatility in veterinary therapeutics: A review

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DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i4Sc.3221>

Abstract

Pentoxifylline (PTX) is a synthetic dimethylxanthine derivative that modulates blood rheological properties and has anti-oxidant and anti-inflammatory properties. It is water-soluble and was first used in human medicine for claudication since 1972. Pentoxifylline's documented mechanism of action includes phosphodiesterase inhibition, adenosine receptor antagonist, red blood cell flexibility, and immunomodulatory effects. It also reduces the viscosity of blood by decreasing erythrocyte aggregation and stimulating fibrinolysis to reduce plasma fibrinogen concentrations. PTX has been shown to inhibit the production of various cytokines, including TNF- α , IL-1, 6 and 8, which contribute to anti-inflammatory and potentially anti-fibrotic effects. PTX has been used in multi-organ dysfunction such as in companion animal medicine for various conditions like canine cutaneous vasculitis, canine familial dermatomyositis, allergic dermatitis, chronic kidney disease, and hepatitis. It has been proven effective as an adjunctive therapy for respiratory, endotoxemia and pain associated diseases in ruminants, horses and poultry due to its vasodilatory effects. It has also been regarded for its antiviral efficacy, potential to improve reproductive performance in seasonal breeders like sheep and increasing fertility rates and hatchability in poultry and also its radioprotective effect are of prospective areas which needs further research.

Keywords: Pentoxifylline, Veterinary practice, Rheological, Multifaceted

1. Introduction

Pentoxifylline (PTX) also called Oxypentifylline is a synthetic derivative of dimethylxanthine, is renowned for its ability to modulate the rheological properties of blood. This pharmacological agent also possesses notable antioxidant and antiinflammatory properties. Chemically classified as 3,7-dihydro-3,7-dimethyl-1-(5-oxohexyl)-1H-purine-2,6-dione (C₁₃H₁₈N₄O₃), pentoxifylline belongs to the same drug class as natural compounds like theophylline and theobromine. Studies by Wen *et al.* (2017) ^[41] and Balazic *et al.* (2023) ^[4] have contributed to a better understanding of pentoxifylline's pharmacological profile. These investigations highlighted its multifaceted mechanisms, which include improving blood flow dynamics through rheological modulation, scavenging reactive oxygen species to mitigate oxidative stress, and suppressing inflammatory pathways to alleviate tissue inflammation. The compound's structural similarity to natural methylxanthines facilitates its interaction with adenosine receptors and phosphodiesterase enzymes, thereby influencing vascular smooth muscle tone and cellular signalling cascades. This pharmacodynamic profile not only enhances tissue oxygenation but also potentially mitigates chronic inflammatory responses implicated in various pathological conditions. In clinical contexts, pentoxifylline's therapeutic applications extend beyond its hemorheological effects. It is increasingly recognized for its potential in treating vascular disorders, such as peripheral arterial disease and diabetic nephropathy, where its properties may aid in improving microcirculation and attenuating renal dysfunction progression.

History and Background

Pentoxifylline, initially introduced to the European market in 1972, is a watersoluble drug that gained FDA approval in 1984. It belongs to the class of methylxanthine derivatives and was first utilized in human medicine primarily for the treatment of claudication, a condition characterized by impaired blood flow to the limbs. Despite its early approval and clinical use, evidence supporting pentoxifylline's efficacy in veterinary medicine remained largely anecdotal until the turn of the millennium. The drug's pharmacokinetic properties, including its water solubility, facilitate its distribution and interaction within bodily fluids, enabling potential therapeutic benefits in various clinical scenarios beyond its initial indications. Over time, advances in veterinary research have expanded the understanding of pentoxifylline's mechanisms of action and broadened its clinical applications in treating conditions such as vascular disorders and inflammatory diseases in animals. Ongoing studies continue to refine its veterinary use, elucidating its potential benefits and optimizing treatment protocols to enhance therapeutic outcomes (Klinger *et al.*, 2024) ^[25].

