# "The 6th Veterinary Technology & Nursing for Healthcare Practices in the Era of Carbon Neutrality"

9.00- 17.00

12-13 DECEMBER 2024

**Venue : Pibul Chai-Anan auditorium room (11th Floor)**
**Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand**

Organized by
Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand
Centre national de la recherche scientifique (CNRS or French National Centre for Scientific Research), Paris, France
IRL HealthDEEP, CNRS – Kasetsart University – Mahidol University, Bangkok, Thailand

**Edited by**
Associate Professor Dr.Chainarong Sakulthaew, Vice Dean for Research and Innovations, Faculty of Veterinary Technology.

**Assistant Editor**
Ms.Siriporn Pranee

**Acknowledged by**
This international conference was organized by the Faculty of Veterinary Technology at Kasetsart University in Bangkok, Thailand.

**Financially supported by**
This international conference was financially supported by Faculty of Veterinary Technology, Kasetsart University, and Kasetsart University.

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# Preface

The 6th Veterinary Technology & Nursing for Healthcare Practices in the Era of Carbon Neutrality was organized by the Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand on December 12–13, 2024. This seminar aims to provide a platform for lecturers, scholars, researchers, students, and participants to exchange ideas and learn from leading experts in the fields of veterinary technology and nursing. Additionally, it seeks to strengthen educational programs and foster research networks both domestically and internationally, collaborating with esteemed universities and organizations.

The seminar addressed a range of timely and significant topics, including SARS-CoV-2 infections in animals, the impact of serotype switching on the virulence of *Streptococcus suis*, zoonotic and reverse zoonotic transmission potential of SARS-CoV-2 and its related coronaviruses, insights into current practices and innovations in pet rehabilitation, the benefits of using biochar in dairy cow diets for sustainable farming practices targeting carbon neutrality, potential antigens like glutathione-S-transferase for developing promising anti-tick vaccines, and ASAMCO Laos-Thailand initiative on preventing zoonotic diseases at the ecosystem level.

The knowledge and expertise shared throughout the seminar aim to inspire participants to pursue further research and drive innovative solutions that contribute to the betterment of the global community. We extend our sincere gratitude to the speakers from our international partner universities and organizations, as well as those from Thailand, for their invaluable contributions. Special thanks are also due to the organizing committee, whose dedication and effort have ensured the seminar's success.

Finally, we sincerely acknowledge and deeply appreciate the support of Kasetsart University, whose financial assistance has been vital to the success of this event.

Associate Professor Dr.Wuttinun Raksajit

Dean, Faculty of Veterinary Technology

December 2024

# "The 6th Veterinary Technology & Nursing for Healthcare Practices in the Era of Carbon Neutrality"

Organized by
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Centre national de la recherche scientifique (CNRS or French National Centre for Scientific Research), Paris, France
IRL HealthDEEP, CNRS – Kasetsart University – Mahidol University, Bangkok, Thailand

Assoc.Prof.Dr.Wuttinun Raksajit
Dean of Veterinary Technology

12-13 DECEMBER 2024
9.00- 17.00

Venue : Pibul Chai-Anan auditorium room (11th Floor)
Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand

## KEYNOTE SPEAKERS

Professor Cheng-Shu, CHUNG, DVM, Ph.D.
National Pingtung University of Science and Technology, Taiwan

Professor Ken Maeda, DVM, Ph.D.
National institute of Infectious Disease, Japan

Professor Qian Zhaohui, Ph.D.
Institute of Pathology, Biology,
Chinese Academy of Medical Sciences, China

Dr.Masatoshi Okura,
National Institute of Animal Health, Japan

Dr. Sara Tahery,
University of New South Wales, Australia

## Upskill/Reskill in Thai session

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คณะสัตวแพทยศาสตร์ มหาวิทยาลัยมหิดล

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Professor Serge Morand, Ph.D.
IRL - HealthDEEP, France

Professor Dr.Sathaporn Jittapalapong, DVM, Ph.D.
Faculty of Veterinary Technology,
Kasetsart University, Thailand

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ผู้ช่วยคณบดีฝ่ายกายภาพและสิ่งแวดล้อม
คณะเทคนิคการสัตวแพทย์

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Centre national de la recherche scientifique (CNRS or French National Centre for Scientific Research) Paris, France
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**12 DECEMBER**
**13.00- 17.00**
**2024**

Venue : ROOM 501 (5th Floor)
Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand

## Upskill/Reskill in Thai session

| Time | Program/Topic | Presenter/co-authors |
|---|---|---|
| 13.00-14.10 | Pitfalls In Analytical process of Clinical Chemistry |  คุณศุภกิจ บัวมาศ<br>หัวหน้าหน่วยวินิจฉัยโรงพยาบาลสัตว์ประศุอากร<br>คณะสัตวแพทยศาสตร์ มหาวิทยาลัยมหิดล |
| **Coffee Break 10 min (14.10-14.20)** | | |
| 14.20-15.30 | การเตรียมความพร้อมในการผ่าตัด exotic |  คุณปุณยนุช ธรรมรัตนนนท์<br>โรงพยาบาลสัตว์พนาลัย |
| 15.30-16.40 | "Data Visualization"<br>สรุปข้อมูลด้วยภาพช่วยในการตัดสินใจ |  คุณนริศ ปานศรีแก้ว<br>ผู้ช่วยคณบดีฝ่ายกายภาพและสิ่งแวดล้อม<br>คณะเทคนิคการสัตวแพทย์ |

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# Conference Program

## "The 6th Veterinary Technology & Nursing for Healthcare Practices in the Era of Carbon Neutrality"

## 12th December 2024

## Chairman of the Conference: Assoc.Prof.Dr.Chainarong Sakulthaew
## 9.00 – 16.00 at Pibul Chai-Anan auditorium room (11th Floor)

