

Poultry Science Association 2017 Annual Meeting Program

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President's Welcome



On behalf of the Board of Directors of the Poultry Science Association and the Annual Meeting Program Committee, I would like to welcome you to Orlando and the 106th PSA Annual Meeting.

The venue for this year's meeting is the fabulous Orlando World Center Marriott in Orlando, which offers a great variety of activities for families and world-class facilities for meeting participants. The meeting begins with the welcome address and reception—now moved back to the traditional Sunday evening spot—but with a more casual and outdoor feel suitable for the location. The location for the BBQ dinner also has a unique "Florida feel,"

as Gatorland hosts this annual event, which is sure to be fun-filled for the whole family.

The main events for the week are the scientific programs planned by the Annual Meeting Program Committee, led by Deana Jones. The program this year contains 11 symposia from a variety of disciplines, including the recurring National Poultry Extension Workshop and Informal Nutrition Symposium, 577 scientific presentations, and the WPSA Lecture. The scientific sessions begin with the student competition presentations on Monday and Tuesday mornings.

The Board also wishes to extend our sincere appreciation and thanks to the generous support of all of our sponsors. The importance of our sponsors cannot be overstated and they continue to make the meeting affordable for all attendees. Signs are posted throughout meeting halls to help thank our sponsors, and we encourage you to personally thank company representatives who have helped sponsor the meeting.

We also wish to extend our appreciation to the PSA leadership and staff—particularly Executive Director Steve Koenig, Director of Business Operations Jon Cole, and Managing Editor and Communications Director David Busboom—for their hard work and oversight in organizing and coordinating our meeting. Thanks to Debi Seymour as well, who again leads the FASS meeting planning team and continues to provide excellent services to our Annual Meeting.

So welcome to Orlando, which this week will not only be home to the "Happiest Place on Earth" but also to the over 1,100 members of the Poultry Science Association and our 106th Annual Meeting.

Randolph D. Mitchell
PSA President 2016–2017

2017 Annual Program Committee

Thanks to Deana and her program committee for their selfless efforts on our behalf. Please take a minute to express your appreciation when you see them this week.

Deana R. Jones, General Program Chair (2017)
Manpreet Singh, General Program Chair-Elect (2018)
Brian D. Fairchild, General Program Chair-Elect (2019)
Marisa Erasmus, Animal Well-Being and Behavior
Wilmer J. Pacheco, Extension and Instruction
Petek Settar, Genetics and Genomics
Lisa R. Bielke, Immunology, Health, and Disease
Richard A. Blatchford, Management and Production
Justin Fowler, Woo Kyun Kim, Samuel J. Rochell, and Charles W. Starkey,
Metabolism and Nutrition
Anup Kollanoor-Johny, Microbiology and Food Safety
Jessica D. Starkey, Molecular and Cellular Biology
Darrin Karcher, Physiology and Reproduction
Dianna Bourassa, Processing and Products
Manpreet Singh, Student Presentation Evaluations
C. Roselina Angel, Informal Nutrition Symposium: Critical content in a feed additive portfolio that is needed and will be meaningful to poultry decision makers
Gregory P. Martin, National Extension Workshop: Handling Change
Christopher M. Ashwell and Karen Schwean-Lardner, WPSA Lecture: History and future of genetically engineered food animal regulation
Mark E. Cook, Symposium: Pathogens and cancer manipulate immune defenses: Opportunities to innovate host targeted strategies to prevent and treat disease without antimicrobial and chemical therapies
William A. Dozier III, Symposium: Phosphorus utilization evaluation in feed ingredients for poultry: Opportunities and challenges
William A. Dozier III, Industry Forum: Unresolved issues facing the poultry industry
Jose Otavio B. Sorbara, Symposium: Relevance of starch in poultry diets
Karen D. Christensen, Symposium: The future is already here: Application of technology to poultry health and welfare
Pierre André Geraert and Roger Sunde, Symposium: Oxidative stress
Paul H. Patterson, Symposium: Vegetative buffers for environmental stewardship on poultry farms
Robert L. Taylor Jr. and John B. Carey, Publishing Workshop: Successful publishing in poultry science journals

Schedule at a Glance

Friday, July 14

2:00 pm–7:00 pm PSA Finance Committee Jade

Saturday, July 15

8:00 am–5:00 pm PSA Board of Directors Meeting Marriott Boardroom

12:00 pm–1:00 pm PSA Board of Directors Luncheon Jade

Sunday, July 16

9:00 am–2:00 pm PSA Golf Outing Hawk's Landing
Golf Course

8:00 am–5:00 pm PSA Board of Directors Meeting Marriott Boardroom

12:00 pm–1:00 pm PSA Board of Directors Luncheon Jade

3:00 pm–7:00 pm Registration. Outside Boston

3:00 pm–7:00 pm Upload and Preview Room Boston

5:30 pm–7:00 pm Welcome Reception West Terrace

Monday, July 17

7:00 am–6:00 pm Registration. Palms Registration
Desk

7:00 am–5:00 pm Upload and Preview Room Boston

7:30 am–8:00 am Breakfast for sessions. Palms Foyer

8:00 am–12:00 pm Student Competition Oral Presentations

8:00 am–12:00 pm Immunology, Health, and Disease. Crystal J 2

8:00 am–12:00 pm Management and Production I Crystal J 1

8:00 am–12:00 pm Metabolism and Nutrition: Nutrition I Royal

8:00 am–11:45 am Metabolism and Nutrition: Nutrition II. Sago

8:00 am–12:00 pm Microbiology and Food Safety Canary 1

8:45 am–10:00 am Processing and Products Canary 2

8:45 am–12:00 pm Animal Well-Being and Behavior Canary 3–4

12:00 pm–3:00 pm Exhibit Setup Sabal

12:00 pm–3:00 pm Poster Setup Sabal

(Posters must be set between 12:00 pm and 3:00 pm)

Use of cameras, video cameras, and phones (for calls or audio/video recording) is strictly prohibited during oral and poster presentations to minimize disruption and unauthorized dissemination of data. Anyone found in violation of this policy will be asked to leave the session.

12:00 pm–1:00 pm National Extension Workshop Lunch* Crystal K–L

1:00 pm–5:00 pm National Extension Workshop: Canary 3–4
Handling Change

1:00 pm–5:00 pm Informal Nutrition Symposium: Sago
Critical content in a feed additive portfolio that
is needed and will be meaningful to
poultry decision makers

1:15 pm–4:45 pm Physiology and Reproduction Crystal J 2

1:30 pm–4:15 pm Genomics, Molecular and Cellular Biology Canary 1

1:45 pm–4:30 pm Microbiology and Food Safety Crystal J 1

3:00 pm–5:00 pm Exhibits Sabal

3:00 pm–5:00 pm Poster Sessions. Sabal

3:00 pm–5:00 pm PSA Foundation Board Meeting San Antonio

Tuesday, July 18

7:00 am–5:00 pm Registration. Palms Registration
Desk

7:00 am–5:00 pm Upload and Preview Room Boston

8:00 am–6:00 pm Poster Sessions. Sabal

8:00 am–6:00 pm Exhibits Sabal

8:00 am–12:00 pm Student Competition Oral Presentations

8:00 am–12:00 pm Genomics and Molecular
and Cellular Biology Canary 1

8:00 am–12:00 pm Metabolism and Nutrition: Nutrition III Royal

8:00 am–10:00 am Metabolism and Nutrition: Nutrition IV Sago

8:00 am–12:00 pm Muscle Myopathies: Multidiscipline
Approach Crystal J 1

8:00 am–12:00 pm Nutritional Immunology. Crystal J 2

8:15 am–11:45 am Physiology and Reproduction Canary 3–4

10:30 am–12:00 pm Management and Production II Sago

11:00 am–12:00 pm	WPSA-Canada Board Meeting	Crystal Q
12:00 pm–1:00 pm	WPSA-USA/Canada Luncheon*	Crystal K–L
12:00 pm–1:00 pm	Student Luncheon and Hatchery	Crystal H Business Meeting*
1:00 pm–3:00 pm	Symposium:	Royal Phosphorus utilization evaluation in feed ingredients for poultry: Opportunities and challenges
1:00 pm–5:00 pm	Management and Production I	Canary 3–4
1:00 pm–5:00 pm	Metabolism and Nutrition: Enzymes	Crystal J 2
1:00 pm–5:00 pm	Symposium:	Sago Pathogens and cancer manipulate immune defenses: Opportunities to innovate host targeted strategies to prevent and treat disease without antimicrobial and chemical therapies
1:15 pm–3:00 pm	Extension and Instruction	Canary 1
1:15 pm–3:00 pm	Muscle Myopathies: Multidiscipline Approach	Crystal J 1
3:30 pm–4:30 pm	Processing and Products	Crystal J 1
3:30 pm–5:00 pm	Publishing Workshop:	Royal Successful publishing in poultry science journals

4:00 pm–6:00 pm Student Competition Poster Judging . . . Sabal

(All student poster competition participants are required to be present.)

The Ballroom will be closed to all attendees except student competition participants and judges from 4:00 to 5:00 pm.

5:00 pm–6:00 pm	“Suds and Spuds” Reception	Sabal Exhibit and Poster Viewing
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(All presenting authors of posters are required to be present.)

Wednesday, July 19

7:00 am–4:00 pm	Registration.	Palms Registration Desk
7:00 am–4:00 pm	Upload and Preview Room	Boston
8:00 am–5:00 pm	Poster Sessions.	Sabal
8:00 am–6:00 pm	Exhibits	Sabal

8:00 am–9:30 am	WPSA Lecture:Royal History and future of genetically engineered food animal regulation
10:00 am–12:00 pm	PSA Business MeetingRoyal
10:30 am–12:00 pm	WPSA-USA Board MeetingCrystal N–P
12:00 pm–1:00 pm	American Poultry Historical Society Lunch* .Miami
1:00 pm–2:45 pm	Management and Production IICrystal J 2
1:00 pm–3:00 pm	Immunology, Health, and Disease ICrystal J 1
1:00 pm–5:00 pm	Animal Well-Being and Behavior.Canary 1
1:00 pm–5:00 pm	Symposium:Royal Industry Forum: Unresolved issues facing the poultry industry
1:15 pm–4:30 pm	Metabolism and Nutrition: Amino Acids. . . .Sago
3:00 pm – 3:30 pm	Ice Cream SocialSabal
3:30 pm–5:00 pm	Metabolism and Nutrition: Nutrition ICrystal J 2
6:00 pm–10:00 pm	PSA BBQ*Gatorland <i>Please have your ticket before boarding the shuttle. (Shuttle service begins at 5:30 pm from the Marriott Orlando World Center Convention Center Entrance.)</i>
9:30 pm–11:30 pm	PSA, WPSA-USA Student Mixer*WhirlyDome <i>(Shuttle service begins at 9:00 pm from Gatorland and the Marriott Orlando World Center Convention Center Entrance.)</i>

Thursday, July 20

5:45 am–7:30 am	Chicken Trot Fun RunFairway Terrace <i>(Meet in the hotel lobby to walk over for the start of the race.)</i>
7:00 am–1:00 pm	Registration.Palms Registration Desk
7:00 am–1:00 pm	Upload and Preview RoomBoston
7:00 am–8:00 am	PSA Board of Directors MeetingMiami
8:00 am–11:00 am	Poster Sessions.Sabal
8:00 am–12:00 pm	Nutritional Immunology.Crystal J 2
8:00 am–12:00 pm	Symposium:Royal Relevance of starch in poultry diets
8:00 am–12:00 pm	Symposium:Sago The future is already here: Application of technology to poultry health and welfare

8:00 am–11:00 am	Exhibits	Sabal
8:15 am–11:45 am	Metabolism and Nutrition: Feed Additives I	Canary 1–2
8:30 am–11:30 am	Metabolism and Nutrition: Vitamins and Minerals	Crystal J 1
10:30 am–12:00 pm	Poster Take Down <i>(All posters must be removed by 12:00 pm. Any posters remaining after 12:00 pm will be disposed of.)</i>	Sabal
10:30 am–2:30 pm	Exhibit Booth Teardown	Sabal
1:00 pm–2:45 pm	Immunology, Health, and Disease II	Canary 1–2
1:00 pm–4:45 pm	Metabolism and Nutrition: Nutrition II	Crystal J 1
1:00 pm–5:00 pm	Symposium: Oxidative stress	Sago
1:00 pm–5:00 pm	Symposium: Vegetative buffers for environmental stewardship on poultry farms	Crystal J 2
3:30 pm–5:00 pm	Metabolism and Nutrition: Feed Additives II	Canary 1–2
5:30 pm	Awards Celebration*	Royal

Please refer to the scientific program portion of this book for detailed information on oral and poster presentations. Please note that all rooms and times are subject to change. Always be sure to check room signs and the daily newsletter for any last-minute room changes or cancellations. **Any event noted with an asterisk (*) will require a ticket for entrance.**

Contact Information and Meeting Details

Phone Numbers

Orlando World Center Marriott, 8701 World Center Drive, Orlando	407-238-4200
FedEx Store, Orlando World Center Marriott	407-239-6411
Florida Hospital Celebration Health, 400 Celebration Pl, Kissimmee, FL	407-764-4000
PSA Business Office	217-356-5285

Registration

Palms Registration Office	
Sunday, July 16.	3:00 pm–7:00 pm
Monday, July 17	7:00 am–6:00 pm
Tuesday, July 18	7:00 am–5:00 pm
Wednesday, July 19	7:00 am–4:00 pm
Thursday, July 20	7:00 am–1:00 pm

Upload and Preview Room

Boston	
Sunday, July 16.	3:00 pm–7:00 pm
Monday, July 17	7:00 am–5:00 pm
Tuesday, July 18	7:00 am–5:00 pm
Wednesday, July 19	7:00 am–4:00 pm
Thursday, July 20	7:00 am–1:00 pm

Poster Sessions

Sabal	
Monday, July 17 (Poster set up)	12:00 pm–3:00 pm
Monday, July 17	3:00 pm–5:00 pm
Tuesday, July 18	8:00 am–6:00 pm
Wednesday, July 19	8:00 am–5:00 pm
Thursday, July 20	8:00 am–10:30 am
Thursday, July 20 (Teardown).	10:30 am–12:00 pm

All posters must be removed by 12:00 pm

Exhibits

Sabal	
Monday, July 17 (Exhibit set up)	12:00 pm–3:00 pm
Monday, July 17	3:00 pm–5:00 pm
Tuesday, July 18	8:00 am–6:00 pm
Wednesday, July 19	8:00 am–5:00 pm
Thursday, July 20	8:00 am–11:00 am
Thursday, July 20 (Teardown)	10:30 am–2:30 pm

Membership

Membership in the Poultry Science Association (PSA) is not required to attend this meeting. All that is needed is an interest in the field of poultry science. The difference, however, between the member and nonmember registration fee makes it very attractive to join PSA. Members also receive other discounts throughout the year and free online access to the *Poultry Science* journal, at reduced publishing charges making PSA membership both cost effective and beneficial. You may go online to <http://www.poultryscience.org/join.asp> or download the application and send to the PSA headquarters office: 701 Devonshire Drive, C-51, Champaign, IL 61820.

Important Reminders!

Badges

Wear your meeting badge! It is your admission to all special events and meal functions.

Tickets

Keep your tickets. Tickets for special events will be collected at the door or table for the appropriate event. Event name, location, and date will appear on the ticket—please be sure to give the ticket-taker the appropriate ticket.

Photo Policy

Use of cameras, video cameras, and smartphones (for calls or audio/video recording) **is strictly prohibited during oral and poster presentations** to minimize disruption and unauthorized dissemination of data. Anyone found in violation of this policy will be asked to leave the session.

Poster Presentation

The boards will be **42 inches wide and 48 inches high**, so please do not exceed your allotted space. Poster viewing will be on Monday afternoon through Thursday morning. Posters must be in place by 3:00 pm on Monday, July 17.

Students participating in the Student Award of Excellence Competition are REQUIRED to be present by their poster during the competition, which will be held on Tuesday, July 18, from 4:00 pm to 6:00 pm. The exhibit hall will be closed to all but those competing in the Student Competition from 4:00 pm to 5:00 pm.

Presenting authors, including students, are **REQUIRED** to be present by their poster from 5:00 pm to 6:00 pm on Tuesday, July 18, for the the Suds and Spuds Reception—Exhibit and Poster Viewing. Failure to display an accepted poster and be present during the mandated poster time at the annual meeting may result in the rejection and removal of the abstract from the electronic version of the conference proceedings. All posters must be removed by the author by **12:00 pm on Thursday, July 20.**

On-Site Presentation Upload

On-site presentation upload will be available; files can be delivered to the Preload Room located in Boston at the Orlando World Center Marriott. No presentations will be loaded while the session is in progress, between presentations, or during breaks. Files will not be accepted via e-mail.

Oral Presentations

All oral presenters in symposia and scientific sessions must upload their presentations online or onsite. You may upload your presentation online before 11:59 pm CDT on Wednesday, July 12, 2017, at <http://www.poultryscience.org/psa17/uploads.aspx>. You are encouraged to upload your presentation online. If you do not upload it online, you must upload your presentation in the **Boston** room at the Orlando World Center Marriott before the relevant onsite upload deadline.

PSA staff will preload the presentations in the session rooms before the beginning of the session. Presentations can NOT be loaded in the session rooms by the presenters. Files will NOT be accepted by e-mail. The use of personal laptop computers for presentations in the session rooms is NOT permitted.

All presentations must be in Microsoft PowerPoint or Adobe PDF format. PowerPoint is recommended over PDF. It is strongly recommended that you embed all fonts. Each session room will be equipped with a laptop computer configured with Microsoft PowerPoint 2010 or newer, a software DVD player, and the latest versions of Acrobat Reader, Windows Media Player, and QuickTime Player; an LCD projector; and voice amplification equipment. Computer audio will NOT be amplified. Internet access will NOT be available.

Onsite Uploads

Presentations must be uploaded in the **Boston** room at the Orlando World Center Marriott. Presentations can be uploaded from USB sticks/drives. The deadline for uploading each presentation is based on the day/time of the session it will be presented in. You are encouraged to upload your presentation as early as possible.

Monday Morning Oral Presentations	Presentations must be uploaded before 7:00 pm on Sunday.
Oral Presentations in Morning Sessions (Tuesday–Thursday)	Presentations must be uploaded before 4:00 pm the day prior to the presentation.
Oral Presentations in Afternoon Sessions (Monday–Thursday)	Presentations must be uploaded before 10:00 am on the day of the presentation.

Preview Room

Boston, at the Orlando World Center Marriott, will be available for presenters to plug in their personal laptop computers and preview their presentations. Please remember that the use of personal computers will only be allowed in the preview room. Personal computers in session rooms will not be permitted.

PSA Career Center

Palms Ballroom Hall

Post your job opening with the Poultry Science Association.

PSA would like its members affiliated with companies, universities, or governmental agencies to participate in the 2017 PSA Career Center. If you know of a job opening, please place your information at the PSA Career Center before the meeting. Employers and job seekers are encouraged to visit and post their information online at <http://careers.poultryscience.org/>.

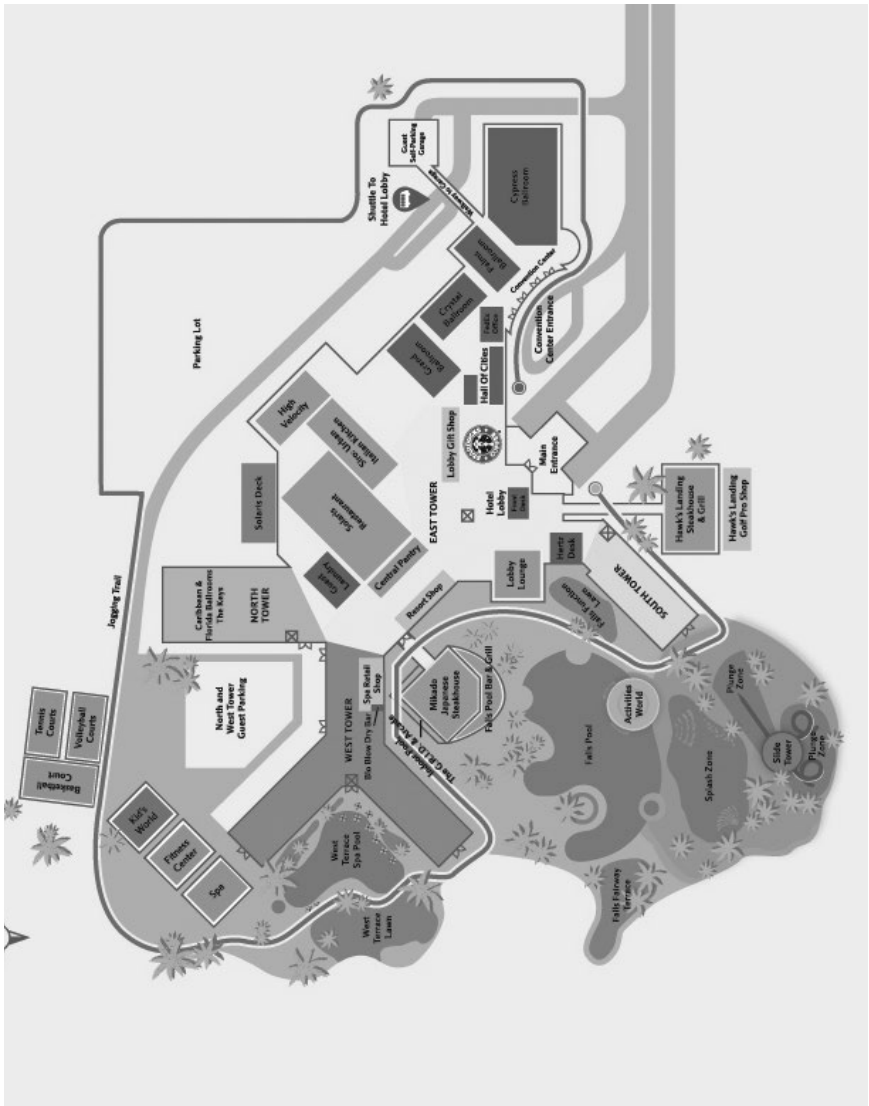
Continuing Education

This meeting is worth up to 23 ARPAS Continuing Education Units.

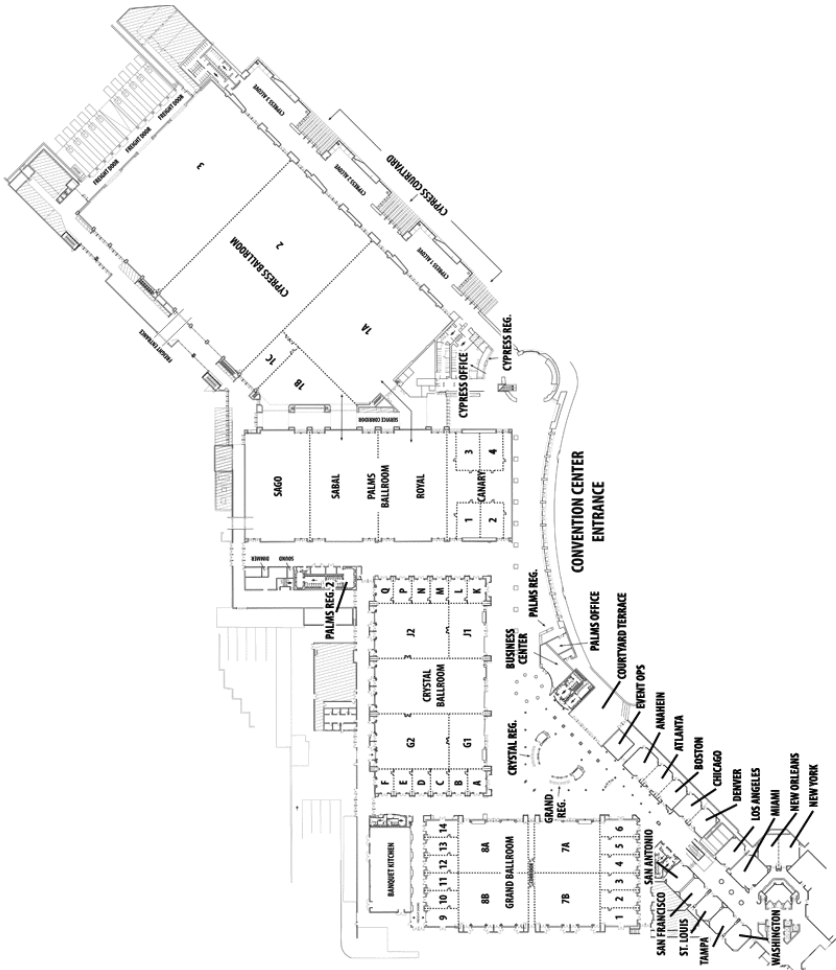
Mobile MyProgram—An Easier Way to Plan Your Schedule

The MyProgram planner is now mobile. Mobile MyProgram provides PSA 2017 attendees with convenient access to the conference schedule via most mobile devices. With Mobile MyProgram, the PSA 2017 program is more convenient than ever. Mobile MyProgram includes a personal scheduler for symposia, sessions, and events you wish to attend, and you can access and share abstracts for all presentations, find exhibitors, and more, making it easier than ever to plan your meeting while on the go. Visit <http://m.poultryscience.org/> today.

Orlando Maps



Orlando Maps



PSA 2017 Special Events

Opening Reception

This year the opening reception will take place at the Orlando World Center Marriott, West Terrace, located past the pool area, on Sunday evening from 5:30 pm–7:00 pm. There will be a short welcome message from PSA's president, Randy Mitchell. Hors d'oeuvres will be served from 5:30 pm–7:00 pm with a cash bar. Please plan to attend to get a great start for the 106th Poultry Science Association Annual Meeting.

Suds and Spuds Reception

Following the sessions on Tuesday afternoon, from 5:00 pm–6:00 pm, join us in the Sabal Ballroom for the first ever Suds and Spuds Reception. Meet the exhibitors and visit with the poster presenters.

WPSA Lecture

The WPSA lecture, titled "History and future of genetically engineered food animal regulation," will be given on Wednesday morning, starting at 8:00 am, in the Royal Ballroom of the Orlando World Center Marriott, by Kevin Wells, University of Missouri. All meeting participants are invited to attend.

PSA Business Meeting

The Poultry Science Association business meeting will take place on Wednesday morning. Join us after the break, from 10:00 am to 12:00 pm, in the Royal Ballroom for the PSA business meeting, at the Orlando World Center Marriott.

Ice Cream Social

The ice cream social will be held on Wednesday afternoon at 3:00 pm in the Sabal Ballroom. Enjoy a sweet treat and get reacquainted with old friends.

PSA BBQ

When the sun goes down, the swamp comes alive! For more than 60 years, Gatorland (<http://www.gatorland.com>) has been creating fun, smiles, and special memories for millions of visitors who have entered through its world-famous gator mouth entrance. Join us for some up-close encounters with fascinating creatures from around the globe as well as Florida's largest alligators. Watch as the bravest daredevils grab a 7–8 foot alligator by the tail for an "Old Florida" match of man versus beast. Clip in and zip off on an exciting outdoor adventure with the Gator Gauntlet Zip Line. Your journey will take you along 350 feet of high-flying, heart-pounding adventure. Soar through the air and defy gravity over one of the theme park's star attractions before heading over the Alligator Breeding Marsh, complete with one hundred and thirty giant alligators watching from below. Dinner service will start at 6:00 pm. Shuttle service will be provided starting at 5:30 pm from the Orlando World Center Marriott Convention Center Entrance, with return service beginning at 7:30 pm. There will be music for your dancing and listening pleasure from Derek and the Slammers. Don't miss this exciting, family-oriented event.

Tickets are required for this event.*

PSA, WPSA–USA Student Mixer

This year's student mixer will be held at the WhirlyDome (<http://www.whirlydome.com>). This is a great place to hang out and get to know your fellow PSA students. There will be whirly ball, laser tag games, food, and fun. Shuttle service will begin at 9:00 pm from Gatorland and the Orlando World Center Marriott Convention Center entrance. Return bus service will begin at 10:30 pm, and run until 12:30 am. WhirlyDome is the perfect destination for anyone looking to have fun and get acquainted with fellow students.

Tickets are required for this event.*

Chicken Trot Fun Run

This year's Chicken Run will take place along the jogging course of the Orlando World Center Marriott on Thursday morning. The registration fee includes a t-shirt. Meet in the hotel lobby at 5:45 am, the run will begin at 6:00 am.

PSA Awards Celebration

Please join us as we share an evening of honoring the 2017 award winners. All meeting participants, spouses, and friends are welcome to attend this annual event. The celebration will be held on Thursday in the Royal Ballroom of the Orlando World Center Marriott. Please be sure to purchase your ticket in advance. There will be a limited number of tickets available for purchase at the registration desk. **Tickets are required for this event.***

PSA 106th Annual Meeting Sponsors

Platinum Level (\$10,000+)

Chr. Hansen Inc.
Elanco

Jones-Hamilton Co.

Gold Level (\$5,000–\$9,999)

AB Vista
Alltech Inc.
Biomim America Inc.
Cobb-Vantress Inc.
DSM Nutritional Products
DuPont

Evonik Corporation
Jefo Nutrition Inc.
Maple Leaf Farms Inc.
Novus International Inc.
United Soybean Board

Silver Level (\$1,500–\$4,999)

Adisseo USA Inc.
Archer Daniels Midland Co.
Aviagen Inc.
Aviagen Turkeys Inc.
BioResource International Inc.
C J America Inc.
Diamond V
EASY BIO Inc.
E W Nutrition USA
Feedstuffs
Fieldale Farms Corporation
Hendrix Genetics
Huvepharma Inc.
Innovative Feed and Technology
Additives (IFTA)

JBS United
Kemira
Kerry
King Techina Group
Monsanto Corporation
Mosaic Feed Ingredients
Nutriad Inc.
Phibro Animal Health Corporation
PMI Nutritional Additives
Provimi
QualiTech Inc.
Southern Poultry Science Society
Tyson Foods Inc.
Vetagro Inc.
Zinpro Corporation

Bronze Level (up to \$1,499)

Agro BioSciences Inc.
Arm & Hammer Animal Nutrition
Lallemand Animal Nutrition
Midwest Poultry Federation

Pancosma
Quality Technology International Inc.
Trouw Nutrition USA
Zoetis

Symposium Sponsors

Ab E Discovery
Adisseo USA Inc.
Cobb-Vantress Inc.
DSM Nutritional Products
DuPont
Eggland's Best LLC
Perdue Farms LLC

USDA Conservation Innovation Grant
World Animal Protection
World's Poultry Science Association–
Canada Branch
World's Poultry Science Association–USA
Branch

Exhibitors

Alternative Design Manufacturing &
Supply
ATC Scientific
BIOMIN America Inc.
Chr. Hansen Inc.
GHW USA LLC
Keepyoung Technology Co., Ltd.
King Techina Group
Life Products Inc.

Maple Leaf Farms Inc.
Microlife Innovative Microbials
ONCE Inc.
Oxford University Press
Phytobiotics
PSA Foundation
Texture Technologies Corp.
Vetagro Inc.

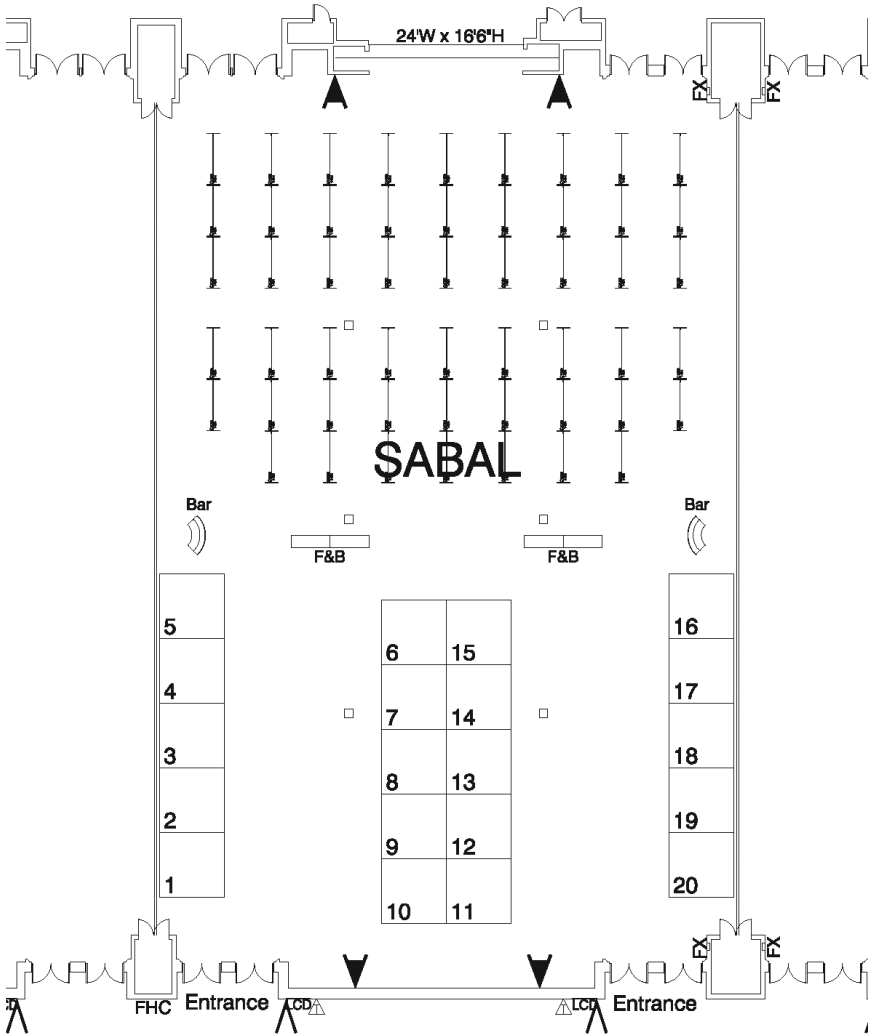
PSA Award Sponsors

Alltech Inc.
American Egg Board
American Feed Industry Association
American Poultry Historical Society
Aviagen Turkeys Inc.
Biomim America Inc.
Evonik Degussa Corporation
Hy-Line International
Jones-Hamilton Co.
Maple Leaf Farms Inc.

National Chicken Council
National Turkey Federation
Novus International Inc.
Phibro Animal Health
Poultry Science Association
Tyson Foods Inc.
United Egg Producers
USPOULTRY
Zoetis

Exhibitor Map

Sabal



PSA 106th Annual Meeting Exhibitors

Alternative Design Manufacturing & Supply
PO Box 6330
Siloam Springs, AR 72761-6330
<http://www.alternativedesign.com>

Booth 17

In our 30th year of poultry caging design and fabrication! If you can dream it, we can build it! Our company designs and manufactures a complete line of housing equipment for the poultry science community. Researchers depend on Alternative Design for a variety of products including super brooders, start grow housing with optional brooding heater, feed conversion caging, artificial insemination sets and poultry isolators. We have a strong reputation for quality construction and service, including an industry-leading 5-year warranty on stainless steel fabricated products.

ATC Scientific
312 N Hemlock
North Little Rock, AR 72114
<http://atcscientific.com>

Booth 13

ATC Scientific is an independent analytical laboratory, with over 150 years of collective professional experience. ATC scientific specializes in assisting University's research projects on nutritional and health analytically. ATC Scientific is an AOCS/NOPA certified laboratory. We are centrally located in Arkansas.

