President’s Welcome ................................................................. 1
Schedule at a Glance .................................................................. 3
Contact Information and Meeting Details .................................. 8
Hilton New Orleans Riverside Map ............................................. 11
Downtown New Orleans Map .................................................. 12
PSA 2016 Special Events .......................................................... 13
Sponsors and Exhibitors ........................................................... 15
PSA 105th Annual Meeting Exhibitors ...................................... 18
Program Grid ................................................................. 25

Monday, July 11

Monday Morning Sessions
Opening Session ....................................................................... 29
Student Competition Oral Presentations
  Immunology, Health, and Disease I ........................................... 29
  Management and Production ............................................... 31
  Metabolism and Nutrition: Enzymes ................................... 33
  Metabolism and Nutrition: Feed Additives ......................... 35
  Metabolism and Nutrition: Nutrition I ................................. 37
  Microbiology and Food Safety I ........................................... 38

Monday Afternoon Sessions
Informal Nutrition Symposium ............................................... 40
National Extension Workshop ............................................... 41
Microbiology and Food Safety .............................................. 42
Processing and Products ...................................................... 44
Animal Well-Being and Behavior ........................................... 46

Tuesday, July 12

Tuesday Morning Sessions
Student Competition Oral Presentations
  Immunology, Health, and Disease II ..................................... 47
  Metabolism and Nutrition: Nutrition II ................................. 48
  Microbiology and Food Safety II ........................................... 48
  Physiology and Reproduction ............................................. 49
  Animal Well-Being and Behavior ........................................ 50
  Metabolism and Nutrition: Amino Acids ............................. 52
  Molecular and Cellular Biology ......................................... 53
  Genetics and Genomics ..................................................... 55
Tuesday Afternoon Sessions
Symposium: Challenges with Antibiotic-Free Poultry Production ........................................... 58
Symposium: Environmental Lighting in Poultry Facilities: New Technologies and New Results ............ 59
Metabolism and Nutrition: Enzymes I .............................................................. 60
Metabolism and Nutrition: Feed Additives I .................................................. 62
Physiology and Reproduction .............................................................................. 65
Business Meeting and Breakfast .............................................................................. 67
WPSA Lecture ......................................................................................... 67
Extension and Instruction ..................................................................................... 67

Wednesday, July 13

Wednesday Morning Sessions
Management and Production I .............................................................................. 68
Metabolism and Nutrition: Feed Additives II ....................................................... 69
Metabolism and Nutrition: Nutrition I ............................................................... 70
Molecular and Cellular Biology ............................................................................. 71
Genetics and Genomics ....................................................................................... 72

Wednesday Afternoon Sessions
Symposium: Salmonella and Campylobacter Control During Poultry Processing: Advances and Regulatory Compliance in the New Millennium .............................................................. 72
Symposium: Rethinking Our Approach to Poultry Science Through Duck Research ....................................................................................... 73
Immunology, Health, and Disease I ..................................................................... 74
Metabolism and Nutrition: Feed Additives III ....................................................... 76
Metabolism and Nutrition: Nutrition II ............................................................... 77
Metabolism and Nutrition: Enzymes II ................................................................ 78

Thursday, July 14

Thursday Morning Sessions
Symposium: Nutrition Ecology—Feeding the Gut or the Bird. ............................................. 80
Metabolism and Nutrition: Amino Acids ..................................................................... 80
Metabolism and Nutrition: Nutrition III ..................................................................... 82
Management and Production II .............................................................................. 84

Thursday Afternoon Sessions
Symposium: Avian Embryo Nutrition and Incubation .................................................. 85
Symposium: Meeting Today’s Animal Care Standards: Are You Ready? .................. 86
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunology, Health, and Disease II</td>
<td>87</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Vitamins and Minerals</td>
<td>89</td>
</tr>
<tr>
<td>Animal Well-Being and Behavior</td>
<td>92</td>
</tr>
<tr>
<td>Extension and Instruction</td>
<td>93</td>
</tr>
<tr>
<td>Genetics and Genomics</td>
<td>93</td>
</tr>
<tr>
<td>Immunology, Health, and Disease</td>
<td>94</td>
</tr>
<tr>
<td>Management and Production</td>
<td>98</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Nutrition</td>
<td>100</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Amino Acids</td>
<td>102</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Enzymes</td>
<td>104</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Feed Additives</td>
<td>106</td>
</tr>
<tr>
<td>Metabolism and Nutrition: Vitamins and Minerals</td>
<td>111</td>
</tr>
<tr>
<td>Microbiology and Food Safety</td>
<td>112</td>
</tr>
<tr>
<td>Molecular and Cellular Biology</td>
<td>115</td>
</tr>
<tr>
<td>Physiology and Reproduction</td>
<td>116</td>
</tr>
<tr>
<td>Processing and Products</td>
<td>118</td>
</tr>
<tr>
<td>PSA Officers, Directors, and Committees</td>
<td>119</td>
</tr>
</tbody>
</table>
President’s Welcome

On behalf of the Poultry Science Association Board of Directors and the Annual Meeting Program Committee, welcome to New Orleans! The program for our 105th annual meeting promises to deliver timely and informative presentations across many comprehensive scientific sessions and symposia. Numerous professional development and recreational opportunities have also been organized for attendees.

Since learning that we would be holding the 2016 annual meeting in New Orleans, I have personally been looking forward to this event because of this city’s rich cultural history and seemingly unlimited opportunities for unique live music and world-class dining. We are taking a slightly nontraditional approach to our annual barbeque this year in that we have chartered the Steamboat Natchez for the evening. We feel this should provide the perfect venue for interaction with friends and colleagues as we enjoy traditional Cajun food and beverages, while listening to live music and cruising along on the Mississippi River.

Morgan Farnell and the Annual Meeting Program Committee have done an outstanding job of organizing our meeting this year. The program this year contains nine symposia, including the National Poultry Extension Workshop, and 528 scientific presentations, of which 186 will be delivered by students. The strong scientific programs from our meetings over the past several years have positively influenced meeting attendance, as has the recruitment of new members from industry and academia outside North America. We expect this year’s meeting will continue to contribute to PSA becoming a more globally represented association.

The Board of Directors wishes to extend appreciation and thanks to our annual meeting sponsors. Please look for sponsor recognition signage while attending sessions and symposia and help us extend a special thank you to these companies for their generosity and support. We also wish to extend our appreciation to the PSA leadership, particularly Executive Director Steve Koenig, Director of Business Operations Jon Cole, and Managing Editor and Communications Director David Busboom, for their tireless effort and oversight in organizing and coordinating meeting logistics and planning.

Again, we wish you a very warm welcome to New Orleans, and we hope you have an outstanding week at the 105th Annual Meeting of the Poultry Science Association.

David J. Caldwell
PSA President 2015–2016
2016 Annual Program Committee
Thanks to Morgan and his program committee for their selfless efforts on our behalf. Please take a minute to express your appreciation when you see them this week.

Morgan B. Farnell, General Program Chair (2016)
Deana R. Jones, General Program Chair-Elect (2017)
Manpreet Singh, General Program Chair-Elect (2018)
Hongwei Xin, Behavior and Well-Being
Theresia K. Lavergne, Extension and Instruction
Huaijun Zhou, Genetics and Genomics
Michael H. Kogut, Immunology, Health, and Disease
George T. Tabler, Management and Production
Kelley G. S. Wamsley, Curran Gehring, Justin Fowler, Jason T. Lee, Metabolism and Nutrition
Manpreet Singh, Microbiology and Food Safety
Sami Dridi, Molecular and Cellular Biology
Wallace D. Berry Jr., Physiology and Reproduction
Harshavardhan Thippareddi, Processing and Products
Deana R. Jones, Student Presentation Evaluations
Roselina Angel, Mamduh Sifri, H. Michael Hellwig, Informal Nutrition
Symposium—Energy systems in poultry: Where are we and do we need to move to net energy?
Kenneth W. Koelkebeck, National Extension Workshop
E. Ernest M. Pierson, Karen Schween-Lardner, WPSA Keynote Lecture—Microbial endocrinology: Why the intersection of microbiology and neurobiology matter to poultry health
Ted Sefton, Challenges with antibiotic-free poultry production
Petek Settar, Environmental lighting in poultry facilities: New technologies and new results
Zachary Tucker, Rethinking our approach to poultry science through duck research
Manpreet Singh, Salmonella and Campylobacter control during poultry processing: Advances and regulatory compliance challenges in the new millennium
Robert B. Shirley, Nutrition ecology—Feeding the gut or the bird
Gretchen M. Hill, Meeting today’s animal care standards: Are you ready?
Zahid Nasir, Avian embryo nutrition and incubation
Schedule at a Glance

**Friday, July 8**
2:00 pm–7:00 pm   PSA Finance Committee . . . . . . . . . . . . . . Windsor

**Saturday, July 9**
8:00 am–5:00 pm   PSA Board of Directors Meeting . . . . . . Newberry-Ascot
Noon–1:00 pm   PSA Board of Directors Luncheon . . . . . . Windsor

**Sunday, July 10**
8:00 am–5:00 pm   PSA Board of Directors Meeting . . . . . . Newberry-Ascot
Noon–1:00 pm   PSA Board of Directors Luncheon . . . . . . Windsor
3:00 pm–7:00 pm   Registration . . . . . . . . . . . . . . . . . . . . . . . . 3rd Floor Registration
3:00 pm–7:00 pm   Upload and Preview Room . . . . . . . . . . . . . . . Warwick

**Monday, July 11**
7:00 am–6:00 pm   Registration . . . . . . . . . . . . . . . . . . . . . . . . 3rd Floor Registration
7:00 am–5:00 pm   Upload and Preview Room . . . . . . . . . . . . . . . Warwick
7:30 am–8:30 am   Breakfast for Opening Session . . . . . . . . . . . Fountain Room
8:00 am–2:00 pm   Exhibit Setup . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom
8:00 am–2:00 pm   Poster Setup . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom and Court Assembly

*(Posters must be set by 2:00 pm.)*

**9:00 am–Noon**   **Student Competition Oral Presentations**
9:00 am–12:00 pm   Immunology, Health, and Disease I . . . . . . . . . Belle Chasse
9:00 am–11:45 am   Management and Production . . . . . . . . . . . . . Jasperwood
9:00 am–11:15 am   Metabolism and Nutrition: Enzymes . . . . . . . . . Oak Alley
9:00 am–12:00 pm   Metabolism and Nutrition: Feed Additives . . . Rosedown
9:00 am–12:00 pm   Metabolism and Nutrition: Nutrition I . . . . . . Jefferson Ballroom
9:00 am–12:00 pm   Microbiology and Food Safety I . . . . . . . . . . . . . Elmwood
12:00 pm–1:00 pm   National Extension Workshop Lunch* . . . . . Newberry-Ascot
1:00 pm–4:45 pm  Microbiology and Food Safety . . . . . . . . . . . . . . . . . . . . . . Belle Chasse
1:00 pm–2:45 pm  Processing and Products . . . . . . . . . . . . . . . . . . . . . . Oak Alley
1:00 pm–5:00 pm  National Extension Workshop . . . . . . . . . . . . . . . . . . . . . . Rosedown
   Hot Topic Discussion
1:00 pm–5:00 pm  Informal Nutrition Symposium. . . . . . . . . . . . . . . . . . . . . . Jefferson Ballroom
   Energy systems in poultry: Where are we and do we need to move to net energy?
2:00 pm–6:00 pm  Exhibits . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom
2:00 pm–6:00 pm  Posters Sessions . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom
   and Court Assembly
3:30 pm–5:00 pm  Animal Well-Being and Behavior. . . . . . . . . . . . . . . . . . . . . . Oak Alley
4:00 pm–5:00 pm  Foundation Board Meeting . . . . . . . . . . . . . . . . . . . . . . Windsor
5:00 pm–6:00 pm  Welcome Reception . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom
   and Court Assembly

Tuesday, July 12

7:00 am–5:00 pm  Registration. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 3rd Floor
   Registration
7:00 am–5:00 pm  Upload and Preview Room . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Warwick
8:00 am–6:00 pm  Poster Sessions. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom
   and Court Assembly
8:00 am–6:00 pm  Exhibits . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Napoleon Ballroom

8:00 am–12:00 pm  **Student Competition Oral Presentations**
8:00 am–9:15 am  Immunology, Health, and Disease II . . . . . . . . . . . . . . . . . . . . . Belle Chasse
8:00 am–8:45 am  Metabolism and Nutrition: Nutrition II . . . . . . . . . . . . . . . . . Jefferson Ballroom
8:00 am–9:00 am  Microbiology and Food Safety II . . . . . . . . . . . . . . . . . . . . . Oak Alley
8:00 am–10:00 am  Physiology and Reproduction . . . . . . . . . . . . . . . . . . . . . . Rosedown
9:00 am–12:00 pm  Animal Well-Being and Behavior. . . . . . . . . . . . . . . . . . . . . . Elmwood
9:00 am–11:45 am  Metabolism and Nutrition: Amino Acids . . . . . . . . . . . . . . . . Jefferson Ballroom
9:00 am–11:45 am  Molecular and Cellular Biology. . . . . . . . . . . . . . . . . . . . . . Jasperwood
9:15 am–10:00 am  Genetics and Genomics . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Belle Chasse
9:15 am–12:00 pm  Processing and Products . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Oak Alley
10:30 am–12:00 pm  Metabolism and Nutrition: . . . . . . . . . . . . . . . . . . . . . . . . . . . Belle Chasse
   Vitamins and Minerals
11:00 am–12:00 pm  WPSA-Canada Board Meeting . . . . . . . . . . . . . . . . . . . . . . Windsor
12:00 pm–1:00 pm  WPSA-USA/Canada Luncheon*. Newberry-Ascot
12:00 pm–1:00 pm  Student Luncheon and Hatchery*. Versailles Ballroom Business Meeting*
1:00 pm–5:00 pm  Metabolism and Nutrition: Enzymes I. Oak Alley
1:00 pm–5:00 pm  Metabolism and Nutrition: Feed Additives I. Belle Chasse
1:00 pm–4:15 pm  Symposium: Challenges with antibiotic-free poultry production. Jefferson Ballroom
1:00 pm–5:00 pm  Symposium: Environmental lighting in poultry facilities: New technologies and new results. Rosedown
1:30 pm–4:30 pm  Physiology and Reproduction. Jasperwood
4:00 pm–6:00 pm  Student Competition Poster Judging. Napoleon Ballroom and Court Assembly

(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  Wine and Cheese Reception—. Napoleon Ballroom and Court Assembly

(All presenting authors of posters are required to be present.)

Wednesday, July 13

6:30 am–7:30 am  PSA Breakfast. Fountain Room
7:00 am–8:30 am  PSA Business Meeting. Jefferson Ballroom
7:00 am–4:00 pm  Registration. 3rd Floor Registration
7:00 am–4:00 pm  Upload and Preview Room. Warwick
8:00 am–5:00 pm  Poster Sessions. Napoleon Ballroom and Court Assembly
8:00 am–5:00 pm  Exhibits. Napoleon Ballroom
8:30 am–10:00 am  WPSA Lecture. Jefferson Ballroom
Microbial endocrinology: Why the intersection of microbiology and neurobiology matter to poultry health
10:30 am–12:00 pm  WPSA-USA Board Meeting. Trafalgar
10:30 am–11:30 am  Extension and Instruction. Jasperwood
10:30 am–12:00 pm  Management and Production I. Oak Alley
10:30 am–12:00 pm  Metabolism and Nutrition: Feed Additives II. Jefferson Ballroom
10:30 am–11:30 am  Metabolism and Nutrition: Nutrition I. Rosedown
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30 am–11:30 am</td>
<td>Molecular and Cellular Biology.</td>
<td>Belle Chasse</td>
</tr>
<tr>
<td>11:30 am–12:00 pm</td>
<td>Genetics and Genomics</td>
<td>Belle Chasse</td>
</tr>
<tr>
<td>12:00 pm–1:00 pm</td>
<td>American Poultry Historical Society Lunch*</td>
<td>Windsor</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Immunology, Health, and Disease I.</td>
<td>Jasperwood</td>
</tr>
<tr>
<td>1:00 pm–3:00 pm</td>
<td>Metabolism and Nutrition: Feed Additives III</td>
<td>Oak Alley</td>
</tr>
<tr>
<td>1:00 pm–2:00 pm</td>
<td>Metabolism and Nutrition: Nutrition II</td>
<td>Rosedown</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Symposium: Rethinking our approach to poultry science through duck research</td>
<td>Belle Chasse</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Symposium: Salmonella and Campylobacter control during poultry processing: Advances and regulatory compliance in the new millennium</td>
<td>Jefferson Ballroom</td>
</tr>
<tr>
<td>2:15 pm–4:45 pm</td>
<td>Metabolism and Nutrition: Enzymes II</td>
<td>Rosedown</td>
</tr>
<tr>
<td>3:00 pm–3:30 pm</td>
<td>Ice Cream Social</td>
<td>Napoleon Ballroom</td>
</tr>
<tr>
<td>6:00 pm–8:30 pm</td>
<td>Steamboat Cruise and Creole Fête*</td>
<td>Steamboat Natchez</td>
</tr>
<tr>
<td>8:30 pm–11:30 pm</td>
<td>PSA, WPSA-USA Student Mixer*</td>
<td>Fulton Alley</td>
</tr>
<tr>
<td>7:00 am–1:00 pm</td>
<td>Registration</td>
<td>3rd Floor Registration</td>
</tr>
<tr>
<td>7:00 am–1:00 pm</td>
<td>Upload and Preview Room</td>
<td>Warwick</td>
</tr>
<tr>
<td>7:00 am–8:00 am</td>
<td>PSA Board of Directors Meeting</td>
<td>Newberry-Ascot</td>
</tr>
<tr>
<td>8:00 am–11:00 am</td>
<td>Poster Sessions.</td>
<td>Napoleon Ballroom and Court Assembly</td>
</tr>
<tr>
<td>8:00 am–11:00 am</td>
<td>Exhibits</td>
<td>Napoleon Ballroom</td>
</tr>
<tr>
<td><strong>11:00 am–3:00 pm</strong></td>
<td><strong>Poster and Exhibit Booth Teardown</strong></td>
<td><strong>Napoleon Ballroom</strong></td>
</tr>
<tr>
<td>8:00 am–11:45 am</td>
<td>Metabolism and Nutrition: Amino Acids</td>
<td>Belle Chasse</td>
</tr>
<tr>
<td>8:00 am–10:00 am</td>
<td>Metabolism and Nutrition: Nutrition III</td>
<td>Rosedown</td>
</tr>
<tr>
<td>8:00 am–12:00 pm</td>
<td>Symposium: Nutrition ecology—Feeding the gut or the bird</td>
<td>Jefferson Ballroom</td>
</tr>
</tbody>
</table>
9:00 am–12:00 pm Management and Production II . . . . . . . . . . Oak Alley
12:00 pm–1:00 pm Past Presidents’ Luncheon. . . . . . . . . . . Windsor
(invitation only)
1:00 pm–5:00 pm Immunology, Health, and Disease II . . . . . . Belle Chasse
1:00 pm–4:15 pm Metabolism and Nutrition: . . . . . . . . . . . Oak Alley
Vitamins and Minerals
1:00 pm–4:00 pm Symposium: . . . . . . . . . . . . . . . . . . . . . . . . Jefferson Ballroom
Meeting today’s animal care standards:
Are you ready?
1:00 pm–5:00 pm Symposium: . . . . . . . . . . . . . . . . . . . . . . . . Rosedown
Avian embryo nutrition and incubation
5:30 pm Awards Celebration* . . . . . . . . . . . . . . . . . . . . . . . . Grand Ballroom

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
- Hilton New Orleans Riverside, 2 Poydras Street: 504-561-0500
- FedEx Store, Hilton New Orleans Riverside: 504-581-5892
- Tulane Medical Center, 1415 Tulane Avenue: 504-988-5263

Registration
- Third Floor Registration Counter
  - Sunday, July 10: 3:00 pm–7:00 pm
  - Monday, July 11: 7:00 am–6:00 pm
  - Tuesday, July 12: 7:00 am–5:00 pm
  - Wednesday, July 13: 7:00 am–4:00 pm
  - Thursday, July 14: 7:00 am–1:00 pm

Upload and Preview Room
- Warwick
  - Sunday, July 10: 3:00 pm–7:00 pm
  - Monday, July 11: 7:00 am–5:00 pm
  - Tuesday, July 12: 7:00 am–5:00 pm
  - Wednesday, July 13: 7:00 am–4:00 pm
  - Thursday, July 14: 7:00 am–1:00 pm

Poster Sessions
- Napoleon Ballroom and Court Assembly
  - Monday, July 11 (Poster Setup): 8:00 am–2:00 pm
  - Monday, July 11: 2:00 pm–6:00 pm
  - Tuesday, July 12: 8:00 am–6:00 pm
  - Wednesday, July 13: 8:00 am–5:00 pm
  - Thursday, July 14: 8:00 am–11:00 am
  - Thursday, July 14 (Teardown): 11:00 am–3:00 pm

Exhibits
- Napoleon Ballroom
  - Monday, July 11 (Exhibit Setup): 8:00 am–2:00 pm
  - Monday, July 11: 2:00 pm–6:00 pm
  - Tuesday, July 12: 8:00 am–6:00 pm
  - Wednesday, July 13: 8:00 am–5:00 pm
  - Thursday, July 14: 8:00 am–11:00 am
  - Thursday, July 14 (Teardown): 11:00 am–3:00 pm

Job Resource Center
- Riverside Building Bridge
  - Monday, July 11: 2:00 pm–6:30 pm
  - Tuesday, July 12: 8:00 am–6:00 pm
  - Wednesday, July 13: 8:00 am–5:00 pm
  - Thursday, July 14: 8:00 am–11:00 am
**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; however, the difference 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, 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**
Capturing Power Point images during oral presentations or images of poster presentations via *photography with cameras or cell phones* is **strictly prohibited**.

**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 2:00 pm Monday, July 11.

**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 12, 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 12, for the Wine and Cheese 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 **3:00 pm on Thursday, July 14.**

**Oral Presentation**
All oral presenters in symposia and scientific sessions must upload their presentations online or on site. You may upload your presentation online before 11:59 pm CDT on Thursday, July 7, 2016, at http://www.poultryscience.org/psa16/uploads.asp. You are encouraged to upload your presentation online. If you do not upload it online, you must upload your presentation in the Warwick room on the third floor of the Hilton New Orleans Riverside before the relevant on-site 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; 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.

**On-Site Uploads**

On-site presentation upload will be available. Presentations must be uploaded in the *Warwick* room on the third floor of the Hilton New Orleans Riverside. Presentations can be uploaded from USB sticks or drives. The deadline for uploading each presentation is based on the day and time of the session it will be presented in. You are encouraged to upload your presentation as early as possible. **No presentations will be loaded while the session is in progress, between presentations, or during breaks. Files will not be accepted via e-mail.**

<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**

*Warwick*, at the Hilton New Orleans Riverside, 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 Job Resource Center**

Riverside Building Bridge

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 2016 Job Placement Center. If you know of a job opening, please place your information at the Job Placement Center before the meeting.

**Continuing Education**

This meeting is worth up to 24 ARPAS Continuing Education Units.
PSA 2016 Special Events

Opening Session and Breakfast
The opening session will take place at the Hilton New Orleans Riverside, Jefferson Ballroom, 8:00 am, July 11. Breakfast will be served from 7:30 to 8:30 am. Please plan to attend to get a great start for the 105th Poultry Science Annual Meeting.

Welcome Reception, Exhibits, and Poster Viewing
A welcome reception will be held in the Napoleon Ballroom and Court Assembly, of the Hilton New Orleans Riverside, from 5:00 to 6:00 pm on Monday, July 11. Meet the exhibitors and check out the latest scientific research in the poster sessions.

Wine and Cheese Reception
Following the sessions on Tuesday afternoon, join us in the Napoleon Ballroom for the wine and cheese reception. Meet the exhibitors and talk with the poster presenters.

PSA Business Meeting
The Poultry Science Association business meeting will take place on Wednesday morning. Join us for breakfast from 6:30 to 7:30 am, in the Fountain Room, and for the PSA business meeting from 7:00 am to 8:30 am, in the Jefferson Ballroom, at the Hilton New Orleans Riverside. The WPSA lecture will follow the business meeting.

WPSA Lecture
The WPSA lecture, titled “Microbial endocrinology: Why the intersection of microbiology and neurobiology matter to poultry health,” will be given on Wednesday morning in the Jefferson Ballroom, of the Hilton New Orleans Riverside, by Mark Lyte, Iowa State University. All meeting participants are invited to attend.

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

PSA BBQ
Take a riverboat excursion into the heart of historical New Orleans. Join us and step aboard the Steamboat Natchez and share food, drink, and conversation with new and old friends. The 2016 PSA Steamboat Cruise and Creole Fête will be aboard the Natchez steamboat, the ninth steamboat to bear the name Natchez. Her powerful antique steam engines were built in 1925 and are still on view today from the engine room. Her copper bell, inlaid with 250 silver dollar coins, produces a pure tone that once graced the SS JD Ayres. An evening on the Natchez is truly an evening of adventure and excitement. Boarding will begin at 6:00 pm, and we will cruise from 7:30 to 8:30 pm. Shuttle service will be provided starting at 5:30 pm, from the Hilton New Orleans Riverside, outside of the Suite Tower, with return service beginning at 8:30 pm. There will be music for your listening pleasure from the Nonc Nu and Da Wild Matous band, a Zydeco Rock Fusion band from Louisiana. Don't miss this exciting event. Tickets are required for this event.
PSA, WPSA Student Mixer
This year’s student mixer will be held at Fulton Alley. This is a great place to get together and get to know your fellow PSA students. There will be bowling, games, food, music, and fun. Shuttle service will begin at 8:30 pm from the Steamboat Natchez and Hilton New Orleans Riverside, at the side door exit. There will be no return bus service because Fulton Alley is just a short walk from the Hilton New Orleans Riverside Hotel. Fulton Alley is the perfect destination for anyone looking to have fun.

Chicken Trot Fun Run
This year’s Chicken Run will take place along the Waterfront Park Trails, down past the aquarium from the Hilton New Orleans Riverside, on Thursday, July 14. The registration fee includes a t-shirt. Meet in the Hilton New Orleans Riverside lobby at 5:45 am; the race will begin at 6:00 am.

PSA Awards Celebration
Please join us as we share an evening of honoring the 2016 award winners. All meeting participants, spouses, and friends are welcome to attend this annual event. The celebration will be held on Thursday, July 14, in the Hilton New Orleans Grand Ballroom. This year’s event will be a fun-filled evening that all will want to attend. 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.**

Breakfast Schedule
A hot breakfast will be available for the opening session and business meeting. On Monday, July 11, there will be breakfast in the Fountain Room from 7:30 to 8:30 am for the opening session. On Wednesday, July 13, for the business meeting from 6:30 to 7:30 am. Tuesday and Thursday morning, from 7:30 to 8:00 am, coffee will be available before the sessions begin in the Court Assembly of the Hilton New Orleans Riverside.

Attendees are advised to travel in groups when leaving the Hilton New Orleans Riverside Hotel.
## PSA 105th Annual Meeting Sponsors

### Platinum Level ($10,000+)

- Elanco
- Jones-Hamilton Co.

### Gold Level ($5,000–$9,999)

- Alltech Inc.
- AB Vista
- Biomin America Inc.
- Cobb-Vantress Inc.
- DSM Nutritional Products
- DuPont
- Evonik Corporation
- Jefo Nutrition Inc.
- Maple Leaf Farms Inc.
- Novus International Inc.
- United Soybean Board

### Silver Level ($1,500–$4,999)

- Adisseo USA Inc.
- Ajinomoto Heartland Inc.
- Archer Daniels Midland Co.
- Aviagen Inc.
- Aviagen Turkeys Inc.
- BioResource International
- Cargill Animal Nutrition
- Diamond V
- EASY BIO Inc.
- Feedstuffs
- Fieldale Farms Corporation
- Hendrix Genetics
- Huvepharma Inc.
- JBS United
- Kemin
- Kerry
- King Techna Group
- Klarion, a Division of Spraying Systems Co.
- Monsanto Corporation
- Mosaic Feed Ingredients
- Phibro Animal Health Corporation
- PMI Nutritional Additives
- Provimi
- QualiTech Inc.
- Southern Poultry Science Society
- Tyson Foods Inc.
- Zinpro Corporation

### Bronze Level (up to $1,499)

- Algal Scientific Corporation
- CHR Hansen Inc.
- Lallemand Animal Nutrition
- Midwest Poultry Federation
- Quality Technology International Inc.
- Vetagro Inc.
- Zoetis
Symposium Sponsors

Adisseo USA Inc.
Alltech Inc.
Bayer
Hy-Line International
Maple Leaf Farms Inc.

