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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
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.
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

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

(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: History and future of genetically engineered food animal regulation

10:00 am–12:00 pm PSA Business Meeting

10:30 am–12:00 pm WPSA-USA Board Meeting

12:00 pm–1:00 pm American Poultry Historical Society Lunch*

1:00 pm–2:45 pm Management and Production II

1:00 pm–3:00 pm Immunology, Health, and Disease I

1:00 pm–5:00 pm Animal Well-Being and Behavior

1:00 pm–5:00 pm Symposium: Industry Forum: Unresolved issues facing the poultry industry

1:15 pm–4:30 pm Metabolism and Nutrition: Amino Acids

3:00 pm – 3:30 pm Ice Cream Social

3:30 pm–5:00 pm Metabolism and Nutrition: Nutrition I

6:00 pm–10:00 pm PSA BBQ*

9:30 pm–11:30 pm PSA, WPSA-USA Student Mixer*

Thursday, July 20

5:45 am–7:30 am Chicken Trot Fun Run

Meet in the hotel lobby to walk over for the start of the race.

7:00 am–1:00 pm Registration

7:00 am–8:00 am PSA Board of Directors Meeting

8:00 am–11:00 am Poster Sessions.

8:00 am–12:00 pm Nutritional Immunology

8:00 am–12:00 pm Symposium: Relevance of starch in poultry diets

8:00 am–12:00 pm Symposium: The future is already here: Application of technology to poultry health and welfare

Please have your ticket before boarding the shuttle.

(Shuttle service begins at 5:30 pm from the Marriott Orlando World Center Convention Center Entrance.)

(Shuttle service begins at 9:00 pm from Gatorland and the Marriott Orlando World Center Convention Center Entrance.)
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<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am–11:00 am</td>
<td>Exhibits</td>
</tr>
<tr>
<td>8:15 am–11:45 am</td>
<td>Metabolism and Nutrition: Feed Additives I</td>
</tr>
<tr>
<td>8:30 am–11:30 am</td>
<td>Metabolism and Nutrition: Vitamins and Minerals</td>
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<tr>
<td>10:30 am–12:00 pm</td>
<td>Poster Take Down</td>
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<tr>
<td>10:30 am–2:30 pm</td>
<td>Exhibit Booth Teardown</td>
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<tr>
<td>1:00 pm–2:45 pm</td>
<td>Immunology, Health, and Disease II</td>
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<tr>
<td>1:00 pm–4:45 pm</td>
<td>Metabolism and Nutrition: Nutrition II</td>
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<tr>
<td>1:00 pm–5:00 pm</td>
<td>Symposium: Oxidative stress</td>
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<tr>
<td>1:00 pm–5:00 pm</td>
<td>Symposium: Vegetative buffers for environmental stewardship on poultry farms</td>
</tr>
<tr>
<td>3:30 pm–5:00 pm</td>
<td>Metabolism and Nutrition: Feed Additives II</td>
</tr>
<tr>
<td>5:30 pm</td>
<td>Awards Celebration*</td>
</tr>
</tbody>
</table>

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
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- 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
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- Wednesday, July 19  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  . 3:00 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
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- 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.

<table>
<thead>
<tr>
<th>Monday Morning Oral Presentations</th>
<th>Presentations must be uploaded before 7:00 pm on Sunday.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Presentations in Morning Sessions (Tuesday–Thursday)</td>
<td>Presentations must be uploaded before 4:00 pm the day prior to the presentation.</td>
</tr>
<tr>
<td>Oral Presentations in Afternoon Sessions (Monday–Thursday)</td>
<td>Presentations must be uploaded before 10:00 am on the day of the presentation.</td>
</tr>
</tbody>
</table>

**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.
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.**
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Keepyoung Technology Co. Ltd.
Rm. 603, Bldg. E, Yingchuangdongli
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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.

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<th>SECTION</th>
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<tr>
<td>8:00 am–12:00 pm</td>
<td>Crystal J 2</td>
<td>Student Competition: Immunology, Health, and Disease</td>
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<td>8:00 am–12:00 pm</td>
<td>Crystal J 1</td>
<td>Student Competition: Management and Production</td>
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<td>Royal</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Nutrition I</td>
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<td>8:00 am–11:45 am</td>
<td>Sago</td>
<td>Student Competition: Metabolism and Nutrition</td>
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<td>Student Competition: Microbiology and Food Safety</td>
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<td>Student Competition: Processing and Products</td>
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<td>Canary 3-4</td>
<td>Student Competition: Animal Well-Being and Behavior</td>
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<td>1:00 pm–5:00 pm</td>
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<td>National Extension Workshop</td>
<td>Handling Change</td>
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<td>1:00 pm–5:00 pm</td>
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<td>Informal Nutrition Symposium</td>
<td>Critical content in a feed additive portfolio that is needed and will be meaningful to poultry decision makers</td>
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<td>Crystal J 2</td>
<td>Physiology and Reproduction</td>
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<td>Genomics, Molecular and Cellular Biology</td>
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<td>Student Competition: Management and Production II</td>
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<td>Symposium</td>
<td>Phosphorus utilization evaluation in feed ingredients for poultry: Opportunities and challenges</td>
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<td>1:00 pm–5:00 pm</td>
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<td>Symposium</td>
<td>Pathogens and cancer manipulate immune defenses: Opportunities to innovate host targeted strategies to prevent and treat disease without antimicrobial and chemical therapies</td>
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<td>Publishing Workshop</td>
<td>Successful publishing in poultry science journals</td>
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<td>WPSA Lecture</td>
<td>History and future of genetically engineered food animal regulation</td>
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<td>10:00 am–12:00 pm</td>
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<td>PSA Business Meeting</td>
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<td>Relevance of starch in poultry diets</td>
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<td>Symposium</td>
<td>The future is already here: Application of technology to poultry health and welfare</td>
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<td>Vitamins and Minerals</td>
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<td>Symposium</td>
<td>Vegetative buffers for environmental stewardship on poultry farms</td>
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<td>3:30 pm–5:00 pm</td>
<td>Canary 1-2</td>
<td>Metabolism and Nutrition</td>
<td>Feed Additives II</td>
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</table>
8:00 AM 1  **Effect of different fat sources in parental diets on nutrient metabolism in pigeon squabs.**
Xueping Wan¹, Peng Xie¹, Xinyang Dong¹, Xiaoyun Zhang¹, Zhu Bu², and Xiaoting Zou¹, ¹Zhejiang University, Hangzhou, China, ²Chinese Academy of Agricultural Sciences, Yangzhou, 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, ²Evonik Nutrition & Care, Hanau-Wolfgang, Germany, ¹University 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 hulless barley on broiler amino acid digestibility and performance.**

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, ¹Mississippi State University, Mississippi State, MS, ²West Virginia University, Morgantown, WV.

9:15 AM 6  **Physicochemical characterization of feed-grade zinc oxide sources.**
Denise Cardoso*¹, Yves Chevalier², and Agnes Narcy³, ¹ANIMINE, Sillingy, France, ²University of Lyon, Villeurbanne Cedex, France, ³INRA, Nouzilly, France.
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<th>Institutions</th>
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<tr>
<td>9:30 AM</td>
<td>7</td>
<td>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.</td>
<td>Kyle Brown*¹, Cody Flores¹, Gemma González-Ortiz², and Jason Lee¹, ¹Texas A&amp;M University, College Station, TX, ²AB Vista, Marlborough, United Kingdom.</td>
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<tr>
<td>9:45 AM</td>
<td>8</td>
<td>The effects of diet formulation and degree of processing on 18-d broiler performance and amino acid digestibility.</td>
<td>Ariel Bergeron*, John Boney, and Joseph Moritz, West Virginia University, Morgantown, WV.</td>
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<td>10:00 AM</td>
<td></td>
<td>Break</td>
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<tr>
<td>10:30 AM</td>
<td>9</td>
<td>Evaluating the response of Cobb 500 × MV broilers to varying amino acid density regimens for a small bird program.</td>
<td>Rosana Hirai*¹, Leonel Mejía², Cesar Coto², Justina Caldas², Christopher McDaniel¹, and Kelley Wamsley¹, ¹Mississippi State University, Mississippi State, MS, ²Cobb-Vantress, Siloam Springs, AR.</td>
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<td>10:45 AM</td>
<td>10</td>
<td>Uptake of ten minerals in Cobb 500 yolk during incubation and after hatch.</td>
<td>Ryan Hopcroft*, Wendy Muir, and Peter Groves, University of Sydney, Sydney, New South Wales, Australia.</td>
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<td>11:00 AM</td>
<td>11</td>
<td>Evaluation of a super-dose of phytase in reduced nutrient density diets on laying hen performance.</td>
<td>Kyle Smith*, Hunter Walters¹, Nelson Ward², and Jason Lee¹, ¹Texas A&amp;M University, College Station, TX, ²DSM Nutritional Products, Ringoes, NJ.</td>
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<td>11:15 AM</td>
<td>12</td>
<td>Evaluation of multiple phytase enzymes and levels on broiler performance when utilizing an elevated phytase matrix value including minerals, energy, and amino acids.</td>
<td>Christopher Eagleson*, Kyle Smith², Yueming Dersjant-Li¹, Milan Hruby¹, and Jason Lee², ¹DuPont Industrial Biosciences, Woodbury, MN, ²Texas A&amp;M University, College Station, TX.</td>
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<tr>
<td>11:30 AM</td>
<td>13</td>
<td>Evaluation of a phytogenic feed additive on turkey poult performance and nutrient digestibility.</td>
<td>Charles Zumbaugh*, G. Raj Murugesan¹, and Michael Persia², ¹Biomin America Inc, San Antonio, TX, ²Virginia Tech, Blacksburg, VA.</td>
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</table>
Effect of hydrolyzed yeast and yeast cell wall as alternatives to zinc bacitracin on performance of broilers from 1 to 42 days. Jose Rivera*, 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

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.

Evaluation of an encapsulated sodium butyrate with varying releasing times on broiler performance, energy digestibility, gut development and Salmonella colonization.
Jundi Liu*, Haci Bayir², Douglas Cosby¹, Nelson Cox¹, and Justin Fowler², ¹US Department of Agriculture, Athens, GA, ²University of Georgia, Athens, GA.

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*, Alice Murakami¹, Iván Camilo Ospina-Rojas¹, Kelly Kunes¹, and Eustace Iyayi², ¹Universidade Estadual de Maringá, Maringá, Brazil, ²University of Ibadan, Ibadan, Ibadan, Nigeria.

Effects of increasing zinc hydroxychloride level on male growth performance and breast meat yield.
Austin Jasek*, Kyle Brown¹, Terri Parr², and Jason Lee¹, ¹Texas A&M University, College Station, TX, ²Micronutrients USA LLC, Indianapolis, IN.

