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Welcome to Bethany Eckhart as our new Business Coordinator in the Department of Animal and Dairy Sciences.



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AND DAIRY SCIENCES



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UNDERGRADUATE ADS RESEARCH EXPERIENCE FORGES AHEAD DURING COVID-19 PANDEMIC

Junior and senior undergraduate students across multiple Departments across Mississippi State University are committed to responsible research in beef cattle. Under the guidance of Zully Contreras-Correa, ADS Doctoral Student, these undergraduate researchers are working daily to provide feed and treatments to pregnant heifers via the Calan Broadbent Feeding System, as well as cleaning pens and monitoring heifer comfort during this hot summer.

This is the third year of a 5-year USDA-AFRI grant (awarded to Drs. Caleb Lemley, Derris Burnett, Brian Rude, and Heath King) examining the potential benefits of supplementing beef heifers with melatonin to reverse the negative

consequences of maternal nutrient restriction on uterine blood flow, fetal growth, and placental functional capacity. The animal collection period of this project is expected to end in September when the heifers undergo Cesarean sections for collection of placental and fetal tissues.

Submitted by Zully Contreras-Correa.



Cason Brown, an undergraduate MSU student intern enrolled in ADS 4420, weighs feed rations for the pregnant heifers.

UNDERGRADUATE ADS RESEARCH EXPERIENCE FORGES AHEAD DURING COVID-19 PANDEMIC



Masked undergraduate student interns and workers from the Department of Animal and Dairy Sciences, Biological Sciences, and Poultry Sciences working on beef cattle research during COVID-19 pandemic.

L-R: Top row, Cason Brown, Kirsten Thompson, Amelie Signorel, Carley Rhoads, Robin Sessums; Bottom row, Hayden Duncan, Kaitlyn Wood, Taylor Cochran, and Mackenzie Ripper (bottom).

PHOTO CONTRIBUTION FROM SAMMY BLOSSOM



Sammy Blossom is an alumnus of ADS and captured many photos during his 16-year career with the Mississippi Cattlemen's Association. Enjoy the photo.

Photo courtesy of Sammy Blossom Photography: <https://www.sammyblossomphotography.com/>.

DRS. LIAO AND HASAN DELIVER INVITED TALK

The ASAS-CSAS-WSASAS Annual Meeting and Trade Show was held virtually for the first time from July 19-23, 2020. The North East Section of the American Society of Animal Science (ASAS) hosts a symposium during this event, and the symposium topics change each from year. This year the NES chose to focus on the usage of different omics-based tools in animal science research, which include epigenomics, transcriptomics, proteomics, etc.

Drs. Shengfa Liao and Shamimul Hasan in our ADS department were invited to talk about the "best practices" for applying RNA sequencing technology in swine-related research. The title of their presentation was "Application and Practices of RNA Sequencing for Understanding Transcriptional Regulation of Gene Expression Affected by Dietary Nutrients or Feed Additives in Swine." In this online Zoom presentation, they discussed some "best practices" in the application of this technology, including appropriately designing experiments, collecting samples,

laboratory analysis, and bioinformatics data analyses in order to have confidence in the results obtained from the RNA sequencing methodology.

In addition to this RNA sequencing



presentation, Dr. Liao also delivered another presentation titled "Feeding arsenic-containing rice bran to growing pigs: arsenic distribution in major tissues."

This was presented in the third poster session (No. PSIII-29) of this Annual

Meeting and Trade Show.



Dr. Shengfa Liao

*Submitted by
Rebecca
Humphrey.*

DRS. LIAO AND HASAN DELIVER INVITED TALK

Introduction

protein source fat source

macro and micro-nutrients deficiency

↓

20,000-25,000 Genes

↑

short-term diet regimen long-term diet regimen

Dietary aspects of nutrigenomics research in pigs: an overview

gene transcript level protein level

DNA methylation histone modifications

↓

metabolism changes production traits

↓

health status

Adapted from Nowacka-Wosuzuk (2020)

MISSISSIPPI STATE UNIVERSITY

Department of Animal & Dairy Sciences

https://www.eventscribe.com/2020/ASASAnnual/searchbyposterbucket.asp?pf=PosterBucketTrack&f=PosterSessionName

Feeding arsenic-containing rice bran to growing pigs: arsenic distribution in major tissues

Shengfa F. Liao,¹ M. Shamimul Hasan,¹ Zhongyue Yang,¹ Andrew W. Stevens,² James Brett,³ and Zhaoxia Peng⁴

¹Department of Animal & Dairy Sciences, Mississippi State University, Mississippi State, MS 39762; ²Department of Agricultural & Applied Economics, University of Wisconsin-Madison, Madison, WI 53706; ³Department of Veterinary Pathobiology & Population Medicine, Mississippi State University, Mississippi State, MS 39762; and ⁴Department of Biochemistry, Molecular Biology, Entomology, & Plant Pathology, Mississippi State University, Mississippi State, MS 39762