World’s Poultry Science
Association–Canada Branch
World’s Poultry Science
Association–USA Branch

Exhibitors

Alternative Design Manufacturing & Supply
American Association of Avian Pathologists
Biomin America Inc.
Bruker Optics Inc.
CHR Hansen Inc.
Clean Earth Enterprises LLC
Cobb-Vantress Inc.
EASY BIO Inc.
Elanco
Jefo Nutrition Inc.

King Techina Group
Klarion, a Division of Spraying Systems Co.
Life Products Inc.
Maple Leaf Farms Inc.
Norel Animal Nutrition USA Inc.
Novus International Inc.
ONCE Innovations Inc.
Oxford University Press
PSA Foundation
Vetagro Inc.

2015 PSA Award Sponsors

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

National Chicken Council
National Turkey Federation
Novus International Inc.
Phibro Animal Health
Poultry Science Association
Tyson Foods Inc.
United Egg Producers
USPOULTRY
Zoetis
If you can dream it, we can build it! Our company designs and manufactures a complete line of housing equipment for the poultry science community. Researchers depend on Alternative Design for a variety of products including super brooders, start grow housing with optional brooding heater, feed conversion caging, artificial insemination sets, and poultry isolators. We have a strong reputation for quality construction and service, including an industry-leading five-year warranty on stainless steel fabricated products.

Biomin America Inc.
1846 Lockhill Selma Rd., Ste. 101
San Antonio, TX 78213–1551
www.biomin.net
Biomin, a leader in animal nutrition, develops and produces feed additives, as well as provides services for the improvement of animal performance, in an economically viable way. Biomin will share recent advances in mycotoxin detoxification strategies, Spectrum 380°—the multi-mycotoxin determination assay, 2015 US corn survey data on the mycotoxin prevalence in the USA, as well as a research update on the natural solutions to improve gut performance in poultry species.

Bruker Optics Inc.
19 Fortune Drive
Billerica, MA 01821-3923
www.bruker.com/feed
Save costs while improving quality by upgrading to the next generation of NIR analyzers, the TANGO by Bruker Optics. From improved control of feed ingredients to more precise testing of proximates, these analyzers have also been used to monitor blending processes and optimize mill operation. Existing calibrations and data are upwardly mobile. These FT-NIR systems feature the lowest cost of ownership, with a 10-year warranty on the Rock Solid™ Interferometer, which is permanently aligned, eliminating time-consuming “instrument standardization” protocols. Samples can be measured “as is” in seconds without time-consuming sample preparation.

CHR Hansen Inc.
99015 W. Maple Street
Milwaukee, WI 53214-4213
www.chr-hansen.com/animal-probiotics-and-silage-inoculants
Rooted in science, grounded in agriculture, since 1874. It all started in a rural Danish farming community in 1874. Today, thanks to our team of scientific specialists, Chr. Hansen has the largest collection of microbial strains for probiotics and silage
inoculants in the world. So, we can help you boost profitability, while meeting all regulatory requirements for safety, stability, and efficacy. The Nutrient Scorecard™ - Probios® - SiloSolve® - BioPlus® - GalliPro®

Clean Earth Enterprises LLC  
238 Albemarle Road  
Charleston, SC 29407  
www.NebuPure.com

Clean Earth Enterprises’ patented technology produces a sub-micron particle size dry fog that quickly and efficiently disperses throughout targeted areas. Clean Earth Enterprises is an economical, efficient, efficacious, and environmentally safe disinfecting technology that can be used in a variety of commercial applications including healthcare, agriculture, hospitality, as well as athletic and sports venues.

Cobb-Vantress Inc.  
PO Box 1030  
Siloam Springs, AR 72761-8906  
www.cobb-vantress.com

Cobb-Vantress is a global company using innovative research and technology to make protein available, healthy, and affordable worldwide.

EASY BIO Inc.  
3rd Floor, 310 Gangnam-Daero  
Gangnam-Gu, Seoul 135-937  
South Korea  
www.easybio.co.kr/Eng

Since it was founded in 1988 with a clear vision to be a trailblazer of the livestock industry, EASY BIO Inc. has made rapid growth to become a world-foremost business group in the animal and bioengineering fields through its innovative ideas and unique technologies. We have been leading the world market by developing the world-foremost feed additives through our high-end fermentation technology and by our joint venture company with Canadian and British companies. Our powerful brand products, such as Endo-Power, Lipidol, AcceLA, and Fermkito, are being sold in North America, Latin America, Asia, the Middle East, Africa, and so on, expanding over the world rapidly.

Elanco  
2500 Innovation Way N  
Greenfield, IN 46140-9163  
www.elanco.com

Elanco provides comprehensive products and knowledge services to improve animal health and food-animal production in more than 70 countries around the world. With a global presence of approximately 7,000 people and offices in more than 40 countries, Elanco anticipates, serves, and supports the diverse and evolving needs of its customers—from veterinarians to food producers to all those concerned with
animal health—to help them address the challenges of a diverse and changing world, and to advance a vision of food and companionship enriching life. Elanco is committed to raising awareness about global food security, and to celebrating and supporting the human–animal bond. Elanco is a division of Eli Lilly and Company, a Fortune 500 global pharmaceutical corporation in Indianapolis with a heritage more than 130 years strong.

**Jefo Nutrition**
5020 Jefo Avenue
Box Office 325
St-Hyacinthe, QC, J2S 7B6
Canada
www.jefo.com

Jefo is a global leader in the field of nonmedicated performance feed additives. From the beginning, Jefo has concentrated on innovation—understanding and contributing to the science, economics, and practices of livestock production and management. Today, Jefo is a world leader and global partner in the field of feed additives, with its pioneering, cost-saving, and efficient solutions, which also promote sustainable development. Feed additives with a new philosophy: Life, made easier. Life. It's health. It's reproduction. Calving, farrowing, laying, hatching. It's milk. It’s growth. It’s animals feeding the hands that feed them. Jefo is a circle of life.

**King Techina Group**
8 Yinxing Road
Ren He Jie Dao, Yuhang District
Hangzhou, Zhejiang 311107
China
www.kdqfeed.com

King Techina is specialized in developing and manufacturing microcapsulated feed additives. Through our ground breaking patented Intelligent Microcapsule (IM) technology, feed additives and medicines can be coated according to animal digestion systems for higher feed efficiency, better animal health, and growth performance.

**Klarion, a Division of Spraying Systems Co.**
PO Box 7900
Wheaton, IL 60187
www.klarion.com

Klarion makes ECA on-site solution generators for the on-site production of cleaning and sanitizing solutions for hatcheries. They are made only in skin- and eye-safe concentrations and require no mixing or dilution before use. Klarion helps you reduce cost and improve worker safety while eliminating the daily risks and costs associated with concentrated chemical cleaners and sanitizers. Klarion is part of Spraying Systems Company and is backed by our 75-year history of world class service and support.
Vit-E-Men™ and Life Products™, a Nebraska-based agricultural company, have been manufacturing direct-fed microbials, animal feed supplements, crop treatments, and livestock health products since 1971. We supply a combination form of live, naturally occurring, lactic acid producing bacteria to the poultry industry.

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

Norel USA is based in Texas with plans of opening a new plant next year. We have experience in development, manufacturing, and trading of additives, raw materials, natural growth promoters, and ingredients for animal nutrition for 35 years.

Novus International, headquartered in St. Charles, Missouri, creates animal nutrition solutions for livestock, poultry, and aquaculture. These solutions make up five core product platforms: methionine, minerals, enzymes, eubiotics, and feed quality. Novus operations include corporate offices, research and development laboratories, and manufacturing facilities in more than 35 countries, as well as smaller offices with field staff in an additional 60 countries.
ONCE Innovations Inc.  
5455 Highway 169N  
Minneapolis, MN 55442  
http://www.onceinnovations.com/

Increased productivity of layer, broiler, and turkey farms is just one of the benefits of ONCE LED Lighting Systems. Along with the energy savings of LED lighting, poultry-specific ONCE AgriShift® LED Lighting Systems are designed for the spectral sensitivities of poultry. With AgriShift® technology and a proper dimmer program, the producer has the ability to adjust light intensity, photoperiod, and color spectrum throughout the life cycle of the bird to maximize performance, enhance animal welfare, and reduce costs.

Oxford University Press  
198 Madison Avenue  
New York, NY 10016-4308  
www.oup.com

Oxford University Press (OUP) is proud to publish the official journals of the Poultry Science Association, *Poultry Science* and *The Journal of Applied Poultry Research*. Visit OUP at booth #16 to browse books and pick up free journal sample copies.

Vetagro Inc.  
230 S. Clark Street, Suite 320  
Chicago, IL 60604-1406  
www.vetagro.com

Vetagro has specialized in microencapsulation of feed additives and nutrients for poultry, swine, and ruminants since 1982. Our main poultry product is Aviplus® P, which is an innovative microencapsulated combination of organic acids and natural identical compounds (NIC) that improves performance, intestinal mucosa integrity, and anti-inflammatory response. Find out more details about Vetagro technology and products by visiting us at our booth.

Exhibitors Located by Registration Desk

American Association of Avian Pathologists  
12627 San Jose Blvd., Suite 202  
Jacksonville, FL 32223-8638  
www.aaap.info/

The American Association of Avian Pathologists (AAAP) is an international association whose mission is to promote scientific knowledge to enhance the health, well-being, and productivity of poultry to provide safe and abundant food for the world. Established in 1957, it is open to anyone who is engaged in some phase of avian diseases. Each year AAAP conducts a scientific program and symposium where the latest findings and issues regarding diseases in poultry are shared and discussed. AAAP also publishes *Avian Diseases*, a quarterly, international journal for original basic or clinical research from various disciplines including microbiology, immunology, and pathology. In addition, AAAP publishes many educational materials on avian health including *Diseases of Poultry* and the *Avian Disease Manual*. AAAP committees and
interest groups offer members a forum for discussion and action on specific poultry topics and issues. Through the AAAP Foundation, scholarships and awards are given each year to support those who are striving for careers in poultry medicine and to acknowledge outstanding achievement in the area of poultry medicine.

**Poultry Science Association Foundation**  
701 Devonshire Drive, C-51  
Champaign, IL 61820  
www.poultryscience.org/foundation.asp

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

Patrons

Archer Daniels Midland Co.
Biomin America Inc.
Cobb-Vantress Inc.

Mosaic Feed Ingredients
Novus International Inc.
Tyson Foods Inc.

Sustaining Members

Adisseo USA Inc.
Ajinomoto Heartland LLC
Alltech Inc.
Aviagen Inc.
Diamond V
Huvepharma Inc.

Hy-Line International
Maple Leaf Farms Inc.
Provim 
Purina Animal Nutrition LLC
Zinpro Corporation

The Journal of Applied Poultry Research Sponsors

Gold

Cobb-Vantress Inc.
Evonik Corporation

Novus International Inc.
Tyson Foods Inc.

Silver

AB Vista
Archer Daniels Midland Co.
Ajinomoto Heartland LLC
Hendrix Genetics
Hy-Line International
Maple Leaf Farms Inc.

Mosaic Feed Ingredients
Perdue Farms Inc.
Proviron
Purina Animal Nutrition LLC
Zinpro Corporation
<table>
<thead>
<tr>
<th>TIME</th>
<th>ROOM</th>
<th>SECTION</th>
<th>SESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Belle Chasse</td>
<td>Student Competition: Immunology, Health, and Disease I</td>
<td></td>
</tr>
<tr>
<td>9:00 am–11:45 am</td>
<td>Jasperwood</td>
<td>Student Competition: Management and Production</td>
<td></td>
</tr>
<tr>
<td>9:00 am–11:15 am</td>
<td>Oak Alley</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Enzymes</td>
</tr>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Rosedown</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Feed Additives</td>
</tr>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Nutrition I</td>
</tr>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Elmwood</td>
<td>Student Competition: Microbiology and Food Safety I</td>
<td></td>
</tr>
<tr>
<td>1:00 pm–4:45 pm</td>
<td>Belle Chasse</td>
<td>Microbiology and Food Safety</td>
<td></td>
</tr>
<tr>
<td>1:00 pm–2:45 pm</td>
<td>Oak Alley</td>
<td>Processing and Products</td>
<td></td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Rosedown</td>
<td>National Extension Workshop</td>
<td>Hot Topic Discussion</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Informal Nutrition Symposium</td>
<td>Energy systems in poultry: Where are we and do we need to move to net energy?</td>
</tr>
<tr>
<td>3:30 pm–5:00 pm</td>
<td>Oak Alley</td>
<td>Animal Well-Being and Behavior</td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>ROOM</td>
<td>SECTION</td>
<td>SESSION</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>8:00 am–9:00 am</td>
<td>Belle Chasse</td>
<td>Student Competition: Immunology, Health, and Disease II</td>
<td></td>
</tr>
<tr>
<td>8:00 am–8:45 am</td>
<td>Jefferson Ballroom</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Nutrition II</td>
</tr>
<tr>
<td>8:00 am–9:00 am</td>
<td>Oak Alley</td>
<td>Student Competition: Microbiology and Food Safety</td>
<td>Food Safety II</td>
</tr>
<tr>
<td>8:00 am–10:00 am</td>
<td>Rosedown</td>
<td>Student Competition: Physiology and Reproduction</td>
<td></td>
</tr>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Elmwood</td>
<td>Student Competition: Animal Well-Being and Behavior</td>
<td></td>
</tr>
<tr>
<td>9:00 am–11:45 am</td>
<td>Jefferson Ballroom</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Amino Acids</td>
</tr>
<tr>
<td>9:00 am–11:45 am</td>
<td>Jasperwood</td>
<td>Student Competition: Molecular and Cellular Biology</td>
<td></td>
</tr>
<tr>
<td>9:15 am–10:00 am</td>
<td>Belle Chasse</td>
<td>Student Competition: Genetics and Genomics</td>
<td></td>
</tr>
<tr>
<td>9:15 am–12:00 pm</td>
<td>Oak Alley</td>
<td>Student Competition: Processing and Products</td>
<td></td>
</tr>
<tr>
<td>10:30 am–12:00 pm</td>
<td>Belle Chasse</td>
<td>Student Competition: Metabolism and Nutrition</td>
<td>Vitamins and Minerals</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Oak Alley</td>
<td>Metabolism and Nutrition</td>
<td>Enzymes I</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Belle Chasse</td>
<td>Metabolism and Nutrition</td>
<td>Feed Additives I</td>
</tr>
<tr>
<td>1:00 pm–4:15 pm</td>
<td>Jefferson Ballroom</td>
<td>Symposium</td>
<td>Challenges with antibiotic-free poultry production</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Rosedown</td>
<td>Symposium</td>
<td>Environmental lighting in poultry facilities: New technologies and new results</td>
</tr>
<tr>
<td>1:30 pm–4:30 pm</td>
<td>Jasperwood</td>
<td>Physiology and Reproduction</td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>ROOM</td>
<td>SECTION</td>
<td>SESSION</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7:00 am–8:30 am</td>
<td>Jefferson Ballroom</td>
<td>PSA Business Meeting</td>
<td></td>
</tr>
<tr>
<td>8:30 am–10:00 am</td>
<td>Jefferson Ballroom</td>
<td>WPSA Lecture</td>
<td>Microbial endocrinology: Why the intersection of microbiology and neurobiology matter to poultry health</td>
</tr>
<tr>
<td>10:30 am–11:30 am</td>
<td>Jasperwood</td>
<td>Extension and Instruction</td>
<td></td>
</tr>
<tr>
<td>10:30 am–12:00 pm</td>
<td>Oak Alley</td>
<td>Management and Production I</td>
<td></td>
</tr>
<tr>
<td>10:30 am–12:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Metabolism and Nutrition</td>
<td>Feed Additives II</td>
</tr>
<tr>
<td>10:30 am–11:30 am</td>
<td>Rosedown</td>
<td>Metabolism and Nutrition</td>
<td>Nutrition I</td>
</tr>
<tr>
<td>10:30 am–11:30 am</td>
<td>Belle Chasse</td>
<td>Molecular and Cellular Biology</td>
<td></td>
</tr>
<tr>
<td>11:30 am–12:00 pm</td>
<td>Belle Chasse</td>
<td>Genetics and Genomics</td>
<td></td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Jasperwood</td>
<td>Immunology, Health, and Disease I</td>
<td></td>
</tr>
<tr>
<td>1:00 pm–3:00 pm</td>
<td>Oak Alley</td>
<td>Metabolism and Nutrition</td>
<td>Feed Additives III</td>
</tr>
<tr>
<td>1:00 pm–2:00 pm</td>
<td>Rosedown</td>
<td>Metabolism and Nutrition</td>
<td>Nutrition II</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Belle Chasse</td>
<td>Symposium</td>
<td>Rethinking our approach to poultry science through duck research</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Symposium</td>
<td>Salmonella and Campylobacter control during poultry processing: Advances and regulatory compliance in the new millennium</td>
</tr>
<tr>
<td>2:15 pm–4:45 pm</td>
<td>Rosedown</td>
<td>Metabolism and Nutrition</td>
<td>Enzymes II</td>
</tr>
<tr>
<td>TIME</td>
<td>ROOM</td>
<td>SECTION</td>
<td>SESSION</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>8:00 am–11:45 am</td>
<td>Belle Chasse</td>
<td>Metabolism and Nutrition</td>
<td>Amino Acids</td>
</tr>
<tr>
<td>8:00 am–10:00 am</td>
<td>Rosedown</td>
<td>Metabolism and Nutrition</td>
<td>Nutrition III</td>
</tr>
<tr>
<td>8:00 am–12:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Symposium</td>
<td>Nutrition ecology—Feeding the gut or the bird</td>
</tr>
<tr>
<td>9:00 am–12:00 pm</td>
<td>Oak Alley</td>
<td>Management and Production</td>
<td>Management and Production II</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Belle Chasse</td>
<td>Immunology, Health, and Disease</td>
<td>Immunology, Health, and Disease II</td>
</tr>
<tr>
<td>1:00 pm–4:15 pm</td>
<td>Oak Alley</td>
<td>Metabolism and Nutrition</td>
<td>Vitamins and Minerals</td>
</tr>
<tr>
<td>1:00 pm–4:00 pm</td>
<td>Jefferson Ballroom</td>
<td>Symposium</td>
<td>Meeting today’s animal care standards: Are you ready?</td>
</tr>
<tr>
<td>1:00 pm–5:00 pm</td>
<td>Rosedown</td>
<td>Symposium</td>
<td>Avian embryo nutrition and incubation</td>
</tr>
</tbody>
</table>
Monday, July 11

SYMPOSIA AND ORAL SESSIONS

Opening Session
Jefferson Ballroom

8:00 am
Welcome
David J. Caldwell, Texas A&M University, College Station, TX.

Student Competition: Immunology, Health, and Disease I
Chair: Michael H. Kogut, USDA-ARS
Moderator: Christina Swaggerty, USDA-ARS
Belle Chasse

9:00 am 1
Evaluation of the effects of an autogenous turkey dermatitis/cellulitis oil emulsion vaccine on immune response and mortality in commercial turkeys.
Brittany D. Mahaffey*, Kabel M. Robbins2, Neil R. Pumford3, Marion J. Morgan3, Ruben Merion-Guzman4, Lucas E. Graham1, Kyle D. Teague1, Mikayla F. A. Baxter1, Juan D. Latorre1, Amanda D. Wolfenden1, Guillermo Tellez1, and Billy M. Hargis1,
1University of Arkansas, Fayetteville, AR, 2Butterball, Garner, NC, 3NWA Veterinary Services, Fayetteville, AR, 4Universidad Nacional Autónoma de México, Cuidad de Mexico, Mexico.

9:15 am 2
Evaluation of the impact of live LaSota strain Newcastle disease virus vaccine on early development of humoral and cell-mediated immune response in broilers.
Juan C. Suarez Martinez*, Wen K. Chou, Rachel L. Blount, JungWoo Park, Luc R. Berghman, and John B. Carey, Texas A&M University, College Station, TX.

9:30 am 3
Identification and biological characterization of house finch interleukin-1β.
Myeongseon Park*, Sungwon Kim1,2, James S. Adelman3, Dana M. Hawley4, and Rami A. Dalloul5, 1Avian Immunobiology Laboratory, Animal and Poultry Sciences, Virginia Tech, Blacksburg, VA, 2The Roslin Institute and R(D)SVS, University of Edinburgh, Easter Bush, Midlothian, UK, 3Natural Resource Ecology and Management, Iowa State University, Ames, IA, 4Department of Biological Sciences, Virginia Tech, Blacksburg, VA.
Phenotypic analysis and localization of leukocytes at the site of intradermal injection of phytohemagglutinin in chickens. 
Kallie A. Sullivan*, Hyeonmin Jang, Kristen A. Byrne, and Gisela F. Erf, University of Arkansas, Fayetteville, AR.

Epitope mapping of Clostridium perfringens α-toxin using an antibody-guided immunization method. 
Christine N. Vuong*, Wen-Ko Chou, Vivek A. Kuttappan, Luc R. Berghman, Billy M. Hargis, and Lisa R. Bielke, 1Department of Veterinary Pathobiology, Texas A&M University, College Station, TX, 2Department of Poultry Science, Texas A&M University, College Station, TX, 3Department of Poultry Science, University of Arkansas, Fayetteville, AR, 4Department of Animal Science, The Ohio State University, Columbus, OH.

Optimization of FITC-D assay to quantify enteric inflammation using a feed restriction model in broilers. 
Mikayla F. A. Baxter*, Ruben Merino-Guzman, Juan D. Latorre, Sami Dridi, Brittany D. Mahaffey, Kyle D. Teague, Lucas E. Graham, Vivek A. Kuttappan, Lisa R. Bielke, Amanda D. Wolfenden, Billy M. Hargis, and Guillermo Tellez, 1University of Arkansas, Fayetteville, AR, 2Universidad Nacional Autónoma de México, Ciudad de México, México, 3Novus International Inc., St Louis, MO, 4The Ohio State University, Columbus, OH.

New biomarkers for intestinal permeability induced by dextran sodium sulfate and fasting in chickens. 
Saad Gilani, Gordon Howarth, Soressa Kitessa, Cuong Tran, Rebecca Forder, and Bob Hughes, 1School of Animal and Veterinary Sciences, University of Adelaide, Roseworthy, SA, Australia, 2Poultry CRC, University of New England, Armidale, NSW, Australia, 3Commonwealth Scientific and Industrial Research Organisation, Food, Nutrition and Bio-based Products, Adelaide, SA, Australia, 4PPPI Nutrition Research Laboratory, South Australian Research & Development Institute, Roseworthy, SA, Australia.

Effect of fructoligosaccharides on colonization of the ceca, liver/gall bladder, and ovary plus fecal shedding and ileum morphology in hens challenged with Salmonella Enteritidis. 
Pratima A. Adhikari, Douglas E. Cosby, Nelson A. Cox, and Woo Kim Kyun, 1University of Georgia, Athens, GA, 2US National Poultry Research Center, USDA, Athens, GA.
11:00 am  9  Modulation of adaptive immune responses by probiotics in chicken pullets.
Pablo A. Lopera*1,2, Juan C. Rodriguez-Lecompte3, and Julian Reyes1,1 Avicola Nacional S.A, Medellin, Antioquia, Colombia, 2Faculty of Agricultural Science, Universidad de Antioquia, Medellin, Antioquia, Colombia, 3Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, Canada.

11:15 am  10  Regulation of host defense peptide expression and barrier function by butyrate and FSK in broiler chicks.
Kelsy Robinson*, Lakshmi Sunkara, and Glenn Zhang, Oklahoma State University, Stillwater, OK.

11:30 am  11  In ovo inoculation of raffinose improves hatchability, vitalizes gut mucosa, and enhances immune response in broiler chickens.
Amit K. Singh*, Julio D. Berrocoso, Ryosuke Kida, Yong Soo Kim, and Rajesh Jha, Department of Human Nutrition, Food and Animal Sciences, University of Hawaii at Manoa, Honolulu, HI.

11:45 am  12  Feed supplementation with red seaweed Chondrus crispus alters gut microbiome and reduces Salmonella Enteritidis in layer hens.
Garima Kulshreshtha*1, Bruce Rathgeber1, Martine Boulianne2, Lehoux Brigitte2, Glenn Stratton1, Alan Critchley3, Jeff Hafting3, and Balakrishnan Prithiviraj1, Dalhousie University, Halifax, NS, Canada, 1University of Montreal, St-Hyacinthe, QC, Canada, 3Acadian Sea Plants, Dartmouth, NS, Canada.

---

Student Competition: Management and Production
Chair: Tom Tabler, Mississippi State University
Moderator: Yvonne V. Thaxton, University of Arkansas

9:00 am  13  Comparison of egg production parameters and quality between molted and non-molted hens in enriched colony cages at two different densities from 73 to 109 weeks of age.
Rafael Crivellari*, Ramon Malheiros, Peter R. Ferket, and Kenneth E. Anderson, Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC.

9:15 am  14  Effect of cooled perches on efficiency of induced molt during hot weather in caged hens.
Jiaying Hu*, Patricia Y. Hester1, and Heng-Wei Cheng2,1 Purdue University, West Lafayette, IN, 2Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.
9:30 am 15 **Production response of laying hens provided a photoperiod during incubation.**
William Hannah* and Bruce Rathgeber, Dalhousie Agricultural Campus, Truro, NS, Canada.

9:45 am 16 **Effects of genetic line and incubation temperature profiles on hatchability and hatching characteristics.**
Albaraa Sarsour*1, Edgar O. Oviedo-Rondón1, Hernan A. Cordova1, Luis Carlos Bernal-Arango1,2, Beatriz Saldaña1,2, Ricardo Fasanaro1,4, Mariana Mesquita1,5, Michael J. Wineland1, Luke Borst6, and John Barnes6, 1Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, 2Universidad Politécnica de Madrid, Madrid, Spain, 3Politécnico Colombiano Jaime Isaza Cadavid, Medellín, Antioquia, Colombia, 4Universidade Federal de Goiás, Goiânia, GO, Brazil, 5Universidade Estadual Paulista, Botucatu, SP, Brazil, 6College of Veterinary Medicine, North Carolina State University, Raleigh, NC.

10:00 am 17 **Assessment of the penetration of eggshells of chickens of different genetic background by different bacteria.**
Xujie Li*, Breagh Quigley, and Bruce Rathgeber, Dalhousie University, Truro, NS, Canada.

10:15 am 18 **Effects of incubation temperature profiles on organ and gastrointestinal tract development of four genetic lines of broilers.**
Hernan A. Cordova*1, Edgar O. Oviedo-Rondón1, Albaraa Sarsour1, Beatriz Saldaña1,2, Luis C. Bernal-Arango1,3, Mariana Mesquita1,4, Ricardo Fasanaro1,5, Michael J. Wineland1, Luke Borst6, and John Barnes6, 1Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, 2Universidad Politécnica de Madrid, Madrid, Spain, 3Politécnico Colombiano Jaime Isaza Cadavid, Medellín, Antioquia, Colombia, 4Universidade Federal de Goiás, Goiânia, GO, Brazil, 5Universidade Estadual Paulista, Botucatú, SP, Brazil, 6College of Veterinary Medicine, North Carolina State University, Raleigh, NC.

10:30 am 19 **Withdrawn**

10:45 am 20 **Effect of sex and feed ingredients on carcass yields of commercial broilers and Rhode Island Reds.**
Tatijana Fisher*1, Anthony J. Pescatore1, Jacqueline P. Jacob1, Austin Cantor1, Michael J. Ford1, and Tuoying Ao2, 1University of Kentucky, Lexington, KY, 2Alltech Inc., Nicholasville, KY.
11:00 am  21  **Sorghum inclusion levels and the addition of a serine protease on footpad dermatitis at 40 days of age.**  
Pedro H. Ferzola*¹, Edgar O. Oviedo-Rondón¹, Albaraa Sarsour¹, and Hernan A. Cordova¹, ¹Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, ²Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.

11:15 am  22  **Effects of main and supplemental light spectrum on broiler breeder growth and maturation.**  
Adriana Rodriguez*¹, Martin J. Zuidhof², Charlene Hanlon¹, Brandi Sparling¹, and Gregory Y. Bedecarrats¹, ¹University of Guelph, Guelph, ON, Canada, ²University of Alberta, Edmonton, AB, Canada.