## Faculty of Veterinary Technology, Kasetsart University, Bangkok, Thailand

**12th December 2024**

**Address: Faculty of Veterinary Technology, Kasetsart University, 50 Ngamwongwan Rd., Chatuchak, Bangkok, Thailand 10900**

| Time | Program/Topic | Presenter/co-authors |
|---|---|---|
| 8.30-9.00 | **Registration** | |
| 9.00-9.15 | **Opening Ceremony** | **Dr. Jongrak Watcharinrat, the President of Kasetsart University**<br>**Assoc.Prof.Dr.Wuttinun Raksajit**<br>**Dean of Faculty of Veterinary Technology** |
| **Invited speaker session**<br>**(Present 20 min and Q&A 5 min)** | | |
| 9.15-9.40 | SARS-CoV-2 Infection in Animals | Professor Ken Maeda, D.V.M., Ph.D.<br>Department of Veterinary Science, National Institute of Infectious Diseases, Japan |
| 9.40-10.05 | Effect of Serotype Switching on Virulence in *Streptococcus suis* | Dr.Masatoshi Okura<br>National Institute of Animal Health, Japan |
| 10.05-10.25 | ***Coffee Break 20 min*** | |
| 10.25-10.50 | Zoonotic and Reverse Zoonotic Transmission Potential of SARS-CoV-2 and Its Related CoVs | Professor Qian Zhaohui, Ph.D.<br>National Institute of Pathology Biology, Chinese Academy of Medical Sciences, China |
| 10.50-11.15 | Insights into Current Practices and Innovations in Pet Rehabilitation | Professor Cheng-Shu CHUNG, D.V.M, Ph.D.,<br>Department of Veterinary Medicine, National Pingtung University of Science and Technology |

**12th December 2024**

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| Time | Program/Topic | Presenter/co-authors |
|---|---|---|
| 11.15-11.40 | The Overall Benefits of Biochar, Fed to Dairy Cows, for the Farming System towards Carbon neutrality | Dr. Sara Tahery<br>School of Materials Science & Engineering<br>University of New South Wales Sydney, Australia |
| 11.40-12.05 | An Update of Potential Candidate Antigens for the more Promising Anti-Tick Vaccine: Glutathione S-Transferases | Professor Sathaporn Jittapalapong, D.V.M., Ph.D.<br>Faculty of Veterinary Technology Kasetsart University, Thailand |
| 12.05-13.00 | ***Lunch at Building 3*** | |
| **Afternoon session I at 5th Floor Upskill/Reskill in Thai session (Present 60 min and Q&A 10 min)** | | |
| 13.00-14.10 | Pitfalls In Analytical process of Clinical Chemistry | คุณศุภกิจ บัวมาศ<br>หัวหน้าหน่วยวินิจฉัยโรงพยาบาลสัตว์ประศุอาทร<br>คณะสัตวแพทยศาสตร์ มหาวิทยาลัยมหิดล |
| 14.10-14.20 | ***Coffee Break 10 min*** | |
| 14.20-15.30 | การเตรียมความพร้อมในการผ่าตัด exotic | คุณปุณยนุช ธรรมรัตนนนท์<br>โรงพยาบาลสัตว์พนาลัย |
| 15.30-16.40 | “Data Visualization”<br>สรุปข้อมูลด้วยภาพช่วยในการตัดสินใจ | คุณนริศ ปานศรีแก้ว<br>ผู้ช่วยคณบดีฝ่ายกายภาพและสิ่งแวดล้อม คณะเทคนิคการสัตวแพทย์ |
| 16.40-16.50 | Closing ceremony by<br>Dean of Veterinary Technology Faculty (Assoc.Prof.Dr.Wuttinun Raksajit) | |
| **Afternoon: session II at 11th Floor Young Scientist session (Present 15 min and Q&A 5 min)** | | |
| 13.00-13.20 | Mxene/CuO/Y Nanocomposite-Enhanced BDD Electrochemical Oxidation for Water Treatment | Kitipong Poomipuen<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 13.20-13.40 | Molecular detection of *Plasmodium* spp. in Non-human Primates in Thailand | Phakorn Wilaisri<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |

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| Time | Program/Topic | Presenter/co-authors |
|---|---|---|
| 13.40-14.00 | Prevalence of Gastrointestinal Parasites in Turkeys in Thailand | Chanapath Thabthimsri<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 14.00-14.20 | Optimization of Ultrasonic Assisted Extraction of Bioactive Compounds and Antioxidant Activities from *Caesalpinia sappan* Heartwood | Chawanakorn Thavornloha<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 14.20-14.40 | Molecular detection of *Trypanosoma* spp. in cattle from Sa Kaeo Province, Thailand | Thanisorn Konlertvanich<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 14.40-15.00 | Improving UV-driven ozonation technology through ultrasonic methods for the decomposition of LDPE | Apiladda Pattanateeradetch<br>Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok |
| 15.00-15.20 | SOD-Enhancing Properties of *Alpinia galanga* Rhizome Extract in RAW 264.7 and J774A.1 Macrophage Cell Lines: An in Vitro Study | Anchasa Laodumongchai<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 15.20-15.40 | Impacts of Low-Density Polyethylene Microplastics on the Microalga *Arthrospira platensis* | Sekbunkorn Treenarat<br>Faculty of Veterinary Technology, Kasetsart University, Bangkok |
| 16.00-16.20 | Award for the Best Presenter for young scientist session and Closing ceremony by Dean of Veterinary Technology Faculty (Assoc.Prof.Dr.Wuttinun Raksajit) | |

# "ASAMCO Laos-Thailand: Preventing zoonotic diseases at the ecosystem level (a new project of Prezode)"

## 12th December, 2024: 9.00 – 16.00 at 5th Floor 503

## 13th December 2024: 8.00 – 16.00 at Pibul Chai-Anan auditorium room (11th Floor)

| **13th December 2024 at Pibul Chai-Anan auditorium room (11th Floor)**<br>**Address: Faculty of Veterinary Technology, Kasetsart University, 50 Ngamwongwan Rd., Chatuchak, Bangkok, Thailand 10900** | | |
|---|---|---|
| Time | Program/Topic | Presenter/co-authors |
| 8.00 – 9.00 | Registration of participants | |
| 9.00 – 9.45 | Welcome speeches | **Dr. Jongrak Watcharinrat, the President of Kasetsart University**<br>**Assoc.Prof.Dr.Wuttinun Raksajit**<br>**Dean of Faculty of Veterinary Technology** |
| | Opening ceremony | His Excellency Mr. Jean-Claude Poimbœuf<br>Ambassador of France to Thailand<br>Mr. Jean – Pirrer Marcelli<br>Agence Francaise de Développement (AFD)<br>Dr. Benjamin Roche (IRD)<br>Dr. Flavie Goutard (CIRAD)<br>Dr. Soawapak Hinjoy<br>(OIC, Department of Disease Control, Ministry of Public Health, Thailand)<br>Prof. Serge Morand<br>(IRL HealthDEEP – CNRS – Kasetsart University – Mahidol University) |
| 9.45 – 10.00 | PREACT 1 – AfriCAM Cambodia | Dr. Anne-Laure Bañuls<br>(IRD) |
| 10.00 – 10.15 | ASAMCO AmLat (video)<br><br>ASAMCO Republic Democratic of Congo (video) | Dr. Audrey Arnal<br>(IRD)<br><br>TBA |
| 10.15 – 10.45 | *Coffee break* | |
| 10.45 – 11.45 | PREACT 2 - ASAMCO Lao & Thai<br>- Partners<br>- Geography, Methodology<br>- Expected impacts and outcomes | Dr. Soawapak Hinjoy<br>Dr. Phimpha Paboriboune<br>(CI Mérieux, Ministry of Health, Lao PDR)<br><br>All partners (DCDC Ministry of Health, Lao PDR, AVSF, WCS, WWF) |

