Safeguarding Public Health Against Animal Diseases, Zoonotic Challenges, and Livestock Concerns

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Edited by

Aneela Zameer Durrani,
Muhammad Aftab
and Sadia Sanaullah

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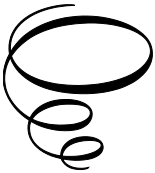

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PREFACE

We are pleased to welcome national and international scientists to the International Conference on Health Security 2023. This conference aims to bring experts together from various fields to discuss the latest developments in health security and share knowledge and insights into how to improve global health security. The conference is organized to address a broad range of topics related to health security, including emerging infectious diseases, global health governance, disaster preparedness and response, bioterrorism, biosafety and biosecurity, public health surveillance, and risk communication. The conference provides a unique opportunity for researchers, policy makers, public health practitioners, and other stakeholders to engage in meaningful discussions on the challenges and opportunities facing the global health security community. This book contains a collection of abstracts submitted by authors around the world, highlighting their research and perspectives on health security. The abstracts cover a wide range of topics, reflecting the breadth and diversity of the conference. Each abstract provides a concise summary of the research and findings, as well as key insights and recommendations for future research and practice. The conference brings together experts from academia, governmental, nongovernmental organizations, and private sector to foster collaboration and build networks to advance health security. The conference program includes plenary sessions, workshops, and poster presentations, providing attendees with opportunities to share their experiences, learn from each other, and identify potential collaborations. The International Conference on Health Security aims to foster a better understanding of health security, and to catalyze efforts to address the most pressing health security challenges facing the world today. We hope that this abstract book inspires new ideas, collaborations, and initiatives to improve global health security. We would like to express our gratitude to all the authors who have contributed to this abstract book and to the organizing committee and sponsors who have made this conference possible. We hope that this conference will be a fruitful and enjoyable experience for all participants, and we look forward to the outcomes and impact it will have on the global health security community.

ACKNOWLEDGEMENTS

The successful publication of this proceeding book would not have been possible without the contribution and support of many individuals and organizations. We would like to express our gratitude to all those who have played a vital role in making this proceeding book a reality.

We would like to thank all the authors who submitted their abstracts to the International Conference on Health Security 2023. Your contributions have greatly enriched the content of this proceeding book and helped to ensure the success of the conference
.
We would also like to thank the members of the organizing committee of this conference for their dedication, hard work, and invaluable contributions to the planning and execution of the conference. Their tireless efforts ensured successful conferences and helped create a meaningful platform for experts in the field of health security to share their knowledge and insights.
We extend our gratitude to the conference sponsors and partners whose generous support made this event possible. Their support enabled us to provide exceptional conference experience for attendees, and we hope that the outcomes of the conference will reach a wider audience.
Finally, we would like to express our appreciation to the staff of the conference secretariat for their commitment, support, and tireless efforts in coordinating the logistics of the conference and the publication of this proceeding book.

Once again, we extend our sincere greetings to all those who have contributed to the publication of this proceeding book, and we look forward to continued collaboration and success in promoting global health security.

Sincerely,

Prof. Dr. Aneela Zameer Durrani
Organizing Secretary

Dr. Zahid Farooq
Co-Organizing secretary

INTERNATIONAL SPEAKERS

A High-protein Chicken Diet Reduces High-fat-induced Fat Accumulation and Transcriptomics Related to Lipid Biosynthesis in the Epididymal Adipose Tissue of Rats

Dr Shangxin Song

Dr. Shangxin Song received a doctoral degree in food science from Nanjing Agricultural University in June 2016. From Feb. 2014 to Feb. 2016, she visited the Nutrition, Metabolism and Genomics Group in the Division of Human Nutrition at Wageningen University (the Netherlands).