11:30 am  23  **Feeding patterns in feed restricted broiler breeders.**  
Carla D. Aranibar*¹, Colin Usher², Wayne D. Daley², and Jeanna L. Wilson¹, ¹Department of Poultry Science, University of Georgia, Athens, GA, ²Georgia Tech Research Institute, Georgia Institute of Technology, Atlanta, GA.

11:45 am  24  **Benefits of a hands-on production laboratory in an undergraduate curriculum.**  
Sara K. Orlowski* and Nicholas B. Anthony, University of Arkansas, Fayetteville, AR.

**Student Competition: Metabolism and Nutrition: Enzymes**  
Chair: Curran Gehring, Tucker Milling LLC  
Moderator: Kurt Perryman, Micronutrients Oak Alley

9:00 am  25  **Effect of cysteine protease enzyme in diet to reduce soybean meal without affecting performance of Kadaknath birds in India.**  
Sandeep Gupta* and Mukesh Mehta, Government College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, India.

9:15 am  26  **Effect of different proteases on performance, nutrient digestibility, and carcass response in broilers fed poultry by-product meal-based diets from 1 to 35 days post-hatching.**  
Tahir Mahmood*¹, Muhammad Aslam Mirza¹, Haq Nawaz¹, Muhammad Shahid², and Mubashar Hussain¹, ¹Institute of Animal Sciences, University of Agriculture, Faisalabad, Punjab, Pakistan, ²Department of Biochemistry, University of Agriculture, Faisalabad, Punjab, Pakistan.
9:30 am  27  Evaluation of increasing levels of phytase in diets containing variable levels of amino acids on male broiler performance and processing yields.
Kyle A. Smith*, Austin T. Jasek¹, Craig Wyatt², and Jason T. Lee¹. ¹Texas A&M AgriLife Research, College Station, TX, ²AB Vista, Stillwell, KS.

9:45 am  28  Efficacy of a novel protease provided to broiler chicks in diets that vary in composition and degree of processing.
Danielle A. Reese* and Joseph S. Moritz, West Virginia University, Morgantown, WV.

10:00 am  29  Effects of dietary phytase on production, eggshell quality, and bone traits in laying hens from 55 to 74 weeks of age.
Koonphol Pongmanee* and Douglas R. Korver, University of Alberta, Edmonton, AB, Canada.

10:15 am  30  The efficacy of two phytases on inositol phosphate degradation in different segments of the gastrointestinal tract and bone quality of broilers.
Abiodun Bello*, Yueming Dersjant-Li², and Douglas R. Korver¹, ¹Department of Agricultural, Food, and Nutritional Science, University of Alberta, Edmonton, AB, Canada, ²Danisco Animal Nutrition, DuPont Industrial Bioscience, Marlborough, United Kingdom.

10:30 am  31  Influence of a super-dose of a novel microbial phytase on growth performance and tibia ash in broilers raised under two light intensities.
Maurice Frost*, Karen D. Christensen¹, and Craig Wyatt², ¹University of Arkansas, Fayetteville, AR, ²AB Vista, Stillwell, KS.

10:45 am  32  Evaluation of the effect of dietary fat inclusion on xylanase efficacy in broiler diets.
Kyle D. Brown*, Rocky E. Latham¹, Omar Gutierrez², and Jason T. Lee¹, ¹Texas AgriLife Research, College Station, TX, ²Huvepharma Inc., Peachtree City, GA.

11:00 am  33  Amylase improves digestibility of pelleted diets.
Vinícius Gonzales Schramm*, Jean Fagner Durau¹, Andreia Massuqueto¹, Vitor Augusto Bernardini Zavelinski¹, Vitor Barbosa Fascina², and Alex Maiorka¹, ¹Federal University of Paraná, Curitiba, Paraná, Brazil, ²DSM Nutritional Products, São Paulo, São Paulo, Brazil.
Student Competition: Metabolism and Nutrition: Feed Additives

Chair: Kelley G. S. Wamsley, Mississippi State University
Moderator: Robert C. Van Wyhe, AB Vista

Rosedown

9:00 am 34 Effects of a direct-fed microbial on live performance of broilers challenged with an avian pathogenic *Escherichia coli*.
Nathaniel W. Barrett*1, Miranda M. Ritzi1, Rami A. Dalloul1, Nicholas Evans1, Jason Sewell2, and Michael E. Persia1, 1Virginia Tech, Blacksburg, VA, 2Nutraferm Inc., North Sioux City, SD.

9:15 am 35 The effect of synbiotic supplementation on immune parameters and *Salmonella* colonization in layer hens pre and post *Salmonella* challenge.
Amanda E. Luoma*1, G. Raj Murugesan2, Michaela Mohnl3, Revathi Shanmugasundaram1, Ashley Markazi1, and Ramesh Selvaraj1, 1Department of Animal Sciences, The Ohio State University, Columbus, OH, 2Biomin America Inc., San Antonio, TX, 3Biomin Holding GmbH, Getzersdorf, Austria.

9:30 am 36 Evaluation of an encapsulated sodium butyrate on broiler performance following challenge with a nalidixic acid-resistant *Salmonella Typhimurium*.
Jundi D. Liu*1, Douglas E. Cosby2, Nelson A. Cox2, and Justin Fowler1, 1University of Georgia, Athens, GA, 2US National Poultry Research Center, USDA-ARS, Athens, GA.

9:45 am 37 Effects of antibiotic alternatives and *Eimeria* challenge on growth and carcass yields of male broilers.
Xi Wang*, E. David Peebles, Aaron S. Kiess, Kelley G. S. Wamsley, and Wei Zhai, Department of Poultry Science, Mississippi State University, Mississippi State, MS.

10:00 am 38 Response of broilers to refined functional carbohydrates (RFC) dosage and early coccidiostat withdrawal.
Coltin T. Caraway*1, Satid Auttawong1, Sangita Jalukar2, and John T. Brake1, 1Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, 2Arm and Hammer Animal Nutrition, Princeton, NJ.

10:15 am 39 Effect of corn distillers solubles oil on broiler chicken skin pigmentation and plasma carotenoid content.
Marta Viguie*, Kimberly A. Livingston, Ramon Malheiros, and Peter R. Ferket, North Carolina State University, Raleigh, NC.
Effect of a Bacillus-based direct fed microbial on broiler growth performance in low and high DDGS diets.
Cody A. Flores*, Hunter G. Walters, Nathan Augspurger, and Jason T. Lee.  
1Department of Poultry Science, Texas A&M AgriLife Research, College Station, TX,  
2JBS United Inc., Sheridan, IN.

Effect of dietary fumaric acid and corn dried distillers grains with solubles on laying hen performance and excreta characteristics with or without sodium bisulfate.
1University of New England, Armidale, NSW, Australia,  
2University of Khartoum, Khartoum, Sudan,  
3Technical University of Madrid, Madrid, Spain,  
4Purdue University, West Lafayette, IN,  
5University of Georgia, Athens, GA.

The changes of short-chain fatty acids and cecal bacteria in response to a lignocellulose supplementation in wheat or corn based diet.
Sarbast Khidher Kheravii*, Robert A. Swick, Mingan Choct, and Shu-Biao Wu.  
University of New England, Armidale, NSW, Australia.

Effect of GalliPro supplementation on performance and jejunum morphology of broiler challenged with heat stress.
1Universidade Federal de Lavras, Lavras, MG, Brazil,  
2University of Delaware, Newark, DE.

Emulsifier additive improves energy utilization in broiler chickens.
Levy Teixeira*, Lislaine Batista, Luiz Rombola, Marc Rovers, Arno Aa, and Antonio Bertechiini.  
1Federal University of Lavras, Lavras, Minas Gerais, Brazil,  
2Orffa, Werkendam, the Netherlands.

Effect of in-feed supplementation of phytochemicals on the response of hepatic transcriptome to aflatoxin in broilers.
Hsinbai Yin*, Indu Upadhyaya, Chihung Chen, Abhinav Upadhyay, Jill Wegrzyn, Michael J. Darre, Dan J. Donoghue, Annie M. Donoghue, and Kumar Venkitanarayanan.  
1University of Connecticut, Storrs, CT,  
2University of Arkansas, Fayetteville, AR,  
3University of Arkansas, USDA-ARS, Fayetteville, AR.
Student Competition: Metabolism and Nutrition: Nutrition I
Chair: Justin Fowler, University of Georgia
Moderator: Woo Kyun Kim, University of Georgia
Jefferson Ballroom

9:00 am 46 An in vitro technique for measuring the digestion kinetics of dietary proteins fed to poultry.
Dervan D. S. L. Bryan*, Dawn A. Abbott, and Henry L. Classen,
University of Saskatchewan, Saskatoon, SK, Canada.

9:15 am 47 Effects of modifying diet and feed manufacture concern areas that are notorious for decreasing pellet quality.
Tyler R. Rigby*, Brian G. Glover, Kolby L. Foltz, and Joseph S. Moritz, West Virginia University, Morgantown, WV.

9:30 am 48 Maternally derived anti-fibroblast growth factor 23 antibody as new tool to reduce phosphorus requirement of chicks.
Zhouzheng Ren*, Daniel E. Bütz, Jordan M. Sand, and Mark E. Cook, Department of Animal Sciences, University of Wisconsin-Madison, Madison, WI.

9:45 am 49 Split feeding as an alternative system to improve shell quality of aged hens.
Anikó Molnár*1,2, Luc Maertens1, Johan Buyse3, Johan Zoons2, and Evelyne Delezie1, 1Institute for Agricultural and Fisheries Research, Melle, Belgium, 2Experimental Poultry Center, Geel, Belgium, 3KU Leuven, Leuven, Belgium.

10:00 am 50 Evaluation of the lysine requirement of 7- to 28-day-old Bobwhite quail.
Ariel N. Bergeron*, Jose W. Charal, and Theresia A. Lavergne, LSU Agricultural Center, Baton Rouge, LA.

10:15 am 51 Effects of feed form, environment, and caloric density on energy partitioning and subsequent broiler performance.
Brian G. Glover*, Kolby L. Foltz, Kenneth J. Ryan, and Joseph S. Moritz, West Virginia University, Morgantown, WV.

10:30 am 52 Diet-induced thermogenesis in broilers: A precision feeding approach.
Sasha A. S. van der Klein*, Chris A. Ouellette, and Martin J. Zuidhof, Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada.
The rate and extent of starch digestion affects digestive tract morphology and ileal brake activation in broiler chickens.
Eugenia Herwig*, Rachel Savary, Karen Schwean-Lardner, and Henry L. Classen, University of Saskatchewan, Saskatoon, SK, Canada.

Starch digestibility and apparent metabolizable energy of western Canadian wheat market classes in broiler chickens.
Namalika D. Karunaratne*, Pierre Hucl, Ravindra N. Chibbar, Curtis J. Pozniak, Dawn A. Abbott, and Henry L. Classen, University of Saskatchewan, Saskatoon, SK, Canada.

Profile of synthesized versus preformed n-3 fatty acids in chicken egg, liver and adipose tissue and the expression of genes associated with hepatic lipid metabolism.
Neijat Mohamad*, Peter Eck, and James D. House, University of Manitoba, Winnipeg, MB, Canada.

Dietary n-3 fatty acids did not attenuate performance during sustained inflammation on commercial broilers.
Julianna Jespersen*, Isa Ehr¹, Cheryl Morris¹, Brian Kerr², Anna Johnson¹, Nicholas Gabler¹, and Elizabeth Bobeck¹, Iowa State University, Ames, IA, USDA-ARS, Ames, IA.

Effect of fat application site and percentage fines on feed manufacturing characteristics, broiler live performance, and carcass parts yield.
Jeffrey T. Pope*, Adam C. Fahrenholz, and John T. Brake, Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC.

Student Competition: Microbiology and Food Safety I
Chair: Manpreet Singh, Purdue University
Moderator: Zachary Williams,
Tennessee Technological University

The effects of varying short-term steam conditioning temperatures on the mitigation of Enterococcus faecium 8459, a nonpathogenic surrogate of Salmonella.
John W. Boney* and Joseph S. Moritz, West Virginia University, Morgantown, WV.
Eugenol wash and chitosan-based coating reduces *Campylobacter jejuni* counts on poultry products.

Screening of lactic acid bacteria-based probiotics for in ovo application in poultry.
Lucas E. Graham*, Kyle D. Teague, Jacob Lum, Ross E. Wolfenden, and Billy M. Hargis, University of Arkansas, Fayetteville, AR, Pacific Vet Group-USA Inc., Fayetteville, AR.

Thermal destruction of *Salmonella* during rendering of chicken byproduct meal.
Amie M. Jones-Ibarra*, Gary R. Acuff, Ansen R. Pond, T. Matthew Taylor, and Christine Z. Alvarado, Texas A&M University, College Station, TX, Darling Ingredients Inc., Irving, TX.

Comparison of thermal resistance of rugose phenotype of *Salmonella* Typhimurium with normal smooth morphology at different growth phases.
Janak Dhakal*, Rama Nannapaneni, and Chander S. Sharma, Mississippi State University, Starkville, MS.

Effect of lighting intensity on transmission of *Salmonella* among broiler chicks.
Ayoola A. Onafowokan*, James A. Byrd, Gregory S. Archer, and Christine Z. Alvarado, Food Science and Technology and Nutrition, Texas A&M University, College Station, TX, Southern Plains ARS-USDA, College Station, TX, Poultry Science, Texas A&M University, College Station, TX.

*Propionibacterium freudenreichii* reduces cecal colonization of multidrug-resistant *Salmonella* Heidelberg in turkey poults.
Divek V. T. Nair*, Jijo V. Thomas, and Anup Kollanoor-Johny, University of Minnesota, Saint Paul, MN.
Kyle D. Teague*, Lucas E. Graham¹, Juan D. Latorre¹, Brittney D. Mahaffey¹, Mikayla F. A. Baxter¹, Lisa R. Bielke¹, Ross E. Wolfenden², Billy M. Hargis¹, and Guillermo Tellez¹, ¹University of Arkansas, Fayetteville, AR, ²Pacific Vet Group-USA Inc., Fayetteville, AR.

Recovery of Salmonella Enteritidis and Heidelberg from market age broilers when inoculated as chicks.
Elle Chadwick*, James Krehling, Laci MacKay, Bradley Schrader, and Kenneth S. Macklin, Auburn University, Auburn, AL.

The effect of refined functional carbohydrates (RFC) from enzymatically hydrolyzed yeast on the presence of Salmonella spp. in broiler breeders and their progeny.
Grayson K. Walker*, John T. Brake¹, and Sangita Jalukar², ¹Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, ²Arm and Hammer Animal Nutrition, Princeton, NJ.

Antibacterial effect of lemon grass (Cymbopogon citratus) essential oil on multidrug-resistant Salmonella Heidelberg in poultry drinking water.
Claire Peichel*, Divek V. T. Nair, Grace Dewi, and Anup Kollanoor-Johny, University of Minnesota, Saint Paul, MN.

Prevalence and characterization of antimicrobial-resistant Salmonella isolated from a broiler processing plant.
Matthew A. Bailey*, Jagpinder S. Brar, Sydney C. Corkran, Carmen Velasquez, Estefania Novoa Rama, and Manpreet Singh, Department of Food Science, Purdue University, West Lafayette, IN.

Informal Nutrition Symposium
Chair: Roselina Angel, University of Maryland
Jefferson Ballroom

Welcome and Introduction.
Roselina Angel, University of Maryland, College Park, MD.

Critical review of energy systems used in poultry and cover pluses and minuses of each system.
Gonzalo G. Mateos, Universidad Politecnica de Madrid, Madrid, Spain.
1:45 pm  Critical update on net energy research and implementation status in poultry.
Martin J. Zuidhof, University of Alberta, Edmonton, AB, Canada.

2:15 pm  Application of net energy in commercial poultry formulation: Challenges and needs.
Jan Dirk van Der Klis, Delacon Biotechnik GmbH, Steyregg, Austria.

2:50 pm  Break

3:30 pm  Rethinking the energy contribution of amino acids.
Paul B. Tillman, Poultry Technical Nutrition Services LLC, Buford, GA.

3:40 pm  Summary of energy presentations.
Douglas R. Korver, University of Alberta, Edmonton, AB, Canada.

3:50 pm  Hot topic presentation.
J. Vernon Felts¹, Kristjan Bregendahl², and Phillip A. Smith³,
¹Butterball LLC, Goldsboro, NC, ²ADM Animal Nutrition, South Haven, MN, ³Tyson Foods Inc., Springdale, AR.

4:20 pm  Roundtable discussion.
Darrin M. Karcher, Michigan State University, East Lansing, MI;
Stephen W. Davis, Colorado Quality Research, Wellington, CO;
Martin Zuidhof, University of Alberta, Edmonton, AB, Canada;
Robert B. Beckstead, North Carolina State University, Raleigh, NC.

---

National Extension Workshop
Chair: Kenneth W. Koelkebeck, University of Illinois Rosedown

1:00 pm  Odors and particulates: Monitoring, assessments, and control measures.
Paul H. Patterson, Pennsylvania State University, University Park, PA.

1:40 pm  How to solve legal issues that poultry growers face.
Paul Goeringer, University of Maryland, College Park, MD.

2:20 pm  Assessing how poultry growers respond to current biosecurity demands.
Jonathan Moyle, University of Maryland, College Park, MD.

3:00 pm  Break

3:30 pm  Epidemiologic findings from the 2015 HPAI outbreak and what they tell us about disease prevention.
Lindsey P. Garber, USDA, ARS, Fort Collins, CO.
4:10 pm HPAI—Round 2: What happened in Indiana, how was it handled, and how should we prepare for the future. Duane Murphy, Farbest Farms Inc., Jasper, IN.

4:50 pm Conclusions

Microbiology and Food Safety
Chair: Manpreet Singh, Purdue University
Moderator: Amit Morey, Auburn University

1:00 pm Microbiological status of broiler respiratory tracts before and after feed withdrawal during catching. Dianna V. Bourassa*, Kim M. Wilson, and R. Jeff Buhr, US National Poultry Research Center, USDA-ARS, Athens, GA.

1:15 pm Influence of aviary forage substrate on environmental and egg microbial indicator organisms and pathogen prevalence. Deana R. Jones*1 and Darrin M. Karcher2, 1US National Poultry Research Center, USDA ARS, Athens, GA, 2Department of Animal Science, Michigan State University, East Lansing, MI.

1:30 pm Colonization of internal organs by Salmonella serovars Heidelberg and Typhimurium in experimentally infected laying hens housed in enriched colony cages at different stocking densities. Richard K. Gast*, Rupa Guraya1, Deana R. Jones1, Jean Guard1, Kenneth E. Anderson2, and Darrin M. Karcher3, 1US National Poultry Research Center, USDA-ARS, Athens, GA, 2Department of Poultry Science, North Carolina State University, Raleigh, NC, 3Department of Animal Science, Michigan State University, East Lansing, MI.

1:45 pm Evaluation of recombinant Salmonella Typhimurium and Enteritidis vaccines to protect against Salmonella Heidelberg infection. Amanda D. Wolfenden*, Yichao Yang1, Olivia B. Faulkner1, Rabindra K. Mandal1, Luc R. Berghman2, Billy M. Hargis1, Young M. Kwon1, and Lisa R. Bielke3, 1University of Arkansas, Fayetteville, AR, 2Texas A&M University, College Station, TX, 3The Ohio State University, Columbus, OH.
Effectiveness of various feed additives for reduction of *Salmonella Enteritidis* colonization of ceca and ovaries in commercial layers.

Charles L. Hofacre*, 1, Greg Mathis2, Karl Dawson3, and Brett S. Lumpkins2, 1Poultry Diagnostic and Research Center, The University of Georgia, Athens, GA, 2Southern Poultry Research Inc., Athens, GA, 3Alltech Inc., Nicholasville, KY.

The effect of different spectrums of LED light on *Salmonella* in laying hens.

James A. Byrd*1 and Gregory S. Archer2, 1Food and Feed Safety Research Unit, USDA, ARS, College Station, TX, 2Department of Poultry Science, Texas A&M University, College Station, TX.

Phytochemicals reduce *Campylobacter jejuni* virulence factors in vitro and down-regulate expression of virulence genes.

Abhinav Upadhyay*1, Komala Arsi1, Ann M. Donoghue2, Basanta R. Wagle1, Sandip Shrestha1, Pam Blore1, and Dan J. Donoghue1, 1Department of Poultry Science, University of Arkansas, Fayetteville, AR, 2Poultry Production and Product Safety Research Unit, Agricultural Research Service, USDA, Fayetteville, AR.

Can next-generation sequencing identify indicator organisms associated with *Campylobacter* status in commercial broiler chickens?

Brian Oakley*1, Nelson A. Cox2, Rick Meinersmann2, and Mark Berrang2, 1Western University of Health Sciences, Pomona, CA, 2USDA Agricultural Research Service, Athens, GA.

Treatment of eggs using an advanced oxidation process sanitizer reduces *Salmonella* contamination in broiler chicks.

Andrew C. Rehkopf*1, James A. Byrd2, Craig D. Coufal1, and Tri Duong1, 1Department of Poultry Science, Texas A&M University, College Station, TX, 2USDA-ARS, Southern Plains Agriculture Research Center, College Station, TX.

Effect of inoculum level on cecal colonization and organ invasion by multidrug-resistant *Salmonella* Heidelberg in turkey poults after experimental oral challenge.

Anup Kollanoor-Johny*, Divek V. T. Nair, and Jijo V. Thomas, University of Minnesota, Saint Paul, Minnesota, USA.
4:00 pm 80 Effects of feeding Diamond V Original XPC on *Salmonella* prevalence, numbers, virulence, and antibiotic resistance in ceca samples taken from commercial turkeys.
Donald R. McIntyre*, Hilary O. Pavlidis¹, Steve A. Carlson², and Douglas P. Smith¹, *Diamond V, Cedar Rapids, IA,*¹Department of Biomedical Sciences, Iowa State University College of Veterinary Medicine, Ames, IA.

4:15 pm 81 Effects of feeding Diamond V Original XPC on *Salmonella* prevalence, numbers, virulence, and antibiotic resistance in ceca samples taken from commercial broilers.
Hilary O. Pavlidis*, Douglas P. Smith¹, Steve A. Carlson², and Donald R. McIntyre¹, *Diamond V, Cedar Rapids, IA,*¹Department of Biomedical Sciences, Iowa State University College of Veterinary Medicine, Ames, IA.

4:30 pm 82 The effects of feeding Diamond V Original XPC on production performance parameters and *Salmonella* prevalence and numbers in commercial broilers.
Hilary O. Pavlidis*, Sharon Heins-Miller¹, Paul T. Price¹, Steve A. Carlson², and Douglas P. Smith¹, *Diamond V, Cedar Rapids, IA,*¹Department of Biomedical Sciences, Iowa State University College of Veterinary Medicine, Ames, IA.

**Processing and Products**

Chair: Harshavardhan Thippareddi, University of Georgia

Oak Alley

1:00 pm 83 Chemical characteristics of soybean meals available in the European Union market: A 2015 survey.

1:15 pm 84 Feeding program and pelleting affects broiler performance.
Vinícius Gonsales Schramm*, Andréia Massuquetto¹, Jean Fagner Durau¹, Josiane Carla Panisson¹, Vivian Izabel Vieira¹, Diego Surek², Everton Luís Krabbe², and Alex Maiorka¹, *Federal University of Paraná, Curitiba, Paraná, Brazil,*²Embrapa Suínos e Aves, Concórdia, Santa Catarina, Brazil.

1:30 pm 85 Present scenario and possible approaches for mini poultry processors in Bangladesh.
Effect of marigold flower meal supplementation on production performance, egg quality, egg geometry and lutein concentration in egg yolks of laying hens.
Zafar Hayat*, Rehman Akram1, and Muhammad Nasir2,
1Department of Animal Sciences, University of Sargodha, Sargodha, Punjab, Pakistan, 2Department of Food Science and Human Nutrition, University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan.

Proteomic characterization and the nutritive potential of hatchery egg shell membrane.
Narayan C. Rath*, Rohana Liyanage2, Sarbjeet K. Makkar3, and Jackson O. Lay2, 1USDA-ARS, Fayetteville, AR, 2Statewide Mass Spectrometry Facility, University of Arkansas, Fayetteville, AR, 3Department of Poultry Science, University of Arkansas, Fayetteville, AR.

Effect of sampling location on L* values and pH measurements and their relationship in broiler breast fillets.
Hong Zhuang* and Brian Bowker, US National Poultry Research Center, Athens, GA.

The effects of fermentation and enzymatic predigestion of pea on nutrient digestibility in broilers.
Farshad Goodarzi Boroojeni*, Martin Senz2, Krzysztof Kozlowski3, Klaus Männer1, Denise Rose4, and Jürgen Zentek1,
1Department of Veterinary Medicine, Institute of Animal Nutrition, Freie Universität Berlin, Berlin, Germany, 2Department Bioprocess Engineering and Applied Microbiology, Research and Teaching Institute for Brewing in Berlin, Institute of Biotechnology and Water, Berlin, Germany, 3Department of Poultry Science, Faculty of Animal Bioengineering, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland, 4Department of Food Biotechnology and Food Process Engineering, Berlin University of Technology, Berlin, Germany.
Evaluating laying hen EEGs in response to environmental stressors during ventilation shutdown (VSD) for the development of humane methodologies used for mass depopulation amid a disease outbreak.

Kenneth E. Anderson*, Kimberly A. Livingston¹, Sanjay B. Shah¹, Michael P. Martin¹, Krista N. Eberle¹, Ramon D. Malheiros¹, Jason A. Osborne¹, and Wallace D. Berry². ¹North Carolina State University, Raleigh, NC, ²Auburn University, Auburn, AL.

The effect of chronic ammonia exposure on plasma physiological parameters of laying hens.

Yanan Wu¹, Fei F. Yan¹, Christina M. Tucker³, Angela R. Green³, and Hengwei Cheng³. ¹Department of Animal Sciences, Purdue University, West Lafayette, IN, ²USDA-ARS, Livestock Behavior Research Unit, West Lafayette, IN, ³Department of Agricultural and Biological Engineering, University of Illinois, Champaign, IL.

Dietary supplementation of Original XPC to reduce stress in heat stressed and non-heat stressed broilers.

Paul T. Price¹,³, Hilary O. Pavlidis¹, Donald R. McIntyre¹, James A. Byrd², and Gregory S. Archer³. ¹Diamond V, Cedar Rapids, IA, ²USDA-ARS, College Station, TX, ³Texas A&M University, College Station, TX.

The effects of dietary n-3 fatty acids on commercial broiler bird bone health.

Isa Ehr¹, Samaneh Azapajouh¹, Elizabeth Bobeck¹, Brian Kerr², Cheyrl Morris¹, Kenneth Stalder¹, Nicholas Gabler¹, and Anna Johnson¹. ¹Iowa State University, Ames, IA, ²USDA-ARS, Ames, IA.

Effects of UV light on broiler behavior.

Rachel L. Dennis* and Antonia Patt. University of Maryland, College Park, MD.

Practical assessment and management of footpad dermatitis in broiler chickens.

Jesse M. Hunter*, Douglas R. Korver¹, Sven M. Anders¹, Trever G. Crowe², and Clover J. Bench¹. ¹University of Alberta, Edmonton, AB, Canada, ²University of Saskatchewan, Saskatoon, SK, Canada.
Tuesday, July 12

SYMPOSIA AND ORAL SESSIONS

Student Competition: Immunology, Health, and Disease II
Chair and Moderator: Michael H. Kogut, USDA-ARS Belle Chasse

8:00 am  96  Effects of *Salmonella* infection on gene expression of nutrient transporters and an antimicrobial peptide in young broiler chicks.
Javier S. Garcia*, James A. Byrd, and Eric A. Wong, Virginia Tech, Blacksburg, VA, USDA-ARS, Southern Plains Agricultural Research, College Station, TX.

8:15 am  97  Effects of oral administration of *Salmonella enterica* serovar Enteritidis cytokine expression and growth performance in immunoglobulin knockout chickens.
Kevin J. Bolek* and Kirk C. Klasing, University of California, Davis, CA.

8:30 am  98  Indigestible protein fraction and not protein level affects infectious mortality in coccidiosis-vaccinated broiler chickens.
Rachel K. Savary*, Dervan D. L. S. Bryan, Jenny A. Fricke, Andrew G. Van Kessel, and Henry L. Classen, University of Saskatchewan, Saskatoon, SK, Canada.

8:45 am  99  The effect of an anticoccidial vaccination on body weight, oocyst counts, and iNOS activity in broiler chicks.
Stephanie Hutsko*, Macdonald Wick, and Michael S. Lilburn, The Ohio State University, Columbus, OH.