| | | |
|---|---|---|
| 11.45 – 12.00 | PREACT 3 – ASEACA | Dr. Flavie Goutard<br>(CIRAD) |
| 12.00 – 13.00 | *Lunch* | |
| 13.00 – 14.00 | 1st round table: Presentations and questions to the international organizations | |
| | Presentation of partnerships<br>Presentation of WOAH guidelines | Mr. André Furco,<br>(WOAH) |
| | TBA | Dr. Scott Newman,<br>(FAO) |
| | TBA | Makiko Yashiro,<br>(UNEP) |
| | TBA | Mr. Khalid Pacha,<br>(IUCN) |
| | RECOFTC: Community Forests in Thailand | TBC |
| 14.00 – 14.15 | *Coffee break* | |
| 14.15 – 15.30 | 2nd round - table: Presentations and questions to the Academics and research networks | |
| | INGSA-Asia and the U.S. National Academies of Sciences, Engineering, and Medicine (NASEM): preventing zoonotic diseases guidelines | Dr. Hazel Yean Ru Ann<br>(International Network for Governmental Science Advices) |
| | SEAOHUN | TBA |
| | LMI PRESTO | Ass. Prof. Woottichai Khamduang<br>(Faculty of Associated Medical Sciences, Chiang University) |
| | IRL – HealthDEEP | Ass. Prof. Kittipong Chaisiri<br>(Faculty of Tropical Medicine, Mahidol University) |
| | OHHLEP: One Health tools (video) 5-7 mins | TBC |
| 15.15 – 15.30 | Presenting of FEF-R Project FEF-R: “One Health Community training” | Juliette PERROT<br>(French Embassy) |
| 15.30 – 16.00 | Conclusion | Dr. Saowapack Hinjoy /<br>Dr. Serge Morand<br>Mr. Jean – Pierre Marcelli<br>Agence Francaise de Développement (Afd) |

# Table of Contents

## Session III: Young Scientist session

# SARS-CoV-2 infection in animals

*Ken Maeda*[1, *]

[1] *Department of Veterinary Science, National Institute of Infectious Diseases, 1-23-1 Toyama, Shinjuku-ku, Tokyo 162-8640, Japan*

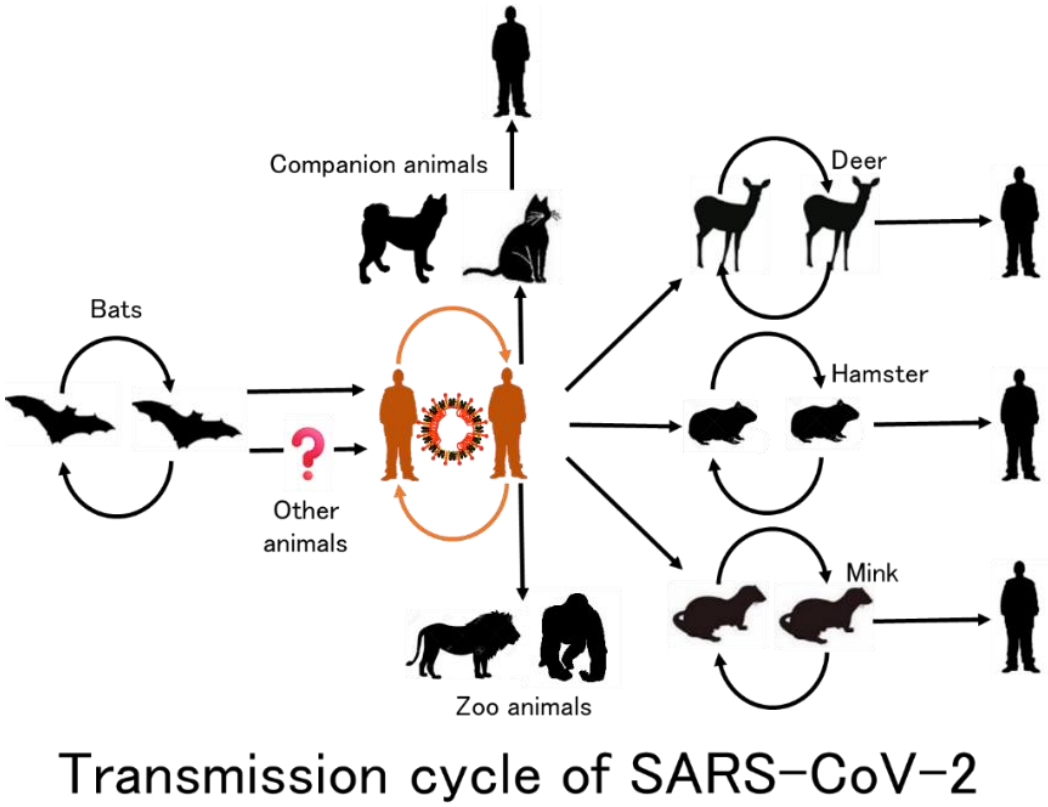
**Corresponding author, ✉ kmaeda@niid.go.jp*

## Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in 2019 and caused pandemic of coronavirus disease 2019 (COVID-19), leading to numerous human patients and deaths. SARS-CoV-2 might originate from bats in Asia by zoonotic transmission and now circulating among human populations. In addition, reverse zoonotic transmission from human to susceptible animal species has been also reported. Previously, we documented reverse zoonotic SARS-CoV-2 infection in dogs and cats from COVID-19 patients in Japan, with an approximate infection rate of 15% and an outbreak of SARS-CoV-2 omicron variant among lions at the zoo in Japan. In USA, SARS-CoV-2 has been circulating among deer through reverse zoonotic transmission from human. Transmission of SARS-CoV-2 from human to minks on farms has been confirmed in several countries in Europe, followed by spillback to humans. The information on SARS-CoV-2 infection among animals is important for countermeasure against SARS-CoV-2. Our studies on SARS-CoV-2 infection in animals, cats, dogs, lions and rodents will be introduced. These studies are implementations of the One Health Approach.

