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Welcome Address

Forum Chairman
Dr. Shu-Yin Wang, the President of the Chinese Society of Animal Science

Dear friends:

I am Shu-Yin Wang, the President of the Chinese Society of Animal Science and also representing the organization committee of “The4th International Animal Precision Nutrition Forum”.

CSAS was established in 1971 with the purpose of research, academic development in animal Science.

We have organized the forum 4 times in a roll, and joined by the World Poultry Science, Taiwan branch since the 2nd year.

We eagerly await your participation for this upcomingexciting event.

This forum will be held at the Taipei Nangang Exhibition center on September 10th 2024, which will invite scientists and experts from academic institution or global corporations from all sides to discuss 4 key themes about the new trend of animal precision nutrition.

We hope that anyone who is interested in the research and application of animal precision nutrition can come to Taiwan, exchange and pool ideas and experiences with others, and share the latest research results on animal precision nutrition.

We will welcome you with open arms.

Looking forward to seeing you in Taipei.



歡迎詞

第四屆動物精準營養國際論壇主席，
中國畜牧學會理事長 王淑音 博士

各位業界先進您們好：

我是王淑音，中國畜牧學會理事長，同時也代表「第四屆動物精準營養國際論壇」籌備委員會向各位致意。

中國畜牧學會成立於 1971 年，致力於動物科學的研究和學術發展。

我們已連續四年舉辦這個論壇，自第二屆起與世界家禽學會台灣分會共同舉辦。

我們熱切期待您的參與，共襄這一個令人振奮的盛會。

本屆論壇將於 2024 年 9 月 10 日在臺北南港展覽館舉行，屆時將邀請來自全球學術機構和企業的科學家和專家，圍繞動物精準營養新趨勢的四大主題展開討論。

我們希望所有對動物精準營養研究與應用感興趣的朋友能來到台灣，與各位業界先進們進行交流和分享經驗，並共同分享最新的研究成果。

誠摯歡迎各位蒞臨臺灣。

期待在臺北與您相見。

王淑音

謹識

中華民國 113 年 8 月 30 日

Welcome Address

Forum Chairman

Dr. Jeng-Fang Huang, the President of the Taiwan Branch of The World's Poultry Science Association

Hello everyone! I am Dr. Jeng-Fang Huang, President of the Taiwan Branch of The World's Poultry Science Association, WPSA. I sincerely welcome you to The 4th Animal Precision Nutrition International Forum Taiwan 2024!

WPSA Taiwan Branch was established in 1989. Our mission is to promote poultry academic research, education, and to enhance international academic exchanges. With the global trend of reducing carbon emissions in the livestock industry, precise nutrition management and strategies for the livestock industry have become crucial!



This year's international forum will focus on four main themes:

Firstly, trends in nutritional utilization for companion animals and economic animals,

Secondly, applications of biotechnology and feed additives in precision nutrition,

Thirdly, circular economy and precision nutrition,

Lastly, development of precision nutrition facilities and technologies.

We believe these topics will provide you with the latest and most innovative knowledge on green feeding precision nutrition management. Together, we can spark new ideas for the development of Taiwan's and your country's low-carbon livestock industry.

We are honored to co-host the Forum with the Chinese Society of Animal Science, here at the Taipei Nangang Exhibition Center. We warmly welcome experts and scholars from the animal nutrition industry, government, and academia, to join us in discussing the latest trends in precision nutrition management and formulating strategies. You are all key players in driving the low-carbon development of Taiwan's and your country's livestock industry!

Let's MEET again on September 10th in Taiwan!

歡迎詞

第四屆動物精準營養國際論壇主席，
世界家禽學會台灣分會理事長 黃振芳 所長

各位貴賓大家好，我是黃振芳，世界家禽學會台灣分會理事長。誠摯歡迎各位蒞臨臺灣，參加 2024 年第四屆精準營養國際研討會！

世界家禽學會台灣分會，於 1989 年成立。其宗旨為促進家禽學術研究，教育與推廣，並增進國際學術交流。在全球畜牧產業減碳飼養的趨勢下，畜牧產業的精準營養管理與策略也相當重要！

本屆國際論壇的四大主題，第一、伴侶動物或經濟動物的營養利用趨勢、第二、生物技術與飼料添加物在精準營養之應用、第三、循環經濟與精準營養與第四、精準營養設施設備與技術發展，相信可以讓各位貴賓獲得更多更新穎的綠色飼養精準營養管理新知，共同為臺灣的低碳畜牧產業發展，激盪出更不一樣的火花。

本次很榮幸可以再與和中國畜牧學會，在臺北南港展覽館共同舉辦第四屆動物精準營養國際論壇，再次歡迎國內外動物營養的產官學界專家學者共襄盛舉，共同探討世界最新的精準營養管理趨勢與研擬策略，您們都是推動臺灣畜牧產業低碳發展最重要的推手！

讓我們於 9 月 10 日在臺灣再相會！

黃振芳 謹識

中華民國 113 年 8 月 30 日



The 4th Animal Precision Nutrition International Forum Taiwan 2024 -Innovative Pathways in Precision Nutrition and Circular Economy

AGENDA

- ▲ **Date:** 2024/09/10 (Tuesday)
- ▲ **Venue:** Taipei Nangang Exhibition Hall, Taiwan
- ▲ **Endorsed by:** Ministry of Agriculture
- ▲ **Organized by:** Chinese Society of Animal Science, World's Poultry Science Association-Taiwan Branch
- ▲ **Co-organized by:** Taiwan Livestock Research Institute, Ministry of Agriculture, Taiwan Institute of Economic Research
- ▲ **Managed by:** MY Exhibition Co., Ltd.

09/10, 2024			
Time	min	Event / Topic	Speaker
08:30-09:00	30	Registration	
09:00-09:05	5	Opening Remarks	
09:05-09:35	30	Keynote 1 The future of precision nutrition in broiler production	Speaker: Dr. Robert (Bob) Buresh (USA)/Novus International, Inc.
		Session 1 Optimizing Nutrition Trends for Companion and Commercial Animals	
09:35-10:05	30	Using Commercial Enzymes for Energy Conservation, Carbon Reduction, and Pollution Control in Feed	Chi-chen Chen, Ph.D. / GO FAR INTL. CO., LTD.
10:05-10:20	15	Trends of Precision Nutrition in the Pet Industry	I-Chen Liu/Chief of Research Division VII of Taiwan Institute of Economic Research
10:20-10:50	30	Precision Nutrition for Companion Animals	Mei-Fong Lin, Ph. D. / Department of Animal Science and Technology, National Taiwan University

09/10, 2024			
Time	min	Event / Topic	Speaker
10:50-11:00	10	Coffee Break	
		Session 2 Applying Biotechnology and Feed Additives in Precision Nutrition	
11:00-11:30	30	Application of compounded Xylanases on Growth Performance of Broilers	Eric Y.L., Tai, General Manager / TEC BioWorks Co., Ltd.
11:30-12:00	30	Identification, analysis, and optimization of the gut microbiomes of Taiwan pig breeds at the Central Performance Test Station using next-generation sequencing	Chang, Chi-Sheng, Assistant Professor / Chinese Culture University Kim Forest Enterprise Co., Ltd.
12:00-12:30	30	Charting Animal Precision Nutrition: Breeding & Biosecurity Perspectives	Mr. Chris Jackson / UKTAG Director
12:30-12:45	15	Moderated Discussion	
12:45-13:40	55	Lunch	
13:40-14:10	30	Keynote 2 Feed Ingredients as an Effective Tool to Reduce Carbon Footprint	Speaker: Paul Lu, Consultant / Triple A
		Session 3 Circular Economy and Precision Nutrition Applications	
14:10-14:40	30	Production and Application Achievements of Black Soldier Fly in Feed Industry of Taiwan	Po-Lun Chien, Chairman / InnoRs Biotechnology Co., LTD.
14:40-15:10	30	A Brief Discussion of Raw Feather Rendering Methods	Tung Lung Kuo PhD candidate / Department of Animal Science and Technology, National Taiwan University
15:10-15:30	20	Coffee Break	

09/10, 2024			
Time	min	Event / Topic	Speaker
		Session 4 Development of Precision Nutrition Facilities, Equipment, and Technology	
15:30-16:00	30	Unlocking Precision Nutrition: Maximizing Animal Health Through Feed Processing with KAHL expander technology	Mr. Ame Heuer-Amandus Kahl's Senior Asia Pacific Area Manager/Amandus Kahl Agriasia Development Corporation
16:00-16:30	30	Innovative Technologies for Precision Feeding and Delivery in Modern Poultry Farming	Mr. Frank Andreasen /Landmeco / Director
16:30-17:00	30	The Precise Role of AI in Antibiotic- Free Poultry and Livestock Feeding	Dr. Yu-Chuan Liang / Agricultural Biotechnology Research Center
17:00-17:15	15	Moderated Discussion	
17:15-17:30	15	End of Symposium	
18:00-20:30	150	Gala Dinner	



