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E-PROCEEDING

EXTENDED ABSTRACT

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EXTENDED ABSTRACT

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Welcome Message

RECTOR, UITM KEDAH BRANCH

Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to extend my deepest appreciation to the organising committee of i-SPiKE 2025 for their steadfast dedication and commitment in making this prestigious event a reality. My heartfelt congratulations to the committee for their tireless efforts in ensuring that i-SPiKE continues to grow as a meaningful and impactful platform for academics, researchers, students, and industry players worldwide.

The theme for this year, "Empowering Minds: Bridging Innovation, Knowledge and Education for a Sustainable Future," is both timely and significant. It reflects our shared responsibility to not only embrace creativity and technological advancement, but also to ensure that innovation directly contributes to sustainable development, equitable education, and the well-being of future generations.

i-SPiKE 2025 provides a dynamic platform for showcasing innovations that address real-world challenges while opening new avenues for collaboration, engagement, and inclusivity. By bridging knowledge, innovation, and education, this symposium strengthens our collective capacity to design solutions that empower communities and inspire positive change.
I am truly impressed by the diversity and calibre of participants in this year's event. The projects and ideas presented highlight the extraordinary creativity and determination of our innovators. I am confident that the insights and solutions shared here will pave the way for continuous advancement in teaching, learning, and innovation.

It is my sincere hope that you will find i-SPiKE 2025 an enriching experience, one that sparks new ideas, builds lasting collaborations, and strengthens our shared vision for a sustainable future. To all participants, I wish you every success, and to the winners, my warmest congratulations.
Once again, I thank the organising committee, partners, and contributors for their invaluable support. May i-SPiKE 2025 continue to inspire and empower minds for many years to come.

Professor Dr. Roshima Haji Said
Acting Rector
Universiti Teknologi MARA (UiTM) Kedah Branch

Welcome Message
(i-SPiKE 2025 CHAIR)

It is my great pleasure to welcome you to the 4th International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2025 (i-SPiKE 2025). This year's theme, "Empowering Minds: Bridging Innovation, Knowledge, and Education for a Sustainable Future," reflects our collective commitment to advancing innovation and fostering meaningful collaboration across academia, industry, and communities.

i-SPiKE 2025 provides a platform for scholars, researchers, students, and practitioners from diverse fields to showcase their ideas, share knowledge, and inspire new solutions to global challenges. We extend our sincere appreciation to all participants and contributors whose efforts and dedication have made this symposium possible.
We hope that this e-proceedings serves not only as a record of the innovations presented but also as a valuable resource that continues to inspire long after the event.

Thank you.

Dr Junaida Ismail
Chair
4th International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2025 (i-SPiKE 2025)

PREFACE

The 4th International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education (i-SPiKE 2025) marks yet another milestone in our ongoing commitment to fostering innovation, creativity, and collaboration across disciplines. Guided by this year's theme, "Empowering Minds: Bridging Innovation, Knowledge and Education for a Sustainable Future," the event provides a dynamic platform for students, educators, researchers, and professionals to share their ideas, showcase their innovations, and engage in meaningful knowledge exchange.

This year, we are pleased to report that i-SPiKE 2025 received approximately 50 initial submissions, with more than 35 projects successfully advancing to final presentation and exhibition. These projects reflect a rich diversity of innovation, ranging from educational technologies, digital applications, and gamified learning tools to sustainable materials, cultural heritage preservation, and community-focused solutions. Collectively, they embody the spirit of bridging innovation and education to address pressing societal and global challenges.

We sincerely thank all participants, reviewers, and committee members for their invaluable contributions in making i-SPiKE 2025 a success. It is our hope that this e-proceedings will not only serve as a record of the ideas and innovations presented, but also as an inspiration for future collaborations and advancements in the pursuit of sustainable knowledge and innovation.