Introduction

• Although arsenic (As) is required by pigs, inorganic As is a non-threshold carcinogen to humans (Lilja et al., 2004; Mahomed et al., 2015)

• The unique physiology of rice plant allows rice to take up As from water and soil in a very efficient manner (Williams et al., 2007), and rice bran (RB) contains more As than the refined rice grain (Sun et al., 2008, 42)

• As an animal feed or human food (Jal et al., 2015), RB can be a potential source of As contamination in the chain from animal feed to human food

• Using RB as a feedstuff raises a critical question: whether or not the As-containing RB contaminates the meat or other edible tissues of food animals

• Therefore, it is crucial to study the accumulation of residual As in different tissues of the pigs fed As-containing RB

Objective

• To investigate the As distribution among various pig tissues after a chronic exposure to an As-containing RB

Materials and Methods

• **Experimental design.** Twenty crossbred gilts (initial body weight 26.3 ± 2.18 kg) were used in an experiment with a completely randomized experimental design and pigs as experimental units.

• **Treatment groups.** As shown in Tables 1 and 2, Diet I was the control diet (n = 6), Diet II was a moderate RB-containing diet (n = 7), and Diet III was a high RB-containing diet (n = 7).

• **Animals handling.** Pigs fed ad libitum access to their respective diets for 6 weeks.

• **Sample collection.** Blood and hair samples were collected at the beginning and the end of the 6 weeks, while liver, kidney, and skeletal muscle samples were collected at the end of the 6 weeks (slaughter).

• **Arsenic determination.** The As concentrations were determined at the Midwest Laboratories in Omaha, NE, using a standard protocol of Inductively Coupled Plasma – Mass Spectrometry (ICP-MS Method 6020).

• **Statistical analysis:**

• Data were analyzed with ANOVA. However, Tukey model was used in cases where some dependent variables were repeatedly measured (Dixon, 1996). Significance was set at p < 0.05.

Experimental Diets

Table 1. Composition (% as fed basis) of the three experimental diets formulated for the three groups of pigs.

Item	Diet I	Diet II	Diet III
Corn	28.215	21.958	0.000
Rice bran ¹	0.000	16.751	75.464
Soybean meal	28.409	14.400	15.500
Poultry fat	0.000	1.130	0.000
L-Cystine-HCl	0.430	0.440	0.290
DL-Methionine	0.060	0.060	0.050
L-Threonine	0.120	0.120	0.100
L-Tryptophan	0.040	0.040	0.030
L-Isoleucine	0.050	0.040	0.040
L-Valine	0.040	0.040	0.040
L-Cystine-HCl, analytical	0.060	0.040	0.040
Lysine-HCl	0.050	1.200	1.200
Dicalcium phosphate	1.200	0.050	0.020
Salt	0.140	0.140	0.140
Micronutrient premix ²	0.070	0.070	0.070
Mineral premix ³	0.060	0.060	0.060

¹Free As concentration in the RB used was 333 µg/kg.

²Three mineral premix (PB-455-05) and vitamin premix (PB-400-0004) were obtained from Nutrena Brand, LLC (Denver, MO).

Results and Discussion

Table 2. Concentration and enrichment of arsenic (µg/g) in various tissues of the three experimental diets as fed basis.

Item	Diet I	Diet II	Diet III
As in feed	0.000	0.000	0.000
As in blood	0.17	0.14	0.17
As in kidney	0.17	0.14	0.17
As in liver	0.17	0.14	0.17
As in muscle	0.17	0.14	0.17
As in hair	0.17	0.14	0.17
As in skin	0.17	0.14	0.17
As in bone	0.17	0.14	0.17
As in fat	0.17	0.14	0.17
As in bone marrow	0.17	0.14	0.17
As in spleen	0.17	0.14	0.17
As in stomach	0.17	0.14	0.17
As in small intestine	0.17	0.14	0.17
As in large intestine	0.17	0.14	0.17
As in feces	0.17	0.14	0.17
As in urine	0.17	0.14	0.17
As in saliva	0.17	0.14	0.17
As in sweat	0.17	0.14	0.17
As in milk	0.17	0.14	0.17
As in hair	0.17	0.14	0.17
As in skin	0.17	0.14	0.17
As in bone	0.17	0.14	0.17
As in fat	0.17	0.14	0.17
As in bone marrow	0.17	0.14	0.17
As in spleen	0.17	0.14	0.17
As in stomach	0.17	0.14	0.17
As in small intestine	0.17	0.14	0.17
As in large intestine	0.17	0.14	0.17
As in feces	0.17	0.14	0.17
As in urine	0.17	0.14	0.17
As in saliva	0.17	0.14	0.17
As in sweat	0.17	0.14	0.17
As in milk	0.17	0.14	0.17

Fig. 5. The concentrations of As in the hair of the pigs fed with three experimental diets. The mean values based with different letters differ (p < 0.05).