**Keywords:** SARS-CoV-2; reverse zoonosis; One Health

**Graphical abstract:**



# Effect of serotype switching on virulence in *Streptococcus suis*

*Masatoshi Okura*[1, *]

[1]*Division of Transboundary Animal Disease Research, Kagoshima Research Station, National Institute of Animal Health, National Agriculture and Food Research Organization*

*2702 Chuzan, Kagoshima, 891-0105, Japan*

**Corresponding author, ✉ mokura@affrc.go.jp*

## Abstract

*Streptococcus suis* is an important zoonotic pathogen causing various diseases in pigs and humans. Although strains of *S. suis* can be classified into different serotypes based on antigenic differences in capsular polysaccharide (CPS), serotype 2 is the most frequently associated with clinical cases in both pigs and humans. CPS of *S. suis* is known to be a major virulence factor contributing to protection against phagocytosis by host cells. However, it has been unknown whether differences in serotype (i.e. differences in CPS structure) directly affect *S. suis* virulence. To answer this question, we experimentally generated six serotype switched mutants using the reference serotype 2 strain P1/7 by exchanging the CPS synthesis gene cluster for those of serotypes 3, 4, 7, 8, 9 and 14, respectively, and investigated the effects of serotype switching on adhesion to/invasion of epithelial cells, killing by whole blood, virulence using mouse infection model. Our results indicated serotype switching can drastically alter *S. suis* virulence and host cell interactions. Switching to serotype 8 showed higher mortality and blood bacterial load than serotype 2 strain P1/7 in mice, whereas virulence in mice inoculated with the mutants switching to serotype 3 and 4 was remarkably reduced compared with that of P1/7. Switching to serotypes 7, 9 and 14 did not affect the virulence in mice. Our data suggested that CPS structure is an important factor in determining levels of *S. suis* virulence, although further studies are needed to elucidate the mechanisms behind the observed phenomena.

**Keywords:** *Streptococcus suis*; Serotype; Capsular polysaccharide; Serotype switch; Virulence

# Zoonotic and reverse zoonotic transmission potential of SARS-CoV-2 and its related CoVs

*Xiuyuan Ou[1], Jiaxin Hu[1], Pei Li[2], Fuwen Zan[1], Yan Liu[1], Jian Lu[3], Xiangxi Wang4, Zhaohui Qian[1,*]*

*[1] National Institute of Pathogen Biology, Chinese Academy of Medical Sciences, Beijing, China,*

*[2] Center for Retrovirus Research, The Ohio State University, Columbus, USA*

*[3]College of Life Sciences, Peking University, Beijing, China*

*[4]Institute of Biophysics, Chinese Academy of Sciences, Beijing, China*

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## Abstract

SARS-CoV-2 is believed to have been originated from bat coronavirus (CoV), and both SARS-CoV-2 and its closely related bat CoVs not only infect humans but also various animals, posing zoonotic and reverse zoonotic risks. In this study, we first determined potential host susceptibility of two bat CoVs BANAL-20-52 and 236 among different bat species and animal species, and found both might have extensive host ranges, indicating high zoonotic transmission potential. We also determined the cryo-EM structures of BANAL-20-52 and BANAL-20-236 S proteins, and found that both trimeric S proteins adopt all three receptor binding domains (RBDs) in "closed" conformation and the unique sugar moiety at N370 of bat SC2r-CoVs acts like a "bolt" and crosses over two neighboring subunits, facilitating the S proteins in the "closed" conformation. We further found that the highly conserved sugar moiety at N370 might result from the selective advantages in stability of S prpotein during the fecal-oral transmission and better immune evasion during virus evolution.

As SARS-CoV-2 rapidly evolves, newly emerged omicron variants like BA.2.86 and JN.1 have become dominant globally. We also determined the reverse zoonotic potential of XBB.1.16, EG.5.1, BA.2.86, and JN.1 among different animal species, and found that, similar to WT, the omicron variants also exhibited potential broad host ranges, but JN.1 displayed substantially higher overall reverse zoonotic risk potential than other variants except for EG.5.1. Further mechanistic analysis revealed that L455S mutation in JN.1 S proteins might be responsible for significant decrease in overall receptor binding affinity but substantial increase in overall fusogenecity and infectivity with various animal ACE2s and hACE2. L455S change slightly

decreased S protein thermostability, likely resulting in lower the overall energy barrier required for conformational changes of S protein after receptor binding.

Together, our findings aid a better understanding of the molecular basis of CoV entry, selective evolution, and immunogenicity and highlight the importance of surveillance of susceptible hosts of these viruses to prevent potential outbreaks.

**Keywords:** SARS-CoV-2, reverse zoonotic transmission, ACE2, bat coronavirus,

# Insights into current practices and innovations in pet rehabilitation

*Cheng-Shu Chung[1,2 *], Lee-Shuan Lin[1,2]*

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## Abstract

For over two decades, pet rehabilitation has captured the attention of veterinarians and pet owners alike. Much like in human medicine, rehabilitation interventions can significantly enhance an animal's quality of life and accelerate recovery from illness, reducing the need for invasive surgical procedures and medication while fostering positive relationships between pet owners and healthcare providers. Today, advancements in rehabilitation equipment enable veterinarians to deliver these services more effectively in clinical settings. However, a thorough understanding of rehabilitation principles and accurate disease diagnosis is essential before implementing such procedures. In Taiwan, several challenges persist, including the education of veterinarians in pet rehabilitation, collaboration with veterinary assistants, access to equipment, and effective communication with animals. On the positive side, the growing demand from pet owners for rehabilitation services, fueled by their personal experiences, drives the rapid advancement and improvement of these treatments. Beyond clinical services, pet rehabilitation studies have explored areas such as regeneration therapy using platelet-rich plasma, mesenchymal stem cells, growth factors, gait analysis in dogs and cats, advance diagnostic imaging, the development of 3D-printed prostheses, and clinical methods for reducing anxiety. These studies offer veterinarians more treatment options and more sophisticated rehabilitation services. In conclusion, by addressing educational and technological gaps, the field of pet rehabilitation holds significant promise for improving animal well-being and strengthening human-animal bonds.