9:00 am  236  Histological characterization of the age effects associated with wooden breast in the pectoralis major of commercial broilers.
Jacqueline R. Griffin*, Michael S. Lilburn, and Macdonald Wick, The Ohio State University, Columbus, OH.
Student Competition: Metabolism and Nutrition: Nutrition II
Chair: Justin Fowler, University of Georgia
Moderator: Paul B. Tillman, Poultry Technical Nutrition Service LLC
Jefferson Ballroom

8:00 am  100  Effects of dietary apparent metabolizable energy and amino acid density on male Cobb MX × Cobb 500 broilers from 1 to 14 days of age.
Klinton W. McCafferty* and William A. Dozier, Auburn University, Auburn, AL.

8:15 am  101  The effects of dietary amino acids, dietary metabolizable energy, and broiler strain on incidence of breast muscle myopathy at 42 and 58 days.
Michael J. Schlumbohm*, Katie M. Hilton¹, Garrett J. Mullenix¹, Justina V. Caldas¹, Barbara A. Mallmann¹, Judith A. England¹, Antonio Kalinowski², Casey M. Owens¹, and Craig N. Coon¹,
¹The University of Arkansas, Fayetteville, AR, ²Evonik Nutrition & Care GmbH, Hanau, Germany.

8:30 am  102  Effect of different dietary methionine supplementation sources on oxidative status in broiler chickens.
Shuai Zhang*, Behnam Saremi², Elizabeth R. Gilbert¹, and Eric Wong¹, ¹Virginia Tech, Blacksburg, VA, ²Evonik Nutrition & Care GmbH, Hanau, Germany.

Student Competition: Microbiology and Food Safety II
Chair: Manpreet Singh, Purdue University
Moderator: Chander Shekhar Sharma, Mississippi State University
Oak Alley

8:00 am  103  Evaluation of Salmonella attachment and penetration to broiler breast skin during exposure with/without stomaching.
Morgan M. Metheny*, P. Singh², H. C. Lee³, and I. Kang¹²,
¹Department of Animal Science, California Polytechnic State University, San Luis Obispo, CA, ²Department of Food Science and Human Nutrition, Michigan State University, East Lansing, MI, ³Department of Animal Science, Chonnam National University, Gwangju, Korea.
Development of rugose morphotype of *Salmonella Typhimurium* following exposure to sub-inhibitory chlorine concentrations that exhibit chlorine resistance and strong biofilm forming ability.

Tomilola Obe*, Rama Nannapaneni, and Chander Shekhar Sharma, *Mississippi State University, Mississippi State, MS.*

Effects of trisodium phosphate dip, hot water dip, and combination dip on structural changes of broiler breast skin.

Carol Wu*, Prangal Singh, Hong C. Lee, Mariane Silver, Koo B. Chin, and Ike Kang, *1Department of Animal Science, California Polytechnic State University, San Luis Obispo, CA, 2Department of Food Science and Human Nutrition, Michigan State University, East Lansing, MI, 3Department of Animal Science, Chonnam National University, Gwangju, Korea.*

Antiviral effect of carvacrol against avian influenza virus in an in ovo infection model.

Abraham J. Pellissery*, Meera S. Nair, Zeinab Helal, Chi-hung Chen, Jianping Li, Indu Upadhyaya, Michael J. Darre, Mazhar I. Khan, and Kumar Venkitanarayanan, *University of Connecticut, Storrs, CT.*

---

**Student Competition: Physiology and Reproduction**

*Chair and Moderator: Wallace D. Berry, Auburn University Rosedown*

Injecting GalliPro Hatch into fertile broiler hatching eggs using commercial in ovo technology and its effect on hatchability and early chick mortality.

Chrysta Beck*, Pedro Mota, Christopher McDaniel, David Peebles, Alfred Blanch, Mickaël Rouault, Kelley Wamsley, and Aaron S. Kiess, *1Mississippi State University, Mississippi State, MS, 2Chr. Hansen, Hørsholm, Denmark.*

Effect of incubational egg turning rate on gut development in the chick, gut morphology, and developmental biomarkers.

Victoria N. Holland*, Yewande O. Fasina, Jonathan Roberts, and Wallace D. Berry, *Auburn University, Auburn, AL.*

Effects of prehatch hypobaric challenge to six different lines of chickens.

Timothy Licknack*, Katy J. Tarrant, and Nicholas B. Anthony, *The University of Arkansas, Fayetteville, AR.*
Temporal changes in gene expression of neuroendocrine stress hormones in the chick brain following food deprivation.
Gurueswar Nagarajan*, Seong W. Kang, and Wayne J. Kuenzel, University of Arkansas, Fayetteville, AR.

Fasting increases the mRNA expression of gonadotropin inhibitory hormone in the pituitary of broiler breeder hens.
Ashley G. Stephens*, Martha E. Freeman, and Adam J. Davis, University of Georgia, Athens, GA.

Quantification of androgen receptors (AR) and AR expression in the germinal disc region of the hen.
Elizabeth R. Wrobel*, Erica Molina, Nicola Y. Khan, Elizabeth A. Pusch, Kristen J. Navara, and Mary T. Mendonça, University of Georgia, Athens, GA, Auburn University, Auburn, AL.

Comb prick serial blood sampling for glucometer assay of blood glucose in chickens.
Brendan Gould*, Wallace D. Berry, Suzanne Oates, and Joseph B. Hess, Auburn University Poultry Science, Auburn, AL.

Keel bone measurement consistency in enriched colony laying hens.
Nicholas J. Chargo*, Cara I. Robison, Sydney L. Baker, Michael J. Toscano, and Maja M. Makagon, Department of Animal Science, Michigan State University, East Lansing, MI, University of California, Davis, Davis, CA, University of Bern, Bern, Switzerland.

Student Competition: Animal Well-Being and Behavior
Chair: Hongwei Xin, Iowa State University
Moderator: Kenneth W. Koelkebeck, University of Illinois

The effect of Bacillus subtilis based probiotic on bone health in broiler chickens.
Fei-Fei Yan*, Wei-Chao Wang, Ross Wolfenden, and Heng-Wei Cheng, Department of Animal Sciences, Purdue University, West Lafayette, IN, Pacific Vet Group-USA, Inc., Fayetteville, AR, USDA-ARS, Livestock Behavior Research Unit, West Lafayette, IN.
Wei-Chao Wang*, Fei-Fei Yan¹, Jiaying Hu¹, Chaoyin Zhang¹, and Heng-Wei Cheng², ¹Department of Animal Sciences, Purdue University, West Lafayette, IN, ²Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.

Effect of dark exposure duration and age on broiler feeding behavior.
Tory D. Shynkaruk*, Henry L. Classen¹, Trever G. Crowe², and Karen V. Schwean-Lardner¹, ¹Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada, ²Department of Mechanical Engineering, University of Saskatchewan, Saskatoon, SK, Canada.

Wire-flooring induced lameness in broilers from hens fed a *Bacillus subtilis* direct-fed microbial.
Ashley L. Owen*, Charles L. Hofacre², Stephen R. Collett², and Jeanna L. Wilson¹, ¹Department of Poultry Science, University of Georgia, Athens, GA, ²Department of Population, University of Georgia, Athens, GA.

Effect of raised platforms and litter material on broiler chicken footpad quality.
Jesse M. Hunter*, Douglas R. Korver, and Clover J. Bench, University of Alberta, Edmonton, AB, Canada.

Effects of simulated warm transport on the physiology, meat quality, and behavior of 16-week-old turkey toms.
Zoe A. Henrikson*, Catherine J. Vermette, Karen Schwean-Lardner, and Trever G. Crowe, University of Saskatchewan, Saskatoon, SK, Canada.

Using a choice experiment to account for preference in perching behavior of broilers.
Veronica Nacchia* and Hong Li, University of Delaware, Newark, DE.

Measuring stress and welfare of laying hens in aviary and conventional cages.
Dani-el R. Hanna* and Sheila Purdum, University of Nebraska-Lincoln, Lincoln, NE.
Rale detection using a microphone and audio signal processing.
Brandon T. Carroll*, Douglas F. Britton², Wayne D. Daley², Mark W. Jackwood³, Simeon Harbert², and David V. Anderson¹, ¹Georgia Institute of Technology, Atlanta, GA, ²Georgia Tech Research Institute, Atlanta, GA, ³Poultry Diagnostic and Research Center, University of Georgia, Athens, GA.

Effect of light intensity and flooring type on leg surface temperature, leg bone necrosis, and latency to lie of broilers tested individually and in groups.
Shawna L. Weimer*, Robert F. Wideman, Dawn A. Koltes, Karen D. Christensen, and Yvonne Vizzier-Thaxton, University of Arkansas, Fayetteville, AR.

Student Competition: Metabolism and Nutrition: Amino Acids
Chair: Jason T. Lee, Texas A&M University
Moderator: Milan Hruby, DuPont
Jefferson Ballroom

Varying dietary amino acid levels effect on modern broiler growth performance and processing yield.
Garrett J. Mullenix*, Katie M. Hilton¹, Judith A. England¹, Justina Caldas¹, Antonio Kalinowski², and Craig N. Coon¹, ¹Poultry Science, University of Arkansas, Fayetteville, AR, ²Evonik Nutrition & Care GmbH, Hanau, Germany.

Determination of the total sulfur amino acid requirement of the Cobb 500 male broiler between 28 and 42 days of age.
Rocky E. Latham*, Hunter G. Walters¹, Robert B. Shirley², and Jason T. Lee¹, ¹Texas A&M AgriLife Research, College Station, TX, ²Adisseo USA, Alpharetta, GA.

Evaluation of the valine requirement of small-framed first cycle laying hens.
Jinlei Wen*, Ariane Helmbrecht², Michael Elliot³, John E. Thomson², and Michael E. Persia¹, ¹Virginia Tech, Blacksburg, VA, ²Evonik, Kennesaw, GA, ³A&E Nutrition Services LLC, Lancaster, PA.

Heat production and net energy of two broiler strains fed varying amino acid levels.
Katie M. Hilton*, Garrett J. Mullenix¹, Michael J. Schlumbohm¹, Justina V. Caldas¹, Judy A. England¹, Antonio Kalinowski², and Craig N. Coon¹, ¹University of Arkansas, Fayetteville, AR, ²Evonik Nutrition & Care GmbH, Hanau, Germany.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 am</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 am</td>
<td>129</td>
<td>The effect of herbal- vs. DL-methionine on broiler live performance and carcass parameters.</td>
<td>Lisa D. Kitto*, Paul H. Patterson, and R. Michael Hulet, Pennsylvania State University, University Park, PA.</td>
<td></td>
</tr>
<tr>
<td>10:45 am</td>
<td>130</td>
<td>Effects of feeding reduced crude protein diets to broiler chicks on growth performance and plasma uric acid concentration from 1 to 21 d of age.</td>
<td>Ruben Kriseldi*¹, Paul B. Tillman², Zhirong Jiang³, and William A. Dozier¹, ¹Auburn University, Auburn, AL, ²Poultry Technical Nutrition Service LLC, Buford, GA, ³Ajinomoto Heartland Inc., Chicago, IL.</td>
<td></td>
</tr>
<tr>
<td>11:00 am</td>
<td>131</td>
<td>Effect of yeast cell wall supplementation on threonine requirements in broilers as measured by performance and intestinal morphology.</td>
<td>Raghad A. Abdaljaleel*, Morouj Al-Ajeeli, Mohammed M. Hashim, Yasser J. Jameel, Akhil M. Alsadwi, and Christopher A. Bailey, Texas A &amp; M University system, College Station, TX.</td>
<td></td>
</tr>
<tr>
<td>11:15 am</td>
<td>132</td>
<td>Comparative efficacy of 2-hydroxy-4-methylthio-butanoic acid (HMTBA) relative to DL-methionine for laying hens fed on medium or low nutrient under restricted feeding regimen.</td>
<td>Jian M. Wan*, Xue M. Ding, Jian P. Wang, Shi P. Bai, Huan W. Peng, Yu H. Luo, Zhuo W. Su, Yue Xuan, and Ke Y. Zhang, Animal Nutrition Institute, Sichuan Agricultural University, Chengdu, Sichuan, China.</td>
<td></td>
</tr>
<tr>
<td>11:30 am</td>
<td>133</td>
<td>Live performance of broilers fed diets with varying levels of synthetic methionine.</td>
<td>Anthony Pokoo-Aikins*, Jennifer R. Timmons¹, Samuel N. Mwangi¹, and Randolph D. Mithchell², ¹University Of Maryland Eastern Shore, Princess Anne, MD, ²Perdue Farms Inc., Salisbury, MD.</td>
<td></td>
</tr>
</tbody>
</table>

**Student Competition: Molecular and Cellular Biology**

Chair and Moderator: Sami Dridi, University of Arkansas Jasperwood

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 am</td>
<td>134</td>
<td>Expression of neuropeptide Y system in avian liver and its role in hepatic lipogenesis.</td>
<td>Austin Decker*, Elizabeth Greene, Byung-Whi Kong, and Sami Dridi, Center of Excellence for Poultry Science, University of Arkansas, Fayetteville, AR.</td>
<td></td>
</tr>
</tbody>
</table>
Ammonia elicits a different myogenic response in avian and murine myotubes.
Rachel A. Stern*, Srinivasan Dasarathy, and Paul E. Mozdziak.
1North Carolina State University, Raleigh, NC, 2Cleveland Clinic, Cleveland, OH.

Evidence of hormone receptors in mitochondria of QM7 cells and breast muscle of quail and broilers.
1Department of Poultry Science, University of Arkansas, Fayetteville, AR, 2Department of Poultry Science, Texas A&M University, College Station, TX, 3Department of Animal Science, University of Queensland, St. Lucia, Australia.

Effect of different levels of 20(S)-hydroxycholesterol on osteogenic and myogenic differentiation of mesenchymal stem cells isolated from compact bones of broilers.
Roshan Adhikari* and Woo Kyun Kim.
University of Georgia, Athens, GA.

Feeding restriction alters DICER1 gene and protein expression in avian tissues.
Phuong H. Nguyen, Elizabeth Greene, Kaley Blankenship, Sara Orlowski, Alex Gilly, Annie Donoghue, F. Dustan Clark, Nicholas B. Anthony, and Sami Dridi.
1Center of Excellence for Poultry Science, University of Arkansas, Fayetteville, AR, 2USDA, Agricultural Research Service, Poultry Production and Product Safety Research Unit, Fayetteville, AR.

Characterization of a putative bile salt hydrolase from Lactobacillus crispatus ST1.
Timothy J. Broderick*, Tyler E. Askelson, and Tri Duong.
Texas A&M University, College Station, TX.
Targeted gene inactivation in *Lactobacillus gallinarum* ATCC 33199.
Tyler E. Askelson*, Anna K. Barker, and Tri Duong, Texas A&M University, College Station, TX.

**Student Competition: Genetics and Genomics**
Chair and Moderator: Huaijun Zhou, University of California, Davis
Belle Chasse

Predicting ascites incidence in altitude-challenged broilers using single nucleotide polymorphisms.

Exploring the effect of host genotype and environment on gut microbiomes in broiler chickens.
Rabindra K. Mandal, Audrianna Rogers, Nicholas B. Anthony, and Young Min Kwon, Department of Poultry Science, University of Arkansas, Fayetteville, AR, Cell and Molecular Biology Program, University of Arkansas, Fayetteville, AR.

Expression of gene for endocannabinoid metabolism and receptors in four tissues in response to feed consumption in broiler hens.
Liliana Yadira, Nolasco Isaula, Ning Liu, Geen Hyeun Choi, Tara Price, Adam Kieffer, and Rosemary Walzem, Department of Poultry Science, Texas A&M University, College Station, TX, College of Animal Science and Technology, Henan University of Science and Technology, Luoyang, China.

**Student Competition: Processing and Products**
Chair and Moderator: Harshavardhan Thippareddi, University of Georgia
Oak Alley

Evaluation of production, quality parameters, and sensory attributes of eggs from Hy-line Brown layers fed soybean and soybean free diets using a caged and cage-free rearing system.
Morouj N. Al-Ajeeli, Yasser J. Jameel, Raghad A. Abduljaleel, Mohammed M. Hashim, Hector Leyva-Jimenez, and Christopher A. Bailey, Texas A&M University, College Station, TX.
Effects of reduced digestible lysine density on myopathies of the pectoralis major muscles in broiler chickens at 46 d of age.
Kathryn J. Meloche*, Bryan I. Fancher, Sarge F. Bilgili, Derek A. Emmerson, and William A. Dozier, Auburn University, Auburn, AL, Aviagen Inc., Huntsville, AL.

Carvacrol reduces both Campylobacter and aerobic counts on broiler chicken skin.
Sandip Shrestha*, Basanta R. Wagle, Komala Arsi, Abhinav Upadhyay, Pam J. Blore, Annie M. Donoghue, Kumar Venkitanarayanan, and Dan J. Donoghue, University of Arkansas, Fayetteville, AR, University of Connecticut, Storrs, CT, Poultry Production and Product Safety Research Unit, ARS, USDA, Fayetteville, AR.

Comparison of two methods for determining cook loss in broiler breast meat.
Gerardo Casco* and Christine Z. Alvarado, Department of Poultry Science, Texas A&M University, College Station, TX.

Functionality of a native rice starch compared with modified corn starches in marinated chicken breast meat.
Jiyang Fang*, Gerardo Casco, and Christine Z. Alvarado, Department of Poultry Science, Texas A&M University, College Station, TX.

Using peak counts in shear data to detect woody breast in cooked broiler fillets.
Xiao Sun*, Famous L. Yang, Jessica L. Solo, Barbara A. Mallmann, Craig N. Coon, and Casey M. Owens, College of Engineering, Nanjing Agricultural University, Nanjing, Jiangsu, China, Poultry Science Department, University of Arkansas, Fayetteville, AR.

Effect of broiler age and woody breast condition on breast meat quality.
Barbara A. Mallmann*, Jessica L. Solo, Xiao Sun, Famous L. Yang, and Casey M. Owens, University of Arkansas, Fayetteville, AR, United States, Nanjing Agricultural University, Nanjing, Jiangsu, China.
Wooden breast muscle myopathies are reduced with increased dietary potassium and available phosphorus. Matthew L. Livingston*, Chelsea D. Landon, Harold J. Barnes, and John T. Brake, Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, Department of Population and Health Pathology, NCSU College of Veterinary Medicine, Raleigh, NC.

Descriptive sensory and texture profile characterization of marinated woody breast meat. Maria E. Aguirre*, Casey M. Owens, Rhonda K. Miller, and Christine Z. Alvarado, Department of Nutrition and Food Science, Texas A&M University, College Station, TX, Department of Poultry Science, University of Arkansas, Fayetteville, AR, Department of Animal Science, Texas A&M University, College Station, TX, Department of Poultry Science, Texas A&M University, College Station, TX.

Student Competition: Metabolism and Nutrition: Vitamins and Minerals
Chair: Jason T. Lee, Texas A&M University
Moderator: Reza Poureslami, Kerry Ingredients and Flavours Belle Chasse

Effect of available phosphorus during rearing on subsequent feathering and fertility of broiler breeders. Kaitlyn C. Hull*, Yun M. Lin, and John T. Brake, Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC.


Bioavailability evaluation of cholecalciferol in growing broiler chickens. Hector E. Leyva-Jimenez*, Yasser J. Jameel, Morouj Al-Ajeeli, Akhil M. Alsadwi, and Christopher A. Bailey, Texas A&M University, College Station, TX, University of Kerbala, Karbala, Iraq.
Effects of 25-OH-D$_3$ on performance, egg quality, and bone traits of brown egg layers.
Felipe A. Silva$^{1}$, Ramiro Delgado$^{2}$, Oscar Ortiz$^{2}$, Carlos A. Lozano$^{3}$, Diego F. Aldana$^{3}$, Martin J. Zuidhof$^{1}$, and Douglas R. Korver$^{1}$. 1University of Alberta, Edmonton, AB Canada, 2Nutriavicola S.A, Buga, Colombia, 3DSM Nutritional Products Colombia S.A, Bogota, Colombia.

Role of 1,25-dihydroxyvitamin D$_3$ on broiler osteoblast differentiation and mineralization in vitro.
Chongxiao Chen* and Woo Kyun Kim, Poultry Science Department, University of Georgia, Athens, GA.

Effect of increasing levels of dietary zinc, manganese, and copper from organic and inorganic sources on egg quality and egg zinc, manganese, and copper content in laying hens.
Katherine Rubio*, Jose W. Charal, and Theresia A. Lavergne, Louisiana State University Agricultural Center, Baton Rouge, LA.

Symposium: Challenges with Antibiotic-Free Poultry Production
Chair: Arnold E. Sefton, Alltech Inc.
Jefferson Ballroom

1:00 pm  Physiology of gut health and the road to ABF.
Peter R. Ferket, North Carolina State University, Raleigh, NC.

1:30 pm  Antibiotic resistance development.
Randall S. Singer, University of Minnesota, Saint Paul, MN.

2:00 pm  Control of gut health including cocci with antibiotic replacements.
Greg F. Mathis, Southern Poultry Research Inc., Athens, GA.

2:30 pm  ABF—What is the current European position?
Peter Spring, Bern University of Applied Sciences, Zollikopen, Switzerland.

3:00 pm  Break

3:30 pm  ABF Panel—An integrator’s perspective.

3:40 pm  ABF Panel—An integrator’s perspective.
Amy B. Batal, Sanderson Farms Inc., Laurel, MS.
3:50 pm  ABF Panel—An integrator’s perspective.  
G. Donald Ritter, Mountaire Farms Inc., Millsboro, DE.

4:00 pm  ABF Panel—An integrator’s perspective.  
David L. Wicker, Fieldale Farms Corp., Gainesville, GA.

4:10 pm  Panel discussion  
Moderator: Charles L. Hofacre, University of Georgia, Athens, GA.

Symposium: Environmental Lighting in Poultry Facilities: New Technologies and New Results  
Chair: Petek Settar, Hy-Line International Rosedown

1:00 pm  The science of animal centric lighting—Why do spectrum and intensity matter?  
Zdenko Grajcar, Once Innovations Inc., Plymouth, MN.

1:20 pm  Photostimulation: Effects on poultry production.  
Israel Rozenboim, Hebrew University of Jerusalem, Rehovot, Israel.

2:00 pm  Lighting for incubation and hatch: Increasing production.  
Gregory S. Archer, Texas A&M University, College Station, TX.

2:20 pm  Spectrum and intensity: Layer behavior and preference lab studies.  
Hongwei Xin, Iowa State University, Ames IA.

2:40 pm  Spectrum and intensity: Lighting for broiler performance and physiological parameters.  
Hammed A. Olanrewaju, USDA, ARS, Mississippi State, MS.

3:00 pm  Break

3:30 pm  Spectrum, intensity, and photoperiod: LED lighting program for broiler performance and welfare.  
Joey Bray, Stephen F. Austin University, Nacogdoches, TX.

3:50 pm  Broiler lighting: Traditional vs. LED performance.  
Eric R. Benson, University of Delaware, Newark, DE.

4:10 pm  How lighting affects distribution, and therefore ventilation, and broiler performance.  
Brian D. Fairchild, University of Georgia, Athens, GA.
4:30 pm  **Spectrum lighting and egg laying.**
Gregory Y. Bedecarrats, *University of Guelph, Guelph, ON, Canada.*

4:50 pm  **Roundtable discussion**
Israel Rozenboim, *Hebrew University of Jerusalem, Rehovot, Israel.*

---

**Metabolism and Nutrition: Enzymes I**
*Chair and Moderator: Curran Gehring, Tucker Milling LLC, Oak Alley*

1:00 pm  **Effect of two phytase activity products and their combination with other feed enzymes on broiler productive performance.**
Sergio R. Fernandez*, Ernesto Avila², Benjamin Fuente², Ezequiel Rosales¹, and Silvestre Charraga¹, *DSM Nutritional Products México, El Salto, México; Universidad Nacional Autónoma de México, México City, México.*

1:15 pm  **Beneficial phytase and protease effects on gene for gut-level immunity and cellular integrity in male broilers reared under challenge conditions.**
Oluyinka A. Olukosi*, Fidelis Fru-Nji², and Aaron J. Cowieson², *Monogastric Science Research Centre, SRUC, Edinburgh, United Kingdom; DSM Nutritional Products Ltd, Basel, Switzerland.*

1:30 pm  **Interactive effects of graded levels of phytase and decreasing dietary levels of available P on performance, bone parameters, and litter moisture of broilers from 1 to 21 d.**
Gilson A. Gomes*, Vasil R. Pirgozliev², S. Paul Rose², Waseem Mirza², and Robert A. H. M. ten Doeschate¹, *AB Vista, Marlborough, Wiltshire, United Kingdom; Harper Adams University, Newport, Shropshire, United Kingdom.*

1:45 pm  **Assessment of P equivalency of an evolved *Escherichia coli* phytase when birds were fed the dietary treatments at day-old or after a 5-day adaptation period.**
Gilson A. Gomes*, Agnès Narcy², Xaviere Rousseau¹, and Robert A. H. M. ten Doeschate¹, *AB Vista, Marlborough, Wiltshire, United Kingdom; INRA, Paris, France.*
Phosphorus-releasing efficacy of a 6-phytase for broiler performance and bone mineralization compared with monocalcium phosphate.
Maria Francesch¹, Peter A. Ader², Dieter Feuerstein², and Michael B. Coelho*¹, ¹IRTA, Monogastric Nutrition, Spain, ²BASF SE, Lampertheim, Germany, ³BASF Corp., Florham Park, NJ.

Manipulation of dietary phytic acid, myo-inositol, and exogenous phytase levels influence the blood insulin to glucose ratio but not their overall concentration.
Laura A. Beeson¹³, Carrie L. Walk², Peter M. Hastie³, Kolapo M. Ajuwon⁴, Michael R. Bedford², and Oluyinka A. Olukosi*¹, ¹Monogastric Science Research Centre, SRUC, Edinburgh, United Kingdom, ²AB Vista, Marlborough, Wiltshire, United Kingdom, ³University of Glasgow, Glasgow, United Kingdom, ⁴Purdue University, West Lafayette, IN.

Interactive effects of P, Ca, and phytase supplements on InsP6 degradation and myo-inositol release in broiler chickens.
Vera Sommerfeld¹, Margit Schollenberger¹, Imke Kühn², and Markus Rodehutscord*¹, ¹University of Hohenheim, Stuttgart, Germany, ²AB Vista Feed Ingredients, Darmstadt, Germany.

Wheat-arabinoxylan produced by enzymatic pretreatment improve the performance and digestive health of wheat-fed broilers.
Nadia Yacoubi¹², Luc Saulnier¹, Estelle Bonnin¹, Estelle Devillard*³, Lamya Rhayat³, Richard Ducatelle², and Filip Van Immerseel², ¹INRA UR, Nantes, France, ²Department of Pathology, Bacteriology and Avian Diseases, Faculty of Veterinary Medicine, Ghent, Belgium, ³Adisseo France SAS, Commentry, France.

Amylase improves broilers performance in pelleted diets.
Vinícius Gonsales Schramm*¹, Lucas Newton Ezaki Barrilli¹, Josiane Carla Panisson¹, Chayane Rocha¹, José Otavio Berti Sorbara², and Ananda Portela Félix¹, ¹Federal University of Parana, Curitiba, Paraná Brazil, ²DSM Nutritional Products, São Paulo, São Paulo, Brazil.

Roberto Montanhini Neto¹, Robert B. Shirley*², Adam Davis³, Elisabeth Freeman³, Pierre-Andre Geraert¹, and Aurélie Preynat¹, ¹Adisseo France S.A.S, Antony, France, ²Adisseo USA Inc., Alpharetta, GA, ³University of Georgia, Athens, GA.
Efficacy of a carbohydrase complex enriched in xylanases and arabinofuranosidases on the performance of broilers fed corn-, corn DGGS-, and soybean meal-based diets, with different digestible amino acid reductions.
Roberto Montanhini Neto¹, Robert B. Shirley*², Adam Davis³, Elisabeth Freeman³, Pierre-Andre Geraert¹, and Aurélie Preynat¹, ¹Adisseo France S.A.S, Antony, France, ²Adisseo USA Inc., Alpharetta, GA, ³University of Georgia, Athens, GA.