Shangxin Song 1*, Sher Ali 3, Yulin Gao 1, Tianlan Xia 1, Yefei Zhou 1, Chunbao Li

Abstract

The impact of high-protein diets on body fat regulation is still disputed. This study explored the effects of chicken protein at high (40%E, HCK) or normal (20%E, CK) levels on body fat accumulation and epididymal adipose tissue (EAT) transcriptomics in rats fed high-fat diets for 84 d. Blood insulin, glucose, adipokines and inflammatory factors were also measured. Compared with the CK diet, the HCK diet significantly reduced body weight gain (by 15%), EAT mass (by 18.4%) and adipocyte size (by 18.8%) without affecting the food intake of the rats. Blood insulin and glycosylated serum protein were reduced by the HCK diet. The HCK diet downregulated EAT transcriptomics related to the biosynthesis of cholesterol, triglycerides and fatty acids, which was highly correlated with the top downregulated hub genes of Insig1, Srebf2, Hmgcs and Fasn. Together, a high chicken protein diet reduced high-fat-induced EAT fat accumulation and transcriptomics related to lipid biosynthesis in rats.

Keywords: high meat protein diet, obese, lipid metabolism, transcriptomics

Technological Innovations and Development Trends in Beef Product Processing

Zhu Chaozhi[1*] Sher Ali[2]

Dr Chaozhi Zhu, Associate Professor and Associate Dean, College of Food Science and Technology, Henan Agricultural University, Zhengzhou, China. She is currently the deputy director of the Department of Food Science and Engineering of Henan Agricultural University, the director of the Office of Henan Meat Processing and Safety International Joint Laboratory, and a member of the Chinese Association of Animal Product Processing. The main research areas are meat processing and nutritional regulation, protein function and structure–activity relationships.

Abstract

China has a vast territory, diverse terrain, and a large climate span; thus, beef cattle vary, and an uneven breeding environment exists. There are great differences in the sensory, nutritional and processing characteristics of beef across different growth regions, varieties, ages, genders, parts and breeding methods. The beef processing rate has increased from less than 3% to more than 10%, but the homogeneity of beef products on the market is high, and the product form cannot meet the needs of consumers. The product is single, and a large number of boneless minced meat and leftover materials are produced in the production process, resulting in a large amount of waste and seriously damaging the economic benefits of the enterprise. The consumption demand of beef products greatly differs among consumers of different ages, occupations and physiological conditions. The project focuses on the chain of "processing platform - processing technology - new products", constructs a technical support chain along the industrial chain and value chain, applies the technology to business entities (enterprises, cooperatives, pastures and farmers), and promotes the extension of the industrial chain. The quality and processing characteristic data of beef from different sources were collected and analysed, the existing data were integrated, and a beef processing visualization platform was established to realize the leading role in beef processing. We have established raw meat quality control, tenderness differentiation control and high-value product processing technology and created new beef products and equipment to improve the scientific and technological innovation level of beef processing in China.

Keywords: Beef processing, innovative technologies, development trends

Emerging Animal Diseases in China

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Reviewer of Frontiers in Immunology、Phytomedicine、BMC Genomics, Frontiers in Microbiology, Scientific Reports, International Journal of Molecular Medicine, BioMed Research International, Frontiers in Veterinary Science、The Lancet Regional Health-Western Pacific.
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[*]Presenter

Abstract

Emerging animal diseases pose significant challenges to the health of humans and other animals worldwide. These diseases can severely damage any country's economic growth, food supply, or environmental vitality. Research has shown that new livestock diseases will tend to arise in the coming years. Hence, the focus has been on the more macroscale factors that contribute to the emergence of diseases, such as changes in husbandry practices, international trade, and environmental destruction. Each of these factors has the potential to facilitate the transfer of any microorganism from one country to another, with potentially lethal results. The emergence of severe acute respiratory syndrome (SARS), highly pathogenic avian influenza (HPAI) H5N1, avian influenza H7N9, severe fever with thrombocytopenia syndrome (SFTS), brucellosis, and other diseases in livestock has had a significant impact on China's national economy as well as the country's public health system. Both social and environmental factors continue to play a role in the emergence and re-emergence of these infectious diseases. The Chinese government has devised new strategies and measures to address these challenges. Some of these measures include the issuance of laws and regulations, the establishment of disease reporting systems, the implementation of special projects for interdisciplinary and international co-operations, and exotic disease surveillance agencies by

providing research funding, e.g., the National Natural Science Foundation of China. These strategies and precautions have the potential to serve as models for monitoring and responding to ongoing threats posed by newly developing and re-emerging livestock diseases in other partner countries, particularly after China's Belt and Road Initiative.