BIOMIN America Inc.
1846 Lockhill Selma Rd Ste 101
Attn: Noemi Estrella
San Antonio, TX 78213-1551
<http://www.biomin.net>

Booth 6

As an animal nutrition company, BIOMIN develops and produces feed additives, premixes and services for healthy and profitable animals. Our solutions cover mycotoxin risk management and natural growth promotion for swine, poultry, ruminants, and aquaculture.

Chr. Hansen
99015 W Maple St
Milwaukee, WI 53214
<http://www.chr-hansen.com/animalhealth>

Booths 11 & 12

Rooted in science, grounded in agriculture. Since 1874. It all started in a rural Danish farming community in 1874. Today, thanks to our team of scientific specialists, Chr. Hansen has the largest collection of microbial strains for probiotics and silage inoculants in the world, so we can help you boost profitability while meeting all regulatory requirements for safety, stability, and efficacy. The Nutrient Scorecard™ - Probios® - SiloSolve® - BioPlus® - GalliPro®

GHW USA LLC
10015 Windfern Road
Houston, TX 77064
www.ghw-usa.com

Booth 7

GHW USA LLC is a part of the GHW Group (Nanjing Goldenhighway Int'l SCM Corp.), headquartered in Nanjing, China. With three production facilities located in Tai'An (China), Xuzhou (China), and Ho Chi Minh City (Vietnam), we are a leading supplier

of fine chemicals in China, with an annual turnover of more than \$500 million (US). Through a highly integrated network including over 40 distribution centers in China, and overseas branches in India, Russia, Ukraine, Vietnam, and Europe, GHW Group provides service to more than 10,000 customers around the world. The GHW Group focuses on the following: animal nutrition, with annual production capacities of 220,000 Mt of choline chloride, 20,000 Mt of betaine, and 50,000 Mt of trace mineral premix; iodine derivatives, with a global source and production base (1,500 Mt/year capacity) and a supply package of iodide, iodate, and periodate; PU material (with broad experience and a qualified R&D team, GHW can offer customized solutions); and oil and gas drilling [we supply green chemicals—choline chloride aqueous (KCl substitution)].

Keepyoung Technology Co. Ltd.
Rm. 603, Bldg. E, Yingchuangdongli
No 1, Shangdi East Rd
Haidian District
Beijing, Beijing 100085, China
<http://en.keepyoung.com.cn/>

Booth 9

Beijing Keepyoung is a company providing plant extract feed additives to promote animal growth performance, improve animal health status, and improve animal products quality. All of our products are managed in strict accordance with specifications such as ISO9001, ISO22000, HACCP, and FAMI-QS. The company is located in Beijing, China, which integrates R&D, production, test, and office. Its laboratory covers over 2,000 square meters, while the workshop covers over 8,000 square meters. It also has a production line that yields 10,000 tons of plant extracts every year.

King Techina Group
8 Yinxing Road
Ren He Jie Dao, Yuhang District
Hangzhou, Zhejiang 311107, China
<http://www.kingtechina.com>

Booth 10

King Techina has been devoted to developing and utilizing patented IMTM (Intelligent Microcapsule) Technology since 1999. We provide IMTM Technology-based products and services to improve animal health, increase productivity and efficiency, promote food safety, and build a more sustainable agricultural system. In order to ensure we deliver the best quality products to our customers, all King Techina products are manufactured and packaged in plants certified by GMP+, FAMI-QS, ISO9001, and FDA. Customers in nearly 50 countries trust and use King Techina products and services, and our team will always be here to work with you side by side.

Life Products Inc.
1507 South First Street
PO Box 1252
Norfolk, NE 68701
<http://www.lifeproductsinc.com>

Booth 8

Life Products, Inc. is a family-owned Nebraska-based company which has been manufacturing probiotics, animal health products and crop treatments since 1971. We supply quality probiotic products to a wide variety of poultry production systems.

Maple Leaf Farms Inc.
PO Box 167
Attn: Dr. Daniel Shafer
Leesburg, IN 46538
<http://www.mapleleafarms.com/>

Booth 16

Maple Leaf Farms Inc. is a fourth-generation, family-owned company based out of Leesburg, IN, and is North America's largest producer of duck. Maple Leaf Farms utilizes the white Pekin duck in its production and is one of three primary breeders in the world. Maple Leaf Farms also does its own further processing in house which provides greater ability to meet consumer needs and demand. Maple Leaf Farms believes that research is of the utmost importance in the animal agricultural realm and it helps us to provide our ducks with better care, our employees and partners with better knowledge, and our customers with a better product. We are always looking for new partners in our research endeavors and ask those interested to stop by our booth. We hope you will join us and Discover Duck!

Microlife Innovative Microbials
1845 57th Street
Sarasota, FL 34243
<http://www.microlifepoultry.com>

Booth 1

Since 1990, Osprey Biotechnics has been producing *Bacillus* probiotics in our Sarasota, Florida facility. By freeze drying our beneficial bacteria, we produce 100% viable spores that survive the heat pelleting process to be delivered via feed. Microlife L, *Bacillus licheniformis* is a patented strain selected to enhance GIT microflora and composition by our in-house research and development team. In consultation with experts in the poultry industry, we characterized this specific strain to play a specific role in the growing need for antibiotic-free production. Our Microlife Direct Fed Microbials assure affordable gut health at a fair minimum everyday cost.

ONCE Inc.
5455 Highway 169N
Minneapolis, MN 55442
<http://www.onceinnovations.com/>

Booths 19 & 20

ONCE focuses on improving animal health through applied photo-biology by developing innovative animal-centric lighting systems. Specifically designed for poultry, swine, and aquaculture markets, all systems are species specific and made to influence desirable biological processes to achieve optimum results. With proprietary Dim-to-Red and Dim-to-Blue technology, a natural sunrise and sunset simulation recreates an enhanced natural environment to reduce stress, enhance productivity, and promote animal welfare.

Oxford University Press
198 Madison Ave Fl 8
Attn: Nora Strecker
New York, NY 10016-4308
<http://www.oup.com>

Booth 3

Oxford University Press is proud to publish the official journals of the Poultry Science Association, *Poultry Science* and *The Journal of Applied Poultry Research*. Visit OUP at booth #3 to browse books and pick-up free journal sample copies.

Phytobiotics**Booth 5**

1288 Monroe Dr NE
Atlanta, GA 30306
<http://www.phytobiotics.com>

Founded in 2000, Phytobiotics quickly developed to become an expert provider of high-quality feed additives in more than 50 countries. From the very beginning, our aim has been to make outstanding economic results possible for our customers and to allow the unrestricted marketability of feed and food.

Poultry Science Association Foundation**Booth 2**

701 Devonshire Drive, C-51
Champaign, IL 61820
www.poultryscience.org/foundation.asp

The PSA Foundation is a charitable corporation affiliated with the Poultry Science Association. The primary purpose of the Foundation is to advance the founding principles of the PSA by securing private financial support for specific components and activities of the PSA. The Foundation is authorized to receive, manage, invest and distribute assets acquired by the Foundation for the purposes stipulated by the donors.

Texture Technologies Corp.**Booth: 4**

123 Stone Mill Ln. NW
Marietta, GA 30064-2600
<http://www.texturetechnologies.com>

Texture Technologies Corporation provides the world's most popular line of Texture Analyzers. The TA.XTPlus, TA.HDPlus, and TA.XTExpress Texture Analyzers can test a wide variety of products from poultry meat and eggs to baked goods and packaging materials. The newly released Egg Testing Kit will allow users to perform 10 egg quality checks within 4 minutes. The MORS Blade Fixture is a quick way to test for firmness and quantify the woody texture of poultry meat. The powerful, yet easy to use, Exponent software can be easily configured for both R&D and QC/QA environments to automate the testing procedure and data storage.

Vetagro Inc.**Booth: 15**

230 S Clark St # 320
Chicago, IL 60604-1406
<http://www.vetagro.com>

Vetagro specializes in the microencapsulation of feed additives and nutrients tailored to match the digestive capacity and intestinal transit time of poultry, swine, and ruminants. We are present globally, with international patents evidencing our novelty and innovation. Our main poultry products include Aviplus® P, which is an innovative microencapsulated combination of organic acids and nature-identical compounds (NIC) to help the growth of healthy chickens, and AviProtect®, a line dedicated to pre-harvest food-safety. To find out more about Vetagro products, please visit us at our booth.

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Program Grid

Monday, July 17			
TIME	ROOM	SECTION	SESSION
8:00 am–12:00 pm	Crystal J 2	Student Competition: Immunology, Health, and Disease	
8:00 am–12:00 pm	Crystal J 1	Student Competition: Management and Production	
8:00 am–12:00 pm	Royal	Student Competition: Metabolism and Nutrition	Nutrition I
8:00 am–11:45 am	Sago	Student Competition: Metabolism and Nutrition	Nutrition II
8:00 am–12:00 pm	Canary 1	Student Competition: Microbiology and Food Safety	
8:45 am–10:00 am	Canary 2	Student Competition: Processing and Products	
8:45 am–12:00 pm	Canary 3-4	Student Competition: Animal Well-Being and Behavior	
1:00 pm–5:00 pm	Canary 3-4	National Extension Workshop	Handling Change
1:00 pm–5:00 pm	Sago	Informal Nutrition Symposium	Critical content in a feed additive portfolio that is needed and will be meaningful to poultry decision makers
1:15 pm – 4:45 pm	Crystal J 2	Physiology and Reproduction	
1:30 pm–4:15 pm	Canary 1	Genomics, Molecular and Cellular Biology	
1:45 pm–4:30 pm	Crystal J 1	Microbiology and Food Safety	

Tuesday, July 18

TIME	ROOM	SECTION	SESSION
8:00 am–12:00 pm	Canary 1	Student Competition: Genomics and Molecular and Cellular Biology	
8:00 am–12:00 pm	Royal	Student Competition: Metabolism and Nutrition	Nutrition III
8:00 am–10:00 am	Sago	Student Competition: Metabolism and Nutrition	Nutrition IV
8:00 am–12:00 pm	Crystal J 1	Student Competition: Muscle Myopathies	Multidiscipline Approach
8:00 am–12:00 pm	Crystal J 2	Student Competition: Nutritional Immunology	
8:15 am–11:45 am	Canary 3-4	Student Competition: Physiology and Reproduction	
10:30 am–12:00 pm	Sago	Student Competition: Management and Production II	
1:00 pm–3:00 pm	Royal	Symposium	Phosphorus utilization evaluation in feed ingredients for poultry: Opportunities and challenges
1:00 pm–5:00 pm	Sago	Symposium	Pathogens and cancer manipulate immune defenses: Opportunities to innovate host targeted strategies to prevent and treat disease without antimicrobial and chemical therapies
1:00 pm–5:00 pm	Canary 3-4	Management and Production I	
1:00 pm–5:00 pm	Crystal J 2	Metabolism and Nutrition	Enzymes
1:15 pm–3:00 pm	Canary 1	Extension and Instruction	
1:15 pm–3:00 pm	Crystal J 1	Muscle Myopathies	Multidiscipline Approach
3:30 pm–4:30 pm	Crystal J 1	Processing and Products	
3:30 pm–5:00 pm	Royal	Publishing Workshop	Successful publishing in poultry science journals

Wednesday, July 19

TIME	ROOM	SECTION	SESSION
8:00 am–9:30 am	Royal	WPSA Lecture	History and future of genetically engineered food animal regulation
10:00 am–12:00 pm	Royal	PSA Business Meeting	
1:00 pm–5:00 pm	Canary 1	Animal Well-Being and Behavior	
1:00 pm–3:00 pm	Crystal J 1	Immunology, Health, and Disease I	
1:00 pm–2:45 pm	Crystal J 2	Management and Production II	
1:00 pm–5:00 pm	Royal	Symposium	Industry Forum: Unresolved issues facing the poultry industry
1:15 pm–4:30 pm	Sago	Metabolism and Nutrition	Amino Acids
3:30 pm–5:00 pm	Crystal J 2	Metabolism and Nutrition	Nutrition I

Thursday, July 20

TIME	ROOM	SECTION	SESSION
8:00 am–12:00 pm	Crystal J 2	Nutritional Immunology	
8:00 am–12:00 pm	Royal	Symposium	Relevance of starch in poultry diets
8:00 am–12:00 pm	Sago	Symposium	The future is already here: Application of technology to poultry health and welfare
8:15 am–11:45 am	Canary 1-2	Metabolism and Nutrition	Feed Additives I
8:30 am–11:30 am	Crystal J 1	Metabolism and Nutrition	Vitamins and Minerals
1:00 pm–2:45 pm	Canary 1-2	Immunology, Health, and Disease II	
1:00 pm–4:45 pm	Crystal J 1	Metabolism and Nutrition	Nutrition II
1:00 pm–5:00 pm	Sago	Symposium	Oxidative stress
1:00 pm–5:00 pm	Crystal J 2	Symposium	Vegetative buffers for environmental stewardship on poultry farms
3:30 pm–5:00 pm	Canary 1-2	Metabolism and Nutrition	Feed Additives II

Monday, July 17

SYMPOSIA AND ORAL SESSIONS

Student Competition: Metabolism and Nutrition I

Chair: Justin Fowler, University of Georgia

Moderator: Pramir Maharjan, University of Arkansas
Royal

- 8:00 AM 1 **Effect of different fat sources in parental diets on nutrient metabolism in pigeon squabs.**
Xueping Wan*¹, Peng Xie³, Xinyang Dong¹, Xiaoyun Zhang¹, Zhu Bu², and Xiaoting Zou¹, ¹*Zhejiang University, Hangzhou, China*, ²*Chinese Academy of Agricultural Sciences, Yangzhou, China*, ³*Huaiyin Normal University, Huaian, China*.
- 8:15 AM 2 **Comparison of two net energy calculations of two broiler strains with varying levels of metabolizable energy in two different temperatures.**
Katie Hilton*², Garret Mullenix², Michael Schlumbohm², Justina Caldas², Judith England², Maria Cortes², Victor Naranjo¹, and Craig Coon², ¹*Evonik Nutrition & Care, Hanau-Wolfgang, Germany*, ²*University of Arkansas, Fayetteville, United States*.
- 8:30 AM 3 **Evaluation of manganese methionine in laying hens diet.**
Xiaoyun Zhang*, Xinyang Dong, Minyao Zhou, and Xiaoting Zou, *Zhejiang University, Hangzhou, China*.
- 8:45 AM 4 **Effects of various cultivars of hulled and hullless barley on broiler amino acid digestibility and performance.**
Kolby Foltz*, Levi Gardner, Stuart Hill, Carl Griffey, Wynse Brooks, Wade Thomason, and Michael Persia, *Virginia Tech, Blacksburg, VA*.
- 9:00 AM 5 **Effects of crumble particle size on d0-14 Ross x Ross 708 male broiler performance.**
Mark Lemons*¹, Christopher McDaniel¹, Joseph Moritz², and Kelley Wamsley¹, ¹*Mississippi State University, Mississippi State, MS*, ²*West Virginia University, Morgantown, WV*.
- 9:15 AM 6 **Physicochemical characterization of feed-grade zinc oxide sources.**
Denise Cardoso*¹, Yves Chevalier², and Agnes Narcy³, ¹*ANIMINE, Sillingy, France*, ²*University of Lyon, Villeurbanne Cedex, France*, ³*INRA, Nouzilly, France*.

- 9:30 AM 7 **Impacts of xylanase and β -glucanase inclusion in corn-soy diets on performance, relative gizzard weight, energy digestibility and volatile fatty acid production of male broilers.**
Kyle Brown*¹, Cody Flores¹, Gemma González-Ortiz², and Jason Lee¹, ¹Texas A&M University, College Station, TX, ²AB Vista, Marlborough, United Kingdom.
- 9:45 AM 8 **The effects of diet formulation and degree of processing on 18-d broiler performance and amino acid digestibility.**
Ariel Bergeron*, John Boney, and Joseph Moritz, *West Virginia University, Morgantown, WV.*
- 10:00 AM **Break.**
- 10:30 AM 9 **Evaluating the response of Cobb 500 \times MV broilers to varying amino acid density regimens for a small bird program.**
Rosana Hirai*¹, Leonel Mejia², Cesar Coto², Justina Caldas², Christopher McDaniel¹, and Kelley Wamsley¹, ¹Mississippi State University, Mississippi State, MS, ²Cobb-Vantress, Siloam Springs, AR.
- 10:45 AM 10 **Uptake of ten minerals in Cobb 500 yolk during incubation and after hatch.**
Ryan Hopcroft*, Wendy Muir, and Peter Groves, *University of Sydney, Sydney, New South Wales, Australia.*
- 11:00 AM 11 **Evaluation of a super-dose of phytase in reduced nutrient density diets on laying hen performance.**
Kyle Smith*¹, Hunter Walters¹, Nelson Ward², and Jason Lee¹, ¹Texas A&M University, College Station, TX, ²DSM Nutritional Products, Ringoes, NJ.
- 11:15 AM 12 **Evaluation of multiple phytase enzymes and levels on broiler performance when utilizing an elevated phytase matrix value including minerals, energy, and amino acids.**
Christopher Eagleson*², Kyle Smith², Yueming Dersjant-Li¹, Milan Hruby¹, and Jason Lee², ¹DuPont Industrial Biosciences, Woodbury, MN, ²Texas A&M University, College Station, TX.
- 11:30 AM 13 **Evaluation of a phytogetic feed additive on turkey poult performance and nutrient digestibility.**
Charles Zumbaugh*², G. Raj Murugesan¹, and Michael Persia², ¹Biomim America Inc, San Antonio, TX, ²Virginia Tech, Blacksburg, VA.

- 11:45 AM 14 **Effect of hydrolyzed yeast and yeast cell wall as alternatives to zinc bacitracin on performance of broilers from 1 to 42 days.**
Jose Rivera*², Lucio Araújo², Melina Bonato¹, Ricardo Barbalho¹, Liliana Borges¹, and Cristiane Araujo², ¹ICC Brazil, São Paulo, São Paulo, Brazil, ²University of São Paulo, Pirassununga, São Paulo, Brazil.

Student Competition: Metabolism and Nutrition II

Chair: **Woo Kyun Kim, University of Georgia**

Moderator: **Kurt Perryman, Micronutrients Sago**

- 8:00 AM 15 **Effect of corn particle size during the starter and grower periods on broiler performance.**
Andrea Rubio*, Allan Pinto, Joseph Hess, and Wilmer Pacheco, *Auburn University, Auburn, AL.*
- 8:15 AM 16 **Evaluation of an encapsulated sodium butyrate with varying releasing times on broiler performance, energy digestibility, gut development and *Salmonella* colonization.**
Jundi Liu*², Haci Bayir², Douglas Cosby¹, Nelson Cox¹, and Justin Fowler², ¹US Department of Agriculture, Athens, GA, ²University of Georgia, Athens, GA.
- 8:30 AM 17 **Effect of dietary glycine+serine levels on low-protein diet with different levels of sulfur amino acids on performance, pectoral muscle creatine and relative breast weight of broilers.**
Paschal Aguihe*², Alice Murakami¹, Iván Camilo Ospina-Rojas¹, Kelly Kunes¹, and Eustace Iyayi², ¹Universidade Estadual de Maringá, Maringá, Brazil, ²University of Ibadan, Ibadan, Ibadan, Nigeria.
- 8:45 AM 18 **Effects of increasing zinc hydroxychloride level on male growth performance and breast meat yield.**
Austin Jasek*¹, Kyle Brown¹, Terri Parr², and Jason Lee¹, ¹Texas A&M University, College Station, TX, ²Micronutrients USA LLC, Indianapolis, IN.
- 9:00 AM 19 **The effect of four rearing programs on heat production (HP) and body composition of broiler breeders.**
Michael Schlumbohm*¹, Katie Hilton¹, Garret Mullenix¹, Antonio Beitia¹, Pramir Maharjan¹, Maria Cortes¹, Justina Caldas², Judith England¹, and Craig Coon¹, ¹University of Arkansas, Fayetteville, AR, ²Cobb-Vantress, Tontitown, AR.

- 9:15 AM 20 **Effect of a 60% protein soybean meal diet, feed particle size, and Rovabio Advance on poult live performance to 20 d of age.**
Karlinton Flores*, Jesse Grimes, Ramon Malheiros, and Adam Fahrenholz, *North Carolina State University, Raleigh, NC.*
- 9:30 AM 21 **Effects of inorganic trace mineral sulfates, organic trace mineral proteinates, or a mixture of the two on broiler breeder egg production and egg characteristics.**
Coltin Caraway*¹, John Brake¹, and Gregory Page², ¹*North Carolina State University, Raleigh, NC*, ²*Trouw Nutrition Agresearch, Guelph, ON, Canada.*
- 9:45 AM 22 **Determining the efficacy of two carbohydrase enzymes in commercial diets on d 0-57 broiler performance.**
Courtney Ennis*, Aaron Kiess, Wei Zhai, Christopher McDaniel, and Kelley Wamsley, *Mississippi State University, Mississippi State, MS.*
- 10:00 AM **Break.**
- 10:30 AM 23 **Evaluation of two enzyme composites in reduced nutrient density diets on laying hen performance.**
Cody Flores*¹, Kyle Smith¹, Nelson Ward², and Jason Lee¹, ¹*Texas A&M University, College Station, TX*, ²*DSM Nutritional Products, Ringoes, NJ.*
- 10:45 AM 24 **Does a diet with no added copper have adverse effects on laying hens under different temperatures?**
Wenxiang Li*, Yuanqing Chen, Lihong Zhao, Qiugang Ma, Jianyun Zhang, and Cheng Ji, *China Agricultural University, Beijing, China.*
- 11:00 AM 25 **Effects of broilerization and non-broilerization on pureline broiler breeder fertility, hatchability, chick quality, egg composition and body composition.**
Antonio Beitia*², Justina Caldas¹, Katie Hilton², Garret Mullenix², Michael Schlumbohm², Pramir Maharjan², Maria Mayorga², Judith England², and Craig Coon², ¹*Cobb-Vantress, Siloam Springs, AR*, ²*University of Arkansas, Fayetteville, AR.*
- 11:15 AM 26 **Phytase effect on amino acids, Ca, and P digestibility in laying hen fed with graded levels of digestible lysine.**
Ingrid Y. Martinez Rojas*¹, Ernesto Avila¹, Jose Arce Menocal³, Gilson Gomes², and Carlos Lopez¹, ¹*Universidad Nacional Autónoma de México, Mexico City, Mexico City, Mexico*, ²*AB Vista, Marlborough, United Kingdom*, ³*UMSNH, Morelia, Michoacan, Mexico.*

11:30 AM 27 **Evaluation of a yeast cell wall product in soybean and soybean free diets using Hy-line Brown layers.**
Morouj Al-Ajeeli*¹, Shawna Peer¹, Raghad Abdaljaleel¹, Mohammed Hashim¹, Hector Leyva-Jimenez¹, Thomas Gaydos², Giridhar Athrey¹, and Christopher Bailey¹, ¹Texas A&M University System, College Station, TX, ²Phileo Lesaffre, Milwaukee, WI.

Student Competition: Management and Production I
Chair: **Richard Blatchford, University of California, Davis**
Moderator: **Kenneth Koelkebeck, University of Illinois**
Crystal J1

8:00 AM 28 **Effects of atmospheric pressure change on broiler breeder egg production.**
Joshua Deines*, Doug Yoho, and R. Bramwell, *University of Arkansas, Fayetteville, AR.*

8:15 AM 29 **Can rearing feeding strategies improve the laying performance of broiler breeders?**
Aitor Arrazola*, Tina Widowski, Michele Guerin, and Stephanie Torrey, *University of Guelph, Guelph, ON, Canada.*

8:30 AM 30 **Broiler breeder laying signals: Body weight and rearing daylength.**
S. A. S. van der Klein*¹, K. L. Lovely¹, C. A. Ouellette¹, G. Y. Bédécarrats², and M. J. Zuidhof¹, ¹University of Alberta, Edmonton, AB, Canada, ²University of Guelph, Guelph, ON, Canada.

8:45 AM 31 **Hatching performance of broiler chicks provided a photoperiod during incubation.**
Kayla Graham*, Xujie Li, Janice MacIsaac, and Bruce Rathgeber, *Dalhousie University, Truro, NS, Canada.*

9:00 AM 32 **Growth and reproductive performances of broiler breeder hens under different daytime and supplemental light spectrum.**
Kayo Takeshima*¹, Martin Zuidhof², Charlene Hanlon¹, Adriana Rodriguez¹, and G. Y. Bédécarrats¹, ¹University of Guelph, Guelph, ON, Canada, ²University of Alberta, Edmonton, AB, Canada.

9:15 AM 33 **Yolk free body weight of layer chicks provided different wavelengths of LED light during incubation.**
Nilakshi Abeyasinghe*¹, Janice MacIsaac¹, Karen Schwean-Lardner², and Bruce Rathgeber¹, ¹Dalhousie University, Truro, NS, Canada, ²University of Saskatchewan, Saskatoon, SK, Canada.

- 9:30 AM 34 **Providing a photoperiod with different wavelengths LED lights on growth performance of broiler chickens during the first week of life.**
Xujie Li*¹, Kayla Graham¹, Bruce Rathgeber¹, and Janice MacIsaac²,
¹Dalhousie University, Truro, NS, Canada, ²Atlantic Poultry Research Institute, Truro, NS, Canada.
- 9:45 AM 35 **Impacts of dietary crude protein and breed selection on soil health, survivability of *Eimeria*, and crude protein digestibility in backyard poultry farms.**
Maureen Reiser*¹, Zac Williams², and Toree Bova¹, ¹University of Findlay, Findlay, OH, ²Tennessee Technological University, Cookeville, TN.
- 10:00 AM **Break.**
- 10:30 AM 36 **The effects of stocking density on turkey tom performance to 16 weeks of age.**
Kailyn Beaulac*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, *University of Saskatchewan, Saskatoon, SK, Canada.*
- 10:45 AM 37 **Effect of stocking density on live performance and leg health on broilers up to 49 d.**
Viviana San Martín*, Edgar Oviedo-Rondón, Albaraa Sarsour, Hernan Cordova-Noboa, Pedro Ferzola, Kenneth Anderson, Jesse Grimes, and Kimberly Livingston, *North Carolina State University, Raleigh, NC.*
- 11:00 AM 38 **Effect of stocking density on carcass and cut up yields, and meat quality of broilers up to 49 d.**
Santiago Alvarez*², Edgar Oviedo-Rondón¹, Albaraa Sarsour¹, Hernan Cordova-Noboa¹, Pedro Ferzola¹, Kenneth Anderson¹, Jesse Grimes¹, and Kimberly Livingston¹, ¹North Carolina State University, Raleigh, NC, ²Universidad Nacional de Colombia, Bogota, Cundinamarca, Colombia.
- 11:15 AM 39 **Thermal manipulation of commercial lines selected for different market ages and the impact on breast meat yield and meat quality characteristics.**
Sara Orłowski*¹, James Mason², Alex Gilley¹, and Nicholas Anthony¹, ¹University of Arkansas, Fayetteville, AR, ²Aviagen, Crossville, TN.
- 11:30 AM 40 **Effects of infrared beak treatment on early pullet feed intake, water intake, and body weight.**
Sarah Struthers*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, *University of Saskatchewan, Saskatoon, SK, Canada.*

- 11:45 AM 41 **Carbon dioxide and nitrogen infused compressed air foam for depopulation of caged laying hens.**
Shailesh Gurung*, Dima White, Gregory Archer, Dan Zhao, Yuhua Farnell, and Morgan Farnell, *Texas A&M AgriLife Research, College Station, TX.*

Student Competition: Immunology, Health, and Disease

Chair: **Lisa Bielke, Ohio State University**

Moderator: **Kayla Price, Alltech
Crystal J 2**

- 8:00 AM 42 **In vivo evaluation of acetyl-CoA carboxylase inhibitors as novel anticoccidial drug candidates in broiler chickens.**
Emily Kimminau*, Stacy Galaviz, Bill McCutchen, Jim Sacchettini, Manchi Reddy, Nian Zhou, Jason Lee, and Tri Duong, *Texas A&M University, College Station, TX.*
- 8:15 AM 43 **Impact of drinking water quality on cellular antimicrobial responses in broiler chickens.**
Juan More Bayona*, Anbu Karuppannan, Caitlin Thomson, Jeremy Wakaruk, and Daniel Barreda, *University of Alberta, Edmonton, AB, Canada.*
- 8:30 AM 44 **Evaluation of autofluorescent *Eimeria maxima* oocysts as a potential indicator of non-viability when enumerating oocysts.**
Lesleigh Beer², Lisa Bielke¹, John Barta³, Olivia Faulkner², Juan Latorre², Whitney Briggs¹, Kim Wilson¹, Mikayla Baxter², Guillermo Tellez², and Billy Hargis², ¹*Ohio State University, Wooster, OH,* ²*University of Arkansas Division of Agriculture, Fayetteville, AR,* ³*Ontario Veterinary College, University of Guelph, Guelph, ON, Canada.*
- 8:45 AM 45 **Evaluation of *Pichia* and *Bacillus* subunit vaccines for protection against *Eimeria maxima* in broilers.**
Audrey Duff^{*1}, Whitney Briggs¹, Kim Wilson¹, Kaylin Krueger¹, Leona Calhoun², Billy Hargis², Young Min Kwon², and Lisa Bielke¹, ¹*The Ohio State University, Columbus, OH,* ²*University of Arkansas, Fayetteville, AR.*

- 9:00 AM 46 **Resources for identifying and disinfecting *Heterakis gallinarum*, the vector for Blackhead disease.**
Katherine Cupo*¹, Roshan Adhikari², and Robert Beckstead¹,
¹*North Carolina State University, Raleigh, NC*, ²*University of Georgia, Athens, GA*.
- 9:15 AM 47 **Comparison of multiple methods for induction of necrotic enteritis in broilers.**
Kim Wilson*¹, Kaylin Krueger¹, Audrey Duff¹, Whitney Briggs¹,
Denise Rodrigues¹, Juan Latorre², Billy Hargis², John Barta³, and
Lisa Bielke¹, ¹*Ohio State University, Columbus, OH*, ²*University of Arkansas, Fayetteville, AR*, ³*University of Guelph, Guelph, ON, Canada*.
- 9:30 AM 48 **Using embryonated chicken eggs from MHC inbred lines as a novel resistant/susceptible model to study host responses to infectious bronchitis virus.**
Ali Nazmi* and Rodrigo Gallardo, *University of California Davis, Davis, CA*.
- 9:45 AM 49 **The antibody-guided vaccine method provides full protection against H5N1 HPAI challenge.**
Christine Vuong*², Wen-Ko Chou², Whitney Briggs¹, Amanda Wolfenden³,
Olivia Faulkner³, Melina Jonas⁴, Darrell Kapczynski⁵, Billy Hargis³,
Lisa Bielke¹, and Luc Berghman², ¹*Ohio State University, Wooster, OH*,
²*Texas A&M University, College Station, TX*, ³*University of Arkansas, Fayetteville, AR*,
⁴*Medion Vaccine Company, Bandung, Indonesia*, ⁵*United States Department of Agriculture, Atlanta, GA*.
- 10:00 AM **Break.**
- 10:30 AM 50 **Effect of fructoligosaccharides (FOS) on *Salmonella* colonization, immune response and ileal microbiome in laying hens challenged with *Salmonella Enteritidis*.**
Pratima Acharya Adhikari*¹, Hooman Derakhshani², Ehsan Khafipour²,
and Woo Kyun Kim¹, ¹*University of Georgia, Athens, GA*, ²*University of Manitoba, Winnipeg, MB, Canada*.
- 10:45 AM 51 **Different *Salmonella* serovars on performance and histological alterations in broilers.**
Paulo Hümmelgen*, Bruna Luiza Belote, Jessica Wammes, Antonio Kraieski,
Ricardo Hayashi, Aline Silva, and Elizabeth Santin, *Federal University of Paraná, Curitiba, Paraná, Brazil*.
- 11:00 AM 52 **Effect of embryonic thermal manipulation on HSP70 and T cell development in ducklings.**
Revathi Shanmugasundaram*, Ramesh Selvaraj, and Michael Lilburn, *The Ohio State University, Wooster, OH*.