The effect of four rearing programs on heat production (HP) and body composition of broiler breeders.
Michael Schlumbohm*, 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.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Number</th>
<th>Title</th>
<th>Authors</th>
<th>Affiliations</th>
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<tr>
<td>9:15 AM</td>
<td>20</td>
<td>Effect of a 60% protein soybean meal diet, feed particle size, and Rovabio Advance on poult live performance to 20 d of age.</td>
<td>Karlinton Flores*, Jesse Grimes, Ramon Malheiros, and Adam Fahrenholz, North Carolina State University, Raleigh, NC.</td>
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<td>9:30 AM</td>
<td>21</td>
<td>Effects of inorganic trace mineral sulfates, organic trace mineral proteinates, or a mixture of the two on broiler breeder egg production and egg characteristics.</td>
<td>Coltin Caraway*, John Brake¹, and Gregory Page², ¹North Carolina State University, Raleigh, NC, ²Trouw Nutrition Agresearch, Guelph, ON, Canada.</td>
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<td>9:45 AM</td>
<td>22</td>
<td>Determining the efficacy of two carbohydrase enzymes in commercial diets on d 0-57 broiler performance.</td>
<td>Courtney Ennis*, Aaron Kiess, Wei Zhai, Christopher McDaniel, and Kelley Wamsley, Mississippi State University, Mississippi State, MS.</td>
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<td>10:00 AM</td>
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<td>Break.</td>
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<tr>
<td>10:30 AM</td>
<td>23</td>
<td>Evaluation of two enzyme composites in reduced nutrient density diets on laying hen performance.</td>
<td>Cody Flores*, Kyle Smith¹, Nelson Ward², and Jason Lee¹, ¹Texas A&amp;M University, College Station, TX, ²DSM Nutritional Products, Ringoes, NJ.</td>
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<td>10:45 AM</td>
<td>24</td>
<td>Does a diet with no added copper have adverse effects on laying hens under different temperatures?</td>
<td>Wenxiang Li*, Yuanqing Chen, Lihong Zhao, Qiugang Ma, Jianyun Zhang, and Cheng Ji, China Agricultural University, Beijing, China.</td>
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<td>11:00 AM</td>
<td>25</td>
<td>Effects of broilerization and non-broilerization on pureline broiler breeder fertility, hatchability, chick quality, egg composition and body composition.</td>
<td>Antonio Beitia*, Justina Caldas¹, Katie Hilton², Garret Mullenix², Michael Schlumbohm², Pramir Maharjan², Maria Mayorga², Judith England², and Craig Coon², ¹Cobb-Vantress, Siloam Springs, AR, ²University of Arkansas, Fayetteville, AR.</td>
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<td>11:15 AM</td>
<td>26</td>
<td>Phytase effect on amino acids, Ca, and P digestibility in laying hen fed with graded levels of digestible lysine.</td>
<td>Ingrid Y. Martinez Rojas*, Ernesto Avila¹, Jose Arce Menocal³, Gilson Gomes², and Carlos Lopez¹, ¹Universidad Nacional Autónoma de México, Mexico City, Mexico City, Mexico, ²AB Vista, Marlborough, United Kingdom, ³UMSNH, Morelia, Michoacan, Mexico.</td>
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</table>
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 Abduljaleel1, 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 Koelkebebeck, University of Illinois
Crystal J1

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

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.

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.

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

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.

Yolk free body weight of layer chicks provided different wavelengths of LED light during incubation.
Nilakshi Abeyesinghe*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*, 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*, 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.

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*, 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 Orlowski*, 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.
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 Beer*2, Lisa Bielke1, John Barta3, Olivia Faulkner2, Juan Latorre2, Whitney Briggs1, Kim Wilson1, Mikayla Baxter2, Guillermo Tellez2, and Billy Hargis2, 1Ohio State University, Wooster, OH, 2University of Arkansas Division of Agriculture, Fayetteville, AR, 3Ontario 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, 1The Ohio State University, Columbus, OH, 2University 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, 
1North Carolina State University, Raleigh, NC, 2University 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, 1Ohio State University, Columbus, OH, 2University of Arkansas, Fayetteville, AR, 3University 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 HPAl challenge.**
Christine Vuong*2, Wen-Ko Chou2, Whitney Briggs1, Amanda Wolfenden3, Olivia Faulkner3, Melina Jonas4, Darrell Kapczynski5, 
Billy Hargis3, Lisa Bielke1, and Luc Berghman2, 1Ohio State University, Wooster, OH, 2Texas A&M University, College Station, TX, 3University of Arkansas, Fayetteville, AR, 4Medion Vaccine Company, Bandung, Indonesia, 5United States Department of Agriculture, Atlanta, GA.

10:00 AM  Break.

10:30 AM  50  **Effect of fructooligosaccharides (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, 1University of Georgia, Athens, GA, 2University 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.
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.

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.

Natural environmental selection differentially modulates the diversity of gut microbes and innate immune responses of feral and modern broiler chickens.
Ricardo Hayashi*, Celia Garcia³, Eben Gering¹, Alexandra Smith⁴, Thomas Rehberger⁴, Isaac Cann¹, Elizabeth Santin², and Roderick Mackie¹, ¹Michigan State University, East Lansing, MI, ²UFPR, Curitiba, PR, Brazil, ³University of Illinois, Urbana-Champaign, IL, ⁴Agro Biosciences, Wauwatoosa, WI.

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

Assessing the impact of early production molting of pullets on the prevalence of Salmonella, Campylobacter, and Enterobacteriaceae.
Krista Eberle*, Deana Jones⁴, Richard Gast³, Cara Robison¹, Kenneth Anderson², and Darrin Karcher³, ¹Michigan State University, East Lansing, MI, ²North Carolina State University, Raleigh, NC, ³Purdue University, West Lafayette, IN, ⁴USDA-ARS, Athens, GA.

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.

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.

Effect of white mustard essential oil and carvacrol on Salmonella in ground chicken.
John Porter* and Emefa Monu, Auburn University, Auburn, AL.
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.

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.

Effects of dietary flaxseed on ceca microbial community compositions of Peking Ducks.
Yuqin Wu*, Fuhuang Li, Muhammad Shahid, Zhibin Xiao, Xiaoyu Dong, Dafei Yin, Zhao Lei, and Jianmin Yuan, 1College of Animal Science and Technology, China Agricultural University, Beijing, China, 2Beijing General Station of Animal Husbandry, Beijing, China.

Evaluation of cetylpyridinium chloride (CPC) on water usage and Salmonella retention in broilers following feed and water withdrawal.
Caitlin Harris*, Nicole Bartenfeld, Dianna Bourassa, Brian Fairchild, Brian Kiepper, and R. Jeff Buhr, 1Auburn University, Auburn, AL, 2University of Georgia, Athens, GA, 3USDA-ARS US National Poultry Research Center, Athens, GA.

In-vessel poultry litter composting to facilitate pathogen reduction and biofertilizer production system.
Felix Buabeng*, Fawzy Hashem, Patricia Millner, and Lorna Graham, 1University of Maryland Eastern Shore, Princess Anne, MD, 2US Department of Agriculture, Beltsville, MD.

Evaluation of the role of infection route in the development of systemic Salmonella infection in chickens.
Amie Marie Jones-Ibarra*, Denise Caldwell, J. Byrd, and Christine Alvarado, 1Texas A&M University, Bryan, TX, 2USDA, ARS, SPARC, College Station, TX.

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.
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.*

Ice slurry to aid in antimicrobial reduction of *Salmonella typhimurium* in poultry chilling.
Stephanie Richter*, Comas Haynes, and Daniel Sabo, *GTRI, Atlanta, GA.*

Phytochemicals reduce biofilm formation and inactivates mature biofilm of *Campylobacter jejuni*.
Basanta Raj Wagle*, Abhinav Upadhyay, Komala Arsi, Indu Upadhyaya, Sandip Shrestha, Kumar Venkitanarayanan, Annie Donoghue, and Dan Donoghue, *University of Arkansas, Fayetteville, AR, ARS USDA, Fayetteville, AR.*

### Student Competition: Processing and Products

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

A carvacrol wash and/or a chitosan-based coating reduced *Campylobacter jejuni* on chicken wingettes.

Evaluation of commercial cage-free barn egg quality during early production.

Essential oils on lipid oxidation in chicken meatballs: In vivo and in situ assays.
Adriana Figueiredo*, Renata Maria Duarte, Glaucia Napty, Cristiane Lima, Aline Racanicci, and Marta Cristina Duarte, *UNICAMP, Campinas, São Paulo, Brazil, UnB, Brasilia, Brazil, ESALQ-USP, Piracicaba, Brazil.*

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, 1University of Guelph, Guelph, ON, Canada, 2University 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, 1University of Guelph, Guelph, ON, Canada, 2University 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, 1Georgia Institute of Technology, Atlanta, GA, 2University of Arkansas, Fayetteville, AR, 3Georgia 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*, Don McIntyre, Hilary Pavlidis, and Gregory Archer, 
1Diamond V, Virginia Beach, VA, 2Texas A&M University, College Station, TX, 3Diamond V, 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 Schwan-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*, Susantha Gomis, Henry Classen, and Karen Schwan-Lardner, 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*, Cara Robison, Sally Noll, R. Michael Hulet, Marisa Erasmus, and Darrin Karcher, 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.**
Gabriella Furo*, R. Michael Hulet, Lisa Kitto, Sally Noll, Darrin Karcher, and Marisa Erasmus, 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, 1Sifri Solutions LLC, Quincy, IL, 2University 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, 1AB Vista Feed Ingredients, Marlborough, United Kingdom, 2DSM, 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.**
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.

The effect of incubation temperature and time of hatch on muscle growth and morphology.
Daniel Clark*, Kim Walter2, and Sandra Velleman1, 1The Ohio State University, Wooster, OH, 2Aviagen, Inc, Albertville, AL.

Sentinel cells of ducks complicate interpretation of the H/L ratio.
Paul Cotter*, Cotter Laboratory, Arlington, MA.

Glucose and uric acid in blood of broiler chicken.
Ricardo Nunes1, Jomara Broch1, Lucas Wachholz1, Cleison Souza1, Cinthia Eyng1, Paulo Pozza2, and Gene Pesti3, 1Universidade Estadual do Oeste do Paraná–UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil, 2Universidade Estadual de Maringá, Maringa, Parana, Brazil, 3University of Georgia, Athens, GA.

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.

Cholesterol and triglycerides in blood of broiler chicken.
Ricardo Nunes1, Cleison Souza1, Lucas Wachholz1, Jomara Broch1, Cinthia Eyng1, Jarred Oxford2, and Gene Pesti2, 1Universidade Estadual do Oeste do Paraná – UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil, 2University of Georgia, Athens, GA.

Reproductive performance assessment of two White Leghorn lines free of endogenous viruses.
Gururaj Kulkarni1, Kunzhe Dong, and Huanmin Zhang, USDA-ARS, East Lansing, MI.

Laying hen strain influences skeletal morphology and keel fracture prevalence in multi-tier aviary system.
Prafulla Regmi1, Deana Jones2, Richard Gast2, and Darrin Karcher1, 1Purdue University, West Lafayette, IN, 2USDA-ARS, Athens, GA.
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.

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

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.

Transcriptional profiling of keel bone from low calcium diet induced osteoporosis hens.
Sha Jiang*, Southwest University, Chongqing, China.

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.

Transcriptome analysis reveals inhibitory effects of lentogenic Newcastle disease virus on cell survival and immune function in spleen of layer chickens.
Jibin Zhang*, 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.

Break.
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| 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 Guraya1, 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 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 In vitro inhibition of Enterococcus cecorum by probiotic Bacillus strains. Alexandra Wealleans*, Marion Bernardeau¹, and Marina Cretenet², ¹Danisco Animal Nutrition, DuPont Industrial Biosciences, Marlborough, United Kingdom, ²Normandie Université, UNICAEN, Caen, France.

3:00 PM Break.

3:30 PM Effects of dietary eubiotics on Salmonella enteritidis excretion in layer hens. Diana Alvarez³, Claudia Torres³, Leticia Bittencourt¹, and Carlos Lozano*, ¹DSM Nutritional Products Brazil, São Paulo, Brazil, ²DSM Nutritional Products Colombia S.A, Bogotá, Colombia, ³Universidad Nacional de Colombia, Bogotá, Colombia.

3:45 PM In-water supplementation of Trans-cinnamaldehyde nanoemulsion reduces Campylobacter jejuni colonization in broiler chickens. Abhinav Upadhyay*, Komala Arsi², Basanta Raj Wagle², Sandip Shrestha², Indu Upadhyaya², Kanika Bhargava³, Annie Donoghue¹, and Dan Donoghue², ¹ARS, USDA, Fayetteville, AR, ²University of Arkansas, Fayetteville, AR, ³University of Central Oklahoma, Edmond, OK.

4:00 PM In vitro evaluation of the antimicrobial effects of a gram-negative control solution. Chasity Pender*, Antonia Tocconi², Attila Kovacs³, and G. Raj Murugesan¹, ¹Biomin America Inc, San Antonio, TX, ²Biomin Holding GmbH, Getzersdorf, Austria.