**Keywords:** Pet, Rehabilitation, Taiwan, Veterinary

# Overall benefits of a carbon-based supplement, fed to dairy cows, for the farming system

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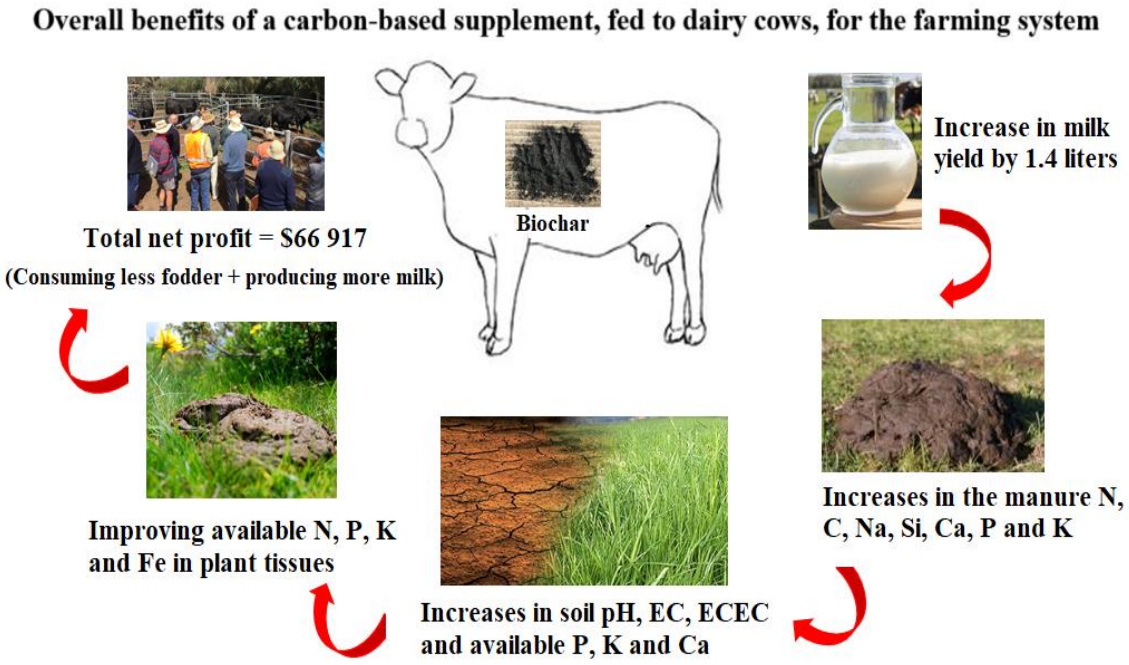
## Abstract

Biochar, a porous carbon-rich material, has been used as a feed supplement for dairy cattle to improve animal productivity, soil and pasture health, and farm profitability. A mixed-feedstock biochar was produced from available agricultural waste biomass, including 50% eucalyptus wood chips, 25% soybean residue and 25% tea tree mulch, at a pyrolysis temperature of 450 ºC. The microstructural and physicochemical properties of the biochar were characterized using advanced analytical techniques. A 9-month biochar feeding trial was conducted on a dairy in South Australia (SA) to investigate the effects of the biochar, mixed with supplement at a rate of 0.006% of the total dry matter (DM), on milk production, manure properties, soil and plant health. The resulting financial benefits were also assessed. The results showed that the average milk yield was higher (2.2%) compared to yield prior to this trial. There was also improvement in feed conversion with less fodder needed as a result of biochar inclusion. There were increases in mineral nutrients, such as N, Ca, P and K in the manure after feeding biochar to the cows. Consequently, increases in the concentrations of N, Ca, K and P in both soil and plant were observed following the burial of biochar-infused-manure. The increase in farm income, due to increased milk productivity and improvements in feed efficiency, was greater than the costs of the biochar. This study indicates that additions of small quantities of a carbon-based feed supplement can assist in improvements in health and productivity of a farm.

**Keywords:** Carbon-based feed supplement, Characterization, Livestock productivity, Soil and plant health.

**Graphical abstract:**



# An Update of Potential Candidate Antigens for the more Promising Anti-Tick Vaccine: Glutathione S-Transferases

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## Abstract

The cattle tick, *Rhipicephalus (Boophilus) microplus*, is a major ectoparasite affecting livestock, contributing to economic losses through blood depletion, immune suppression, reduced milk and meat production, and the transmission of hemoparasites such as *Anaplasma*, *Babesia*, and *Theileria* species. Current control measures rely heavily on chemical acaricides, but widespread use has led to acaricide resistance, environmental pollution, and product residues in food chains. These challenges have accelerated the need for alternative control strategies, including the development of anti-tick vaccines. Among the antigens previously explored, Bm86, 95, Serpins, and subolesin have shown potential; however, identifying more efficacious candidates is crucial for enhancing vaccine performance.