Table 3. The As concentrations (µg/g, as fed) in different tissues of the pigs.

Tissue	Diet I	Diet II	Diet III	F-value ¹	LS-MSD ²	p-value ³
Blood	< 30	< 30	< 10	NA	NA	NA
Muscle	< 30	< 30	< 10	NA	NA	NA
Liver	< 30	19.8	13.6	0.35	0.296	0.896
Kidney	< 30 ⁴	21.0 ⁴	10.0 ⁴	1.43	< 0.001	< 0.001

¹NA = the F statistic shown here sets for the non-significance of Diet II vs Diet I.

²MSD = within a row that have different superscripts differ (p < 0.05).

Results and Discussion

• As shown in Table 2 and Fig. 1, the As concentrations in the blood were below the detection limit, whereas the As concentrations in the liver and kidney were above 30 µg/g when the pigs were fed the moderate to high level of As-containing RB. The As concentrations in the hair were the highest among all the tissues tested. These results are consistent with some previous reports (Jedidi et al., 2013; Olgun et al., 1988; López-Alonso et al., 2007).

• The tissue As concentration data (Table 3 and Fig. 1) indicate that after absorption, most As must be cleared off rapidly from the blood stream with some being retained in various tissues in the body, which confirmed some previous reports that the As compound in animal diets can be readily absorbed by the intestine and rapidly transported by the blood (Jedidi et al., 1979; Chen et al., 2013).

• The As concentrations in the muscle, however, were below the detection limit, which suggests that the pork produced from the pigs fed a typical As-containing RB is safe for human consumption.

Conclusions

• The tissue distribution data indicate that the absorbed As was rapidly cleared from the blood with some being retained in various tissues. While pig's hair retained the highest level of As, the retention is much lower in the liver and kidney. The muscle As data suggest that the pork produced from the pigs fed a typical As-containing RB is safe for human consumption.

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DR. LEMLEY PRESENTS TWO INVITED LECTURES AT THE 2020 SOCIETY FOR THERIOGENOLOGY CONFERENCE

The 2020 Society for Theriogenology Conference was held virtually from July 22 – 25, 2020. During this year’s meeting, Dr. Caleb Lemley presented back-to-back 1-hour lectures on Saturday, July 25th in the Production Animal Track session sponsored by Lane Manufacturing, Inc. Dr. Lemley’s first talk titled “Fetal Programming: Maternal-Fetal Interactions” focused on environmental stimuli or insults during pregnancy which alter placental functional capacity and fetal development. Dr. Lemley’s second talk titled “Fetal Programming: Postnatal Performance” focused discussion on the overwhelming evidence linking size morphometrics at birth with lifelong consequences to livestock production and fertility.

The mission of the Society for Theriogenology is “to promote standards of excellence in reproductive medicine, to

provide outreach and education to veterinarians, and to foster continual improvements in theriogenology”. Information from Dr. Lemley’s talks were compiled into a proceedings paper that will be published in Clinical Theriogenology September 2020 issue.

The full citation for this conference proceeding is as follows: Lemley, C.O. 2020. Fetal programming: maternal-fetal interactions and postnatal performance. Clinical Theriogenology, Volume 12, Number 3, Page 252-267.