4:15 PM Alquermold natural reduces the ability of Salmonella to invade intestinal epithelial cells. Anna Tesouro*¹ and Cristina Latasa², ¹Biovet, S.A, Constanti, Spain, ²University of Navarra, Navarra, Spain.
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, 1Chungnam National University, Daejeon, Korea, 2CJ CheilJedang Corporation, Seoul, Korea.

Effects of 1,3-diacylglycerol (DAG) on growth performance and carcass characteristics in broilers. Jinquian Wang*1, Paula Sedlacek1, Helen Choi2, and Woo Kyun Kim1, 1University of Georgia, Athens, GA, 2Kimin, Seoul, Seoul, Korea.

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.

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.

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 Jaluka2, and John Brake1, 1North Carolina State University, Raleigh, NC, 2Arm and Hammer Animal Health, Princeton, NJ.

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, 1University of Georgia, Athens, GA, 2CJ 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*, Katie Elaine Collins¹, Oluwaseun Durojaye¹, Haijun Zhang¹, Bradley Turner², and E. Peebles¹, ¹Mississippi State University, Mississippi State, MS, ²DSM 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*, Kimberly Livignston², and Michael Persia¹, ¹Virginia Tech, Blacksburg, VA, ²North Carolina State University, Raleigh, NC.

11:00 AM 126 Comparison of Narasin and bioshuttle programs with different environmental temperatures in commercial broilers. Jarred Oxford*, Jaime Ruiz², Melissa Landrum¹, and Gene Pesti¹, ¹The University of Georgia, Athens, GA, ²Elanco 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 Abduljaleel, 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.
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, ¹North Carolina State University, Raleigh, NC, ²Novus International, St. Charles, MO.

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

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, ¹Avicola Nacional SA, Medellín, Antioquia, Colombia, ²University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada.

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, ¹University of Kentucky, Lexington, KY, ²Alltech Inc, Nicholasville, KY.

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.

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, ¹The University of Georgia, Athens, GA, ²DSM Nutritional Products, North America, Parsippany, NJ.

Graded levels of hulless barley and β-glucanase affect the performance of broiler chickens vaccinated for coccidiosis in an age dependent manner.
Namalika Karunarathne*¹, Mike Bedford², Rex Newkirk¹, and Henry Classen¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²AB 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*, Andréia Massuquetto, Jean Fagner Durau, Josiane Panisson, Emanuelle Cristiny Goes, Everton Krabbe, and Francielle Oliveira Marx, Universidade Federal do Paraná, Curitiba, Paraná, Brazil, 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*, Michael Lilburn, Macdonald Wick, and Luis Moraes, The Ohio State University, Dublin, OH, The Ohio State University, Wooster, OH, 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.** Heloisa Fialkowski Bordignon*, Anete Rorig, Elisangela Vanroo, Sabrina De Castro Palma, Djovane 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 Sapcota2, Damian Lopez3, Leticia Gross4, Meike Rademacher-Heilshorn5, and Ulrike Braun6, 1North Carolina State University, Raleigh, NC, 2Assam Agricultural University, Guwahati, India, 3Universidad de las Fuerzas Armadas ESPE, Quito, Ecuador, 4Universidade Federal Do Rio Grande Do Sul, Rio Grande Do Sul, Brazil, 5Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany, 6AlzChem 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, 1Texas A&M University, College Station, TX, 2Adisseo USA, Alpharetta, GA, 3Adisseo 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 Koltes, 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, 1Auburn University, Auburn, AL, 2Auburn University, Arab, AL.

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, 1UFRGS, Porto Alegre, RS, Brazil, 2UFSM, Santa Maria, Brazil.

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.

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 Koltes2, Karen Christensen2, and Casey Owens2, 1Nanjing Agricultural University, Nanjing, Jiangsu, China, 2University 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

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, 1University of Guelph, Guelph, ON, Canada, 2University of Manitoba, Winnipeg, MB, Canada.

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.
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, 1The Ohio State University, Dublin, OH, 2The Ohio State University, Wooster, OH, 3DSM Nutritional Products, Belfast, United Kingdom, 4The Ohio State University, Columbus, OH.

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, 1The Ohio State University, Wooster, OH, 2Biomin, San Antonio, TX, 3Biomin, Getzersdorf, Austria.

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, 1University of Guelph, Guelph, ON, Canada, 2Canadian Bio-Systems Inc, Calgary, AB, Canada.

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.

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, 1DSM, São Paulo, Brazil, 2Federal University of Paraña, Curitiba, Brazil.

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, 1Texas A&M University, College Station, TX, 2USDA, College Station, TX.

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.
Effect of a commercial blend of cashew nut shell liquid and castor oil on the microbiota of broilers challenged with *Eimeria* spp.
Priscila Moraes*, Fernanda Gouvêa¹, Bruna Schroeder¹, Lucas Villela¹, Joan Torrent², and Andrea Ribeiro¹, ¹Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil; ²Oligo Basics, Câscavel, Brazil.

Effects of dietary Microfused Essential Oils technology on growth performance, jejunal histology, and meat quality of coccidiosis-challenged broilers.
Samantha Welu*, Jon Holt², Keith Underwood¹, Crystal Levesque¹, and Robert Thaler¹, ¹South Dakota State University, Brookings, SD; ²Ralco Nutrition Inc, Marshall, MN.

Dietary supplementation of *Allium hookeri* improved intestinal immune response on necrotic enteritis of young broiler chickens.
Youngsub Lee*, Sunghyen Lee², Sungteak Oh¹, and Hyun Lillegoj¹, ¹USDA-ARS, Beltsville, MD; ²RDA, Wan-ju, Jeollabuk-do, Korea.

Comparative efficacy of dietary zinc sources for the mitigation of the impact of necrotic enteritis in coccidial challenged broiler chickens.
Cristiano Bortoluzzi*, Brett Lumpkins², Gregory Mathis², W. King³, Daniel Graugnard³, Karl Dawson³, and Todd Applegate¹, ¹The University of Georgia, Athens, GA; ²Southern Poultry Research Inc, Athens, GA; ³Alltech Inc, Lexington, KY.

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*, W. King³, Daniel Graugnard³, Karl Dawson³, Cristiano Bortoluzzi¹, and Todd Applegate¹, ¹The University of Georgia, Athens, GA; ²University of Georgia-Sichuan Agricultural University, Athens, GA; ³Alltech-University of Kentucky Nutrition Research Alliance, Lexington, KY.
Primordial germ cell-based biobanking of Hungarian indigenous chicken breeds.
Bence Lazar*, 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.

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.

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*, 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.

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.

The effects of feeding a diet high in methyl donors on Japanese quail.
Chelsea Phillips*, Roselina Angel2, and Christopher Ashwell1, 1North Carolina State University, Raleigh, NC, 2University of Maryland, College Park, MD.

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*, Juan Latorre2, Si Hong Park2, Xiaolun Sun1, Billy Hargis1, Guillermo Tellez1, and Steve Ricke2, 1University of Arkansas, Prairie Grove, AR, 2University 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*, Suchita Das1, Abigail Farmer1, Shawn Campagna1, Jiali Yu1, Jeanna Wilson2, Robert Hettich1, Michael Smith1, and Brynn Voy1, 1University of Tennessee, Knoxville, TN, 2University of Georgia, Athens, GA.

11:00 AM 176 Identification and characterization of extracellular vesicles from the amniotic fluid of layer chicken embryos. Dan Zhao*, Tina Tran3, E. Peebles1, Wei Zhai1, and Yuhua Farnell2, 1Mississippi State University, Mississippi State, MS, 2Texas A&M AgriLife Research, College Station, TX, 3Mississippi State University, Mississippi State, MS.


11:30 AM 178 Expression of avian beta-defensins and liver-expressed antimicrobial peptide 2 mRNA in young broilers infected with Campylobacter. Javier Garcia*, J. Byrd2, and Eric Wong1, 1Virginia Tech, Blacksburg, VA, 2USDA, ARS, Southern Plains Agricultural Research Center, College Station, TX.
Molecular mechanisms of synergistic enhancement of chicken innate immunity and barrier function by butyrate and forskolin.
Kelsy Robinson*, Hong Li, Long Zhang, Ryan Arsenault, Lakshmi Sunkara, Brian Cougar, and Glenn Zhang, Oklahoma State University, Stillwater, OK, Henan Agriculture University, Henan, Zhengzhou, China, Sichuan Agricultural University, Chengdu, Sichuan, China, University of Delaware, Newark, DE, USDA, East Lansing, MI.

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

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.

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.

The deposition and elimination of glucosinolates metabolites derived from rapeseed meal in laying hens and eggs.
Liping Zhu*, Jianping Wang, Xuemei Ding, Qiu Feng Zeng, Shiping Bai, and Keying Zhang, Animal Nutrition Institution, Chengdu, Sichuan, China.

Production stage effects on white laying hens’ blood glucose concentrations.
Jeffrey Helfrich*, Darrin Karcher, and Elizabeth Karcher, Purdue University, West Lafayette, IN.

Identification of gene expression differences associated with high and low egg production in turkey hens.
Kristen Brady*, Julie Long, and Tom Porter, University of Maryland, College Park, MD, BARC, ARS, USDA, Beltsville, MD.

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.
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*, G. Y. Bédécarrats2, P. R. O. Carneiro1, and M. J. Zuidhof1, 1University of Alberta, Edmonton, AB, Canada, 2University of Guelph, Guelph, ON, Canada.

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.

Effects of herbal liver tonic products on growth performance and hepatic lipid metabolism in broiler chickens.
Joshua Flees*, Elizabeth Greene1, Walter Bottje1, Shivi Maini2, and Sami Dridi1, 1University of Arkansas, Fayetteville, AR, 2Ayurved Ltd, Baddi, India.

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.

Calcium and phosphorus loss from bones autoclaved for tissue removal.
Sara Cloft*, Cara Robison2, and Darrin Karcher3, 1Auburn University, Auburn, AL, 2Michigan State University, East Lansing, MI, 3Purdue University, West Lafayette, IN.

Adenosine A1 receptor and serotonin transporter expression in broiler with acute right ventricular failure.
Mohammad Kamely*, Robert Wideman2, and Mohammad Amir Karimi Yorshizi3, 1Tarbiat Modares University, Leuven, Belgium, 2University of Arkansas, Fayetteville, AR, 3Tarbiat 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*, Jennifer Timmons2, Arthur Allen1, and Yeong Chi1, 1University of Maryland, Eastern Shore, Bishopville, MD, 2University 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.

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*, Shailesh Gurung1, Dan Zhao1, Yuhua Farnell1, J. Byrd2, and Morgan Farnell1, 1Texas A&M AgriLife Research, College Station, TX, 2USDA, College Station, TX.

11:45 AM 197 Effectiveness of duck hatching egg sanitization with the combination of hydrogen peroxide and ultraviolet light.
Karely Cantu*, Gregory Archer1, Zach Tucker2, and Craig Coufal1, 1Texas A&M University, College Station, TX, 2Maple 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 Rodehutscord*, University of Hohenheim, Stuttgart, Germany.

1:45 PM 596S Dietary calcium concentrations affect the determination of true phosphorus utilization.
Kurt Perryman*, Micronutrients, McDonough, GA.
Evaluation of phosphorus digestibility response to exogenous phytases.
Mike Bedford*, ABVista, Marlborough, United Kingdom.

Panel Discussion.

Metabolism and Nutrition: Enzymes
Chair: Samuel Rochell, University of Arkansas
Moderator: Mojtaba Yegani, DSM Nutritional Products
Crystal J 2

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, 1Federal University of Paraiba, Areia, Paraiba, Brazil, 2Federal University of Southern Bahia, Teixeira de Freitas, Brazil, 3AB Vista, Marlborough, United Kingdom.

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, 1Federal University of Paraiba, Areia, Paraiba, Brazil, 2Federal University of Southern Bahia, Teixeira de Freitas, Brazil, 3AB Vista, Marlborough, United Kingdom.