- 11:15 AM 53 **High throughput screening of histone deacetylase inhibitors that induce host defense peptide expression.**
Zhuo Deng*, Wentao Lyu, and Glenn Zhang, *Oklahoma State University, Stillwater, OK.*
- 11:30 AM 54 **Identification of natural host defense peptide-inducing compounds using a cell-based high-throughput screening assay.**
Wentao Lyu* and Zhuo Deng, *Oklahoma State University, Stillwater, OK.*
- 11:45 AM 55 **Natural environmental selection differentially modulates the diversity of gut microbes and innate immune responses of feral and modern broiler chickens.**
Ricardo Hayashi*², Celia Garcia³, Eben Gering¹, Alexandra Smith⁴, Thomas Rehberger⁴, Isaac Cann³, Elizabeth Santin², and Roderick Mackie³, ¹*Michigan State University, East Lansing, MI*, ²*UFPR, Curitiba, PR, Brazil*, ³*University of Illinois, Urbana-Champaign, IL*, ⁴*Agro Biosciences, Wauwatoosa, WI.*

Student Competition: Microbiology and Food Safety
Chair: Anup Kollanoor-Johny, University of Minnesota
Moderator: Amit Morey, Auburn University
Canary 1

- 8:00 AM 56 **Assessing the impact of early production molting of pullets on the prevalence of *Salmonella*, *Campylobacter*, and *Enterobacteriaceae*.**
Krista Eberle*², Deana Jones⁴, Richard Gast⁴, Cara Robison¹, Kenneth Anderson², and Darrin Karcher³, ¹*Michigan State University, East Lansing, MI*, ²*North Carolina State University, Raleigh, NC*, ³*Purdue University, West Lafayette, IN*, ⁴*USDA-ARS, Athens, GA.*
- 8:15 AM 57 **Evaluation of a commercial probiotic product in controlling transmission of *Salmonella* from hens to eggs.**
Ayoola Onafowokan* and Christine Alvarado, *Texas A&M University, College Station, TX.*
- 8:30 AM 58 **Antibacterial effect of food-grade lemongrass essential oil on *Salmonella* Heidelberg in vitro.**
Grace Dewi*, Divek V. T. Nair, and Anup Kollanoor-Johny, *University of Minnesota, Saint Paul, Minnesota, United States.*
- 8:45 AM 59 **Effect of white mustard essential oil and carvacrol on *Salmonella* in ground chicken.**
John Porter* and Emefa Monu, *Auburn University, Auburn, AL.*

- 9:00 AM 60 **The effects of varying long-term steam conditioning temperature and antimicrobial inclusion on the mitigation of *Enterococcus faecium* 8459, a non-pathogenic surrogate of *Salmonella*.**
John Boney*, Ariel Bergeron, and Joseph Moritz, *West Virginia University, Morgantown, WV.*
- 9:15 AM 61 **Biofilm inactivation of two morphotypes of two *Salmonella enterica* serovars by sodium hypochlorite on different surfaces.**
Mohit Bansal*, Chander Shekhar Sharma, Christopher McDaniel, Janak Dhakal, RamaKrishna Nannapaneni, Amanda Lawrence, and Aaron Kiess, *Mississippi State University, Starkville, MS.*
- 9:30 AM 62 **Effects of dietary flaxseed on ceca microbial community compositions of Peking Ducks.**
Yuqin Wu*¹, Fuhuang Li², Muhammad Shahid¹, Zhibin Xiao¹, Xiaoyu Dong¹, Dafei Yin¹, Zhao Lei¹, and Jianmin Yuan¹, ¹*College of Animal Science and Technology, China Agricultural University, Beijing, China*, ²*Beijing General Station of Animal Husbandry, Beijing, China.*
- 9:45 AM 63 **Evaluation of cetylpyridinium chloride (CPC) on water usage and *Salmonella* retention in broilers following feed and water withdrawal.**
Caitlin Harris*², Nicole Bartenfeld³, Dianna Bourassa¹, Brian Fairchild², Brian Kiepper², and R. Jeff Buhr³, ¹*Auburn University, Auburn, AL*, ²*University of Georgia, Athens, GA*, ³*USDA-ARS US National Poultry Research Center, Athens, GA.*
- 10:00 AM **Break.**
- 10:30 AM 64 **In-vessel poultry litter composting to facilitate pathogen reduction and biofertilizer production system.**
Felix Buabeng*¹, Fawzy Hashem¹, Patricia Millner², and Lorna Graham¹, ¹*University of Maryland Eastern Shore, Princess Anne, MD*, ²*US Department of Agriculture, Beltsville, MD.*
- 10:45 AM 65 **Evaluation of the role of infection route in the development of systemic *Salmonella* infection in chickens.**
Amie Marie Jones-Ibarra*¹, Denise Caldwell², J. Byrd², and Christine Alvarado¹, ¹*Texas A&M University, Bryan, TX*, ²*USDA, ARS, SPARC, College Station, TX.*
- 11:00 AM 66 **Effects of multiple alternatives-to-antibiotic interventions on multidrug-resistant *Salmonella* Heidelberg in turkey poults.**
Divek V. T. Nair*, Jijo Vazhakkattu Thomas, Grace Dewi, Timothy Johnson, Sally Noll, Carol Cardona, and Anup Kollanoor Johny, *University of Minnesota, Saint Paul, MN.*

- 11:15 AM 67 **Differences in recovery of *Salmonella* Heidelberg when chicks are inoculated on days 0 and 14.**
Elle Chadwick*, James Krehling, Brittany Singh, Bradley Schrader, and Ken Macklin, *Auburn University, Auburn, AL.*
- 11:30 AM 68 **Ice slurry to aid in antimicrobial reduction of *Salmonella typhimurium* in poultry chilling.**
Stephanie Richter*, Comas Haynes, and Daniel Sabo, *GTRI, Atlanta, GA.*
- 11:45 AM 69 **Phytochemicals reduce biofilm formation and inactivates mature biofilm of *Campylobacter jejuni*.**
Basanta Raj Wagle*, Abhinav Upadhyay¹, Komala Arsi¹, Indu Upadhyaya¹, Sandip Shrestha¹, Kumar Venkitanarayanan², Annie Donoghue³, and Dan Donoghue¹, ¹*University of Arkansas, Fayetteville, AR*, ²*University of Connecticut, Storrs, CT*, ³*ARS USDA, Fayetteville, AR.*

Student Competition: Processing and Products

Chair and Moderator: **Dianna Bourassa,**
Auburn University
Canary 2

- 8:45 AM 70 **A carvacrol wash and/or a chitosan-based coating reduced *Campylobacter jejuni* on chicken wingettes.**
Sandip Shrestha*¹, Annie Donoghue², Komala Arsi¹, Abhinav Upadhyay¹, Basanta Raj Wagle¹, Kumar Venkitanarayanan³, and Dan Donoghue¹, ¹*University of Arkansas, Fayetteville, AR*, ²*ARS-USDA, Fayetteville, AR*, ³*University of Connecticut, Storrs, CT.*
- 9:00 AM 71 **Evaluation of commercial cage-free barn egg quality during early production.**
Garrett Ward*³, Deana Jones², Richard Gast², Harshavardhan Thippareddi³, and Kenneth Anderson¹, ¹*North Carolina State University, Raleigh, NC*, ²*USDA-ARS, Athens, GA*, ³*University of Georgia, Athens, GA.*
- 9:15 AM 72 **Essential oils on lipid oxidation in chicken meatballs: In vivo and in situ assays.**
Adriana Figueiredo*¹, Renata Maria Duarte¹, Glauca Napy³, Cristiane Lima², Aline Racanicci², and Marta Cristina Duarte¹, ¹*UNICAMP, Campinas, São Paulo, Brazil*, ²*UnB, Brasilia, Brazil*, ³*ESALQ-USP, Piracicaba, Brazil.*
- 9:30 AM 73 **Effects of replacing antibiotics and anticoccidials with probiotics in broiler diets on processing yields.**
Kacey O'Donnell*, Xi Wang, Kelley Wamsley, Aaron Kiess, E. Peebles, and Wei Zhai, *Mississippi State University, Starkville, MS.*

- 9:45 AM 74 **The effect of diet and age on breast muscle characteristics in commercial broilers.**
Victoria Polentz*, Jacqueline Griffin, Stephanie Hutsko, Macdonald Wick, and Michael Cressman, *The Ohio State University, Columbus, OH.*

Student Competition: Animal Well-Being and Behavior
Chair and Moderator: **Marisa Erasmus,**
Purdue University
Canary 3-4

- 8:45 AM 75 **Efficacies of manual, assisted manual, and mechanical cervical dislocation methods in anesthetized layer chicks.**
Rathnayaka Bandara*¹, Stephanie Torrey¹, Anna Bolinder¹, Karen Schwean-Lardner², Patricia Turner¹, and Tina Widowski¹,
¹*University of Guelph, Guelph, ON, Canada,* ²*University of Saskatchewan, Saskatoon, SK, Canada.*
- 9:00 AM 76 **Assessing the effect of dehydration on onset of insensibility and death during on-farm euthanasia in broilers.**
Bethany Baker*², Stephanie Torrey¹, Tina Widowski¹, Patricia Turner¹, Susantha Gomis², Henry Classen², Tennille Knezacek², Jenny Fricke², and Karen Schwean-Lardner², ¹*University of Guelph, Guelph, ON, Canada,* ²*University of Saskatchewan, Saskatoon, SK, Canada.*
- 9:15 AM 77 **Temperatures experienced by broilers at the time of farm departure during Canadian prairie winters.**
Aidan McNeil*, Catherine Vermette, Nileeka Irugalbandara, Karen Schwean-Lardner, and Trever Crowe, *University of Saskatchewan, Saskatoon, SK, Canada.*
- 9:30 AM 78 **Change point detection for monitoring changes in the broiler growout environment.**
Muhammad Rizwan*¹, Brandon T. Carroll¹, Douglas F. Britton³, Wayne Daley³, Simeon Harbert³, Karen Christensen², Doug Alridge², and David V. Anderson¹, ¹*Georgia Institute of Technology, Atlanta, GA,* ²*University of Arkansas, Fayetteville, AR,* ³*Georgia Tech Research Institute, Atlanta, Georgia, United States.*
- 9:45 AM 79 **Comparison of health, physiology and stress measures of clinically healthy and lame broilers.**
Shawna Weimer*, Robert Wideman, Andronikos Mauromoustakos, Karen Christensen, and Yvonne Thaxton, *University of Arkansas, Fayetteville, AR.*
- 10:00 AM **Break.**

- 10:30 AM 80 **Supplementation of Original XPC or AviCare to reduce stress in broilers.**
Jill Nelson*², Don McIntyre³, Hilary Pavlidis¹, and Gregory Archer²,
¹Diamond V, Virginia Beach, VA, ²Texas A&M University, College Station, TX, ³DiamondV, Cedar Rapids, IA.
- 10:45 AM 81 **Effect of rate and extent of starch digestion on broiler feeding and drinking behavior.**
Eugenia Herwig*, Henry Classen, and Karen Schwean-Lardner, University of Saskatchewan, Saskatoon, SK, Canada.
- 11:00 AM 82 **The impact of infrared beak treatment on the productivity traits of turkeys.**
Timothy Fiss*¹, Susantha Gomis³, Henry Classen¹, and Karen Schwean-Lardner², ¹University of Saskatchewan, Qu'Appelle, SK, Canada, ²University of Saskatchewan, Saskatoon, SK, Canada, ³Veterinary Pathology, Saskatoon, SK, Canada.
- 11:15 AM 83 **Effects on feather pecking and cloacal cannibalism by providing nest boxes in colony cages for layer breeders.**
Haipeng Shi*, Weichao Zheng, and Baoming Li, China Agricultural University, Beijing, China.
- 11:30 AM 84 **Growth-dependent changes in pressure sensing walkway data for turkeys.**
Jody Kremer*¹, Cara Robison¹, Sally Noll⁴, R. Michael Hulet², Marisa Erasmus³, and Darrin Karcher³, ¹Michigan State University, East Lansing, MI, ²Penn State University, University Park, PA, ³Purdue University, West Lafayette, IN, ⁴University of Minnesota, St Paul, MN.
- 11:45 AM 85 **Effect of bird density and bedding source on heavy turkey hens: footpad dermatitis.**
Gabiella Furo*³, R. Michael Hulet¹, Lisa Kitto¹, Sally Noll³, Darrin Karcher², and Marisa Erasmus², ¹Penn State University, University Park, PA, ²Purdue University, West Lafayette, IN, ³University of Minnesota, St Paul, MN.

Informal Nutrition Symposium: Critical content in a feed additive portfolio that is needed and will be meaningful to poultry decision makers

Chairs and Moderators: **Roselina Angel, University of Maryland; Doug Korver, University of Alberta; Mamduh Sifri, Sifri Solutions LLC Sago**

- 1:00 PM 578S **Introduction to critical data for poultry nutritionists to use feed additives.**
Roselina Angel*² and Mamduh Sifri¹, ¹*Sifri Solutions LLC, Quincy, IL*, ²*University of Maryland, College Park, MD*.
- 1:05 PM 579S **Identifying the problem and the opportunities: Defining a hypothesis.**
Kirk Klasing*, *University of California, Davis, Davis, CA*.
- 1:45 PM 580S **Product portfolio: Needed experimental support—Basic and applied (products that increase gut health).**
Todd Applegate*, *University of Georgia, Athens, GA*.
- 2:15 PM 581S **Product portfolio: Proper statistics on individual experiments, interpretation and time-tested ways to provide results that include confidence intervals for application.**
Rex Newkirk*, *University of Saskatchewan, Saskatoon, SK, Canada*.
- 2:45 PM **Discussion.**
- 3:00 PM **Break.**
- 3:30 PM 582S **Meta-analysis: Uses, misuses, and common misinterpretations.**
Mike Bedford*¹ and Aaron Cowieson², ¹*AB Vista Feed Ingredients, Marlborough, United Kingdom*, ²*DSM, Kirkwall, Orkney, United Kingdom*.
- 3:55 PM 583S **Field trials: Commercial experience—Mini pens in commercial houses.**
Nelson Ward*, *DSM Nutritional Products, Ringoes, NJ*.
- 4:20 PM 584S **Commercial industry nutritionist perspective on what are the essential pieces needed for commercial consideration of feed additives.**
Sergio Vieira*, *USFRGS, Porto Alegre, Brazil*.
- 4:45 PM **Summary/Discussion.**

National Extension Workshop: Handling change

Chair and Moderator: **Gregory Martin,**

Penn State University

Canary 3-4

- 1:00 PM 585S **Introduction and state updates.**
Gregory Martin*, *Pennsylvania State University, Lancaster, PA.*
- 1:20 PM 586S **Consumer preferences and behaviors regarding poultry meat and eggs.**
Wes Jamison*, *Palm Beach Atlantic University, West Palm Beach, FL.*
- 2:20 PM 587S **Odors and particulates: Monitoring, assessments and control measures.**
Paul Patterson*, *Penn State University, University Park, PA.*
- 3:00 PM **Break.**
- 3:30 PM **Panel discussion: Handling and staying ahead of change.**
Kenneth E. Anderson, *North Carolina State University, Raleigh, NC*; John B. Carey, *Texas A&M University, College Station, TX*; R. Michael Hulet, *Penn State University, University Park, PA*; Sally Noll, *Minneapolis, University of Minnesota, MN.*
- 3:30 PM 588S **Extension farm safety and emergency preparedness programs.**
Jonathan Moyle*, *University of Maryland, Salisbury, MD.*

Physiology and Reproduction

Chair: **Darrin Karcher, Purdue University**

Moderator: **Andrew Benson, University of Georgia**

Crystal J 2

- 1:15 PM 86 **Effect of early-life nutritional stress on the expression of vasotocin and corticotropin-releasing hormone receptors in liver and anterior pituitary of male broilers.**
Seong Kang* and Wayne Kuenzel, *Department of Poultry Science, University of Arkansas, Fayetteville, AR.*
- 1:30 PM 87 **Cellular evidence supporting an additional structure in the chick brain involved in the neuroendocrine regulation of the stress response.**
Wayne Kuenzel*¹, Gurueswar Nagarajan¹, Alexander Jurkevich², and Seong Kang¹, ¹*University of Arkansas, Fayetteville, AR,* ²*University of Missouri, Columbia, MO.*

- 1:45 PM 88 **Sperm-associated antigen 6, a flagellar protein important in mammalian fertility, is sequentially expressed in the male reproductive tract and associated with increased sperm mobility in the rooster.**
Andrew Benson and Muslah Ahammad*, *University of Georgia, Athens, GA.*
- 2:00 PM 89 **The effect of incubation temperature and time of hatch on muscle growth and morphology.**
Daniel Clark*¹, Kim Walter², and Sandra Velleman¹, ¹*The Ohio State University, Wooster, OH*, ²*Aviagen, Inc, Albertville, AL.*
- 2:15 PM 90 **Sentinel cells of ducks complicate interpretation of the H/L ratio.**
Paul Cotter*, *Cotter Laboratory, Arlington, MA.*
- 2:30 PM 91 **Glucose and uric acid in blood of broiler chicken.**
Ricardo Nunes*¹, Jomara Broch¹, Lucas Wachholz¹, Cleison Souza¹, Cinthia Eyng¹, Paulo Pozza², and Gene Pesti³, ¹*Universidade Estadual do Oeste do Paraná–UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil*, ²*Universidade Estadual de Maringa, Maringa, Parana, Brazil*, ³*University of Georgia, Athens, GA.*
- 2:45 PM 92 **Evaluating the accuracy and precision of blood glucose measurements in broilers and turkeys.**
Catherine Vermette*, Aidan McNeil, Karen Schwean-Lardner, and Trever Crowe, *University of Saskatchewan, Saskatoon, SK, Canada.*
- 3:00 PM **Break.**
- 3:30 PM 93 **Cholesterol and triglycerides in blood of broiler chicken.**
Ricardo Nunes*¹, Cleison Souza¹, Lucas Wachholz¹, Jomara Broch¹, Cinthia Eyng¹, Jarred Oxford², and Gene Pesti², ¹*Universidade Estadual do Oeste do Paraná - UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil*, ²*University of Georgia, Athens, GA.*
- 3:45 PM 94 **Reproductive performance assessment of two White Leghorn lines free of endogenous viruses.**
Gururaj Kulkarni*, Kunzhe Dong, and Huanmin Zhang, *USDA-ARS, East Lansing, MI.*
- 4:00 PM 95 **Laying hen strain influences skeletal morphology and keel fracture prevalence in multi-tier aviary system.**
Prafulla Regmi*¹, Deana Jones², Richard Gast², and Darrin Karcher¹, ¹*Purdue University, West Lafayette, IN*, ²*USDA-ARS, Athens, GA.*

- 4:15 PM 96 **Analytical bone calcium correlates to calcium calculated using quantitative computed tomography in long bones from mature laying hens.**
 Cara Robison*¹ and Darrin Karcher², ¹Michigan State University, East Lansing, MI, ²Purdue University, West Lafayette, IN.
- 4:30 PM 97 **Efficacy of protein and probiotics supplementation on dynamics of endocrine markers and liver enzymes in serum of molted egg laying hens.**
 Haseeb Anwar*, Government College University, Faisalabad, Pakistan.

Genomics, Molecular and Cellular Biology
 Chair and Moderator: **Jessica Starkey,**
Auburn University
Canary 1

- 1:30 PM 98 **On the origin (and evolution) of feral *Gallus gallus*.**
 Eben Gering*¹, Dominic Wright³, Martin Johnsson³, Levi Storks⁴, Thomas Getty¹, Ricardo Hayashi², William Muir⁵, Wesley Warren⁶, and Hans Cheng¹, ¹Michigan State University, East Lansing, MI, ²UFPR, Curitiba, PR, Brazil, ³Linköping University, Linköping, Sweden, ⁴University of Missouri, Columbia, MO, ⁵Purdue University, West Lafayette, IN, ⁶Washington University in St. Louis, Saint Louis, MO.
- 1:45 PM 99 **Transcriptional profiling of keel bone from low calcium diet induced osteoporosis hens.**
 Sha Jiang*, Southwest University, Chongqing, China.
- 2:00 PM 100 **Consequences of extended photoperiods for poultry gut and metabolic health.**
 Anne-Sophie Hieke*, Shawna Peer, and Giridhar Athrey, Texas A&M University, College Station, TX.
- 2:15 PM 101 **Transcriptome analysis reveals inhibitory effects of lentogenic Newcastle disease virus on cell survival and immune function in spleen of layer chickens.**
 Jibin Zhang*¹, Michael Kaiser¹, Melissa Deist¹, Rodrigo Gallardo², David Bunn², Terra Kelly², Jack Dekkers¹, Huaijun Zhou², and Susan Lamont¹, ¹Iowa State University, Ames, IA, ²University of California Davis, Davis, CA.
- 2:30 PM **Break.**

- 3:30 PM 104 **Noni (*Morinda citrifolia*) modulates the expression of hepatic lipid metabolism genes in acute and chronic heat stressed broilers.**
Joshua Flees*, Elizabeth Greene, Walter Bottje, and Sami Dridi,
University of Arkansas, Fayetteville, AR.
- 3:45 PM 105 **Ets-1 is a target of MAPK signaling in the embryonic anterior pituitary gland during glucocorticoid initiation of pituitary growth hormone expression.**
Laura Ellestad*, Monika Proszkowiec-Weglarz, and Tom Porter,
University of Maryland, College Park, MD.
- 4:00 PM 106 **Localization of cells expressing PepT1 mRNA by in situ hybridization in the yolk sac and small intestine in broiler chickens.**
Haihan Zhang* and Eric Wong, *Virginia Tech, Blacksburg, VA.*

Microbiology and Food Safety

Chair and Moderator: **Anup Kollanoor-Johny,**
University of Minnesota
Crystal J 1

- 1:45 PM 107 **Modulating the turkey host and its microbiome: Host-microbe interactions following antibiotic and probiotic administration.**
Timothy Johnson*¹, Sally Noll¹, Kent Reed¹, Dan Knights¹, Mike Kogut², Ryan Arsenault³, Bonnie Youmans¹, Jeanine Brannon¹, Kristelle Mendoza¹, and Tonya Ward¹, ¹*University of Minnesota, St Paul, MN,* ²*USDA-ARS, College Station, TX,* ³*University of Delaware, Newark, DE.*
- 2:00 PM 108 **Frequency and persistence of fecal shedding of *Salmonella* serovars Heidelberg and Typhimurium by experimentally infected laying hens housed in enriched colony cages at different stocking densities.**
Richard Gast*³, Rupa Guraya³, Deana Jones³, Jean Guard³, Kenneth Anderson², and Darrin Karcher¹, ¹*Purdue University, West Lafayette, IN,* ²*North Carolina State University, Raleigh, NC,* ³*USDA-ARS, Athens, GA.*
- 2:15 PM 109 **Effect of butyrate release location on cecal microbiota composition of broilers.**
Pierre Moquet*¹, Chuanlan Tang¹, Lonneke Onrust², and René Kwakkel¹, ¹*Wageningen University, Wageningen, the Netherlands,* ²*Faculty of Veterinary Medicine, Gent, Belgium.*

- 2:30 PM 110 **Application of a micro-aerosolized disinfectant system to control environmentally deposited poultry pathogens.**
Jeffrey Evans*, Scott Branton, Stephanie Collier, John Brooks, and Joseph Purswell, *USDA-ARS, Mississippi State, MS.*
- 2:45 PM 111 **In vitro inhibition of *Enterococcus cecorum* by probiotic *Bacillus* strains.**
Alexandra Wealleans*¹, Marion Bernardeau¹, and Marina Cretenet²,
¹*Danisco Animal Nutrition, DuPont Industrial Biosciences, Marlborough, United Kingdom,* ²*Normandie Universite, UNICAEN, Caen, France.*
- 3:00 PM **Break.**
- 3:30 PM 112 **Effects of dietary eubiotics on *Salmonella enteritidis* excretion in layer hens.**
Diana Alvarez³, Claudia Torres³, Leticia Bittencourt¹, and Carlos Lozano*², ¹*DSM Nutritional Products Brazil, São Paulo, Brazil,* ²*DSM Nutritional Products Colombia S.A, Bogotá, Colombia,* ³*Universidad Nacional de Colombia, Bogotá, Colombia.*
- 3:45 PM 113 **In-water supplementation of Trans-cinnamaldehyde nanoemulsion reduces *Campylobacter jejuni* colonization in broiler chickens.**
Abhinav Upadhyay*², Komala Arsi², Basanta Raj Wagle², Sandip Shrestha², Indu Upadhyaya², Kanika Bhargava³, Annie Donoghue¹, and Dan Donoghue², ¹*ARS, USDA, Fayetteville, AR,* ²*University of Arkansas, Fayetteville, AR,* ³*University of Central Oklahoma, Edmond, OK.*
- 4:00 PM 114 **In vitro evaluation of the antimicrobial effects of a gram-negative control solution.**
Chasity Pender*¹, Antonia Tocconi², Attila Kovacs², and G. Raj Murugesan¹, ¹*BioMin America Inc, San Antonio, TX,* ²*BioMin Holding GmbH, Getzersdorf, Austria.*
- 4:15 PM 115 **Alquer mold natural reduces the ability of *Salmonella* to invade intestinal epithelial cells.**
Anna Tesouro*¹ and Cristina Latasa², ¹*Biovet, S.A, Constanti, Spain,* ²*University of Navarra, Navarra, Spain.*

Tuesday, July 18

Student Competition: Metabolism and Nutrition III

Chair: Samuel Rochell, University of Arkansas

Moderator: Rocky Latham, Tyson Foods Inc.
Royal

- 8:00 AM 116 **Broiler chickens fed a diet with l-methionine improved growth performance and gut integrity compared to those fed a diet with d-methionine isomer challenged with acute heat stress.**
Samiru Wickramasuriya*¹, Eunjoo Kim¹, Taeg Kyun Shin¹, Hyun Min Cho¹, Ho Jun Choi², Jung Un Kim², and Jung Min Heo¹, ¹*Chungnam National University, Daejeon, Korea*, ²*CJ CheilJedang Corporation, Seoul, Korea*.
- 8:15 AM 117 **Effects of 1,3-diacylglycerol (DAG) on growth performance and carcass characteristics in broilers.**
Jinquan Wang*¹, Paula Sedlacek¹, Helen Choi², and Woo Kyun Kim¹, ¹*University of Georgia, Athens, GA*, ²*Kimin, Seoul, Seoul, Korea*.
- 8:30 AM 118 **Nutritional evaluation of novel ethanol co-products.**
Shelby Corray*, Carl Parsons, Pamela Utterback, Divya Ramchandran, Vijay Singh, and H. Huang, *University of Illinois, Urbana, IL*.
- 8:45 AM 119 **An evaluation of the effect of choice of reference diets and adaptation length on apparent metabolizable energy contents of corn and wheat middlings in broiler chickens.**
Andrew Dunaway* and Sunday Adedokun, *University of Kentucky, Lexington, KY*.
- 9:00 AM 120 **The effects of refined functional carbohydrates (RFCs) supplemented to broiler breeders and to broiler progeny on the vertical transmission of *Salmonella* spp.**
Grayson Walker*¹, Sangita Jalukar², and John Brake¹, ¹*North Carolina State University, Raleigh, NC*, ²*Arm and Hammer Animal Health, Princeton, NJ*.
- 9:15 AM 121 **Effects of various levels of synthetic arginine supplementation on growth response and body composition in broilers.**
Fernanda Castro*¹, Jung Un Kim², Eunji Koo², Ho Jun Choi², Jeanna Wilson¹, and Woo Kyun Kim¹, ¹*University of Georgia, Athens, GA*, ²*CJ Corporation, Seoul, Korea*.

- 9:30 AM 122 **Further evaluation of a slope-ratio precision-fed rooster assay for relative metabolizable energy values for fats and oils.**
Patrick von Schaumburg*, Carl Parsons, and Pamela Utterback, *University of Illinois Urbana-Champaign, Urbana, IL.*
- 9:45 AM 123 **Effects of different levels of *in ovo*-injected vitamin D sources on the hatchability and serum 25-hydroxycholecalciferol concentrations of Ross 708 broilers.**
Saman Fatemi*¹, Katie Elaine Collins¹, Oluwaseun Durojaye¹, Haijun Zhang¹, Bradley Turner², and E. Peebles¹, ¹*Mississippi State University, Mississippi State, MS*, ²*DSM Nutritional Products, Parsippany, NJ.*
- 10:00 AM **Break.**
- 10:30 AM 124 **Determination of phosphorus digestibility/retention using different types of balance assays.**
John Munoz*, Christina Hanna, Pamela Utterback, and Carl Parsons, *University of Illinois, Urbana, IL.*
- 10:45 AM 125 **Effect of high concentrations of dietary vitamin D₃ on skeleton health, egg shell quality and yolk vitamin D₃ content when fed to W-36 laying hens over the pullet, early and peak egg production.**
Jinlei Wen*¹, Kimberly Livignston², and Michael Persia¹, ¹*Virginia Tech, Blacksburg, VA*, ²*North Carolina State University, Raleigh, NC.*
- 11:00 AM 126 **Comparison of Narasin and bioshuttle programs with different environmental temperatures in commercial broilers.**
Jarred Oxford*¹, Jaime Ruiz², Melissa Landrum¹, and Gene Pesti¹, ¹*The University of Georgia, Athens, GA*, ²*Elanco Animal Health, McKinney, TX.*
- 11:15 AM 127 **Effects of a commercial β -mannanase product on live performance and intestinal morphology in Pekin ducks.**
Jungwoo Park*, Raghad Abdaljaleel, Micky Clary, John Padgett, and John Carey, *Texas A&M University, College Station, TX.*
- 11:30 AM 128 **Formulation and feed manufacturing factors that affect xylanase activity loss during thermal processing.**
J. T. Pope*, John Brake, and Adam Fahrenholz, *North Carolina State University, Raleigh, NC.*

- 11:45 AM 129 **Effect of different levels of sorghum inclusion and the addition of a serine protease on live performance of broilers from 1 to 35 days of age.**
Albaraa Sarsour*¹, Hernan Cordova-Noboa¹, Edgar Oviedo-Rondón¹, Pedro Ferzola¹, and Nasser Odetallah², ¹*North Carolina State University, Raleigh, NC*, ²*Novus International, St. Charles, MO*.

Student Competition: Metabolism and Nutrition IV
Chair: **Charles Starkey, Auburn University**
Moderator: **Justina Caldas, Cobb-Vantress**
Sago

- 8:00 AM 130 **Long-term effects of continuous supplementation with probiotics on production parameters in chicken pullets and laying hens.**
Pablo Lopera*¹, Javier Sanchez², Julian Reyes², and Juan Rodriguez-Lecompte², ¹*Avicola Nacional SA, Medellin, Antioquia, Colombia*, ²*University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada*.
- 8:15 AM 131 **The effect of sampling method, marker type, drying methods and temperature on apparent ileal amino acid digestibility in 21-d-old broilers.**
Opeyemi Olojede*¹, Michael Ford¹, Jacqueline Jacob¹, Tuoying Ao², Anthony Pescatore¹, and Sunday Adedokun¹, ¹*University of Kentucky, Lexington, KY*, ²*Alltech Inc, Nicholasville, KY*.
- 8:30 AM 132 **Comparative effects of high fiber diets on gastrointestinal and liver weights in Lohman Select Leghorn and Shavers Heritage hens.**
Alisha Wornath Van Humbeck*, Mohamed Neijat, and Elijah Kiarie, *University of Guelph, Guelph, ON, Canada*.
- 8:45 AM 133 **Effects of long-term supplementation of pullets and layers with 25-hydroxyvitamin D₃ on performance, bone quality, egg production, and egg quality.**
Chongxiao Chen*¹, Bradley Turner², Todd Applegate¹, and Woo Kyun Kim¹, ¹*The University of Georgia, Athens, GA*, ²*DSM Nutritional Products, North America, Parsippany, NJ*.
- 9:00 AM 134 **Graded levels of hulless barley and β -glucanase affect the performance of broiler chickens vaccinated for coccidiosis in an age dependent manner.**
Namalika Karunaratne*¹, Mike Bedford², Rex Newkirk¹, and Henry Classen¹, ¹*University of Saskatchewan, Saskatoon, SK, Canada*, ²*AB Vista, Marlborough, United Kingdom*.

- 9:15 AM 135 **Effect of corn particle size in complete commercial diets on broiler growth performance and carcass characteristics.**
Lisa Kitto*, R. Michael Hulet, and Paul Patterson, *Pennsylvania State University, University Park, PA.*
- 9:30 AM 136 **Effect of available phosphorus in growing and laying diets of broiler breeders on egg production and egg characteristics at the onset of lay.**
Dinabandhu Joardar*, John Brake, and Coltin Caraway, *North Carolina State University, Raleigh, NC.*
- 9:45 AM 137 **Feeding program and pelleting affects carcass composition of broilers.**
Gabriela Cardoso Dal Pont*¹, Andréia Massuquetto¹, Jean Fagner Durau¹, Josiane Panisson¹, Emanuelle Cristiny Goes¹, Everton Krabbe², and Francielle Oliveira Marx¹, ¹*Universidade Federal do Paraná, Curitiba, Paraná, Brazil,* ²*EMBRAPA, Concórdia, Santa Catarina, Brazil.*

Student Competition: Muscle Myopathies— Multidiscipline Approach

Chair: **Dianna Bourassa, Auburn University**

Moderator: **Amit Morey, Auburn University**
Crystal J 1

- 8:00 AM 138 **Transcriptional events underlying wooden breast ontogeny in the *Pectoralis major* breast muscle of commercial broilers.**
Jacqueline Griffin*¹, Michael Lilburn², Macdonald Wick³, and Luis Moraes³, ¹*The Ohio State University, Dublin, OH,* ²*The Ohio State University, Wooster, OH,* ³*The Ohio State University, Columbus, OH.*
- 8:15 AM 139 **Comparative gene expression profiling reveals genes important in woody breast.**
Shawna Peer* and Giridhar Athrey, *Texas A&M University, College Station, TX.*
- 8:30 AM 140 **Myofiber and connective tissue characteristics in chicken breast muscle affected by wooden breast.**
Tamara Ferreira*, Cristina Simões, Thais Pereira, Vladimir Nascimento, Sergio Vieira, and Liris Kindlein, *UFRGS, Porto Alegre, Rio Grande do Sul, Brazil.*
- 8:45 AM 141 **The impact of soybean or canola meal based broiler diet on water-holding capacity and woody breast prevalence.**
Gerardo Casco*, Jason Lee, Rosemary Walzem, Giridhar Athrey, and Christine Alvarado, *Texas A&M University, College Station, TX.*

- 9:00 AM 142 **Effect of supplementing organic selenium on occurrence and severity of white striping and wooden breast in broilers.**
Heloise Fialkowski Bordignon*, Anete Rorig, Elisangela Vanroo, Sabrina De Castro Palma, Djiovane Augusto Pazdiora, and Jovanir Ines Muller Fernandes, *Federal University of Parana-Brazil, Palotina, Parana, Brazil.*
- 9:15 AM 143 **Effects of guanidinoacetic acid (GAA) supplementation on pectoral myopathies and blood serum parameters on broilers fed diets with or without poultry by-products meal up to 56 d.**
Hernan Cordova-Noboa*¹, Edgar Oviedo-Rondón¹, Albaraa Sarsour¹, Deben Sapkota², Damian Lopez³, Leticia Gross⁴, Meike Rademacher-Heilshorn⁵, and Ulrike Braun⁶, ¹*North Carolina State University, Raleigh, NC*, ²*Assam Agricultural University, Guwahati, India*, ³*Universidad de las Fuerzas Armadas ESPE, Quito, Ecuador*, ⁴*Universidade Federal Do Rio Grande Do Sul, Rio Grande Do Sul, Brazil*, ⁵*Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany*, ⁶*AlzChem AG, Trostberg, Bavaria, Germany.*
- 9:30 AM 144 **Defining the effect of higher dietary arginine, vitamin C, vitamins and lower dietary digestible amino acid levels on broiler performance, meat yield, and the incidence of white striping (WS) and woody breast (WB).**
Brooke Bodle*¹, Christine Alvarado¹, Jason Lee¹, Rob Shirley², and Yves Mercier³, ¹*Texas A&M University, College Station, TX*, ²*Adisseo USA, Alpharetta, GA*, ³*Adisseo France, Malicorne, France.*
- 9:45 AM 145 **Use of manual palpation in live broilers to identify the onset of the woody breast myopathy.**
Barbara de Almeida Mallmann*, Dawn Koltés, Karen Christensen, Alissa Piekarski, Juan Caldas-Cueva, Craig Coon, and Casey Owens, *University of Arkansas, Fayetteville, AR.*
- 10:00 AM **Break.**
- 10:30 AM 146 **Fresh chicken sausage formulated with different percentages of woody breast meat.**
Maria Aguirre* and Christine Alvarado, *Texas A&M University, College Station, TX.*
- 10:45 AM 147 **Optimizing deboning times to improve texture of breast meat from fast-growing big broilers.**
Meredith Johnson*², Avery Smith¹, Ada Madrid¹, Allan Pinto¹, Laura Bauermeister¹, and Amit Morey¹, ¹*Auburn University, Auburn, AL*, ²*Auburn University, Arab, AL.*

- 11:00 AM 148 **Sensory attributes of ready-to-eat cooked products with broiler chicken breasts affected by wooden breast myopathy.**
Fernanda Prado, Pedro Ferzola, Tamara Ferreira, Silvana Caldas*, Sergio Vieira, and Liris Kindlein, *UFRGS, Porto Alegre, Rio Grande do Sul, Brazil.*
- 11:15 AM 149 **Ultrasonography patterns in the developing breast muscle of broilers fed at 70% restriction or low density diets.**
Cristina Simoes*¹, Sergio Vieira¹, Liris Kindlein¹, Tamara Ferreira¹, Catarina Stefanello², Gabriela Santiago¹, Maieli Rohr¹, and Silvana Caldas¹, ¹*UFRGS, Porto Alegre, RS, Brazil*, ²*UFMS, Santa Maria, Brazil.*
- 11:30 AM 150 **Exploring magnetic resonance imaging, an advanced technology to study modern meat quality defects, such as wooden breast, in broilers.**
Avery Smith*, Samantha Patton, Laura Bauermeister, Ronald Beyers, Ada Madrid, Allan Pinto, Jessica Starkey, and Amit Morey, *Auburn University, Auburn, AL.*
- 11:45 AM 151 **Use of image analysis to identify woody breast characteristics in broiler carcasses from 7 and 10 week old commercial broilers.**
Juan Caldas-Cueva*², Xiao Sun¹, Sara Landis², Barbara Mallmann², Dawn Koltjes², Karen Christensen², and Casey Owens², ¹*Nanjing Agricultural University, Nanjing, Jiangsu, China*, ²*University of Arkansas, Fayetteville, AR.*

Student Competition: Nutritional Immunology

Chairs: **Lisa Bielke, Ohio State University; Justin Fowler, University of Georgia**

Moderator: **Lisa Bielke, Ohio State University**
Crystal J 2

- 8:00 AM 152 **Indices of gut function in broiler chickens fed corn-soybean meal diets without or with exogenous epidermal growth factor upon challenge with *Eimeria*.**
Emily Kim*¹, Nadeem Akhtar¹, Ryan Snyder¹, Julang Li¹, John Barta¹, Chengbo Yang², Chengbo Yang², and Elijah Kiarie¹, ¹*University of Guelph, Guelph, ON, Canada*, ²*University of Manitoba, Winnipeg, MB, Canada.*
- 8:15 AM 153 **Can dietary slowly digested starch mitigate coccidiosis in cage-housed broiler chickens?**
Rachel Savary*, Dawn Abbott, Andrew Van Kessel, and Henry Classen, *University of Saskatchewan, Saskatoon, SK, Canada.*

- 8:30 AM 154 **The effects of anticoccidial vaccination and supplemental protease and vitamin C on host immune response in broilers.**
Stephanie Hutsko*¹, Michael Lilburn², Aaron Cowieson³, and Macdonald Wick⁴, ¹*The Ohio State University, Dublin, OH*, ²*The Ohio State University, Wooster, OH*, ³*DSM Nutritional Products, Belfast, United Kingdom*, ⁴*The Ohio State University, Columbus, OH*.
- 8:45 AM 155 **Effects of an enhanced acid-based feed additive on *Salmonella* challenge in laying hens.**
Ashley Markazi*¹, Amanda Luoma¹, Revathi Shanmugasundaram¹, G. Raj Murugesan², Michaela Mohnl³, and Ramesh Selvaraj¹, ¹*The Ohio State University, Wooster, OH*, ²*Biomim, San Antonio, TX*, ³*Biomim, Getzersdorf, Austria*.
- 9:00 AM 156 **Effect of feeding yeast nucleotides (Maxi-Gen Plus) to broiler chickens challenged with *Eimeria*.**
Haley Leung*¹, Mohamed Neijat¹, Ryan Snyder¹, Rob Patterson², John Barta¹, Niel Karrow¹, and Elijah Kiarie¹, ¹*University of Guelph, Guelph, ON, Canada*, ²*Canadian Bio-Systems Inc, Calgary, AB, Canada*.
- 9:15 AM 157 **Dietary protein level and indigested protein fraction modulate broiler chicken cecal fermentation metabolites.**
Dervan Bryan*, Dawn Abbott, and Henry Classen, *University of Saskatchewan, Saskatoon, SK, Canada*.
- 9:30 AM 158 **Differences of animal or vegetable diets on broiler performance and intestinal integrity.**
Bruna Luiza Belote*², Gabriela Cardoso Dal Pont², Josiane Panisson², Jessica Wammes², Leticia Bittencourt¹, Alex Maiorka², and Elizabeth Santin², ¹*DSM, São Paulo, Brazil*, ²*Federal University of Parana, Curitiba, Brazil*.
- 9:45 AM 159 **Effects of prebiotic yeast cell wall on starter broiler performance, intestinal morphology and ileal digestibility in a *Clostridium perfringens* challenge model.**
Raghad Abdaljaleel*¹, Morouj Al-Ajeeli¹, Hector Leyva-Jimenez¹, Akhil Alsadwi¹, J. Byrd², and Christopher Bailey¹, ¹*Texas A&M University, College Station, TX*, ²*USDA, College Station, TX*.
- 10:00 AM **Break.**
- 10:30 AM 160 **Development and inoculation of a simplified microbiota in germ-free chickens and examination of the effect of co-inoculation with *Bacillus subtilis* C-3102 on gastrointestinal tract development.**
Tomohiro Hamaoka*, Jason Marshall, and Andrew Van Kessel, *University of Saskatchewan, Saskatoon, SK, Canada*.