第四屆動物精準營養國際論壇

—精準營養與循環經濟的創新之路

議程

會議時間：2024 年 9 月 10 日

會議地點：臺北南港展覽館

指導單位：農業部

主辦單位：中國畜牧學會、世界家禽學會台灣分會

協辦單位：農業部畜產試驗所、臺灣經濟研究院

承辦單位：貿有展覽有限公司

09/10, 2024			
時間	分鐘	議程	講者
08:30-09:00	30	報到	
09:00-09:05	5	開幕	
09:05-09:35	30	專題演講 1 The future of precision nutrition in broiler production 肉雞生產中的精準營養未來發展	世界家禽學會副會長 & Novus International Executive Manager Dr. Robert (Bob) Buresh
		Session 1 伴侶動物或經濟動物的營養利用趨勢	
09:35-10:05	30	使用商業化酵素進行飼料節能、減碳 與降低污染	國歡企業集團 陳啓禎博士
10:05-10:20	15	寵物精準營養產業趨勢	台灣經濟研究院研究七所 劉依蓁組長
10:20-10:50	30	伴侶動物的精準營養	國立臺灣大學動物科學技 術學系 林美峰教授
10:50-11:00	10	茶敘	
		Session 2 生物技術與飼料添加物在精準營養之 應用	

09/10, 2024			
時間	分鐘	議程	講者
11:00-11:30	30	複合木聚醣酶應用在白肉雞之生長表現	台灣酵素股份有限公司 戴友煉總經理
11:30-12:00	30	利用次世代定序進行臺灣種豬性能檢 定站豬隻腸道菌相研析	金萬林企業股份有限公司 中國文化大學動物科學系 張啟聖助理教授
12:00-12:30	30	Charting Animal Precision Nutrition: Breeding & Biosecurity Perspectives 從育種與生物安全的觀點探討動物精 準營養	UKTAG Director Mr. Chris Jackson
12:30-12:45	15	綜合討論	
12:45-13:40	55	午餐	
13:40-14:10	30	專題演講 2 飼料成分：減少碳足跡的有效工具	TripleA 亞洲區技術總監 盧世哲顧問
		Session 3 循環經濟與精準營養	
14:10-14:40	30	黑水蛇在台灣飼料領域的生產及應用 實績	循創生物科技股份有限公司 錢柏綸董事長
14:40-15:10	30	生羽毛化製方法之淺析	國立臺灣大學動物科學技 術學系 郭東隴博士候選人
15:10-15:30	20	茶敘	
		Session 4 精準營養設施設備與技術發展	
15:30-16:00	30	Unlocking Precision Nutrition: Maximizing Animal Health Through Feed Processing with KAHL expander technology 通過 KAHL 的飼料加工膨化技術解 鎖動物精準營養	正同開發股份有限公司 Amandus Kahl Senior Asia Pacific Area Manager Mr. Arne Heuer

09/10, 2024			
時間	分鐘	議程	講者
16:00-16:30	30	Innovative Technologies for Precision Feeding and Delivery in Modern Poultry Farming 現代家禽養殖中精準飼料投餵的創新技術	Landmeco Asia Sales Director Mr. Frank Andreasen
16:30-17:00	30	AI 在禽畜飼養無抗的精準角色	中央研究院農業生物科技研究中心 梁佑全博士
17:00-17:15	15	綜合討論	
17:15-17:30	15	閉幕	
18:00-20:30	150	Gala Dinner(需額外報名)	



The 4th Animal Precision Nutrition International Forum Taiwan 2024
第四屆動物精準營養國際論壇

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NovusInternational, Inc./Executive Manager / Dr. Robert (Bob) Buresh.....

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Chairperson: World's Poultry Science Association-Taiwan Branch/President

Jeng-Fang Huang

Using Commercial Enzymes for Energy Conservation, Carbon Reduction, and Pollution Control in Feed

Go Far International Co., Ltd./Dr. Chi-Chen Chen.....

Trends of Precision Nutrition in the Pet Industry

Research Division VII, Taiwan Institute of Economic Research /Chief / I-Chen Liu.....

Precision Nutrition for Companion Animals

Department of Animal Science and Technology, National Taiwan University /

Professor / Dr. Mei-Fong Lin.....

Session 2

Applying Biotechnology and Feed Additives in Precision Nutrition

Chairperson: World's Poultry Science Association-Taiwan Branch / President

Jeng-Fang Huang

Application of compounded Xylanases on Growth Performance of Broilers

TEC BioWorks Co., Ltd. / General Manager / Eric Y.L., Tai

Identification, analysis, and optimization of the gut microbiomes of Taiwan

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Charting Animal Precision Nutrition: Breeding & Biosecurity Perspectives

UKTAG / Director /Chris Jackson

Keynote 2

Feed Ingredients as an Effective Tool to Reduce Carbon Footprint

Triple A / Consultant /Paul Lu

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Circular Economy and Precision Nutrition Applications

Chairperson: Chinese Society of Animal Science / President Shu-Yin Wang

Production and Application Achievements of Black Soldier Fly in Feed

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InnoRs Biotechnology Co., Ltd. / Chairman /Po-Lun Chien

A Brief Discussion of Raw Feather Rendering Methods

Department of Animal Science and Technology, National Taiwan University /

PhD Candidate Tung-Lung Kuo

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Development of Precision Nutrition Facilities, Equipment, and Technology

Chairperson: Chinese Society of Animal Science / President Shu-Yin Wang

Unlocking Precision Nutrition: Maximizing Animal Health Through Feed

Processing with KAHL expander technology

AmandusKahl / Senior Asia Pacific Area Manager /Arne Heuer

Innovative Technologies for Precision Feeding and Delivery in Modern Poultry Farming

Landmeco / Asia Sales Director/ Frank Andreasen

The Precise Role of AI in Antibiotic-Free Poultry and Livestock Feeding

Agricultural Biotechnology Research Center, Academia Sinica / Dr. Yu-Chuan Liang



第四屆動物精準營養國際論壇

The 4th Animal Precision Nutrition International Forum Taiwan 2024

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／世界家禽學會副會長 NovusInternational, Inc./Executive Manager /

Dr. Robert (Bob) Buresh

Session 1

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使用商業化酵素進行飼料節能、減碳與降低污染

／國歡企業集團陳啓禎博士

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／金萬林企業股份有限公司 / 中國文化大學動物科學系張啟聖助理教授

Charting Animal Precision Nutrition: Breeding & Biosecurity Perspectives

從育種與生物安全的觀點探討動物精準營養

／ UKTAG / Director /Chris Jackson

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／ 循創生物科技股份有限公司錢柏綸董事長

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Unlocking Precision Nutrition: Maximizing Animal Health Through Feed Processing with
KAHL expander technology

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／ AmandusKahl / Senior Asia Pacific Area Manager / Arne Heuer

Innovative Technologies for Precision Feeding and Delivery in Modern Poultry Farming

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／ Landmeco / Asia Sales Director/ Frank Andreasen

AI 在禽畜飼養無抗的精準角色

／ 中央研究院農業生物科技研究中心梁佑全博士



Brief Resume

Dr. Bob Buresh

POSITION

Executive Manager – Poultry Technical Services

AFFILIATION

Name of affiliation: Novus International, Inc.

Address: 307 Wescott Drive, Clemson, SC, 29631, USA

E-mail: bob.buresh@novusint.com

EDUCATION

PhD – 1985 – University of Florida – Poultry Nutrition

MS – 1982 – Clemson University – Poultry Science

BS – 1980 – Clemson University – Poultry Science

PROFESSIONAL EXPERIENCE

2008 – Present - Novus International, Inc.

1989 – 2008 – Tyson Foods, Inc.

1988 – 1989 – Southeastern Minerals

1985 – 1988 – Purina Mills, Inc.

SPECIALITY AND RESEARCH FIELD OF INTEREST

Poultry (Broiler, Layer and Turkey Nutrition), Poultry live production and management, Broiler Breeder Nutrition and Management

AWARDS AND HONORS

2016 - Present – World's Poultry Science Association Senior Vice President

2010 – Present – WPSA USA Branch Secretary

Clemson University - Department of Animal & Veterinary Sciences Adjunct Professor

BRIEF INTRODUCTION OF THE SPEAKER

Dr. Bob Buresh is the Executive Manager for the North American Poultry Technical Service team at Novus International. He is responsible for providing nutritional, live production and health-related technical service to customers and others within Novus. Bob currently resides in Clemson, SC. He earned his B.S. degree from Clemson University in Animal & Food Industries and his M.S. degree (also from Clemson) in Poultry Nutrition and Management. He then received his Ph.D. from the University of Florida in Poultry Nutrition, with his dissertation focusing on the nutritional inter-relationships of antibiotics and nutritional requirements of poultry.

Bob joined Novus in April of 2008, initially serving as Poultry Technical Service Manager. For two years in 2011-2013, Bob served as the North America Sales Manager for the Poultry Team in addition to his technical service responsibilities. From 2013 through 2020, Bob served as Executive Manager for the North America Technical Services team. In 2020, he





returned to providing technical service for North American poultry customers.