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

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, 1AB Vista, Marlborough, Wiltshire, United Kingdom, 2Scottish Rural College, Ayr, United Kingdom.
Effect of phytate esters and inositol created by phytase supplementation on broiler performance and nutrient digestibility.
Carrie Walk*1 and David Ledoux2, 1AB Vista, Marlborough, Wiltshire, United Kingdom, 2University of Missouri, Columbia, MO.

Optimal *Buttiauxella* phytase level for broilers.
Daniella Donato*1, Luciana Franco1, Mauricio Cunha1, Ana Paula de Oliveira1, Mirella Melaré2, Henrique Nogueira2, and Nilva Sakomura2, 1DuPont, Paulinia, Sao Paulo, Brazil, 2Univ. Estadual Paulista, Jaboticabal, Sao Paulo, Brazil.

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.

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, 1BASF Corporation, Humble, TX, 2Kaposvar University, Guba, Hungary, 3BASF SE, Lampertheim, Germany.

The combination of xylanase, amylase, and protease consistently improves FCR in broilers fed different types of diet: A meta-analysis.

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.

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.
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.

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, Glaucia Napty¹, Alvaro Burin Junior¹, Vitor Fascina², and Levy Teixeira², ¹University of Sao Paulo, Piracicaba, Sao Paulo, Brazil, ²DSM Nutritional Products, Sao Paulo, Brazil.

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

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.

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.

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*, 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*, 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*, Danileli Brolo Martins¹, Roberto Jardim Filho¹, Marcos Barcellos Café¹, Evelyn Oliveira¹, and Cibele Silva Minafra², ¹Federal University of Goias, Goiânia, Goiás, Brazil, ²Instituto Federal Goiano, Rio Vedre, 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.**
The influence of hatching time and post-hatch holding time on live performance of broilers.
Serdar Özlü1, Reza Shiranjangi1, Okan Elibol1, and John Brake2,
1Faculty of Agriculture, University of Ankara, Ankara, Turkey,
2North Carolina State University, Raleigh, NC.

Effects of maternal protein diets and age at photo stimulation on production performance of the progeny.
Rick van Emous1, Victor Narango2, and Carlos de la Cruz2,
1Wageningen University & Research, Wageningen, the Netherlands,
2Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany.

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.

Egg quality assessment of Latin American producers.
José Miranda Jr., Leticia Bittencourt*, Murtala Faruk, Belén Cáceres,
Sofía 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

Wooden breast occurrence in broilers subjected to feed restriction: Growth performance, serologic profile and meat quality.
Liris Kindlein1, Sergio Vieira1, Catarina Stefanello2, Cristina Simoes1, Tamara Ferreira1, Ismael Franca1, Vinicius Nickel1, and Stella Valle1,
1UFRGS, Porto Alegre, RS, Brazil, 2UFSM, Santa Maria, Brazil.

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.

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.
Capillary density of Pectoralis major muscle of broilers affected by white striping myopathy.

The woody breast condition affects the surface color of cooked broiler breast.
Hong Zhuang*, U.S. National Poultry Research Center, Athens, GA.

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.

Woody breast affects the marination and cooking performance of portioned broiler breast fillets.
Brian Bowker*, Alex Maxwell2, and Hong Zhuang1, 1USDA-ARS, Athens, GA, 2University of Georgia, Athens, GA.

Utility of robust mixed models in describing growth of seven strains of chicken using Logistics and Richards growth functions.
Sunday Peters*, Michael Ozoje3, and Kadir Kizilkaya2, 1Berry College, Mount Berry, GA, 2Adnan Menderes University, Aydin, Turkey, 3Federal University of Agriculture, Abeokuta, Abeokuta, Ogun State, Nigeria.

Application of Bayesian robust mixed models in the use of non-linear functions to describe growth of three turkey genotypes.
Sunday Peters*, Michael Ozoje2, and Kadir Kizilkaya3, 1Berry College, Mount Berry, GA, 2Federal University of Agriculture Abeokuta, Abeokuta, Ogun State, Nigeria, 3Adnan Menderes University, Aydin, Turkey.

Methods, equipment, and considerations during training for backyard chicken processing.
Dianna Bourassa*, 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, ¹University of Guelph, Guelph, ON, Canada,
²University 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, ¹Texas A&M University, College Station, TX, ²West 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.
Effect of a standardized blend of carvacrol, cinnamaldehyde and capsicum oleoresin on carcass quality of broilers using multiple trial analysis method.

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, 1Colegio de Postgraduados, Mexico State, Mexico, 2Colegio de Postgraduados, Texcoco, Mexico, 3Universidad Autónoma Chapingo, Texcoco, Mexico, 4Universidad Politécnica de Francisco I. Madero, Hidalgo, Mexico.

A new turn: Assessing the shape of the avian egg.
Deana Jones*2 and Darrin Karcher1, 1Purdue University, West Lafayette, IN, 2US National Poultry Research Center, Athens, GA.

Cage-free aviary egg functionality: Impact of hen strain and cold storage.
Deana Jones*3, Darrin Karcher2, Prafulla Regmi2, Cara Robison1, and Richard Gast3, 1Michigan State University, East Lansing, MI, 2Purdue University, West Lafayette, IN, 3USDA-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

8:00 AM  624S  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

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

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 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 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 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.


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

1:00 PM 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*, Ori Elad¹, Shayan Sharif², Alexander Yitbarek², and Randall Bishop¹, ¹Atlantic Veterinary College, Charlottetown, PEI, Canada, ²Ontario Veterinary College, Guelph, ON, Canada, ³Cornwallis Veterinarians, Kenville, NS, Canada.
Genotypic variation, class I gene copy number variation and recombination within the chicken major histocompatibility complex Y (MHC-Y) system.
Renee Kopulos*, Robert Taylor¹, and W. Briles², ¹West Virginia University, Morgantown, WV, ²Northern Illinois University, DeKalb, IL.

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*, Hyeonmin Jang¹, Daniel Falcon¹, Kristen Byrne¹, and Zoraida Aguilar², ¹University of Arkansas, Division of Agriculture, Fayetteville, AR, ²Zystein LLC, Fayetteville, AR.

Examination of cellular and molecular events during the induction and resolution of acute inflammation in broiler chickens.
Daniel Barreda*, Juan More Bayona, and Anbu Karuppannan, University of Alberta, Edmonton, AB, Canada.

Effects of long-term of early life probiotics administration on adaptive immune responses in chicken pullets and laying hens.
Pablo Lopera*, Julian Reyes¹, and Juan Rodriguez-Lecompte¹, ¹Atlantic Veterinary College, Charlottetown, PEI, Canada, ²Avicola Nacional S.A, Medellin, Antioquia, Colombia.

Highly pathogenic avian influenza H5N2 in naturally infected turkey breeder hens: Virus distribution, histopathology, and host immune gene expression.
Michelle Behl*, David Caldwell¹, Mike Kogut², Luc Berghman¹, Kenneth Genovese², and Morgan Farnell¹, ¹Texas A&M, Spicer, MN, ²USDA-ARS, College Station, TX.

Development and performance of an automated whole-house poultry vaccination system.
Joseph Purswell, Scott Branton, and Jeffrey Evans*, USDA ARS, Mississippi State, MS.

Effect of allicin in broilers raised at 2278 m above sea level.
Artemio Vargas-Galicia¹, Raúl Argüello-García², Fernando González-Cerón³, Arturo Pro-Martínez¹, Eliseo Sosa-Montes³, Jaime Bautista-Ortega¹, Leodan Rodríguez-Ortega¹, Analy 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 Schwen-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*, Roy Berghaus2, Gregory Mathis1, and Sangita Jalukar3, 1Southern Poultry Research Group, Athens, GA, 2The University of Georgia, Athens, GA, 3Arm 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*, Sang Lee1, Da-Hye Kim1, Moun-Cheul Keum1, Eileen Han2, and Byoung-Ki An1, 1Konkuk University, Seoul, Korea, 2Biomin, 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 Schwen-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*, 1Hope College, Holland, MI, 2Maple Leaf Farms, Inc, Leesburg, IN.
Evaluation of alternative euthanasia methods of neonatal chickens.
Shailesh Gurung*, 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

Assessment of commercial Pekin duck welfare: A comparison of methods.
Essam Abdelfattah*, Maja Makagon, and Giuseppe Vezzoli, University of California, Davis, Davis, CA.

Effect of bird density and bedding source on heavy turkey hens: Growth efficiency and litter composition.
R. Michael Hulet*, 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.

Effect of bird density and bedding source on heavy turkey hens: Behavior.
Marisa Erasmus*, 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.

Effect of on-farm hatching of broiler chickens on welfare and performance.
Ingrid de Jong*, Sofie Cardinaels2, Henk Gunnink1, Kris De Baere2, Ine Kempen2, Johan Zoons2, Theo van Hatthum1, and Lotte van de Ven3, 1Wageningen Livestock Research, Wageningen, the Netherlands, 2Experimental Poultry Centre, Geel, Belgium, 3Vencomatic, Eersel, the Netherlands.

An intra-lab evaluation of performance in testing tonic immobility in broilers.
Diego Martinez*, 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.
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.

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.

Effect of ventilation shut down (VSD) on changes in heat shock protein 70 and blood chemistry throughout depopulation.
Kenneth Anderson*, James Petitte, Kimberly Livignston, Sanjay Shah, Michael Martin, Krista Eberle, and Ramon Malheiros, North Carolina State University, Raleigh, NC.

High and low feather-pecking lines of laying hens differ in their physiological responses to social stress.
Patrick Birkl*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.

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.

The unforeseen consequences of a “bad hair day” in laying hens.

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.
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, 1Michigan State University, East Lansing, MI, 2Purdue University, West Lafayette, IN, 3University of California, Davis, Davis, CA, 4Research Centre for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH Institute, University of Bern, Bern, Switzerland.

Two-dimensional space use by 4 genetic strains of laying hens in an aviary system.
Ahmed Ali*1, Elizabeth Riddle1, Dana Campbell2, and Janice Siegfried, 1Michigan State University, East Lansing, MI, 2Armidale, NSW, Armidale, New South Wales, Australia.

Metabolism and Nutrition: Amino Acids
Chair: Woo Kyun Kim, University of Georgia
Moderator: Sergio Fernandez, DSM Nutritional Products

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, 1Evonik Nutrition & Care, Hanau-Wolfgang, Germany, 2Universidade Federal do Paraná, Curitiba, Brazil, 3Evonik Nutrition & Care, São Paulo, Brazil.

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, 1Universidade Estadual de Maringá, Maringá, Paraná, Brazil, 2Evonik Industries, São Paulo, Brazil, 3Evonik Nutrition & Care, Hanau-Wolfgang, Germany.

Digestible valine requirements in practical diets for Ross 308 broiler chicks in growing period.
Arash Hassanzaded Seyedi* and Hossein Janmohammadi, University of Tabriz, Tabriz, East Azarbijan, Iran.
Effect of different ratios of valine and iso-leucine to lysine on growth performance, blood biochemistry and carcass characteristics in broilers.
Zafar Hayat*, Gulbeena Saleem2, Aneeza Hafeez1, Abd Rehman1, Zafar Ullah1, and Muhammad Arif1, 1University of Sargodha, Sargodha, Pakistan, Sargodha, Pakistan, 2University of Veterinary and Animal Sciences, Lahore, Pakistan.

Dietary tryptophan requirement of laying hens fed corn-soybean meal diets.
William Lambert*, Aude Simongiovanni1, Etienne Corrent1, and Jaap van Milgen2, 1Ajinomoto Eurolysine S.A.S, Paris, France, 2INRA UMR Pegase, Saint Gilles, France.

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.

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*, Sana Ullah2, Saima Naveed2, Talat Naseer Pasha2, Athar Mahmud1, and Usman Liaquat2, 1University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan, 2University of Veterinary and Animal Sciences, Pattoki, Punjab, Pakistan.

Break.