Assoc. Prof. Dr. Azlyn Ahmad Zawawi
Editor-in-Chief, i-SPiKE 2025 Proceedings

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CATEGORY 1

S&T (ACADEMIC)

THERMAL ANTINOCICEPTIVE EFFECT OF TRANSDERMAL TRAMADOL HYDROCHLORIDE IN AVIAN

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ABSTRACT

Physical restraint necessary for parenteral drug administration is inherently stressful for birds. In contrast, transdermal drug delivery offers a simpler method of administration with minimal associated stress. This study aimed to investigate the potential of transdermal delivery as a less stressful alternative route for administering tramadol hydrochloride in birds. Broiler chickens (n=24) age 85 days were used as a model for avian species in this study. The broilers were randomly allocated into four groups of six: a control group with no intervention (C); an intravenous group receiving 5mg/kg of tramadol (IV); and two transdermal groups receiving 5mg/kg (TD1) and 10mg/kg (TD2) of tramadol, respectively. To simulate pain, thermal antinociception effect was assessed using a customised cage with a temperature-controlled floor. The foot withdrawal response to thermal stimulation was recorded for each bird at baseline (pre-administration), at 30-, 60-, 120-, 240-, 360-, and 480-minute post administration. Compared to the control group, all treatment groups (IV, TD1, TD2) exhibited significantly elevated ($P<0.05$) foot withdrawal thermal threshold. Both TD1 and TD2 showed a significant elevation of foot withdrawal thermal threshold compared to baseline at 60- and 120-minutes following tramadol administration, while IV was statistically significant only at 60 minutes following tramadol administration. The greatest increase in foot withdrawal thermal threshold was observed at 30 minutes following intravenous tramadol administration. TD2 demonstrated the longest duration of effect, remaining effective up to 240 minutes following tramadol administration. This study is the first to assess the antinociceptive effect of transdermal tramadol in birds. Further investigation is warranted to validate its efficacy across different avian species.

Keywords: analgesia, avian, tramadol, transdermal, wellbeing

INTRODUCTION

In animals, pain is defined as an aversive sensory experience arising from actual or potential tissue injury (Schlegel et al., 2024). Despite having a similar capacity for pain perception as mammals, birds exhibit limited behavioural expressions of pain, making pain assessment difficult (Cunningham et al., 2010). Therefore, it is likely that avian patients in practice are undertreated for pain. Tramadol is widely used in birds for its multimodal analgesia effects mediated through opioid, serotonergic, and adrenergic receptor systems (Edinoff et al., 2021).

Tramadol is commonly administered via parenteral and oral routes, but these can be challenging in conscious birds as physical restraints often induce stress and hinder recovery (Kubiak, 2016). Transdermal drug administration is becoming increasingly popular in veterinary practice for its convenience and non-invasive nature. It offers an easier alternative for drug administration requiring minimal to no physical restraint, as the drug is applied and absorbed through the skin (Bird & Ravindra, 2020). Tramadol meets the stringent physicochemical requirements for transdermal absorption, making it compatible for this route of administration (Choy & Prausnitz, 2011). Therefore, this study aimed to investigate the potential of transdermal tramadol hydrochloride as an alternative to parenteral administration in birds, employing broiler chicken as an animal model.

Problem Statement

Pain relief is critical to reduce stress in birds and promote healing. Tramadol is a common drug used for pain control due to its promising analgesic effect and is often administered through parenteral and oral routes. Restraint, handling, and injections exacerbate stress in the bird, while oral administration is challenging in avian patients due to the beak anatomy. The high metabolism of avian species necessitates repeated doses to maintain sufficient plasma concentrations for adequate analgesia. Frequent handling and manipulation of a sick bird for drug administration induce stress, potentially delaying recovery. Transdermal application of tramadol may provide a more efficient and less stressful alternative for the animal. Transdermal tramadol has been successfully used in pets, such as cats and dogs. However, to date, there is a lack of studies investigating the antinociceptive effect of transdermal tramadol in avian species.