Performance of broilers fed corn-, corn DGGS-, and soybean meal-based diets with the addition of a carbohydrolase complex enriched in xylanases and arabinofuranosidase.
Roberto Montanhini Neto¹, Robert B. Shirley*², Adam Davis³, Elisabeth Freeman³, Pierre-Andre Geraert¹, and Aurélie Preynat¹, ¹Adisseo France S.A.S, Antony, France, ²Adisseo USA Inc., Alpharetta, GA, ³University of Georgia, Athens, GA.

Evaluation of xylanase form and dose in broilers fed wheat-based diets.
Fenglan Yan*, Drew Lichtenstein, and Mercedes Vazquez-Anon, Novus International Inc., St. Charles, MO.

Nitrogen-corrected apparent metabolizable energy of an exogenous carbohydrase added to diets formulated with low-fat distillers dried grains with solubles (LF-DDGS) from 0 to 28 d in broilers.
Elizabeth J. Kim*, Michael E. Persia², Jonathan Broomhead³, Xuimei Li³, Philip Lessard³, and Mike Lanahan³, ¹ARS-USDA Poultry Research Unit, Mississippi State, MS, ²Virginia Tech University, Blacksburg, VA, ³Agrivida Inc., Medford, MA.

Metabolism and Nutrition: Feed Additives I
Chair: Kelley Wamsley, Mississippi State University
Moderator: Leonel Mejia, Cobb-Vantress Inc.
Belle Chasse

Effect of a commercial organic acid product (pHorce) on performance of broiler chickens fed wheat-maize-soybean meal-based diet.
Katharina Schuh*¹, Augustine Owusu-Asiedu², Georg Dusel¹, Aikaterini E. Konstanti², Emma Graystone², and Leon J. Broom², ¹University of Applied Sciences Bingen, Bingen, am Rhein, Germany, ²Anpario PLC, Worksop, Nottinghamshire, United Kingdom.
1:15 pm 176 Evaluating the effect of *Moringa oleifera* leaf meal and differently processed seed meal as feed additive in broiler diet.
Isaac O. Adejumo*¹ and Olufemi A. Adebibi², ¹Landmark University, Nigeria; ²University of Ibadan, Nigeria.

1:30 pm 177 Yeast as nucleotide source in turkey diets.
Melina A. Bonato*¹, John Schliefer², Glycon D. Santos¹, Brett S. Lumpkins³, Greg F. Mathis⁴, and Frederic J. Hoerr⁵, ¹ICC Industrial Comércio Exportação e Importação Ltda, São Paulo, SP, Brazil; ²Quality Technology International Inc., Elgin, IL; ³Southern Poultry Research Inc., Athens, GA; ⁴Veterinary Diagnostic Pathology LLC, Fort Valley, GA.

1:45 pm 178 Effect of methionine and mannan oligosaccharides supplementation on growth performance, carcass characteristics, and gut morphology in broiler chicken under conditions of high ambient temperature and humidity.
Asif Mahmood, Muhammad Afzal Rashid*, Talat Naseer Pasha, Athar Mahmud, Muhammad Shahbaz Yousuf, and Muhammad Irfan Malik, University of Veterinary and Animal Sciences, Lahore, Pakistan.

2:00 pm 179 Effects of dietary lysophospholipid product (Lipidol) on laying performance, egg quality, nutrient digestibility, blood profiles, yolk cholesterol, and fatty acid deposition of laying hens.
Waewaree Boontiam¹, Byoung Y. Jung*², Yoon K. Hyun², Seoung O. Nam¹, and Yoo Y. Kim¹, ¹Department of Agriculture and Biotechnology, College of Agriculture and Life Sciences, Seoul National University, Seoul, South Korea; ²Easy Bio Inc., Seoul, South Korea.

2:15 pm 180 Withdrawn

2:30 pm 181 Performance enhancer complex on pullet growth and hen production parameters with and without *Salmonella* vaccination.
Amanda Luoma*¹, G. Raj Murugesan², Attila Kovacs³, Revathi Shanmugasundaram¹, Ashley Markazi¹, and Ramesh Selvaraj¹, ¹Department of Animal Sciences, The Ohio State University, Columbus, OH; ²Biomin America Inc., San Antonio, TX; ³Biomin Holding GmbH, Getzersdorf, Austria.
Performance and necrotic enteritis lesion scores of broilers fed diets containing Avi-Lution or BMD and challenged with *Clostridium perfringens*.

Michael D. Sims*, David A. Spangler, and Lucas A. Krueger,
1Virginia Diversified Research Corp., Harrisonburg, VA, 2Agri-King Inc., Fulton, IL.

---

Bacterial bacitracin resistance potential in broilers challenged with *Clostridium perfringens* and supplemented with BMD or Avi-Lution.

Lucas A. Krueger*, David A. Spangler, and Michael D. Sims,
1Agri-King Inc., Fulton, IL, 2Virginia Diversified Research, Harrisonburg, VA.

---

Chemistry curtailing bacterial enteritis in poultry.

Jeroen Baeyens, Tina Rogge, Jan Anné*, Wael Gad, and Maarten De Gussem,
1Proviron, Flanders, Belgium, 2TGD – Tiergesundheitsdienst, Fellbach, Germany, 3Vetworks, Flanders, Belgium.

---

Susceptibility of broiler chickens fed fumonisin-contaminated diet and efficacy of an enzyme for gastrointestinal fumonisin hydrolysis.

Bertrand Grenier*, Heidi Elisabeth Schwartz-Zimmermann, Markus Aleschko, Gerd Schatzmayr, Wulf-Dieter Moll, and Todd J. Applegate,
1Biomin Research Center, Tulln, Austria, 2Department of Animal Sciences, Purdue University, West Lafayette, IN, 3Christian Doppler Laboratory for Mycotoxin Metabolism and Center for Analytical Chemistry, Department for Agrobiotechnology (IFA-Tulln), Tulln, Austria, 4Department of Poultry Science, University of Georgia, Athens, GA.

---

Biotransformation of deoxynivalenol to de-epoxy-deoxynivalenol in turkeys by Biomin BBSH 797.

Simone Schaumberger, Barbara Doupovec, and Dian Schatzmayr,
1Biomin Holding GmbH, Getzersdorf, Austria, 2Biomin Research Center, Tulln, Austria.

---

An in vitro investigation into the effect of phytic acid on starch hydrolysis: Novel molecular insights.

1Danisco Animal Nutrition – DuPont Industrial Biosciences, Marlborough, United Kingdom, 2DuPont Knowledge Center, E.I. DuPont India Private Limited, Hyderabad, India.
Influence of initial body weight, beak trimming, and inclusion of Na-butyrate in the diet on growth performance, body weight uniformity, and digestive tract traits of brown pullets from hatching to 16 wk of age.
Nuria Nuñez¹, Guillermo Fondevila¹, Pilar Guzmán¹, Beatrix Saldaña¹, Andrés Ortíz², Raúl Rodríguez³, and Gonzalo G. Mateos*¹, ¹Departamento de Producción Agraria, Universidad Politécnica de Madrid, Madrid, Spain, ²Nutega S. L, Coslada, Madrid, Spain, ³Ibertec S. A. U, Boecillo, Valladolid, Spain.

Physiology and Reproduction
Chair and Moderator: Wallace D. Berry, Auburn University Jasperwood

Effects of temperature and growth selection on adipogenic potential of turkey pectoralis major muscle satellite cells.
Daniel L. Clark*¹, Gale M. Strasburg², Kent M. Reed³, and Sandra G. Velleman¹, ¹The Ohio State University / Ohio Agricultural Research and Development Center, Wooster, OH, ²Michigan State University, East Lansing, MI, ³University of Minnesota, St. Paul, MN.

Two circumventricular organs bordering the hypothalamus play a role in the regulation of the stress response in birds.
Wayne J. Kuenzel*, N. Alphonse Aman, Gurueswar Nagarajan, and Seong W. Kang, University of Arkansas, Fayetteville, AR.

Identification of vasotocin receptor antagonists involved in the attenuation of stress response in male broilers.
Seong W. Kang*, Srinivas Jayanthi, Gurueswar Nagarajan, Thallapuranam K. Kumar, and Wayne J. Kuenzel, University of Arkansas, Fayetteville, AR.

Depression of growth performance and immunity in heat-stressed broiler chickens.
Ahmed Abbas*¹, Ayman Hassan¹², Abdel-Rahman Atta¹, and Magdi Mashaly¹, ¹Cairo University, Giza, Egypt, ²Ain Shams University, Cairo, Egypt.

Efficacy of protein and probiotics supplementation on dynamics of endocrine markers in serum and pituitary gonadotrophs of molted layers.
Haseeb Anwar*, Department of Physiology, Government College University, Faisalabad, Pakistan.
2:45 pm 194  **Effect of neem leaf (Azadirachta indica) meal diets on growth, hematological and serum biochemical indices of Japanese quail (Coturnix japonica).**
Oluremi M. Daudu*, Rachel Balami, Musa Muhammad, Taiye S. Olugbemi, and Kayode A. Olutunmogun, Ahmadu Bello University, Zaria, Nigeria.

3:00 pm  **Break**

3:30 pm 195  **Gonadal regression elicited in Pekin duck drakes and hens associated with supplemental light from kerosene lanterns during the winter months.**
Gregory S. Fraley*, Lindsey Porter, and Erin Alenciks, Hope College, Holland, MI.

3:45 pm 196  **Live indicators of woody breast in male broiler chickens at various ages.**
Karen D. Christensen¹, Shawna L. Weimer¹, Barbara A. Mallmann¹, Xiao Sun¹², Casey M. Owens¹, and Dawn A. Koltes*¹, ¹University of Arkansas, Fayetteville, AR, ²Nanjing Agricultural University, Nanjing, Jiangsu, China.

4:00 pm 197  **Influence of thermomanipulation from 13 to 15 days of hatch on egg weight loss, hatchability and chick weight at hatch of commercial broiler breeders eggs.**
Ahmed M. Elkaiaty¹, Alaa K. AlamEldin², Ayat R. Elzieny², and Hosam M. Safaa*¹, ¹Animal Production Department, Faculty of Agriculture, Cairo University, Giza, Egypt, ²Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Giza, Egypt.

4:15 pm 198  **The chicken alimentary tract demarcation of the jejunum and ileum junction.**
Richard Buhr* and Dianna Bourassa, USDA-ARS US National Poultry Research Center, Athens, GA.
Wednesday, July 13

OTHER EVENTS

Business Meeting and Breakfast
Jefferson Ballroom
7:00 am – 8:30 am

SYMPOSIA AND ORAL SESSIONS

WPSA Lecture
Chairs: E. Ernest M. Pierson, Pierson Consulting Group, Karen Schwean-Lardner, University of Saskatchewan
Jefferson Ballroom

8:30 am
Introduction.
Ernest Pierson, Pierson Consulting Group, University City, MO.

8:45 am
Microbial endocrinology: Why the intersection of microbiology and neurobiology matter to poultry health.
Mark Lyte, Iowa State University, Ames, IA.

Extension and Instruction
Chair and Moderator: Theresia A. Lavergne,
Louisiana State University
Jasperwood

10:30 am 199
The development of innovative laboratory exercises that recruit students to poultry science.
Drew Benson* and Mark Compton, University of Georgia, Athens, GA.

10:45 am 200
Specification grading in a distance-education nutrition course reduces students’ stress and improves grade distributions.
Kimberly A. Livingston* and Sara Brierton, North Carolina State University, Raleigh, NC.

11:00 am 201
Improving engagement at extension events.
Valerie L. Carney*, Brenda L. Schneider, and Jessica K. Josephson, Alberta Agriculture and Forestry, Edmonton, AB, Canada.
11:15 am 202 Light emitting diode (LED) lamp and dimmer selection tool for broiler growers.
Eric R. Benson*, Daniel P. Hougentogler, Sarah M. Morrissey, William R. Brown, and Robert L. Alphin, University of Delaware, Newark, DE.

Management and Production I
Chair: Tom Tabler, Mississippi State University
Moderator: Kenneth S. Macklin, Auburn University
Oak Alley

10:30 am 203 The influence of hot exposure conditions during simulated transport on 12-week-old turkey hen physiology and meat quality.
Catherine J. Vermette*, Zoe A. Henrikson, Karen Schween-Lardner, and Trever G. Crowe, University of Saskatchewan, Saskatoon, SK, Canada.

10:45 am 204 Efficacy of different anti-stressors on carcass characteristic of broilers reared during hot and humid season.
Tahreem Asad¹, Shahid Mehmood¹, Athar Mahmud*, Khalid Javed², Faisal Hussnain¹, and Jibran Hussain¹,¹Department of Poultry Production, University of Veterinary and Animal Sciences, Lahore, Pakistan,²Department of Livestock Production, Lahore, Pakistan.

11:00 am 205 Giant miscanthus grass as an alternative bedding for poultry houses.
Claudia S. Dunkley* and Casey W. Ritz, University of Georgia, Athens, GA.

11:15 am 206 Assessment of three litter amendments with multiple application on ammonia emission, growth, and health of broilers.
Alyson Weiss, Hong Li*, and Daniel Bautista, University of Delaware, Newark, DE.

11:30 am 207 Laying hen performance and well-being over two flock cycles on different litter substrates in an aviary housing.
Darrin M. Karcher*¹ and Deana R. Jones²,¹Michigan State University, East Lansing, MI,²US National Poultry Research Center, Egg Safety and Quality Research Unit, USDA Agricultural Research Service, Athens, GA.
11:45 am 208 Evaluation of nonanorexic molt in enrichable cages and enriched colony cage systems.
Ramon D. Malheiro*, Rafael Crivellari, Peter R. Ferket, and Kenneth E. Anderson, Prestage Department of Poultry Science, NC State University, Raleigh, NC.

Metabolism and Nutrition: Feed Additives II
Chair: Kelley Wamsley, Mississippi State University
Moderator: Samuel J. Rochell, University of Arkansas
Jefferson Ballroom

10:30 am 209 Effect of diets with or without BacPack (Bacillus subtilis C-3102 plus yeast cell wall) on hatchery parameters in three commercial broiler breeder field trials at the same company.
Ronald Nietfeld*, Danny M. Hooge, and John Schleifer1, 1Quality Technology International, Inc., Elgin, IL, 2Hooge Consulting Service, Eagle Mountain, UT.

10:45 am 210 Efficacy of a bacillary probiotic supplementation (Bacillus subtilis DSM 17299) in broilers: Combined analysis of fourteen different studies.
Alfred Blanch*, Mickaël Rouault1, Oscar Casabuena2, Carlos Millán2, and Marta I. Gracia2, 1Chr. Hansen A/S, Hørsholm, Denmark, 2Imasde Agroalimentaria S.L, Pozuelo de Alarcón, Spain.

11:00 am 211 Bacillus subtilis probiotic improved performance of corn-fed broilers with or without ionophore coccidiostats.
Vincent Jacquier1, Lamya Rhayat*, Pierre-André Geraert2, and Estelle Devillard1, 1Adisseo France SAS, Commentry, France, 2Adisseo France SAS, Antony, France.

11:15 am 212 Bacillus subtilis DSM29784 counteracts the effect of Clostridium perfringens on broiler performance.
Lamya Rhayat*, Greg F. Mathis2, Charles L. Hofacre3, Vincent Jacquier1, and Estelle Devillard1, 1Adisseo France SAS, Commentry, France, 2Southern poultry Research Inc., Athens, GA, 3University of Georgia, PDRC, Athens, GA.

11:30 am 213 Bacillus subtilis improves performance of broilers fed medicated or nonmedicated feed.
Effect of feeding Mexican sunflower leaf *Tithonia diversifolia* Hemsl A. Gray on carcass quality of Guinea fowl.

**Metabolism and Nutrition: Nutrition I**

**Chair:** Justin Fowler, University of Georgia
**Moderator:** Omar Gutierrez, Huvepharma Inc. Rosedown

10:30 am 215  **Withdrawn**

10:30 am 216  **Evaluation of nutritional rehabilitation and gut inflammation model in broiler chickens.**

10:45 am 217  **Effect of supplementing n-3 fatty acids on carcass composition, nutrient retention, and blood metabolites in broiler.**

11:00 am 218  **Gastrointestinal taste sensing in broiler chicken.**
Shira L. Cheled-Shoval, Masha Niv, and Zehava Uni, *Department of Animal Science, The Robert H. Smith, Faculty of Agriculture, Food and Environment, Hebrew University of Jerusalem, Rehovot, Israel, Institute of Biochemistry, Food Science and Nutrition, The Robert H. Smith, Faculty of Agriculture, Food and Environment, Hebrew University of Jerusalem, Rehovot, Israel.*
Molecular and Cellular Biology
Chair and Moderator: Sami Dridi, University of Arkansas, Belle Chasse

10:30 am 219  **Hormonal and mitochondrial signatures in muscle: Possible implications for mitochondrial function and feed efficiency.**
Walter G. Bottje*, Kentu Lassiter¹, Sami Dridi¹, and Nicholas Hudson²,¹ *Department of Poultry Science, University of Arkansas, Fayetteville, AR, ²Department of Animal Science, University of Queensland, St. Lucia, Australia.

10:45 am 220  **Leptin up-regulates the expression of autophagy-related genes in avian tissues.**
Alissa L. Piekarski-Welsher*, Peter Ishola¹, Elizabeth Greene¹, Walter G. Bottje¹, Helena Maier³, Takeshi Ohkubo⁴, Mark Cline², and Sami Dridi¹, ¹University of Arkansas, Fayetteville, AR, ²Virginia Tech, Blacksburg, VA, ³Pirbright Institute, Woking, United Kingdom, ⁴Ibaraki University, Ami, Ibaraki, Japan.

11:00 am 221  **Infection of broilers with Eimeria causes species-specific changes in mRNA expression of genes associated with amino acid and sugar uptake in the gut.**
Katarzyna B. Miska* and Raymond H. Fetterer, USDA/ARS, Beltsville, MD.

11:15 am 222  **Differential expression of DNA-methyltransferases in the pituitary and liver of male broilers following posthatch nutritional stress.**
Seong W. Kang*, Gurueswar Nagarajan, Mahmoud Madkour, and Wayne J. Kuenzel, University of Arkansas, Fayetteville, AR.
Genetics and Genomics
Chair and Moderator: Huaijun Zhou,
University of California, Davis
Belle Chasse

11:30 am 223 Genetic divergence in domestic Japanese quail inferred from mitochondrial DNA D-loop and microsatellite markers.
Mitsuo Nunome*1, Mikiharu Nakano1, Ryo Tadano2, Ryoka Kawahara-Miki3, Tomohiro Kono4, Shinji Takahashi5, Takaharu Kawashima6, Akira Fujiwara7, Keijiro Nirasawa8, Makoto Mizutani1, and Yoichi Matsuda1,9 1Avian Bioscience Research Center, Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya, Japan, 2Faculty of Applied Biological Sciences, Gifu University, Gifu, Japan, 3Genome Research Center, NODAI Research Institute, Tokyo University of Agriculture, Tokyo, Japan, 4Department of Bioscience, Tokyo University of Agriculture, Tokyo, Japan, 5General Affairs Department, National Institute for Environmental Studies, Tsukuba, Japan, 6Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies, Tsukuba, Japan, 7Laboratory Animal Research Station, Nippon Institute for Biological Science, Hokuto, Japan, 8Animal Breeding and Reproduction Research Division, NARO Institute of Livestock and Grassland Science, Tsukuba, Japan, 9Laboratory of Animal Genetics, Graduate School of Bioagricultural Sciences, Nagoya, Japan.

11:45 am 224 Shell quality evaluation incorporating double repeatability in layer chicken.
Jesus Arango*1, Anna Wolc1,2, Petek Settar1, and Neil P. O’Sullivan1, 1Hy-Line International, Dallas Center, IA, 2Iowa State University, Ames, IA.

Symposium: Salmonella and Campylobacter Control During Poultry Processing: Advances and Regulatory Compliance in the New Millennium
Chair: Manpreet Singh, Purdue University
Jefferson Ballroom

1:00 pm Pathogen control during poultry processing—21st century challenges.
Ashley B. Peterson, National Chicken Council, Washington, D.C.

1:45 pm Emerging technologies for pathogen control during processing.
Manpreet Singh, Purdue University, West Lafayette, IN.
2:15 pm Validation of antimicrobial interventions for pathogen control—An industry perspective.
Kendra Waldbusser, Pilgrims Pride Corporation, Greeley, CO.

3:00 pm Break

3:30 pm Indicator organisms and pathogen surrogates—Criteria for optimizing application strategies.
Gary Acuff, Texas A&M University, College Station, TX.

4:00 pm Signature microbiome communities in poultry processing—Application of new generation sequencing.
Steven C. Ricke, University of Arkansas, Fayetteville, AR.

4:30 pm Panel discussion

Symposium: Rethinking Our Approach to Poultry Science Through Duck Research
Chair: Zachary S. Tucker, Maple Leaf Farms Inc. Belle Chasse

1:00 pm The physiology and behavior responses to differences in light spectrum.
Gregory S. Fraley, Hope College, Holland, MI.

1:30 pm Responses to amino acids—The threonine-mucin axis.
Todd J. Applegate, University of Georgia, Athens, GA.

2:00 pm Skeletal development as a response to selection for growth in poultry—A decade of correlated data in ducks.
Darrin M. Karcher, Michigan State University, East Lansing, MI.

2:30 pm Understanding the myriad effects of temperature variability during incubation.
Michael S. Lilburn, The Ohio State University, Columbus, OH.

3:00 pm Break

3:30 pm The dynamics and interpretation of intestinal microbiome data.
Aaron A. Best, Hope College, Holland, MI.

4:00 pm Avian influenza—Unique immunological adaptation in ducks.
Danyel Evseev, University of Alberta, Edmonton, AB, Canada.
4:30 pm  An international perspective of duck production.
Cesar Chavez, Maple Leaf Farms Inc., Leesburg, IN.

Immunology, Health, and Disease I
Chair: Michael H. Kogut, USDA-ARS
Moderator: Glenn Zhang, Oklahoma State University
Jasperwood

1:00 pm  225  Phytogenic feed additives display anti-inflammatory and anti-oxidative properties in vitro.
Theresa Kaschubek¹, Christine Hunger², Carina Schieder², Klaus Teichmann¹, Elisabeth Mayer¹, and Gerd Schatzmayr¹,
¹BIOMIN Research Center, Tulln, Austria, ²BIOMIN Holding GmbH, Getzersdorf, Austria.

1:15 pm  226  Hyperimmune IgY technology and its potential application for antibiotic-free poultry production.
Ujvala Deepthi Gadde*¹,² and Hyun S. Lillehoj¹, ¹Animal Biosciences and Biotechnology Laboratory, Beltsville Agricultural Research Center, USDA-ARS, Beltsville, MD, ²Oak Ridge Institute for Science and Education (ORISE) Research Participation Program at the Animal Biosciences and Biotechnology Laboratory, Beltsville Agricultural Research Center, USDA-ARS, Beltsville, MD.

1:30 pm  227  A combination of direct-fed microbial and enzymes reduces intestinal inflammation and extraintestinal spread in Campylobacter jejuni-challenged broilers.
Kirsty A. Gibbs*¹, Lizeth Lacharme-Lora², Gemma Chaloner², Alexandra Wealleans¹, Yueming Dersjant-Li¹, and Paul Wigley²,
¹Danisco Animal Nutrition, DuPont Industrial Biosciences, Marlborough, United Kingdom, ²Institute of Infection and Global Health, University of Liverpool, United Kingdom.

1:45 pm  228  Effect of yeast-derived products on Salmonella Enteritidis shedding and colonization in different organs of laying hens.
Pratima Acharya Adhikari*¹, Anna Rogiewicz², Woo Kyun Kim¹, Douglas E. Cosby³, Nelson A. Cox³, and Bogdan A. Slominski²,
¹Department of Poultry Science, University of Georgia, Athens, GA, ²Department of Animal Science, University of Manitoba, Winnipeg, MB, Canada, ³National Poultry Research Center, USDA, Athens, GA.
Evaluation of the effects of long-term Maxiban (nicarbazin/narasin) use on coccidiosis control and broiler chicken performance.

Performance of coccidia vaccinated broiler chickens fed varying levels of Natustat or Natustat NS.

Performance and anticoccidial effects of Magni-Phi in salinomycin-fed broilers.

Effects of whole yeast cell product in chickens post-coccidial challenge.
Ashley Markazi* and Amanda Luoma, The Ohio State University, Wooster, OH.

The effect of herbal medicine on immune system, blood biochemical parameters, intestinal microbial population, and performance of broilers.
Shaban Rahimi*, M. A. Karimi Torshizi, M. M. Ayari, and Saeed Yakhkeshi, Tarbiat Modares University, Tehran, Iran.

The effect of a Bacillus licheniformis probiotic on intestinal coccidial lesions in broiler chickens.
Dorthe Sandvang, Tina Styrishe, Alfred Blanch*, Mickaël Rouault, and Joren Verbeke, Chr Hansen A/S, Hørsholm, Denmark, Poulpharm, Izegem, Belgium.

Effect of dietary oleoresin mix on the performance of laying hens challenged with high pathogenic influenza virus H7N3.
4:15 pm 237  Effects of a multi-strain probiotic on the performance of broiler chickens exposed to a necrotic enteritis challenge. Eduardo Vicuna*, Chasity M. Pender1, G. Raj Murugesan1, Charles L. Hofacre2, and Greg F. Mathis3, 1Biomin America Inc., San Antonio, TX, 2Department of Population Health, Poultry Diagnostic and Research Center, University of Georgia, Athens, GA, 3Southern Poultry Research, Athens, GA.

4:30 pm 238  Inflammation hematology of ducks illustrates the monocyte-macrophage continuum. Paul Cotter*, Cotter Laboratory, Arlington, MA.

Metabolism and Nutrition: Feed Additives III
Chair: Kelley Wamsley, Mississippi State University
Moderator: Wei Zhai, Mississippi State University
Oak Alley

1:00 pm 239  Effects of microencapsulated Enterococcus faecalis and the extract of Camellia oleifera seed on growth performance, organ index, blood parameters, and cecal microflora in broiler chickens challenged with Escherichia coli K88. Yongwei Wang*, Zhenglin Dong, Dan Song, Yijiang Hou, Weiwei Wang, and Aike Li, Academy of Science and Technology of State Administration of Grain, Beijing, P. R. China.

1:15 pm 240  Commercial oregano product increases intestinal cell proliferation, antioxidant capability and performance of broilers. Aikaterini E. Konstanti*, Leon J. Broom1, Augustine Owusu-Asiedu1, David Harrington1, and Ilias Giannenas2, 1Anpario PLC, Manton Wood Enterprise Park, Worksop, United Kingdom, 2Laboratory of Nutrition, Faculty of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.

1:30 pm 241  Oregano essential oil improves performance in coccidiosis-vaccinated broilers. David Harrington*, Kat Constanti1, Greg F. Mathis2, and Leon Broom1, 1Anpario Plc, Worksop, United Kingdom, 2Southern Poultry Research Inc., Athens, GA.

1:45 pm 242  The effect of oregano essential oil on the immunity of broilers vaccinated against coccidiosis. Kat Constanti*, David Harrington1, Leon Broom1, and Greg F. Mathis2, 1Anpario Plc, Worksop, United Kingdom, 2Southern Poultry Research Inc., Athens, GA.
Effect of dietary β-galactooligosaccharides supplementation on performance parameters in heat-stressed broilers.
Saima Ashraf*, Hafsa Zaneb, Saima Masood, Habib Rehman, Sahar Ijaz, Mirza Muhammad Usman, Shaista Abbas, and Arbab Sikandar.
University of Veterinary and Animal Sciences Lahore, Lahore, Pakistan.
College of Veterinary Sciences Jhang, Jhang, Pakistan.

The effect of a phytogenic feed additive on apparent ileal digestibility and growth performance in broilers subject to a reduced-nutrient diet.
Chasity M. Pender, G. Raj Murugesan, Eduardo Vicuna, Carina Schieder, Klaus Männer, Jürgen Zentek, Mirjana Dukic-Stojicic, Sinisa Bjedov, Natasa Milosevic, and Lidija Peric.
Biomin America Inc., San Antonio, TX.
Biomin Holding GmbH, Getzersdorf, Austria.
Free University Berlin, Institute of Animal Nutrition, Berlin, Germany.
University of Novi Sad, Department of Animal Science, Novi Sad, Serbia.

Six-week observation of broilers fed diets containing various plant based feed additives and challenged with *Clostridium perfringens*.
Michael D. Sims, Jennifer Maurin, and Mieke Zoon.
Virginia Diversified Research Corp., Harrisonburg, VA.
Pancosma SA, Le Grand-Saconnex, Geneva, Switzerland.