*Submitted by
Dr. Caleb
Lemley.*



Dr. Caleb Lemley

DR. LEMLEY PRESENTS TWO INVITED LECTURES AT THE 2020 SOCIETY FOR THERIOGENOLOGY CONFERENCE

Fetal programming: maternal-fetal interactions

Caleb O. Lemley

Department of Animal and Dairy Sciences

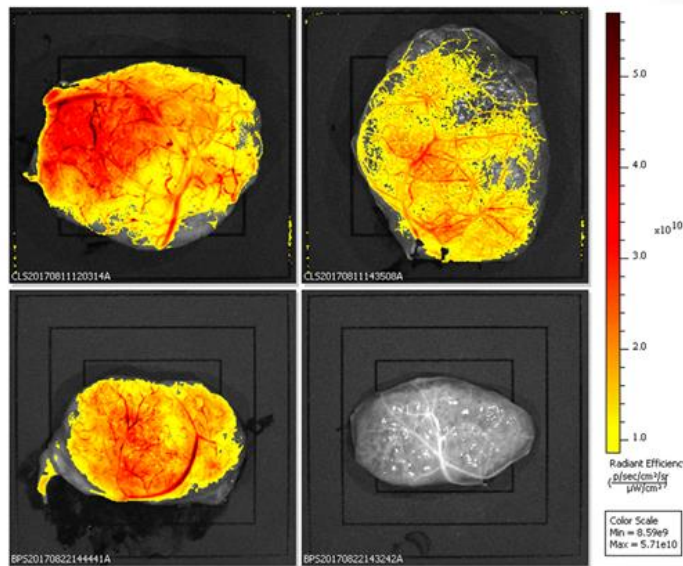
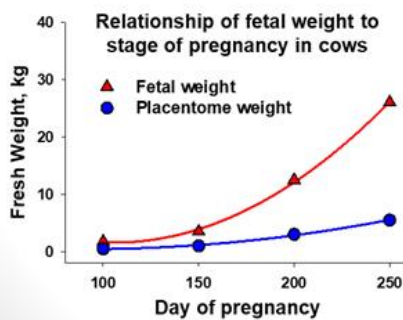
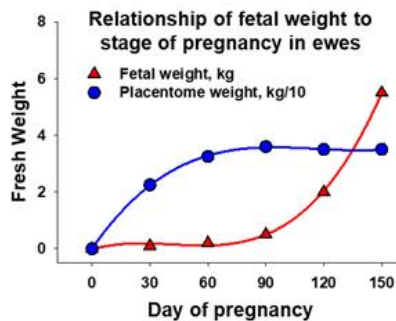


PHOTO CONTRIBUTION FROM ZULLY CONTRERAS-CORREA



Zully Contreras-Correa is a graduate student in the Department of Animal and Dairy Sciences working with Dr. Caleb Lemley. Here is a photo, courtesy of Zully with Magnolia Farm Photography, of cattle on the MSU South Farm enjoying the water.

ADS GRADUATE STUDENT HEADS TO KSU

Alicia Gilmore, an Animal & Dairy Sciences masters student, completed her graduate degree this summer after successfully defending her thesis titled “The molecular and cellular dynamics of Holstein bull spermatozoa.” Alicia’s graduate committee consisted of Dr. Erdogan Memili (co-advisor), Dr. Molly Nicodemus (co-advisor), and Dr. Dean Jousan (committee member).

During her time at Mississippi State University, Alicia was the teaching assistant for ADS 3221 Practices in Horse Care & Management. She was also able to assist with several research projects in both dairy cattle and equine. Last summer she traveled to the Equine Science Society Meeting to present research on one of her projects regarding teaching.

Her interest in both reproduction and equine is taking her to Kansas State

University where she will be pursuing a Ph.D. in equine reproduction under the guidance of Dr. Joann Kouba. Along with researching cryotolerance in equines at KSU, Alicia will be assisting with teaching the equine health, equine management, and equine reproduction laboratories, along with the colt starting class.

Outside of her teaching and research responsibilities at KSU, Alicia will be helping with foaling and breeding activities at the KSU Equine Unit. Alicia is excited about starting her Ph.D. program at KSU this fall and feels she is well prepared after her experience at MSU in the ADS graduate program.



Submitted by Dr. Molly Nicodemus.

Graduate Student Alicia Gilmore showing off her new jersey as she gets ready to head to Kansas State University to work on her Ph.D.

DR. MEMILI RECEIVES USDA NIFA FUNDING

Dr. Memili, Professor in the Department of Animal and Dairy Sciences, received \$20,000 in competitive funding from the USDA NIFA for the Association for Applied Animal Andrology's (AAAA) International Conference. However, the conference was scheduled to be in Italy in June 2020 was canceled (<http://animalandrology.org/futuremeetings.htm>), so the funding will be used for the future conference.

Dr. Memili was one of the plenary conference speakers and had a conference paper published in the Journal of Animal Reproduction Science (see below in ADS Publications). He has also been elected for the Board of Directors for the AAAA and will also be serving on the Publications/Editorial Task Force.

Submitted by Dr. Erdogan Memili.



Dr. Erdogan Memili



DR. HEATON ACCEPTS POSITION AT AUBURN

Greetings! I just wanted to take a quick moment to thank everyone for the guidance and support during my time as a graduate student at Mississippi State. I'm excited to announce that I have accepted a job at Auburn University as their Equine Science Lecturer beginning August 17th.

I'm looking forward to teaching as well as collaborating with others on equine research. I

wanted to sincerely thank everyone who has had a hand in my education and impacted me in more ways than I can think of. I am so grateful for the opportunities I have had while at Mississippi State University and look forward to what the future holds! Thank you, and Gig 'em /Hail State/War Eagle!

Submitted by Dr. Courtney Heaton.



Logo from <https://ansc.auburn.edu/>



Dr. Courtney Heaton

2020 REFEREED PUBLICATIONS (27 total)

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2020 REFEREED PUBLICATIONS (27 total)

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2020 REFEREED PUBLICATIONS (27 total)

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