Pharmacokinetics

Pentoxifylline, administered orally, undergoes rapid and complete absorption in the gastrointestinal tract. Typically formulated as a sustained-release tablet, it achieves peak plasma concentrations within two to three hours post-administration. However, its bioavailability is relatively modest, ranging from 20% to 30%, owing to substantial firstpass metabolism in the liver. Metabolically, pentoxifylline is extensively processed in erythrocytes and the liver, where it is converted into active metabolites. These metabolites play a pivotal role in exerting therapeutic effects, contributing to the drug's efficacy in clinical settings. Elimination of pentoxifylline and its metabolites predominantly occurs via renal excretion, with less than 5% excreted in feces. Notably, key metabolites are also secreted into breast milk, warranting caution during lactation. The pharmacokinetics of pentoxifylline are characterized by a short half-life, typically ranging from 0.4 to 0.8 hours, indicating rapid clearance from the bloodstream. In contrast, the metabolites exhibit a slightly longer half-life of approximately 1 to 1.5 hours, suggesting continued pharmacological activity beyond the parent compound. These pharmacokinetic properties underscore the importance of dosing schedules and formulation strategies to maintain therapeutic plasma levels and optimize clinical outcomes in patients receiving pentoxifylline therapy (Aviado and Dettelbach, 1984; Poondru *et al.*, 2001) ^[3, 36].

Mechanism of Action

Pentoxifylline exerts its pharmacological effects through

several distinct mechanisms, making it a versatile therapeutic agent in various clinical applications.

- 1. Phosphodiesterase Inhibition:** Pentoxifylline primarily inhibits phosphodiesterase enzymes, particularly phosphodiesterase type-4 (PDE-4). This inhibition prevents the breakdown of cyclic adenosine monophosphate (c AMP) within cells. Elevated c AMP levels lead to vasodilation, which improves blood flow by relaxing vascular smooth muscle cells. Additionally, increased c AMP inhibits platelet aggregation and reduces leukocyte activation, thereby mitigating inflammation (Mc Carty, 2016) ^[28].
- 2. Adenosine Receptor Antagonism:** Pentoxifylline antagonizes adenosine receptors, particularly the A2a receptor subtype. Adenosine receptors are widely distributed throughout the body, with A2a receptors notably abundant in the lungs. Antagonism of these receptors contributes to vasodilation and antiinflammatory effects, which are beneficial in conditions where improving blood flow and reducing inflammation are therapeutic goals (Effendi *et al.*, 2020) ^[16].
- 3. Red Blood Cell Flexibility:** Pentoxifylline enhances red blood cell (RBC) flexibility by increasing ATP and cyclic nucleotide levels within erythrocytes. This biochemical modulation reduces RBC aggregation and improves their ability to deform under flow conditions. Consequently, blood viscosity decreases, facilitating improved microcirculation and oxygen delivery to tissues (Ward and Clissold, 1987) ^[40].
- 4. Inhibition of Pro-inflammatory Cytokines:** Pentoxifylline has demonstrated inhibitory effects on the production of various pro-inflammatory cytokines, including tumour necrosis factor-alpha (TNF- α), interleukin-1 (IL-1), IL-6, and IL-8. By reducing the levels of these cytokines, pentoxifylline exerts potent antiinflammatory effects, which can attenuate tissue damage and potentially mitigate fibrotic processes associated with chronic inflammation (Wenisch *et al.*, 1998; Papich, 2016) ^[42].
- 5. Immunomodulatory Action:** Beyond its anti-inflammatory effects, pentoxifylline exhibits immunomodulatory properties by enhancing leukocyte deformability and chemotaxis. It suppresses neutrophil degranulation and decreases the adhesion of leukocytes to endothelial cells. Moreover, pentoxifylline reduces the sensitivity of leukocytes to cytokine signals, thereby modulating immune responses and potentially mitigating excessive immune activation seen in autoimmune conditions or inflammatory disorders (Zhang *et al.*, 2005) ^[44].