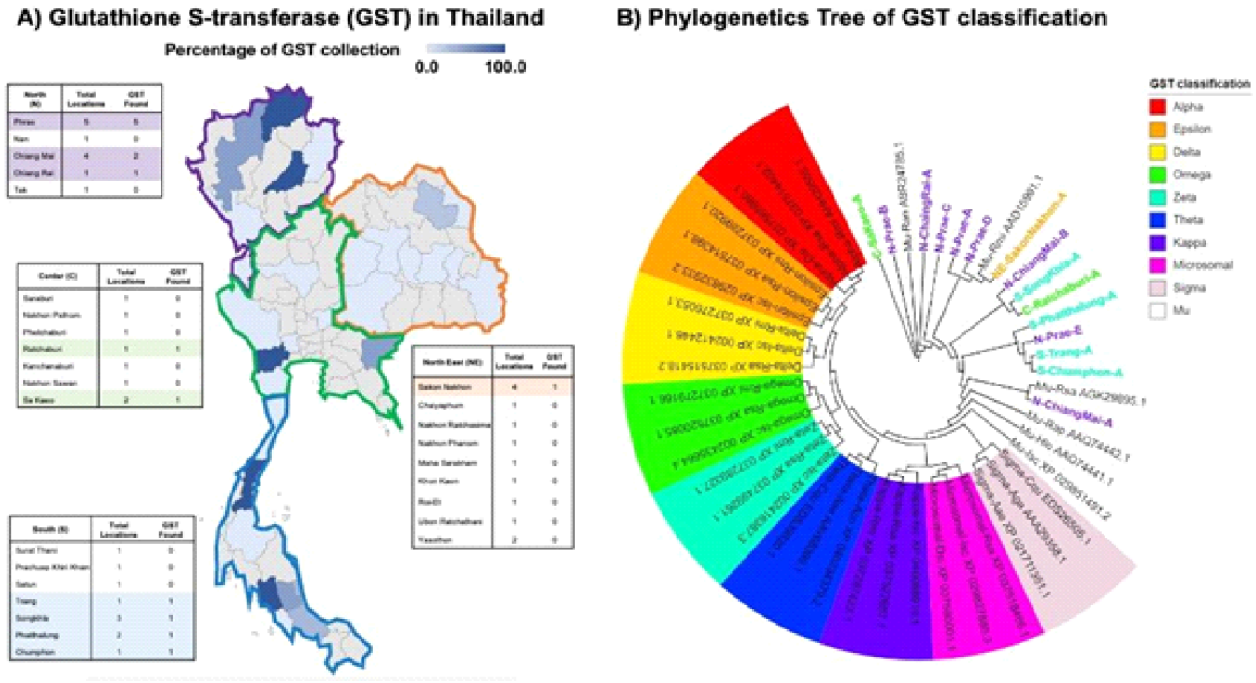
Glutathione S-transferases (GSTs) represent a promising target in this context due to their multifunctional role in cellular detoxification, immune modulation, and acaricide resistance. GSTs are involved in the neutralization of reactive oxygen species (ROS) and the conjugation of harmful substances, including acaricides, thus playing a critical role in the survival and adaptation of *R. microplus*. Moreover, their upregulation in acaricide-resistant tick populations has positioned them as biomarkers of resistance. In addition to their detoxification function, GSTs are immunogenic, making them viable candidates for vaccine development.

This study aimed to identify and characterize GST sequences from *R. microplus* ticks collected in Thailand and assess their potential as vaccine antigens through epitope prediction. Sequence- and structure-based analyses revealed conserved regions within GSTs that are suitable for vaccine targeting, showing the capacity to elicit robust immune responses while minimizing cross-reactivity. Importantly, these epitopes could provide cross-species protection, making GSTs a versatile component in anti-tick vaccine formulations. The findings offer new insights

into the mechanisms of acaricide resistance and the potential of GSTs to contribute to effective and sustainable tick control strategies. A GST-based vaccine could pave the way for more efficient and locally adapted tick control programs, addressing both resistance and environmental concerns.

**Keywords:** *Rhipicephalus (Boophilus) microplus*; glutathione S-transferase (GST); Epitope Prediction; Acaricide Resistance; Anti-Tick Vaccine

**Graphical abstract:**



# Pitfalls In Analytical process of Clinical Chemistry

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In veterinary medicine, biochemical tests are essential for the diagnosis process. They have to follow suitable procedures to get test results that are appropriate for interpretation. The interpretation process requires an understanding of physiological principles and scientific approaches, which are important in considering treatment.

Incorrect test results may occur in any process of the analytical laboratory, from test requests to reports and interpretation. It affects the treatment plan.

"**NO result is better than bad result**"

**การเตรียมความพร้อมในการผ่าตัด exotic**

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การเตรียมความพร้อมสำหรับการผ่าตัดสัตว์เลี้ยงพิเศษ ที่มีความแตกต่างจากสุนัขและแมว โดย สัตว์แต่ละสปีชีส์ มีความจำเพาะและการเตรียมความพร้อมที่แตกต่างกัน เราจึงควรรู้ข้อมูลเบื้องต้นของแต่ละตัว เพื่อจะได้สามารถ วางแผนเตรียมตัวสัตว์แต่ละชนิดได้ เริ่มจากการตรวจ **Physical examination (PE)** คือ การตรวจร่างกายเบื้องต้น ที่เราควรรู้ค่าพื้นฐานต่างๆ การดูสภาพสัตว์ การนับจังหวะการเต้นของหัวใจ การหายใจและการวัดอุณหภูมิร่างกาย เพื่อให้สามารถเตรียมตัวสัตว์ก่อนการผ่าตัดได้อย่างถูกต้องและปลอดภัย

ในระหว่างการผ่าตัดจะต้องมีการมอนิเตอร์เพื่อจับสัญญาณชีพของสัตว์ที่อยู่ในระหว่างการวางยา ดังนั้นเราต้องรู้วิธีการหรือตำแหน่งในการติดเครื่องมือมอนิเตอร์ต่างๆรวมถึงเครื่องมือบางชนิดที่ไม่สามารถติดในสัตว์ขนาดเล็กได้ เราจึงจำเป็นต้องรู้ว่าต้องมอนิเตอร์อย่างไรรวมถึงหลังจากการผ่าตัดแล้วสัตว์จะต้องถูกดูแลอย่างใกล้ชิด เนื่องจากยังอยู่ใน สภาพที่ยังไม่รู้สึกตัวอาจจะทำให้เกิดอันตรายต่อสัตว์ได้ ดังนั้นจึงควรจะต้องหมั่นสังเกตอาการต่างๆของสัตว์ เช่นจังหวะ การหายใจ อุณหภูมิร่างกายหลังจากการผ่าตัด เพื่อให้สัตว์พ้นช่วงอันตรายและฟื้นตัวขึ้นมาอย่างปลอดภัย

# Data Visualization สรุปข้อมูลด้วยภาพช่วยในการตัดสินใจ

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การนำเสนอข้อมูลด้วยภาพ (**Data Visualization**) เป็นเทคนิคการแปลงข้อมูลเชิงตัวเลขที่ซับซ้อนให้เป็นภาพกราฟิกที่เข้าใจง่าย เพื่อช่วยให้ผู้คนมองเห็นรูปแบบแนวโน้มและข้อมูลเชิงลึกที่ซ่อนอยู่ในข้อมูลได้อย่างรวดเร็วและชัดเจน การนำเสนอข้อมูลในรูปแบบภาพนี้ไม่เพียงแต่ช่วยให้เข้าใจข้อมูลได้ง่ายขึ้น แต่ยังช่วยในการวิเคราะห์ข้อมูลการตัดสินใจ และการสื่อสารข้อมูลกับผู้อื่นได้อย่างมีประสิทธิภาพมากยิ่งขึ้น

การนำเสนอข้อมูลด้วยภาพ สามารถทำได้หลายรูปแบบ เช่น แผนภูมิแท่ง แผนภูมิเส้น แผนภูมิวงกลม กราฟเส้น กราฟกระจาย แผนที่แสดงข้อมูลที่เกี่ยวข้องกับตำแหน่งทางภูมิศาสตร์ และ อินโฟกราฟิก