Phytogenic growth promoter as an alternative for antibiotic and mannan oligosaccharides in broiler diets.
Youssef Attia, Mohammed Al-Harthi, and Saber Hassan.
Department of Arid Land Agriculture, Faculty of Meteorology, Environment and Arid Land Agriculture, King Abdulaziz University, Jeddah, Saudi Arabia.
Department of Animal and Poultry Production, Faculty of Agriculture, Damanhour University, Damanhur, Egypt.

Metabolism and Nutrition: Nutrition II
Chair and Moderator: Justin Fowler, University of Georgia Rosedown

A two-alternative forced choice method for detecting taste thresholds in chicken.
Naama Reicher, Shira L. Cheled-Shoval, and Zehava Uni.
Department of Animal Sciences, Robert H. Smith Faculty of Agriculture, Food and Environment, the Hebrew University of Jerusalem, Rehovot, Israel.
Investigation of the interaction between separate calcium feeding and phytase supplementation on the growth performance and nutrient utilization in broilers.
Mohammad Reza Abdollahi*, Yada Duangnumsawang1, and Velmuruga Ravindran1, 1Monogastric Research Centre, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, New Zealand, 2Animal Nutrition Group, Wageningen University and Research Centre, Wageningen, the Netherlands.

Effect of different carotenoid combinations on broiler skin color.
Sergio R. Fernandez*, Ernesto Avila2, Benjamin Fuente2, Fernando Cisneros1, and Francisco Miranda1, 1DSM Nutritional Products México, El Salto, México, 2Universidad Nacional Autónoma de México, México City, México.

Corn quality determination—A comparison of three near infrared (NIR)-based models and broiler data.
Shivaram K. Rao*, Pilgrim’s Pride, Canton, GA.

Metabolism and Nutrition: Enzymes II
Chair: Curran Gehring, Tucker Milling LLC
Moderator: Michael E. Persia, Virginia Tech
Rosedown

Growth performance and intestinal morphometric responses of broilers to xylanase supplementation in wheat-based diets.
Gemma González-Ortiz*, Marta Martínez-Mora2, David Sola-Oriol2, José F. Perez2, and Michael R. Bedford1, 1AB Vista, Marlborough, United Kingdom, 2Servei de Nutrició i Benestar Animal (SNiBA), Department de Ciencia Animal i dels Aliments, Universitat Autonoma de Barcelona (UAB), Barcelona, Spain.

Dietary enzymes prepared at ensiling (ZADO) affects productivity and enzyme activity in laying hens.
Hosam M. Safaa*, Hany R. Elsherif1, Mourad H. Elsanhoury2, Ahmed M. Fouad1, Mohamed A. Elmenawey1, and Ahmed O. Abass1, 1Animal Production Department, Faculty of Agriculture, Cairo University, Giza, Egypt, 2Poultry Production Department, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

Evaluation of Cibenza DP100 protease enzyme on apparent ileal amino acid digestibility of full fat extruded soybeans in broilers.
Karen Wedekind* and Jeffery Escobar, Novus International Inc., St. Charles, MO.
3:00 pm  
Break

3:30 pm  
β-Mannans of soybean meal: Their enzymatic hydrolysis and the effect of β-mannanase on growth performance and immune status of broiler chickens.
Anna Rogiewicz*¹, Jakub Naczmanski¹, Mohammad Alizadeh¹, Rob Patterson², and Bogdan A. Slominski¹. ¹University of Manitoba, Winnipeg, MB, Canada, ²Canadian Bio-Systems, Calgary, AB, Canada.

3:45 pm  
Performance of broilers fed a corn-soybean meal-based diet supplemented with a non-starch polysaccharidase and phytase enzyme combination.
Augustine Owusu-Asiedu*¹, Aikaterini E. Konstanti¹, Leon J. Broom¹, Emma Graystone¹, and Marta I. Gracia². ¹Anpario PLC, Worksop, United Kingdom, ²Imasde Agroalimentaria, S.L, Napolés, Madrid, Spain.

4:00 pm  
Effects of enriched xylanase and arabinofuranosidase activities on laying hens’ performance when fed wheat-based diets that differ in nutritional density.
Maxime Traineau¹, Pierre Cozannet¹, Estelle Devillard¹, Robert B. Shirley², Roberto Montanhini Neto³, Christophe Alleno⁴, and Aurélie Preynat*¹. ¹Adisseo, Commentry, France, ²Adisseo, Atlanta, GA, ³Adisseo, Antony, France, ⁴Zootest, Ploufragan, France.

4:15 pm  
Evaluation of the efficacy of xylanase and arabinofuranosidase enrichment of a multi-enzyme complex on metabolizable energy value of corn-soybean meal- and wheat-soybean meal-based diets.
Pierre Cozannet*¹, Maxime Traineau¹, Estelle Devillard¹, Roberto Montanhnini Neto³, Robert B. Shirley², and Aurélie Preynat¹. ¹Adisseo S.A.S, Commentry, France, ²Adisseo S.A.S, Atlanta, GA, ³Adisseo S.A.S, Antony, France.

4:30 pm  
Does phytate origin affect phytase response differently?
Roger Davin*¹,², Colwayne Morris¹, Fenglan Yan², Megharaja K. Manangi², David R. Ledoux¹, and Mercedes Vázquez-Añón². ¹University of Missouri, Columbia, MO, ²Novus International Inc., Saint Charles, MO.
Thursday, July 14

Symposium: Nutrition Ecology—Feeding the Gut or the Bird

Chair: Robert B. Shirley, Adisseo USA Inc.
Jefferson Ballroom

8:00 am  
**Microbial ecology in the gut: Key for performance consistency.**
Richard Ducatelle, Ghent University, Merelbeke, Belgium.

8:40 am  
**Necrotic enteritis and digestive disorders.**
Charles L. Hofacre, Southern Poultry Research Group, Watkinsville, GA.

9:20 am  
**Gut microbiota, physiological and behavioral homeostasis and product quality.**
Rachel L. Dennis, University of Maryland, College Park, MD.

10:00 am  
Break

10:30 am  
**Natural solutions to modulate gut microbiota.**
Debabrata Biswas, University of Maryland, College Park, MD.

11:10 am  
**Bacillus or bacillus: What makes an efficient strain?**
Preben Nielsen, Novozymes, Copenhagen, Denmark.

Metabolism and Nutrition: Amino Acids

Chair: Jason T. Lee, Texas A&M University
Moderator: Omar Gutierrez, Huvepharma Inc.
Belle Chasse

8:00 am  259  
**Bioavailability of methionine sources.**
Leticia Soares*, 1 Fernando Andres Prado Antayhua¹, Nilva Kazue Sakomura¹, Ariane Helmbrecht², and Nei André Arruda Barbosa³, ¹Universidade Estadual Paulista, J jaboticabal, Sao Paulo, Brazil, ²Evonik Industries, Hanau, Wolfgang, Germany, ³Evonik Industries, Sao Paulo, Sao Paulo, Brazil.

8:15 am  260  
**A comparison of equations to depict and predict nutritional kinetics.**
Runliaan L. Wang*, 1, 2, Rashed A. Alhotan³, Lynn Billard², and Gene M. Pesti², ¹Department of Animal Science, Guangdong Ocean University, Zhanjiang, Guangdong, China, ²Departments of Poultry Science and Statistics, The University of Georgia, Athens, GA.
Comparative efficacy of 2-hydroxy-4-methylthio-butanoic acid (HMTBA) relative to dl-methionine for laying hens fed on medium or low nutrient under ad libitum feeding regimen.
Jian M. Wan*, Xue M. Ding, Jian P. Wang, Shi P. Bai, Huan W. Peng, Yu H. Luo, Zhuo W. Su, Yue Xuan, and Ke Y. Zhang, Animal Nutrition Institute, Sichuan Agricultural University, Chengdu, Sichuan, China.

Evaluation of the tryptophan requirement of small-framed first cycle laying hens.

Effect of dietary leucine supplementation on growth and muscle mass in broilers.

Dietary methionine deficiency is associated with the bone remodeling in meat-type chickens.
Samuel E. Aggrey, Marie C. Milfort, Romdhane Rekaya, and Behnam Saremi, Poultry Science Department, University of Georgia, Athens, GA, Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Hessen, Germany.

Dietary methionine deficiency is associated with the inflammatory bowel disease pathway in meat-type chickens.
Samuel E. Aggrey, Marie C. Milfort, Romdhane Rekaya, and Behnam Saremi, Poultry Science Department, University of Georgia, Athens, GA, Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Hessen, Germany.

Effect of dietary supplementation of either dl-methionine or dl-methionine hydroxy analogue on the antioxidant system in broilers.

Break
Evaluation of the effects of supplementation with methionine and/or betaine on broiler meat quality.

Replacing supplemental DL-methionine by betaine effects on the occurrence of breast myopathies.

Dietary methionine sources and levels affect sulfur amino acid metabolism in broiler breeder hens.
Jian M. Wan*, Xue M. Ding, Jian P. Wang, Shi P. Bai, Huan W. Peng, Yu H. Luo, Zhuo W. Su, Yue Xuan, and Ke Y. Zhang, Animal Nutrition Institute, Sichuan Agricultural University, Chengdu, Sichuan, P. R. China.

Examining the effect of high dietary calcium on ileal endogenous amino acid losses and standardized ileal amino acid digestibility in broilers.
Sunday A. Adedokun*, Anthony J. Pescatore¹, Michael J. Ford¹, Jacqueline P. Jacob¹, and Tuoying Ao², ¹Department of Animal and Food Sciences, University of Kentucky, Lexington, KY, ²Alltech Inc., Catnip Pike, Nicholasville, KY.

Comparison of three levels of amino acid density on sex separate broiler performance and processing characteristics.
Sandro Cerrate*, Kim Walter, Benton Hudson, Alejandro Corzo, and Bryan Fancher, Aviagen Inc., Huntsville, AL.

Cereal type and AME content affect broiler performance.
Marta Martínez-Mora¹, David Solà-Oriol¹, Roser Sala¹, Gemma González-Ortiz*, Michael R. Bedford², and José F. Pérez¹, ¹Servei de Nutriciò i Benestar Animal (SNiBA), Department de Ciencia Animal i dels Aliments, Universitat Autònoma de Barcelona (UAB), Barcelona, Spain, ²AB Vista, Marlborough, United Kingdom.
The interaction of varying metabolizable energy levels and broiler strains on growth performance and processing yield.
Garrett J. Mullenix*, Katie M. Hilton¹, Justina Caldas¹, Michael Schlumbohm¹, Judith A. England¹, Antonio Kalinowski², and Craig N. Coon¹, ¹University of Arkansas-Poultry Science, Fayetteville, AR, ²Evonik Nutrition & Care GmbH, Hanau, Germany.

Diets varying in protein content and indigestible protein fractions influence meat yield of broiler chickens.
Dervan D. S. L. Bryan*, Dawn A. Abbott, and Henry L. Classen, University of Saskatchewan, Saskatoon, SK, Canada.

Effect of flaxseed oil and microalgae DHA-Gold on the production performance and fatty acid profiles of egg yolk and plasma in laying hens.
Mohamed Neijat*, Okeoghene Ojekudo, and James D. House, University of Manitoba, Winnipeg, MB, Canada.

Effect of altering dietary electrolyte balance using sodium bicarbonate and potassium carbonate on broiler breeder performance and egg shell parameters.
John Halley*, Sandro Cerrate, Alejandro Corzo, and Bryan Fancher, Aviagen Inc., Huntsville, AL.

Influence of particle size of the main cereal of the diet on egg production of brown laying hens.
Jorge Herrera¹, Beatrix Saldaña², Pilar Guzmán², Mohammad V. Kimiaeitalab², and Gonzalo G. Mateos*², ¹Camar Agroalimentaria, S.L, Toledo, Spain, ²Departamento de Producción Agraria, Universidad Politécnica de Madrid, Madrid, Spain.

Occurrence of mycotoxins in the 2015 US corn crop.
G. Raj Murugesan*, Chasity M. Pender¹, Ruben Beltran², and Ursula Hofstetter³, ¹Biomin America Inc., San Antonio, TX, ²Biomin USA Inc., San Antonio, TX, ³Biomin Holding GmbH, Getzersdorf, Austria.

Heat production and net energy of two broiler strains fed varying levels of metabolizable energy.
Katie M. Hilton*, Garrett J. Mullenix¹, Michael J. Schlumbohm¹, Justina V. Caldas¹, Judy A. England¹, Antonio Kalinowski², and Craig N. Coon¹, ¹University of Arkansas, Fayetteville, AR, ²Evonik Nutrition & Care GmbH, Hanau, Germany.
Management and Production II
Chair: Tom Tabler, Mississippi State University
Moderator: Karen D. Christensen, University of Arkansas
Oak Alley

9:00 am 280 Effects of tannic acid extract formulations on performance and intestinal health of Eimeria spp. challenged and coccidia-vaccinated broilers. Rachel M. Tonda*, Jon K. Rubach¹, Brett S. Lumpkins², Greg F. Mathis², and Mitchell J. Poss¹, ¹Kemin Industries, Inc., Des Moines, IA, ²Southern Poultry Research, Athens, GA.

9:15 am 281 Effect of hatching time, immediate feed access, and post-hatch holding time on broiler live performance. Serdar Ozlu*, Reza Shiranjang¹, Okan Elibol¹, and John T. Brake², ¹Department of Animal Science, Faculty of Agriculture, University of Ankara, Ankara, Turkey, ²Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC.

9:30 am 282 Ectoparasite diversity on backyard chicken flocks. Amy C. Murillo* and Bradley A. Mullens, University of California, Riverside, CA.

9:45 am 283 The effect of in ovo photostimulation with monochromatic green light during incubation on the expression of the somatotropic axis in broilers. Liron Dishon*, Natalie Avital-Cohen, and Israel Rozenboim, Robert H. Smith Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem, Rehovot, Israel.

10:00 am Break

10:30 am 284 Energy balance using two energy levels in the diet for broiler breeder flock. Nayara T. Ferreira*, Nilva K. Sakomura¹, Leticia Soares¹, Hilda C. P. Bendezu¹, and Robert M. Gous², ¹Faculdade de Ciências Agrárias e Veterinárias - UNESP, Jaboticabal, São Paulo, Brazil, ²University of KwaZulu-Natal, Pietermaritzburg, South Africa.

10:45 am 285 Evaluation of techniques to reduce moisture accumulation inside broiler transport trailers in western Canada. Nileeka H. Irugalbandara*, Catherine J. Vermette, Karen Schwean-Lardner, and Trever G. Crowe, University of Saskatchewan, Saskatoon, SK, Canada.
**Effect of dark exposure duration on broiler production parameters and gut transit time.**
Tory D. Shynkaruk*, Henry L. Classen¹, Trever G. Crowe², and Karen Schwann-Lardner¹, ¹Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada, ²Department of Mechanical Engineering, University of Saskatchewan, Saskatoon, SK, Canada.

**Leveraging animal behavior for robot planning.**
Colin Usher*, Wayne D. Daley¹, Jeanna L. Wilson², and Carla Aranibar², ¹Georgia Tech Research Institute, Atlanta, GA, ²University of Georgia, Athens, GA.

**Evaluation of plastic transpired solar collector for heating a turkey brooder room.**
Mark Poole*, Sanjay Shah, and Jesse L. Grimes, North Carolina State University, Raleigh, NC.

**Assessing the efficacy of a newly developed micro-aerosol for disinfection of the avian respiratory pathogen Mycoplasma gallisepticum.**
Jeffrey D. Evans*, Joseph L. Purswell, and Stephanie D. Collier, USDA-ARS Poultry Research Unit, Mississippi State, MS.

---

**Symposium: Avian Embryo Nutrition and Incubation**
**Chairs: Zahid Nasir, Trouw Nutrition, David E. Peebles, Mississippi State University**
**Rosedown**

**Avian embryo nutrition and its relationship to incubational metabolism and development.**
Zehava Uni, Hebrew University of Jerusalem, Rehovot, Israel.

**Influences of maternal flock age and trace mineral nutrition on avian embryo bone development.**
Cibele A. Torres, Trouw Nutrition, Casarrubios de Monte, Spain.

**Recent developments and future prospects of in ovo nutrition.**
Peter R. Ferket, North Carolina State University, Raleigh, NC.

**Energy partitioning during incubation and its relationship to embryo temperature.**
Ampai Nangsuy, Wageningen University, Wageningen, the Netherlands.

**Break**
Use of embryo temperature as a means to accurately regulate incubational temperature.
R. Michael Hulet, Pennsylvania State University, University Park, PA.

Optimizing incubational conditions to maximize embryonic nutrient transfer and hatchability.
Marleen L. Boerjan, Pas Reform BV, Zeddam, the Netherlands.

Current and future innovations in incubation technology to meet the changing broiler hatching egg.

Symposium: Meeting Today’s Animal Care Standards: Are You Ready?
Chair: Gretchen M. Hill, Michigan State University
Jefferson Ballroom

New Ag Guide—What should we expect?
A. Bruce Webster, University of Georgia, Athens, GA.

How ag research studies differ from “rat” studies in AAALAC accreditation.
Stephen Ford, University of Wyoming, Laramie, WY.

Getting along with your IACUC—Helping them understand agricultural species research.
Janeen Salak-Johnson, University of Illinois, Urbana, IL.

Applying AAALAC International’s peer review program to support agricultural research animal activities.
John F. Bradfield, AAALAC International, Frederick, MD.

What AAALAC means to poultry scientists developing research in universities and industries for production.
Kenneth E. Anderson, North Carolina State University, Raleigh, NC.

Break

Animal care and use in international poultry research.
Helena Paradell, Zoetis Inc., Spain.
Major histocompatibility complex variability in Finnish Landrace chickens.
Janet E. Fulton*, Mark E. Berres, Juha Kantanen, and Mervi Honkaukia.
Hy-Line International, Dallas Center, IA, University of Wisconsin, Madison, WI, Natural Resources Institute Finland, Jokioinen, Finland, Department of Environmental and Biological Sciences, University of Eastern Finland, Kuopio, Finland.

SNP identification of major histocompatibility complex haplotypes in Lakenvelder and Golden Sebright chickens.
Robert L. Taylor*, Mark E. Berres, and Janet E. Fulton.
West Virginia University, Morgantown, WV, University of Wisconsin, Madison, WI, Hy-Line International, Dallas Center, IA.

In-process quality control factors affecting the quality of locally prepared Salmonella gallinarum antigen.
Zahra Malik, Arfan Ahmad, Aftab Ahmad Anjum, Asim Aslam, Muhammad Zubair Shabbir, Amir Ghafoor, Muhammad Avais, Nisar Ahmad, Muhammad Hassan Saleem, and Masood Rabban, University of Veterinary and Animal Sciences, Lahore, Pakistan.

Determination of the capacity of Bacillus amyloliquefaciens CECT 5940 to inhibit quorum sensing.
Alvaro Ortiz*, Pilar Honrubia, and Juan J. Mallo, Norel, Madrid, Spain.

Sequence and residue analysis of complete F and HN genes of wild bird-originated Newcastle disease virus.
Muhammad Umar Sohail*, Muhammad Zubair Shabbir, Sameera Akhtar, Muhammad Anees, and Arfan Ahmad, Government College University Faisalabad, Faisalabad, Pakistan, University of Veterinary and Animal Sciences, Lahore, Pakistan.

Genetic and pathobiologic characterization of pigeon-originated Newcastle disease virus.
Muhammad Z. Shabbir*, Sameera Akhtar, Yi Tang, Tahir Yaqub, Arfan Ahmad, Ghulam Mustafa, Muhammad A. Alam, and Muhammad Munir, University of Veterinary and Animal Sciences, Lahore, Pakistan, The Pennsylvania State University, State College, PA, The Pirbright Institute, Woking, United Kingdom.
2:30 pm  296  **Staphylococcus agnetis** involvement in bacterial chondronecrosis with osteomyelitis in broilers.
Adnan A. Al-Rubaye, Sura Zaki, Nnamdi S. Ekesi, Abdulkarim Shwani, Robert F. Wideman, Young Min Kwon, and Douglas D. Rhoads*, University of Arkansas, Fayetteville, AR.

2:45 pm  297  **Reduced Escherichia coli** burdens and virulence in US commercial flocks fed multi-strain *Bacillus*.
Alexandra L. Wealleans*, Kirsty A. Gibbs¹, Jodi Benson², Firmin Delago³, Jennifer Lambrecht², Elizabeth Galbraith², and Marion Bernardeau¹, ¹Danisco Animal Nutrition, DuPont Industrial Biosciences, Marlborough, United Kingdom, ²DuPont Nutrition and Health, Waukesha, WI.

3:00 pm  Break

3:30 pm  298  **A preliminary study on carrier potential of Salmonella enterica** serotype Gallinarum biotypes *pullorum* and *gallinarum* in common wild bird species in Pakistan.
A. Aslam*, M. Ali¹, I. Ahmad¹, M. Ijaz¹, Habib Rehman³, N. Ahmad⁴, K. Ashraf⁴, Raheel Akhtar¹, and G. Mustafa¹, ¹Department of Pathology, University of Veterinary and Animal Sciences, Lahore, Pakistan, ²Department of CMS, University of Veterinary and Animal Sciences, Lahore, Pakistan, ³Department of Physiology, University of Veterinary and Animal Sciences, Lahore, Pakistan, ⁴Department of Parasitology, University of Veterinary and Animal Sciences, Lahore, Pakistan.

3:45 pm  299  **Antibiotics: New use policies won’t change the outcome.**
Hector M. Cervantes*, ¹Phibro Animal Health, Atlanta, GA, ²University of Georgia, Athens, GA.

4:00 pm  300  **The effects of coccidiosis and Clostridium perfringens** challenge on immune cell dynamic and nutrient digestibility in broiler chickens: Combination of antibiotic growth promoter and protected organic acid plus essential oils.
Antonio Leonardo Kraieski¹, Paula Gabriela Santin¹, Carolina Oliva Pinto¹, Mariana Lemos Moraes², Duarte Almeida Neves², and Elizabeth Santin*, ¹Federal University of Parana, Curitiba, PR, Brazil, ²Jefo Nutrition Inc., St-Hyacinthe, QC, Canada.

4:15 pm  301  **Focal duodenal necrosis is evident in end-of-lay table egg flocks in Saskatchewan, Canada.**
Tennille D. Knezacek*, Jenny A. Fricke², and Henry L. Classen¹, ¹Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada, ²Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.
Factors influencing coccidiosis as a disease challenge model for broiler chickens housed in cages.
Rachel K. Savary*, Timothy A. Fiss, Dawn A. Abbott, Jenny A. Fricke, Andrew G. Van Kessel, and Henry L. Classen, University of Saskatchewan, Saskatoon, SK, Canada.

Ileal and cecal microbiota in early onset of necrotic enteritis in chickens.
Rosemary L. Walzem*, Thomas Gaydos, Omar Gutierrez, Katie Burchfield, and Audrey P. McElroy, Texas A&M University, College Station, TX, HuvePharma, Peachtree City, GA.

Metabolism and Nutrition: Vitamins and Minerals
Chair: Jason T. Lee, Texas A&M University
Moderator: Mark E. Jackson, Huvepharma Inc.
Oak Alley

Including copper sulfate or dicopper oxide in the diet up to 300 mg of Cu/kg of feed affects performance and copper accumulation in broiler chicken.
Manel Hamdi, David Solà Oriol, Rosa Franco Rosselló, Stéphane Durosoy, and José Francisco Pérez, Animal Nutrition and Welfare Service (SNiBA), Departament de Ciència Animal i dels Aliments, Universitat Autònoma de Barcelona, Bellaterra, Spain, Animine, Sillingy, France.

Effects of copper sources on eggshell ultra-structure and yolk quality of broiler breeder hen.
Eveline Berwanger, Sergio L. Vieira, Liris Kindlein, Clara Roselina Angel, Marco Antônio Ebbing, and Bárbara Moreira, UFRGS, Porto Alegre, RS, Brazil, University of Maryland, College Park, MD.

Effect of chelated copper on gut health in broilers.

Hen calcium and phosphorus metabolism during the egg-laying cycle.
Toshie Sugiyama*, Chiharu Miyakawa, and Minami Uchida, Niigata University, Niigata, Japan.
Investigation of the effects of dietary Ca and P deficiency (depletion) and of the following recovery (repletion) on broiler chicken growth performance and bone characteristics.
Anne-Sophie Valable*1,2, Agnès Narcy2, Michel Duclos2, Greg Page3, and Marie-Pierre Letourneau-Montminy1, 1Laval University, Quebec, QC, Canada, 2INRA Poultry Research unit, Nouzilly, France, 3Trouw Nutrition AgResearch, Guelph, ON, Canada.

Effect of dietary 2,5-hydroxycholecalciferol on broiler chicken skeletal muscle proximate composition.
Mariah A. Hiott1, Kelly C. Hutton2, Mathew A. Vaughn2, Bradley J. Turner3, Gilberto Litta3, and Jessica D. Starkey*1,2, 1Auburn University, Auburn, AL, 2Texas Tech University, Lubbock, TX, 3DSM Nutritional Products, Parsippany, NJ.

Vitamin E and selenium source or level effect on broiler breeders antioxidant status and performances.
Mickaël Briens1, Rama Rao Savaram Venkata2, Robert B. Shirley*1, and Yves Mercier1, 1Adisseo France S.A.S, Antony, France, 2Project Directorate on Poultry, Hyderabad, India.

Effect in broilers of dietary fiber from rapeseed meal on phosphorus and calcium digestibility in diets supplemented with microbial phytase.
Marion Bournazel*1,2, Michel Lessire1, Nathalie Meme1, Michel Magnin2, Corinne Peyronnet3, Alain Quinsac4, Michel Duclos1, and Agnès Narcy1, 1Institut National de la Recherche Agronomique–Unité de Recherches Avicoles, Nouzilly, France, 2MiXscience, Bruz, France, 3Terres Univia, Paris, France, 4Terres Inovia, Pessac, France.

Supplementation of arginine, selenium, and vitamins E and C increased the tendon breaking strength in broilers raised at 2278 m above sea level.
Leodan T. Rodríguez-Ortega1, Artemio J. Vargas-Galicia1, Fernando González-Cerón*3, Arturo Pro-Martínez1, Eliseo Sosa-Montes3, Jaime Bautista-Ortega2, Ciro A. Ruiz-Feria1, Gabriel Juárez-Juárez3, and David Chan-Díaz4, 1Colegio de Postgraduados, Campus Montecillo, Montecillo, México, 2Colegio de Postgraduados, Campus Campeche, Champotón, México, 3Universidad Autónoma Chapingo, Chapingo, México, 4Trouw Nutrition, Zapopan, México.
Bioavailability of zinc oxide sources in broilers.
Agnès Narcy¹, Agathe Roméo², Yves Nys¹, and Stéphane Durosoy*², ¹INRA, UR, Nouzilly, France, ²ANIMINE, Sillingy, France.
<table>
<thead>
<tr>
<th>Presentation Number</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>315P</td>
<td>The effect of housing Single Comb White Leghorns in conventional cages versus enriched colony cages from 23 to 79 weeks of age on stress and fear.</td>
<td>Morgan B. Farnell¹, Marcelo J. Moreira¹, and Gregory S. Archer*², Mississippi State University, Mississippi State, MS, Texas A&amp;M University, College Station, TX.</td>
</tr>
<tr>
<td>316P</td>
<td>The effect of different spectrums of LED light on hen production and welfare from 18 to 30 weeks of age.</td>
<td>James A. Byrd¹ and Gregory S. Archer*², USDA-ARS, College Station, TX, Texas A&amp;M University, College Station, TX.</td>
</tr>
<tr>
<td>317P</td>
<td>The effect of raising broilers under 3000K or 5000K LED light on production, stress, and behavior.</td>
<td>Gregory S. Archer*, Texas A&amp;M University, College Station, TX.</td>
</tr>
<tr>
<td>318P</td>
<td>Interpreting thermal micro-environment using video recordings during live haul.</td>
<td>Douglas J. Aldridge*¹, Karen D. Christensen, Susan E. Watkins, Yvonne Vizzier-Thaxton, and Yi Liang, University of Arkansas, Fayetteville, AR.</td>
</tr>
<tr>
<td>319P</td>
<td>Hens selected for feather pecking behavior show increased levels of impulsive action in a delayed reward task.</td>
<td>Patrick Birk¹, Joergen B. Kjaer², and Alexandra Harlander*, Animal Biosciences, University of Guelph, Guelph, ON, Canada, Friedrich-Loeffler Institute, Celle, Lower Saxony, Germany.</td>
</tr>
<tr>
<td>320P</td>
<td>Do laying hens discriminate between artificially and naturally sourced ammonia gas mixtures?</td>
<td>Bishwo B. Pokhare³, Vinicius Santos¹,², David Wood³, Bill V. Heyst³, and Alexandra Harlander*, Animal Biosciences, University of Guelph, Guelph, ON, Canada, Zootecnista, Brasilia, Brazil, School of Engineering, University of Guelph, Guelph, ON, Canada.</td>
</tr>
<tr>
<td>321P</td>
<td>Gait scores of broiler chickens provided different photoperiods and feed form.</td>
<td>Kayla Graham*¹, Nora Weatherbee, and Bruce Rathgeber, Faculty of Agriculture, Dalhousie University, Truro, NS, Canada.</td>
</tr>
<tr>
<td>322P</td>
<td>Effect of commercial housing type on laying hen welfare and bone characteristics in Alberta.</td>
<td>Clover J. Bench, Emmanuel Y. Opoku*, Caitlyn Erickson, and Douglas R. Korver, University of Alberta, Edmonton, AB, Canada.</td>
</tr>
</tbody>
</table>
Fei-Fei Yan*, Wei-Chao Wang1, Ross Wolfenden2, and Heng-Wei Cheng3, 1Department of Animal Sciences, Purdue University, West Lafayette, IN, 2Pacific Vet Group-USA Inc., Fayetteville, AR, 3USDA-ARS, Livestock Behavior Research Unit, West Lafayette, IN.