- 10:45 AM 161 **Effect of a commercial blend of cashew nut shell liquid and castor oil on the microbiota of broilers challenged with *Eimeria* spp.**
Priscila Moraes*¹, Fernanda Gouvêa¹, Bruna Schroeder¹, Lucas Villela¹, Joan Torrent², and Andrea Ribeiro¹, ¹*Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*, ²*Oligo Basics, Cáscavel, Brazil*.
- 11:00 AM 162 **Effects of dietary Microfused Essential Oils technology on growth performance, jejunal histology, and meat quality of coccidiosis-challenged broilers.**
Samantha Welu*¹, Jon Holt², Keith Underwood¹, Crystal Levesque¹, and Robert Thaler¹, ¹*South Dakota State University, Brookings, SD*, ²*Ralco Nutrition Inc, Marshall, MN*.
- 11:15 AM 163 **Dietary supplementation of *Allium hookeri* improved intestinal immune response on necrotic enteritis of young broiler chickens.**
Youngsub Lee*¹, Sunghyen Lee², Sungteak Oh¹, and Hyun Lillehoj¹, ¹*USDA-ARS, Beltsville, MD*, ²*RDA, Wan-ju, Jeollabuk-do, Korea*.
- 11:30 AM 164 **Comparative efficacy of dietary zinc sources for the mitigation of the impact of necrotic enteritis in coccidial challenged broiler chickens.**
Cristiano Bortoluzzi*¹, Brett Lumpkins², Gregory Mathis², W. King³, Daniel Graugnard³, Karl Dawson³, and Todd Applegate¹, ¹*The University of Georgia, Athens, GA*, ²*Southern Poultry Research Inc, Athens, GA*, ³*Alltech Inc, Lexington, KY*.
- 11:45 AM 165 **Zinc source influences the gene expression of zinc transporters in the jejunum and cecal tonsils of broilers challenged with coccidia and *Clostridium perfringens*.**
Bin He*², W. King³, Daniel Graugnard³, Karl Dawson³, Cristiano Bortoluzzi¹, and Todd Applegate¹, ¹*The University of Georgia, Athens, GA*, ²*University of Georgia-Sichuan Agricultural University, Athens, GA*, ³*Alltech-University of Kentucky Nutrition Research Alliance, Lexington, KY*.

**Student Competition: Genomics, Molecular
and Cellular Biology**
Chair and Moderator: **Petek Settari,**
Hy-Line International
Canary 1

- 8:00 AM 166 **Primordial germ cell-based biobanking of Hungarian indigenous chicken breeds.**
Bence Lazar*¹, Roland Tóth¹, Alexandra Nagy², Mahek Anand³, Krisztina Liptói⁴, Eszter Patakiné Várkonyi⁴, and Elen Gócza¹,
¹NARIC, ABC, Godollo, Hungary, ²Veterinary Science University, Budapest, Hungary, ³SZIU, Doctoral School of Animal Husbandry Science, Godollo, Hungary, ⁴Research Centre for Farm Animal Gene Conservation, Godollo, Hungary.
- 8:15 AM 167 **Differences in jejunal gene expression of two chicken lines divergently selected for antibody response to sheep red blood cells.**
Shelly Nolin* and Christopher Ashwell, *North Carolina State University, Raleigh, NC.*
- 8:30 AM 168 **Time course transcriptional analysis of response to Newcastle disease virus infection and heat stress in two genetically distinct inbred chicken lines in Harderian gland tissue.**
Perot Saelao*¹, Ying Wang¹, Ali Nazmi¹, Rodrigo Gallardo¹, David Bunn¹, Terra Kelly¹, Susan Lamont², and Huaijun Zhou¹, ¹University of California–Davis, Davis, CA, ²Iowa State University, Ames, IA.
- 8:45 AM 169 **Capture array genomic analysis of the causative region for *wingless-2*, a developmental syndrome in the chicken.**
Ingrid Youngworth* and Mary Delany, *University of California–Davis, Davis, CA.*
- 9:00 AM 170 **The effects of feeding a diet high in methyl donors on Japanese quail.**
Chelsea Phillips*¹, Roselina Angel², and Christopher Ashwell¹,
¹North Carolina State University, Raleigh, NC, ²University of Maryland, College Park, MD.
- 9:15 AM 171 **Comparison of fecal bacteria richness and functional gene prediction between broiler and layer chickens.**
Liliana Nolasco Isaula*, Justin Dobbs, and Rosemary Walzem, *Texas A&M, Bryan, TX.*

- 9:30 AM 172 **The relationship between the microbiome in different sections of the gastrointestinal tract of broiler chickens fed a corn versus a rye based diet.**
Mikayla Baxter*¹, Juan Latorre², Si Hong Park², Xiaolun Sun¹, Billy Hargis¹, Guillermo Tellez¹, and Steve Ricke², ¹*University of Arkansas, Prairie Grove, AR*, ²*University of Arkansas, Fayetteville, AR*.
- 9:45 AM 173 **Effect of DNA isolation methodology on gene expression of *Clostridium perfringens* alpha toxin in qPCR.**
Whitney Briggs*, Revathi Shanmugasundaram, Kim Wilson, and Lisa Bielke, *OARDC, The Ohio State University, Wooster, OH*.
- 10:00 AM **Break.**
- 10:30 AM 174 **Evaluation of broiler chicken myogenic stem cell population heterogeneity and skeletal muscle fiber morphometrics.**
Oscar Tejeda*, Jeanine Arana, Allan Calderon, and Jessica Starkey, *Auburn University, Auburn, AL*.
- 10:45 AM 175 **Mechanisms for programming reduced adiposity in broiler chicks through hen dietary n-3 long chain polyunsaturated fatty acids.**
Ronique Beckford*¹, Suchita Das¹, Abigail Farmer¹, Shawn Campagna¹, Jiali Yu¹, Jeanna Wilson², Robert Hettich¹, Michael Smith¹, and Brynn Voy¹, ¹*University of Tennessee, Knoxville, TN*, ²*University of Georgia, Athens, GA*.
- 11:00 AM 176 **Identification and characterization of extracellular vesicles from the amniotic fluid of layer chicken embryos.**
Dan Zhao*², Tina Tran³, E. Peebles¹, Wei Zhai¹, and Yuhua Farnell², ¹*Mississippi State University, Mississippi State, MS*, ²*Texas A&M AgriLife Research, College Station, TX*, ³*Mississippi State University, Mississippi State, MS*.
- 11:15 AM 177 **RNA sequencing analysis of the shell gland region of oviduct in laying hens challenged with infectious bronchitis virus.**
Sami Samiullah*, Juliet Roberts, and Shu-Biao Wu, *University of New England, Armidale, New South Wales, Australia*.
- 11:30 AM 178 **Expression of avian beta-defensins and liver-expressed antimicrobial peptide 2 mRNA in young broilers infected with *Campylobacter*.**
Javier Garcia*¹, J. Byrd², and Eric Wong¹, ¹*Virginia Tech, Blacksburg, VA*, ²*USDA, ARS, Southern Plains Agricultural Research Center, College Station, TX*.

- 11:45 AM 179 **Molecular mechanisms of synergistic enhancement of chicken innate immunity and barrier function by butyrate and forskolin.**
Kelsy Robinson*¹, Hong Li², Long Zhang³, Ryan Arsenault⁴, Lakshmi Sunkara⁵, Brian Cougar¹, and Glenn Zhang¹, ¹*Oklahoma State University, Stillwater, OK*, ²*Henan Agriculture University, Henan, Zhengzhou, China*, ³*Sichuan Agricultural University, Chengdu, Sichuan, China*, ⁴*University of Delaware, Newark, DE*, ⁵*USDA, East Lansing, MI*.

Student Competition: Physiology and Reproduction
Chair: **Darrin Karcher, Purdue University**
Moderator: **Dawn Koltes, University of Arkansas**
Canary 3-4

- 8:15 AM 180 **Alteration of sexual maturation across three differentially selected strains of laying hens.**
Charlene Hanlon*, Kayo Takeshima, and G. Y. Bédécarrats, *University of Guelph, Guelph, ON, Canada*.
- 8:30 AM 181 **Evaluating bacterial colonization of a developing broiler embryo after in ovo injection with a bioluminescent bacteria.**
Claudia Castaneda*, Hossam Abdelhamed, Attila Karsi, Christopher McDaniel, and Aaron Kiess, *Mississippi State University, Starkville, MS*.
- 8:45 AM 182 **The deposition and elimination of glucosinolates metabolites derived from rapeseed meal in laying hens and eggs.**
Liping Zhu*, Jianping Wang, Xuemei Ding, Qiufeng Zeng, Shiping Bai, and Keying Zhang, *Animal Nutrition Institution, Chengdu, Sichuan, China*.
- 9:00 AM 183 **Production stage effects on white laying hens' blood glucose concentrations.**
Jeffrey Helfrich*, Darrin Karcher, and Elizabeth Karcher, *Purdue University, West Lafayette, IN*.
- 9:15 AM 184 **Identification of gene expression differences associated with high and low egg production in turkey hens.**
Kristen Brady*¹, Julie Long², and Tom Porter¹, ¹*University of Maryland, College Park, MD*, ²*BARC, ARS, USDA, Beltsville, MD*.
- 9:30 AM 185 **Protein expression for zona pellucida protein B1, and C in two genetic lines of turkey hens that differ in fertility.**
Joshua Steed*, Andrew Benson, and Adam Davis, *University of Georgia, Athens, GA*.

- 9:45 AM 186 **The effect of post-photostimulation energy intake on GnRH and GnIH gene expression at the onset of lay in broiler breeder pullets.**
S. H. Hadinia*¹, G. Y. Bédécarrats², P. R. O. Carneiro¹, and M. J. Zuidhof¹, ¹*University of Alberta, Edmonton, AB, Canada*, ²*University of Guelph, Guelph, ON, Canada*.
- 10:00 AM **Break.**
- 10:30 AM 187 **Gonadotropin hormones do not regulate gonadotrophin inhibitory hormone receptor mRNA expression in cultured granulosa cells from broiler breeder hens.**
Ashley Stephens*, Martha Freeman, and Adam Davis, *University of Georgia, Athens, GA*.
- 10:45 AM 188 **Effects of herbal liver tonic products on growth performance and hepatic lipid metabolism in broiler chickens.**
Joshua Flees*¹, Elizabeth Greene¹, Walter Bottje¹, Shivi Maini², and Sami Dridi¹, ¹*University of Arkansas, Fayetteville, AR*, ²*Ayurvet Ltd, Baddi, India*.
- 11:00 AM 189 **Effects of ButiPEARL and PrimaLac used alone or in combination on 57-d broiler intestinal morphology and immune tissues.**
Dana Dittoe*, Christopher McDaniel, Kelley Wamsley, Wei Zhai, and Aaron Kiess, *Mississippi State University, Mississippi State, MS*.
- 11:15 AM 190 **Calcium and phosphorus loss from bones autoclaved for tissue removal.**
Sara Cloft*¹, Cara Robison², and Darrin Karcher³, ¹*Auburn University, Auburn, AL*, ²*Michigan State University, East Lansing, MI*, ³*Purdue University, West Lafayette, IN*.
- 11:30 AM 191 **Adenosine A1 receptor and serotonin transporter expression in broiler with acute right ventricular failure.**
Mohammad Kamely*¹, Robert Wideman², and Mohammad Amir Karimi Yorshizi³, ¹*Tarbiat Modares University, Leuven, Belgium*, ²*University of Arkansas, Fayetteville, AR*, ³*Tarbiat Modares University, Tehran, Iran*.

Student Competition: Management and Production II
Chair: **Richard Blatchford, University of California, Davis**
Moderator: **Karen Christensen, University of Arkansas**
Sago

- 10:30 AM 192 **Broiler litter nutrients and production in the Chesapeake Bay watershed.**
Erica Rogers*, Paul Patterson, and R. Michael Hulet, *Penn State University, University Park, PA.*
- 10:45 AM 193 **Evaluation of biomass sorghum as an alternative bedding material in broiler houses.**
Patricia King*¹, Jennifer Timmons², Arthur Allen¹, and Yeong Chi¹, ¹*University of Maryland, Eastern Shore, Bishopville, MD,* ²*University of Maryland, Eastern Shore, Princess Anne, MD.*
- 11:00 AM 194 **Commercial application of switchgrass as renewable alternative bedding for broilers in a single-cycle production system.**
Amy Barkley*, Paul Patterson, R. Michael Hulet, and Jude Liu, *Penn State University, University Park, PA.*
- 11:15 AM 195 **Evaluation of an engineered biocarbon for reduction of ammonia volatilization in broiler production.**
Haci Bayir*, Jundi Liu, Justin Fowler, and Casey Ritz, *The University of Georgia, Athens, GA.*
- 11:30 AM 196 **Evaluation of layer cage cleaning and disinfection regimens.**
Dima White*¹, Shailesh Gurung¹, Dan Zhao¹, Yuhua Farnell¹, J. Byrd², and Morgan Farnell¹, ¹*Texas A&M AgriLife Research, College Station, TX,* ²*USDA, College Station, TX.*
- 11:45 AM 197 **Effectiveness of duck hatching egg sanitization with the combination of hydrogen peroxide and ultraviolet light.**
Karely Cantu*¹, Gregory Archer¹, Zach Tucker², and Craig Coufal¹, ¹*Texas A&M University, College Station, TX,* ²*Maple Leaf Farms, Leesburg, IN.*

Symposium: Pathogens and cancer manipulate immune defenses—Opportunities to innovate host targeted strategies to prevent and treat disease without antimicrobial and chemical therapies

Chair: **Mark Cook, University of Wisconsin**
Moderator: **Prafulla Regmi, Purdue University Sago**

- 1:00 PM 589S ***Eimeria* control of immune function.**
Hyun Lillehoj*, *USDA/ARS/NEA/ABBL, Beltsville, MD.*
- 1:40 PM 590S **Cancer immune regulation and immune/vaccine therapies.**
Douglas McNeel*, *University of Wisconsin-Madison, Madison, WI.*
- 2:20 PM 591S **Anti-IL-10 therapy in reducing antibiotics and chemical in animal agriculture.**
Mark Cook*, *University of Wisconsin-Madison, Madison, WI.*
- 3:00 PM **Break.**
- 3:30 PM 592S **Viral piracy concepts.**
W. L. William Chang*, *University of California, Davis, Davis, CA.*
- 4:10 PM **Symposium Summary.**

Symposium: Phosphorus utilization evaluation in feed ingredients for poultry: Opportunities and challenges
Chair and Moderator: **William A. Dozier III, Auburn University Royal**

- 1:00 PM 593S **Expressing feed phosphorus and requirement on a digestible basis.**
Olayiwola Adeola*, *Purdue University, West Lafayette, IN.*
- 1:20 PM 594S **Challenges for standardized phosphorus digestibility assays.**
Markus Rodehutschord*, *University of Hohenheim, Stuttgart, Germany.*
- 1:45 PM 596S **Dietary calcium concentrations affect the determination of true phosphorus utilization.**
Kurt Perryman*, *Micronutrients, McDonough, GA.*

2:10 PM 595S **Evaluation of phosphorus digestibility response to exogenous phytases.**
Mike Bedford*, *ABVista, Marlborough, United Kingdom.*

2:35 PM **Panel Discussion.**

Metabolism and Nutrition: Enzymes

Chair: **Samuel Rochell, University of Arkansas**

Moderator: **Mojtaba Yegani, DSM Nutritional Products
Crystal J 2**

1:00 PM 198 **Feeding low Ca and aP diets supplemented with phytase to laying Japanese quails.**
Matheus Lima², Fernando Perazzo Costa¹, Leonilson Dantas¹, Guilherme Lima¹, Danilo Cavalcante¹, Tiago Santos³, Gilson Gomes³, and Robert Van Wyhe^{*3}, ¹*Federal University of Paraiba, Areia, Paraiba, Brazil,* ²*Federal University of Southern Bahia, Teixeira de Freitas, Brazil,* ³*AB Vista, Marlborough, United Kingdom.*

1:15 PM 199 **Performance of laying hens fed low nutrient diets supplemented with phytase and xylanase from 46 to 94 weeks of age.**
Fernando Perazzo Costa¹, Leonilson Dantas¹, Matheus Lima², Guilherme Lima¹, Filipe Barros¹, Danilo Cavalcante¹, Tiago Santos³, Gilson Gomes³, and Robert Van Wyhe^{*3}, ¹*Federal University of Paraiba, Areia, Paraiba, Brazil,* ²*Federal University of Southern Bahia, Teixeira de Freitas, Brazil,* ³*AB Vista, Marlborough, United Kingdom.*

1:30 PM 200 **Phytase supplementation in Ca- and available P-deficient diets maintains laying hen productivity.**
Abiodun Bello^{*1}, Yueming Dersjant-Li², and Doug Korver¹, ¹*University of Alberta, Edmonton, AB, Canada,* ²*Danisco Animal Nutrition, DuPont Industrial Bioscience, Marlborough, United Kingdom.*

1:45 PM 201 **Effect of phytase on growth performance, phytate degradation and expression of myo-inositol transporters in the small intestine, liver and kidney of 21 day old broilers.**
Carrie Walk^{*1} and Oluyinka Olukosi², ¹*AB Vista, Marlborough, Wiltshire, United Kingdom,* ²*Scottish Rural College, Ayr, United Kingdom.*

- 2:00 PM 202 **Effect of phytate esters and inositol created by phytase supplementation on broiler performance and nutrient digestibility.**
Carrie Walk*¹ and David Ledoux², ¹*AB Vista, Marlborough, Wiltshire, United Kingdom*, ²*University of Missouri, Columbia, MO.*
- 2:15 PM 203 **Optimal *Buttiauxella* phytase level for broilers.**
Daniella Donato*¹, Luciana Franco¹, Mauricio Cunha¹, Ana Paula de Oliveira¹, Mirella Melaré², Henrique Nogueira², and Nilva Sakomura², ¹*DuPont, Paulinia, Sao Paulo, Brazil*, ²*Univ. Estadual Paulista, Jaboticabal, Sao Paulo, Brazil.*
- 2:30 PM 204 **Effect of a new 6-phytase, Natuphos E, on broiler performance at variable calcium/phosphorus ratios in corn/soy diets.**
Michael Coelho*, *BASF Corporation, Humble, TX.*
- 2:45 PM 205 **Effect of a novel 6-phytase, Natuphos E, on turkey performance, calcium and phosphorus retention and excretion.**
Annamaria Tischler², Michael Coelho*¹, Peter Ader³, and Janos Tossenberger², ¹*BASF Corporation, Humble, TX*, ²*Kaposvar University, Guba, Hungary*, ³*BASF SE, Lampertheim, Germany.*
- 3:00 PM **Break.**
- 3:30 PM 206 **The combination of xylanase, amylase, and protease consistently improves FCR in broilers fed different types of diet: A meta-analysis.**
Luke Barnard*, Andres Belalcazar, and Luis Romero, *Dansico Animal Nutrition, Marlborough, United Kingdom.*
- 3:45 PM 207 **The combination of xylanase, amylase and protease consistently improves energy, nitrogen, starch and fat digestibility in broilers fed different types of diet: A meta-analysis.**
Luke Barnard*, Andres Belalcazar, and Luis Romero, *Dansico Animal Nutrition, Marlborough, United Kingdom.*
- 4:00 PM 208 **Total-tract digestibility of non-starch polysaccharide portion of diets in 21 and 42 d-old birds fed diets with and without composite enzymes supplementation.**
Pramir Maharjan*, Katie Hilton, Maria Cortes, Michael Schlumbohm, Garret Mullenix, Antonio Beitia, Judith England, and Craig Coon, *University of Arkansas, Fayetteville, AR.*

- 4:15 PM 209 **Single xylanase activity versus more complex enzymes offerings and their effect on broiler performance and carcass characteristics.**
Milan Hruby*² and Luke Barnard¹, ¹DuPont Industrial Biosciences, Marlborough, United Kingdom, ²DuPont Industrial Biosciences, Woodbury, MN.
- 4:30 PM 210 **Supplementation of protease and amylase to diets based on corn fractions segregated in densimetric table.**
Kelen Zavarize*¹, Jose Menten¹, Rafaela Pereira¹, Diana Suckeveris¹, Naiara Fagundes¹, Glauca Napy¹, Alvaro Burin Junior¹, Vitor Fascina², and Levy Teixeira², ¹University of Sao Paulo, Piracicaba, Sao Paulo, Brazil, ²DSM Nutritional Products, São Paulo, Brazil.
- 4:45 PM 211 **Effect of protease on chicks fed conventional versus underprocessed soybean meal in diets formulated similar to organic feed.**
Anthony Pokoo-Aikins*¹ and Randy Mitchell², ¹Perdue Farms Inc, Westover, MD, ²Perdue Farms, Salisbury, MD.

Management and Production I

Chair and Moderator: **Richard Blatchford,**
University of California, Davis
Canary 3-4

- 1:00 PM 212 **Graded levels of nicarbazin inclusion and influence on fertility and hatchability of broiler breeder eggs.**
Jeanna Wilson*¹, Ken Bafundo², Carla Aranibar¹, and Ashley Owen¹, ¹University of Georgia, Athens, GA, ²Phibro Animal Health, Teaneck, NJ.
- 1:15 PM 213 **Protein degradation of broiler breeders from the onset of lay through peak production.**
Garret Mullenix*, Xuemei Ding, Judith England, and Craig Coon, University of Arkansas, Fayetteville, AR.
- 1:30 PM 214 **Sexual maturation status at 21 weeks in 1957, 1978, 1997, and 2015 broiler breeder pullets.**
Brenda Reimer*¹, Valerie Carney¹, Martin Zuidhof², Doug Korver², Frank Robinson², and Nicholas Anthony³, ¹Alberta Agriculture and Forestry, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada, ³University of Arkansas, Fayetteville, AR.

- 1:45 PM 215 **BW restriction in female broiler breeders from 1957 to 2015 to 19 weeks of age.**
Valerie Carney*¹, Brenda Reimer¹, Martin Zuidhof², Doug Korver², Frank Robinson², and Nicholas Anthony³, ¹Alberta Agriculture and Forestry, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada, ³University of Arkansas, Fayetteville, AR.
- 2:00 PM 216 **Effect of female feed allocation at 6 weeks of age and calcium:available phosphorus ratio during rearing on subsequent feathering and fertility of broiler breeders.**
John Brake* and Joaquin Cabanas, North Carolina State University, Raleigh, NC.
- 2:15 PM 217 **Effect of post-hatch holding time and AviLighting on light intensity near feed and water areas, broiler body weights and uniformity at time of housing to 5-wks in antibiotic-free chicken programs.**
James McNaughton, Mike Barnas*, Mick Roberts, and Aaron Redden, AHPharma Inc, Hebron, MD.
- 2:30 PM 218 **Early molting of layers: Impact on production and well-being.**
Darrin Karcher*³, Deana Jones⁴, Cara Robison¹, Prafulla Regmi³, and Krista Eberle², ¹Michigan State University, East Lansing, MI, ²North Carolina State University, Raleigh, NC, ³Purdue University, West Lafayette, IN, ⁴USDA ARS, Athens, GA.
- 2:45 PM 219 **Effects of different processing lairage holding times on metabolism and meat quality of broilers.**
Denise Russi Rodrigues*¹, Danileli Brolo Martins¹, Roberto Jardim Filho¹, Marcos Barcellos Café¹, Evelyn Oliveira¹, and Cibele Silva Minafra², ¹Federal University of Goiás, Goiânia, Goiás, Brazil, ²Instituto Federal Goiano, Rio Verde, Goiás, Brazil.
- 3:00 PM **Break.**
- 3:30 PM 220 **Effect of incubation temperatures profiles on footpad skin development of broiler and layer chicks from different genetic lines.**
Edgar Oviedo-Rondón*, Leticia Gross, Albaraa Sarsour, and Hernan Cordova-Noboa, North Carolina State University, Raleigh, NC.
- 3:45 PM 221 **Effect of incubation temperatures profiles on bone development of broiler and layer chicks from different genetic lines.**
Edgar Oviedo-Rondón, Ingrid Y. Martinez Rojas*, Albaraa Sarsour, Hernan Cordova-Noboa, Santiago Alvarez, and Viviana San Martín, North Carolina State University, Raleigh, NC.

- 4:00 PM 222 **The influence of hatching time and post-hatch holding time on live performance of broilers.**
Serdar Özlü*¹, Reza Shiranjang¹, Okan Elibol¹, and John Brake²,
¹*Faculty of Agriculture, University of Ankara, Ankara, Turkey,*
²*North Carolina State University, Raleigh, NC.*
- 4:15 PM 223 **Effects of maternal protein diets and age at photo stimulation on production performance of the progeny.**
Rick van Emous*¹, Victor Naranjo², and Carlos de la Cruz²,
¹*Wageningen University & Research, Wageningen, the Netherlands,*
²*Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany.*
- 4:30 PM 224 **Egg characteristics of two commercial layer strain under different rearing systems.**
Athar Mahmud*, Ali Husnain, Shahid Mehmood, Jibran Hussain, Muhammad Usman, Muhammad Waqas, and Sohail Ahmad,
University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan.
- 4:45 PM 225 **Egg quality assessment of Latin American producers.**
José Miranda Jr., Leticia Bittencourt*, Murtala Faruk, Belén Cáceres, Sofia Macaya, and Alexandre Sechinato, *DSM Nutritional Products LATAM, São Paulo, Brazil.*

Muscle Myopathies—Multidiscipline Approach

Chair: **Dianna Bourassa, Auburn University**

Moderator: **Brian Bowker, USDA-ARS**

Crystal J 1

- 1:15 PM 226 **Wooden breast occurrence in broilers subjected to feed restriction: Growth performance, serologic profile and meat quality.**
Liris Kindlein*¹, Sergio Vieira¹, Catarina Stefanello², Cristina Simoes¹, Tamara Ferreira¹, Ismael Franca¹, Vinicius Nickel¹, and Stella Valle¹, ¹*UFRGS, Porto Alegre, RS, Brazil,* ²*UFMS, Santa Maria, Brazil.*
- 1:30 PM 227 **Defining the phenotypic growth parameters associated with the onset of wooden breast in the *Pectoralis major* of commercial broilers.**
Jacqueline Griffin*, Michael Lilburn, Macdonald Wick, and Luis Moraes, *The Ohio State University, Columbus, OH.*
- 1:45 PM 228 **Skeletal muscle fiber morphometrics and in vivo myogenic stem cell mitotic activity in broiler chickens affected by wooden breast.**
Kate Meloche, William Dozier, and Jessica Starkey*, *Auburn University, Auburn, AL.*

- 2:00 PM 229 **Capillary density of Pectoralis major muscle of broilers affected by white striping myopathy.**
Vinicius Nickel, Tamara Ferreira*, Sergio Vieira, and Liris Kindlein, *UFRGS, Porto Alegre, Rio Grande do Sul, Brazil.*
- 2:15 PM 230 **The woody breast condition affects the surface color of cooked broiler breast.**
Hong Zhuang*, *U.S. National Poultry Research Center, Athens, GA.*
- 2:30 PM 231 **Relationships between instrumental texture measurements and subjective woody breast condition scores.**
Hong Zhuang*, Brian Bowker, and Seung-Chul Yoon, *U.S. National Poultry Research Center, Athens, GA.*
- 2:45 PM 232 **Woody breast affects the marination and cooking performance of portioned broiler breast fillets.**
Brian Bowker*¹, Alex Maxwell², and Hong Zhuang¹, *¹USDA-ARS, Athens, GA, ²University of Georgia, Athens, GA.*

Extension and Instruction

Chair and Moderator: **Wilmer J. Pacheco,**
Auburn University
Canary 1

- 1:15 PM 102 **Utility of robust mixed models in describing growth of seven strains of chicken using Logistics and Richards growth functions.**
Sunday Peters*¹, Michael Ozoje³, and Kadir Kizilkaya², *¹Berry College, Mount Berry, GA, ²Adnan Menderes University, Aydin, Turkey, ³Federal University of Agriculture, Abeokuta, Abeokuta, Ogun State, Nigeria.*
- 1:30 PM 103 **Application of Bayesian robust mixed models in the use of non-linear functions to describe growth of three turkey genotypes.**
Sunday Peters*¹, Michael Ozoje², and Kadir Kizilkaya³, *¹Berry College, Mount Berry, GA, ²Federal University of Agriculture Abeokuta, Abeokuta, Ogun State, Nigeria, ³Adnan Menderes University, Aydin, Turkey.*
- 1:45 PM 233 **Methods, equipment, and considerations during training for backyard chicken processing.**
Dianna Bourassa*¹, Joseph Hess¹, Alex Tigue², and Joshua Elmore², *¹Auburn University, Auburn, AL, ²Alabama Cooperative Extension System, Auburn, AL.*

- 2:00 PM 234 **Status quo and opportunities for a structured development of Myanmar's poultry sector.**
Amit Morey*, *Auburn University, Auburn, AL.*
- 2:15 PM 235 **Using videos to teach growers about biosecurity.**
Jonathan Moyle*, Jennifer Rhodes, and Nathaniel Tablante,
University of Maryland, Salisbury, MD.
- 2:30 PM 236 **Effect of incline angle on the preparatory step for ramp climbing in the domestic fowl.**
Chantal LeBlanc¹, Bret Tobalske², Bill Szkotnicki¹, and Alexandra Harlander*¹, ¹*University of Guelph, Guelph, ON, Canada,*
²*University of Montana, Missoula, MT.*
- 2:45 PM 237 **Teaching food defense in the age of the *Food Safety Modernization Act*.**
Emefa Monu* and Robert Norton, *Auburn University, Auburn, AL.*

Publishing Workshop: Successful publishing in poultry science journals

Chairs and Moderators: **John B. Carey, Texas A&M University; Robert L. Taylor, Jr., West Virginia University Royal**

- 3:30 PM 597S **Key components to successful publishing in the Poultry Science Association journals.**
John Carey¹ and Robert Taylor*², ¹*Texas A&M University, College Station, TX,* ²*West Virginia University, Morgantown, WV.*
- 4:00 PM ***The Journal of Applied Poultry Research.***
John B. Carey, *Texas A&M University, College Station, TX.*
- 4:30 PM **Publishing literature review papers: Approaches and potential career impact.**
Steven C. Ricke, *University of Arkansas, Fayetteville, AR.*
- 4:40 PM **Oxford University Press.**
Ashley Petrylak and Sara McNamara, *Oxford University Press USA, New York,, NY.*

Processing and Products

Chair: **Dianna Bourassa, Auburn University**

Moderator: **Brian Bowker, USDA-ARS**

Crystal J 1

- 3:30 PM 238 **Effect of a standardized blend of carvacrol, cinnamaldehyde and capsicum oleoresin on carcass quality of broilers using multiple trial analysis method.**
Clementine Oguey*, *Pancosma SA, Le Grand Saconnex, Geneva, Switzerland.*
- 3:45 PM 239 **Skin pigmentation, yield, cook-loss and shear force of breast from broilers fed with a grape seed extract.**
Leodan Rodriguez-Ortega², Artemio Vargas-Galicia², Fernando González-Cerón^{*3}, Arturo Pro-Martínez², Eliseo Sosa-Montes³, Jaime Bautista-Ortega¹, Alejandro Rodriguez-Ortega⁴, and Gabriel Juárez-Juárez³, ¹*Colegio de Postgraduados, Mexico State, Mexico*, ²*Colegio de Postgraduados, Texcoco, Mexico*, ³*Universidad Autónoma Chapingo, Texcoco, Mexico*, ⁴*Universidad Politécnica de Francisco I. Madero, Hidalgo, Mexico.*
- 4:00 PM 240 **A new turn: Assessing the shape of the avian egg.**
Deana Jones^{*2} and Darrin Karcher¹, ¹*Purdue University, West Lafayette, IN*, ²*US National Poultry Research Center, Athens, GA.*
- 4:15 PM 241 **Cage-free aviary egg functionality: Impact of hen strain and cold storage.**
Deana Jones^{*3}, Darrin Karcher², Prafulla Regmi², Cara Robison¹, and Richard Gast³, ¹*Michigan State University, East Lansing, MI*, ²*Purdue University, West Lafayette, IN*, ³*USDA-ARS, Athens, GA.*