# Mxene/CuO/Y Nanocomposite-Enhanced BDD Electrochemical Oxidation for Water Treatment

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## Abstract

Electrochemical oxidation using boron-doped diamond (BDD) anodes has emerged as a promising technology for the treatment of recalcitrant organic pollutants in wastewater. However, further improvements in the efficiency and performance of BDD electrodes are still needed to enhance their practical application. This study investigates the enhancement of boron-doped diamond electrochemical oxidation for water treatment through the use of a Mxene/CuO/Y nanocomposite material. The catalyst was synthesized, characterized, and its application for BDD electrodes was evaluated. The degradation of methylene blue (MB) at 10 $mg \cdot L^{-1}$ as a representative pollutant was studied under voltage 2.5 V and 50 mM of $Na_2SO_4$ condition. The pseudo-first-order rate constant ($k_{obs}$) of BDD with MXene 5 to 20 mg was 1.22 to 10.87 × $10^{-2}$ $min^{-1}$ and BDD with MCY 50 to 200 mg was 0.97 to 1.72 × $10^{-2}$ $min^{-1}$, which were much higher than using only BDD in processes ($k_{BDD}$ = 0.71 × $10^{-2}$ $min^{-1}$). These studies also demonstrated that the main reactive oxygen species (ROS) for the degradation of MB were $^1O_2$ and following with ·OH, $SO_4^{\cdot-}$ and $O_2^{\cdot-}$. Consequently, the Mxene/CuO/Y nanocomposite significantly can improve the electrochemical oxidation performance of the BDD electrodes, leading to enhanced degradation efficiency. Importantly, using Mxene/CuO/Y nanocomposite material can enhance the wastewater treatment efficiency, which is a significant advantage in terms of both cost-effectiveness and environmental sustainability for water treatment applications.

**Keywords**: Advance oxidation process, BDD electrode, Electro-catalytic oxidation, Methylene blues degradation, MXene/CuO/Yttrium catalyst

# Molecular detection of *Plasmodium* spp. in non-human primates in Thailand

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## Abstract

The expansion of agriculture and urban development had led to significant habitat loss for non-human primates (NHPs), resulting in increased interactions with humans. NHPs could harbor various infectious diseases that might have been transmitted to humans through bites or vectors. *Plasmodium* spp., which caused malaria, posed a significant global public health challenge. Malaria remained a leading cause of morbidity and mortality in many regions of the world. In addition to humans, *Plasmodium* spp. infected a variety of animals including NHPs, such as *Plasmodium knowlesi*, *Plasmodium cynomolgi* and *Plasmodium inui*. Previously studies documenting the detection of *Plasmodium* infections in NHPs in Thailand had remained limited. Therefore, the current study aimed to detect *Plasmodium* infection in NHPs in Thailand and to identify the species of *Plasmodium* spp. obtained using molecular methods. Blood samples were collected from NHPs in northern Thailand. DNA was extracted from whole blood and tested for *Plasmodium* using semi-nested polymerase chain reaction targeting the *18S rRNA* gene followed by sequencing for spices identification. The results revealed that infection with *P. knowlesi*,, *P. cynomolgi* and *P. inui* were found in NHPs. This study highlighted the presence of *Plasmodium* infections in this macaque population, indicating that they serve as natural reservoirs for the parasite in the region.

**Keywords**: Malaria, non-human primate (NHPs), *Plasmodium* spp., Thailand

# Prevalence of gastrointestinal parasites in turkeys in Thailand

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## Abstract

The poultry industry is the largest and most popular sector of the global livestock production, Turkey (*Meleagris gallopavo*) is a significant avian species widely distributed in North America and Europe. In Thailand, turkey farming has expanded significantly in Northeastern, especially in Nong Bua Lam Phu province. One of the major problems in turkey farming is gastrointestinal parasitic infections caused by parasites such as *Heterakis gallinarum*, *Ascaridia dissimilis*, *Capillaria* spp. and *Eimeria* spp. These parasites can lead to various health issues, including anorexia, weight loss, diarrhea, anemia, and reduced egg production. However, there have been limited studies on gastrointestinal parasitic infections in turkey in Thailand. Therefore, this research aimed to determine the prevalence of gastrointestinal parasites affecting turkeys in Nong Bua Lam Phu province using microscopic examination. A total of 213 fecal samples were collected from domestic turkey and the results showed that the infection rate for gastrointestinal parasites was 36.15% (77/213). The most parasite was Ascarid eggs found in 24.8% (53/213), followed by *Eimeria* spp. at 11.73% (25/213), *Capillaria* spp. at 2.81% (6/213) and Strongyle type egg at 1.4% (3/213). This study revealed the presence of the gastrointestinal parasites in Nong Bua Lam Phu province highlighting that turkeys serve as the primary host for these infection.

**Keywords**: Gastrointestinal parasites, Meleagris gallpavo, Turkey

# Optimization of Ultrasonic Assisted Extraction of Bioactive Compounds and Antioxidant Activities from *Caesalpinia sappan* Heartwood

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## Abstract

Sappan (*Caesalpinia sappan* L.) is a medicinal plant that can be used as an ingredient in food and beverages. Brazilin as major component and has various biological activities. The conventional method for extraction is takes a long time and uses a large volume of solvent. The objective of this work was to optimize the extraction of brazilin from *C.sappan* heartwood by ultrasonic extraction. The brazilin content and antioxidant activity of the crude extract was determined. The extraction condition was designed using Box-Behnken designs (BBD) by 3 factors and 3 levels. The brazilin content was determined by reverse phase high performance liquid chromatography. Then antioxidant activity was also tested by the DPPH and total phenolic method. The extract yield are between 1.72 - 8.8 %. The brazilin contents are in the range of 69.47 – 169.65 mg/kg extract. DPPH free radical inhibition value of the extract in term of IC50 was 3.77 - 11.71 ppm. and the total phenolic content are in the range of 42.88 - 77.84 mg GAE/g extract. From these study the optimal extract condition as 70% ethanol as the extraction solvent in the ratio of 1:20 for 40 min was obtained.