Keywords: Livestock, public health, SARS, avian influenza

Single and Combined Effects of *Clostridium butyricum* and Coccidiosis Vaccines on the Growth Performance and Intestinal Microbiome of Broiler Chickens

Professor Dr. Mingfei Sun
Director of Institute of Animal Health, Guangdong Academy of Agricultural Sciences. As the head of the Parasitic Featured Subject Team of GAAS, he carried out innovative work in the field of veterinary parasitic disease prevention and control technology research, successively presided with more than 16 national and provincial research projects, 3 provincial- and ministerial-level science and technology awards, and 27 national invention patents.

Abstract

Avian coccidiosis is an important intestinal protozoan disease that has caused major economic losses to the poultry industry. *Clostridium butyricum* not only maintains the stability of the intestinal barrier but can also improve the production performance of broiler chickens. We studied the effects of feeding *C. butyricum* alone, the coccidiosis vaccine alone, and the combined administration of *C. butyricum* and the coccidiosis vaccine on the body weight gain, feed consumption, and feed conversion ratio of broilers. Moreover, the intestinal contents of 8- and 15-day-old broilers were collected, and their intestinal microbiome was characterized via high-throughput sequencing of the V3–V4 region of 16S rDNA. We analysed the oocysts per gram values and lesion scores in the *C. butyricum* alone group, in the group challenged with the coccidiosis-causing parasite *Eimeria*, and in the groups simultaneously challenged with *Eimeria* and pretreated with *C. butyricum*, the coccidiosis vaccine, or the combination of *C. butyricum* and the coccidiosis vaccine. Intestinal tissue samples were collected from 32-day-old broilers for microbiome analysis. Our results showed that the combination of *C. butyricum* with the coccidiosis vaccine significantly improved the performance of broiler chickens and significantly reduced the number of oocysts per gram and the number of intestinal lesions caused by *Eimeria* sp. infection. Furthermore, *C. butyricum* and the coccidiosis vaccine administered alone or in combination significantly increased the relative abundance of the immune biomarker genus *Barnesiella*. The significant increase in the abundance of Clostridia_UCG.014, the *Eubacterium coprostanoligenes* group and *Bacteroides* was a key factor in controlling *Eimeria* sp. infection.

Keywords: *C. butyricum, Eimeria* sp., coccidiosis, vaccine

Management of Alpine Grasslands on the Qinghai–Tibetan Plateau to Cope with Climate Change

Dr. Shikui Dong
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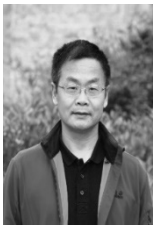
School of Grassland Science
Beijing Forestry University, Beijing, China
He served as an Invited Scientist for the Environment Impact Assessment Center for China's Ministry of Environmental Protection.