Wednesday, July 19

SYMPOSIA AND ORAL SESSIONS

WPSA Lecture: History and future of genetically engineered food animal regulation

Chairs: **Christopher Ashwell, North Carolina State University; Karen Schwean-Lardner, University of Saskatchewan**

Moderator: **Christopher Ashwell, North Carolina State University
Royal**

8:00 AM 6245 **History and future of genetically engineered food animal regulation.**
Kevin D. Wells*, *University of Missouri, Columbia, MO.*

OTHER EVENTS

PSA Business Meeting

Chair: **Randolph Mitchell, PSA President
Royal**

10:00 AM–12:00 PM

SYMPOSIA AND ORAL SESSIONS

Industry Forum - Unresolved issues facing the poultry industry

Chair and Moderator: **William A. Dozier III, Auburn University
Royal**

1:00 PM **Introduction.**
William A. Dozier III, *Auburn University, AL*

1:05 PM **Industry Perspective: Alternatives to skip-a-day feeding of pullets.**
Leonel Mejia, *Cobb-Vantress Inc.*

- 1:15 PM 598S **Alternatives to skip-a-day feeding of pullets.**
Carla Aranibar, Ashley Owen, and Jeanna Wilson*, *University of Georgia, Athens, GA.*
- 1:45 PM **Industry Perspective: Keel deformities in laying hens.**
Kevin D. Roberson, *Michael foods Egg Products Co., Wakefield, NE.*
- 1:55 PM 599S **Keel deformities in laying hens.**
Darrin Karcher*, *Purdue University, West Lafayette, IN.*
- 2:25 PM **Industry Perspective: Optimizing leg quality in heavy toms.**
Christopher Rude, *Devenish, Minneapolis, MN.*
- 2:35 PM 600S **The challenge with skeletal soundness in commercial turkeys.**
Michael Lilburn*, *The Ohio State University, Wooster, OH.*
- 3:00 PM **Break.**
- 3:30 PM **Break-out groups.**
- 3:55 PM **Group summaries.**
Group 1 Summary, H. Michael Hellwig, *Foster Farms, Delhi, CA*,
Group 2 Summary, Phillip A. Smith, *Tyson Foods Inc., Springdale, AR*,
Group 3 Summary, Kristjan Bregendahl, *ADM Animal Nutrition, South Haven, MN.*,
Group 4 Summary, Paul B. Tillman, *Poultry Technical Nutrition Services LLC, Buford, GA.*
- 4:55 PM **Concluding remarks.**
William A. Dozier III, *Auburn University, Auburn, AL.*

Immunology, Health, and Disease I

Chair: **Lisa Bielke, Ohio State University**

Moderator: **Xiaolun Sun, University of Arkansas
Crystal J 1**

- 1:00 PM 242 **Ex vivo epigenetic effect of folic acid on the proximal promoter area and mRNA gene expression of chicken embryonic primary B cell receptors.**
Juan Rodriguez-Lecompte*¹, Ori Elad¹, Shayan Sharif², Alexander Yitbarek², and Randall Bishop³, ¹*Atlantic Veterinary College^c, Charlottetown, PEI, Canada*, ²*Ontario Veterinary College, Guelph, ON, Canada*, ³*Cornwallis Veterinarians, Kenville, NS, Canada.*

- 1:15 PM 243 **Genotypic variation, class I gene copy number variation and recombination within the chicken major histocompatibility complex Y (MHC-Y) system.**
Renee Kopulos*², Robert Taylor¹, and W. Briles², ¹West Virginia University, Morgantown, WV, ²Northern Illinois University, DeKalb, IL.
- 1:30 PM 244 **Humoral and cellular immune responses in chickens following primary and secondary immunization with T-dependent antigen (mouse IgG) administered alone, mixed with alum adjuvant, or conjugated to nanoparticles.**
Gisela Erf*¹, Hyeonmin Jang¹, Daniel Falcon¹, Kristen Byrne¹, and Zoraida Aguilar², ¹University of Arkansas, Division of Agriculture, Fayetteville, AR, ²Zystein LLC, Fayetteville, AR.
- 1:45 PM 245 **Examination of cellular and molecular events during the induction and resolution of acute inflammation in broiler chickens.**
Daniel Barreda*, Juan More Bayona, and Anbu Karuppanan, University of Alberta, Edmonton, AB, Canada.
- 2:00 PM 246 **Effects of long-term of early life probiotics administration on adaptive immune responses in chicken pullets and laying hens.**
Pablo Lopera*², Julian Reyes¹, and Juan Rodriguez-Lecompte¹, ¹Atlantic Veterinary College, Charlottetown, PEI, Canada, ²Avicola Nacional S.A, Medellin, Antioquia, Colombia.
- 2:15 PM 247 **Highly pathogenic avian influenza H5N2 in naturally infected turkey breeder hens: Virus distribution, histopathology, and host immune gene expression.**
Michelle Behl*¹, David Caldwell¹, Mike Kogut², Luc Berghman¹, Kenneth Genovese², and Morgan Farnell¹, ¹Texas A&M, Spicer, MN, ²USDA-ARS, College Station, TX.
- 2:30 PM 248 **Development and performance of an automated whole-house poultry vaccination system.**
Joseph Purswell, Scott Branton, and Jeffrey Evans*, USDA ARS, Mississippi State, MS.
- 2:45 PM 249 **Effect of allicin in broilers raised at 2278 m above sea level.**
Artemio Vargas-Galicia¹, Raúl Argüello-García², Fernando González-Cerón*³, Arturo Pro-Martínez¹, Eliseo Sosa-Montes³, Jaime Bautista-Ortega¹, Leodan Rodríguez-Ortega¹, Anely Mata-Estrada¹, Jesús Arreola-Enríquez¹, María Rangel-Zepeda³, and Diego Zarate-Contreras¹, ¹Colegio de Postgraduados, Mexico State, Mexico, ²Centro de Investigación y Estudios Avanzados, Instituto Politécnico Nacional, Mexico City, Mexico, ³Universidad Autónoma Chapingo, Mexico State, Mexico.

Management and Production II

Chair: Richard Blatchford, University of California, Davis

Moderator: Karen Schwean-Lardner, University of
Saskatchewan
Crystal J 2

- 1:00 PM 250 **The effectiveness of a yeast cell wall product in commercial layers for reduction of *Salmonella enteritidis* colonization in ovaries and ceca.**
Charles Hofacre*², Roy Berghaus², Gregory Mathis¹, and Sangita Jalukar³, ¹*Southern Poultry Research Group, Athens, GA*, ²*The University of Georgia, Athens, GA*, ³*Arm and Hammer Animal Nutrition, Mason City, IA*.
- 1:15 PM 251 **Evaluation of foam applied disinfectants and chemicals for inactivating infectious bronchitis virus with and without the presence of high organic load.**
Robert Alphin*, Alissa Moritz, Daniel Hougentogler, and Eric Benson, *University of Delaware, Newark, DE*.
- 1:30 PM 252 **Observational analysis of broiler production and health data collected during the transition from a raised with to a raised without antibiotic program.**
Kevin Watkins*, Kristi Baker, and Matt Salois, *Elanco, Greenfield, IN*.
- 1:45 PM 253 **Effects of stocking density, fumonisin B1, or mycotoxin binder on growth performance, bone quality, stress indicators, and gut physiology in broiler chickens.**
Kyung-Woo Lee*¹, Sang Lee¹, Da-Hye Kim¹, MOUNG-CHEUL KEUM¹, Eileen Han², and Byoung-Ki An¹, ¹*Konkuk University, Seoul, Korea*, ²*Biomim, Jalan Bukit Merah, Singapore*.
- 2:00 PM 254 **The effect of stocking density on turkey tom health and welfare to 16 weeks of age.**
Kailyn Beaulac*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, *University of Saskatchewan, Saskatoon, SK, Canada*.
- 2:15 PM 255 **Partial feed restriction in Pekin duck grow-out has minimal effect on overall production rates and may reduce lameness.**
Lindsey Porter¹, Hannah Potter¹, Luke Van Blois¹, Emily Gregory¹, Grace Ditzenberger¹, Murphy Stadelmaier¹, Zach Tucker², Dan Shafer², Mike Turk², and Gregory Fraley*¹, ¹*Hope College, Holland, MI*, ²*Maple Leaf Farms, Inc, Leesburg, IN*.

- 2:30 PM 256 **Evaluation of alternative euthanasia methods of neonatal chickens.**
Shailesh Gurung^{*2}, Dima White², Gregory Archer², Dan Zhao², Yuhua Farnell², E. Peebles¹, and Morgan Farnell², ¹Mississippi State University, Mississippi State, MS, ²Texas A&M AgriLife Research, College Station, TX.

Animal Well-Being and Behavior
Chair and Moderator: **Marisa Erasmus,**
Purdue University
Canary 1

- 1:00 PM 257 **Assessment of commercial Pekin duck welfare: A comparison of methods.**
Essam Abdelfattah^{*}, Maja Makagon, and Giuseppe Vezzoli,
University of California, Davis, Davis, CA.
- 1:15 PM 258 **Effect of bird density and bedding source on heavy turkey hens: Growth efficiency and litter composition.**
R. Michael Hulet^{*1}, Lisa Kitto¹, Sally Noll³, Darrin Karcher², and Marisa Erasmus², ¹Pennsylvania State University, University Park, PA, ²Purdue University, West Lafayette, IN, ³University of Minnesota, St Paul, MN.
- 1:30 PM 259 **Effect of bird density and bedding source on heavy turkey hens: Behavior.**
Marisa Erasmus^{*2}, Kailynn VanDeWater², Darrin Karcher², Sally Noll³, and R. Michael Hulet¹, ¹Penn State University, University Park, PA, ²Purdue University, West Lafayette, IN, ³University of Minnesota, St Paul, MN.
- 1:45 PM 260 **Effect of on-farm hatching of broiler chickens on welfare and performance.**
Ingrid de Jong^{*1}, Sofie Cardinaels², Henk Gunnink¹, Kris De Baere², Ine Kempen², Johan Zoons², Theo van Hattum¹, and Lotte van de Ven³, ¹Wageningen Livestock Research, Wageningen, the Netherlands, ²Experimental Poultry Centre, Geel, Belgium, ³Vencomatic, Eersel, the Netherlands.
- 2:00 PM 261 **An intra-lab evaluation of performance in testing tonic immobility in broilers.**
Diego Martinez^{*1}, Elizabeth Cisneros², Cristian Uculmana¹, Erick Villegas², Jorge Tay², Fabiola Caqui², Ruth Yupanqui², and Carlos Vilchez², ¹LIAN Development & Service, Lima, Peru, ²La Molina National Agrarian University, Lima, Peru.

- 2:15 PM 262 **Effect of methionine restriction and intestinal challenge on tonic immobility in broilers.**
Diego Martinez*¹, Elizabeth Cisneros², Cristian Uculmana¹, Erick Villegas², Jorge Tay², Fabiola Caqui², Ruth Yupanqui², and Carlos Vilchez², ¹LIAN Development & Service, Lima, Peru, ²La Molina National Agrarian University, Lima, Peru.
- 2:30 PM 263 **Assessing the welfare impact of on-farm euthanasia methods on broilers.**
Bethany Baker*², Stephanie Torrey¹, Tina Widowski¹, Patricia Turner¹, Susantha Gomis², Henry Classen², Jenny Fricke², Tennille Knezacek², and Karen Schwean-Lardner², ¹University of Guelph, Guelph, ON, Canada, ²University of Saskatchewan, Saskatoon, SK, Canada.
- 2:45 PM 264 **Effect of ventilation shut down (VSD) on changes in heat shock protein 70 and blood chemistry throughout depopulation.**
Kenneth Anderson*, James Petite, Kimberly Livignston, Sanjay Shah, Michael Martin, Krista Eberle, and Ramon Malheiros, *North Carolina State University, Raleigh, NC.*
- 3:00 PM **Break.**
- 3:30 PM 265 **High and low feather-pecking lines of laying hens differ in their physiological responses to social stress.**
Patrick Birkel*¹, Peter McBride¹, Joergen Kjaer³, Paul Forsythe², and Alexandra Harlander¹, ¹University of Guelph, Guelph, ON, Canada, ²McMaster University, Hamilton, ON, Canada, ³Friedrich-Loeffler Institute, Celle, Germany.
- 3:45 PM 266 **Effects of infrared beak treatment on early pullet behavior, pecking force, and beak length.**
Sarah Struthers*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, *University of Saskatchewan, Saskatoon, SK.*
- 4:00 PM 267 **The unforeseen consequences of a “bad hair day” in laying hens.**
Irene Campderrich, Guiomar Liste, and Inma Estevez*, *Neiker-Tecnalia, Vitoria-Gasteiz, Alava, Spain.*
- 4:15 PM 268 **Do laying hens avoid dirty scratch pads in enriched cages?**
Bishwo Pokharel*, Luxan Jeyachanthiran, Ilka Boecker, and Alexandra Harlander, *University of Guelph, Guelph, ON, Canada.*

- 4:30 PM 269 **Keel bone damage: The role of behavior and impacts experienced at the keel.**
Maja Makagon*³, Sydney Baker³, Cara Robison¹, Darrin Karcher², and Michael Toscano⁴, ¹*Michigan State University, East Lansing, MI*, ²*Purdue University, West Lafayette, IN*, ³*University of California, Davis, Davis, CA*, ⁴*Research Centre for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH Institute, University of Bern, Bern, Switzerland.*
- 4:45 PM 270 **Two-dimensional space use by 4 genetic strains of laying hens in an aviary system.**
Ahmed Ali*¹, Elizabeth Riddle¹, Dana Campbell², and Janice Siegford¹, ¹*Michigan State University, East Lansing, MI*, ²*Armidale, NSW, Armidale, New South Wales, Australia.*

Metabolism and Nutrition: Amino Acids

Chair: **Woo Kyun Kim, University of Georgia**

Moderator: **Sergio Fernandez, DSM Nutritional Products Sago**

- 1:15 PM 271 **The effects of replacing methionine hydroxy-analogue calcium salt with 65% DL-methionine on growth performance and carcass quality of broilers from 21 to 42 days of age.**
Emanuele Goes*², Maria Aparecida Iuspa³, Victor Naranjo¹, Leopoldo Almeida², Adhemar Oliveira¹, and Alex Maiorka², ¹*Evonik Nutrition & Care, Hanau-Wolfgang, Germany*, ²*Universidade Federal do Paraná, Curitiba, Brazil*, ³*Evonik Nutrition & Care, São Paulo, Brazil.*
- 1:30 PM 272 **Bioavailability of methionine hydroxy analog relative to DL-methionine in broilers during the starter and grower phases.**
Alice Eiko Murakami¹, Adhemar Rodrigues de Oliveira Neto², Iván Camilo Ospina-Rojas*¹, Victor Naranjo³, and Nei Andre Arruda Barbosa², ¹*Universidade Estadual de Maringá, Maringá, Paraná, Brazil*, ²*Evonik Industries, São Paulo, Brazil*, ³*Evonik Nutrition & Care, Hanau-Wolfgang, Germany.*
- 1:45 PM 273 **Digestible valine requirements in practical diets for Ross 308 broiler chicks in growing period.**
Arash Hassanzadeh Seyedi* and Hossein Janmohammadi, *University of Tabriz, Tabriz, East Azarbijan, Iran.*

- 2:00 PM 274 **Effect of different ratios of valine and iso-leucine to lysine on growth performance, blood biochemistry and carcass characteristics in broilers.**
Zafar Hayat*¹, Gulbeena Saleem², Aneeza Hafeez¹, Abd Rehman¹, Zafar Ullah¹, and Muhammad Arif¹, ¹University of Sargodha, Sargodha, Pakistan, ²University of Veterinary and Animal Sciences, Lahore, Pakistan.
- 2:15 PM 275 **Dietary tryptophan requirement of laying hens fed corn-soybean meal diets.**
William Lambert*¹, Aude Simongiovanni¹, Etienne Corrent¹, and Jaap van Milgen², ¹Ajinomoto Eurolysine S.A.S, Paris, France, ²INRA UMR Pegase, Saint Gilles, France.
- 2:30 PM 276 **Optimum dietary level of digestible threonine for growing broilers determined by economic approach.**
Matheus Reis*, Nilva Sakomura, Juliano Cesar Dorigam, and Daniella Donato, Unesp, Jaboticabal, São Paulo, Brazil.
- 2:45 PM 277 **Effect of different levels of L-isoleucine on production performance, serum biochemistry and ileal digestibility of proteins in laying hens (LSL-LITE).**
Yasir Allah Ditta*², Sana Ullah², Saima Naveed², Talat Naseer Pasha², Athar Mahmud¹, and Usman Liaqat², ¹University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan, ²University of Veterinary and Animal Sciences, Pattoki, Punjab, Pakistan.
- 3:00 PM **Break.**
- 3:30 PM 278 **Determination of optimum dietary glycine and serine concentrations for broilers fed low protein diets with varying standardized ileal digestible threonine levels.**
Paschal Aguihe*², Alice Murakami¹, Iván Camilo Ospina-Rojas¹, Claudia Tamehiro³, and Eustace Iyayi², ¹Universidade Estadual de Maringá, Maringá, Parana, Brazil, ²University of Ibadan, Ibadan, Oyo, Nigeria, ³Universidade Estadual do Norte do Paraná, Campus Luiz Meneghel, Bandeirantes, Brazil.
- 3:45 PM 279 **Effects of guanidinoacetic acid supplementation on carcass and cut up yields and meat quality on broilers fed diets with or without poultry by-products meal up to 56 d.**
Hernan Cordova-Noboa*¹, Edgar Oviedo-Rondón¹, Albaraa Sarsour¹, Deben Sapkota⁶, Damian Lopez⁴, Leticia Gross⁵, Meike Rademacher-Heilshorn³, and Ulrike Braun², ¹North Carolina State University, Raleigh, NC, ²AlzChem AG, Trostberg, Bavaria, Germany, ³Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany, ⁴Universidad de las Fuerzas Armadas ESPE, Quito, Ecuador, ⁵Universidade Federal Do Rio Grande Do Sul, Rio Grande Do Sul, Brazil, ⁶Assam Agricultural University, Guwahati, India.

4:00 PM 280 **In vivo collagen and sarcoplasmic protein synthesis in pectoralis major at d-16 birds as determined by isotope flooding technique.**
Pramir Maharjan*, Michael Schlumbohm, Garret Mullenix, Katie Hilton, Antonio Beitia, Maria Cortes, Judith England, Casey Owens, and Craig Coon, *University of Arkansas, Fayetteville, AR.*

4:15 PM 281 **Metabolizable energy and standardized amino acid digestibility of soybean meals with protease supplementation in diets for broilers chickens.**
Felipe Santos Dalólio¹, Diego Silva¹, Vitor Fascina³, José Otávio Sorbara², Rafael Gustavo Hermes³, Levy Teixeira^{*3}, and Luis Albino¹, *¹Federal University of Viçosa, Viçosa, Brazil, ²DSM Nutritional Products, Basel, Switzerland, ³DSM Nutritional Products, São Paulo, Brazil.*

Metabolism and Nutrition: Nutrition I

Chair: Justin Fowler, University of Georgia

Moderator: Wei Zhai, Mississippi State University
Crystal J 2

3:30 PM 282 **True P digestibility of corn, SBM and corn-soybean meal without and with phytase in broilers.**
Roger Davin*¹, Colwayne Morris², Fenglan Yan¹, Megharaja Manangi¹, David Ledoux², and Mercedes Vazquez¹, *¹Novus International Inc, Saint Charles, MO, ²University of Missouri, Columbia, MO.*

3:45 PM 283 **Protein sources determine intestinal protein digestion dynamics and the characteristics of the ileal undigested protein fraction.**
Dervan Bryan*, Dawn Abbott, and Henry Classen, *University of Saskatchewan, Saskatoon, SK, Canada.*

4:00 PM 284 **Effect of dietary amylose/amylopectin ratio on gut mucosa amino acid metabolism in broiler chicken.**
Dafei Yin*, Zhao Lei, Xiaonan Yin, Liqun Wang, Xiaoyu Dong, Zhibin Xiao, and Jianmin Yuan, *China Agricultural University, Beijing, China.*

4:15 PM 285 **A novel organic Se compound exerts unique regulations of Se speciation, selenogenome, and selenoproteins in broiler chicks.**
L. Zhao*², L. H. Sun², J. Q. Huang³, D. S. Qi², Mickael Briens¹, and Xingen Lei⁴, *¹Adisseo France S.A.S, Commeny, France, ²Huazhong Agricultural University, Wuhan, China, ³China Agricultural University, Beijing, China, ⁴Cornell University, Ithaca, NY.*

- 4:30 PM 286 **Effects of dietary calcium and energy source on performance, nitrogen corrected apparent metabolizable energy, and body composition of broiler chickens.**
Nathaniel Barrett*, Brittany Singh, Meredith Lewis, and Michael Persia, *Virginia Tech, Blacksburg, VA.*
- 4:45 PM 287 **Effect of rate and extent of starch digestion on turkey production parameters.**
Eugenia Herwig*, Michael Kautzman, Dawn Abbott, Karen Schwean-Lardner, and Henry Classen, *University of Saskatchewan, Saskatoon, SK, Canada.*

Thursday, July 20

Symposium: Relevance of starch in poultry diets

Chair and Moderator: **José Otávio Sorbara,**
DSM Nutritional Products
Royal

- 8:00 AM Welcome.
- 8:10 AM 601S **Starch digestion in fowl: Granule, amylose-amylopectin, and GI tract.**
Edwin Moran*, *Auburn University, Auburn, AL.*
- 8:45 AM 602S **Starch structure and factors that influence starch digestibility.**
Yong-Cheng Shi*, *Kansas State University, Manhattan, KS.*
- 9:20 AM 603S **Intestinal flow and starch digestion dynamics as influenced by feeding pattern, structural components and feed form.**
Birger Svihus*, *Norwegian University of Life Science, Aas, Norway.*
- 10:00 AM **Break.**
- 10:30 AM 604S **The relevance of starch and protein digestive dynamics in poultry.**
Peter Selle*, *University of Sydney, Sydney, New South Wales, Australia.*
- 11:05 AM 605S **Exogenous amylase, what do we know?**
Aaron Cowieson¹ and Sergio Vieira^{*2}, ¹*DSM Nutritional Products, Kaisersgrst, Switzerland,* ²*Universit  Federal Rio Grande do Sul, Porto Alegre, Brazil.*
- 11:40 AM **Roundtable discussion.**

Symposium: The future is already here: Applications of technology to poultry health and welfare

Chair and Moderator: **Karen Christensen,**
University of Arkansas
Sago

- 8:00 AM 606S **Technologies in poultry research and production: Recent advances and future directions.**
Maja Makagon*, *University of California, Davis, Davis, CA.*
- 8:30 AM 607S **Precision livestock farming.**
Daniel Berckmans*, *KU Leuven, Leuven, Belgium.*

- 9:00 AM 608S **Optical flow analysis for real-time monitoring of broiler welfare and health.**
Marian Dawkins*, *University of Oxford, Oxford, United Kingdom.*
- 9:30 AM 609S **Sensing technologies and their application in poultry welfare.**
Wayne Daley*, *Georgia Tech, Atlanta, GA.*
- 10:00 AM **Break.**
- 10:30 AM 610S **The App universe: Pocket tools to improve health and welfare.**
Inma Estevez*, *Neiker-Tecnalia, Vitoria-Gasteiz, Alava, Spain.*
- 11:00 AM 611S **Big data: The real crystal ball to predict the future?**
Rachel Hawken*, *Cobb-Vantress, Siloam Springs, AR.*
- 11:30 AM **Roundtable Discussion.**

Nutritional Immunology

Chairs: **Lisa Bielke, Ohio State University; Justin Fowler, University of Georgia**

Moderator: **Adebayo Sakale, Evonik Corporation
Crystal J 2**

- 8:00 AM 288 **Effect of *Bacillus subtilis* DSM 32315 on performance and gut pathology of broiler chickens in a necrotic enteritis challenge.**
Adebayo Sokale*¹, Anita Menconi¹, Kiran Doranalli², Gregory Mathis³, and Brett Lumpkins³, ¹*Evonik Corporation, Nutrition & Care, Kennesaw, GA,* ²*Evonik Nutrition & Care GmbH, Hanau, Germany,* ³*Southern Poultry Research, Athens, GA.*
- 8:15 AM 289 **A polysaccharidic extract of *Ulva* sp. stimulates in vitro innate immunity in broilers.**
Maria Rodriguez*, *Olmix, Brehan, Morbihan, France.*
- 8:30 AM 290 **Effect of dietary supplemental daidzein on immune function in chickens.**
Hao Fan*, Zengpeng Lv, Liping Gan, and Yuming Guo, *China Agricultural University, Beijing, China.*
- 8:45 AM 291 **Evaluation of the effects of probiotics on bacterial chondronecrosis with osteomyelitis lameness and antibiotics use in broiler chickens under commercial conditions.**
Eduardo Vicuna*, *Biomin, San Antonio, TX.*

- 9:00 AM 292 **Graded levels of hulless barley and β -glucanase affect the digestive tract morphology of broiler chickens vaccinated for coccidiosis.**
 Namalika Karunaratne*¹, Mike Bedford², Rex Newkirk¹, and Henry Classen¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²AB Vista, Marlborough, United Kingdom.
- 9:15 AM 293 **Effects of replacing antibiotics and anticoccidials with probiotics in broiler diets on intestinal coccidial lesion development.**
 Wei Zhai*, Kacey O'Donnell, and Xi Wang, *Mississippi State University, Mississippi State, MS.*
- 9:30 AM 294 **Supplemental dietary microalgal astaxanthin affects hepatic gene expression related to redox status, heat stress, inflammation, and lipid metabolism in laying hens.**
 Samar Tolba*¹, Andrew Magnuson¹, Tao Sun¹, Sandip Shinde², and Xingen Lei¹, ¹Cornell University, Ithaca, NY, ²Heliae, Gilbert, Germany.
- 9:45 AM 295 **Effect of xylanase, probiotics and their combination on broiler performance, intestinal lesion observation in response to *Eimeria* and *Clostridium perfringens* challenges.**
 Basheer Nusairat*¹, James McNaughton², Fang Zhou¹, and Jeng-Jie Wang¹, ¹BioResource International Inc, Durham, NC, ²AHPharma Inc, Hebron, MD.
- 10:00 AM **Break.**
- 10:30 AM 296 **Evaluation of the effect of a novel *Bacillus subtilis* (CHCC15076) probiotic strain on chickens subjected to physiological intestinal inflammation.**
 Alfred Blanch*¹, Dorthe Sandvang¹, Line Skjoet-Rasmussen¹, Mickael Rouault¹, Jaime Sánchez², and Marta Gracia², ¹Chr. Hansen A/S, Hørsholm, Denmark, ²Imasde Agroalimentaria S.L, Pozuelo de Alarcón, Spain.
- 10:45 AM 297 **Titrateable effects of AviLution on cecal bacteria in broiler chickens during infection with *Clostridium perfringens*.**
 Lucas Krueger*¹, David Spangler¹, and Michael Sims², ¹Agri-King, Inc, Fulton, IL, ²VA Diversified Research, Harrisonburg, VA.
- 11:00 AM 298 **Vaccine to fibroblast growth factor 23 peptides increases eggshell strength.**
 Zhouzheng Ren*, Alexis Piepenburg, Daniel Bütz, James Claus, and Mark Cook, *University of Wisconsin-Madison, Madison, WI.*

- 11:15 AM 299 **Investigation of the dietary direct-fed microbials as an antibiotic alternative on growth, gut immunity and epithelial barrier protein expression in young broiler chickens.**
Sungteak Oh*, Ujvala Gadde, Youngsub Lee, and Hyun Lillehoj, *USDA-ARS, Beltsville, MD.*
- 11:30 AM 300 **Performance of broiler chickens fed *Bacillus subtilis* DSM 32315 and an antibiotic growth promoter in a necrotic enteritis challenge.**
Anita Menconi¹, Adebayo Sokale¹, Kiran Doranalli³, and Michael Sims², ¹*Evonik Corporation, Kennesaw, GA,* ²*VA Diversified Research, Harrisonburg, VA,* ³*Evonik Nutrition & Care GmbH, Hanau, Germany.*
- 11:45 AM 301 **Effects of Mentofin on humoral immune response and bursal morphology against Infectious bursal disease in broiler chickens.**
Muhammad Umair Shah, Asim Aslam*, Ghulam Mustafa, Ali Ahmed Sheikh, and Gulbeena Saleem, *University of Veterinary and Animal Sciences, Lahore, Lahore, Punjab, Pakistan.*

Metabolism and Nutrition: Vitamins and Minerals
Chair: **Woo Kyun Kim, University of Georgia**
Moderator: **Charles Starkey, Auburn University**
Crystal J 1

- 8:30 AM 302 **The effect of various selenium sources on tissue enrichment in broiler chickens: A meta-analysis.**
Jeremy Jachacz and Mickael Briens*, *Adisseo France S.A.S, Commeny, France.*
- 8:45 AM 303 **Effect of selenium yeast and sodium selenite on performance, egg quality, antioxidant capacity and selenium deposition of laying hens.**
Xuejiao Han, Peng Qin, Wenxiang Li*, Qiugang Ma, Cheng Ji, Jianyun Zhang, and Lihong Zhao, *China Agricultural University, Beijing, China.*
- 9:00 AM 304 **Intestinal morphometry of broilers fed with different trace minerals sources under influence of heat stress.**
Jorge Muniz¹, Leticia Bittencourt^{*2}, Rita Donzele¹, Juarez Donzele¹, Gabriel Viana¹, Erika Figueiredo¹, Leonardo Faria¹, and Pedro Arnaut¹, ¹*Universidade Federal de Viçosa, UFV, Viçosa, Brazil,* ²*DSM, Nutritional Products, São Paulo, Brazil.*

- 9:15 AM 305 **Increased available phosphorus during rearing improves feathering of broiler breeder females during the laying period.**
John Brake* and Joaquin Cabanas, *North Carolina State University, Raleigh, NC.*
- 9:30 AM 306 **Effect of zinc sources and doses on the degree of presence of necrotic enteritis lesions caused by *C. perfringens* in broilers.**
Gregory Mathis*², Brett Lumpkins², Agathe Romeo¹, Denise Cardoso¹, and Stephane Durosoy¹, ¹*ANIMINE, Sillingy, France*, ²*Southern Poultry Research, Athens, GA.*
- 9:45 AM 307 **Effect of dietary vitamin level on laying hen performance and egg vitamin content.**
Sergio Fernandez*¹, Ernesto Avila², and Silvestre Charraga¹, ¹*DSM Nutritional Products México S.A. de C.V, El Salto, Jalisco, Mexico*, ²*Universidad Nacional Autónoma de México, México City, México City, Mexico.*
- 10:00 AM **Break.**
- 10:30 AM 308 **Effect of 25-hydroxycholecalciferol on single cycle laying hen performance, egg parameters, and well-being.**
Darrin Karcher*¹, Cara Robison³, Todd Applegate², and Omar Gutierrez⁴, ¹*Purdue University, West Lafayette, IN*, ²*University of Georgia, Athens, GA*, ³*Michigan State University, East Lansing, MI*, ⁴*Huvepharma Inc, Peachtree City, GA.*
- 10:45 AM 309 **Ascorbic acid biosynthesis and absorption in hens of different ages.**
Liping Gan*, Weiwei Wang, Qiqi Han, Hao Fan, and Yuming Guo, *College of Animal Science and Technology, China Agricultural University, Beijing, China.*
- 11:00 AM 310 **The influence of *in ovo* injection of carbohydrates, β -hydroxy- β -Methylbutyrate, and protein into embryonated eggs on the liver glycogen of neonatal broilers.**
Sedigheh Shahvali, Shaban Rahimi*, and Mohammad Amir Karimi Torshizi, *Tarbiat Modares University, Tehran, Iran.*
- 11:15 AM 311 **High-pressure liquid chromatography method determination for organic feedstuffs.**
Darlene Bloxham*¹, Mary Formo¹, Rebekah Scott¹, Ricardo Nunes², and Gene Pestl¹, ¹*University of Georgia, Athens, GA*, ²*Universidade Estadual do Oeste do Parana, Marechal Candido Rondon, PR, Brazil.*

Metabolism and Nutrition: Feed Additives I
Chair: **Charles Starkey, Auburn University**
Moderator: **Woo Kyun Kim, University of Georgia**
Canary 1-2

- 8:15 AM 336 **The effects of drinking water additives on performance and intestinal microbiota in broilers.**
Petra Roubos van den Hil*¹, Mark Davids¹, and Ana Isabel Garcia-Ruiz², ¹*Trouw Nutrition, Boxmeer, Netherlands*, ²*Trouw Nutrition, Cassarubios del Monte, Spain*.
- 8:30 AM 312 **Yeast cell wall in broilers' diets improves performance and reduces phosphorus in litter.**
Roberto Fornazier⁵, Daniela Rodrigues*¹, Valdir Junior², Luis Albino⁴, Fernando Tavernari³, Horacio Rostagno², Diego Silva², Mariane Marques², Tarcisio Tizziani², and Maurilio Junior², ¹*Aleris, Jundiai, SP, Brazil*, ²*Viçosa Federal University, Viçosa, Minas Gerais, Brazil*, ³*Embrapa Swine and Poultry, Concórdia, Santa Catarina, Brazil*, ⁴*Viçosa Federal University, Viçosa, Minas Gerais, Brazil*, ⁵*University Estado de Santa Catarina, Chapecó, Santa Catarina, Brazil*.
- 8:45 AM 313 **Effects of synbiotic supplementation on intestinal development and integrity of broilers.**
Chasity Pender*¹, G. Raj Murugesan², and Dawn Koltes³, ¹*Biomim America Inc, Manassas, VA*, ²*Biomim America Inc, San Antonio, TX*, ³*University of Arkansas, Fayetteville, AR*.
- 9:00 AM 314 **Effect of various sodium and chloride levels on the performance of broilers fed diets with Lasalocid.**
Manuel Da Costa*¹, Kalen Cookson¹, Sam Hendrix², Steve Davis², Jon Schaeffer¹, and John Dickson¹, ¹*Zoetis, U.S. Poultry, Durham, NC*, ²*Colorado Quality Research, Wellington, CO*.
- 9:15 AM 315 **Validation of an alternative growth promoter, Presan-FY, under research and commercial broiler production conditions in North America.**
Kellie Hogan*¹ and Gregory Page², ¹*Trouw Nutrition, Dacula, GA*, ²*Trouw Nutrition Agresearch, Guelph, ON, Canada*.
- 9:30 AM 316 **Male broilers fed corn-soy or wheat-milo-soy diets supplemented with the direct-fed microbial BiOWISH MultiBio 3P over a 6-week period.**
Michael Sims*¹, JoElla Barnes², Richard Carpenter², Michael Showell², and Josh Ison², ¹*VA Diversified Research, Harrisonburg, VA*, ²*Biowish Technologies, Cincinnati, OH*.