METHODOLOGY

This study used broiler chickens (n=24, 85-day-old) as a model for avian species. The broilers were randomly assigned to four equal number groups as indicated in Table 1. This study was conducted following the protocol approved by the Institutional Animal Care and Use Committee (IACUC), Faculty of Veterinary Medicine, University Malaysia Kelantan (UMK/FPV/ACUE/PG/004/2023).

Table 1. Experimental grouping and treatment allocation of the broilers.

Group	No of Animal	Dosage of Tramadol	Route
Intravenous (IV)	6	5mg/kg	Intravenous
Transdermal 1 (TD1)	6	5mg/kg	Transdermal
Transdermal 2 (TD2)	6	10mg/kg	Transdermal
Control	6	No Treatment	No treatment

Thermal nociception testing was conducted to simulate pain by measuring foot withdrawal thresholds in all chickens. A customised cage with a gradually heated floor was used to apply thermal stimuli to the plantar surface of broiler feet, with a maximum temperature of 70°C to prevent tissue damage. The thermal threshold was defined as the floor temperature at which the bird exhibited signs of withdrawing its foot from the heated surface. This experimental procedure was derived from a validated approach for assessing analgesia in conscious avian subjects, which has shown applicability across various bird species (Paul-Murphy et al., 1999).

RESULT AND DISCUSSION

Across the six investigated time points, all treatment groups (IV, TD1, TD2) showed statistically significant increases in foot withdrawal thermal threshold relative to the control group, particularly within the first two hours after tramadol administration (Table 2). IV showed the greatest change at 30 minutes, while TD2 maintained its effect up to 240 minutes. Due to high standard deviation (SD), these changes were not statistically significant. Therefore, a two-fold increase over the control group was deemed noteworthy in this study.With onset as early as 30 minutes post-administration, IV, TD1 and TD2 reached their peak effects at 30-, 60-, and 120 minutes following tramadol administration, respectively. While TD2 shared a similar onset with TD1, its effect persisted for longer up to 240 minutes. These findings suggest that increasing the transdermal tramadol dose may extend its duration of effect.

Table 2. Mean ± SD of the change in foot withdrawal thermal threshold of broilers.

	Change of foot withdrawal thermal threshold (°C)			
	IV	TD1	TD2	Control
Baseline	41.23 ± 1.56	41.25 ± 2.33	42.15 ± 2.15	42.00 ± 1.72
30 mins	+11.60 ± 2.10 [a, c]	+6.53 ± 2.79 [c]	+5.75 ± 1.42 [c]	+2.10 ± 1.04
60 mins	+8.75 ± 1.06 [a, b, c]	+8.10 ± 1.09 [a, b, c]	+5.57 ± 0.76 [b, c]	+2.35 ± 1.42
120 mins	+7.65 ± 1.40 [a, c]	+7.37 ± 0.41 [a, b, c]	+8.30 ± 0.81 [a, b, c]	+3.02 ± 0.99
240 mins	+2.38 ± 1.42	+1.92 ± 0.90	+3.48 ± 1.04 [c]	+2.05 ± 1.82
360 mins	+1.72 ± 0.82	+1.85 ± 0.68	+1.95 ± 1.47	+1.25 ± 1.09
480 mins	+1.97 ± 0.44	+0.52 ± 0.73	+0.23 ± 0.62	-0.38 ± 0.71

Note: [a]Mean significantly different from control group ($P<0.05$), [b]Mean significantly) different from baseline ($P < 0.05$), [c]Mean value greater than twice that of the control group.

CONCLUSION

IV demonstrated a rapid onset and the greatest increase in foot withdrawal thermal threshold at 30 minutes following tramadol administration. The duration of effect for TD1 was comparable to IV, lasting up to 120 minutes. Increasing the transdermal dose in TD2 extended the effect duration to 240 minutes. While the intravenous route often causes stress, transdermal administration of tramadol offers a gentler yet more manageable alternative. Incorporating transdermal tramadol alongside parenteral administration in practice could provide an integrated, efficient, and less stressful pain management strategy. A transdermal application will be more convenient and promote better client compliance, particularly if the patient is discharged and the owner is required to administer analgesic drugs.

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