Abstract

The Qinghai-Tibetan Plateau (QTP) is a unique eco-region called the "Roof of the World" because of its high elevation, "Third Pole on Earth" because of its alpine environment and "Water Tower in Asia" because of its head water location. The alpine grasslands cover more than 60% of the QTP, which is approximately 1/4 of China's total territorial lands. The QTP's grassland ecosystems not only provide important ecological services and functions such as biodiversity conservation, carbon storage, and water resource regulation at a global scale but also provide critical ecosystem services such as pastoral production and cultural inheritance at local and regional scales. However, the sustainability of the QTP's grassland ecosystems is being challenged by both anthropogenic and nonanthropogenic disturbances with rapid global change. To mitigate the negative impacts of climate change on alpine grassland ecosystems, we conducted manipulation studies to examine the effects of grazing regimes and grazing intensity on the plants and soils of QTP grassland ecosystems in response to climate change. We found that rotational grazing with moderate grazing intensity in the warm season may retain or promote plant height, cover, productivity and biodiversity and improve soil fertility and microbial biomass. Overgrazing in the form of continuous grazing with heavy grazing intensity can lead to reduced plant diversity and productivity and decreased soil fertility. Long-term grazing exclusion cannot effectively mitigate problems of grassland degradation and instead can lead to reduced grassland productivity and declining soil quality. Sustainable grazing management with rational grazing regimes and sound grazing intensity can promote grassland ecosystem health and maintain grassland ecosystem services on the QTP in the era of climate change.

Keywords: carbon storage, grassland degradation, pastoral production, Qinghai-Tibetan Plateau (QTP), rotational grazing

Thiram-induced Hyperglycemia Causes Tibial Dyschondroplasia by Triggering Aberrant ECM Remodelling via the Gut–Pancreas Axis in Broiler Chickens



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Abstract
Thiram, a pesticide extensively used in agriculture, has been shown to cause tibial dyschondroplasia (TD) in birds. However, the fundamental process is still unknown. This study used multiomics analysis to examine the molecular pathways associated with TD in broilers exposed to low concentrations of thiram. An integrated transcriptomic, proteomic, and metabolomic investigation revealed that thiram activity promotes pathological ECM remodelling by inhibiting glycolysis and activating the hexosamine and glucuronic acid pathways. Surprisingly, we discovered that hyperglycemia was a critical determinant of ECM overproduction, which led to the cause of TD. We also found that islet secretion failure caused elevated glucose levels in thiram-treated broilers. A number of variables, including lipid dysregulation, low-grade inflammation, and gut flora disruption, may lead to insulin secretion dysregulation. For the first time, the current study demonstrated the underlying toxicological processes of thiram-induced tibial dyschondroplasia in chickens via blood glucose disturbance under the gut pancreas axis, making it easier to determine pesticide risks for worldwide policy decisions.

Keywords: Pesticides, thiram, tibial dyschondroplasia, ECM remodelling

Tick-borne Zoonotic Severe Fever with Thrombocytopenia Syndrome in Animals

Dr. Joon Seok Chae
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Areas of interest

Virus, gene, and ecology

His scientific interests lie mostly in Ehrlichia, Virology, Zoology, Anaplasma and Microbiology.

Abstract

Severe fever with thrombocytopenia syndrome (SFTS) is caused by a tick-borne *Dabie bandavirus* in the Phenuiviridae family. SFTS virus (SFTSV) is a Group V negative single-strand RNA virus. The vector of SFTSV is an Ixodid tick, the main vector is *Haemaphysalis longicornis*, and the virus has been detected from *H. flava*, *Ixodes nipponensis*, and *Amblyomma testudinarium*. SFTS is an emerging infectious disease first discovered in China in 2009. In 2011, the first human infection with the SFTS virus was officially reported in Western China and then reported in Japan and the Republic of Korea (ROK) in 2013. Since then, the detection of SFTSV and antibodies has been reported in humans, animals, and ticks from Asian countries, including Pakistan, Vietnam, Thailand, Myanmar, and Taiwan. SFTS is characterized mainly by fever, leukopenia, thrombocytopenia, and elevated liver function values in humans and a few animal species, dogs, cats, and cheetahs. The SFTS virus primarily infects humans and animals through tick biting. Secondary infections have been confirmed by the human-to-human transmission of the SFTS virus and secondary transmission from companion animals, dogs and cats to humans. According to an epidemiological study of the serologic and molecular prevalence of SFTS virus from companion animals, livestock and wild animals, viral antigens and antibodies were detected in 14 animal species (dog, cat, cow, goat, horse, chicken, duck, alpaca, geese, wild boar, Korean water deer, white-tail deer, raccoon dog, and rodents) in the ROK. These results indicate that the SFTS virus is circulated in ticks and animals in natural environments. It is a very important issue for public health. The government should establish guidelines for the infection of the animal SFTS virus to

ensure that there are no secondary infections of animal-related workers or guardians of companion animals.