- 9:45 AM 317 ***Bacillus subtilis* 29784 improves performance of broilers fed different diets.**
Vincent Jacquier*¹, Lamy Rhayat¹, Pierre André Geraert¹, Karoline Brinch², and Estelle Devillard¹, ¹*Adisseo, Commentry, France*, ²*Novozymes, Bagsvaerd, Denmark*.
- 10:00 AM **Break.**
- 10:30 AM 318 **Feeding the direct-fed microbial, *Bacillus subtilis* DSM 32315, alters the cecal microbiome of broilers chickens.**
Rose Whelan*¹, Kiran Doranalli¹, German Jurgens², Teemu Rinttilä², and Juha Apajalahti², ¹*Evonik Nutrition & Care GmbH, Hanau, Germany*, ²*Alimetrics Ltd, Espoo, Finland*.
- 10:45 AM 319 ***Bacillus subtilis* 29784, a reliable efficacy in highly performing broilers.**
Vincent Jacquier*, Lamy Rhayat, Pierre André Geraert, and Estelle Devillard, *Adisseo, Commentry, France*.
- 11:00 AM 320 **Effect of a novel *Bacillus subtilis* (CHCC16872) based DFM on the performance of chickens with physiological intestinal inflammation.**
Alfred Blanch*¹, Dorthe Sandvang¹, Line Skjoet-Rasmussen¹, Mickael Rouault¹, Carlos Millán², and Marta Gracia², ¹*Chr. Hansen A/S, Hørsholm, Denmark*, ²*Imasde Agroalimentaria, S.L, Pozuelo de Alarcón, Spain*.
- 11:15 AM 321 **Effects of ButiPEARL and PrimaLac used alone or in combination on 57-d broiler performance and processing.**
Dana Dittoe*, Christopher McDaniel, Kelley Wamsley, Wei Zhai, and Aaron Kiess, *Mississippi State University, Mississippi State, MS*.
- 11:30 AM 322 **Effects of in-water synbiotic supplementation in laying hens challenged with *Salmonella*.**
Ashley Markazi*¹, Amanda Luoma¹, Revathi Shanmugasundaram¹, G. Raj Murugesan², Michaela Mohnl³, and Ramesh Selvaraj¹, ¹*The Ohio State University, Wooster, OH*, ²*Biomim, San Antonio, TX*, ³*Biomim, Getzersdorf, Austria*.

Symposium: Oxidative stress

Chairs: **Pierre André Geraert, Adisseo France SAS;
Roger Sunde, University of Wisconsin**

Moderator: **Pierre André Geraert, Adisseo France SAS
Sago**

- 1:00 PM 6125 **Efficiency and oxidative metabolism: The difficult balance.**
Walter Bottje*, *University of Arkansas, Fayetteville, AR*.

- 1:40 PM 613S **Nutritional modulation of the antioxidant capacities in poultry.**
Peter Surai*, *Feed-Food Ltd, Scotland, United Kingdom.*
- 2:20 PM 614S **From oxidative stress to Inflammation: Redox balance and immune system.**
Charlotte Lauridsen*, *Aarhus University, Tjele, Denmark.*
- 3:00 PM **Break.**
- 3:30 PM 615S **Avian selenogenome: Response to dietary Se and protection against oxidative insults.**
Xingen Lei*, *Cornell University, Ithaca, New York, United States.*
- 4:10 PM 616S **Meat: From muscle to food—Oxidative challenges and developmental anomalies.**
Michael Lilburn*, *Ohio State University, Wooster, OH.*

Symposium: Vegetative buffers for environmental stewardship on poultry farms
Chair and Moderator: **Paul Patterson,**
Penn State University
Crystal J 2

This work is supported by the Conservation Innovation Grants Program at USDA's Natural Resources Conservation Service.

- 1:00 PM **Introduction to vegetative buffers.**
Paul Patterson, *Penn State University, University Park, PA.*
- 1:10 PM 617S **Landscaping and screening at the urban-rural interface for mitigation.**
Jonathan Moyle*, *University of Maryland, Salisbury, MD.*
- 1:40 PM 618S **Vegetative buffers for poultry ammonia, particulate and virus emissions.**
R. Michael Hulet*, *Penn State University, University Park, PA.*
- 2:05 PM 619S **Odor: Perception, indexing and mitigation.**
Robert Mikesell*, *Penn State University, State College, PA.*
- 2:25 PM 620S **Riparian buffers for water management and quality.**
Heather Gall*, *Penn State University, State College, PA.*
- 3:00 PM **Break.**

- 3:30 PM 621S **Vegetative buffers: From biomass to bedding.**
Amy Barkley*, *Penn State University, University Park, PA.*
- 3:55 PM 622S **Farm evaluation of chopped giant miscanthus bedding for heavy commercial broilers.**
Jeremiah Davis*¹ and Joseph Purswell², ¹*Auburn University, Auburn, AL,* ²*USDA ARS, Mississippi State, MS.*
- 4:15 PM 623S **Vegetative buffers for energy conservation.**
Paul Patterson*, *Penn State University, University Park, PA.*
- 4:35 PM **Conclusions, questions, and discussion.**

Metabolism and Nutrition: Nutrition II

Chair: **Justin Fowler, University of Georgia**

Moderator: **Mike Blair, Devenish Nutrition
Crystal J 1**

- 1:00 PM 323 **An investigation of the interaction between nutrient density and feed form on the growth performance and nutrient utilization in broilers.**
Mohammad Abdollahi*, Faegheh Zaefarian, and Velmurugu Ravindran, *Monogastric Research Centre, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, New Zealand.*
- 1:15 PM 324 **Effects of physical form and particle size of feed and pellet binder on performance, digestive tract development, ileal nutrient digestibility, and intestinal histomorphology in broiler chicks.**
Mohammad Hossein Mohammadi Ghasem Abadi*¹, Mahmoud Shivazad¹, Hossein Moraveg¹, and Mohammad Amir Karimi Torshizi², ¹*University of Tehran, Karaj, Alborz, Iran,* ²*Tarbiat Modares University, Tehran, Tehran, Iran.*
- 1:30 PM 325 **Effect of extrudates of Bambara groundnut (*Vigna subterranean*) and Pigeon pea (*Cajanus cajan*) on growth performance, organ weights and enzyme activity of meat-type chickens.**
Oluwafunmilayo Adeleye*, Olatomiwa Agunbiade, and Farayibi Damilola, *University of Ibadan, Ibadan, Oyo, Nigeria.*

- 1:45 PM 326 **Evaluation of processing methods on rubber (*Hevea brasiliensis*) seed meal for use as a potential feed ingredient in the diet of broiler chickens.**
Paschal Aguihe*², Abiodun Kehinde², Iván Camilo Ospina-Rojas¹, and Alceu Hirata³, ¹*Universidade Estadual de Maringá, Maringá, Paraná, Brazil*, ²*Federal College of Wildlife Management, New Bussa, Niger, Nigeria*, ³*Universidade Estadual de Maringá, Maringá, Brazil*.
- 2:00 PM 327 **Effects of feed particle size and pellet binder on physical pellet quality parameters, performance, ileal digestibility of nutrients, dietary apparent metabolizable energy, and cecal microflora population in broiler chicks.**
Mohammad Hossein Mohammadi Ghasem Abadi*¹, Mahmoud Shivazad¹, Hossein Moraveg¹, and Mohammad Amir Karimi Torshizi², ¹*University of Tehran, Karaj, Alborz, Iran*, ²*Tarbiat Modares University, Tehran, Tehran, Iran*.
- 2:15 PM 328 **Dietary supplementation of microalgal astaxanthin produced dose-dependent enrichments of the phytochemical and improved redox status in tissues of broiler chicks.**
Tao Sun*¹, Ran Yin¹, Andrew Magnuson¹, Guanchen Liu¹, Samar Tolba¹, Sandip Shinde², and Xingen Lei¹, ¹*Cornell University, Ithaca, NY*, ²*Heliae Development, Gilbert, AZ*.
- 2:30 PM 329 **Effects of dietary rapeseed meal on laying performance, egg quality, and nutrient digestibility in laying hens.**
Liping Zhu*, Jianping Wang, Xuemei Ding, Qiufeng Zeng, Shiping Bai, and Keying Zhang, *Animal Nutrition Institution, Chengdu, Sichuan, China*.
- 2:45 PM 330 **Mycotoxin prevalence in the 2016 US corn crop.**
G. Raj Murugesan*¹, Chasity Pender¹, Erika Hendel¹, Paige Gott¹, and Timothy Jenkins², ¹*Biomín America Inc, San Antonio, TX*, ²*Biomín Holding GmbH, Getzersdorf, Austria*.
- 3:00 PM **Break.**
- 3:30 PM 331 **Occurrence of mycotoxins in US corn distillers dried grains with solubles (DDGS).**
G. Raj Murugesan*¹, Chasity Pender¹, Erika Hendel¹, Paige Gott¹, and Timothy Jenkins², ¹*Biomín America, Inc, San Antonio, TX*, ²*Biomín Holding GmbH, Getzersdorf, Austria*.
- 3:45 PM 332 **Influence of origin of the bean on the chemical composition, particle size, and color of soybean meal.**
Lourdes Cámara, Guillermo Fondevila, Pablo Álvarez, Diego Rodríguez, Paloma García-Rebollar, and Gonzalo Mateos*, *Universidad Politécnica de Madrid, Madrid, Spain*.

- 4:00 PM 333 **Effect of early feed restriction and dietary inclusion of hot red pepper (*Capsicum annuum* L.), garlic (*Allium sativum* L.) and moleita baladi (*Sonchus oleraceus*) on broiler performance.**
Mutaz Mahmoud*, Edris Mohammed, Rasheeda Ibrahim, Dar Elsalam Widaa, Laila Ali, and Mahmoud Dagarsho, *University of Gezira- Faculty of Animal Production, Wad Medani, Gezira, Sudan.*
- 4:15 PM 334 **Effects of the inclusion of xylanase and protease on growth performance and nutrient retention in broilers fed wheat or maize as the main component of the diet.**
Guillermo Fondevila¹, Lourdes Cámara¹, Vanessa Chugcho¹, Joan Archs¹, Adam Smith², and Gonzalo Mateos*¹, *¹Universidad Politécnica de Madrid, Madrid, Madrid, Spain, ²DSM Nutritional Products (UK) Ltd, Heanor, United Kingdom.*
- 4:30 PM 335 **Recreating geophagy in captivity in broiler chickens by inducing dietary sodium salt deprivation.**
Elise Voltura, Kimberly Gardner*, Holleigh Hollis, Hector Leyva-Jimenez, and Christopher Bailey, *Texas A&M University System, College Station, TX.*

Immunology, Health, and Disease II

Chair: **Lisa Bielke, Ohio State University**

Moderator: **Juan Latorre, University of Arkansas
Canary 1-2**

- 1:00 PM 337 **Efficacy of a specific composition of short- and medium chain 1-monoglycerides in controlling *Clostridium perfringens* induced necrotic enteritis in broiler chickens.**
Manuela Parini*², Giovanni Tosi³, Michael Coelho¹, Arianna Buccioni⁴, and Alessio Paoli², *¹BASF Corporation, Humble, TX, ²Company SILO, Firenze, Italy, ³Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna, Forli, Italy, ⁴Università degli studi di Firenze, Firenze, Italy.*
- 1:15 PM 338 **Microbiome improves growth performance and attenuates *Clostridium perfringens* challenge.**
Hong Wang, Juan Latorre, Guillermo Tellez, Billy Hargis, and Xiaolun Sun*, *University of Arkansas, Fayetteville, AR.*
- 1:30 PM 339 **Characterization of *Clostridium perfringens* recovered from broiler chicken affected by necrotic enteritis.**
Samuel Mwangi*¹, Jennifer Timmons¹, Steve Fitz-Coy², and Salina Parveen¹, *¹University Of Maryland Eastern Shore, Princess Anne, MD, ²Merck Animal Health, Millsboro, DE.*

- 1:45 PM 340 **Heat stress and *Eimeria* oocyst infection affect immune tissue histology in broiler chickens.**
Bryan Aguanta*, Alberta Fuller, Susan Williams, Marie Milfort, Romdhane Rekaya, and Samuel Aggrey, *University of Georgia, Athens, GA.*
- 2:00 PM 341 **Live *Salmonella* vaccination of broilers: Pen trials to the field.**
Charles Hofacre*¹, Roy Berghaus¹, Gregory Mathis², and Robert Evans³, ¹*The University of Georgia, Athens, GA,* ²*Southern Poultry Research Group, Athens, GA,* ³*Elanco Animal Health, Harrisonburg, VA.*
- 2:15 PM 342 **Genomic traits of a strain of *Salmonella* Heidelberg isolated in broilers in Brazil and related phenotypic tolerance to organic acids and antibiotics.**
Elizabeth Santin*¹, Ricardo Hayashi¹, Mariana Camargo Lorenci¹, Raquel Bighetti Araujo², Ricardo Gonzalez-Esquerria², Marcelo Falsarella Carazzolle³, Cáo César de Melo Freire⁴, Paulo Sergio Monzani⁵, and Anderson Ferreira da Cunha⁴, ¹*Universidade Federal do Paraná, Curitiba, Parana, Brazil,* ²*Novus International Inc, Indaiatuba, SP, Brazil,* ³*Universidade Estadual de Campinas, Campinas, SP, Brazil,* ⁴*Universidade Federal de São Carlos, São Carlos, SP, Brazil,* ⁵*Universidade de São Paulo, Pirassununga, SP, Brazil.*
- 2:30 PM 343 **Pathomicrobial and immunohistochemical findings in broiler chickens naturally infected with *Salmonella enterica* serotype gallinarum biotype gallinarum.**
Gulbeena Saleem*¹, Umar Farooq¹, Asim Aslam¹, Tariq Javed², Muhammad Younas³, and Iram Liaqat⁴, ¹*University of Veterinary and Animal Sciences, Lahore, Lahore, Punjab, Pakistan,* ²*University of Agriculture, Faisalabad, Faisalabad, Pakistan,* ³*University of Veterinary and Animal Sciences, Lahore, Jhang, Pakistan,* ⁴*Government College University, Lahore, Pakistan.*

Metabolism and Nutrition: Feed Additives II
Chair: **Charles Starkey, University of Georgia**
Moderator: **Justin Fowler, University of Georgia**
Canary 1-2

- 3:30 PM 344 **Effect of dietary genistein supplementation on the reproductive performance and bone status of laying broiler breeders during the late egg-laying period.**
Zengpeng Lv*, Hao Fan, Beibei Zhang, Zhui Li, Liping Gan, and Yuming Guo, *China Agricultural University, Beijing, China.*

- 3:45 PM 345 **Effects of a commercial B-mannanase product on body and bone composition in Pekin ducks.**
Jungwoo Park*, Micky Clary, John Padgett, Hector Leyva-Jimenez, and John Carey, *Texas A&M University, College Station, TX.*
- 4:00 PM 346 **Influence of dietary carotenoids on serum carotenoids levels and live and post-slaughter skin pigmentation of meat-type chicken.**
Oluwafunmilayo Adeleye* and Esther Oginni, *University of Ibadan, Ibadan, Oyo, Nigeria.*
- 4:15 PM 347 **The effects of TYPLEX chelate on broiler growth performance, litter coccidial oocysts and caecal microbial profile.**
Farina Khattak*¹, Simon Williams², Jafar Mahdavi³, and Jos Houdijk¹, *¹SRUC, Edinburgh, United Kingdom, ²Akeso Biomedical Inc, Waltham, MA, ³University of Nottingham, Nottingham, United Kingdom.*
- 4:30 PM 348 **Effects of a novel antioxidant blend, Selko POMix, as partial replacement of vitamin E on broiler chicken growth performance, antioxidant status and meat quality.**
Gregory Page*¹, Zahid Nasir¹, and Theo van Kempen², *¹Trouw Nutrition Agresearch, Guelph, ON, Canada, ²Trouw Nutrition R & D, Boxmeer, the Netherlands.*
- 4:45 PM 349 **Hydrolyzed yeast and *Bacillus subtilis* on the production of broiler breeder and incubation parameters.**
Jeanna Wilson², Melina Bonato*¹, Liliana Borges¹, and Ricardo Barbalho³, *¹ICC Brazil, São Paulo, São Paulo, Brazil, ²University of Georgia, Athens, GA, ³ICC Brazil, São Paulo, São Paulo, Brazil.*

POSTER PRESENTATIONS

Sabal

Animal Well-Being and Behavior

- 350P **Pre-laying behavior and nest substrate preference of laying hens in a cage-free system.**
Gabrielle House*, Kailynn VanDeWater, and Marisa Erasmus, *Purdue University, West Lafayette, IN.*

- 351P **Differences in cecal microbiota between feather peckers and non-peckers.**
Patrick Birkel*¹, Peter McBride¹, Joergen Kjaer², Aadil Bharwani³, Wolfgang Kunze³, Paul Forsythe³, and Alexandra Harlander¹, ¹*University of Guelph, Guelph, ON, Canada*, ²*Friedrich-Loeffler Institute, Celle, Germany*, ³*McMaster University, Hamilton, ON, Canada*.
- 352P **Can Japanese quail male aggressions toward a female cagemate predict aggressiveness toward unknown conspecifics?**
Stefania Pellegrini, Leon Condat, Raul Marin*, and Diego Guzman, *Instituto de Investigaciones Biológicas y Tecnológicas (IIByT; CONICET-UNC) and Instituto de Ciencia y Tecnología de los Alimentos (ICTA), Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina*.
- 353P **Unexpected results when assessing underlying aggressiveness in Japanese quail using photocastrated stimulus birds.**
Jorge Caliva, Jackelyn Kembro, Stefania Pellegrini, Diego Guzman, and Raul Marin*, *Instituto de Investigaciones Biológicas y Tecnológicas (CONICET-UNC), Instituto de Ciencia y Tecnología de los Alimentos, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina*.
- 354P **Feeding behavior and feed efficiency of slow-growing yellow broilers as measured by automatically recording feeders.**
Wei Yan*¹, Congliang Ji², Chaoliang Wen¹, Congjiao Sun¹, and Ning Yang¹, ¹*National Engineering Laboratory for Animal Breeding and MOA Key Laboratory of Animal Genetics and Breeding, College of Animal Science and Technology, China Agricultural University, Beijing, China*, ²*Wen's Nanfang Poultry Breeding Co. Ltd, Yunfu, China*.
- 355P **Synbiotic supplement effects on cecal microbial ecology, growth performance and leukocyte populations of broiler chickens reared under heat stress.**
Ahmed Mohammed*¹, Jiaying Hu¹, and Heng-Wei Cheng², ¹*Purdue University, West Lafayette, IN*, ²*USDA Agricultural Research Service, West Lafayette, IN*.

Extension and Instruction

- 356P **Educating future food professionals in food defense: Are food safety educational models a good fit?**
Emefa Monu* and Robert Norton, *Auburn University, Auburn, AL*.
- 357P **Innovative poultry teaching and research: Appalachian State University case study.**
Anne Fanatico*, *Appalachian State University, Boone, NC*.

- 358P **Economic-productive evaluation of the cleaning and disinfection of facilities of broilers challenged with *Campylobacter jejuni*.**
Maria Fernanda Burbarelli*¹, Gustavo Polycarpo¹, Carlos Alexandre Granghelli¹, Karoline Lelis¹, Livia Maria Soares Queiroz¹, Esther Ramalho Affonso¹, Viviane Ferrari¹, Roberto Bordin³, Andrezza Fernandes², and Ricardo de Albuquerque¹, ¹University of São Paulo, Pirassununga, São Paulo, Brazil, ²University of São Paulo, Pirassununga, SP, Brazil, ³Fatec, Mogi das Cruzes, Brazil.

Genetics and Genomics

- 359P **Improvement of quail primordial germ cell expansion in vitro by activating of TGF- β signaling through a small molecule.**
Saeed Yakhkeshi¹, Shaban Rahimi*¹, Mohsen Sharafi¹, Seyedeh-Nafiseh Hassani², Abdolhossein Shahverdi², and Hossein Baharvand², ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran.
- 360P **Functional genomic analysis of putative adhesion and environmental fitness factors important to the gastrointestinal colonization of *Lactobacillus gallinarum* in poultry.**
Tyler Askelson*, Timothy Broderick, and Tri Duong, Texas A&M University, College Station, TX.
- 361P **The effect of selenium on the expression of anti-viral genes in chickens.**
Bahram Shojadoost², A. E. Ted Sefton¹, Alexander Bekele-Yitbarek², Neda Barjesteh², Adrianna Laursen², Khaled Taha Abd Abdelaziz², Kristen Brennan*³, Kayla Price¹, Trevor Smith⁴, and Shayan Sharif², ¹Alltech, Guelph, ON, Canada, ²Ontario Veterinary College, Guelph, ON, Canada, ³Alltech Global Headquarters, Nicholasville, KY, ⁴Ontario Agricultural College, Guelph, ON, Canada.
- 362P **Transfection of human granulocyte colony stimulating factor gene via sperm for production of transgenic chickens using artificial insemination.**
Shaban Rahimi*¹, Mahin Rahimi¹, Abdolhossein Shahverdi², and Mohsen Sharafi¹, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran.
- 363P **Improving indigenous chickens in developing countries outlet of the Norwegian-Egyptian Project "NORFA" in Egypt (1980–2017).**
Farouk Abdou*¹, A. A. Enab¹, A. El Fiki¹, and N. Kolstad², ¹Menoufia University/ Faculty of Agriculture and Animal Production, Shebin Elkom, Menoufia, Egypt, ²Agricultural University of Norway, Oslo Norway.
- 364P **MicroRNA regulatory mechanisms of the hepatic metabolic transition in developing chickens.**
Julie Hicks², Tom Porter*¹, and Hsiao-Ching Liu², ¹University of Maryland, College Park, MD, ²North Carolina State University, Raleigh, NC.

- 365P **Genetic parameters for body weight and egg production traits in Korean native chicken.**
Jaebeom Cha*, Jongdae Kim, Boseok Kang, Hyojun Choo, and Kangnyeong Heo, *National Institute of Animal Science, Pyeongchang-gun, Korea.*

Immunology, Health, and Disease

- 366P **The effects of *Bacillus subtilis* and yeast cell wall on intestinal health of broilers challenged by *Clostridium perfringens*.**
Zhui Li*, Weiwei Wang, Zengpeng Lv, and Yuming Guo, *China Agricultural University, Beijing, China.*
- 367P **The effects of *Lactobacillus acidophilus* on growth performance and intestinal health of broilers challenged with *Clostridium perfringens*.**
Zhui Li*, Weiwei Wang, Beibei Zhang, and Yuming Guo, *China Agricultural University, Beijing, China.*
- 368P **Identification and functional characterization of a novel chicken interleukin 26 (chIL-26).**
Yeong Ho Hong*¹, Anh Duc Truong¹, Yejin Hong¹, Hans Cheng², and Hyun Lillehoj³, ¹*Chung-Ang University, Anseong, Gyeonggi-do, Korea,* ²*USDA-ARS, East Lansing, MI,* ³*USDA-ARS, Beltsville, MD.*
- 369P **Local antibody and cellular immune responses induced by inactivate infectious bronchitis virus vaccine encapsulated in chitosan nanoparticles are important tracheal immune-protection correlates.**
Priscila Lopes*², Cintia Hiromi Okino¹, Filipe Santos Fernando², Caren Pavani², Luciana Facco Dalmolin³, Viviane Mariguela Casagrande², Maria de Lurdes Feres Tamani², Maria de Fatima S. Montassier², Renata Fonseca Vianna Lopez², and Helio José Montassier², ¹*Empresa Brasileira de Pesquisa Agropecuária, São Carlos, Brazil,* ²*Universidade Estadual Paulista–Unesp Jaboticabal, Jaboticabal, Brazil,* ³*Universidade de São Paulo–Usp Ribeirão Preto, Ribeirão Preto, Brazil.*
- 370P **Fecal shedding of *Eimeria* as a parameter of effectiveness for therapeutic and prophylactic interventions.**
Kaylin Krueger*¹, Whitney Briggs¹, Kim Wilson¹, Audrey Duff¹, John Barta², Billy Hargis³, and Lisa Bielke¹, ¹*Ohio State University, Columbus, OH,* ²*University of Guelph, Guelph, ON, Canada,* ³*University of Arkansas, Fayetteville, AR.*
- 371P **Efficacy of a liposomal *Aspergillus* vaccine against pulmonary aspergillosis in SPF chickens.**
Jill Adler-Moore*¹, Hernan Reza¹, Tracey McNamara², Lisa Griggs², Ellen Collisson², Sam Ho³, Suming Chiang³, and Gary Fujii³, ¹*Cal Poly Pomona, Pomona, CA,* ²*College of Veterinary Medicine, Pomona, CA,* ³*Molecular Express Inc, Rancho Dominguez, CA.*

- 372P **Intestinal immunometabolic phenotype changes induced by *Eimeria maxima* that increase susceptibility to necrotic enteritis (NE).**
Mike Kogut*¹ and Ryan Arsenault², ¹USDA-ARS, College Station, TX, ²University of Delaware, Newark, DE.
- 373P **Immunomodulatory roles of chicken NK-lysin-derived peptide cNK-2 as a host defense peptide.**
Woohyun Kim*¹, Hyun Lillehoj¹, and Wongi Min², ¹USDA-ARS, Baltimore, MD, ²Gyeongsang National University, Jinju, Gyeongnam, Korea.
- 374P **Transmission of toxoplasmosis from feral cats to chickens.**
Si Hong Park³, Edmundo Cuadra¹, Javier Perez¹, Gabriel Sanson¹, Nicholas Sundet¹, Sergio Trana¹, and Irene Hanning*², ¹Lincoln International Academy, Managua, Nicaragua, ²University of Tennessee, Knoxville, TN, ³University of Arkansas, Fayetteville, AR.
- 375P **Performance and body composition of broilers fed phytogetic additives.**
Mallory White*, Virginia Tech, Blacksburg, VA.
- 376P **Role of selenium enriched yeast in enhancement of immunogenicity and efficacy of vaccines against low pathogenic avian influenza virus (H9N2) in chickens.**
Bahram Shojadoost², A. E. Ted Sefton*¹, Alexander Bekele-Yitbarek², Neda Barjesteh², Adrianna Laursen², Tamiru Alkie², Khaled Taha Abd Abdelaziz², J. Shojadoost², Kayla Price¹, Trevor Smith³, and Shayan Sharif¹, ¹Alltech, Guelph, ON, Canada, ²Ontario Veterinary College, Guelph, ON, Canada, ³Ontario Agricultural College, Guelph, ON, Canada.
- 377P **Implications of mycotoxins on productive performance and nutritional efficiency of broilers.**
Carolina Franceschi*, Ines Andretta, Paula Gabriela Pires, Marcos Kipper, Bruna Schroeder, Priscila Moraes, and Carolina Franceschi, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil.
- 378P **Effects of *Eimeria* spp. infection on intestinal interleukin-10 production in broilers.**
Maria Arendt*, Emily Michael, Christopher Nguyen, and Mark Cook, University of Wisconsin-Madison, Madison, WI.
- 379P **Chickens from the UCD200 autoimmune scleroderma line have heightened innate in vivo responses to particulate antigens injected into the dermis of growing feathers.**
Gisela Erf*, Hyeonmin Jang, Daniel Falcon, Joseph Hiltz, and Nicholas Anthony, University of Arkansas, Division of Agriculture, Fayetteville, AR.

- 380P **Evaluation of *Eimeria*-dietary challenge model to test the benefits of alternatives for antibiotic growth promoters in broiler birds.**
Vivek Kuttappan*, Juxing Chen, Fenglan Yan, and Mercedes Vazquez-Anon, *Novus International Inc, St. Charles, MO.*
- 381P **Identification and characterization of Marek's disease virus genes that mediate production of cell-free enveloped infectious virus particles in the feather follicle epithelial cells.**
Mohammad Heidari*, *USDA-ARS, East Lansing, MI.*
- 382P **Industry-wide survey of avian pathogenic *E. coli* levels in US broilers.**
Evan Hutchison*, Alexandra Smith, and Thomas Rehberger, *Agro BioSciences, Wauwatosa, WI.*
- 383P **Effect of supplementing organic selenium on lymphocyte proliferation and antibody titer of broilers.**
Anete Rorig*, Lucas Kind Alvares, Regina Buzim, Daianna Rosse Martins Golcalves, Daiane Horn, and Jovanir Ines Muller Fernandes, *Federal University of Parana-Brazil, Palotina, Parana, Brazil.*
- 384P **Effect of antibiotic withdrawal in feed on chicken gut microbial dynamics, immunity and growth performance.**
Sanjay Kumar*¹, Chongxiao Chen², Nagaraju Indugu³, Gabriela Welang¹, Manpreet Singh², Woo Kyun Kim², and Harshavardhan Thippareddi², ¹*Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil,* ²*University of Georgia, Athens, GA,* ³*University of Pennsylvania, Kennett Square, PA.*
- 385P **Cecal microbiota potentially contributes to enterococcal spondylitis in broilers.**
Joshua Rehberger*, Alexandra Smith, Evan Hutchison, Dan Karunakaran, and Thomas Rehberger, *Agro BioSciences, Wauwatosa, WI.*
- 386P **Effect of antibiotic administration on the frequency of intestinal intraepithelial leukocytes and goblet cells in broiler chicks challenged with *Clostridium perfringens*.**
Yewande Fasina*¹ and Frederic Hoerr², ¹*North Carolina A&T State University, Greensboro, NC,* ²*Veterinary Diagnostic Pathology LLC, Fort Valley, VA.*
- 387P **Growth and metabolic indices of furazolidone-induced cardiomyopathy in the Pearl Grey guinea fowl.**
Collins Khwatenge*, Thyniece Taylor, and Samuel Nahashon, *Tennessee State University, Nashville, TN.*

- 388P **Transcriptional analysis of differentially expressed genes in two Fayoumi chicken lines afflicted with necrotic enteritis by RNA sequencing.**
Yeojin Hong*¹, Anh Duc Truong¹, Yeong Ho Hong¹, Jangguen Lee¹, Kyungebaek Lee¹, Hyun Lillehoj², and Susan Lamont³, ¹*Chung-Ang University, Anseong, Gyeonggi-do, Korea*, ²*United States Department of Agriculture, Beltsville, MD*, ³*Iowa State University, Ames, IA*.
- 389P **Variation in Blackhead infection rates in different strains of turkeys.**
Christina Sigmon* and Robert Beckstead, *North Carolina State University, Raleigh, NC*.
- 390P **Prediction of high epitopic regions of *Clostridium perfringens* alpha toxin as an immunizing agent.**
Ahmadreza Valipouri¹, Shaban Rahimi*¹, Ali Asghar Karkhane², and Mohammad Amir Karimi¹, ¹*Tarbiat Modares University, Tehran, Iran*, ²*National Institute of Genetic Engineering and Biotechnology, Tehran, Iran*.

Management and Production

- 391P **Importance of the South region of Brazil in the export of chicken meat from 2007 to 2016.**
Carolina Franceschi*, Morgana Zortea, and Andrea Pinto, *Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*.
- 392P **Assessment of *in ovo* injection of *Bifidobacterium bifidum* and *Bifidobacterium longum* on performance, hematological, and biochemical profile of broiler chicks.**
Abd El-Moneim Abd El-Moneim*, Magda Wakwak, and Adel Abu-Taleb, *Egyptian Atomic Energy Authority, Zagazig, Egypt*.
- 393P **Effects of fumonisin B₁ and mycotoxin binder on relative organ weights, meat quality and serum characteristics in broiler chickens housed at different stocking density.**
Sang Lee*, Kyung-Woo Lee, Byoung-Ki An, Da-Hye Kim, and Moungh-Cheul Keum, *Konkuk University, Seoul, Korea*.
- 394P **Effect of color of lighting, breeder hen age and methionine restriction on performance and viscera weights of broilers.**
Diego Martinez*¹, Cristian Uculmana¹, and Carlos Vilchez², ¹*LLAN Development & Service, Lima, Peru*, ²*La Molina National Agrarian University, Lima, Peru*.
- 395P **Comparison of two commercially available LED lights on broiler egg hatchability and chick quality.**
Leesa Bushart* and Gregory Archer, *Texas A&M University, College Station, TX*.

- 396P **Effect of initial chick weight on egg characteristics of commercial layer.**
Shamoil Tariq*, Jibran Hussain, Muhammad Usman, Athar Mahmud, Shahid Mehmood, Muhammad Waqas, and Sohail Ahmad, *University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan.*
- 397P **Impact of increased activity during rearing on incidence of woody breast in male broilers.**
Barbara de Almeida Mallmann*, Karen Christensen, Dawn Koltres, Shawna Weimer, Juan Caldas-Cueva, Craig Coon, and Casey Owens, *University of Arkansas, Fayetteville, AR.*
- 398P **Effect of ad libitum, split, and restricted feeding on performance, digestibility and welfare of broiler chickens.**
Gbemiga Adeyemo*, *University of Ibadan, Ibadan, Oyo, Nigeria.*
- 399P **Effect of feed withdrawal at daytime or nighttime on performance of chickens rearing in the Brazilian conventional versus dark house production systems.**
Thiago Melo², Silvana Santos*¹, Aliton Silva², João Pedro Silva², José Filho², and José Vilar Da Silva², ¹*Federal University of Paraíba, Bananeiras, Brazil,* ²*Universidade Federal da Paraíba, Solânea, Brazil.*

Metabolism and Nutrition: Amino Acids

- 400P **Standard body weight and serum estradiol and progesterone concentrations in response to total lysine content in female broiler breeders from 14 to 42 days after hatch.**
Eunjoo Kim*, Taeg Kyun Shin, Hyun Min Cho, Samiru Wickramasuriya, Beomgyu Kim, and Jung Min Heo, *Chungnam National University, Deajeon, Chung-chung-nam-do, Korea.*
- 401P **Exigency of digestible methionine+cystine for broilers in early stage.**
Silvana Santos*¹, José Vilar Da Silva², Aliton Silva¹, João Pedro Silva¹, Mauro Saraiva¹, and Natalí da Cruz², ¹*Federal University of Paraíba, Areia, Brazil,* ²*Federal University of Paraíba, Bananeiras, Brazil.*
- 402P **Influence of dietary amino acid contents on apparent and standardized ileal digestibility of amino acid in corn-soybean meal-based diets fed to broiler chickens.**
Su Hyun An*¹, Beob Gyun Kim¹, and Changsu Kong², ¹*Konkuk University, Seoul, Korea,* ²*Kyungpook National University, Sangju, Korea.*
- 403P **Phenylalanine + tyrosine requirement in a low CP diet for 10- to 21-day-old female turkeys.**
Joao Ferreira* and Jeffrey Firman, *University of Missouri, Columbia, MO.*

- 404P **Digestible total sulfur amino acids requirements of two strains of brown laying hens.**
Moung-Cheul Keum^{*1}, Da-Hye Kim¹, Sang Lee¹, Kyung-Woo Lee¹, Kwan-Eung Kim², Gyo-Moon Choo³, and Byoung-Ki An¹, ¹*Konkuk University, Seoul, Korea*, ²*Nonghyup Feed, Seoul, Korea*, ³*Busan Bio, Nonghyup Feed Inc, Busan, Korea*.
- 405P **Dietary amino acid responses of male Cobb MV × 700 broilers from 0 to 46 d post-hatch.**
Craig Maynard^{*1}, Rocky Latham², Roy Brister², Casey Owens¹, and Samuel Rochell¹, ¹*University of Arkansas, Fayetteville, AR*, ²*Tyson Foods, INC, Springdale, AR*.
- 406P **Efficiency of utilization of valine in Japanese quails.**
Karla Meza Martinez^{*}, Nilva Sakomura, Edney da Silva, Rafael Massami Suzuki, Matheus Reis, and Nayara Ferreira, *Unesp, Jaboticabal, São Paulo, Brazil*.
- 407P **Effect of varying dietary lysine concentrations on expression of genes associated with fat accretion in broiler chickens.**
Boniface Kimathi^{*}, Collins Khwatenge, Thyniece Taylor, and Samuel Nahashon, *Tennessee State University, Nashville, TN*.
- 408P **Effect of dietary glutamine and arginine on woody breast muscle myopathy and muscular calcium, potassium, and phosphorus in broiler chickens.**
Courtney Herrin^{*}, Matthew Livingston, Ramon Malheiros, and Kimberly Livingston, *North Carolina State University, Raleigh, NC*.
- 409P **Effect of dietary digestible lysine-methionine ratio and metabolizable energy levels on growth performances and meat yields of crossbred-native thai chickens as rearing in tropical climates.**
Keatisak Soisuwan^{*}, *Faculty of Agriculture, Rajamagala University of Technology Srivijaya, Thungsong, Nakhon Si Thammarat, Thailand*.
- 410P **Comparison of methionine sources in diets for broilers from 0 to 28 days of age.**
Felipe Fernandez^{*2}, Lorena Morao², Victor Naranjo¹, and Ariane Helmbrecht¹, ¹*Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany*, ²*Evonik Argentina SA, Boulogne, Argentina*.
- 411P **Responses of Ross 308 broiler chicks to different levels of valine amino acids in growing period.**
Arash Hassanzadeh Seyed^{i*} and Hossein Janmohammadi, *University of Tabriz, Tabriz, East Azarbijan, Iran*.
- 412P **Determination of dietary leucine amino acid requirement for Ross 308 male broiler chicks in finisher period.**
Elnaz Safiary^{*} and Parviz Farhoomand, *University of Urmia, Tehran, Tehran, Iran*.