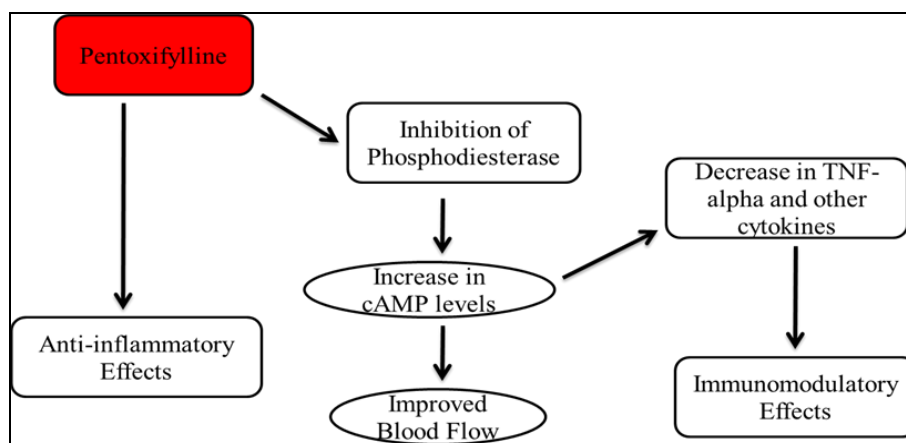


Fig 1: Mechanism of Action of Pentoxifylline

Applications in Veterinary Practice

A. Companion Animals

Pentoxifylline (PTX) has emerged as a therapeutic option in veterinary medicine, demonstrating efficacy across various conditions in companion animals.

1. **Canine Cutaneous Vasculitis:** PTX has been utilized at doses of 10-20 mg/kg orally twice daily for 4-5 weeks in the treatment of cutaneous vasculitis in *dogs*. This treatment regimen has shown effectiveness in improving blood flow and reducing inflammation in affected skin tissues (Scott *et al.*, 2013).
2. **Canine Familial Dermatomyositis:** In cases of familial dermatomyositis, a congenital ischemic disease primarily affecting Collies and Shetland Sheepdogs, PTX has been administered at a dosage of 25 mg/kg orally twice daily for 12 weeks. This treatment approach aims to alleviate symptoms and improve the condition of affected *dogs* (Lewis and Kennis, 2021) ^[26].
3. **Allergic Dermatitis:** PTX has demonstrated efficacy in reducing both TNF-induced and IgE-induced dermatitis in *dogs* suffering from allergic skin conditions. Typically, it is prescribed at a dose of 10 mg/kg orally twice daily for 3-5 weeks to manage these inflammatory skin reactions (Lewis and Kennis, 2021) ^[26].
4. **Chronic Kidney Disease (CKD):** PTX is recognized for its renoprotective effects in *dogs* with CKD. Studies have shown that PTX can reduce proteinuria, a critical marker of kidney damage, in these animals (Nenad *et al.*, 2009) ^[33]. Furthermore, PTX has been associated with halting or delaying the progression of CKD by lowering levels of blood urea nitrogen (BUN), creatinine, cystatin C, and phosphorus in affected *dogs* (Jacob *et al.*, 2002; Belde *et al.*, 2013; Chetan *et al.*, 2023) ^[5, 12, 23].
5. **Canine Immune-Mediated Diseases:** PTX has exhibited promising results in managing immune-mediated diseases such as immune-mediated hemolytic anemia (IMHA) and immune-mediated thrombocytopenia (ITP) in *dogs*. Its immunomodulatory effects have been studied extensively, highlighting its potential to modulate the immune response and improve outcomes in these conditions (Carr *et al.*, 2002) ^[7].
6. **Canine Hepatitis:** In cases of progressive canine hepatitis, PTX has been shown to reduce liver tissue fibrosis, suggesting a role in mitigating the progression of hepatic damage in affected *dogs* (Center *et al.*, 2005) ^[9].

B. Farm Animals

Pentoxifylline (PTX) exhibits therapeutic potential across several conditions affecting ruminants, leveraging its anti-inflammatory and immunomodulatory properties.

1. **Endotoxemia:** PTX has been investigated for its ability to mitigate the inflammatory response associated with endotoxemia in ruminants. Endotoxemia, often caused by bacterial toxins, triggers a cascade of inflammatory reactions leading to systemic illness. PTX modulates cytokine production, particularly reducing the levels of pro-inflammatory cytokines, which improves clinical outcomes in affected animals (Constable *et al.*, 1996; Peek *et al.*, 2018) ^[13, 35].
2. **Bovine Respiratory Disease (BRD):** As an adjunctive treatment for BRD in cattle, PTX has demonstrated efficacy in reducing pulmonary hypertension and acute lung injury. These benefits contribute to alleviating respiratory distress and improving overall lung function

in affected animals (Hodgson *et al.*, 2001; Michetti, 2003) ^[22, 29].