Keywords: tick-borne diseases, zoonosis, SFTS virus

Broiler Chicken Production System in China

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Director of the Production and Environmental Control Laboratory of Broilers of the China Agriculture Research System of the Ministry of Finance (MOF) and MARA.

Abstract

White feathered broilers are raised worldwide because of their high reproduction rate, short growth period and high feed conversion rate. It has obvious advantages in modern intensive farming, such as grain savings, land costs and environmental costs. In the past 20 years, Professor Zhang Hongfu's team has gradually solved the problems faced by China's broiler industry, such as the low level of breeding technology facilities, abuse of antibiotics and veterinary drugs, high fatality rates, and high food safety risks, and innovated and established a healthy broiler production system with a multilayer cage rearing mode. This technology has been used for systematic research and integrated application from feed nutrition, the breeding environment, facilities and equipment, automatic intelligent management and other aspects, forming advanced systematic farming technology. With respect to feed nutrition, key technologies have been developed for the development of herbal extract additives with applicable schemes, efficient utilization of nutrients and improvement of disease resistance. In terms of breeding environment control, an efficient three-dimensional feeding process for broilers based on precise and optimized environmental control has been established, which has achieved systematization and standardization. Automation and intelligent technology have been used to develop precise control and traceability management in all aspects of production, covering the "single house control - farm management - whole industry chain" of broiler production. Compared with the traditional mode, the health production system increases the single farm size from 50,000 ~ 100,000 to 400,000 ~ 600,000 broilers and increases income by 1.5~2.0 RMB. The European Performance Index (EPI) has reached more than 400. Moreover, an antibiotic-free broiler farming system

was also introduced. Since 2015, this broiler system has been widely promoted and applied in China; it has radiated 80% of the production of white-feathered broilers and has achieved significant economic, social and ecological benefits.

Keywords: broilers, European Performance Index (EPI), feed nutrition, herbal extract, multilayer cages

How has China's Rural Landscape Transformed through Rural Ecommerce? The Case of "Taobao Villages"

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Abstract

Amar Razzaq[1] and Muhammad Zahid Farooq[2] China have made remarkable progress in rural e-commerce in recent years. According to the most recent estimates, the country's rural internet penetration rate has reached 34%, with approximately 200 internet users in rural areas. Rural online retail sales totaled RMB 12.56 billion, accounting for 17.4% of total retail sales in China. With current sales of RMB 22.32 billion, the agricultural retail industry accounts for 18% of rural online retail sales. The Chinese government and the Alibaba Group have been instrumental in this remarkable achievement. The Chinese government has made significant investments in rural digital networks and infrastructure over the years. Furthermore, through the Rural Taobao Initiative, Alibaba has established approximately 10,000 service stations in the rural areas of 22 provinces. Clusters of rural online entrepreneurs who have opened shops on Taobao Marketplace, known as "Taobao Villages," began to emerge in China in 2009. A village is designated a "Taobao village" if at least 10% of its residents are actively engaged in e-commerce or if at least 100 active online stores with annual sales of RMB 1.5 million are established in the Taobao marketplace. There are currently 3,202 Taobao villages in 24 Chinese provinces. These villages have approximately 660,000 online stores, which employ over 1.8 million people. These villages' annual transaction volume is approximately 31 billion RMB. Taobao villages and Taobao towns have played important roles in promoting local economic development in some areas. In this paper, we discuss two case studies of Taobao villages in the Shiyan and Zhijiang counties of Hubei Province. In Shiyan, a Taobao village called Xiayingcun capitalized on its existing reputation for selling turquoise stone and grew into a Taobao village with 14 million RMB in annual sales. In Zhijiang, the local government and Alibaba have taken a unique approach to promoting Taobao village. Subsidies and incentives are used to support this model, with the government providing subsidies to