Determination of optimum dietary glycine and serine concentrations for broilers fed low protein diets with varying standardized ileal digestible threonine levels.
Paschal Aguihe*, Alice Murakami1, Iván Camilo Ospina-Rojas1, Claudia Tamehiro1, and Eustace Iyayi2, 1Universidade Estadual de Maringá, Maringá, Parana, Brazil, 2University of Ibadan, Ibadan, Ibadan, Oyo, Nigeria, 3Universidade Estadual do Norte do Paraná, Campus Luiz Meneghel, Bandeirantes, Brazil.

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*, Edgar Oviedo-Rondón1, Albaraa Sarsour1, Deben Sapcota6, 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, ¹*Federal 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, Commentry, France, ²Huazhong Agricultural University, Wuhan, China, ³China Agricultural University, Beijing, China, ⁴Cornell University, Ithaca, NY.
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.

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, 1DSM Nutritional Products, Kaisersugst, Switzerland, 2Université 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.
| Time     | Session    | Title                                                                 | Authors                                                                 | Affiliations                                                                                     |
|----------|------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 9:00 AM  | 608S       | Optical flow analysis for real-time monitoring of broiler welfare and health. | Marian Dawkins*<sup>*, University of Oxford, Oxford, United Kingdom. </sup>                                                   |
| 9:30 AM  | 609S       | Sensing technologies and their application in poultry welfare.        | Wayne Daley*<sup>*, Georgia Tech, Atlanta, GA. </sup>                                                                           |
| 10:00 AM |            | Break                                                                 |                                                                                                                                  |
| 10:30 AM | 610S       | The App universe: Pocket tools to improve health and welfare.        | Inma Estevez*<sup>*, Neiker-Tecnalia, Vitoria-Gasteiz, Alava, Spain. </sup>                                                     |
| 11:00 AM | 611S       | Big data: The real crystal ball to predict the future?                | Rachel Hawken*<sup>*, Cobb-Vantress, Siloam Springs, AR. </sup>                                                                  |
| 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**

| Time     | Session    | Title                                                                 | Authors                                                                 | Affiliations                                                                                     |
|----------|------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 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*<sup>1</sup>, Anita Menconi<sup>1</sup>, Kiran Doranalli<sup>2</sup>, Gregory Mathis<sup>1</sup>, and Brett Lumpkins<sup>3</sup>, <sup>1</sup>Evonik Corporation, Nutrition & Care, Kennesaw, GA, <sup>2</sup>Evonik Nutrition & Care GmbH, Hanau, Germany, <sup>3</sup>Southern Poultry Research, Athens, GA. |
| 8:15 AM  | 289        | A polysaccharidic extract of *Ulva* sp. stimulates in vitro innate immunity in broilers. | Maria Rodriguez*<sup>*, Olmix, Brehan, Morbihan, France. </sup>                                                                    |
| 8:30 AM  | 290        | Effect of dietary supplemental daidzein on immune function in chickens. | Hao Fan*<sup>*, Zengpeng Lv, Liping Gan, and Yuming Guo, China Agricultural University, Beijing, China. </sup>                     |
| 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*<sup>*, Biomin, San Antonio, TX. </sup>                                                                         |
Graded levels of hulless barley and β-glucanase affect the digestive tract morphology of broiler chickens vaccinated for coccidiosis.
Namalika Karunaratne*, Mike Bedford², Rex Newkirk¹, and Henry Classen¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²AB Vista, Marlborough, United Kingdom.

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.

Supplemental dietary microalgal astaxanthin affects hepatic gene expression related to redox status, heat stress, inflammation, and lipid metabolism in laying hens.
Samar Tolba*, Andrew Magnuson¹, Tao Sun¹, Sandip Shinde², and Xingen Lei¹, ¹Cornell University, Ithaca, NY, ²Heliae, Gilbert, Germany.

Effect of xylanase, probiotics and their combination on broiler performance, intestinal lesion observation in response to Eimeria and Clostridium perfringens challenges.
Basheer Nusairat*, James McNaughton², Fang Zhou¹, and Jeng-Jie Wang¹, ¹BioResource International Inc, Durham, NC, ²AHPharma Inc, Hebron, MD.

Evaluation of the effect of a novel Bacillus subtilis (CHCC15076) probiotic strain on chickens subjected to physiological intestinal inflammation.
Alfred Blanch*, Dorthe Sandvang¹, Line Skjøt-Rasmussen¹, Mickael Rouault¹, Jaime Sánchez², and Marta Gracia², ¹Chr. Hansen A/S, Hørsholm, Denmark, ²Imasde Agroalimentaria S.L, Pozuelo de Alarcón, Spain.

Titratable effects of AviLution on cecal bacteria in broiler chickens during infection with Clostridium perfringens.
Lucas Krueger*, David Spangler¹, and Michael Sims², ¹Agri-King, Inc, Fulton, IL, ²VA Diversified Research, Harrisonburg, VA.

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.
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.

Performance of broiler chickens fed Bacillus subtilis DSM 32315 and an antibiotic growth promoter in a necrotic enteritis challenge.

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

The effect of various selenium sources on tissue enrichment in broiler chickens: A meta-analysis.

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, Jianiun Zhang, and Lihong Zhao, China Agricultural University, Beijing, China.

Intestinal morphometry of broilers fed with different trace minerals sources under influence of heat stress.
Jorge Muniz, Leticia Bittencourt*, Rita Donzele, Juarez Donzele, Gabriel Viana, Erika Figueiredo, Leonardo Faria, and Pedro Arnaut, Universidade Federal de Viçosa, UFV, Viçosa, Brazil, DSM, Nutritional Products, São Paulo, Brazil.
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.

Effect of zinc sources and doses on the degree of presence of necrotic enteritis lesions caused by C. perfringens in broilers.
Gregory Mathis*, Brett Lumpkins2, Agathe Romeo1, Denise Cardoso1, and Stephane Durosoy1, 1ANIMINE, Sillingy, France, 2Southern Poultry Research, Athens, GA.

Effect of dietary vitamin level on laying hen performance and egg vitamin content.
Sergio Fernandez*, Ernesto Avila2, and Silvestre Charraga1, 1DSM Nutritional Products México S.A. de C.V, El Salto, Jalisco, Mexico, 2Universidad Nacional Autónoma de México, México City, Mexico.

Effect of 25-hydroxycholecalciferol on single cycle laying hen performance, egg parameters, and well-being.
Darrin Karcher*, Cara Robison3, Todd Applegate2, and Omar Gutierrez4, 1Purdue University, West Lafayette, IN, 2University of Georgia, Athens, GA, 3Michigan State University, East Lansing, MI, 4Huvepharma Inc, Peachtree City, GA.

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.

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.

High-pressure liquid chromatography method determination for organic feedstuffs.
Darlene Bloxham*, Mary Formo1, Rebekah Scott1, Ricardo Nunes2, and Gene Pesti1, 1University of Georgia, Athens, GA, 2Universidade Estadual do Oeste do Parana, Marechal Candido Rondon, PR, Brazil.
8:15 AM 336  **The effects of drinking water additives on performance and intestinal microbiota in broilers.**
Petra Roubos van den Hil*, Mark Davids¹, and Ana Isabel Garcia-Ruiz², *Trouw Nutrition, Boxmeer, Netherlands, ¹Trouw 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, Tarcísio Tizziani², and Maurilio Junior², *Aleris, Jundiai, SP, Brazil, ²Viçosa Federal University, Viçosa, Minas Gerais, Brazil, ³Embrapa Swine and Poultry, Concórdia, Santa Catarina, Brazil, ⁴Viçosa Federal University, Viçosa, Minas Gerais, Brazil, ⁵University 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*, G. Raj Murugesan², and Dawn Koltes³, *Biomin America Inc, Manassas, VA, ²Biomin America Inc, San Antonio, TX, ³University 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*, Kalen Cookson¹, Sam Hendrix², Steve Davis², Jon Schaeffer¹, and John Dickson¹, *Zoetis, U.S. Poultry, Durham, NC, ²Colorado 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, *Trouw Nutrition, Dacula, GA, ²Trouw 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*, Joella Barnes², Richard Carpenter², Michael Showell², and Josh Ison², *VA Diversified Research, Harrisonburg, VA, ²BioWish Technologies, Cincinnati, OH.
9:45 AM 317  **Bacillus subtilis 29784 improves performance of broilers fed different diets.**
Vincent Jacquier*, Lamya Rhayat¹, Pierre André Geraert¹, Karoline Brinch², and Estelle Devillard¹, ¹Adisseo, Commentry, France, ²Novozymes, 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 Whelan¹, Kiran Doranalli¹, German Jurgens², Teemu Rinttilä², and Juha Apajalahti², ¹Evonik Nutrition & Care GmbH, Hanau, Germany, ²Alimetrics Ltd, Espoo, Finland.

10:45 AM 319  **Bacillus subtilis 29784, a reliable efficacy in highly performing broilers.**
Vincent Jacquier*, Lamya 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 Blanch¹, Dorthe Sandvang¹, Line Skjoet-Rasmussen¹, Mickael Rouault¹, Carlos Millán², and Marta Gracia², ¹Chr. Hansen A/S, Hørsholm, Denmark, ²Imasde 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 Markazi¹, Amanda Luoma¹, Revathi Shanmugasundaram¹, G. Raj Murugesan², Michaela Mohn³, and Ramesh Selvaraj¹, ¹The Ohio State University, Wooster, OH, ²Biomin, San Antonio, TX, ³Biomin, 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 612S  **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.
Vegetative buffers: From biomass to bedding.
Amy Barkley*, Penn State University, University Park, PA.

Farm evaluation of chopped giant miscanthus bedding for heavy commercial broilers.
Jeremiah Davis*1 and Joseph Purswell2, 1Auburn University, Auburn, AL, 2USDA ARS, Mississippi State, MS.

Vegetative buffers for energy conservation.
Paul Patterson*, Penn State University, University Park, PA.

Conclusions, questions, and discussion.

Metabolism and Nutrition: Nutrition II
Chair: Justin Fowler, University of Georgia
Moderator: Mike Blair, Devenish Nutrition
Crystal J 1

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.

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 Mohammad Ghasem Abadi*1, Mahmoud Shivazad1, Hossein Moraveg1, and Mohammad Amir Karimi Torshizi2, 1University of Tehran, Karaj, Alborz, Iran, 2Tarbiat Modares University, Tehran, Tehran, Iran.

Effect of extrudates of Bambara groundnut (Vigna subterranea) 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.
Evaluation of processing methods on rubber (*Hevea brasiliensis*) seed meal for use as a potential feed ingredient in the diet of broiler chickens.


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*, Mahmoud Shivazad, Hossein Moraveg, and Mohammad Amir Karimi Torshizi, 1University of Tehran, Karaj, Alborz, Iran, 2Tarbiat Modares University, Tehran, Tehran, Iran.

Dietary supplementation of microalgal astaxanthin produced dose-dependent enrichments of the phytochemical and improved redox status in tissues of broiler chicks.

Tao Sun*, Ran Yin, Andrew Magnuson, Guanchen Liu, Samar Tolba, Sandip Shinde, and Xingen Lei, 1Cornell University, Ithaca, NY, 2Heliae Development, Gilbert, AZ.

Effects of dietary rapeseed meal on laying performance, egg quality, and nutrient digestibility in laying hens.

Liping Zhu*, Jianping Wang, Xuemei Ding, Qufeng Zeng, Shiping Bai, and Keying Zhang, Animal Nutrition Institution, Chengdu, Sichuan, China.

Mycotoxin prevalence in the 2016 US corn crop.


Occurrence of mycotoxins in US corn distillers dried grains with solubles (DDGS).


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.

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*Universidad Politécnica de Madrid, Madrid, Madrid, Spain,* ²DSM Nutritional Products (UK) Ltd, Heanor, United Kingdom.