3. **Mastitis:** In cases of mastitis, an inflammatory condition affecting dairy cattle's mammary glands, PTX has been explored for its potential to modulate the inflammatory response. By reducing inflammation, PTX helps improve milk quality and overall udder health in affected animals (Lima *et al.*, 2011) ^[27].
4. **Rumen Acidosis:** PTX shows promise in attenuating the inflammatory response associated with rumen acidosis in cattle. Rumen acidosis occurs when the pH balance in the rumen becomes too acidic, leading to systemic inflammation and metabolic disturbances. PTX mitigates this inflammatory response, thereby improving clinical outcomes and reducing systemic complications (Alsobayel *et al.*, 2014) ^[1].

C. Equine Practice

Pentoxifylline (PTX) has been investigated for its therapeutic potential in several equine conditions, leveraging its vasodilatory, anti-inflammatory, and immunomodulatory properties.

1. **Navicular Disease and Laminitis:** PTX has been studied as a potential treatment for navicular disease in *horses*. Navicular disease is characterized by chronic foot pain due to inflammation and degeneration of the navicular bone and associated structures. PTX's vasodilatory effects are hypothesized to improve blood flow to the affected area, thereby reducing pain and improving clinical signs. Studies have shown promising results, indicating a reduction in lameness and improvement in overall clinical condition with PTX administered at doses around 6 grams per day for 6-8 weeks (Johnson *et al.*, 1998; Saunders, 1998) ^[24].
2. **Circulatory Disorders:** In equine circulatory disorders such as chronic obstructive pulmonary disease (COPD) or heaves, PTX has been utilized to enhance blood flow, particularly to the lungs. By improving pulmonary circulation, PTX helps alleviate symptoms associated with respiratory distress in affected *horses*. This application underscores PTX's role in managing conditions where optimizing blood flow to specific organs is crucial for mitigating disease progression and improving respiratory function (Muscatello *et al.*, 2008) ^[31].
3. **Sepsis and Endotoxemia:** PTX exhibits potential anti-inflammatory effects in cases of sepsis and endotoxemia in *horses*. These conditions are characterized by systemic inflammation triggered by bacterial toxins (endotoxins) and can lead to severe organ dysfunction and high mortality rates. PTX modulates the inflammatory response by inhibiting cytokine production and reducing the activation of inflammatory pathways. This modulation may contribute to improved survival outcomes in *horses* affected by sepsis and endotoxemia (Geor *et al.*, 2000) ^[19].

D. Poultry

Pentoxifylline (PTX) shows promise in various aspects of *poultry* management, leveraging its vasodilatory, anti-inflammatory, and immunomodulatory properties.

1. **Management of Ascites Syndrome:** PTX's vasodilatory effects are crucial in managing Ascites Syndrome in *poultry*. This condition, often associated with heart and liver congestion, results from increased blood pressure in

the abdominal vessels. PTX improves blood flow by dilating blood vessels, which helps alleviate congestion in the liver and heart, thereby reducing fluid accumulation in the abdomen. Studies suggest that PTX can effectively mitigate Ascites Syndrome by addressing underlying circulatory issues (Alper *et al.*, 2005).

2. **Enhancement of Reproductive Performance:** PTX has been explored for its potential to enhance reproductive performance in *poultry*. By improving blood circulation to reproductive organs, PTX supports gonadal function, potentially enhancing fertility rates and hatchability. This improvement in blood flow optimizes nutrient and oxygen delivery to the ovaries and testes, thereby promoting optimal reproductive function and increasing the likelihood of successful breeding (Nazari *et al.*, 2022) ^[32].
3. **Stress Management:** PTX is suggested to mitigate the negative effects of stress on *poultry* production. Stressors such as environmental changes, transportation, or high stocking densities can lead to physiological stress responses in birds. PTX improves blood circulation and modulates inflammatory responses, which may help *poultry* cope better with stress. By maintaining adequate blood flow to vital organs and reducing inflammation, PTX supports overall health and productivity in stressful conditions (Nazari *et al.*, 2022) ^[32].
4. **Supportive Therapy for Respiratory Conditions:** PTX's anti-inflammatory properties position it as a potential adjunctive therapy for respiratory diseases in *poultry*, such as infectious bronchitis or mycoplasma infections. These respiratory conditions often involve inflammation of the respiratory tract, leading to compromised breathing and reduced health. PTX reduces inflammation in the respiratory tissues, thereby improving airway function and overall respiratory health in *poultry* (Cheng *et al.*, 2009) ^[11].