Through both formal education and industry experience, Bob has gained an extensive knowledge in all areas of poultry production especially in the areas of broiler nutrition and production. Prior to joining Novus, he held the position of Director of Poultry Nutrition for Tyson Foods for 18 years. Based in Springdale, AR, Bob was responsible for establishing nutritional programs and performance for both broilers and breeders, evaluating ingredients and coordinating research conducted both internally and externally with other technical service team members. In this position, Bob provided service in all aspects of feed formulation and nutritional program development and was responsible for about 1/3 of Tyson's broiler production. Before joining Tyson, Bob worked with Purina Mills (Poultry Business Group as Senior Nutritionist) and Eastern Minerals (Poultry Technical Service).

Bob currently serves as Senior Vice President for the World's Poultry Science Association and Branch Secretary for the USA Branch of the WPSA, is former Executive Secretary for the Southern Poultry Science Association and a former Director for the Poultry Science Association.



Abstract of the Speech

The future of precision nutrition in broiler production.

Precision nutrition in broiler production is not a new concept. I define precision nutrition as the holistic process of feeding our chickens while optimizing all facets involved in the nutrition and production process. These facets include everything from ingredient evaluation and feed formulation, to producing a high-quality meat product, to maximizing the economic return to the grower and producer while minimizing the impact on the environment.

As mentioned, precision nutrition is not new. What is new is the recent visibility and attention directed toward our nutrition and production practices by our customers and the consumers of our meat products. Long gone is the time of formulating broiler rations to produce a low-cost whole bird. The industry has transitioned to producing further-processed broiler meat both extremely efficiently and economically.

In the US, we are proud to be an extremely efficient producer of broiler meat and take all of the afore-mentioned facets into consideration, but rarely are they all tied together.

Focusing on broiler nutrition, the areas of most opportunity include ingredient evaluation (mainly accurate and current determinations of digestible amino acids and energy), updated determination of the amino acid requirements of modern broiler genetic lines, feed formulation beyond the current linear programming with goals of “least cost feed formulation” and the development and implementation of broiler growth models that can serve to merge these factors together.

Accurate and current ingredient evaluation provides the foundation for feed formulas that can provide the ideal and precise nutrients that the broiler requires. Near Infrared spectroscopy (NIR) has been available for many years and far under-utilized in the broiler industry. Current NIR technologies have demonstrated the capabilities to provide accurate and rapid estimations of feed ingredient nutrients. But this technology is not static, and it must be continuously updated and not treated as a “book value”.

This leads right into the discussion of digestible amino acids for broilers. In the US, virtually all the broiler producers utilize the digestible amino acid concept for formulating feeds to most precisely meet the specific needs of the broilers being produced. But the determination of the digestible amino acid requirements of the modern broiler are far outdated. The broilers today are being grown larger, faster and more efficiently than ever before. But I would speculate that the amino acid requirements currently serving as the standards for feed formulation have not been seriously updated for years. Most of the producers utilize live performance factors as the key metric for the determination of whether the broilers are being fed to meet their requirements. Further refinement of the precise amino acid requirements



for optimal performance and meat production will surely lead to an increase in the use of supplemental amino acids in the ration; beyond methionine, lysine and threonine to tryptophan, arginine, valine, isoleucine and glycine. This will also lead to a reduction in dietary protein and subsequent excretion into the environment.

A second nutritional consideration that has surfaced is the ideal approach to precisely meeting the energy needs of the growing broiler. In the US, most producers rely on Metabolizable Energy (ME) as the cornerstone for both ingredient and bird requirement values. These values are often based on published tables or the result of published regression equations that provide a ME estimation. But they do not accurately reflect the amount of energy available and utilized by the bird for growth (meat deposition) or maintenance. To accomplish this, one would have to transition to the use of a Net Energy (NE) system defined as the ME content of the feed minus heat increment associated with

feed utilization. This transition has been discussed for many years and would not be an easy one. The swine industry in the US has begun to successfully make this transition.

These are just a few of the benefits of utilizing precision nutrition for our broilers. Producers need to utilize all of the tools currently available (and seek innovative tools) to feed the birds in a manner that optimizes the utilization of the feed ingredients, maximizes the genetic potential of the birds and minimizes any negative impacts of the production process or the environment. This is a growing challenge that US and other producers will be forced to address and embrace.



Resume

Chi-chen chen Ph.D.

POSITION

GO FAR INTL. CO., LTD.

Technical Dept. Director

Education background

Ph.D., Department of Animal Science, National Chung Hsing University

Experiences

Has nearly 30 years of experience in the livestock industry, specializing in feed raw material quality control and feed formula design.

Go Far Group was established in 1982 in Kaohsiung.

We have started from the animal husbandry and always uphold the profession and are delighted to provide the best service for our customers. And be humble to aspire for better quality. The purpose for our improvement is to give this natural and everyone a respectful life.





講者簡歷

陳啓禎 博士

現職

國歡企業集團技術總監

學歷

國立中興大學動物科學系博士

專業和研究領域

擁有畜產業服務近 30 年資歷，專長於飼料原料品質管控與飼料配方設計。

講者介紹

國歡企業集團成立於 1982 年，至今 42 年，目前與全世界近 30 個國家共 100 家擁有研發、配方與技術服務的動物營養保健公司有合作，陳博士長期與全球專業研發團隊有非常密切的合作共享開發成果，並將產品導入台灣在地化運用，是一位提供飼養管理解決方案的專家。

陳博士同時也是全球最優質的發酵蛋白生產廠 - 達邦蛋白生技的首席研發顧問，協助達邦蛋白生技持續投入研發，為畜產業、水產業提供更多更優質並且符合永續生態價值的功能性產品。



Abstract of Presentation

Using Commercial Enzymes for Feed Energy Efficiency, Carbon Reduction, and Pollution Control

Enzymes are a well-established category of feed additives within the animal feed industry. However, their application has predominantly focused on enhancing animal growth performance and reducing feed costs, often overlooking the broader environmental and economic implications. Nowadays, enzyme manufacturers provide precise data on the nutritional contributions of specific enzymes, enabling feed formulators to select the most appropriate enzymes based on raw material usage, species, age stage, and market demands. In addition to lowering feed costs, these enzymes can help achieve objectives such as improving animal performance, enhancing energy efficiency, reducing carbon emissions, and minimizing pollution, all while following the latest feed regulations.



演講摘要

使用商業化酵素進行飼料節能、減碳與降低污染

酵素在飼料工業是一個很成熟的飼料添加劑產品，唯使用者多著重在動物生長成績與降低飼料成本，忽略對環境友善與整體經濟面的考量。目前酵素生產廠商多有提供精準的酵素營養貢獻值的數據，可以讓飼料配方人員依據飼料配方所使用的原物料、動物別、日齡階段與市場需求，挑選適合的酵素來使用，除了可降低飼料成本的需求外，還可以在符合目前新的飼料法規的前提下達到改善動物表現、節能減碳與降低污染的目標。



Brief Resume

I-Chen Liu

POSITION

Chief, Research Division VII, Taiwan Institute of Economic Research

Associate Research Fellow, Research Division VII, Taiwan Institute of Economic Research

AFFILIATION

Name of affiliation: Taiwan Institute of Economic Research

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EDUCATION

Master's degree in Biotechnology and New Drug Technology Management from the Institute of Biopharmaceutical Sciences, National Yang-Ming University

PROFESSIONAL EXPERIENCE

Principal Investigator for the Ministry of Agriculture's projects "Companion Animal Health Products Industry Market Survey and Issues Discussion" and "Decision Support and Performance Management for the Industrialization of Companion Animal Health Products"

Co-Principal Investigator for the Ministry of Agriculture's projects "Pet Ownership Survey and Establishment of Pet Food Management System," "Pet Industry Survey and Guidance Mechanism Construction," "Industrialization Strategy Planning and Benefit Evaluation of Functional Products," and key researcher for the projects "Agricultural Bioeconomy Strategy Planning and Industry Development Research" and "International Livestock Animal Welfare Systems and Legal Studies"

Certified Professional in Intangible Asset Valuation Training by the Taiwan Chapter of the International Association of Consultants, Valuators Analysts (IACVA)

Certified Valuation Analyst (CVA) by the National Association of Certified Valuators and Analysts (NACVA)

SPECIALITY AND RESEARCH FIELD OF INTEREST

- Policy and Industry Analysis of Biotechnology and Pharmaceuticals/Health Products/Pet Food
- Strategic Planning, Performance Management, and Benefit Evaluation
- Intangible Asset Valuation

BRIEF INTRODUCTION

Miss I-Chen Liu has been working at Taiwan Institute of Economic Research since 2012. She has extensive experience in pet industry research, regulatory research, project strategy planning, and performance management. In recent years, she has led and participated in several





policy projects related to the commercialization of companion animal health products and pet food management systems. Her expertise lies in the policy and industry analysis of pet food and health products, as well as strategic planning.