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*, ²Giovanni Tosi³, Michael Coelho¹, Arianna Bucchioni¹, 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*, ¹Jennifer Timmons¹, Steve Fitz-Coy², and Salina Parveen¹, ¹University Of Maryland Eastern Shore, Princess Anne, MD, ²Merck Animal Health, Millsboro, DE.
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.*

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, 2Southern Poultry Research Group, Athens, GA, 3Elanco Animal Health, Harrisonburg, VA.*

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 Lorenzo1, Raquel Bighetti Araujo2, Ricardo Gonzalez-Esquerra2, Marcelo Falsarella Carazzolle3, Cáio César de Melo Freire4, Paulo Sergio Monzani5, and Anderson Ferreira da Cunha4, 1*Universidade Federal do Paraná, Curitiba, Parana, Brazil, 2Novus International Inc, Indaiatuba, SP, Brazil, 3Universidade Estadual de Campinas, Campinas, SP, Brazil, 4Universidade Federal de São Carlos, São Carlos, SP, Brazil, 5Universidade de São Paulo, Pirassununga, SP, Brazil.*

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, 2University of Agriculture, Faisalabad, Faisalabad, Pakistan, 3University of Veterinary and Animal Sciences, Lahore, Jhang, Pakistan, 4Government College University, Lahore, Pakistan.*

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

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*, Simon Williams, Jafar Mahdavi, and Jos Houdijk, SRUC, Edinburgh, United Kingdom, Akeso Biomedical Inc, Waltham, MA, University 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*, Zahid Nasir, and Theo van Kempen, Trouw Nutrition Agresearch, Guelph, ON, Canada, Trouw 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 Wilson, Melina Bonato*, Liliana Borges, and Ricardo Barbalho, ICC Brazil, São Paulo, Brazil, University of Georgia, Athens, GA, ICC Brazil, 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.
Differences in cecal microbiota between feather peckers and non-peckers.
Patrick Birkl¹ *, 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.

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, Fisicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina.

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, Fisicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina.

Feeding behavior and feed efficiency of slow-growing yellow broilers as measured by automatically recording feeders.
Wei Yan¹ *, 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.

Synbiotic supplement effects on cecal microbial ecology, growth performance and leukocyte populations of broiler chickens reared under heat stress.
Ahmed Mohammed¹ *, Jiaying Hu¹, and Heng-Wei Cheng², ¹ Purdue University, West Lafayette, IN, ² USDA Agricultural Research Service, West Lafayette, IN.

Extension and Instruction

Educating future food professionals in food defense: Are food safety educational models a good fit?
Emefa Monu* and Robert Norton, Auburn University, Auburn, AL.

Innovative poultry teaching and research: Appalachian State University case study.
Anne Fanatico*, Appalachian State University, Boone, NC.
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, Lívia 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**

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, Seyyedeh-Nafiseh Hassani2, Abdolhossein Shahverdi2, and Hossein Baharvand2, 1Tarbiat Modares University, Tehran, Iran, 2Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran.

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.

The effect of selenium on the expression of anti-viral genes in chickens.
Bahram Shojadoost2, A. E. Ted Sefton1, Alexander Bekele-Yitbarek2, Neda Barjestehe2, Adrianna Laursen2, Khaled Taha Abd Abdelaziz2, Kristen Brennan2, Kayla Price1, Trevor Smith4, and Shayan Sharif1, 1Tarbiat Modares University, Tehran, Iran, 2Alltech, Guelph, ON, Canada, 3Ontario Veterinary College, Guelph, ON, Canada, 4Alltech Global Headquarters, Nicholasville, KY, 4Ontario Agricultural College, Guelph, ON, Canada.

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.

Farouk Abdou*, 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.

MicroRNA regulatory mechanisms of the hepatic metabolic transition in developing chickens.
Julie Hicks2, Tom Porter*, and Hsiao-Ching Liu, 1University of Maryland, College Park, MD, 2North Carolina State University, Raleigh, NC.
Genetic parameters for body weight and egg production traits in Korean native chicken.

Immunology, Health, and Disease

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.

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.

Identification and functional characterization of a novel chicken interleukin 26 (chIL-26).
Yeong Ho Hong*¹, Anh Duc Truong¹, Yeojin Hong¹, Hans Cheng², and Hyun Lillehoj³, ¹Chung-Ang University, Anseong, Gyeonggi-do, Korea, ²USDA-ARS, East Lansing, MI, ³USDA-ARS, Beltsville, MD.

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 Pavani³, Luciana Facco Dalmolin³, Viviane Mariguella Casagrande³, Maria de Lurdes Feres Tamanini³, Maria de Fatima S. Montassier², Renata Fonseca Vianna Lopez², and Helio José Montassier², ¹Empresa Brasileira de Pesquisa Agropecuária, São Carlos, Brazil, ²Universidade Estadual Paulista–Unesp Jaboticabal, Jaboticabal, Brazil, ³Universidade de São Paulo–Usp Ribeirão Preto, Ribeirão Preto, Brazil.

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 Harquis³, and Lisa Bielke¹, ¹Ohio State University, Columbus, OH, ²University of Guelph, Guelph, ON, Canada, ³University of Arkansas, Fayetteville, AR.

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, ¹Cal Poly Pomona, Pomona, CA, ²College of Veterinary Medicine, Pomona, CA, ³Molecular 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.


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 Sharif2, 1Alltech, Guelph, ON, Canada, 2Ontario Veterinary College, Guelph, ON, Canada, 3Ontario Agricultural College, Guelph, ON, Canada.


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.
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.*

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.*

Industry-wide survey of avian pathogenic *E. coli* levels in US broilers.
Evan Hutchison*, Alexandra Smith, and Thomas Rehberger, *Agro BioSciences, Wauwatosa, WI.*

Effect of supplementing organic selenium on lymphocyte proliferation and antibody titer of broilers.
Anete Rorig*, Lucas Kind Alvares, Regina Buzim, Daiana Rosse Martins Golcalves, Daiane Horn, and Jovanir Ines Muller Fernandes, *Federal University of Parana–Brazil, Palotina, Parana, Brazil.*

Effect of antibiotic withdrawal in feed on chicken gut microbial dynamics, immunity and growth performance.
Sanjay Kumar*¹¹, Chongxiao Chen², Nagaraju Indugu³, Gabriela Welang¹, Manpreet Singh², Woo Kyun Kim², and Harshavardhan Thippareddi², ¹Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, ²University of Georgia, Athens, GA, ³University of Pennsylvania, Kennett Square, PA.

Cecal microbiota potentially contributes to enterococcal spondylitis in broilers.
Joshua Rehberger*, Alexandra Smith, Evan Hutchison, Dan Karunakaran, and Thomas Rehberger, *Agro BioSciences, Wauwatosa, WI.*

Effect of antibiotic administration on the frequency of intestinal intraepithelial leukocytes and goblet cells in broiler chicks challenged with *Clostridium perfringens*.
Yewande Fasina*¹¹ and Frederic Hoerr², ¹North Carolina A&T State University, Greensboro, NC, ²Veterinary Diagnostic Pathology LLC, Fort Valley, VA.

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.*
Transcriptional analysis of differentially expressed genes in two Fayoumi chicken lines afflicted with necrotic enteritis by RNA sequencing.
Yeojin Hong*, Anh Duc Truong¹, Yeong Ho Hong¹, Jangguen Lee¹, Kyungbaek Lee¹, Hyun Lillehoj², and Susan Lamont³, ¹Chung-Ang University, Anseong, Gyeonggi-do, Korea, ²United States Department of Agriculture, Beltsville, MD, ³Iowa State University, Ames, IA.

Variation in Blackhead infection rates in different strains of turkeys.
Christina Sigmon* and Robert Beckstead, North Carolina State University, Raleigh, NC.

Prediction of high epitopic regions of Clostridium perfringens alpha toxin as an immunizing agent.
Ahmadreza Valipouri¹, Shaban Rahimi*, Ali Asghar Karkhane², and Mohammad Amir Karimi¹, ¹Tarbiat Modares University, Tehran, Iran, ²National Institute of Genetic Engineering and Biotechnology, Tehran, Iran.

Management and Production

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.

Assessment of in ovo injection of Bifidobacterium bifidum and Bifidobacterium longum on performance, hematological, and biochemical profile of broiler chicks.

Effects of fumonisin B₁ and mycotoxin binder on relative organ weights, meat quality and serum characteristics in broiler chickens housed at different stocking density.

Effect of color of lighting, breeder hen age and methionine restriction on performance and viscera weights of broilers.
Diego Martinez*, Cristian Uculmana¹, and Carlos Vilchez², ¹LIAN Development & Service, Lima, Peru, ²La Molina National Agrarian University, Lima, Peru.

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.
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.

Impact of increased activity during rearing on incidence of woody breast in male broilers.  
Barbara de Almeida Mallmann*, Karen Christensen, Dawn Koltes, Shawna Weimer, Juan Caldas-Cueva, Craig Coon, and Casey Owens, University of Arkansas, Fayetteville, AR.

Effect of ad libitum, split, and restricted feeding on performance, digestibility and welfare of broiler chickens.  
Gbemiga Adeyemo*, University of Ibadan, Ibadan, Oyo, Nigeria.

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, ¹Federal University of Paraiba, Bananeiras, Brazil, ²Universidade Federal da Paraiba, Solânea, Brazil.

Metabolism and Nutrition: Amino Acids

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.

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, ¹Federal University of Paraiba, Areia, Brazil, ²Federal University of Paraiba, Bananeiras, Brazil.

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, ¹Konkuk University, Seoul, Korea, ²Kyungpook National University, Sangju, Korea.

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.
Digestible total sulfur amino acids requirements of two strains of brown laying hens.
Moung-Cheul Keum*, Da-Hye Kim¹, Sang Lee¹, Kyung-Woo Lee¹, Kwan-Eung Kim², Gyo-Moon Choo³, and Byoung-Ki An¹, ¹Konkuk University, Seoul, Korea, ²Nonghyup Feed, Seoul, Korea, ³Busan Bio, Nonghyup Feed Inc, Busan, Korea.

Dietary amino acid responses of male Cobb MV × 700 broilers from 0 to 46 d post-hatch.
Craig Maynard*, Rocky Latham², Roy Brister², Casey Owens¹, and Samuel Rochell¹, ¹University of Arkansas, Fayetteville, AR, ²Tyson Foods, INC, Springdale, AR.

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.

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.

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 Malheiro, and Kimberly Livingston, North Carolina State University, Raleigh, NC.

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.

Comparison of methionine sources in diets for broilers from 0 to 28 days of age.
Felipe Fernandez*, Lorena Morao², Victor Naranjo¹, and Ariane Helmbrecht¹, ¹Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany, ²Evonik Argentina SA, Boulogne, Argentina.

Responses of Ross 308 broiler chicks to different levels of valine amino acids in growing period.
Arash Hassanzadeh Seyedi* and Hossein Janmohammadi, University of Tabriz, Tabriz, East Azarbijan, Iran.

Determination of dietary leucine amino acid requirement for Ross 308 male broiler chicks in finisher period.
Elnaz Safiyary* and Parviz Farhoomand, University of Urmia, Tehran, Tehran, Iran.
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, 1Federal University of Paraiba, Bananeiras, Brazil, 2Federal University of Paraiba, Areia, Brazil.

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, Vinicius Oliveira1, and Thaisa França1, 1Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, São Paulo, Brazil, 2Evonik Nutrition, Hanau-Wolfgang, Germany.

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.

Ideal dietary levels of leucine, valine, and isoleucine in low-protein diets for broiler chickens using response surface methodology.
Iván Camilo Ospina-Rojas*, Alice Eiko Murakami1, Márcia Izumi Sakamoto1, Paschal Aguihe2, and Paulo Cesar Pozza1, 1Universidade Estadual de Maringá, Maringá, Brazil, 2University of Ibadan, New Bussa, Nigeria.

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.

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.

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.

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 Bertechni*, University Federal of Lavras, Lavras, Minas Gerais, Brazil.

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 Bertechni*, University Federal of Lavras, Lavras, Minas Gerais, Brazil.
Digestible valine requirements for laying hens.
Vinícius Oliveira*, Euclides Malheiros1, Nilva Sakomura1, Matheus Reis2, Camila Gonçalves1, and Fernando Antayhua1, 1UNESP, Jaboticabal, São Paulo, Brazil, 2Unesp, Jaboticabal, São Paulo, Brazil.