Drug Interaction

According to Klinger *et al.* (2024) ^[25], the concomitant use of various medications with pentoxifylline can result in significant pharmacological interactions, affecting both efficacy and safety profiles:

1. **Non-Steroidal Anti-Inflammatory Drugs (NSAIDs):** Medications such as meloxicam, flunixin, and ketoprofen are known to increase the risk of severe bleeding when used alongside pentoxifylline. NSAIDs inhibit cyclooxygenase enzymes, which play a critical role in the formation of thromboxanes and prostaglandins. This inhibition can impair platelet aggregation and gastrointestinal mucosal defense, leading to an increased likelihood of hemorrhage.
2. **Antihypertensive Drugs:** Agents like enalapril, an angiotensin-converting enzyme (ACE) inhibitor, may exhibit a synergistic effect with pentoxifylline, resulting in pronounced hypotensive episodes. Enalapril reduces angiotensin II production, leading to vasodilation and decreased blood pressure, which, when combined with pentoxifylline's vasodilatory properties, can significantly lower blood pressure and cause hypotension.
3. **Antibiotics:** Chloramphenicol and furazolidone are antibiotics that can enhance the risk of hemorrhage and internal bleeding when administered with pentoxifylline. Chloramphenicol can cause bone marrow suppression, reducing platelet count, while furazolidone, a nitrofurantoin derivative, may inhibit monoamine oxidase, leading to

increased levels of tyramine and potentially causing hypertensive crises and subsequent bleeding complications.

4. **Vitamin E:** The combination of vitamin E with pentoxifylline has been shown to enhance the efficacy of pentoxifylline. Vitamin E's antioxidant properties may potentiate the effects of pentoxifylline, which is known for improving microcirculation and reducing blood viscosity, thereby enhancing its therapeutic outcomes.
5. **Salicylic Acid:** The concurrent use of salicylic acid with pentoxifylline may potentiate the risk of bleeding. Salicylic acid, an active metabolite of aspirin, irreversibly inhibits platelet cyclooxygenase-1, thereby reducing platelet aggregation. When used with pentoxifylline, this effect can be magnified, leading to an increased risk of bleeding events.

These interactions highlight the importance of careful medication management and monitoring in patients undergoing treatment with pentoxifylline, particularly when combined with the aforementioned drugs, to mitigate potential adverse effects and ensure therapeutic efficacy.

Adverse Effects

According to Annamaraju *et al.* (2022) ^[2], the administration of pentoxifylline is associated with several adverse effects, with varying degrees of commonality:

1. Most Common Adverse Effects

Nausea and Vomiting: These gastrointestinal symptoms are the most frequently reported side effects in patients receiving pentoxifylline.

2. Other Common Side Effects

A. Gastrointestinal System

- **Abdominal Discomfort:** Patients often report experiencing pain or discomfort in the abdominal region.
- **Bloating:** Swelling or a feeling of fullness in the abdomen is another common symptom.
- **Diarrhea:** Increased frequency of bowel movements or loose, watery stools are frequently observed.

B. Central Nervous System

Convulsions and Seizures: Although less common, some patients may experience neurological disturbances such as convulsions and seizures, indicating a potential for central nervous system involvement.

C. Cardiovascular System

- **Cardiac Arrhythmias:** Irregular heartbeats are a noted side effect, suggesting an impact on cardiac conduction.
- **Dyspnea:** Difficulty in breathing or shortness of breath can occur.
- **Tachycardia:** An increased heart rate is a possible reaction.
- **Hypotension:** Lowered blood pressure may be observed, especially in conjunction with the vasodilatory effects of pentoxifylline.
- **Blood Dyscrasia:** Abnormalities in blood cell components, indicating potential hematological issues, may be present.

These side effects necessitate vigilant monitoring of patients undergoing pentoxifylline therapy, particularly those with pre-existing conditions that might exacerbate these adverse reactions.

Future Prospects

Pentoxifylline (PTX) has demonstrated diverse pharmacological activities across various medical fields, including antiviral, radioprotective, and reproductive applications. Here is an elaboration on its effects as described in several studies:

1. Antiviral Activity

A. Broad-Spectrum Antiviral Properties

Herpes Simplex Virus, Vaccinia Virus, Rotavirus, and Tick-Borne Encephalitis Virus: PTX has shown inhibitory effects against a range of viruses, suggesting its potential as a broad-spectrum antiviral agent (Amvros *et al.*, 1993).