講者簡歷

劉依蓁

現職

台灣經濟研究院研究七所生物經濟組組長 (2023~)

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學歷

國立陽明大學生物藥學所生技新藥科技管理組碩士

長庚大學生命科學系學士

主要經歷

- 農業部「伴侶動物保健食品產業市場調查與議題研討」、「伴侶動物保健品產業化決策支援與成效管理」計畫主持人
- 農業部「寵物飼養調查及寵物食品管理制度建立計畫」、「寵物產業調查及輔導機制建構計畫」、「機能性產品產業化策略規劃與效益評估」共同主持人、「農業生物經濟策略規劃與產業發展研究」、「國際畜牧動物福利體系與法制研究」主要研究人員
- IACVA 台灣分會無形資產評價認證培訓專業人員
- NACVA (National Association of Certified Valuers and Analysts), Certified Valuation Analyst (CVA 國際評價分析師認證)

專業和研究領域

- 生技醫藥 / 保健產品 / 寵物食品政策與產業分析
- 策略規劃、績效管理、效益評估
- 無形資產評價

講者介紹

劉依蓁自 2012 年開始於台灣經濟研究院研究七所服務，具備寵物產業研究、法規研究、計畫策略規劃與績效管理經驗。近年來主持及參與多項伴侶動物保健食品產業化政策計畫及寵物食品管理制度相關計畫，專長於寵物食品、保健產品政策與產業分析及策略規劃。



Abstract of Presentation

Trends of Precision Nutrition in the Pet Industry

The pet economy is flourishing. Even during the economic downturn caused by the COVID-19 pandemic, the global pet industry has maintained a 5% growth. According to a survey by the Taiwan Institute of Economic Research, the market size of Taiwan's pet food industry exceeded NT\$30.8 billion in 2023. As awareness of pet health grows both domestically and internationally, pet owners' feeding practices have evolved from simply feeding well to ensuring nutritional health, leading to an increased demand for high-value "pet supplements." This presentation will analyze the current state of pet ownership in Taiwan, the structure of the pet industry, and further delve into the status and trends of the precision pet nutrition industry. It will cover the nutritional needs of healthy animals as well as the specialized nutritional formulas required for sick animals, and finally, it will present market demand surveys for supplements among Taiwanese pet owners, providing the latest industry trends in precision pet nutrition.



演講摘要

寵物精準營養產業趨勢

寵物經濟蓬勃發展，即使在新冠疫情之經濟負成長情勢下，全球寵物產業仍維持5%正成長，根據台灣經濟研究院調查，目前我國2023年寵物食品產業市場規模已經超過新台幣308億元。伴隨著國內外寵物健康意識漸盛，飼主飼養觀念由吃飽、吃好提升至吃出營養健康，也使高附加價值的「寵物補充品」需求增加。本演講將由我國寵物飼養現況、寵物產業結構分析，進一步解析寵物精準營養產業現況與趨勢，從健康動物的營養需求至患病動物所需特殊營養配方，最後帶至我國寵物飼主針對補充品之市場需求調查等產業資訊，提供寵物精準營養產業最新動態趨勢。

1. 我國寵物飼養現況
2. 全球寵物精準營養產業現況與趨勢
3. 我國寵物補充品市場需求調查



2024 第四屆動物精準營養國際論壇



Brief Resume

Mei-Fong Lin, Ph. D.

POSITION

Professor, retired

AFFILIATION

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EDUCATION

Ph.D., National Taiwan University

PROFESSIONAL EXPERIENCE

Professor, Department of Animal Science and Technology, National Taiwan University

SPECIALITY AND RESEARCH FIELD OF INTEREST

Animal nutrition

Lipid metabolism

Companion animal food and functional products

BRIEF INTRODUCTION

The speaker had graduated from National Taiwan University then worked at National Taiwan University. Main teaching and research topics include animal nutrition, pet nutrition, and feed science. The research scope covers economic animals (mainly poultry), wild animals, and companion animals in the areas of animal nutrition requirements and utilization, feed and functional product development, and feed (food) safety monitoring, etc.





講者簡歷

林美峰 博士

現職

教授 (退休)

單位

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學歷

國立臺灣大學博士

主要經歷

國立臺灣大學動物科學技術學系教授

專業和研究領域

動物營養

脂質代謝

伴侶動物食品與保健品

講者介紹

講者自國立臺灣大學畢業後，即任職於臺灣大學，動物營養、寵物營養及飼料學等為主要教學課程，動物營養及飼料學為主要研究範疇，研究對象包含經濟動物（家禽為主）、野生動物和伴侶動物，研究題目涵蓋動物的營養需求及利用、飼料及保健品開發，以及飼料（食糧）的安全性監控等。



Abstract of Presentation

Precision Nutrition for Companion Animals: Energy Balance and Weight Management for Dogs and Cats

The energy requirements and utilization of dogs and cats are affected by many internal and external factors. Under the influence of factors such as changes in the feeding environment, diversification of pet food, owner attitudes, and animal factors. Thus, the energy balance of dogs and cats becomes more difficult to control. Obesity is currently one of the greatest health and welfare problems facing dogs and cats around the world, especially for the latter.

According to the 2022 U.S. Pet Obesity Prevalence Survey conducted by the Association for Pet Obesity (APOPOP), it was found a staggering 61% of cats and 59% of dogs are overweight or have obesity, indicating that animal overweight or obesity is a widespread problem with pet. However, a 2023 survey of U.S. pet owners showed that only 28% of cat owners and 17% of dog owners admitted that their pets were overweight, and 84% of dog owners and 70% of cat owners considered their pets' physical condition to be healthy. This survey shows that it is quite difficult for animals to lose weight through weight control when they are overweight or obese. Therefore, preventing overweight or obesity in dogs and cats has become an important issue in weight management.



演講摘要

伴侶動物的精準營養：犬貓能量平衡及體重管理

犬貓的能量需求及利用受諸多內在及外在因素所影響，在飼養環境改變、寵物食品多樣化、飼主態度及動物因素等因素影響下，犬貓的能量平衡變成更難以控制。因而造成肥胖成為目前全球犬貓面臨的最大健康和福利問題之一，尤以貓為甚。根據寵物肥胖協會 (APOP) 所執行之 2022 年美國寵物肥胖盛行率調查發現，有 61% 的貓和 59% 的狗超重或肥胖，顯示動物超重或肥胖已是寵物健康存在普遍問題。然而，2023 年針對美國寵物主人進行的一項調查顯示，只有 28% 的貓主人和 17% 的狗主人承認他們的寵物超重，84% 的狗和 70% 的貓主人認為寵物的身體狀況是健康的。此調查顯示動物超重或肥胖後，利用體重控制去減輕體重具有相當的困難度。因此，預防犬貓超重或肥胖成為體重管理的重要課題。



Brief Resume

Mr. Yu-Lien, Tai



Present Position

General Manager of TecBioworks Co., Ltd.

Co-Founder, and Secretary General of Southern Taiwan Textile Research Alliance (STTRA), Taiwan

Education background:

Master of Management Science, National Chiao Tung University, Taiwan.

Doctorate program, Industrial, Production, and System School, Waseda University, Japan.

Experiences:

1. Co-founder, Executive secretary of the board and manager of administration department, LeFram Technology Corporation
3. Vice president of Tsai Ku HR Management Corporation., LTD
4. Manager of New Venture Creation and Technology Diffusion Department, MIRL/ITRI
5. Deputy Director of Global Affairs and New Business Development Office, MIRL/ITRI
6. Director of Planning and Marketing Division, ITRI South
7. General Director of Southern Taiwan Innovation and Research Park, MEA
8. Assistant professor, Graduate institute of Management of innovation and Technology, National Ping-Tung University of Science and Technology, Taiwan

Professional specialties:

Intellectual Property Management and License, New Venture Creation, Corporate Collaboration, Business Development and Administration.

Thesis: The study of relationship Between Corporate Performance and its product/ Market Strategies for Taiwan Machine Tools Industry

Publications:

1. Junzo Watada, Yingru Wang, Yu-Lien Tai, Jaeseok Choi and Mitsushige Shiota, “Supply Balance Optimization of Sustainable Power Generation from Service Cost Perspective”, International Journal of Intelligent Technologies and Applied Statistics, Vol.4, No.2 (2011) pp.221-24.
2. Yu-Lien Tai, Junzo Watada, Hsiu Hsien Su, “To Join or Not to Join: Antecedents of SME’s Decision to Join a Collaborative Network”, IEEE Transaction on Engineering Management, Under reviewing.
3. Yu-Lien Tai, Junzo Watada, “Creating SMEs’ innovation capabilities through formation



of collaborative innovation network in Taiwan” World Automation Congress 2010, September 21-23, 2010, Kobe, Japan.

4. Yu-Lien Tai, Junzo Watada, Hsiu Hsien Su, “Analysis of the Familiarity and Mutual Dependency of Firms from the Perspective of SME CINs’ Effectiveness”, PICMET 2010, July 18 - 22, 2010, PUKIT Tailand.

5. Junzo Watada, Yu-Lien Tai, Yingri Wang, Jaeseok Choi, Mitsushige Shiota, “Service Cost Optimization in Supply Balance of Sustainable Power Generation”, PICMET 2011, July 31 – August 4, 2011, Portland Oregon, USA.