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

A meta-analysis of the effect of Victus Broiler under commercial and experimental conditions.
Nelson Ward*, 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.

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.

Multi-Carbohydrase supplementation improves growth performance and nutrient digestibility in broiler chickens.
Samiru Wickramasuriya*, 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.

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.

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.

Efficacy of NSPase inclusion in reduced energy diets on broiler growth performance.
Halei Williams*, Mallori Williams1, Nathan Augspurger2, Blyn Brown2, and Jason Lee1, 1Texas A&M University, College Station, TX, 2JBS United, Sheridan, IN.
**Carbohydrases in poultry diets on ileal digestibility of nutrients.**
Jomara Broch*2, Ricardo Nunes1, Cinthia Eyng1, Wagner Silva3, Idiana Silva1, Marina Susin1, Gabriela Sangalli6, and Paulo Pozza4, 1Universidade Estadual do Oeste do Parana, Athens, GA, 2Universidade Estadual do Oeste do Paraná - UNIOESTE, Marechal Cândido Rondon, Paraná, Brazil, 3Safeeds, Cascavel, Brazil, 4Universidade Estadual de Maringá, Maringa, Brazil.

**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, 1Texas A&M University, College Station, TX, 2JBS United, Sheridan, IN.

**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, 1University of Sao Paulo, Pirassununga, Sao Paulo, Brazil, 2Adisseo Brazil, Sao Paulo, SP, Brazil.

**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, 1Texas A&M University, Cypress, TX, 2Agrivida, Medford, MA.

**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, São Paulo, Brazil.

**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, 1University of Hawaii at Manoa, Honolulu, HI, 2AB Vista Feed Ingredients, Marlborough, United Kingdom.

**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, 1University of Illinois, Urbana, IL, 2Agrivida, Medford, MA.

**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.
Phytase activity of mash and pelleted monogastric diets containing Allzyme SSF.
Nicole Weidner2, Justin Combs3, Shane Carson4, Megan Scholer2, Kayla Price*, Paul Groenewegen4, and Becky Timmons3, 1Alltech, Guelph, ON, Canada, 2Ontario Veterinary College, Guelph, ON, Canada, 3Alltech Inc, Nicholasville, KY, 4Masterfeeds, London, ON, Canada.

Extra-phosphoric effect of phytase on broiler performance from 1 to 42 days.
Jomara Broch*, Ricardo Nunes1, Cinthia Eyn1, 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.

Addition of exogenous protease improves the weight gain of broiler chickens.
Everton Krabbe*, 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.

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 Parana, Curitiba, Brazil.

True content of digestible amino acids from different sources associated with exogenous enzymes for broilers at 7 days of age.
Bruno Fortes*, Marcos Café2, José Henrique Stringhini2, Júlio César Carvalho3, Jerônimo Brito1, and Thony Carvalho5, 1Instituto Federal Goiano, Iporá, Goias, 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.

Content of true digestible amino acids in different protein sources associated with enzyme supplementation for broilers at 21 days of age.
Bruno Fortes*, Marcos Café2, José Henrique Stringhini2, Thony Carvalho3, Camila Meneghetti4, and Antonio Junior4, 1Instituto Federal de Educação, Ciência e Tecnologia Goiano, Iporá, Goias, 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.
**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.

**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**

**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 Rodrigues1, Valquiria Cruz-Polycarpo1, and Ricardo de Albuquerque3, 1São Paulo State University (Unesp), Dracena, São Paulo, Brazil, 2Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, 3University of São Paulo (USP), Pirassununga, São Paulo, Brazil.

**Growth performance and nutrient retention in broiler chickens fed corn-soybean meal diets without or with exogenous epidermal growth factor upon challenge with Eimeria.**
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**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 Maria 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.

**Modification of egg yolk fatty acids profile by using dietary linseed oil and grape pomace.**
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**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.
Productive and economic effects of withdrawing growth-promoting antibiotics on Brazilian broiler production.

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.

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 Conti Neto, Julianna Batistioli, Juliana Denadai, and Jose Sartori, São Paulo State University (UNESP), Botucatu, São Paulo, Brazil.

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 Sringongkote2, 1Evonik Nutrition & Care GmbH, Hanau, Germany, 2Animal Research and Consultant Co. Ltd, Samutprakan, Thailand.

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.

Effects of dietary bee venom on growth performance, meat quality, serum parameters, intestinal morphology and cecal volatile fatty acid concentration in broiler chickens.
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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, 1School of Veterinary Medicine and Animal Science, Sao Paulo State University, Botucatu, Brazil, 2YES - YesSinergy do Brasil, Campinas, Brazil.
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, 1Cargill Animal Nutrition, Campinas, São Paulo, Brazil, 2Cargill Animal Nutrition, Paris, France, 3Cargill Animal Nutrition, Hopkins, MN.

Efficacy of an anti-mycotoxin additive supplemented in broiler diets contaminated with naturally produced mycotoxin.
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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.

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.

Comparative effect of extracts and leaf meal of bitter leaf (Vernonia amygdalina) with antibiotics on performance and blood profile of broilers.
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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, 1University of Arkansas, Fayetteville, AR, 2Lincoln International Academy, Managua, Managua, Nicaragua.

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 Kreuz1, 1Aleris, Jundiai, SP, Brazil, 2Santa Catarina State University-UDESC, Chapecó, Santa Catarina, Brazil, 3University Federal de Viçosa, Viçosa, Minas Gerais, Brazil, 4Embrapa Swine and Poultry, Concordia, Brazil.
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.

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, 1Texas A&M University System, College Station, TX, 2USDA, College Station, TX, 3Texas A&M Health Science Center, College Station, TX.

Use of essential oils in diet improve the performance of broilers at 21d challenged by Eimeria sp.
Maria Estela Moro2, Rafael Nacimento*1, Lívia Maria Soares Queiroz2, Carlos Alexandre Granghelli2, Paulo Henrique Pelissari1, Luis Vinícius Sanfelice1, Brunna Garcia de Souza Leite1, and Lucio Araújo1, 1University of Sao Paulo, Pirassununga, Sao Paulo, Brazil, 2University of São Paulo, Cardoso, Brazil.

Thymol feed supplementation and growth performance in a commercial broiler flock.
Agustin Luna1, Marcos Tarifa1, Julio Zygadlo2, and Raul Marin*1, 1Instituto 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, 2Instituto Multidisciplinario de Biología Vegetal (CONICET-UNC), Córdoba, Argentina.

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.

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.

Performance characteristics of broiler chickens and French Guinea fowl broilers fed diets supplemented with probiotics L. reuteri and Streptomyces.
Samuel Nahashon*, Sarayu Bhogoju, Agnes Kilonzo-Nthenga, Joseph Donkor, Boniface Kimathi, Collins Khwatenge, and Thyniece Taylor, Tennessee State University, Nashville, TN.
Commercial organic acid complex (Salkil) improves feed utilization in broiler chickens.
Julia Trautwein*, Augustine Owusu-Asiedu, Leon Broom, and Georg Dusel,
1University of Applied Sciences Bingen, Bingen, Germany, 2Anpario PLC, Nottinghamshire, United Kingdom.

Utilization of quorum sensing as ingredients selection tool for a botanical feed additive.
Tim Goossens, Daniel Ramírez, and Haitham Yakout*, 1Nutriad International NV, Dendermonde, Belgium, 2Nutriad Inc, Hampshire, IL.

A precision delivery coated butyrate and a botanical product: Evaluating individual or combined applications on broiler performance.
Daniel Ramírez, Tim Goossens, and Haitham Yakout*, 1Nutriad International NV, Dendermonde, Belgium, 2Nutriad Inc, Hampshire, IL.

Effects of temperature and addition of passion fruit seed oil on health and nutrition for broilers of 1 to 21 days old.
Leonardo Zanetti*, Jose Sartori, Juliana Denadai, Guilherme Pasquali, Everton Muro, Tatiane Santos, Daniele Souza, Livia Dornelas, Raimundo Ferreira Neto, Armando Contin Neto, Julianna Batistioli, and Fernanda Lima, 1São Paulo State University (UNESP), Botucatu, São Paulo, Brazil, 2UNIMAR, Marília, São Paulo, Brazil, 3UFPR, Palotina, Paraná, Brazil.

Betaine and butyric acid for broiler chicks deprived of water and feed for 48 hours before housing.
Paola Serpa, Jose Sartori*, Mônica Aoyagi, Guilherme Pasquali, Juliana Denadai, Everton Muro, Maria Sartori, and Denise Sartori, 1São Paulo State University (UNESP), School of Veterinary Medicine and Animal Science, Botucatu, São Paulo, Brazil, 2São Paulo State University (UNESP), School of Agriculture, Botucatu, São Paulo, Brazil, 3São Paulo State University (UNESP), Institute of Biosciences, Botucatu, São Paulo, Brazil.

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.

Phytogenic additive: Effect on intestinal and caecal diversity microbiome of broilers.
Adrieli Braga de Cristo, Heloisa Fialkowski Bordignon*, Daiana Rosse Martins Golcalves, Thais Lina Taniguti, Fernanda Lima, and Jovanir Ines Muller Fernandes, Federal University of Parana-Brazil, Palotina, Parana, Brazil.
Heat stability of carvacrol and trans-cinnamaldehyde during commercial manufacturing temperatures in chicken feed.
Indu Upadhyaya*, 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.

Evaluation of the potential for select probiotics to enhance phosphorus bioavailability in broiler chickens.
Joseph Donkor*, Sarayu Bhogoji, Agnes Kilinzo-Nthenge, Thyniece Taylor, and Samuel Nahashon, Tennessee State University, Nashville, TN.

Metabolism and Nutrition: Nutrition

Variability of metabolisable energy in different field bean cultivars for broilers.

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.

Expression of umami receptors T1R1/T1R3 in different tissues including intestinal segments of broiler chickens.
Liju Ni1, Yiran Liu2, Trinh Nguyen2, Jie Yin3, Tijun Li3, Min Tang4, Joshua Gong5, Guanquen Chen6, and Chengbo Yang7, 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.

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.

Relationships between nutrient composition, fatty acids content and color characteristics of corn grains.
Ahmet Pekel*, 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.
Impact of dietary supplementation of garlic-derived diallyl disulphide and diallyl trisulphide on broiler chicken growth performance, gut morphology, and cecal microflora.
Saheed Osho*, Nathan Horn2, and Olayiwola Adeola1, 1Purdue University, West Lafayette, IN, 2Biomatrix International, Princeton, MN.

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, Natali da Cruz2, and José Vilar Da Silva2, 1Federal University of Paraiba, Bananeiras, Brazil, 2Universidade Federal da Paraiba, Solânea, Brazil.

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 0×, 1×, or 3×.
Michael Sims*1, Jack Garrett2, and Greg Nunnery2, 1VA Diversified Research, Harrisonburg, VA, 2QualiTech Inc, Chaska, MN.

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, 1Brazilian Agricultural Research Corporation-Embrapa Swine and Poultry, Concordia, Santa Catarina, Brazil, 2Federal University of Pelotas, Pelotas, Brazil.

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.

Effect of dietary supplementation of Actigen on performance of broiler chicks injected with dexamethasone.

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.

Dynamics in hepatic levels of ALA derived from hempseed and flaxseed oils for egg enrichment with omega-3 PUFA.
Mohamed Neijat*, Miyoung Suh2, Peter Eck2, and James House2, 1University of Guelph, Guelph, ON, Canada, 2University of Manitoba, Winnipeg, MB, Canada.
Comparison of energy values estimated by direct, and regression methods for broiler chickens.
Jinyoung Lee* and Changsu Kong, 1Kyungpook National University, Sangju, Korea, 2Konkuk University, Seoul, Korea.

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.

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.

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 Valquiria Cruz-Polycarpo*, São Paulo State University (Unesp), Dracena, São Paulo, Brazil.

Efficacy of an algol-clay complex on decreasing mycotoxins liver toxicity on broiler.
Maria Rodriguez*, Olmix, Brehan, Morbihan, France.