**Keywords**: Sappan Heartwood, Ultrasonic Assisted Extraction, Antioxidant Activities**,** Brazilin

# Molecular detection of *Trypanosoma* spp. in cattle from Sa Kaeo Province, Thailand

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**Abstract**

Cattle are important economic animals in Thailand. According to a report from the Department of Livestock Development, Sa Kaeo Province are rearing more than 150,000 cattle, which is the most in the Eastern Thailand region. The most tick-borne diseases are economically important in cattle. Tick-borne diseases are important causes of sickness and death in cattle, including Trypanosomiasis which are caused by infection *Trypanosoma* spp. The standard method of examination is by looking for internal characteristics of the blood cells under a light microscope. Nowadays, the polymerase chain reaction (PCR) method is preferred because of its sensitivity and specificity. We designed a new genus-specific primer based on 18S rRNA gene used to identify *Trypanosoma* spp. We collected all 29 blood samples from Nong Sang, Sa-Kaeo province to identify these blood parasites by conventional PCR assay. The result, molecular prevalence of *Trypanosoma* spp. using the genus-specific based on 18S rRNA gene was 13.8% (4/29). The identification of *Trypanosoma* spp. in the current study indicates that a new primer efficiently detects *Trypanosoma* spp. and Precautions should be implemented to prevent trypanosoma spp. infection in Nong Sang, Sa Kaeo province.

**Keyword:** Cattle, PCR, *Trypanosoma* spp., Sa-Kaeo

# Improving UV-driven ozonation technology through ultrasonic methods for the decomposition of LDPE

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## Abstract

Microplastic (MP) pollution represents a longstanding environmental challenge, while the advancement of effective technologies for MP removal has been notably insufficient. This study presents $O_3$/US/UV oxidation in water as an alternative method for addressing MP pollution. Low-density polyethylene (LDPE) was selected as the representative target due to its extensive application, and its physical and chemical property alterations were assessed through various techniques. Multiple methods have demonstrated that the $O_3$/US/UV system surpasses single and dual systems through the synergistic generation of reactive radicals. The primary reactive species generated in the system was e-, succeeded by $O_2^{\bullet-}$, $^1O_2$, and $^\bullet OH$, in that order. LDPE demonstrated a loss of its original properties, as indicated by alterations in color and hydrophobicity, the presence of cracks, enlargement, and modifications in surface functional groups. The carbonyl index (CI) of $O_3$/US/UV-treated LDPE was 3.84 and 1.32 times greater than that of the $O_3$ alone and $O_3$/US samples, respectively. The scale-up experiments corroborated the batch experiments, demonstrating that the $O_3$/US/UV system outperformed the sequential system. The germination of three types of edible seedlings indicated that the treated water exhibited negligible toxic effects, as it resulted in no chemical residues following oxidation. Releasing less than 50% of the treated water is recommended to prevent adverse effects on sensitive species. The findings indicate that the $O_3$/US/UV system is an effective and sustainable approach for treating water contaminated with microplastics, contributing to improved water treatment solutions.

**Keywords**: Advanced oxidation processes; Enhanced ozonation; Microplastic decomposition; Seed germination; Ultrasonic-assisted ozonation; UV-assisted ozonation

# SOD-Enhancing Properties of *Alpinia galanga* Rhizome Extract in RAW 264.7 and J774A.1 Macrophage Cell Lines: An In Vitro Study

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## Abstract

*Alpinia galanga* is a medicinal herb rich in antioxidant compounds that help reduce the risk of oxidative stress and various chronic diseases. Superoxide dismutase (SOD), the enzyme of interest, plays a crucial role in inhibiting free radicals and maintaining cellular redox balance. This study investigated SOD activity levels in RAW 264.7 and J774A.1 macrophage cell lines treated with *A.galanga* rhizome extract. Non-cytotoxic concentrations of *A.galanga* rhizome extract at 250-1000 µg/mL were selected for RAW 264.7 and J774A.1, incubated for 24 hours, and evaluated using the SOD inhibitory activity assay. Treatment with *A.galanga* rhizome extract showed significant effects on SOD activity in both cell lines. RAW 264.7 cells treated with *A.galanga* rhizome extract at 1000 µg/mL exhibited significant SOD activity ($p<0.05$) of 26.25±2.277% compared to untreated RAW 264.7 cells. The SOD activity level was comparable to cells treated with vitamin C at 62.5 µg/mL (Positive control). In J774A.1 cells, treatment with *A.galanga* rhizome extract at 500 µg/mL resulted in highly significant SOD activity ($p<0.0001$) of 20.41±3.586% compared to untreated cells and cells treated with Vitamin C at 62.5 µg/mL (Positive control). Notably, *A.galanga* rhizome extract induced SOD activity in J774A.1 cell exceeded that observed in both control groups. These results demonstrate that *A.galanga* rhizome extract effectively enhances SOD activity in both macrophage cell lines, with J774A.1 cell shows higher sensitivity at a lower concentration than RAW 264.7 cells. These suggest that galangal extract enhances SOD activity in free radical inhibition.

**Keywords**: Superoxide dismutase; *Alpinia galanga* rhizome extract; RAW264.7 cell lines; J774A.1 cell lines

# Impacts of low-density polyethylene microplastics on the microalga *Arthrospira platensis*

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## Abstract

Presently, microplastics constitute a significant environmental concern as they undergo decomposition and fragmentation into smaller particles through various processes. These minute plastic particles disperse throughout the environment, accumulating in aquatic ecosystems and being absorbed and ingested by organisms. Microalgae are essential to the food web and biogeochemical cycles, producing commercially valuable compounds. However, their reactions and responses to microplastic contamination remain poorly understood. A recent study investigated the effects of low-density polyethylene (LDPE) microplastics on *Arthrospira platensis* by adding it to Zarrouk medium at concentrations of 0, 1, 10, 100, 300, and 500 mg per 100 ml. This was conducted over a 16-day period under controlled conditions, focusing on factors such as adaptation, pigmentation, external structure, and gene expression. The findings indicate that the logarithmic phase, adaptation, biomass, and pigment levels tended to decrease with exposures to 300 and 500 mg of microplastic. However, *A. platensis* was able to adapt to the microplastic-supplemented medium. Scanning Electron Microscopy revealed that microplastics and *A. platensis* form aggregates upon contact. In addition, substances were observed coating the outer surface of *A. platensis* cells. Based on the results, *A. platensis* has demonstrated an ability to thrive in conditions with high LDPE concentrations. However, microplastics impact the nutritional and pharmaceutical value of the microalgae. Further transcriptome sequencing analysis is needed to gain deeper insights.

**Keywords:** *Arthrospira platensis*, Microplastics, Low-density polyethylene

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