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講者簡歷

戴友煉

現職

工業技術研究院 產業服務中心 業務總監
經濟部南台灣創新園區(代)主任
中華民國南台灣紡織研發聯盟秘書長
台灣麗谷產業創新聯盟秘書長

學歷

交通大學 管理科學研究所碩士，
日本 早稻田大學 博士修業畢

主要經歷

- 經濟部深層海水創新研發中心主任
- 國立屏東科技大學科技管理研究所兼任助理教授
- 勞動部雲嘉南區勞動力發展策進會諮詢委員
- 台南市健康永續綠色城市推動委員會委員
- 南部科學園區產學協會理事
- 工研院南分院企劃推廣組組長
- 工研院機械所國際合作與新創事業室副主任
- 利汎科技共同創辦人

專業和研究領域

技術與專利授權、新創事業發展、企業經營管理



Abstract of Presentation

Application of Xylanase Complex(XyMAX) in the Growth Performance of Broilers

Non-starch polysaccharides (NSP) in poultry feed mainly originate from plant-based ingredients, including hemicelluloses (such as arabinoxylan), cellulose, and pectin, which are large molecules. Monogastric animals find it difficult to digest these substances with their endogenous enzymes. Therefore, NSP enzymes can be added to the feed to increase the utilization rate of NSPs. This study aims to explore the effects of adding different combinations of XyMAX to the feed on the growth performance of broilers.

The experiment involved 480 one-day-old ROSS 308 Broilers, randomly assigned to three treatment groups: a control group (basal diet), a low-dose test group (basal diet with 0.05% XyMAX), and a high-dose test group (basal diet with 0.1% XyMAX). The results showed that, compared to the control group, the groups supplemented with low and high doses of XyMAX exhibited better growth performance in terms of body weight, average daily gain, daily feed intake, and feed conversion ratio. This is because XyMAX can effectively break down NSPs in grains, enhancing the utilization of plant-based feed.

Regarding intestinal villi morphology, the addition of XyMAX significantly increased the villus height to crypt depth ratio, indicating better intestinal tissue development in broilers. In the analysis of intestinal and fecal microbiota, the addition of high dose of XyMAX effectively reduced the populations of *Escherichia coli* and *Clostridium perfringens*, improving the health of the chickens.

In carcass analysis, compared to the control group, the groups supplemented with low and high dose of XyMAX significantly increased the breast meat ratio. The low-dose test group also significantly reduced the abdominal fat ratio, indicating that nutrients in the feed were utilized more efficiently, reducing abdominal fat accumulation.

In summary, the addition of XyMAX to the feed improves the intestinal morphology of broilers and enhances their growth performance, having a positive impact on their health and growth.



演講摘要

複合木聚糖酶 (XyMAX) 應用在 白肉雞之生長表現

家禽飼糧中的非澱粉多醣 (Non-starch polysaccharides, NSP) 主要來自植物性原料中的半纖維素 (阿拉伯木聚糖)、纖維素、果膠等大分子，由於單胃動物的內源性酵素難以消化這些物質，因此可以在飼糧中可額外添加 NSP 酶，以提高 NSP 的利用率。本研究旨在探討飼糧中添加不同組合的木聚糖酶對肉雞生長表現之影響。

試驗選用 480 隻 1 日齡的 ROSS 308 白肉雞，隨機分配至三個處理組：對照組 (基礎飼糧)、低劑量試驗組 (基礎飼糧中添加 0.05% XyMAX)、高劑量試驗組 (基礎飼糧中添加 0.1% XyMAX)。結果顯示，與對照組相比，添加低、高劑量木聚糖酶 (XyMAX) 的肉雞在體重、平均日增重、日採食量及飼料轉換率生長表現有更好的生長表現。這是因為木聚糖酶能有效分解穀物中的 NSP，提升植物飼料的利用率。

腸道絨毛性狀方面，添加木聚糖酶 (XyMAX) 顯著提升絨毛高與腺窩深度比，顯示肉雞腸道組織發育狀況更佳。在腸道與糞便菌相的分析中，添加高劑量木聚糖酶 (XyMAX) 可有效降低大腸桿菌群及產氣夾膜梭菌數量，提升雞隻健康。

在屠體分析中，與對照組相比，添加低、高劑量木聚糖酶 (XyMAX) 的試驗組顯著提升胸肉比例。低劑量試驗組顯著降低腹部脂肪比率，表示飼料中的營養分被妥善利用，進而減少腹部脂肪堆積。

綜合以上結果，飼糧中添加木聚糖酶 (XyMAX) 能改善肉雞的腸道性狀，提升其生長性能，對肉雞的健康和生長具有正面影響



2024 第四屆動物精準營養國際論壇



Brief Resume

Chris Jackson

Chris Jackson is a distinguished figure in the agricultural sector, whose illustrious career has been marked by a profound commitment to excellence and innovation. Following his graduation from university, Chris embarked on a journey in agriculture, starting as a farm manager. His remarkable dedication and strategic acumen propelled him to new heights, ultimately leading him to manage his own farm.



At the helm of his farm, Chris demonstrated exceptional foresight by establishing a nucleus pig breeding company, which soon gained international recognition for its high-quality genetics. Through his visionary leadership, Chris successfully navigated the complexities of global trade, facilitating the export of genetics to various corners of the world.

In addition to his achievements in pig breeding, Chris's passion for animal husbandry extended to breeding pedigree cattle and sport horses. His diverse portfolio of ventures solidified his reputation as a multifaceted industry leader.

Chris's influence transcended his operational roles, as he actively contributed to the governance of farming companies, co-operatives, and industry bodies. His strategic insights and collaborative spirit were instrumental in shaping industry policies and fostering partnerships across the agricultural landscape.

Currently serving as the Export Director for UKTAG, a prestigious trade association accredited by the UK Government, Chris continues to leverage his expertise in export strategies. Throughout his career, he has played a pivotal role in developing and implementing export strategies, collaborating closely with governmental bodies both at home and abroad. Chris's unwavering dedication to advancing the agricultural sector has positioned him as a trusted advisor and advocate for industry growth and sustainability.



Abstract of the Speech

Charting Animal Precision Nutrition: Breeding & Biosecurity Perspectives

Nutrition is a major part of our production programme without which we cannot be successful in efficient and profitable breeding programmes

Today I want to just add a few further thoughts as to how we can maintain efficient and profitable enterprises

In any production system genetics is the first limiting factor of life so without efficient breeding we will not achieve our goal

Our pig industry has been remarkably successful in improving production, reducing inputs and increasing outputs. Over the last 50 years breeding coupled with modern technologies in feed and better production techniques in the UK it has have succeeded in reducing the land needed to produce the same amount and meat by about 70% so a wonderful achievement for protecting the environment

The pig industry has in the last few years seen a sea change in the way it operates. When I started farming many years ago the breeding base was centred around individual pedigree breeders now there are 5 or 6 major breeding companies that dominate the entire world's breeding programmes

Today I wanted to share a few thoughts with you as to how we can become more efficient in in the way we breed pigs and I want to take a look at the use of frozen semen to achieve these aims

Once we have produced the animals then we have to keep them alive and in this day and age of endemic diseases such as African swine fever and PRRS the latter of which our scientists by taking chromosomes from traditional breeds and implanting them in major breeds produced an animal that is resistant to this disease. ASF is a different problem to be tackled by vaccines

Therefore, I want to share some experiences about bio security on my farm in England, for more than 30 years I maintained a nucleus pig breeding unit that had no diseases. We used no vaccines growth promoters or antibiotics

I want to share with you some thoughts as to how with good bio security we can maintain animals in a healthy and profitable state



Brief Resume

Paul Lu (consultant)

POSITION

Technical Consultant in Asia for Triple A, Denmark

AFFILIATION

Name of affiliation: Shanghai Nutritech Technology Consulting Co., LTD

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EDUCATION

Master of Animal Nutrition, Taiwan University

PROFESSIONAL EXPERIENCE

1988-1991: Study on duck nutrition in Yilan Branch of Taiwan Animal Production Research Institute

1992-2008: Director of Technology and Business Department of Taiwan CP Enterprise Co., LTD

2009-2020: Head of R&D and Feed Business of Dacheng Food (Asia) Co., LTD

2020- to now: Consultant of Shanghai Nutrit Technology Consulting Platform

Technical Advisor, TripleA, Denmark, Asia

SPECIALITY AND RESEARCH FIELD OF INTEREST

Animal nutrition, feed product management, livestock waste recycling, livestock management and so on

AWARDS AND HONORS

2017 China Feed Industry Ingenuity Award

2018 China Feed Industry Role Model Award

BRIEF INTRODUCTION

Mr. Lu Shizhe (Paul Lu), born in 1960, graduated from the Institute of Animal Science, Taiwan University with a master's degree in Animal nutrition. After the civil service college entrance examination in 1987, he worked in the Yilan Branch of Taiwan Animal Production Testing Institute engaged in duck nutrition research. In 1992, he joined Taiwan CP Group as the technical director and successively served as the operation director of various business departments.

He joined Dacheng Foods (Asia) Limited in 2008 as Head of R&D and Marketing Planning. He was promoted to head of the feed business in 2013 and responsible for the operation of 30 feed factories in China, Vietnam and Malaysia. In 2017, he stepped down as group strategic advisor and Chairman of Dacheng Malaysia, and retired in October 2020. Currently, he is the technical advisor of Triple A Denmark in Asia.