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*, Bruce Lindquist, Jimmie Corley, and Ryan Arsenault, USDA-ARS, College Station, TX, University of Delaware, Newark, DE, Phileo Lesaffre Animal Health, Humboldt, IA, Phileo Lesaffre Animal Health, Iola, TX.

Role of selenium enriched yeast on low pathogenic avian influenza virus (H9N2) shedding in chickens.
Bahram Shojadoost, A. E. Ted Sefton, Alexander Bekele-Yitbarek, Neda Barjesteh, Adrianna Laursen, Tamiru Alkie, Wanderly Quinteiro-Filho, Kayla Price, Trevor Smith, and Shayan Sharif, Alltech, Guelph, ON, Canada, 2Ontario Veterinary College, Guelph, ON, Canada, 3Ontario Agricultural College, Guelph, ON, Canada.

The effect of mannan-rich yeast cell wall based dietary supplements on the intestinal digestive enzyme capacity of broilers.
Conor McCaffrey*, Aoife Corrigan, and Paul Moynagh, Maynooth University, Maynooth, Kildare, Ireland, Alltech Ireland, Dunboyne, Meath, Ireland.
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.

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 Nacimento¹, Ana Santos de Oliveira¹, Lucio Araújo¹, and Cristiane Araujo¹, ¹University of Sao Paulo, Pirassununga, Sao Paulo, Brazil, ²University of Sao Paulo, Cardoso, Brazil.

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 Nacimento¹, Júlio de Carvalho Balieiro¹, Lucio Araújo¹, and Cristiane Araujo¹, ¹University of São Paulo, Pirassununga, São Paulo, Brazil, ²University of São Paulo, Cardoso, Brazil.

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.

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.

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.

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.

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.
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, 1Novus International Inc, Saint Charles, MO, 2University of Missouri, Columbia, MO.

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.

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, 1Colegio de Post-graduados, Campus Montecillo, Montecillo, Mexico, Mexico, 2Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, México, Mexico, 3Universidad Autónoma Chapingo, Chapingo, Mexico, Mexico.

Metabolism and Nutrition: Vitamins and Minerals

Evaluation of chromium propionate on broiler growth performance and processing yields.
Thomas Lester*1, Kyle Brown1, Christopher Eagleson1, Vanessa Iseri2, and Jason Lee1, 1Texas A&M University, College Station, TX, 2Kemin Industries Inc, Des Moines, IA.

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.

Selenium sources for broiler breeders.
Priscila Zorzetto*1, Márcio Ceccantini2, Adriana Toscan2, Guilherme Gonçalves2, Fabricia Roque1, and Cristiane Araujo1, 1University of Sao Paulo, Pirassununga, Brazil, 2Adisseo Brazil, Sao Paulo, Brazil.

High-pressure liquid chromatography analysis of choline in organic feedstuffs.
Darlene Bloxham*1, Mary Formo1, Rebekah Scott1, Ricardo Nunes2, and Gene Pesti1, 1University of Georgia, Athens, GA, 2Universidade Estadual do Oeste do Parana, Marechal Candido Rondon, PR, Brazil.

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.
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.

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.

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 Qiu Feng Zeng, Animal Nutrition Institute, Chengdu, Sichuan, China.


Plateau models for estimating the optimal zinc level in the diet of broiler chickens from 1 to 21 days of age. Maria Màrcia Sartori*1, Juliana Cristina Rezende2, Jose Sartori2, and Antonio Pezzato2, 1São Paulo State University, College of Agricultural Science, Botucatu, São Paulo, Brazil, 2São Paulo State University, College of Veterinary Medicine and Animal Sciences, Botucatu, São Paulo, Brazil.

Sources and granulometries of the limestone in the initial and growth diets of broilers. Silvana Santos*,1, Aliton Silva1, João Pedro Silva1, Lucas de Albuquerque1, Leandro de Araújo2, and José Vilar Da Silva3, 1Federal University of Paraiba, Areia, Brazil, 2Estadual University of Paraiba, Campina Grande, Brazil, 3Federal University of Paraiba, Bananeiras, Brazil.

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 Viçosa, UFV, Viçosa, Brazil, 2DSM, Nutritional Products Brazil, São Paulo, Brazil.

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.
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.

Dietary supplementation of water-soluble vitamins for white commercial layers from 28 to 44 weeks of age.
Sandra Salguero Cruz*, Dandara Felix de Oliveira, Gabriel Viana, Valdir Ribeiro Junior, Luis Albino, and Horacio Rostagno, Federal University of Viçosa, Vicos, Minas Gerais, Brazil.

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, 1Federal University of Paraíba, Bananeiras, Brazil, 2Universidade Federal da Paraíba, Solânea, Brazil.

Microbiology and Food Safety

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, 1Razi Vaccine and Serum Production Research Institute, Karaj, Alborz, Iran, 2Tarbiat Modares University, Tehran, Tehran, Iran.

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, Jeremy Jackson1, Susan Mize2, Sanjay Kumar1, Amanda Howard1, Angela Rincon1, Mayuri Ukidwe1, Melissa Landrum*, Johnathan Frye2, Jodie Plumblee1, Lari Hiott2, 1University of Georgia, Crawford, GA, 2The U.S. National Research Center, Athens, GA.

Effect of supplementation of trans-cinnamaldehyde with or without oxytetracycline on multidrug-resistant Salmonella Heidelberg in turkey poults.
Divek V. T. Nair*, Jijo Vazhakkattu Thomas, and Anup Kollanoor Johny, University of Minnesota, Saint Paul, MN.

Antimicrobial wash with trans-cinnamaldehyde nanoemulsion reduces Campylobacter jejuni on chicken skin.
Abhinav Upadhyay*, Basanta Raj Wagle1, Sandip Shrestha1, Indu Upadhyaya1, Komala Arsi1, Kanika Bhargava2, Annie Donoghue3, and Dan Donoghue1, 1University of Arkansas, Fayetteville, AR, 2University of Central Oklahoma, Edmond, OK, 3USDA-ARS, Fayetteville, AR.
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.

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.

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, 1Tarbiat Modares University, Tehran, Iran, 2Department of Mycology, Pasteur Institute of Iran, Tehran, Iran.

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 Hiett1, and Andrew Caudill2, 1USDA-ARS, Athens, GA, 2University of Georgia, Athens, GA.

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, 1University of Arkansas, Fayetteville, AR, 2USDA, Fayetteville, AR.

Eggshell cuticle plug protection against invading pathogens in table eggs.
Garima Kulshreshtha*1, Alejandro Rodriguez-Navarro2, Estefania Sanchez-Rodriguez2, and Maxwell Hincke1, 1University of Ottawa, Ottawa, ON, Canada, 2Universidad de Granada, Granada, Spain.

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, 1Diamond V, Virginia Beach, VA, 2University of Arkansas, Fayetteville, AR, 3Diamond V, Cedar Rapids, IA.

Bacterial populations relative to ammonia-capture systems in poultry research housing.
Lorna Graham*1, Fawzy Hashem1, Felix Buabeng1, and Patricia Millner2, 1University of Maryland Eastern Shore, Princess Anne, MD, 2US Department of Agriculture, Beltsville, MD.
Assessing tissue colonization and egg contamination by *Salmonella Oranienburg* in laying hens.
Uma Babu¹, Monika Proszkowiec-Weglarz², and Kannan Balan*¹, ¹FDA, Laurel, MD, ²USDA, Beltsville, MD.

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.

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, Jeremy Jackson², Melissa Landrum¹, and Jeanna Wilson¹, ¹University of Georgia, Athens, GA, ²The U.S. National Poultry Research Center, Athens, GA.

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.

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.

Proteomic analysis of *Campylobacter* interaction with amoeba host.
Deepti Samarth*¹, Young Min Kwon¹, Rohana Liyanage²³, and Jackson Lay²³, ¹Department of Poultry Science, University of Arkansas, Fayetteville, AR, ²Department of Chemistry, University of Arkansas, Fayetteville, AR, ³Statewide Spectrometry Facility, Fayetteville, AR.

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.

Molecular and Cellular Biology

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, ¹University of Arkansas, Fayetteville, AR, ²USDA, Agricultural Research Service, Poultry Production and Product Safety Research Unit, Fayetteville, AR.
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.

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.

Physiology and Reproduction

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.

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.

Enzymatic profile of broilers affected with white striping and wooden breast myopathies.

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.

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.

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.
Basophilia, basophiliosis, and toroids—Observations on atypia in duck blood.
Paul Cotter*, Cotter Laboratory, Arlington, MA.

Changes in intestinal length and jejunal integrity between broiler and layer chickens.
Sara Orlowski, Nicholas Anthony, Samuel Rochell, and Dawn Koltes*,
University of Arkansas, Fayetteville, AR.

Effect of chromium oxide on egg quality parameters in White Leghorns.
Pratulla Regmi*2, Joseph Leszcz1, Cara Robison1, Deana Jones3, and Darrin Karcher2, 1Michigan State University, East Lansing, MI, 2Purdue University, West Lafayette, IN, 3USDA ARS, Athens, GA.

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.

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.

Chicken enterocyte culture to screen chemicals affecting poultry intestinal integrity.
Anamika Gupta*1 and Narayan Rath2, 1University of Arkansas, Fayetteville, AR, 2Poultry Production and Product Safety Research Unit, Fayetteville, AR.

Processing and Products

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 Abdaljaleel1, Yasser Jameel2, Mohammed Hashim1, and Christopher Bailey1, 1Texas A&M University System, College Station, TX, 2University of Kerbala, Karbala, Iraq.

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, Jeromay Jackson3, Susan Mize1, Sanjay Kumar3, Amanda Howard3, Angela Rincon3, Mayuri Ukidwe1, Melissa Landrum2, Johnathan Frye1, Jodie Plumblee1, and Lari Hiott1, 1US Dept of Agriculture, Athens, GA, 2University of Georgia, Crawford, GA, 3University 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.**
Sylwia Sobolewska², Janusz Orda², Bogdan Jarosz², Jacek Majda³, Małgorzata Serowik², Stephen Rose¹, and Vasil Pirgozliev*¹, ¹Harper Adams University, Newport, United Kingdom, ²Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland, ³34th 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 Koltes², Karen Christensen², and Casey Owens*², ¹Nanjing Agricultural University, Nanjing, Jiangsu, China, ²University of Arkansas, Fayetteville, AR.

567P  **Impacts of phytogenic 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, ¹University of Arkansas, Fayetteville, AR, ²Ayurved Ltd, Baddi, India.

568P  **Economic impact related to the condemnation of post-mortem poultry in southern Brazil.**

569P  **Physicochemical and functional properties of egg white powder prepared from shell eggs irradiated at low doses.**
Mahalet Nega*, Byungrok Min¹, Sun Hee Moon², and Dong Ahn³, ¹University of Maryland Eastern Shore, Princess Anne, MD, ²University of Arkansas for Medical Science, Little Rock, AR, ³Iowa State University, Ames, IA.

570P  **Whole carcass rinse versus whole carcass enrichment for determining Salmonella presence on commercially processed quail.**
Douglas Cosby*, 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, ¹US Department of Agriculture, USNPRC, Athens, GA, ²University 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*, Angela Rincon3, Brian Bowker2, Hong Zhuang1, and R. Jeff Buhr2, 1U.S. National Poultry Research Center, Athens, GA, 2USDA-ARS, Athens, GA, 3University 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*, Morgana Zorte1, Aline Santos de Mello1, Tainá Dalpiaz1, Gustavo Perdoncini2, and Andrea Pinto1, 1Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, 2Naturovos, 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*, Harshavardha Thippareddi3, Casey Ritz3, Mark Berrang1, Jeremey Jackson1, Susan Mize1, Sanjay Kumar3, Amanda Howard3, Angela Rincon3, Mayuri Ukidwe3, Melissa Landrum2, Johnathan Frye1, Jodie Plumblee1, and Lari Hiott1, 1US Department of Agriculture, Athens, GA, 2University of Georgia, Crawford, GA, 3University 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*, 1Purdue University, West Lafayette, IN, 2USDA, 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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