- 413P **Levels and substitution of dl-methionine by dl-methionine hydroxy analog in broiler diets of 8-42 days.**
Silvana Santos*², José Vilar Da Silva¹, Aliton Silva², João Pedro Silva², Janiele da Silva¹, and Thiago Melo², ¹*Federal University of Paraíba, Bananeiras, Brazil*, ²*Federal University of Paraíba, Areia, Brazil*.
- 414P **Ideal in-feed amino acid ratio for Hy-line W36 pullets in initial phase.**
Letícia Soares*¹, Nilva Sakomura¹, Juliano César Dorigam², Mariana do Nascimento¹, Raian Acacio¹, Vinícius Oliveira¹, and Thaisa França¹, ¹*Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, São Paulo, Brazil*, ²*Evonik Nutrition, Hanau-Wolfgang, Germany*.
- 415P **Effects of folic acid and methionine on performance, egg zinc and 5-methyltetrahydrofolate content and serum homocysteine in laying hens.**
Sattar Bagheri* and Hossein Janmohammadi, *Tabriz University, Tabriz, East Azerbaijan, Iran*.
- 416P **Ideal dietary levels of leucine, valine, and isoleucine in low-protein diets for broiler chickens using response surface methodology.**
Iván Camilo Ospina-Rojas*¹, Alice Eiko Murakami¹, Márcia Izumi Sakamoto¹, Paschal Aguihe², and Paulo Cesar Pozza¹, ¹*Universidade Estadual de Maringá, Maringá, Brazil*, ²*University of Ibadan, New Bussa, Nigeria*.
- 417P **Effect of dietary glutamine on growth performance of growing broiler chickens raised under heat stress conditions.**
Ji Eun Shin*, Gi Ppeum Han, Franco Pitargue, and Dong Yong Kil, *Chung-Ang University, Anseong, Gyeonggi-do, Korea*.
- 418P **A population approach using linear and quadratic plateau models to valine intake for laying hens.**
Vinícius Oliveira*, Euclides Malheiros, Nilva Sakomura, Edney da Silva, Matheus Reis, and Camila Gonçalves, *Unesp, Jaboticabal, São Paulo, Brazil*.
- 419P **Responses of broilers to tryptophan intakes.**
Raian Acacio, Nilva Sakomura, Nayara Ferreira, Letícia Soares*, Mirella Melaré, Mariana do Nascimento, and Camila Gonçalves, *Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, Brazil*.
- 420P **Bioefficacy of lysine from l-lysine sulfate in starter broiler chickens diets.**
Barbara de Oliveira, Vanessa Silva, Alisson Clemente, Marcelo Espósito, Andressa Carvalho, and Antônio Berstechini*, *University Federal of Lavras, Lavras, Minas Gerais, Brazil*.
- 421P **Bioefficacy of L-lysine sulfate compared with feed-grade L-lysine HCl in finisher for broiler chickens diets.**
Barbara de Oliveira, Bernardo Nogueira, Frederico de Oliveira Bustamante, Luís de Freitas, Fabiana Maciel, and Antônio Berstechini*, *University Federal of Lavras, Lavras, Minas Gerais, Brazil*.

- 422P **Digestible valine requirements for laying hens.**
 Vinicius Oliveira*¹, Euclides Malheiros¹, Nilva Sakomura¹, Matheus Reis²,
 Camila Gonçalves¹, and Fernando Antayhua¹, ¹UNESP, Jaboticabal, São
 Paulo, Brazil, ²Unesp, Jaboticabal, São Paulo, Brazil.
- 423P **Amino acid composition and digestibility of organic feed ingredients.**
 Marie Milfort, James Foutz, Claudia Dunkley, Adam Davis, Romdhane Rekaya,
 and Samuel Aggrey*, *University of Georgia, Athens, GA.*

Metabolism and Nutrition: Enzymes

- 424P **A meta-analysis of the effect of Victus Broiler under commercial and experimental conditions.**
 Nelson Ward*¹, James Kessler², Doug Teige³, April Levy⁴, and Aaron
 Cowieson⁵, ¹DSM Nutritional Products, Ringoes, NJ, ²DSM Nutritional
 Products, Murrieta, CA, ³DSM Nutritional Products, Lindell Beach, BC,
 Canada, ⁴DSM Nutritional Products, Ankeny, IA, ⁵DSM Nutritional Products,
 Basel, Switzerland.
- 425P **The effect of combining microbial phytase, protease, and xylanase on performance of broiler chicks fed diets containing reduced levels of available phosphorus, amino acids and energy.**
 Megharaja Manangi*, Steven Bettis, Juxing Chen, and Mercedes Vazquez-
 Anon, *Novus International Inc, St. Charles, MO.*
- 426P **Multi-Carbohydrase supplementation improves growth performance and nutrient digestibility in broiler chickens.**
 Samiru Wickramasuriya*¹, Eunjoo Kim¹, Hyun Min Cho¹, Taeg Kyun Shin¹, Rob
 Patterson², and Jung Min Heo¹, ¹Chungnam National University, Daejeon,
 Korea, ²Canadian Bio-Systems Inc, Calgary, Canada.
- 427P **The effect of enzyme supplementation on egg quality, omega-3 (n-3) fatty acid deposition, and foregut morphology in hens fed flax.**
 Gita Cherian* and Lindsay Westbrook, *Oregon State University, Corvallis, OR.*
- 428P **Total tract lipid digestibility, muscle fatty acids and oxidative stability during storage in broilers fed flax with carbohydrase enzyme.**
 Brian Head, Francine Vercese*, and Gita Cherian, *Oregon State University,
 Corvallis, OR.*
- 429P **Efficacy of NSPase inclusion in reduced energy diets on broiler growth performance.**
 Halei Williams*¹, Mallori Williams¹, Nathan Augspurger², Blyn Brown², and
 Jason Lee¹, ¹Texas A&M University, College Station, TX, ²JBS United, Sheridan,
 IN.

- 430P **Carbohydrases in poultry diets on ileal digestibility of nutrients.**
Jomara Broch*², Ricardo Nunes¹, Cinthia Eyng¹, Wagner Silva³, Idiana Silva¹, Marina Susin¹, Gabriela Sangalli¹, and Paulo Pozza⁴, ¹*Universidade Estadual do Oeste do Parana, Athens, GA*, ²*Universidade Estadual do Oeste do Paraná - UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil*, ³*Safeeds, Cascavel, Brazil*, ⁴*Universidade Estadual de Maringá, Maringá, Brazil*.
- 431P **Effects of pellet temperature and inclusion of a non-starch polysaccharide degrading enzyme on broiler performance and nutrient digestibility.**
Hunter Walters*¹, Austin Jasek¹, Nathan Augspurger², and Jason Lee¹, ¹*Texas A&M University, College Station, TX*, ²*JBS United, Sheridan, IN*.
- 432P **Evaluation of a multicarbohydrase in broilers diets.**
Lucio Araújo*¹, Márcio Ceccantini², Cristiane Araujo¹, Fabricia Roque¹, Brunna Garcia de Souza Leite¹, Yasmin Sartore¹, Naiara Fagundes², and Adriana Toscan², ¹*University of Sao Paulo, Pirassununga, Sao Paulo, Brazil*, ²*Adisseo Brazil, Sao Paulo, SP, Brazil*.
- 433P **Effects of increasing concentrations of corn-expressed non-starch polysaccharide enzyme on broiler performance and ileal nutrient digestibility.**
Corey Johnson*¹, Austin Jasek¹, Jon Broomhead², Xuemei Li², and Jason Lee¹, ¹*Texas A&M University, Cypress, TX*, ²*Agrivida, Medford, MA*.
- 434P **Xylanase supplementation does not affect the cecal short-chain fatty acids concentration of 35-day-old broilers fed corn-based diets.**
Guilherme Pasquali*, Tatiane Santos, Juliana Denadai, Leonardo Zanetti, Everton Muro, Raimundo Ferreira Netto, Livia Dornelas, Armando Contin Neto, Daniele Souza, Mayara Santana-Eich, Jose Sartori, and Antonio Pezzato, *College of Veterinary Medicine and Animal Sciences, UNESP, Botucatu, Botucatu, São Paulo, Brazil*.
- 435P **Effect of xylanase on growth performance and cecal short chain fatty acid production in broilers fed different levels of fiber.**
Amit Singh*¹, Ryosuke Kida¹, Mike Bedford², and Rajesh Jha¹, ¹*University of Hawaii at Manoa, Honolulu, HI*, ²*AB Vista Feed Ingredients, Marlborough, United Kingdom*.
- 436P **Efficacy of a corn-expressed phytase enzyme in laying hens.**
Pamela Utterback*¹, Shelby Corray¹, Patrick Von Schaumburg¹, John Munoz¹, Carl Parsons¹, and Jon Broomhead², ¹*University of Illinois, Urbana, IL*, ²*Agrivida, Medford, MA*.
- 437P **Effect of microbial phytase on apparent ileal digestibility of amino acids: Meta-analysis approach.**
Maroua Zouaoui, Frédéric Guay, and Marie-Pierre Montminy*, *Laval University, Quebec, QC, Canada*.

- 438P **Phytase activity of mash and pelleted monogastric diets containing Allzyme SSF.**
Nicole Weidner², Justin Combs³, Shane Carson⁴, Megan Scholer³, Kayla Price^{*1}, Paul Groenewegen⁴, and Becky Timmons³, ¹Alltech, Guelph, ON, Canada, ²Ontario Veterinary College, Guelph, ON, Canada, ³Alltech Inc, Nicholasville, KY, ⁴Masterfeeds, London, ON, Canada.
- 439P **Extra-phosphoric effect of phytase on broiler performance from 1 to 42 days.**
Jomara Broch^{*1}, Ricardo Nunes¹, Cinthia Eyng¹, Vitor Fascina², Vaneila Savaris¹, Jessica Damasceno¹, Patricia Nesello¹, and Mariana Lohmann¹, ¹Universidade Estadual do Oeste do Parana, Marechal Cândido Rondon, Paraná, Brazil, ²DSM, São Paulo, Brazil.
- 440P **Addition of exogenous protease improves the weight gain of broiler chickens.**
Everton Krabbe^{*1}, Edenilse Gopinger², Diego Surek¹, and Valdir Avila¹, ¹Brazilian Agricultural Research Corporation-Embrapa Swine and Poultry, Concordia, Santa Catarina, Brazil, ²Animal Science, Postdoctoral Fellow at National Council for Scientific and Technological Development (CNPq), Concordia, Brazil.
- 441P **Effect of a protease on performance and intestinal health of broiler chickens fed a standard diet or a low-density diet.**
Mariana Lemos de Moraes^{*1}, Kátia M. Cardinal², Ines Andretta², Elizabeth Santin³, Derek Detzler¹, Ludovic Lahaye¹, and Andrea Machado Leal Ribeiro², ¹Jefo Nutrition Inc, Porto Alegre, RS, Brazil, ²Federal University of Rio Grande do Sul, Porto Alegre, Brazil, ³Federal University of Paraná, Curitiba, Brazil.
- 442P **True content of digestible amino acids from different sources associated with exogenous enzymes for broilers at 7 days of age.**
Bruno Fortes^{*1}, Marcos Café², José Henrique Stringhini², Júlio César Carvalho³, Jerônimo Brito⁴, and Thony Carvalho⁵, ¹Instituto Federal Goiano, Iporá, Goiás, Brazil, ²Universidade Federal de Goiás, Goiânia, Goiás, Brazil, ³Cargill Animal Nutrition, Campinas, São Paulo, Brazil, ⁴Universidade Federal do Recôncavo Baiano, Cruz das Almas, Bahia, Brazil, ⁵Instituto Federal de Educação, Ciência e Tecnologia Goiano, Ceres, Goiás, Brazil.
- 443P **Content of true digestible amino acids in different protein sources associated with enzyme supplementation for broilers at 21 days of age.**
Bruno Fortes^{*1}, Marcos Café², José Henrique Stringhini², Thony Carvalho³, Camila Meneghetti⁴, and Antonio Junior⁴, ¹Instituto Federal de Educação, Ciência e Tecnologia Goiano, Iporá, Goiás, Brazil, ²Universidade Federal de Goiás, Goiânia, Goiás, Brazil, ³Instituto Federal de Educação, Ciência e Tecnologia Goiano, Ceres, Goiás, Brazil, ⁴Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil.

444P **Effects of dietary protease on productive performance and egg quality in aged laying hens raised under hot climate conditions.**
Gi Ppeum Han*, Tae-Sung Yang, Do Yoon Koo, Ji Eun Shin, Franco Pitargue, and Dong Yong Kil, *Chung-Ang University, Anseong, Gyeonggi-do, Korea.*

445P **Effect of keratinase addition on starter diets containing trypsin inhibitors on the productive performance and intestinal health of broilers.**
Joice Schmidt, Heloisa Fialkowski Bordignon*, Adrieli Braga de Cristo, Alexandra Silva, Jonas Rodrigo Layter, and Jovanir Ines Muller Fernandes, *Federal University of Parana-Brazil, Palotina, Parana, Brazil.*

Metabolism and Nutrition: Feed Additives

446P **Meta-analysis of performance variables of broilers fed diets containing organic acids as alternative to antibiotics.**
Gustavo Polycarpo*¹, Ines Andretta², Marcos Kipper², Julio Dadalt³, Gabriela Ventura¹, Paulo Henrique Rodrigues³, Valquíria Cruz-Polycarpo², and Ricardo de Albuquerque³, ¹*São Paulo State University (Unesp), Dracena, São Paulo, Brazil*, ²*Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*, ³*University of São Paulo (USP), Pirassununga, São Paulo, Brazil.*

447P **Growth performance and nutrient retention in broiler chickens fed corn-soybean meal diets without or with exogenous epidermal growth factor upon challenge with *Eimeria*.**
Emily Kim*, Haley Leung, John Barta, Julang Li, and Elijah Kiarie, *University of Guelph, Guelph, ON, Canada.*

448P **Dietary thymol in quail: Dose-dependent effects on total fatty acid profile of egg yolk during supplementation and after its discontinuation.**
Maria Fernandez, Raul Marin*, Florencia Rodriguez, Jackelyn Kembro, and María Labaque, *Instituto de Investigaciones Biológicas y Tecnológicas (CONICET-UNC); Instituto de Ciencia y Tecnología de los Alimentos, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Córdoba, Argentina.*

449P **Modification of egg yolk fatty acids profile by using dietary linseed oil and grape pomace.**
Sylwia Sobolewska², Janusz Orda², Bogdan Jarosz², Stanislaw Graczyk², Jacek Majda³, Stephen Rose¹, and Vasil Pirgozliev*¹, ¹*Harper Adams University, Newport, United Kingdom*, ²*Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland*, ³*34th Military Hospital, Wroclaw, Poland.*

450P **Effect of selected commercial feed additives on growth performance and blood parameters in broiler exposed to *Salmonella* challenge.**
Alaeldein Abudabos*, *King Saud University, Riyadh, Saudi Arabia.*

- 451P **Productive and economic effects of withdrawing growth-promoting antibiotics on Brazilian broiler production.**
Paula Gabriela Pires*, Kátia M. Cardinal, Marcos Kipper, Ines Andretta, and Andrea Ribeiro, *Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.*
- 452P **Effects of extrusion on the stability of DHA in microalgae.**
Tuoying Ao*, Alex Tsappis, Lizza Macalintal, Anthony Pescatore, Sasha Tozzi, Phyllis Glenney, Michael Ford, and Karl Dawson, *Alltech-University of Kentucky Nutrition Research Alliance, Lexington, KY.*
- 453P **Performance of laying hens fed different levels of shiitake (*Lentinula edodes*) residue.**
Raimundo Ferreira Netto*, Leonardo Zanetti, Guilherme Pasquali, Daniele Souza, Everton Muro, Tatiane Santos, Livia Dornelas, Armando Contin Neto, Julianna Batistioli, Juliana Denadai, and Jose Sartori, *São Paulo State University (UNESP), Botucatu, São Paulo, Brazil.*
- 454P ***Bacillus subtilis* DSM 32315 improves performance of broiler chickens under necrotic enteritis challenge.**
Juliano Cesar De Paula Dorigam*¹, Rose Whelan¹, Kiran Doranalli¹, and Saksit Srirongkote², ¹*Evonik Nutrition & Care GmbH, Hanau, Germany,* ²*Animal Research and Consultant Co. Ltd, Samutprakan, Thailand.*
- 455P **Effects of dietary supplementation of betaine on tight junction-related gene expression in the jejunal mucosa of laying hens raised under hot climate conditions.**
Ji Eun Shin*, Gi Ppeum Han, Franco Pitargue, and Dong Yong Kil, *Chung-Ang University, Anseong, Gyeonggi-do, Korea.*
- 456P **Effects of dietary bee venom on growth performance, meat quality, serum parameters, intestinal morphology and cecal volatile fatty acid concentration in broiler chickens.**
Da-Hye Kim*¹, Sang-Mi Han², Moungh-Cheul Keum¹, Sang Lee¹, Byoung-Ki An¹, and Kyung-Woo Lee¹, ¹*Konkuk University, Seoul, Korea,* ²*Rural Development Administration, Jeonju, Korea.*
- 457P **Prebiotics used in combination can replace performance enhancer antibiotics in broiler diets.**
Everton Muro*¹, Antonio Pezzato¹, Fabiana Luiggi², Jose Sartori¹, Javer Vieira Filho¹, Guilherme Pasquali¹, Tatiane Santos¹, Juliana Denadai¹, Daniele Souza¹, Leonardo Zanetti¹, Raimundo Ferreira Netto¹, and Livia Dornelas¹, ¹*School of Veterinary Medicine and Animal Science, Sao Paulo State University, Botucatu, Brazil,* ²*YES - YesSinergy do Brasil, Campinas, Brazil.*

- 458P **Surface response for broilers fed diets challenged with natural aflatoxins, fumonisins and T-2 toxin.**
Daniel A. Miranda*¹, Maxime Hilbert², Alessandro Belucio¹, Don Giesting³, and Alvaro Dubois¹, ¹*Cargill Animal Nutrition, Campinas, São Paulo, Brazil*, ²*Cargill Animal Nutrition, Paris, France*, ³*Cargill Animal Nutrition, Hopkins, MN.*
- 459P **Efficacy of an anti-mycotoxin additive supplemented in broiler diets contaminated with naturally produced mycotoxin.**
Daniel A. Miranda*¹, Maxime Hilbert², Alessandro Belucio¹, Don Giesting³, and Alvaro Dubois¹, ¹*Cargill Animal Nutrition, Campinas, São Paulo, Brazil*, ²*Cargill Animal Nutrition, Paris, France*, ³*Cargill Animal Nutrition, Hopkins, MN.*
- 460P **Effect of plant extract derived from *Croton lechleri* on performance of broiler chicks at 21 days of age.**
Elias Salvador* and Daniel Chuquispuma, *National University "San Luis Gonzaga" of Ica-Perú, Ica, Peru.*
- 461P **Performance benefits of probiotic and protease in broilers subject to *Eimeria* challenge.**
Fenglan Yan*, Juxing Chen, Vivek Kuttappan, and Mercedes Vazquez-Anon, *Novus International Inc, St. Charles, MO.*
- 462P **Comparative effect of extracts and leaf meal of bitter leaf (*Vernonia amygdalina*) with antibiotics on performance and blood profile of broilers.**
Olufemi Adebisi*¹, Ngozi Anurudu¹, Lukmon Ajani¹, Tolulope Ososanya¹, and Remilekun Oshinowo², ¹*University of Ibadan, Ibadan Nigeria, Ibadan, Oyo, Nigeria*, ²*Federal College of Education, Osielle, Abeokuta, Ogun, Nigeria.*
- 463P **Undefined microbiome cultures of non-*Galliformes* origin increase weight gain in *Gallus gallus*.**
Si Hong Park¹, Fernanda Castro², Irene Jarquin², Dayanara Reyes², and Irene Hanning*², ¹*University of Arkansas, Fayetteville, AR*, ²*Lincoln International Academy, Managua, Managua, Nicaragua.*
- 464P **Yeast cell wall as an alternative to AGP in broilers' diets.**
Roberto Fornazier*², Daniela Rodrigues¹, Valdir Junior³, Luis Albino³, Fernando Tavernari⁴, Diego Silva³, Horacio Rostagno³, Rosana Maia³, Renan Lino³, and Bruna Kreuz³, ¹*Aleris, Jundiai, SP, Brazil*, ²*Santa Catarina State University-UDESC, Chapecó, Santa Catarina, Brazil*, ³*University Federal de Viçosa, Viçosa, Minas Gerais, Brazil*, ⁴*Embrapa Swine and Poultry, Concordia, Brazil.*

- 465P **Effect of supplementation probiotic (Micromix 3B Dry) and organic acid (Selmalex) on growth performances, carcass characteristics and meat quality of broiler chickens as rearing in tropical climates.**
Anon Airlang*, *Faculty of Agriculture, Rajamagala University of Technology Srivijaya, Thungsong, Nakhon Si Thammarat, Thailand.*
- 466P **Evaluation of potential cytotoxic effect of silver carbene complexes in broiler chickens.**
Akhil Alsadwi*¹, Shah Parth³, Carolyn Cannon³, Raghad Abdaljaleel¹, Yansoon Al-Jumaa¹, Denise Caldwell², J. Byrd², and Christopher Bailey¹, ¹*Texas A&M University System, College Station, TX,* ²*USDA, College Station, TX,* ³*Texas A&M Health Science Center, College Station, TX.*
- 467P **Use of essential oils in diet improve the performance of broilers at 21d challenged by *Eimeria* sp.**
Maria Estela Moro², Rafael Nascimento*¹, Livia Maria Soares Queiroz¹, Carlos Alexandre Granghelli², Paulo Henrique Pelissari¹, Luis Vinicius Sanfelice¹, Brunna Garcia de Souza Leite¹, and Lucio Araújo¹, ¹*University of Sao Paulo, Pirassununga, Sao Paulo, Brazil,* ²*University of São Paulo, Cardoso, Brazil.*
- 468P **Thymol feed supplementation and growth performance in a commercial broiler flock.**
Agustin Luna¹, Marcos Tarifa¹, Julio Zygadlo², and Raul Marin*¹, ¹*Instituto de Investigaciones Biológicas y Tecnológicas (CONICET-UNC) and Instituto de Ciencia y Tecnología de los Alimentos, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina,* ²*Instituto Multidisciplinario de Biología Vegetal (CONICET-UNC), Córdoba, Argentina.*
- 469P **Evaluation of the effect of the addition of yeast cell wall and yeast culture in broiler chickens when challenged with *Clostridium perfringens*.**
Yansoon Al-Jumaa*, Hector Leyva-Jimenez, Akhil Alsadwi, Raghad Abdaljaleel, and Christopher Bailey, *Texas A&M University System, College Station, TX.*
- 470P **Effects of acidified drinking water on growth performance, intestinal histomorphology, gastrointestinal pH, digestive enzymes, and intestinal microflora of broilers.**
Humera Hamid*, Huiqin Shi, Qiugang Ma, Gaiyan Ma, Lihong Zhao, Jianyun Zhang, and Cheng Ji, *State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing, China.*
- 471P **Performance characteristics of broiler chickens and French Guinea fowl broilers fed diets supplemented with probiotics *L. reuteri* and *Streptomyces*.**
Samuel Nahashon*, Sarayu Bhogaju, Agnes Kilonzo-Nthenge, Joseph Donkor, Boniface Kimathi, Collins Khwatenge, and Thyniece Taylor, *Tennessee State University, Nashville, TN.*

- 472P **Commercial organic acid complex (Salkil) improves feed utilization in broiler chickens.**
Julia Trautwein*¹, Augustine Owusu-Asiedu², Leon Broom², and Georg Dusel¹,
¹*University of Applied Sciences Bingen, Bingen, Germany*, ²*Anpario PLC, Nottinghamshire, United Kingdom.*
- 473P **Utilization of quorum sensing as ingredients selection tool for a botanical feed additive.**
Tim Goossens¹, Daniel Ramírez¹, and Haitham Yakout*², ¹*Nutriad International NV, Dendermonde, Belgium*, ²*Nutriad Inc, Hampshire, IL.*
- 474P **A precision delivery coated butyrate and a botanical product: Evaluating individual or combined applications on broiler performance.**
Daniel Ramírez¹, Tim Goossens¹, and Haitham Yakout*², ¹*Nutriad International NV, Dendermonde, Belgium*, ²*Nutriad Inc, Hampshire, IL.*
- 475P **Effects of temperature and addition of passion fruit seed oil on health and nutrition for broilers of 1 to 21 days old.**
Leonardo Zanetti*¹, Jose Sartori¹, Juliana Denadai¹, Guilherme Pasquali¹, Everton Muro¹, Tatiane Santos¹, Daniele Souza¹, Livia Dornelas¹, Raimundo Ferreira Netto¹, Armando Contin Neto¹, Julianna Batistoli², and Fernanda Lima³, ¹*São Paulo State University (UNESP), Botucatu, São Paulo, Brazil*, ²*UNIMAR, Marília, São Paulo, Brazil*, ³*UFPR, Palotina, Paraná, Brazil.*
- 476P **Betaine and butyric acid for broiler chicks deprived of water and feed for 48 hours before housing.**
Paola Serpa¹, Jose Sartori*¹, Mônica Aoyagi¹, Guilherme Pasquali¹, Juliana Denadai¹, Everton Muro¹, Maria Sartori², and Denise Sartori³, ¹*São Paulo State University (UNESP), School of Veterinary Medicine and Animal Science, Botucatu, São Paulo, Brazil*, ²*São Paulo State University (UNESP), School of Agriculture, Botucatu, São Paulo, Brazil*, ³*São Paulo State University (UNESP), Institute of Biosciences, Botucatu, São Paulo, Brazil.*
- 477P **Effect of betaine on the biochemical profile of broilers raised in high-density housing.**
Mayara Santana-Eich, Jose Sartori*, Juliana Denadai, Tatiane Santos, Guilherme Pasquali, Leonardo Zanetti, Everton Muro, and Antonio Pezzato, *São Paulo State University (UNESP), School of Veterinary Medicine and Animal Science, Botucatu, São Paulo, Brazil.*
- 478P **Phytogenic additive: Effect on intestinal and caecal diversity microbiome of broilers.**
Adrieli Braga de Cristo, Heloisa Fialkowski Bordignon*, Daianna Rosse Martins Golcalves, Thais Lina Taniguti, Fernanda Lima, and Jovanir Ines Muller Fernandes, *Federal University of Parana-Brazil, Palotina, Parana, Brazil.*

- 479P **Heat stability of carvacrol and trans-cinnamaldehyde during commercial manufacturing temperatures in chicken feed.**
Indu Upadhyaya*², Hsin-Bai Yin³, Jennifer Gidden², Jackson Lay², Annie Donoghue¹, Dan Donoghue², Michael Darre³, and Kumar Venkitanarayanan³,
¹ARS, USDA, Fayetteville, AR, ²University of Arkansas, Fayetteville, AR, ³University of Connecticut, Storrs, CT.
- 480P **Evaluation of the potential for select probiotics to enhance phosphorus bioavailability in broiler chickens.**
Joseph Donkor*, Sarayu Bhogoju, Agnes Kilinzo-Nthenge, Thyniece Taylor, and Samuel Nahashon, *Tennessee State University, Nashville, TN.*

Metabolism and Nutrition: Nutrition

- 481P **Variability of metabolisable energy in different field bean cultivars for broilers.**
Jalil Abdulla*, Stephen Rose, A. Mackenzie, and Vasil Pirgozliev, *Harper Adams University, Newport, United Kingdom.*
- 482P **Methionine supplementation augments n-3 fatty acid and tocopherol content in broiler birds fed flaxseed.**
M. H. Beheshti Moghadam, Ahmed Shehab, and Gita Cherian*, *Oregon State University, Corvallis, OR.*
- 483P **Expression of umami receptors T1R1/T1R3 in different tissues including intestinal segments of broiler chickens.**
Liju Ni*¹, Yiran Liu², Trinh Nguyen², Jie Yin³, Tijun Li³, Min Tang⁴, Joshua Gong⁵, Guanqun Chen⁶, and Chengbo Yang², ¹Shanghai Lab-Animal Research Center, Shanghai, China, ²University of Manitoba, Winnipeg, SK, Canada, ³Institute of Subtropical Agriculture, Chinese Academy of Sciences, Changsha, China, ⁴Columbia University, New York, NY, ⁵Agriculture Agri-Food Canada, Guelph, ON, Canada, ⁶University of Alberta, Edmonton, AB, Canada.
- 484P **Evaluation of the effect of corn particle size on pellet quality using three methodologies.**
Andrea Rubio*, Allan Pinto, Joseph Hess, and Wilmer Pacheco, *Auburn University, Auburn, AL.*
- 485P **Relationships between nutrient composition, fatty acids content and color characteristics of corn grains.**
Ahmet Pekel*¹, Ali Calik², Mustafa Alatas³, Eren Kuter⁴, Ozcan Cengiz⁴, and Guvenc Inan⁵, ¹Faculty of Veterinary Medicine, Istanbul University, Istanbul, Turkey, ²Faculty of Veterinary Medicine, Ankara University, Ankara, Turkey, ³Faculty of Veterinary Medicine, Selcuk University, Konya, Turkey, ⁴Faculty of Veterinary Medicine, Adnan Menderes University, Aydin, Turkey, ⁵Optima Nutritional Products Inc, Kirklareli, Turkey.

- 486P **Impact of dietary supplementation of garlic-derived diallyl disulphide and diallyl trisulphide on broiler chicken growth performance, gut morphology, and cecal microflora.**
Saheed Osho*¹, Nathan Horn², and Olayiwola Adeola¹, ¹*Purdue University, West Lafayette, IN*, ²*Biomatrix International, Princeton, MN*.
- 487P **Evaluation of carbohydrate, lipid and protein as energy sources in diets with low or high energy:protein ratio for European quails housed on moderate or hot environmental temperature.**
Gilnara Araújo Dos Santos², Gabrielle Castro-Pereira², Thiago Melo², Silvana Santos*¹, Natalí da Cruz², and José Vilar Da Silva², ¹*Federal University of Paraíba, Bananeiras, Brazil*, ²*Universidade Federal da Paraíba, Solânea, Brazil*.
- 488P **Performance of broiler chickens fed diets supplemented with 0 or 60 ppm added iron from inorganic ferrous sulfate or organic SQM Fe and Quantum Blue phytase at levels of 0x, 1x, or 3x.**
Michael Sims*¹, Jack Garrett², and Greg Nunnery², ¹*VA Diversified Research, Harrisonburg, VA*, ²*QualiTech Inc, Chaska, MN*.
- 489P **Effect of different nutritional strategies on tibial parameters in laying hens at the end of the production cycle.**
Everton Krabbe*¹, Juliana Forgiarini², Debora Alves², Cristiele Contreira², Suelen da Silva², Valdir Avila¹, and Victor F. Roll², ¹*Brazilian Agricultural Research Corporation-Embrapa Swine and Poultry, Concordia, Santa Catarina, Brazil*, ²*Federal University of Pelotas, Pelotas, Brazil*.
- 490P **Optimum standardized ileal digestible valine to lysine ratio for white commercial layers.**
Gabriel Viana*, Silvana Pastore, Eliane Silva, Warley Alves, Leonardo Barbosa, and Paulo Gomes, *Federal University of Viçosa, Viçosa, Minas Gerais, Brazil*.
- 491P **Effect of dietary supplementation of Actigen on performance of broiler chicks injected with dexamethasone.**
Lizza Macalintal*, Anthony Pescatore, Tuoying Ao, Michael Ford, and Karl Dawson, *Alltech-University of Nutrition Research Alliance, Lexington, KY*.
- 492P **Cassava chips as an alternative feedstuff for broiler chickens: Effect on growth performance and ileal morphology.**
Sudhir Yadav* and Rajesh Jha, *University of Hawaii at Manoa, Honolulu, HI*.
- 493P **Dynamics in hepatic levels of ALA derived from hempseed and flaxseed oils for egg enrichment with omega-3 PUFA.**
Mohamed Neijjat*¹, Miyoung Suh², Peter Eck², and James House², ¹*University of Guelph, Guelph, ON, Canada*, ²*University of Manitoba, Winnipeg, MB, Canada*.

- 494P **Comparison of energy values estimated by direct, and regression methods for broiler chickens.**
Jinyoung Lee*² and Changsu Kong¹, ¹*Kyungpook National University, Sangju, Korea*, ²*Konkuk University, Seoul, Korea*.
- 495P **Fiber utilization in adult broiler breeders fed diets containing soy hulls, oat hulls and flax meal.**
Haley Leung*, Aitor Arrazola, Stephanie Torrey, and Elijah Kiarie, *University of Guelph, Guelph, ON, Canada*.
- 496P **Enzyme supplementation alters hepatic lipid metabolism-related gene expression and phospholipid fatty acid molecular species in broilers fed flax.**
Brian Head, Massimo Bionaz, and Gita Cherian*, *Oregon State University, Corvallis, OR*.
- 497P **Performance of broilers fed with mushroom *Agaricus blazei* and *Pleurotus ostreatus* as an alternative to antibiotics growth promoters.**
Gabrieli de Lima, Bárbara Barbosa, Diego Zied, Gustavo Polycarpo, Victor Amaral, Robert Araujo, Gabriela Ventura, Gabriela Aleixo, Jaqueline Vizú, Bianca Cunha, and Valquíria Cruz-Polycarpo*, *São Paulo State University (Unesp), Dracena, São Paulo, Brazil*.
- 498P **Efficacy of an algo-clay complex on decreasing mycotoxins liver toxicity on broiler.**
Maria Rodriguez*, *Olmix, Brehan, Morbihan, France*.
- 499P **The effects of feeding a bacterial probiotic and a yeast combination (live yeast plus yeast cell wall) probiotic on performance and intestinal immunometabolic phenotype in a commercial turkey operation.**
Mike Kogut*¹, Bruce Lindquist³, Jimmie Corley⁴, and Ryan Arsenault², ¹*USDA-ARS, College Station, TX*, ²*University of Delaware, Newark, DE*, ³*Phileo Lesaffre Animal Health, Humboldt, IA*, ⁴*Phileo Lesaffre Animal Health, Iola, TX*.
- 500P **Role of selenium enriched yeast on low pathogenic avian influenza virus (H9N2) shedding in chickens.**
Bahram Shojadoost², A. E. Ted Sefton*¹, Alexander Bekele-Yitbarek², Neda Barjesteh², Adrianna Laursen², Tamiru Alkie², Wanderly Quinteiro-Filho², Kayla Price¹, Trevor Smith³, and Shayan Sharif², ¹*Alltech, Guelph, ON, Canada*, ²*Ontario Veterinary College, Guelph, ON, Canada*, ³*Ontario Agricultural College, Guelph, ON, Canada*.
- 501P **The effect of mannan-rich yeast cell wall based dietary supplements on the intestinal digestive enzyme capacity of broilers.**
Conor McCaffrey*¹, Aoife Corrigan², and Paul Moynagh¹, ¹*Maynooth University, Maynooth, Kildare, Ireland*, ²*Alltech Ireland, Dunboyne, Meath, Ireland*.