### Extension and Instruction

Assessment of the A.S.P.I.R.E. (ACT Supplemental Preparation In Rural Education) program as an effective extension tool to decrease deficits in ACT college entrance examination scores in rural high school students.
Braxton T. Whitaker*, Jason A. Osborne, Kenneth Anderson, and Kimberly A. Livingston, North Carolina State University, Raleigh, NC.

A cohort approach to graduate education: Attracting and retaining minorities in the biomedical and behavioral sciences.
Ed Smith*, David Bevan, Steven Culver, and Eric Wong, Virginia Tech, Blacksburg, VA.

R. Michael Hulet*, Eva A. Wallner-Pendleton, Philip J. Clauer, Gregory P. Martin, Patricia A. Dunn, and Paul H. Patterson, Penn State University, University Park, PA.

Comparison of roasted soybeans and soybean meal fed to pastured broilers.
Peter J. Lammers* and Libby J. Schertz, School of Agriculture, University of Wisconsin–Platteville, Platteville, WI, Wildlife Prairie Park, Hanna, IL.

Regulatory considerations for the use of insects as a source of nutrients in poultry and other animal feed.

### Genetics and Genomics

Epigenetic effects of progeny from broiler breeders fed a diet high in methyl donors.
Chelsea Phillips*SC and Christopher M. Ashwell, North Carolina State University, Raleigh, NC.

Embryonic growth of White Pekin ducks selected for growth to different ages.
Guy F. Barbato*1 and Zack S. Lowman2, Stockton University, Galloway, NJ, Joe Jurgielewicz & Son Ltd., Shartlesville, PA.
Genetics of embryonic growth among Japanese quail divergently selected for stress responsiveness.  
Timothy J. Licknack\textsuperscript{1,2}, Nicholas A. Anthony\textsuperscript{2}, and Guy F. Barbato*\textsuperscript{1}, \textsuperscript{1}Stockton University, Galloway, NJ, \textsuperscript{2}University of Arkansas, Fayetteville, AR.

Fertilizing effectiveness of White Pekin drakes from lines selected for growth to different ages.  
Guy F. Barbato*\textsuperscript{1} and Zack S. Lowman\textsuperscript{2}, \textsuperscript{1}Stockton University, Galloway, NJ, \textsuperscript{2}Joe Jurgielewicz & Son Ltd., Shartlesville, PA.

Immunology, Health, and Disease

Performance and response of direct-fed microbial (DFM)-fed broilers to a coccidiosis challenge.  
Mallory B. White*\textsuperscript{1 SF}, Steve Lamb\textsuperscript{2}, Debbie Winetzky\textsuperscript{2}, Katie Lecker\textsuperscript{2}, Daniel Little\textsuperscript{2}, Michael E. Persia\textsuperscript{1}, Samer W. El-Kadi\textsuperscript{1}, and Rami A. Dalloul\textsuperscript{1}, \textsuperscript{1}Animal & Poultry Sciences, Virginia Tech, Blacksburg, VA, \textsuperscript{2}Bio-Cat, Troy, VA.

Development and characterization of mouse monoclonal antibodies reactive with chicken interleukin-8.  
Woo H. Kim*\textsuperscript{1}, Hyun S. Lillehoj\textsuperscript{1}, Misun Jeong\textsuperscript{1}, Yvonne B. Sullivan\textsuperscript{2}, Laura Kakach\textsuperscript{2}, and Joanna W. LaBresh\textsuperscript{2}, \textsuperscript{1}Animal Biosciences and Biotechnology Laboratory, Agricultural Research Service, USDA, Baltimore, MD, \textsuperscript{2}Kingfisher Biotech, St. Paul, MN.

Identification of Athens Canadian Random Bred sires with naturally high and low levels of key immune markers.  
Christina L. Swaggerty*\textsuperscript{1}, Christopher M. Ashwell\textsuperscript{2}, Michael H. Kogut\textsuperscript{1}, and Robert L. Taylor\textsuperscript{3}, \textsuperscript{1}USDA/ARS, College Station, TX, \textsuperscript{2}North Carolina State University, Raleigh, NC, \textsuperscript{3}West Virginia University, Morgantown, WV.

Effect of dietary supplementation of sage extract, hyssop, and hawthorn on broiler growth performance.  
Omid Abassi\textsuperscript{1}, Shaban Rahimi*\textsuperscript{1}, and Fatemeh Sefidkon\textsuperscript{2}, \textsuperscript{1}Tarbiat Modares University, Tehran, Iran, \textsuperscript{2}Research Institute of Forests and Rangelands, Tehran, Iran.

Effects of Bacillus direct-fed microbial and plant extracts on the prevalence of necrotic enteritis when challenged with a necrotic enteritis model.  
Laci B. MacKay*\textsuperscript{1 SF}, James T. Krehling\textsuperscript{1}, Tina Y.-T. Wang\textsuperscript{2}, Elle V. Chadwick\textsuperscript{1}, Bradley Schrader\textsuperscript{1}, and Kenneth S. Macklin\textsuperscript{1}, \textsuperscript{1}Auburn University, Auburn, AL, \textsuperscript{2}HuvePharma Inc., Peachtree City, GA.
Identification of natural host defense peptide-inducing compounds using a cell-based high-throughput screening assay.
Wentao Lyu*SC, Zhuo Deng, and Guolong Zhang, Oklahoma State University, Stillwater, OK.

Genetic variation of vaccine target sequences of Clostridium perfringens strains.
Whitney N. Briggs*SC, Kimberly M. Wilson, and Lisa R. Bielke, The Ohio State University, Columbus, OH.

Performance of coccidia challenged broiler chickens fed Gallinat and Gallinat+.

Performance and reduction of necrotic enteritis of broiler chickens fed Sangrovit.
Greg F. Mathis*, Anja Pastor2, Charles L. Hofacre3, and Brett Lumpkins1, 1Southern Poultry Research, Inc., Athens, GA, 2Phytobiotics, Eltville, Germany, 3The University of GA, PDRC, Athens, GA.

Clostridium perfringens infection of the chicken induces immunometabolic alterations in the duodenum that includes the glycolytic and insulin signaling and NLRP3 inflammasome-mediated inflammatory cell death (pyroptosis).
Michael H. Kogut*1 and Ryan Arsenault2, 1USDA-ARS, College Station, TX, 2University of Delaware, Newark, DE.

Effects of live yeast supplementation on intestinal immunity and barrier structure in broilers challenged with Escherichia coli.
Weiwei Wang*, Zhui Li, Qiqi Han, and Yuming Guo, China Agricultural University, Beijing, China.

Evaluation of two different methods for inducing necrotic enteritis.
Kimberly M. Wilson*1 SC, Whitney N. Briggs1, John R. Barta2, and Lisa R. Bielke1, 1The Ohio State University, Columbus, OH, 2University of Guelph, Guelph, ON, Canada.

Effects of long-term Maxiban use on the intestinal bacterial microbiome.
Timothy J. Johnson*, Jessica L. Danzeisen1, Charles L. Hofacre3, Greg F. Mathis3, and Johnna S. Bridges4, 1University of Minnesota, Saint Paul, MN, 2University of Georgia, Athens, GA, 3Southern Poultry Research Group, Athens, GA, 4Elanco Animal Health, Greenfield, IN.

Expression of apoptosis and autophagy related genes in Eimeria-challenged broilers.
Shengchen Su*1 SC, Katarzyna B. Miska2, Mark C. Jenkins3, Raymond H. Fetterer3, and Eric A. Wong1, 1Virginia Tech, Blacksburg, VA, 2USDA-ARS, Beltsville, MD.
Cytosolic DNA sensing genes expression in the intestinal mucosa of necrotic enteritis chickens.
Yeong Ho Hong¹, Deivendran Rengaraj¹, Anh Duc Truong¹, Geun-Bae Kim¹, and Hyun S. Lillehoj², ¹Department of Animal Science and Technology, Chung-Ang University, Anseong, Republic of Korea, ²Animal Biosciences and Biotechnology Laboratory, USDA-ARS, Beltsville, MD.

A novel blend of natural botanical oils inhibits a number of common poultry pathogens.
Ashley L. Wagner*,¹, Lila Maduro², Martine Boulianne², Mariela E. Srednik², and Ivan D. Girard¹, ¹Probiotech International, Saint-Hyacinthe, QC, Canada, ²University of Montreal, Saint-Hyacinthe, QC, Canada.

Surveillance of avian influenza in the backyard poultry of the Chitwan district of Nepal and assessment of its awareness level among farmers.
Najim Sekh¹, UG and Purushowattam Tripathi², ¹Institute of Agriculture and Animal Science (IAAS), Rampur Campus, Rampur, Chitwan, Nepal, ²National Avian Disease Investigation Laboratory (NADIL), Bharatpur, Chitwan, Nepal.

In vitro characterization of Lactobacillus isolates from chicken gut for probiotics potentials.
Anita Mandal¹, SC, Rabindra K. Mandal¹, and Young Min Kwon¹², ¹Department of Poultry Science, University of Arkansas, Fayetteville, AR, ²Cell and Molecular Biology Program, University of Arkansas, Fayetteville, AR.

Comparison of total IgA levels in different samples in Leghorn chickens.
Rubén Merino-Guzmán*,¹, Juan D. Latorre², Amanda D. Wolfenden², Ramiro Delgado³, Billy M. Hargis², and Guillermo Tellez², ¹Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad de México, México, ²Department of Poultry Science, University of Arkansas, Fayetteville, AR, ³Nutriavicola, Cali, Colombia.

Total IgA level in different samples from broiler chickens receiving 50 or 500 ppb aflatoxin B1 for 21 days.
Rubén Merino-Guzmán*,¹, Rosario Galarza-Seeber², Juan D. Latorre², Amanda D. Wolfenden², Mikayla F. A. Baxter², Brittany D. Mahaffey², Kyle D. Teague³, Lucas E. Graham², Billy M. Hargis², and Guillermo Tellez², ¹Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad de México, México, ²Department of Poultry Science, University of Arkansas, Fayetteville, AR.

1,25-Dihydroxyvitamin D₃ synergy with butyrate in inducing the expression of host defense peptides in chicken.
Long Zhang*,¹,² SC, Yiping Liu², and Guolong Zhang¹, ¹Department of Animal Science, Oklahoma State University, Stillwater, OK, ²Farm Animal Genetic Resources Exploration and Innovation Key Laboratory of Sichuan Province, Sichuan Agricultural University, Chengdu, Sichuan, P.R. China.
Haplotype analysis of candidate genes’ resistance to Newcastle disease virus and heat stress in chickens.

Perot Saelao¹, Ying Wang¹, Kelly Chanthavixay¹, Rodrigo A. Gallardo⁴, David Bunn¹², Janet E. Fulton¹, Susan J. Lamont⁴, and Huajun Zhou*¹, ¹Department of Animal Science, University of California, Davis, Davis, CA, ²Iowa State University, Ames, IA, ³Hy-Line International, West Des Moines, IA, ⁴School of Veterinary Medicine, University of California, Davis, Davis, CA, USA.

Evaluation of in vitro effects of Allium hookeri on broiler chicken lymphocytes, macrophages and tumor cells.

Youngsub Lee*¹, Sunghyen Lee¹², Hyun S. Lillehoj¹, and Misun Jeong¹, ¹United States Department of Agriculture, Beltsville, MD, ²Rural Department Administration, Wanju, Jeollabuk-do, South Korea.

Blood pictures of the commercial duck—A neighborhood analysis.

Paul Cotter*, Cotter Laboratory, Arlington, MA.

Characterization of lactic acid bacteria population associated with different regions in gastrointestinal tract of chicken.

Bishnu Adhikari*⁵, Rabindra Mandal, and Young M. Kwon, University of Arkansas, Fayetteville, AR.

Effect of dietary algae (All-G-Rich) on jejunum histomorphology and immune tissue development in lipopolysaccharide-induced stress in broiler chicks.


Serological monitoring of broiler breeders in Tehran province against avian influenza.

Amin Rahimi¹, Saeed Charkhkar¹, Ali R. Bahonar², Shaban Rahimi*³, and Hossein Ebrahimi³, ¹Science and Research Branch of Islamic Azad University, Tehran, Iran, ²Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran, ³Faculty of Agriculture, Tarbiat Modares University, Tehran, Tehran, Iran.

Serological monitoring of broiler breeders in Tehran province against Newcastle disease.

Amin Rahimi¹, Saeed Charkhkar¹, Ali R. Bahonar², Shaban Rahimi*³, and Hossein Ebrahimi³, ¹Science and Research Branch of Islamic Azad University, Tehran, Iran, ²Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran, ³Faculty of Agriculture, Tarbiat Modares University, Tehran, Tehran, Iran.

Serological monitoring of broiler breeders in Tehran province against infectious bronchitis.

Amin Rahimi¹, Saeed Charkhkar¹, Ali R. Bahonar², Shaban Rahimi*³, and Hossein Ebrahimi³, ¹Science and Research Branch of Islamic Azad University, Tehran, Iran, ²Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran, ³Faculty of Agriculture, Tarbiat Modares University, Tehran, Tehran, Iran.
Application of cocktail phage to protect quail against colibacillosis.
Mohammad Naghizadeh, Mohammad Amir Karimi Torshizi, and Shaban Rahimi*,
Tarbiat Modares University, Tehran, Iran.

Management and Production

Mechanical vibrations in the transport of fertilized eggs and the losses caused in the birth and quality of broiler chicks.
Ana C. Donofre*1 SC, Iran J. Oliveira da Silva1, Aérica Cirqueira Nazareno1, and Iuri E. Paula Ferreira2, 1University of São Paulo (ESALQ/USP), Piracicaba, São Paulo, Brazil, 2Federal University of São Carlos (UFSCAR), Buri, São Paulo, Brazil.

Broiler enteric health trends from 2011 to 2015 as measured by field necropsy results.

Evaluation of direct-fed microbial Bacillus licheniformis and 25-hydroxycholecalciferol in coccidiosis vaccinated broilers.
Katie A. Burchfield*1 SC, Omar Gutierrez2, Thomas Gaydos2, Audrey P. McElroy1, and Jason T. Lee1, 1Texas A&M AgriLife Research, College Station, TX, 2Huvepharma Inc., Peachtree City, GA.

Using white with red LED lighting to improve hatchability and chick quality in broilers and layers.
Gregory S. Archer*1 and Juliette Delabbio2, 1Texas A&M University, College Station, TX, 2Once Inc., Plymouth, MN.

Increasing hatchability in duck eggs by exposing them to LED light during incubation.
Zachary S. Tucker1, Debbie Jeffrey1, and Gregory S. Archer*2, 1Maple Leaf Farms Inc., Leesburg, IN, 2Texas A&M University, College Station, TX.

Effect of in ovo feeding on jejunum mucosa development in neonatal Athens Canadian Random Bred (ACRB) and Ross 708 broilers.
Dimitri M. Malheiros* UG, Ramon D. Malheiros, Vera M. B. Moraes, and Peter R. Ferket, Prestage Department of Poultry Science, NC State University, Raleigh, NC.

Growth performance of broiler chickens and heritage breeds raised on pasture.
Jacqueline P. Jacob*1, Anthony J. Pescatore1, Michael J. Ford1, Tatijana M. Fisher1, Sunday A. Adedokon1, and Tuoying Ao2, 1University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.

Carcass yield of broiler chickens and heritage breeds raised on pasture.
Jacqueline P. Jacob*1, Anthony J. Pescatore1, Michael J. Ford1, Tatijana M. Fisher1, Sunday A. Adedokon1, and Tuoying Ao2, 1University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.
Effect of raising different breeds of chicken on pasture on skeletal development.
1University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.

Does spectrum lighting affect layer pullets’ growth and subsequent production?
University of Guelph, Guelph, ON, Canada.

Turkey gait analysis: Calibrating a pressure-sensing walkway.
Cara I. Robison, Prafulla Regmi, and Darrin M. Karcher.
Michigan State University, East Lansing, MI.

Managing ammonia emission in poultry houses using gas-permeable membrane.
1University of Maryland Eastern Shore, Princess Anne, MD, 2USDA-ARS, Florence, SC, 3USDA-ARS, Beltsville, MD.

A novel blend of natural botanical oils supplied in the drinking water reduces on-farm mortality.
Ashley L. Wagner*, Lorraine Fuller, Ivan D. Girard, and David W. Sammons.
1Probiotech International, Saint-Hyacinthe, QC, Canada, 2University of Georgia, Athens, GA, 3University of Tennessee at Martin, Martin, TN.

Effects of genetic line and incubation temperature profiles on broiler live performance until 56 days of age.
1Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, 2Universidad Politécnica de Madrid, Madrid, Spain, 3Politécnico Colombiano Jaime Isaza Cadavid, Medellín, Antioquia, Colombia, 4Universidade Estadual Paulista, Botucatu, SP, Brazil, 5Universidade Federal de Goiás, GO, Brazil, 6College of Veterinary Medicine, North Carolina State University, Raleigh, NC.

Effect of chlorine treatment on day 7 biofilm removal and its effect on inhibition of Escherichia coli serogroup O2 incorporation into established biofilm.
1Department of Poultry Science, University of Arkansas, Fayetteville, AR, 2USDA-ARS Poultry Production and Product Safety Research, University of Arkansas, Fayetteville, AR, 3Department of Civil Engineering, University of Arkansas, Fayetteville, AR.
Effect of direct-fed sulfur on ammonia emission in built-up litter.
James T. Krehling*, Laci B. MacKay, Bradley Schrader, Elle V. Chadwick, Joseph B. Hess, and Kenneth S. Macklin, Auburn University, Auburn, AL.

Effect of incubation temperature on residual yolk sac and liver lipids by meat-type chicken embryos.
Francine Vercese* and Gita Cherian, Oregon State University, Corvallis, OR.

The effect of water magnetization on egg production and quality of laying hens.
Mohamed I. El Sabry¹, Jose W. Charal², Katherine Rubio*², Kenneth W. McMillin², and Theresia Lavergne², ¹Cairo University, Giza, Egypt, ²LSU Agricultural Center, Baton Rouge, LA.

Metabolism and Nutrition: Nutrition

Influence of feed form and diet phase on day 46 to 53 broiler performance and processing.
Mark E. Lemons*¹ SC, Christopher D. McDaniel¹, Joseph S. Moritz², and Kelley G. S. Wamsley¹, ¹Department of Poultry Science, Mississippi State University, Mississippi State University, MS, ²Department of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV.

Dietary lysine: Effects on lysine homeostasis and performance of broiler chickens.
Collins Khwatenge* SC, Samuel Nahashon, Sarayu Boghoju, Boniface Kimathi, and Joseph Donkor, Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, TN.

Yolk sac composition of chick embryos and newly hatched chicks from broiler breeders supplemented with conjugated linoleic acid.
Poliana C. Martins¹, Lais M. Montel¹², Billy N. Marques¹, Laura C. B. Drosghic¹, Januaria S. Santos¹, and Jose H. Stringhini*¹², ¹Universidade Federal de Goias, Goiania, Goias, Brazil, ²CNPq researcher, Brazilia, Distrito Federal, Brazil.

Nitrogen-corrected apparent metabolizable energy value of macadamia nut cake for broiler chickens.
Sudhir Yadav* SC, Julio D. Berrocoso, and Rajesh Jha, Department of Human Nutrition, Food and Animal Sciences, University of Hawaii at Manoa, Honolulu, HI.

Effects of aflatoxins on growth performance and skeletal muscle of Cherry Valley male ducks.
Wenhuan Chang*, Qing Xie, Aijuan Zheng, Guohua Liu, and Huiyi Cai, Key Laboratory of Feed Biotechnology of Agricultural Ministry, Feed Research Institute, Chinese Academy of Agricultural Sciences, Beijing, China.
386P  Apparent metabolizable energy of microalgae (Spirulina sp.) for broilers under different methodologies. Fernando de C. Tavernari*1,2, Lenilson F. Roza2, Diego Surek1, Marcel M. Boiago2, and Diovani Paiana2, 1Embrapa Suinos e Aves, Concordia, SC, Brazil, 2Udesc, Chapeco, SC, Brazil.

387P  Nutritional evaluation of Glutenol, a co-product of ethanol production. Shelby P. Reed*, Pamela L. Utterback, and Carl M. Parsons, University of Illinois, Urbana/Champaign, IL.

388P  Effect of soybean meals of different origins on apparent ileal digestibility of amino acids in 22-day-old broilers. Lourdes Cámara, Mohammad V. Kimiaeitalab, Pilar Guzmán, Beatrix Saldaña, Husham A. Mandalawi, and Gonzalo G. Mateos*, Departamento de Producción Agraria, Universidad Politécnica de Madrid, Madrid, Spain.


390P  Performance, carcass yield and excretion of broilers fed diets supplemented with different calcium and fat sources. Medhat Adly Michael*, Ministry of Agriculture, Cairo, Egypt.

391P  Nutritional density of diets effect on performance of W-36 pullets from 1 to 6 weeks of age. Fernando Guilherme Perazzo Costa*, Lavosier E. Cavalcante, Sarah Gomes Pinheiro, Fernanda A. S. Parizio, Danilo T. Cavalcante, Leonilson Silva Dantas, José H. Junior, G. F. L. Cruz, Eduardo Terra Nogueira, Gabriel B. S. Pessoa, Vitor Arantes, and Matheus Ramalho de Lima, 1Federal University of Paraiba, Areia, Paraiba, Brazil, 2Ajinomoto do Brazil, Sao Paulo, Brazil, 3Hy Line, Sao Paulo, Brazil, 4Federal University of South of Bahia, Teixeira de Freitas, Bahia, Brazil.

392P  Nutritional density of diets effect on performance of Japanese quails from 1 to 42 d of age. Fernando Guilherme Perazzo Costa*, Ana Paula Bernardino da Silva, Sarah Gomes Pinheiro, Danilo Teixeira Cavalcante, Eduardo Terra Nogueira, Gabriel B. Sandt Pessoa, and Matheus Ramalho de Lima, 1Federal University of Paraiba, Areia, Paraiba, Brazil, 2Ajinomoto do Brazil, Sao Paulo, Brazil, 3Federal of South of Bahia, Teixeira de Freitas, Bahia, Brazil.

Effects of in ovo injection of carbohydrate, vitamin D₃, vitamin B₆, and β-hydroxy-β-methylbutyrate on body weight and intestinal development of ostrich chicks.  
Akbar Zamani, Farid Shariatmadari, Shaban Rahimi*, and Mohammad A. Karimi Torshizi, Tarbiat Modares University, Tehran, Iran.

**Metabolism and Nutrition: Amino Acids**

Marissa A. Weissmann* UG, Misty R. Walsh, Kolby L. Foltz, and Joseph S. Moritz, West Virginia University, Morgantown, WV.

Modeling of nitrogen requirement and deposition of lysine for females Redbro broilers lineage.  
Karine Silva Camargo¹, Carlos Bôa Viagem Rabello*¹, Cláudio José de Oliveira Parro², Levi Auto Lopes³, José Diógenes Pereira Neto¹, Ana Carolina Ferreira dos Santos¹, Rogério Ventura da Silva Junior¹, Jéssica de Melo Bandeira¹, Edney Pereira da Silva³, and Cláudia da Costa Lopes², ¹Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, ²Universidade Federal de Sergipe, Aracaju, Sergipe, Brazil, ³Universidade Estadual Paulista, Campus de Jaboticabal, Jaboticabal, São Paulo, Brazil.

Determining the optimum dietary amino acid ratios for females of the Redbro broiler lineage.  
Carlos Bôa Viagem Rabello*¹, Everton Barbosa de Lima¹, Rafaela Ingrid Omena de Abreu¹, Jéssica de Melo Bandeira¹, Cláudio José de Oliveira Parro², Cláudia da Costa Lopes², Edney Pereira da Silva³, and Guilherme Rodrigues do Nascimento¹, ¹Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, ²Universidade Federal de Sergipe, Aracaju, Sergipe, Brazil, ³Universidade Estadual Paulista, Campus de Jaboticabal, Jaboticabal, São Paulo, Brazil.

Levels of crude protein and amino acids supplementation in diets for broilers.  
Luiz Carlos Lemos Camello¹, Carlos Bôa Viagem Rabello*¹, Guilherme Rodrigues do Nascimento¹, Cláudio José de Oliveira Parro², Izaura Maria Lorena Rezende¹, Cláudia da Costa Lopes², Marcos José Batista dos Santos³, and Fernando Guilherme Perazzo Costa⁴, ¹Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, ²Universidade Federal de Sergipe, Aracaju, Sergipe, Brazil, ³Universidade Estadual Paulista, Campus de Jaboticabal, Jaboticabal, São Paulo, Brazil, ⁴Universidade Federal da Paraíba – Campus de Areia, Areia, Paraíba, Brazil.

Determination of dietary methionine requirement of male Korean native ducks for 21 days after hatch.  
Samiru S. Wickramasuriya* SC, Jaehong Yoo, Taeg Kyun Shin, Eunjoo Kim, Nuri Kim, Soo Kee Lee, and Jung Min Heo, Department of Animal Science and Biotechnology, Chungnam National University, Daejeon, South Korea.
Jose W. Charal*, Chaoyang Li, Andrea Rubio, Kenneth W. McMillin, and Theresia Lavergne, LSU Agricultural Center, Baton Rouge, LA.

Chaoyang Li* SC, Jose W. Charal, Andrea Rubio, Kenneth W. McMillin, and Theresia Lavergne, LSU Agricultural Center, Baton Rouge, LA.

Evaluating the effect of dietary calcium levels on ileal endogenous amino acid losses and standardized ileal amino acid digestibility in laying hen.
Sunday Adedokun*1, Anthony J. Pescatore1, Michael J. Ford1, Jacqueline P. Jacob1, and Tuoying Ao2, 1Department of Animal and Food Sciences, University of Kentucky, Lexington KY, 2Alltech Inc., Catnip Pike, Nicholasville, KY.

Effect of arginine and guanidinoacetic acid supplementation on performance, gut health and internal organs weight of male broiler chickens.
Nima Khodambashi Emami*1,2 SC, Abolghasem Golian1, Douglas D. Rhoads2, and Mohsen Danesh Mesgaran1, 1Ferdowsi University of Mashhad, Mashhad, Iran, 2University of Arkansas, Fayetteville, AR.

Effects of α-galactosidase on amino acid digestibility in broiler chickens.
Rocky Latham*1, Austin T. Jasek1, Ray Poureslami2, and Jason T. Lee1, 1Texas AgriLife Research, College Station, TX, 2Kerry Inc., Beloit, WI.

Effects of supplemental glutamine on growth performance of broiler chickens fed diets containing varying concentrations of lysine.
Samuel Nahashon*, Ali Alsogair, Boniface Kimathi, Collins Khwatenge, and Sarayu Boghoju, Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, TN.

Digestible dietary arginine requirements for 7- to 21-day-old male turkeys.
Joao Ferreira* and Jeffre Firman, University of Missouri, Columbia, MO.