講者簡歷

盧世哲 顧問

現職

丹麥 Triple A 公司亞洲區技術顧問

單位

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學歷

臺灣大學動物營養碩士

主要經歷

1988-1991：臺灣省畜試驗所宜蘭分所鴨營養研究

1992-2008：臺灣卜蜂企業股份有限公司技術與事業處主管

2009-2020：大成食品(亞洲)有限公司研發與飼料事業板塊主管

2020- 迄今：上海紐崔特技術諮詢平臺顧問

丹麥 TripleA 公司亞洲區技術顧問

專業和研究領域

動物營養，飼料生品管，畜牧廢棄物循環利用，畜牧一條龍經營管理等

獎項和榮譽

2017 年中國飼料業匠心人物獎

2018 年中國飼料行業榜樣人物獎

講者介紹

盧世哲先生，1960 年生，臺灣大學畜牧研究所動物營養學碩士，1987 年公務員高
考後曾任職于臺灣省畜試驗所宜蘭分所從事鴨子營養研究，1992 年加入臺灣卜蜂集團擔
任技術主管，先後擔任各事業處營運主管，2008 年底加入大成食品(亞洲)有限公司擔
任研發與行企劃主管，13 年提升飼料事業板塊主管，負責集團中國大陸，越南與馬來西
亞共 30 個飼料工廠的營運工作，于 2017 年退居二線，擔任集團戰略顧問與馬來西亞大
成董事長，而于 2020 年 10 月屆齡退休，目前擔任丹麥 Triple A 公司亞洲地區技術顧問。



Abstract of Presentation

Feed ingredients as an effective tool to reduce carbon footprint

Based on the animal's genetics and nutritional needs at different physiological stages and corresponding environmental conditions, providing the most appropriate feed or food, so that it has the maximum utilization efficiency and the lowest emissions and costs, is the so-called precision nutrition.

AX3 is a new type of concentrated protein raw material with high digestibility based on the latest patented technology produced by the University of Copenhagen. Due to its low acid binding capacity and very low anti-nutrient factors and low ash and low potassium characteristics, it can maintain a higher protein digestibility than fish meal (15% higher) or other soybean protein raw materials (more than 12% higher) in newly weaned piglets and other young animals, and the feed utilization efficiency improves FCR 0.1-0.3.

AX3 can reduce the undigested and unabsorbed protein content in the intestines of young animals, thus greatly reducing the abnormal fermentation of protein and toxin production in the intestines of young animals, so that the diarrhea or water of young animals after weaning will be significantly reduced, so that animals not only have better intestinal health and growth performance, but also reduce the proportion of weak pigs and increase the uniformity.

According to third-party certification by BUREAU VERITAS in Europe, AX3 can significantly reduce GWP emissions by 41% (including land use change) to 57% (excluding land use change) depending on the life cycle stage of the product.

A recent study compared its protein dynamics and found that the digestibility of AX3 protein was about 2.3 times that of fish meal and 3.2 times that of soybean meal within 20 minutes of entering the small intestine. It should be assumed that very high protein was rapidly absorbed through pinocytosis in the form of small peptides. Therefore, the use of AX3 protein could significantly improve feed utilization efficiency compared with other animal and plant proteins (FCR).



演講摘要

飼料原料作為減少碳足跡的有效工具

依據動物的遺傳與不同生理階段及相應環境條件下的營養需要，提供最適當的飼料或食物，讓其有最大的利用效率與最低的排放及成本，即所謂的精準營養。AX3 蛋白是基於哥本哈根大學最新的專利技術所生產的新型高消化率的濃縮蛋白質原料，因其低吸酸力與極低的抗營養因數及低灰分和低鉀等等特性，讓其在剛斷奶小豬與其他幼齡動物階段都能保持比魚粉（高 15%）或其他大豆蛋白質原料（高 12% 以上）高的蛋白質消化率與較好的飼料利用效率（改善 FCR 0.1-0.3）。使用 AX3 蛋白會減少幼齡動物後腸道內的未消化與未吸收蛋白質含量，因而可以大幅減少蛋白質在後腸道的異常發酵與毒素的產生，所以讓幼齡動物的斷奶後腹瀉或水便明顯減少，讓動物不僅有較好的腸道健康與生長表現，同時可以減少弱小豬的比例並增加整齊度。經歐洲 BUREAU VERITAS 協力廠商認證，依產品的生命週期階段分析，AX3 蛋白可明顯降低 GWP 的排放達 41%（含土地利用變化）到 57%（未包含土地利用改變）。最近研究比較其蛋白質動力學，發現 AX3 蛋白在進到小腸 20 分鐘內，其消化率約為魚粉的 2.3 倍，豆粕的 3.2 倍，應該有極高的蛋白質是以小肽的形態經由胞飲方式快速吸收，所以使用 AX3 蛋白後，能比其他動植物性蛋白質大幅地改善飼料利用效率（FCR）。



Brief Resume

Po-Lun Chien

Company

InnoRs Biotechnology Co., LTD.

Title

Chairman and General Manager

Education

Department of Life Science, NCHU





講者簡歷

錢柏綸

任職單位

循創生物科技股份有限公司

職稱

董事長兼總經理

學歷

中興大學生命科學系



Abstract of Presentation

Production and Application Achievements of Black Soldier Fly in Feed Industry of Taiwan

InnoRs Biotechnology is a Taiwan-based company specializing in the large-scale application of black soldier fly (BSF). The company is dedicated to developing local BSF farming techniques, production equipment, and processing methods. This presentation will share InnoRs' experience in the production and application of BSF insect protein. The first part will focus on how BSF farming management and processing procedures impact the product's five major nutrients, amino acid composition, and digestibility. Following that, we will provide an overview of the functional substances found in BSF insect protein and share case studies of its application in feed formulations from the perspectives of nutritional balance, functionality, and cost-effectiveness. The aim is to offer industry professionals, government officials, and academic experts a reference for BSF insect protein quality standards and application guidelines.



演講摘要

黑水蛇在台灣飼料領域的生產及應用實績

循創生物科技是臺灣專精於黑水蛇規模化應用的公司，致力於開發在地的黑水蛇養殖技術、生產設備及產品製程。本次報告將分享循創團隊對黑水蛇昆蟲蛋白的生產及應用經驗，前半段將聚焦於黑水蛇養殖管理和加工程序對產品的五大營養、胺基酸組成及消化率的影響；隨後針對黑水蛇昆蟲蛋白中的功能性物質進行簡介，並從營養平衡、機能性、以及性價比的角度分享其在飼料配方中的應用案例，期許對與會產官學先進提供黑水蛇昆蟲蛋白的品質標準和應用方針參考方向。



Brief Resume

Tung Lung Kuo PhD candidate

POSITION

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PROFESSIONAL EXPERIENCE

Bachelor of Science in Animal Science from National Chiayi University

Master of Science in Animal Science from National Chiayi University

Military service on a diplomatic mission in Marshall Islands

Technical Specialist at Juyuan Biotechnology Co., Ltd.

Representative of Jiahe Agricultural Science Co., Ltd.

PhD candidate in the Department of Animal Science and Technology at National Taiwan University

SPECIALITY AND RESEARCH FIELD OF INTEREST

Poultry nutrition, Feed formulation, Microbial fermentation technology, Livestock waste utilization

BRIEF INTRODUCTION

Tung Lung Kuo is currently a PhD candidate under Professor Hen Wei Wei in the Poultry Nutrition Laboratory of the Department of Animal Science and Technology at National Taiwan University. His expertise includes poultry nutrition, feed formulation, and microbial fermentation technology. His research focuses on utilizing poultry waste through microbial and extrusion methods, particularly in enhancing feather digestibility and investigating the nitrogen-corrected metabolizable energy of feather meal in poultry feed formulations.





講者簡歷

郭東隴博士候選人

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桔園生技有限公司技術專員

嘉禾農業科學有限公司代表人

台灣大學動物科學技術學系博士研究生

專業和研究領域

家禽營養學、飼料學、微生物發酵技術、畜牧廢棄物資源化

講者介紹

郭東隴目前為台大動科系家禽營養研究室魏恒巍老師之博士研究生，專長為家禽營養、飼料配方與微生物發酵技術，目前研究方向以利用微生物法或擠壓法進行家禽廢棄物資源化，以微生物發酵工程與擠出機擠壓方法進行羽毛之化製，提升羽毛之動物可消化率，並探討其在家禽之氮矯正代謝能及飼料配方之應用。



Abstract of Presentation

Feather Rendering Methods: A Brief Overview

Feathers are a major byproduct of the poultry industry, accounting for 5-7% of poultry body weight. Feathers contain approximately 90% crude protein and can serve as a protein source for feed. However, the main component of feather protein is keratin, which has a stable structure due to its high content of disulfide and hydrogen bonds, making it difficult for animal proteases to digest and absorb. Typically, feathers are processed using high-temperature and high-pressure hydrolysis to produce hydrolyzed feather meal, which improves the digestibility and absorption of feathers by animals. However, this method is costly and can lead to the loss of some amino acids, such as lysine and cystine. Extrusion technology, although rarely applied in feather processing, has long been used in the food industry and may be a cost-effective alternative. Additionally, microbial fermentation can effectively degrade feathers and improve their digestibility. Both methods hold potential for reducing the cost of feather processing. When exploring feather processing methods, it is essential to consider not only the cost but also the availability to animals. While pepsin digestibility can be quickly assessed, it is necessary to combine this with animal metabolism trials to establish its bioavailability, serving as a reference for subsequent applications.