- 502P **Effect of probiotic, prebiotic, organic acid, antibiotic and tragacanth gum on bacterial colonization of *Clostridium perfringens* type A.**
 Mohammadreza Soleymani¹, Shaban Rahimi^{*1}, and Ahmadreza Jabari²,
¹Tarbiat Modares University, Tehran, Iran, ²Razi Vaccine and Serum Production
 Research Institute, Karaj, Iran.
- 503P **Performance of broilers fed on the concept of precision nutrition.**
 Natalia Utimi¹, Brunna Garcia de Souza Leite^{*1}, Carlos Alexandre Granghelli²,
 Paulo Henrique Pelissari¹, Rafael Nascimento¹, Ana Santos de Oliveira¹, Lucio
 Araújo¹, and Cristiane Araujo¹, ¹University of Sao Paulo, Pirassununga, Sao
 Paulo, Brazil, ²University of São Paulo, Cardoso, Brazil.
- 504P **Energy levels for layer hens submitted to different beak trimming management.**
 Carlos Alexandre Granghelli^{*2}, Karoline Lelis¹, Paulo Henrique Pelissari¹,
 Brunna Garcia de Souza Leite¹, Rafael Nascimento¹, Júlio de Carvalho Balieiro¹,
 Lucio Araújo¹, and Cristiane Araujo¹, ¹University of São Paulo, Pirassununga,
 São Paulo, Brazil, ²University of São Paulo, Cardoso, Brazil.
- 505P **Performance and egg quality of laying hens fed with *Moringa oleifera*.**
 Rogerio Silva Junior¹, Carlos Rabello^{*1}, Claudia Lopes², Guilherme
 Nascimento¹, Waleska Medeiros¹, Helena Manso¹, Almir Silva¹, Jaqueline
 Silva¹, and Fedner Cadeau¹, ¹Universidade Federal Rural de Pernambuco,
 Recife, Brazil, ²Universidade Federal de Sergipe, São Cristóvão, Brazil.
- 506P **Determination of metabolizable energy value of corn gluten meal in adult leghorn roosters by regression method.**
 Hossein Janmohammadi^{*}, University of Tabriz, Tabriz, East Azarbijan, Iran.
- 507P **The effects of conditioning temperature and particle size of grain sorghum on the performance of male broiler chicks during the starter phase.**
 Daniel Seitz^{*}, Christopher Delfelder, Ashton Yoder, Cassandra Jones, and
 Richard Beyer, Kansas State University, Manhattan, KS.
- 508P **Influences on growth performance, energy digestibility, and ileal volatile fatty acid profile associated with multiple corn sources in male broilers.**
 Mallori Williams^{*1}, Kyle Brown¹, Gemma González-Ortiz², and Jason Lee¹,
¹Texas A&M University, College Station, TX, ²AB Vista, Marlborough, United
 Kingdom.
- 509P **Macadamia nut cake as an alternative feedstuff for broiler chickens: effect on growth performance and gut microbiota profile.**
 Sudhir Yadav^{*1}, Kabi Neupane², and Rajesh Jha¹, ¹University of Hawaii at
 Manoa, Honolulu, HI, ²University of Hawaii, Pearl City, HI.

- 510P **Estimation of true phosphorus digestibility of soybean meal is affected by Ca level in broilers.**
Colwayne Morris*², Roger Davin¹, Fenglan Yan¹, Megharaja Manangi¹, David Ledoux², and Mercedes Vazquez¹, ¹*Novus International Inc, Saint Charles, MO*, ²*University of Missouri, Columbia, MO*.
- 511P **The effect of LED light color and feed type on the performance of male broiler chicks to 21 days.**
Kayla McGurk, Christopher Delfelder*, Daniel Seitz, and Richard Beyer, *Kansas State University, Manhattan, KS*.
- 512P **Effect of allicin on tibia and tendon breaking strength of broiler chickens.**
Jaime León Landeros*³, José Orzuna-Orzuna³, Arturo Pro-Martínez¹, Raúl Argüello-García², Eliseo Sosa-Montes³, Artemio Vargas-Galicia¹, Leodan Rodríguez-Ortega¹, María Rangel-Zepeda³, and Fernando González-Cerón³, ¹*Colegio de Post-graduados, Campus Montecillo, Montecillo, Mexico, Mexico*, ²*Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, México, Mexico*, ³*Universidad Autónoma Chapingo, Chapingo, Mexico, Mexico*.

Metabolism and Nutrition: Vitamins and Minerals

- 513P **Evaluation of chromium propionate on broiler growth performance and processing yields.**
Thomas Lester*¹, Kyle Brown¹, Christopher Eagleson¹, Vanessa Iseri², and Jason Lee¹, ¹*Texas A&M University, College Station, TX*, ²*Kemin Industries Inc, Des Moines, IA*.
- 514P **Effects of broiler breeder dietary zinc source on the tibia characteristics and performance of broiler chick offspring.**
Marquisha Paul*, Anthony Pescatore, Tuoying Ao, Michael Ford, and Karl Dawson, *Alltech-University of Kentucky Nutrition Research Alliance, Lexington, KY*.
- 515P **Selenium sources for broiler breeders.**
Priscila Zorzetto*¹, Márcio Ceccantini², Adriana Toscan², Guilherme Gonçalves², Fabricia Roque¹, and Cristiane Araujo¹, ¹*University of Sao Paulo, Pirassununga, Brazil*, ²*Adisseo Brazil, Sao Paulo, Brazil*.
- 516P **High-pressure liquid chromatography analysis of choline in organic feedstuffs.**
Darlene Bloxham*¹, Mary Formo¹, Rebekah Scott¹, Ricardo Nunes², and Gene Pesti¹, ¹*University of Georgia, Athens, GA*, ²*Universidade Estadual do Oeste do Parana, Marechal Candido Rondon, PR, Brazil*.
- 517P **Effects of *in ovo* administration of l-ascorbic acid on broiler hatchability.**
Haijun Zhang*, Katie Elaine Collins, Oluwaseun Durojaye, Seyed Abolghasem Fatemi, and E. Peebles, *Mississippi State University, Mississippi State, MS*.

- 518P **Evaluation of egg production and egg quality factors when supplementing with Mintrex P on post prime aged egg layers.**
Gregory Archer*¹ and Pat Welch², ¹Texas A&M University, College Station, TX, ²Novus International, Saint Charles, MO.
- 519P **Effect of dietary levels of phosphorus on the growth performance of Jinghong laying hens of brood time.**
Boying Dong*, Qiugang Ma, Zhiyu Hu, Lihong Zhao, Cheng Ji, and Jianyun Zhang, *China Agricultural University, Beijing, China.*
- 520P **Non-phytate phosphorus requirement of broilers fed a practical diet with phytase supplementation.**
Kaixin Zhang*, Huan Liu, Keying Zhang, Xuemei Ding, Shiping Bai, Jianping Wang, and Qiufeng Zeng, *Animal Nutrition Institute, Chengdu, Sichuan, China.*
- 521P **Effect of chelated copper on growth performance and woody breast in broilers.**
Juxing Chen*, Fenglan Yan, Vivek Kuttappan, and Mercedes Vazquez, *Novus International Inc, St. Charles, MO.*
- 522P **Plateau models for estimating the optimal zinc level in the diet of broiler chickens from 1 to 21 days of age.**
Maria Marcia Sartori*¹, Juliana Cristina Rezende², Jose Sartori², and Antonio Pezzato², ¹Sao Paulo State University, College of Agricultural Science, Botucatu, Sao Paulo, Brazil, ²Sao Paulo State University, College of Veterinary Medicine and Animal Sciences, Botucatu, Sao Paulo, Brazil.
- 523P **Sources and granulometries of the limestone in the initial and growth diets of broilers.**
Silvana Santos*¹, Aliton Silva¹, Joao Pedro Silva¹, Lucas de Albuquerque¹, Leandro de Araujo², and Jose Vilar Da Silva³, ¹Federal University of Paraiba, Areia, Brazil, ²Estadual University of Paraiba, Campina Grande, Brazil, ³Federal University of Paraiba, Bananeiras, Brazil.
- 524P **Footpad tissue integrity of broiler chickens fed with different trace minerals sources and levels.**
Jorge Muniz¹, Leticia Bittencourt*², Rita Donzele¹, Juarez Donzele¹, Amanda Silva¹, Tarcisio Tizziani¹, Rodrigo Jacob¹, and Mariane Marques¹, ¹Universidade Federal de Viosa, UFV, Viosa, Brazil, ²DSM, Nutritional Products Brazil, Sao Paulo, Brazil.
- 525P **Effect of zinc oxide sources and doses on broilers under heat stress.**
Agathe Romeo¹, Mojtaba Zaghari², Hossein Mehrvarz², Mohammad Riahi², Denise Cardoso*¹, and Stephane Durosoy¹, ¹ANIMINE, Sillingy, France, ²University of Tehran, Karaj, Iran.

- 526P **Decreasing water-soluble phosphorus excreted via micro-encapsulation of iron sulfate and alum added in the diet of broilers.**
Piterson Floradin, Frédéric Guay, and Marie-Pierre Montminy*, *Laval University, Quebec, QC, Canada.*
- 527P **Dietary supplementation of water-soluble vitamins for white commercial layers from 28 to 44 weeks of age.**
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- 528P **The limestone origin alters the availability and the calcium requirement for broilers.**
Lucas de Albuquerque², Silvana Santos*¹, Aliton Silva², Flávio Soares De Lima¹, Thiago Melo², and José Vilar Da Silva², ¹*Federal University of Paraíba, Bananeiras, Brazil,* ²*Universidade Federal da Paraíba, Solânea, Brazil.*

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- 529P **The effect of antibiotic, probiotic, and prebiotic (Diamond Original XPC) in reducing colonization of *Campylobacter jejuni* in intestine of broilers.**
Nazanin Soltani², Shaban Rahimi*², and Pejvac Khaki¹, ¹*Razi Vaccine and Serum Production Research Institute, Karaj, Alborz, Iran,* ²*Tarbiat Modares University, Tehran, Tehran, Iran.*
- 530P **Isolation of *Salmonella* from carcasses in a commercial quail processing plant over a six-month period.**
Nelson Cox², Douglas Cosby², Harshavardha Thippareddi¹, Casey Ritz¹, Mark Berrang², Jerome Jackson¹, Susan Mize², Sanjay Kumar¹, Amanda Howard¹, Angela Rincon¹, Mayuri Ukidwe¹, Melissa Landrum*¹, Johnathan Frye², Jodie Plumblee², Lari Hiott², ¹*University of Georgia, Crawford, GA,* ²*The U.S. National Research Center, Athens, GA.*
- 531P **Effect of supplementation of *trans*-cinnamaldehyde with or without oxytetracycline on multidrug-resistant *Salmonella* Heidelberg in turkey poults.**
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- 532P **Antimicrobial wash with *trans*-cinnamaldehyde nanoemulsion reduces *Campylobacter jejuni* on chicken skin.**
Abhinav Upadhyay*¹, Basanta Raj Wagle¹, Sandip Shrestha¹, Indu Upadhyaya¹, Komala Arsi¹, Kanika Bhargava², Annie Donoghue³, and Dan Donoghue¹, ¹*University of Arkansas, Fayetteville, AR,* ²*University of Central Oklahoma, Edmond, OK,* ³*USDA-ARS, Fayetteville, AR.*

- 533P **Poultry serovar *Salmonella* biofilm formation at the air-liquid interface in media of differing compositions and environmental incubation conditions.**
Zhaohao Shi, Peter Rubinelli, and Steve Ricke*, *University of Arkansas, Fayetteville, AR.*
- 534P **Effect of pressure and rotation speed of tumbling on shelf-life of chicken breast in vacuum tumbling.**
Reza Jahani, Zohreh Hamidi Esfahani*, Hassan Ahmadi, and Shaban Rahimi, *Tarbiat Modares University, Tehran, Iran.*
- 535P **Inhibitory effect of two indigenous *Bacillus* strains on growth of some plant pathogenic fungi and mycotoxins reduction.**
Fatemeh Siahmoshteh¹, Zohreh Hamidi Esfahani*¹, Mohammad Razzaghi-Abyaneh², and Shaban Rahimi¹, ¹*Tarbiat Modares University, Tehran, Iran,* ²*Department of Mycology, Pasteur Institute of Iran, Tehran, Iran.*
- 536P **A combined 16S microbiome and culture-based analysis of foodborne pathogens throughout the entire lifecycle of a single pastured-raised broiler flock.**
Michael Rothrock*¹, Aude Locatelli¹, Kelli Hiatt¹, and Andrew Caudill², ¹*USDA-ARS, Athens, GA,* ²*University of Georgia, Athens, GA.*
- 537P **Plant-derived antimicrobial eugenol modulates *C. jejuni* proteome and virulence critical for colonization in chickens.**
Indu Upadhyaya*¹, Abhinav Upadhyay¹, Komala Arsi¹, Rohana Liyanage¹, Annie Donoghue², Narayan Rath², and Dan Donoghue¹, ¹*University of Arkansas, Fayetteville, AR,* ²*USDA, Fayetteville, AR.*
- 538P **Eggshell cuticle plug protection against invading pathogens in table eggs.**
Garima Kulshreshtha*¹, Alejandro Rodriguez-Navarro², Estefania Sanchez-Rodriguez², and Maxwell Hincke¹, ¹*University of Ottawa, Ottawa, ON, Canada,* ²*Universidad de Granada, Granada, Spain.*
- 539P **Characterization of mixed bacterial populations in chicken ceca recovered from colonies on *Campylobacter* selective commercial media using 16S rRNA next generation sequencing.**
Sunae Kim², Si Hong Park², Amanda Wolfenden², Billy Hargis², Hilary Pavlidis¹, Don McIntyre³, and Steve Ricke*², ¹*Diamond V, Virginia Beach, VA,* ²*University of Arkansas, Fayetteville, AR,* ³*Diamond V, Cedar Rapids, IA.*
- 540P **Bacterial populations relative to ammonia-capture systems in poultry research housing.**
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- 541P **Assessing tissue colonization and egg contamination by *Salmonella* Oranienburg in laying hens.**
Uma Babu¹, Monika Proszkowiec-Weglarz², and Kannan Balan*¹, ¹*FDA, Laurel, MD*, ²*USDA, Beltsville, MD*.
- 542P **Does differential growth affect the distribution and recovery of *Listeria* spp. in pasture-raised broiler farm soils?**
Aude Locatelli* and Michael Rothrock, *USDA-ARS, Athens, GA*.
- 543P **Survival of *Campylobacter* in the albumen, yolk and membrane of fertile broiler breeder eggs.**
Ashley Owen*¹, Nelson Cox², Douglas Cosby², Mark Berrang², Charles Hofacre¹, Susan Mize², Jerome Jackson², Melissa Landrum¹, and Jeanna Wilson¹, ¹*University of Georgia, Athens, GA*, ²*The U.S. National Poultry Research Center, Athens, GA*.
- 544P **Development of in vitro models of competitive exclusion of pathogens by probiotic *Lactobacillus* in poultry.**
Maryanne Nash* and Tri Duong, *Texas A&M, College Station, TX*.
- 545P **Validation of commercial antimicrobials against unstressed and cold-stressed *Campylobacter jejuni* cells on broiler carcasses and wings processed at a small USDA-inspected slaughter facility.**
Lacey Lemonakis*, KaWang Li, and Cangliang Shen, *West Virginia University, Morgantown, WV*.
- 546P **Proteomic analysis of *Campylobacter* interaction with amoeba host.**
Deepti Samarth*¹, Young Min Kwon¹, Rohana Liyanage^{2,3}, and Jackson Lay^{2,3}, ¹*Department of Poultry Science, University of Arkansas, Fayetteville, AR*, ²*Department of Chemistry, University of Arkansas, Fayetteville, AR*, ³*Statewide Spectrometry Facility, Fayetteville, AR*.
- 547P **Effect of multi-strain *Bacillus* probiotic on the ileal and cecal microbiota of broiler chickens.**
Bradley Schrader*, Elle Chadwick, Laci MacKay, James Krehling, and Ken Macklin, *Auburn University, Auburn, AL*.

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- 548P **Short-term fasting alters Dicer 1 expression in chicken hypothalamus and neuroblastoma cells.**
Phuong Nguyen*¹, Elizabeth Greene¹, Gurueswar Nagarajan¹, Peter Ishola¹, F. Dustan Clark¹, Annie Donoghue², and Sami Dridi¹, ¹*University of Arkansas, Fayetteville, AR*, ²*USDA, Agricultural Research Service, Poultry Production and Product Safety Research Unit, Fayetteville, AR*.

549P **Changes of serotonin and dopamine neurotransmission in the raphe nuclei and hypothalamus during chicken embryonic development.**
Xiaohong Huang*² and Heng-Wei Cheng¹, ¹USDA-ARS, West Lafayette, IN, ²Purdue University, West Lafayette, IN.

550P **Identification and localization of stem cells expressing Olfm4 and Lgr5 mRNA in the yolk sac and small intestine.**
Haihan Zhang* and Eric Wong, *Virginia Tech, Blacksburg, VA.*

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551P **Differential abundance of mitochondrial genome produced small RNAs (mitosRNA) in breast muscles of modern broiler compared to unselected chicken breed.**
Byung-Whi Kong*¹, Bhuwan Khatri¹, Dongwon Seo¹, Stephanie Shouse¹, Nicholas Hudson², Casey Owens¹, Nicholas Anthony¹, and Walter Bottje¹, ¹University of Arkansas, Fayetteville, AR, ²The University of Queensland, Brisbane, Queensland, Australia.

552P **MicroRNA profiling associated with muscle growth in modern broiler compared to unselected chicken breed.**
Bhuwan Khatri*¹, Dongwon Seo¹, Stephanie Shouse¹, Nicholas Hudson², Walter Bottje¹, and Byung-Whi Kong¹, ¹University of Arkansas, Fayetteville, AR, ²The University of Queensland, Brisbane, Queensland, Australia.

553P **Enzymatic profile of broilers affected with white striping and wooden breast myopathies.**
Fernanda Prado, Tamara Ferreira, Silvana Caldas, Vladimir Nascimento, Stella Valle, Nilson Junior, Sergio Vieira, and Liris Kindlein*, *UFRRGS, Porto Alegre, Rio Grande do Sul, Brazil.*

554P **Cloning and transfection of human follicle stimulating hormone gene via rooster sperm.**
Shaban Rahimi*¹, Sahar Bazgir¹, Abdolhossein Shahverdi², and Mohsen Sharafi¹, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran.

555P **Cryopreservation of dispersed avian gonadal cells from adults and embryos chickens: A model for exotic avian species germplasm rescue.**
Sara Jabalameli*², Patricia Byrne¹, and Thomas Jensen¹, ¹San Diego Zoo Institute for Conservation Research, Escondido, CA, ²California State University San Marcos, Escondido, CA.

556P **Sterilization of host chicken embryos by partial exsanguination in preparation for xeno-transfer.**
Patricia Byrne*¹, Sara Jabalameli², and Thomas Jensen¹, ¹San Diego Zoo Institute for Conservation Research, Escondido, CA, ²California State University San Marcos, San Marcos, CA.

- 557P **Basophilia, basophiliosis, and toroids—Observations on atypia in duck blood.**
Paul Cotter*, *Cotter Laboratory, Arlington, MA.*
- 558P **Changes in intestinal length and jejunal integrity between broiler and layer chickens.**
Sara Orłowski, Nicholas Anthony, Samuel Rochell, and Dawn Koltes*,
University of Arkansas, Fayetteville, AR.
- 559P **Effect of chromium oxide on egg quality parameters in White Leghorns.**
Prafulla Regmi*², Joseph Leszcz¹, Cara Robison¹, Deana Jones³, and Darrin Karcher², ¹*Michigan State University, East Lansing, MI*, ²*Purdue University, West Lafayette, IN*, ³*USDA ARS, Athens, GA.*
- 560P **Impact of in vitro inoculation and dietary supplementation with *Bacillus subtilis* on sperm quality of aged White Leghorn roosters.**
Midian Nascimento dos Santos*, Reshma Ramachandran, Kelley Wamsley, Aaron Kiess, and Christopher McDaniel, *Mississippi State University, Starkville, MS.*
- 561P **Relationships among sperm-egg penetration, fertility and egg components of Chinese painted quail hens (*Coturnix chinensis*).**
Reshma Ramachandran*, Midian Nascimento dos Santos, and Christopher McDaniel, *Mississippi State University, Starkville, MS.*
- 562P **Chicken enterocyte culture to screen chemicals affecting poultry intestinal integrity.**
Anamika Gupta*¹ and Narayan Rath², ¹*University of Arkansas, Fayetteville, AR*, ²*Poultry Production and Product Safety Research Unit, Fayetteville, AR.*

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- 563P **Evaluation of storage quality parameters of eggs produced by Hy-line Brown hens fed soybean and soybean-free diets using a caged or cage-free rearing systems.**
Hector Leyva-Jimenez*¹, Morouj Al-Ajeeli¹, Raghad Abdaljeleel¹, Yasser Jameel², Mohammed Hashim¹, and Christopher Bailey¹, ¹*Texas A&M University System, College Station, TX*, ²*University of Kerbala, Karbala, Iraq.*
- 564P ***Campylobacter* prevalence on commercially processed quail carcasses as determined by rinse sampling and whole carcass enrichment.**
Douglas Cosby*¹, Nelson Cox¹, Harshavardha Thippareddi³, Casey Ritz³, Mark Berrang¹, Jeromey Jackson³, Susan Mize¹, Sanjay Kumar³, Amanda Howard³, Angela Rincon³, Mayuri Ukidwe³, Melissa Landrum², Johnathan Frye¹, Jodie Plumblee¹, and Lari Hiott¹, ¹*US Dept of Agriculture, Athens, GA*, ²*University of Georgia, Crawford, GA*, ³*University of Georgia, Athens, GA.*

- 565P **Storage of feed enriched with ω -3 fatty acids and grape pomace and the change in its fatty acid profile.**
Sylvia Sobolewska², Janusz Orda², Bogdan Jarosz², Jacek Majda³, Malgorzata Serowik², Stephen Rose¹, and Vasil Pirgozliev*¹, ¹*Harper Adams University, Newport, United Kingdom*, ²*Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland*, ³*4th Military Hospital, Wroclaw, Poland*.
- 566P **Effect of fillet region on meat quality of raw and cooked broiler meat with woody breast characteristics.**
Xiao Sun¹, Barbara Mallmann², Dawn Koltjes², Karen Christensen², and Casey Owens*², ¹*Nanjing Agricultural University, Nanjing, Jiangsu, China*, ²*University of Arkansas, Fayetteville, AR*.
- 567P **Impacts of phytogetic plant supplementations on meat quality in broilers chickens.**
Joshua Flees*¹, Sara Orlowski¹, Elizabeth Greene¹, Alissa Piekarski¹, Walter Bottje¹, Shivi Maini², Casey Owens¹, Michael Kidd¹, Nicholas Anthony¹, and Sami Dridi¹, ¹*University of Arkansas, Fayetteville, AR*, ²*Ayurvet Ltd, Baddi, India*.
- 568P **Economic impact related to the condemnation of post-mortem poultry in southern Brazil.**
Carolina Franceschi*, Morgana Zortea, Andrea Pinto, and Luana Freitas, *Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*.
- 569P **Physicochemical and functional properties of egg white powder prepared from shell eggs irradiated at low doses.**
Mahalet Nega*¹, Byungrok Min¹, Sun Hee Moon², and Dong Ahn³, ¹*University of Maryland Eastern Shore, Princess Anne, MD*, ²*University of Arkansas for Medical Science, Little Rock, AR*, ³*Iowa State University, Ames, IA*.
- 570P **Whole carcass rinse versus whole carcass enrichment for determining *Salmonella* presence on commercially processed quail.**
Douglas Cosby*¹, Nelson Cox¹, Harshavardhan Thippareddi², Casey Ritz², Mark Berrang¹, Jeromey Jackson², Susan Mize¹, Sanjay Kumar², Amanda Howard², Angela Rincon², Mayuri Ukidwe², Melissa Landrum², Johnathan Frye¹, Jodie Plumblee¹, and Lari Hiott¹, ¹*US Department of Agriculture, USNPRC, Athens, GA*, ²*University of Georgia, Athens, GA*.
- 571P **Effects of supplemental dietary glutamine and arginine on broiler live performance, blood chemistry, and incidence of white striping and wooden breast.**
Carol Wu*, Grayson Walker, Matthew Livingston, Matthew Warren, Joaquin Cabanas, and Kimberly Livingston, *North Carolina State University, Raleigh, NC*.

- 572P **Novel deboning method of chilled broiler carcasses (prior to evisceration) and its effect on meat quality.**
Harshavardhan Thippareddi*³, Angela Rincon³, Brian Bowker², Hong Zhuang¹, and R. Jeff Buhr², ¹*U.S. National Poultry Research Center, Athens, GA*, ²*USDA-ARS, Athens, GA*, ³*University of Georgia, Athens, GA*.
- 573P **Effect of natural pigments on color and sensory evaluation of chicken patties.**
Olubunmi Olusola*, Doyin Adeleye, Ayobami Oyesanwen, and Olusegun Oshibanjo, *University of Ibadan, Ibadan, Oyo, Nigeria*.
- 574P **Evaluation of the quality in conventional eggs stored in different temperatures.**
Carolina Franceschi*¹, Morgana Zortea¹, Aline Santos de Mello¹, Tainá Dalpiaz¹, Gustavo Perdoncini², and Andrea Pinto¹, ¹*Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*, ²*Naturovos, Porto Alegre, Rio Grande do Sul, Brazil*.
- 575P **Detection of *Campylobacter* on quail carcasses sampled on nine separate visits to a commercial processing plant.**
Nelson Cox¹, Douglas Cosby*¹, Harshavardha Thippareddi³, Casey Ritz³, Mark Berrang¹, Jerome Jackson³, Susan Mize¹, Sanjay Kumar³, Amanda Howard³, Angela Rincon³, Mayuri Ukidwe³, Melissa Landrum², Johnathan Frye¹, Jodie Plumblee¹, and Lari Hiott¹, ¹*US Department of Agriculture, Athens, GA*, ²*University of Georgia, Crawford, GA*, ³*University of Georgia, Athens, GA*.
- 576P **Effects of probiotic feeding level on meat quality of breast muscle from broilers exposed to cyclic heat stress.**
Hyun-Wook Kim¹, Traci Cramer¹, Osamudiamen Ogbeifun¹, Feifei Yan¹, Heng-Wei Cheng², and Yuan Kim*¹, ¹*Purdue University, West Lafayette, IN*, ²*USDA, West Lafayette, IN*.
- 577P **Sensory evaluation and cooking yields of chicken meat from Heritage breeds or broilers reared on pasture or in floor pens.**
Anthony Pescatore*, McKenzie Bear, Gregg Rentfrow, Jacqueline Jacob, Tatijana Fisher, Marquisha Paul, and Michael Ford, *University of Kentucky, Lexington, KY*.

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C. D. Knight, Vice-Chair (2019)
J. B. Carey, Recording Secretary (2017)
J. E. Fulton (2018)
J. Moye (2018)
F. E. Robinson (2019)
A. J. Pescatore (2021), *USA Branch of the WPSA*
E. E. M. Pierson (2020), *Past President*
P. Settar (2021), *USA Branch of the WPSA*
M. M. Beck (*honorary*)
J. H. Denton (*ex officio*)
R. D. Mitchell (*ex officio*), *PSA President*
S. E. Koenig, *Treasurer, Board Liaison*

Hy-Line International Research Award/

***PSA Early Achievement Award for Research (even years)**

K. C. Mountzouris, Chair (2017)
L. R. Bielke (2018)
R. N. Dilger (2018)
T. Duong (2018)
J. D. Starkey (2018)
J. L. Snow (2019)
P. Settar, Hy-Line Representative
E. D. Peebles, Board Liaison

Industry Committee for Poultry Science

***PSA Honorary Members**

***USPOULTRY Distinguished Poultry Industry Career Award**

***PSA Early Achievement Award for Industry (odd years)**

H. M. Hellwig, Committee Chair (2017)
C. A. Coto, PSA Early Achievement Award Chair (2018)
W. A. Dozier III, Symposium Chair (2019)
M. R. Bedford (2017)
L. Mejia (2017)
A. M. Penz, Jr. (2017)
K. D. Roberson (2017)
P. A. Smith (2017)

K. A. Turner (2017)
K. Bregendahl (2018)
J. V. Felts (2018)
B. Hudson (2019)
R. Loar II (2019)
J. E. Starkey, USPOULTRY Representative
M. R. Bedford, Board Liaison

Journal Planning Committee

S. C. Ricke, Chair (2019)
J. B. Carey, (2019)
M. E. Cook (2019)
T. E. Porter, (2019)
R. L. Taylor, Jr. (2019)
A. Petrylak, *ex officio*
S. E. Koenig
R. D. Mitchell, Board Liaison

Long-Range Planning Committee

R. D. Mitchell, Chair (2017)
M. R. Bedford (2017)
D. J. Caldwell (2017)
V. L. Carney (2017)
M. E. Cook (2017)
G. L. Engelke (2017)
T. A. Lavergne (2017)
M. E. Persia (2017)
E. Santin (2017)
V. L. Carney, Board Liaison

Membership Committee

A. J. Calvert, Chair (2019)
A. Aburto (2019)
A. J. Calvert (2019)
E. N. Fischer (2019)
T. Fisher (2019)
M. P. Lacy (2019)
B. Lumpkins (2019)
A. M. Penz, Jr. (2019)
I. Upadhyaya (2019)
V. L. Carney, Board Liaison

National Chicken Council Broiler Research Award

M. J. Darre, Chair (2017)
M. I. Hannas (2017)
P. J. Rigolin (2017)
R. Loar, II (2018)
E. O. Oviedo (2018)
C. M. Owens (2019)

A. B. Peterson, National Chicken Council Representative
M. E. Persia, Board Liaison

**National Turkey Federation Research Award (even years)/
Maple Leaf Farms Duck Research Award (odd years)**

G. S. Fraley, Chair (2018)
M. S. Lilburn (2017)
M. Rodehutschord (2017)
K. Zhang (2017)
C. Rude (2018)
S. L. Vieira (2018)
L. Picard, NTF Representative
Z. S. Tucker, Maple Leaf Farms Representative
E. D. Peebles, Board Liaison

Nominating Committee

D. J. Caldwell, Chair (2020), Past President
M. T. Kidd (2017), Past President
M. O. Smith (2018), Past President
T. J. Applegate (2019), Past President
M. B. Farnell (2017), Elected
J. L. Grimes (2018), Elected
E. N. Fischer (2019), Elected

Planning Committee for Annual Meeting

D. R. Jones, Chair (2017)
M. Singh (2018)
B. D. Fairchild (2019)
T. A. Lavergne (*ex officio*)
R. D. Mitchell, (*ex officio*), Board Liaison
Program Committee (2017 Annual Meeting)
D. R. Jones, General Program Chair (2017)
M. Singh, General Program Chair-Elect (2018)
B. D. Fairchild, General Program Chair-Elect (2019)
M. Erasmus, Animal Well-Being and Behavior
W. J. Pacheco, Extension and Instruction
P. Settar, Genetics and Genomics
L. R. Bielke, Immunology, Health and Disease
R. A. Blatchford, Management and Production
J. Fowler (Chair), W. K. Kim, S. J. Rochell, and C. W. Starkey, Metabolism and Nutrition
A. Kollanoor-Johny, Microbiology and Food Safety
J. D. Starkey, Molecular and Cellular Biology
D. Karcher, Physiology and Reproduction
D. Bourassa, Processing and Products
R. Angel and M. Sifri, Informal Nutrition Symposium
G. P. Martin, National Extension Workshop
C. M. Ashwell and K. Schwean-Lardner, WPSA Lectureship
R. D. Mitchell (*ex officio*), PSA President
V. L. Carney, Board Liaison

PSA Hatchery Advisory Committee

J. Tyus, Chair (2017)
G. M. Nagel (2018)
I. Upadhyaya (2019)
T. J. Broderick (2018), Student Director
T. Fisher (2017), Student Director, Board Liaison

Resolutions Committee

A. P. McElroy, Chair (2018)
M. E. Cook, Board Liaison

Strategic Plan Progress Committee

R. D. Mitchell, Chair (2017)
V. L. Carney, PSA Second Vice President (2017)
G. L. Engelke, Director (2017)
M. E. Persia, Director (2017)
T. Fisher, Student Director (2017)
S. E. Koenig, Board Liaison

Teaching Committee

***Novus International Teaching Award**

***PSA Early Achievement Award for Teaching**

R. B. Beckstead, Chair (2018)
C. Z. Alvarado (2018)
W. D. Berry, Jr. (2018)
Y. O. Fasina (2019)
E. Kiarie (2019)
C. D. Knight, Novus International Representative
G. L. Engelke, Board Liaison

Tyson Foods Inc. Support Personnel Award

M. J. Zuidhof, Chair (2017)
C. W. Utterback (2017)
J. T. Lee (2018)
M. H. Schwartz (2019)
P. A. Smith, Tyson Representative
E. Santin, Board Liaison

Zoetis Fundamental Science Award

M. Choct, Chair (2017)
S. J. Lamont (2017)
A. L. Johnson (2018)
C. Walk (2018)
R. Walzem (2018)
L. R. Berghman (2019)
E. Santin, Board Liaison

Poultry Science Representatives

Association for the Assessment and Accreditation of Laboratory Animal Care,
International

K. E. Anderson (12/2017)

American Association for the Advancement of Science

M. A. Ottinger (02/2018)

American Feed Industry Association

W. A. Dozier, III (07/2018)

American Institute of Biological Sciences

C. R. Angel (02/2018)

American Poultry Historical Society and Literature Preservation

L. C. Arrington

American Registry of Professional Animal Scientists

G. P. Martin

Board of Agriculture (National Research Council)

F. A. Bradley

Coalition for Sustainable Egg Supply

K. W. Koelkebeck

Coalition on Funding Agricultural Research Missions

W. W. Saylor

Council for Agricultural Science and Technology

R. M. Hulet (11/2018)

Institute of Food Technologists

P. A. Curtis

James E. Rice Memorial Library

R. E. Austic

Professional Animal Auditor Certification Organization

K. E. Anderson

K. D. Christenson

Southern Poultry Science Society

M. M. Beck

World's Poultry Science Association (Canada Branch)

K. Schwean-Lardner

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