A. Japanese Encephalitis Virus

Interference with Viral Assembly and Release: PTX disrupts the viral life cycle during the translation phase, specifically affecting the assembly and release of Japanese encephalitis virus (Sebastian *et al.*, 2009) ^[39].

B. SARS-CoV-2 Infection

Multifaceted Therapeutic Potential: PTX's antiviral, anti-inflammatory, immunomodulatory, and bronchodilatory effects collectively indicate its potential utility in treating COVID-19 (Berenji *et al.*, 2021) ^[20].

2. Radioprotective Agent

A. Reduction of Radiation-Induced Damage

Late Radiation Reaction in Mice: Prophylactic

administration of PTX has been effective in reducing late radiation reactions in mouse foot models (Dion *et al.*, 1989) ^[15].

B. Chronic Osteoradionecrosis

Combination Therapy with Tocopherol: The combined use of PTX and tocopherol has shown efficacy in mitigating chronic osteoradionecrosis in human patients (Huan *et al.*, 2014) ^[18].

3. Reproductive Medicine

A. Sperm Motility in Equine

Thawed Frozen Sperm: PTX has proven effective in enhancing the motility of thawed frozen equine sperm, suggesting benefits for sperm cryopreservation (Gradil, 2000) ^[21].

B. Cryopreservation Industry

Mitigating Freeze-Thaw Damage: PTX is valuable in reducing the detrimental effects of freeze-thaw cycles in sperm cryopreservation (Nazari *et al.*, 2022) ^[32].

C. Improvement in Reproductive Parameters in Rams

Testicular Blood Flow and Semen Quality, PTX has enhanced testicular blood flow and volume, improved semen quality, and increased concentrations of testosterone and nitric oxide in rams, particularly during the non-breeding season (Fadl *et al.*, 2023) ^[17].

Table 1 Common brands of Pentoxifylline in India (From the web)

Brand name	Manufacturer	Form of Drug
Trental	Sanofi Aventis Pharma Ltd.	Tablet
		Injection
Kinetel	Cipla Ltd.	Tablet
		Injection
Flexital	Sun Pharma Ltd.	Tablet
		Injection
Cabaza	Jolly Healthcare	Tablet
Oxifyline	Steris Healthcare	Tablet
Trantal	Penacia Pharma	Injection
Flowpent	Abott Ltd.	Tablet
		Injection

Conclusion

Pentoxifylline's multifaceted pharmacological profile makes it a valuable therapeutic tool across various medical fields. As of current, PTX is generally regarded as an extra-label drug in veterinary applications. However, its rheological, antioxidant, and anti-inflammatory properties enable it to manage conditions characterized by impaired blood flow and chronic inflammation successfully in various animal diseases. As research continues to uncover its full potential, PTX's clinical applications are likely to expand, offering benefits in diverse fields such as antiviral therapy, radioprotective, and reproductive health. Further research on drug repurposing is crucial to harness the potential of this drug. Careful consideration of drug interactions and adverse effects is essential to optimize therapeutic outcomes. Overall, pentoxifylline stands out as a versatile and effective pharmaceutical agent with broad-spectrum therapeutic potential for veterinary therapeutics.

Conflict of Interest

Not available

Financial Support

Not available

References

- Alsobayel AA, *et al.* The effect of systemic administration of pentoxifylline on systemic and local inflammation in lipopolysaccharide challenged calves. J Anim Sci. 2014;92(8):3596-3605.
- Annamaraju P, Baradhi KM. Pentoxifylline. In: StatPearls [Internet]. StatPearls Publishing; 2022.
- Aviado DM, Dettelbach HR. Pharmacology of pentoxifylline a hemorheologic agent for the treatment of intermittent claudication. Angiology. 1984;35(7):407-417.
- Balazic E, Axler E, Konisky H, Khanna U, Kobets K. Pentoxifylline in dermatology. J Cosmet Dermatol. 2023;22(2):410-417.
- Belde K, Mehmet T, Müge K, Filiz K, Alper S, Kazim T, *et al.* Effects of pentoxifylline on gentamicin-induced nephrotoxicity. Ren Fail. 2013;35(10):1376-1381.
- Belshaw Z, Ash S, Ford D, *et al.* The effects of pentoxifylline on the cytokine response and outcome