演講摘要

生羽毛化製方法之淺析

羽毛是家禽產業的主要副產品之一，佔家禽體重的 5-7%。羽毛含有約 90% 的粗蛋白質，可以作為飼料的蛋白質來源。然而，羽毛蛋白質的主要成分是角蛋白，含有大量的雙硫鍵和氫鍵，使其結構穩定且不易被動物體內的蛋白酶吸收利用。羽毛的化製通常利用高溫高壓水解法來生產水解羽毛粉，以提高動物對羽毛的消化吸收能力。然而，這種方法的生產成本較高，並且在過程中會造成一些氨基酸的損失，如離氨酸和胱氨酸。擠出技術是一種在羽毛處理中鮮少應用的方法，但已在食品工業中長期使用，可能是降低羽毛處理成本的替代方案。此外，利用微生物發酵法也能有效分解羽毛並提高其消化率。這兩種方法在降低羽毛化製成本方面具有潛力。在探討羽毛處理方法時，除了考慮成本外，還需考慮其對動物的可利用性。雖然胃蛋白酶消化率可以快速檢測，但仍需結合動物代謝試驗，以確立其生物利用率，作為後續應用的參考。



Brief Resume

Arne Heuer

Arne Heuer is Area Manager of AMANDUS KAHL, responsible for the Asia/ Pacific markets. He has been in AMANDUS KAHL since 2014 and has been active in the Asian market for more than 8 years now.

The expander technology has been one of his main fields of activities, especially in mature Asian expanders markets like Japan and Korea, but also in the fast-developing expander markets such as in Vietnam and Taiwan.

He is very familiar with all aspects of the use of expanders in feed milling, such as improved feed digestibility, an increase of pellet quality and pellet press capacity, hygiene, reduction of anti-nutritive factors for pigs, poultry and cattle feeds.

Through his work at AMANDUS KAHL, Arne is very familiar with general pelleting technology, too. In particular with the flat die pelleting technology, in which AMANDUS KAHL is a global technology leader.

He studied Industrial Engineering (B. Sc.) at the Nordakademie - University of Applied Sciences cooperating with AMANDUS KAHL in a dual education system.

Additionally, in 2024 he graduated with a Master of Science in Sales Management from FOM - University of Applied Sciences after completing its extra-occupational program.





Abstract of the Speech

KAHL expander technology brings precision to feed production. The interaction of temperature, moisture in the conditioning and pressure in the expander enables focused treatment of all feedstuffs for all animals, for efficient feed production and optimum animal nutrition.

Significant increase in pellet mill output, better pellet quality, increased starch modification, reduction of inhibitors, improved digestibility and much more. The precise process control of the expander makes this possible, adapted to the animal, adapted to the philosophy of the feed manufacturer. The result: better feed, higher product quality, higher efficiency, better animal health, lower costs, more profit.

The expander is most frequently used as a pressure conditioner directly upstream of the pellet press for the production of poultry, pig and cattle feed. In addition to conventional conditioning, the expander enables treatment with variably adjustable pressure. Starch modification is up to 45 - 55 %, liquids and oils are homogeneously mixed in and fibrous components are softened. The result in pelletising: a significant increase in the output of the pellet mill of approx. 25 - 100 %, depending on the type of feed and an improvement in pellet quality with the PDI approaching 97 - 98 %.

The efficient hygiene treatment made possible by the expander is important. The pressure drop at the expander outlet ensures high-quality hygienisation and thus contributes to the product safety of the feed.

Another key feature of the expander is the improvement in the digestibility of the feed. Many users are already utilizing this to make significant savings in recipe design. The pressure treatment in the expander has a direct effect: Starch is broken down particularly well, fibers become more digestible and protein digestibility increases. As a result, the metabolizable energy in the feed mixture is increased. This is where the animal nutritionist comes into play. High-priced, high-energy components in the recipe are reduced and replaced by lower costs components. The result: reduced costs for the feed mix with the same nutritional value.

In recent years, the treatment of various raw materials as individual components has become increasingly important, for example the efficient reduction of antinutritive substances such as trypsin inhibitors in full-fat soya, or for targeted starch gelatinization values in cereals such as maize. The KAHL expander with variable energy input and pressure setting enables highly product- and result-specific treatment in a wide range, exactly as required for optimum animal nutrition. This means a significant reduction in digestion-inhibiting trypsin inhibitor activity while maintaining good protein digestibility.

KAHL expanders are made in Germany and offer the highest quality. They can be used in any feed mill, as well as on all pellet mills available on the market. The entire process is controlled by the KAHL automation system.



Amandus KAHL is the leading manufacturer of expanders worldwide. Expander technology for feed was introduced by Amandus KAHL almost 40 years ago and in many countries the KAHL expander is an essential technology component in feed production. In Taiwan, expander technology was introduced by Amandus KAHL almost 20 years ago and is now used very successfully in many feed mills, especially for pig, broiler and duck feed production.



演講摘要

KAHL 膨化機技術使得飼料生產更加精準。調質的溫度、濕度和膨化機中的壓力，在相互作用下熱處理所有動物完全飼料，從而實現高效的飼料生產和最佳的動物營養。

膨化機的精確製程控制，使得製粒機的產量會顯著增加，顆粒品質會更好，澱粉糊化度增加，抗營養因子減少，消化率提高等等變成可能；同時生產適合於動物的飼料，並且符合飼料製造商的理念。結果是：更好的飼料、更高的產品品質、更高的效率、更好的動物健康、更低的成本、更多的利潤。

膨化機最常用作製粒機上方的深度調質機，用於生產家禽、豬和牛飼料。除了傳統的調質機之外，膨化機還可以透過可調變的錐頭壓力進行處理，使得澱粉糊化度高達 45-55%，液體和油混合均勻，纖維成分軟化。製粒結果：製粒機的產量顯著增加約 25 - 100%，取決於飼料類型和顆粒品質的改善（PDI 接近 97 - 98%）。

膨化機的高效殺菌處理非常重要，由於膨化機出口處的壓力降，確保了高品質的殺菌效果，從而有助於飼料的產品安全。

膨化機的另一個主要特點是提高飼料的消化率。許多用戶已經利用這一點在配方設計方面節省了大量成本。膨化機中的壓力深度調質處理有直接效果：澱粉分解得特別好，纖維變得更容易消化，蛋白質消化率增加，這樣飼料混合物中的代謝能增加。這就是動物營養師可以發揮作用的地方，配方中的高價、高能量成份得以減少，並被成本較低的成份所取代。結果降低了具有相同營養價值的飼料混合物的成本。

近年來，將各種單味原料加工盛行，例如有效減少全脂大豆中的胰蛋白酶抑制等抗營養物質，或玉米等穀物中的目標澱粉糊化值。KAHL 膨化機具有可變的比動能輸入和壓力設置，可在廣泛的範圍內高度針對產品特性需求和結果作處理，完全符合最佳動物營養的要求。這意味著抑制消化的胰蛋白酶抑制劑活性顯著降低，同時保持良好的蛋白質消化率。

KAHL 膨化機是德國製造，提供最高品質，它們可用於任何飼料廠，以及市場上的所有製粒機。整個製程都由 KAHL 自動化系統控制。

Amandus KAHL 是全球領先的膨化機製造商。飼料膨化機技術由 Amandus KAHL 於大約 40 年前推出，在許多國家，KAHL 膨化機是飼料生產的重要技術組成部份。在台灣，膨化機技術由 Amandus KAHL 於近 20 年前引入，現已在許多飼料廠中得到非常成功的應用，特別是在豬雞飼料和鴨飼料的生產中。



Brief Resume

Frank Landmeco





2024 第四屆動物精準營養國際論壇



Brief Resume

梁佑全 博士 (Dr. Yu-Chuan Liang)

POSITION

Associate Research Specialist, Agricultural Biotechnology
Research Center, Academia Sinica

AFFILIATION

單位名稱：Agricultural Biotechnology Research Center

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EDUCATION

Ph.D., Department of Animal Science, Tunghai University

PROFESSIONAL EXPERIENCE

Assistant Research Specialist, Agricultural Biotechnology Research
Center, Academia Sinica, Taiwan

Research Coordinator, Erimos Pharmaceuticals LCC., USA

Post-doctoral Fellow, Biology, Johns Hopkins University, USA

Post-doctoral Fellow, Biology, Tunghai University, Taiwan

SPECIALITY AND RESEARCH FIELD OF INTEREST

AI application in livestock; drug-resistant pathogen; skeletal muscle biology

BRIEF INTRODUCTION

Dr. Liang obtained his Ph.D. in Animal Science from Tunghai University, where he specialized in skeletal muscle development. He is currently an associate research specialist at the Agricultural Biotechnology Research Center, Academia Sinica, and oversees the Laboratory Animal Core Facility at ABRC, Academia Sinica.