established companies to establish their units in the village while also providing incentives to villagers to participate in rural e-commerce. Both approaches have been successful in creating jobs and alleviating poverty in these rural areas. This paper concludes that Taobao villages serve as incubators for rural entrepreneurs. Many people benefit from these incubators as they learn from their neighbors and eventually form a cluster of Taobao Villages. We also discovered that rural e-commerce does not necessitate a high level of education. People with basic skills can start an e-commerce business as long as there is a certain level of rural infrastructure. On the basis of the findings of this paper, we conclude that recent advances in Pakistan's 3G and 4G connections, the popularity of smartphones, improvements in rural infrastructure, and the relatively young rural population are all suitable factors for local and cross-border e-commerce development. Rural e-commerce is especially important for creating job opportunities for rural women and young people who do not have professional education.

Keywords: e-commerce, rural economy, Tobao village, China, market

Food Security and Pak-China Cooperation in Agriculture under Belt and Road Initiatives

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He is performing as a coordinator for the International Exchange and Cooperation Office, Yangtze University, and Huazhong Agricultural University, China. He is also a general secretary of the Huazhong Agricultural University Alumni Association in Pakistan.

Abstract

Muhammad Rizwan, Muhammad Zahid Farooq. Food security is a crucial and hot issue globally, particularly in less developed and developing countries. It is one of the sustainable development goals on the agenda of the United Nations in terms of hunger. Data from recent years have shown that hunger has increased, which indicates rising food insecurity among countries. It is estimated that the population will increase by approximately sixty million in the next five years. Food security is a critical challenge; according to data from the WEF (World Economic Forum), a population of nine billion people will have to be fed in 2050. China is the major food producer and consumer in the world, while Pakistan also has a massive food demand with rapid population growth. Both countries help each other with food security by cooperating in the agricultural sector under Belt and Road initiative programs. There are numerous MoUs signed between countries at the government level, as well as collaboration among private companies and enterprises. This cooperation has led to significant progress in agricultural production, particularly for grain crops, which increase food security and farmer income. There are still many opportunities for Chinese stakeholders to invest in and collaborate with Pakistani stakeholders in the agricultural sector for food security and farmer wellbeing. Both countries need to develop policies that support the private sector and enterprises for collaboration directly at the farm level.

Keywords: Food Security; Agriculture; Grain Production; Pak-China Collaboration.

Strategies for the Prevention of Mycotoxicosis in Poultry

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Abstract

Mycotoxins, secondary metabolites of fungi such as *Aspergillus*, *Fusarium* and *Penicillium* spp., are a global concern due to considerable economic losses. There are several strategies for alleviating the negative impacts of mycotoxins on animal performance, including chemical and natural products, but their efficacies are different, with distinct variations. The use of microbial inactivation, ammonization, ozone degradation, and irradiation and the use of sequestering agents to decontaminate and remediate highly contaminated feedstuffs have been suggested, but most of these methods do not meet the criteria for efficient antimycotoxin activity. However, adsorbents that bind toxins, render them inactive, cost effective, safe, and easy to administer seem to be preferred. Solar irradiation, ozonation, and natural products such as essential oils from the leaves of *Cinnamomum tamala*, milk thistle seeds, antioxidants, *Saccharomyces cerevisiae* and *Lactobacillus* spp. are promising newly emerging methods but require further testing for safety and scalability. The effectiveness of detoxification agents, however, varies and depends on the concentration, temperature, pH, treatment time, duration of exposure and age of the chickens. In this study, we focus on the impact of different strategies for eliminating the negative effects of mycotoxins on animal productivity and their physiological and immunological traits via different methods.

Keywords: Dietary manipulation, mycotoxins, growth, blood biochemistry, immunity, recovery.