- following acute surgical intervention in a rat model of hind limb ischemia-reperfusion. *Int J Surg*. 2015;16(Pt A):43-49.
7. Carr AP, Panciera DL, Kidd L. Prognostic Factors for Mortality and Thromboembolism in Canine Immune-Mediated Hemolytic Anemia: A Retrospective Study of 72 Dogs. *J Vet Intern Med*. 2002;16(5):504-509.
 8. Carr SC. Diagnosis and management of venous ulcers. *Perspect Vasc Surg Endovasc Ther*. 2008;20(1):82-85.
 9. Center SA, Warner KL, McCabe J, *et al*. Evaluation of the influence of Sadenosylmethionine on systemic and hepatic effects of pentoxifylline in dogs with induced chronic hepatitis. *Am J Vet Res*. 2005;66(3):330-341.
 10. Center SA, Warner KL, McCabe J, Foureman P, Hoffmann WE, Erb HN. Evaluation of the influence of S-adenosylmethionine on systemic and hepatic effects of prednisolone in dogs. *Am J Vet Res*. 2005;66(2):330-341.
 11. Cheng KM. Pharmacological applications of pentoxifylline in poultry. *World Poult Sci J*. 2009;65(3):473-483.
 12. Chetan Kumar GK, Kamran CA, Ashwini A. Pentoxifylline in management of chronic kidney disease in dogs. *Group*. 2023;1(58.29):2-1.
 13. Constable PD, *et al*. Effects of pentoxifylline on *in vivo* endotoxin-induced production of tumor necrosis factor- α and interleukin-6 in calves. *Am J Vet Res*. 1996;57(2):177-181.
 14. Demircan V, Guzel C, Sarıbas GS, Dinc SC, Cetin S, Gulbahar O, *et al*. Evaluation of therapeutic use of a combination of pentoxifylline and vitamin E in radiation-induced renal fibrosis. *Sci Rep*. 2024;14(1):6977.
 15. Dion MW, Hussey DH, Osborne JW. The effect of pentoxifylline on early and late radiation injury following fractionated irradiation in C3H mice. *Int J Radiat Oncol Biol Phys*. 1989;17(1):101-107.
 16. Effendi WI, Nagano T, Kobayashi K, Nishimura Y. Focusing on adenosine receptors as a potential targeted therapy in human diseases. *Cells*. 2020;9(3):785.
 17. Fadl AM, El-Shahat KH, Hashem MF. Effect of pentoxifylline on the testicular hemodynamic, volume, testosterone, nitric oxide levels and semen quality in Ossimi rams during non-breeding-season. *Theriogenology*. 2023;209:126-133.
 18. Fan H, *et al*. New approach for the treatment of osteoradionecrosis with pentoxifylline and tocopherol. *Biomater Res*. 2014;18(1):13.
 19. Geor RJ, *et al*. Effects of pentoxifylline on indices of endotoxemia and acute phase reaction in horses. *Am J Vet Res*. 2000;61(6):641-646.
 20. Ghasemnejad-Berenji M, Pashapour S, Sadeghpour S. Pentoxifylline: a drug with antiviral and anti-inflammatory effects to be considered in the treatment of coronavirus disease 2019. *Med Princ Pract*. 2021;30(1):98-100.
 21. Gradil CM, Ball BA. The use of pentoxifylline to improve motility of cryopreserved equine spermatozoa. *Theriogenology*. 2000;54(7):1041-1047.
 22. Hodgson JL, *et al*. The effect of pentoxifylline on pulmonary hypertension and bronchoalveolar neutrophil influx in calves with experimentally induced respiratory syncytial virus infection. *J Vet Pharmacol Ther*. 2001;24(6):413-421.
 23. Jacob F, Polzin DJ, Osborne CA, Allen TA, Kirk CA, Neaton JD, *et al*. Clinical Evaluation of Pentoxifylline and Its Effect on Survival Time in Dogs with Chronic Kidney Disease. *J Am Vet Med Assoc*. 2002;220(8):1169-1172.
 24. Johnson FE, Harrison BR, McKirgan LW, Raju PI, Roy TK, Virgo KS. A phase II evaluation of pentoxifylline combined with radiation in the treatment of brain metastases. *Int J Oncol*. 1998;13(4):801-806.