Prior to his current role, Dr. Liang conducted research on drug development for treating drug-resistant pathogens at Johns Hopkins University and Erimos Pharmaceuticals LLC. Upon returning to Academia Sinica, his research has focused on the use of phytogenics to combat drug-resistant pathogens and as feed additives to promote skeletal muscle growth. Concurrently, Dr. Liang has introduced AI technologies to enhance the management of animal husbandry and health control. This integration of AI in animal science has led him to collaborate on various research topics, including fluid dynamics, animal nutrition, animal physiology, veterinary science, electrical engineering, and computer science.

Through his innovative approach of combining animal science and AI technologies, Dr. Liang has established interdisciplinary collaborations within the animal industry and animal health domains.





Abstract of Presentation

The precise role of artificial intelligent on reducing antibiotic use in livestock production

The livestock industry in Taiwan is encountering multiple challenges and technical needs, including human resource, monitoring of harmful chemicals and bacteria, automatic sensing, manure recycling, antibiotic-free zoonotic prevention, artificial intelligence and internet of things, big data storage, analysis and digitalization, etc. While mechanization can alleviate some labor works, antibiotics can be used for disease treatment and prevention. However, antibiotics leads to the drug resistant pathogens which made environmental protection, food safety and agricultural sustainability more difficult to address. Several equipment providers are attempting to address these challenges by applying AI techniques to environmental parameter analysis. However, most efforts lack the inclusion of biological parameters and advanced generative AI methodologies. Here, we integrated IoT sensors, equipment, big data analysis of environmental and animal biological parameters, machine deep learning, and algorithms to develop an Artificial Intelligence Animal Production System. This system not only monitors and analyzes the physiological parameters of animals but also employs big data analysis and automated diagnostic systems to mitigate the risk of disease occurrence and spread. Furthermore, it recommends the most effective antibiotic-free prevention and treatment strategies. AI animal production systems enhance breeding efficiency and animal health while addressing antibiotic resistance, thereby making a significant contribution to safeguarding the health of both humans and animals.



演講摘要

AI 在禽畜飼養減抗的精準角色

台灣畜牧產業面臨人力、環保、食安、熱緊迫與疾病等問題。雖然牧場機械自動化可改善部分人力需求，抗生素可用於疾病治療或預防。卻衍生出更嚴重的抗藥病原體，使得環保、食安與農業永續無法解決且更加嚴峻。因此，在農業機械自動化後，導入人工智慧 (AI)，希望能解決上述問題。目前國際設備大廠雖有標榜智慧化禽畜飼養系統，但偏重環境參數監測與 AI 初階分析，缺乏生物參數和 AI 高階分析。主要仍有關鍵性技術缺口，包括減少或無抗生素使用、環境化學物質與病原體監測、生理數據感測、機械裝置與物聯網整合、演算法與解決方案提供等。我們利用智慧設備與互聯網，整合現有禽畜飼養設備，收集環境及生物 (禽畜生理) 參數，建立環境和生物數據資料庫，利用高速計算與機器學習，建立「AI 動物生產系統」高階演算法。AI 動物生產系統可通過監測和分析動物的生理參數 (年齡、聲紋、體溫、體重、採食、飲水量與臨床外觀)、飼養環境參數 (溫濕度與空氣品質)、大數據分析 (預測疾病發生的可能性和趨勢) 與自動診斷系統等；實現早期干預，減少疾病發生與擴散的風險，精準建議最有效的無抗生素預防與治療方案，避免抗生素過度使用。「AI 動物生產系統」不僅能夠提高飼養效率和動物健康，更助於解決抗生素帶來的抗藥性問題，對於保護人類和動物的健康具有重要意義。

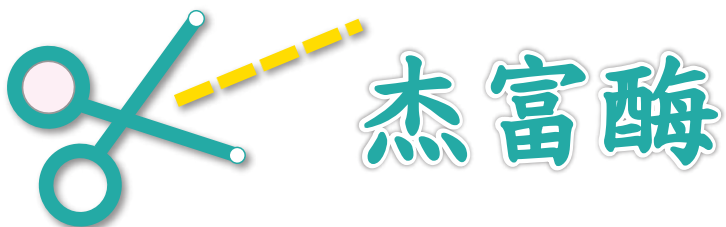


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illumina NovaSeq X Plus

動/植物全基因組定序 Whole Genome Sequencing

定序平台：illumina NovaSeq X Plus / NovaSeq 6000

定序規格：150 PE

建議定序深度： $\geq 20X$ average coverage

收樣標準：gDNA ≥ 1 ug (Qubit), 體積 ≥ 20 ul
濃度 ≥ 40 ng/ul, OD260/280 1.8-2.2, OD260/230 > 2.0

生物資訊分析：1. 僅限具有參考基因組(reference genome)物種
2. 資料交付格式為fastq、bam、vcf, vcf包含SNV、short insertion與deletion

RNA-Seq Quantification

定序平台：illumina NovaSeq X Plus / NovaSeq 6000

定序規格：150PE, 20M clean paired-reads per sample

定量分析 [Total RNA總量 ≥ 1 ug (Qubit), 體積 ≥ 20 ul, 濃度 ≥ 40 ng/ul]

定性分析 [Bioptic Qsep100 RQN ≥ 6.5]

微生物宏觀基因組定序 Shotgun Metagenomics

定序平台：illumina NovaSeq X Plus / NovaSeq 6000

定序規格：150 PE

建議定序深度：10G 或以上

收樣標準：gDNA ≥ 500 ug (Qubit), 體積 ≥ 20 ul, 濃度 ≥ 40 ng/ul, OD260/280 1.8-2.2, OD260/230 > 2.0

文庫純定序 Library Sequencing

定序平台：illumina NovaSeq X Plus

定序規格：Per lane (~375Gb) for novaseq X 10B flow cell

Per lane (~1000Gb) for novaseq X 25B flow cell

生物晶片服務 Genotyping microarray

儀器平台：illumina iScan

晶片規格：BovineHD、Porcine、Ovine、Human Infinium Arrays

收樣標準：1. gDNA ≥ 500 ng (Qubit), 體積 ≥ 10 ul, 濃度 ≥ 40 ng/ul, OD260/280 1.8-2.2, OD260/230 > 2.0
2. High-quality genomic DNA with minimal fragmentation

營養 NUTRITIOUS 環保 SUSTAINABLE 乾淨 CLEAN

- 來自台灣的黑水虻專業團隊

循創生物科技以黑水虻養殖為起點，希望透過熱忱以及所學，為環境議題提供更為友善的解方。循創生技用追求細節、重視科學的態度，一步步建立黑水虻生質資源轉化模式的技術體系以及商業模式，並逐步完善昆蟲資材在水產、畜產、農業甚至寵物領域的品保規範以及市場教育。循創生技會持續精進，直至成功打造一條正向於社會的循環經濟產業鏈。



100%植物性食料

使用包含新鮮豆渣、水果渣等原料餵養，充分符合國內外產品指標。



安全成分

採用維他命E等天然抗氧化劑、不含衣索金、香精、色素或化學防腐劑。



科學化製程

標準化的食料、養殖週期及加工程序，確保產品穩定且安全。



第三方檢驗

產品經國際認證之第三方機構檢驗，均通過各式有害物質及營養組成測定。

低碳昆蟲蛋白與永續農業資材

黑水虻昆蟲蛋白含有均衡的胺基酸、高比例的月桂酸及豐富的微量元素，同時具有改善腸道菌相、調節免疫功能、低致敏性以及毛皮和關節保健等機能 and 特性。黑水虻蟲砂則富含蟲糞、蟲蛻和粗纖維，可提升土壤幾丁質及有機質含量，並強健植物根系。



◀ 黑水虻幼蟲只需7天即可將豆渣轉化為營養豐富的「蟲砂」。

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200g 1kg

1. 調整土壤酸鹼值恢復地力，減少運作障礙。
2. 颱風後或氣候異常時期可加強使用，強健植株降低災損。
3. 降低化學農藥使用量，減少藥劑殘留。
4. 作物收成後耐儲運，延長儲架壽命。



弧立減 - 水產 - 微生物水質改良劑

抑制弧菌、提高育成有效菌
數高達100億CFU/g

200g 1kg

1. 使用白蝦腸道篩選之強勢菌種，經證實可有效抑制水中95%以上弧菌種類。
2. 輔助芽孢桿菌可幫助抑制水中其他常見病原菌，如無乳鏈球菌、愛德華氏菌、產氣單胞菌、仙人掌桿菌等。
3. 在水中形成優勢菌種，減少病原菌危害，提高養殖水產育成率。
4. 添加飼料時可進入消化道，達到抑制消化道病原菌功效，減少魚蝦腸胃疾病。

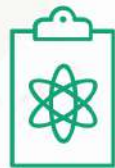


肥利寶 - 家畜 - 機能性飼料添加劑

促進生長 肉量提升
富含高單位促生胜肽

1kg 25kg

1. 富含高單位胜肽，經由腸胃道吸收後，可增強生長作用機制，持續加速肉質增生。
2. 提高家畜肌肉量，減少腹腔油脂堆積，肉品質相好。



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樣品提供、確認



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