 25. Klinger CM, Cox J, So D, Staath T, Wilson M, Wilson A, Knox C. DrugBank Online: A How-to Guide. *Open Access Databases Datasets Drug Discov*. 2024:67-99.
 26. Lewis S, Kennis R. Top 5 dermatologic indications for pentoxifylline in dogs. 2021.
 27. Lima FS, *et al*. The effect of pentoxifylline on endotoxin-induced leukocyte response, organ function, and mortality in Holstein calves. *J Dairy Sci*. 2011;94(6):2818-2829.
 28. McCarty MF, O'Keefe JH, DiNicolantonio JJ. Pentoxifylline for vascular health: a brief review of the literature. *Open Heart*. 2016;3(1):e000365.
 29. Michetti C, Coimbra R, Hoyt DB, Loomis W, Junger W, Wolf P. Pentoxifylline reduces acute lung injury in chronic endotoxemia. *J Surg Res*. 2003;115(1):92-99.
 30. Miller WH, Griffin CE, Campbell KL. Muller and Kirk's small animal dermatology. Elsevier Health Sciences; 2012.
 31. Muscatello G, *et al*. The use of pentoxifylline in chronic obstructive pulmonary disease of the horse. *Vet J*. 2008;177(3):409-415.
 32. Nazari M, Daghigh-Kia H, Mehdipour M, Najafi A. Comparison of the performance of targeted mitochondrial antioxidant mitoquinone and nontargeted antioxidant pentoxifylline in improving rooster sperm parameters during freezing and thawing. *Poult Sci*. 2022;101(9):102035.
 33. Nenad S, Slavimir V, Dragan M, Milan S, Mirjana R, Goran R, *et al*. Protective Effects of pentoxifylline treatment on gentamicin-induced nephrotoxicity in rats. *Ren Fail*. 2009;31(1):54-61.
 34. Papich MG. Papich Handbook of Veterinary Drugs-E-Book. Elsevier Health Sciences; 2020.
 35. Peek SF, Divers TJ. Rebhun's Diseases of Dairy Cattle-E-Book. Elsevier Health Sciences; 2018.
 36. Poondru S, Devaraj R, Boinpally RR, Yamsani MR. Time-dependent influence of pentoxifylline on the pharmacokinetics of orally administered carbamazepine in human subjects. *Pharmacol Res*. 2001;43(3):301-305.
 37. Rahman TM, Hodgson HJF. Low dose pentoxifylline (PTX) reduces mortality in an animal model of acute hepatic and multi-organ failure. *Crit Care*. 2001;5(Suppl 1):P081.
 38. Saunders J. Pentoxifylline in the treatment of equine laminitis. *Vet Rec*. 1988;122(24):583-585.
 39. Sebastian L, Desai A, Madhusudana SN, Ravi V. Pentoxifylline inhibits replication of Japanese encephalitis virus: a comparative study with ribavirin. *Int J Antimicrob Agents*. 2009;33(2):168-173.
 40. Ward A, Clissold SP. Pentoxifylline: a review of its pharmacodynamic and pharmacokinetic properties, and its therapeutic efficacy. *Drugs*. 1987;34(1):50-97.
 41. Wen WX, Lee SY, Siang R, Koh RY. Repurposing pentoxifylline for the treatment of fibrosis: an overview. *Adv Ther*. 2017;34:1245-1269.
 42. Wenisch C, Sornchai L, Polrat W, Bernhard P, Suparp V, Vara W, *et al*. Effect of Pentoxifylline on cytokine patterns in the therapy of complicated Plasmodium

- falciparum malaria. Am J Trop Med Hyg. 1998;58:343-347.
43. Yoon S, Gianturco SL, Pavlech LL, Storm KD, Yuen MV, Mattingly AN. Pentoxifylline: Summary Report. 2020.
44. Zhang M, Xu YJ, Saini HK, Turan B, Liu PP, Dhalla NS. Pentoxifylline attenuates cardiac dysfunction and reduces TNF- α level in ischemic-reperfused heart. Am J Physiol Heart Circ Physiol. 2005;289(2):H832-H839.

How to Cite This Article

Thounaojam R, Raguvaran R, Gowtham M, Naveen N, Shaurya S. Pentoxifylline in the era of one health: Versatility in veterinary therapeutics: A review. International Journal of Veterinary Sciences and Animal Husbandry 2026; SP-11(4): 202-208.

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