Estimation of apparent ileal digestibility of amino acids and endogenous losses in broilers fed cereals: A meta-analysis.
Hector H. Salgado* and Marie-Pierre Létourneau-Montminy, Laval University, Quebec, QC, Canada.
408P Levels of dTrp on performance of white layers from 46 to 69 weeks of age.
Fernando Guilherme Perazzo Costa*, Fernanda Alice Santos Parizio, Sarah Gomes Pinheiro, Leonilson da Silva Dantas, Lavosier Enéas Cavalcante, José Gomes Vidal Junior, Gabriel F. L. Cruz, Eduardo Terra Nogueira, Gabriel Bruno Sandt Pessoa, Vitor Arantes, and Matheus Ramalho de Lima, ¹Federal University of Paraiba, Areia, Paraiba, Brazil, ²Ajinomoto do Brazil, Sao Paulo, Brazil, ³Hy Line, Sao Paulo, Brazil, ⁴Federal University of South of Bahia, Teixeira de Freitas, Bahia, Brazil.

409P Levels of dVal to white layers from 69 to 87 weeks of age.
Fernando Guilherme Perazzo Costa*, Cristina Aparecida Barbosa de Lima, Matheus Ramalho de Lima, Eduardo Terra Nogueira, Gabriel Bruno Sandt Pessoa, Vitor Arantes, Danilo Teixeira Cavalcante, and Sarah Gomes Pinheiro, ¹Federal University of Paraiba, Areia, Paraiba, Brazil, ²Ajinomoto do Brazil, Sao Paulo, Brazil, ³Hy Line, Sao Paulo, Brazil, ⁴Federal University of South of Bahia, Teixeira de Freitas, Bahia, Brazil.

410P Digestible amino acid ratios for starting and finishing male market turkeys.
Sally L. Noll*, Zhirong Jiang, and Paul B. Tillman, ¹University of Minnesota, St. Paul, MN, ²Ajinomoto Heartland, Chicago, IL, ³Poultry Technical Nutrition Services LLC, Buford, GA.

411P Withdrawn

412P Optimal in-feed amino acid ratio for broiler breeder hens based on deletion studies.

413P Effects of increasing phytase levels on male broiler performance and tibia bone ash in corn-soy diets.
Hunter G. Walters*, Cody A. Flores, Mike Coelho, Peter Ader, and Jason T. Lee, ¹Poultry Science Department, Texas A&M AgriLife Research, College Station, TX, ²BASF Corporation, Florham Park, NJ, ³BASF SE, Lampertheim, Germany.

414P Evaluation of the True Check in vitro screening method in determining the effect of trace mineral levels on Allzyme SSF phosphate uplift.

415P Influence of a superdose of a novel microbial phytase on growth performance and tibia ash.
Maurice Raccoursier* and Karen D. Christensen, University of Arkansas, Fayetteville, AR.
**416P** Efficacy of *Buttiauxella* sp. phytase on production performance in turkeys fed corn-soybean meal-based diet deficient in phosphorus and calcium.
Luke P. Barnard*1, Yueming Dersjant-Li1, Rachael Bold1, and Arun Kumar2,
1Danisco Animal Nutrition–DuPont Industrial Biosciences, Marlborough, United Kingdom, 2The University of Queensland, Gatton, QLD, Australia.

**417P** Storage at ambient temperature improves metabolizable energy in wheat distillers dried grains with solubles (DDGS) for broilers.
Vasil Pirgozliev*1, Isobel M. Whiting1, Muhammad W. Mirza1, Filiz I. Karadas2, and Amy L. Sharpe1, 1NIPH, Harper Adams University, Newport, United Kingdom, 2Yuzuncu Yil University, Van, Turkey.

**418P** Metabolizable energy in wheat for broilers.
Vasil Pirgozliev*1, Stephen P. Rose1, Isobel M. Whiting1, Sonya G. Ivanova2, and Genoveva Staikova2, 1NIPH, Harper Adams University, Newport, United Kingdom, 2Agricultural Institute, Shumen, Bulgaria.

**419P** The addition of phytase to the diet does not contribute to woody breast or white striping in commercial male broilers.
Dawn Koltes1, Shawna Weimer1, Xiao Sun1, Barbara A. Mallman1, Casey M. Owens1, Karen D. Christensen*1, Tara York2, and Craig Wyatt2, 1University of Arkansas, Fayetteville, AR, 2AB Vista, Plantation, FL.

**420P** Influence of phytase on growth, tibia ash, ileal Ca and P digestibility, carcass yield and composition of broilers.
Eduardo M. de Oliveira1,2, Jose H. Stringhini*1,2, and David R. Ledoux3, 1Universidade Federal de Goias, Goiania, Goias, Brazil, 2CNPq researcher, Goiânia, Goias, Brazil, 3University of Missouri, Columbia, MO.

**421P** Effect of high levels of microbial phytase in broiler diets.
Eduardo M. de Oliveira1, Jose H. Stringhini*1,2, and Dadid R. Ledoux3, 1Universidade Federal de Goias, Goiania, Goias, Brazil, 2CNPq researcher, Goiânia, Goias, Brazil, 3University of Missouri, Columbia, MO.

**422P** Impact of fumonisins and a fumonisin-degrading feed additive on laying performance and biomarkers of exposure.
Barbara Doupovec*, Ilse Dohnal1, Gerlinde Bichl1, Simone Schaumberger2, Christiane Gruber-Dorninger1, and Dian Schatzmayr1, 1Biomin Research Center, Tulln, Austria, 2Biomin Holding GmbH, Getzersdorf, Austria.

**423P** Nutritional challenge with dietary commercial phytases through performance and bone characteristic assessment of broiler chickens.
Antonio G. Bertechini*1, Matheus de P. Reis1, and Julio Cesar C. Carvalho2, 1Universidade Federal de Lavras, Lavras, MG, Brazil, 2Cargil Animal Nutrition Latin America, Campinas, SP, Brazil.
**The effect of mineral source and level on the activity of exogenous phytase.**  
Rachel A. O’Rourke, Laurann A. Byrne, Mark A. Gaffney, Kate A. Jacques*, and Richard A. Murphy, Alltech Bioscience, Dunboyne, Co. Meath, Ireland.

**Energy values of sugar cane yeast, with or without addition of enzyme complex for growing broilers.**  
Claudia da Costa Lopes¹, Carlos Bôa Viagem Rabello²*, Emanuela Nataly Ribeiro Barbosa¹, Camilla Roana Costa de Oliveira¹, Elainy Cristina Lopes¹, and Andreza Lourenço Marinho³, ¹Universidade Federal de Sergipe, Aracaju, Sergipe, Brazil, ²Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, ³Universidade Federal do Rio Grande do Norte, Natal, Rio Grande do Norte, Brazil.

**In vitro evaluation on relative enzyme activity of different Bacillus isolates.**  
Jose L. Vicente-Salvador*, Jacob Lum¹, Juan D. Latorre², Guillermo Tellez², and Ross Wolfenden¹, ¹Pacific Vet Group USA Inc., Fayetteville AR, ²University of Arkansas, Fayetteville AR.

**Efficacy of a next-generation microbial phytase in laying hens fed corn-soybean meal-based diets low in non-phytate phosphorus.**  
Megharaja K. Manangi*, Joe Cushing, and Mercedes Vazquez-Anon, Novus International Inc., St. Charles, MO.

**Effect of high usage levels of commercial phytase on performance, bone ash, and thermostability in broilers fed with corn-soybean-based diets.**  
Luis-Miguel Gomez*, Oliver Restrepo¹, Carolina Mesa¹, and Roselina Angel², ¹Research and Development Unit, Solla S.A. Company, Colombia, ²Department of Animal and Avian Sciences, University of Maryland, College Park, MD.

**Metabolism and Nutrition: Feed Additives**

**Effect of a Bacillus subtilis probiotic inclusion with and without coccidiosis control on d 0 to 14 male Ross x Ross 708 broiler performance.**  
Andrew T. Brown*¹ UG, Hannibal A. Brooks¹, Rosana A. Hirai¹, Masaya Kato², Corey Farmer², and Kelley G. S. Wamsley¹, ¹Department of Poultry Science, Mississippi State, MS, ²Calpis America Inc., Peachtree City, GA.

**The effect of Bacillus sp. in broilers to control Clostridium perfringens-induced necrotic enteritis.**  
Sean Griffin*, Greg F. Mathis³, Charles L. Hofacre³, and Brett Lumpkins², ¹Osprey Biotechnics, Sarasota, FL, ²Southern Poultry Research Inc., Athens, GA, ³Poultry Diagnostic and Research Center, The University of Georgia, Athens, GA.

**An evaluation of biochar in feed for 0- to 10-day-old broilers.**  
Brandon M. Cheron* SC, Jose W. Charal, and Theresia A. Lavergne, LSU Agricultural Center, Baton Rouge, LA.
Effects of metabolizable energy level and lysophospholipid supplementation on productive performance, nutrient digestibility, blood metabolites, and yolk cholesterol in laying hens.
Waewaree Boontiam*, 1, Byoung Y. Jung2, Yoon K. Hyun2, Jong H. Jeong1, and Yoo Y. Kim1, 1Department of Agriculture and Biotechnology, College of Agriculture and Life Sciences, Seoul National University, Seoul, South Korea, 2Easy Bio Inc., Seoul, South Korea.

Effects of ButiPearl supplementation on broiler performance, blood chemistry, and cecal fatty-acid analysis.
Courtney E. Ennis*1 SC, Jennifer M. DuCray2, Anne C. Cox2, and Kelley G. S. Wamsley1, 1Mississippi State University, Mississippi State, MS, 2Kemin Industries Inc., Des Moines, IA.

Camphor (Cinnamomum camphora) as an effective molecule for enhancing the fertility and hatching fertile eggs.
Asghar Sedaghat, Mohammad A. Karimi Torshizi, and Shaban Rahimi*, Tarbiat Modares University, Tehran, Iran.

Biological study of the incorporation of a natural carotene premix in laying hens feeding.
Luz M. Alzate*1,2 SC, Maria V. Alvarez2, Natyal Saavedra2, Julian Londoño2, and Claudio Jimenez2, 1University of Antioquia, Medellin-Antioquia, Colombia, 2Corporacion Universitaria Lasallista, Caldas-Antioquia, Colombia.

Development and in vitro evaluation of protected butyrate formulations for broiler chickens.
Pierre C. A. Moquet*, 1 Lonneke Onrust1, Rosalie van Emous1, and René P. Kwakkel1, 1Animal Nutrition Group, Wageningen University, Wageningen, the Netherlands, 2Department of Pathology, Bacteriology and Avian Diseases, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium.

Effect of two free silver carbene complexes on bacterial growth and expression of virulence genes of Clostridium perfringens type A.
Akhil M. Alsadwi*1 SC, Parth N. Shah2, Carolyn L. Cannon2, James A. Byrd3, Denise Y. Caldwell2, Hector E. Leyva-Jimenez1, and Christopher A. Bailey1, 1Poultry Science Department, Texas A&M University, College Station, TX, 2Department of Microbial Pathogenesis and Immunology, Texas A&M Health Science Center, College Station, TX, 3USDA, Southern Plains Agricultural Research Center, College Station, TX.

Meta-analysis of the effects of a plant extract from Ferula spp. on production response of laying hens.
Pauline Pourtau* and David Bravo, Pancosma, Geneva, Switzerland.
Effects of dietary xylooligosaccharide supplementation on performance and egg quality in laying hens.
Dongdong Li, Xuemei Ding, Le Kang, Keying Zhang, Shiping Bai, Qiu Feng Zeng, Jianping Wang*, Yue Xuan, and Zhuo Wei Su, Institute of Animal Nutrition, Sichuan Agricultural University, Chengdu, Sichuan, China.

Performance of broilers fed diets supplemented with two yeast cell wall strains using two feeding strategies.
Mohammed M. Hashim*1SC, Morouj N. Al-Ajeeli1, Raghad A. Abdaljaleel1, Akhil M. Alsadwi1, Yasser J. Jameel1, Hector E. Leyva-Jimenez1, Akram U. Haq1, Jimmie R. Corley2, and Christopher A. Bailey1, 1Texas A&M University System, College Station, TX, 2Phileo Lesaffre Animal Care, Milwaukee, WI.

Effect of GalliPro on performance, digestibility, and intestine morphology on broiler chickens.
Mateus de P. Reis1, Paulo B. Rodrigues*1, Antonio A. P. Garcia1, Nathaniel Barrett3, Michael E. Persia3, and Carl J. Schmidt2, 1Universidade Federal de Lavras, Lavras, MG, Brazil, 2University of Delaware, Newark, DE, 3Virginia Polytechnic and State University, Blacksburg, VA.

Effects of Original XPC and broiler maturity on Salmonella survival and cecal microbiome modulation utilizing an anaerobic in vitro mixed culture assay.
Stephanie M. Roto, Peter M. Rubinelli, Si Hong Park, and Steven C. Ricke*, University of Arkansas, Fayetteville, AR.

A comparative analysis of microbial profile of chicken and guinea fowl using a metagenomic approach.
Sarayu Bhogoju*1SC, Samuel Nahashon, and Joseph Donkor, Department of Agricultural and Environmental Sciences, Tennessee State University, Nashville, TN.

Noni (Morinda citrifolin) modulates the hypothalamic expression of feeding-related neuropeptides and heat shock proteins in broilers exposed to acute heat stress.
Hossein Rajaei-Sharifabadi1, Elizabeth Greene1, Kentu Lassiter1, Alissa Piekar ski1, Devin Cook1, Kaley Blankenship1, Phong Nguyen1, Austin Decker1, Lukas Gramlich1, Yvonne V. Thaxton1, Yi Liang2, Laura Estlad2, Tom E. Porter1, Walter G. Bottje1, Sami Dridi1, 1Center of Excellence for Poultry Science, University of Arkansas, Fayetteville, AR, 2Department of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, AR, 3Department of Animal and Avian Sciences, University of Maryland, College Park, MD.
Influence of dietary Na-butyrate, initial BW, and beak trimming on BW uniformity and growth performance of brown-egg laying pullets from hatching to 42 d of age.
Beatrix Saldaña¹, Pilar Guzmán¹, Guillermo Fondevila¹, Andrés Ortiz², Raúl Rodríguez³, and Gonzalo G. Mateos⁴, ¹Departamento de Producción Agraria, Universidad Politécnica de Madrid, Madrid, Spain, ²Nutega S. L, Madrid, Spain, ³Ibertec S. A. U, Valladolid, Spain.

Performance and intestinal microbial profile of broiler chickens supplemented with a blend of protected organic acids and essential oils.
Glenmer B. Tactacan*, Kathleen Sary, Wayne Bradshaw, and Derek Detzler, Jefo Nutrition, Saint-Hyacinthe, QC, Canada.

Aflatoxin contamination and the use of a specific bentonite alter plasma parameters in ducklings: Multiple trial analyses.
Clementine Oguey*¹ and Gaëlle Benzoni², ¹Pancosma SA, Le Grand Saconnex, Geneva, Switzerland, ²InVivo NSA, Saint Nolff, France.

Evaluation of productive parameters of broilers supplemented with cyproheptadine hydrochloride in a corn-soy based diet.
Neshan W. Sarkisian¹², Valentino Arnaiz*¹, and Pedro Shiomura¹, ¹Montana S.A, Lima, Perú, ²Universidad Científica del Sur, Lima, Perú.

Evaluation of the effect of a vegan protein supplement on broiler growth performance and processing yield.
Kyle A. Smith*¹, Bob Hill², Kip Karges², and Jason T. Lee¹, ¹Texas A&M AgriLife Research, College Station, TX, ²H.J. Baker & Bro. Inc., Shelton, CT.

Dietary inclusion of probiotic, prebiotic, synbiotic, and phytobiotic and evaluating performance, immunity and intestinal health of broilers fed different dietary protein levels.
Haitham Yakout*¹, Garmian Omar², Samar ElNagar², and Enas Abd ElKhalek², ¹Virginia Tech, Blacksburg, VA, ²Alexandria University, Alexandria, Egypt.

Broiler diets with energy reduction and different fat sources supplemented with an emulsifier.
Melina A. Bonato*¹, Ricardo L. C. Barbalho¹, Rafael A. Nacemento², Paulo H. Pelissari², Cristiane S. S. Araújo², and Lúcio F. Araújo³, ¹ICC Industrial Comércio Exportação e Importação Ltda, São Paulo, SP, Brazil, ²Universidade de São Paulo, FMVZ/VNP, Pirassununga, SP, Brazil, ³Universidade de São Paulo, FZEA/ZAZ, Pirassununga, SP, Brazil.

Effects of an emulsifier in diets with different sources of oil/fat for broiler chickens.
Levy Teixeira*¹, Sabrina Alcebiades¹, Luiz Rombola², Marc Rovers³, Arno Aa², and Antonio Bertechini¹, ¹Federal University of Lavras, Lavras, Minas Gerais, Brazil, ²Orffa, Werkendam, the Netherlands.
Effects of dietary supplementation of antibiotic, anticoccidial, probiotic, and zinc on meat quality of male broilers.
Xingyong Chen$^{1,2}$, Xi Wang$^1$, Kezhou Cai$^3$, Mark W. Schilling$^4$, and Wei Zhai$^1$,

$^1$Department of Poultry Science, Mississippi State University, Mississippi State, MS, $^2$College of Animal Science and Technology, Anhui Agricultural University, Hefei, Anhui, China, $^3$School of Biotechnology and Food Engineering, Hefei University of Technology, Hefei, Anhui, China, $^4$Department of Food Science, Nutrition and Health Promotion, Mississippi State University, Mississippi State, MS.

Efficacy of a plant alkaloid extract in broilers compared with zinc bacitracin.
Anja Pastor$^1$, Carlos López Coello$^2$, Krimilda Valle$^3$, Jose Arce Menocal$^4$, and Ernesto Ávila González$^2$, Phytobiotics Futterzusatzstoffe GmbH, Eltville, Hesse, Germany, $^1$Universidad Michoacana de San Nicolás Hidalgo, Morelia, Michoacán, Mexico, $^2$Universidad Nacional Autónoma de México, Mexico City, Mexico, $^3$Grupo de Asesores en Biotecnologica, Mexico City, Mexico.

The effects of medium-chain fatty acids (MCFA) on the performance and health of turkeys vaccinated with coccidiosis vaccine.
Theodore P. Karnezos$^1$, Curtis L. Novak$^2$, Mahmoud Masadeh$^2$, Barry W. Koppen$^2$, and Ronald A. Dvorak$^1$, PMI Nutritional Additives, Arden Hills, MN, $^1$Purina Animal Nutrition, Shoreview, MN.

Effects of antioxidant supplementation on performance, intestinal morphology, and visceral organ mass in broilers fed commercial-type diets.
Christian H. Ponce$^1$, Luis Fuentes$^2$, Bety Heredia$^3$, Diana Sandoval$^3$, Mario Ortiz$^3$, and Julio Ortiz-Yepez$^3$, Escuela de Medicina Veterinaria, Colegio de Ciencias de la Salud, Universidad San Francisco de Quito USFQ, Quito, Pichincha, Ecuador, $^2$Departamento de Ciencias de la Vida y Agricultura, Universidad de las Fuerzas Armadas ESPE, Sangolqui, Pichincha, Ecuador, $^3$Centro de Investigacion traslacional, Carrera de Medicina Veterinaria y Zootecnia, Facultad de Ciencias de la salud, Universidad de las Americas, Quito, Pichincha, Ecuador.

Effect of Bredol on metabolizable energy in broiler diets.
Everton Luis Krabbe$^1$, Edenilse Goppinger$^2$, Valdir Silveira de Avila$^1$, Diego Surek$^1$, and Anne-Cathrine Samuelsson$^3$, Embrapa Swine and Poultry, Concordia, SC, Brazil, $^1$Federal University of Pelotas, Pelotas, RS, Brazil, $^2$AkzoNobel, Stenungsund, Sweden.

Replacement of antibiotic growth promoters by commercially available eubiotics.
Luis M. Indio$^1$, Juan C. González$^1$, Javier O. Bohórquez$^1$, and Carlos A. Lozano$^2$, Avícola San Isidro, Isidro Ayora, Guayas, Ecuador, $^2$DSM Nutritional Products Colombia S.A, Bogotá, Colombia.
Effects of direct-fed microbial supplementation on skin pigmentation and productive performance of broiler chickens challenged with *Eimeria* sp.
Julissa Perez-Rubio*, Aleyda S. Hernandez-Cazares¹, Arturo Pro-Martinez², Victor M. Valdes-Narvaez³, David J. Chan-Diaz³, and Victor Brito⁴, ¹Colegio de Posgraduados, campus Cordoba, Amatlan de los reyes, Veracruz, Mexico, ²Colegio de Posgraduados, campus Montecillos, Texcoco, Estado de Mexico, Mexico, ³Trouw Nutrition Mexico SA de CV, Zapopan, Jalisco, Mexico, ⁴SynBios SA de CV, Queretaro, Queretaro, Mexico.

**Metabolism and Nutrition: Vitamins and Minerals**

Evaluation of increasing levels of zinc methionine hydroxyl analogue chelate on male growth.
Austin T. Jasek*, Kyle D. Brown¹, Katie Burchfield¹, Robert E. Buresh², Mike Roux², Christine Z. Alvarado¹, Rocky E. Latham¹, and Jason T. Lee¹, ¹Texas AgriLife Research, College Station, TX, ²Novus International Inc., St. Charles, MO.

Effects of trace mineral sources on bioavailability and function in broiler chickens.
David F. Calabotta*, Kevin C. DeHaan, Troy J. Wistuba, A. Bruce Johnson, Wendell A. Knehans, and James D. Chapman, Phibro Animal Health Corporation Inc., Teaneck, NJ.

Comparison of bone mineralization measured by dual energy X-ray absorptiometry and tibia and toe bone characteristics in broilers fed varying dietary calcium and non-phytate phosphorus levels.
Anne-Sophie Valable*, Agnès Narcy², Michel Duclos², Greg Page³, and Marie-Pierre Letourneau-Montminy¹, ¹Laval University, Quebec, QC, Canada, ²INRA Poultry Research unit, Nouzilly, France, ³Trouw Nutrition Agresearch, Guelph, ON, Canada.

Total replacement of inorganic microminerals with reduced levels of proteinates in laying hen diets: Effect on productive performance, egg characteristics, and bone quality.

The effects of zinc supplementation from two sources on egg quality and bone health in laying hens.
Kelli M. Martin*, Napoleon Vargas Jurado, and Sheila E. Purdum, University of Nebraska-Lincoln, Lincoln, NE.
Influence of antagonists on broiler performance when fed either an inorganic or organic zinc source.
Michael D. Sims¹, Jack E. Garrett*, and Greg A. Nunnery², ¹Virginia Diversified Research Corp., Harrisonburg, VA, ²QualiTech Inc., Chaska, MN.

Effects of dietary calcium, nonphytate phosphorus, and phytase on growth performance and bone ash of Pekin ducks.
Ming Xie¹, Cristiano Bortoluzzi*, Roselina Angel³, Wenting Li³, Yael Noy⁴, and Todd J. Applegate⁵, ¹Institute of Animal Science, Institute of Animal Sciences, Chinese Academy of Agricultural Sciences, Beijing, China, ²Department of Poultry Science, The University of Georgia, Athens, GA, ³Department of Animal and Avian Sciences, University of Maryland, College Park, MD, ⁴Miloubar Feedmill, MP Ashrat, Israel.

Withdrawn

Effects of available phosphorus source and concentration on sodium phosphate type IIb co-transporter, vitamin D-1α-hydroxylase, and vitamin D-24-hydroxylase mRNA gene expression in broiler chicks.
Islam I. Omara*, Connie T. Mou¹, Michael E. Persia¹, and Eric A. Wong¹, ¹Virginia Tech, Blacksburg, VA, ²Cairo University, Giza, Egypt.

Performance of broilers fed different dietary choline sources and levels.
Giovani F. Farina, Kessler Alexandre, Patricia D. Ebling, and Andrea ML Ribeiro*, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.

Microbiology and Food Safety

The application of cultures of Lactobacillus spp. isolates with or without a chitosan coating reduce Campylobacter jejuni on chicken wingettes.
Komala Arsi*, Ann Woo-Ming¹, Basanta R. Wagle¹, Sandip Shreshta¹, Abhinav Upadhyay¹, Pam J. Blore¹, Ann M. Donoghue², Kumar Venkitanarayanan³, and Dan J. Donoghue¹, ¹Poultry Science Department, University of Arkansas, Fayetteville, AR, ²Poultry Production and Product Safety Research Unit, Agricultural Research Service, USDA, Fayetteville, AR, ³Department of Animal Science, University of Connecticut, Storrs, CT.

Validation of peroxyacetic acid, lactic acid, lactic and citric acid blend, and sodium hypochlorite against unstressed- and cold-stress-adapted salmonella on broiler carcasses and wings processed at a small USDA-inspected slaughter facility in West Virginia.
Lacey Lemonakis*, SC, KaWang Li, Jordan Garry, Payton Southall, and Cangliang Shen, West Virginia University, Morgantown, WV.
Gut microbiota-mediated suppression of virulence and antibiotic resistance of *Salmonella* Typhimurium DT104 by Original XPC in an in vitro poultry model.
Victor L. Nsereko*, Tom Weigand†, Steve A. Carlson‡, Joan M. Butler†, Don R. McIntyre†, and Mark F. Scott†, 1Diamond V, Cedar Rapids, IA, 2Department of Biochemical Sciences, Iowa State University College of Veterinary Medicine, Ames, IA.

Microbiological quality assessment, *Salmonella* and *Campylobacter* prevalence in broiler ceca and ready-to-cook carcasses.
KaWang Li*, Lacey Lemonakis, Brian G. Glover, Jordan Garry, Payton Southall, Joseph S. Morritz, and Cangliang Shen, West Virginia University, Morgantown, WV.

Effect of lactate on growth of cultures of cecal bacteria from commercial broilers.
Arthur Hinton* and Kimberly Ingram, U. S. National Poultry Research Center, Athens, GA.

In vitro evaluation of four commercially available *Bacillus* spp. probiotic supplements and their effect on an antibiotic resistant strain of *Salmonella* Heidelberg.
Claudia D. Castañeda*, Omar Gutierrez‡, Christopher D. McDaniel†, and Aaron S. Kiess†, 1Mississippi State University, Mississippi State, MS, 2Huvepharma Inc., Austin, TX.

Evaluation of enrofloxacin on *Salmonella* Enteritidis cecal colonization and organ invasion in broiler chickens.
Edurdo Morales Barrera*, Jose L. Lobato Tapia†, Juan Latorre Cárdenas‡, Ruben Merino Guzan‡, Omar Prado Rebolledo‡, Billy M. Hargis, and Guillermo Téllez-Isaías‡, 1Universidad Autónoma Metropolitana, México D. F., México, 2University of Arkansas, Fayetteville, AR, 3Universidad de Colima, Tecomán Colima, México.

The in vitro effectiveness of four *Bacillus* strains against three major pathogens.
Bradley C. Schrader*, Elle C. Chadwick, Laci B. McKay, James T. Krehling, Mark R. Liles, and Kenneth S. Macklin, Poultry Science Department, Auburn University, Auburn, AL.

Effect of feeding Original XPC on *Salmonella* enumeration and prevalence in ceca, breast, and ground breast meat in heat-stressed and non-heat-stressed broilers.
Christine Z. Alvarado*, Jiyang Fang†, Gerardo Casco†, Gregory S. Archer†, James A. Byrd‡, Paul T. Price§, Douglas P. Smith, and Hilary O. Pavlidis§, 1Texas A&M University, College Station, TX, 2Southern Plains ARS-USDA, College Station, TX, 3Diamond V, Cedar Rapids, IA.
Ice slurry to reduce processing intensity in poultry sanitation.
Stephanie Richter*, Ebony Rowe, Daniel Sabo, and Comas Haynes, Georgia Tech Research Institute, Atlanta, GA.

Evaluating methods for experimental contamination of *Salmonella* on eggs.
Andrew C. Rehkopf¹, James A. Byrd², Craig D. Coufal¹, and Tri Duong¹,
¹Department of Poultry Science, Texas A&M University, College Station, TX, 
²USDA-ARS, Southern Plains Agriculture Research Center, College Station, TX.

Growth of *Salmonella* in four enrichment broths at 37 or 42°C.

Ecometric evaluation of *Salmonella* selective enrichment broths to suppress background microflora.

Inactivation of *Salmonella* Enteritidis on shell eggs by coating with phytochemicals.
Indu Upadhyaya*, Hsin Bai Yin, Meera Surendran Nair, Chi-Hung Chen, Rebecca Lang, Michael J. Darre, and Kumar Venkitanarayanan, University of Connecticut, Storrs, CT.

Reducing *Salmonella* Heidelberg colonization in 21-day-old broiler chicks by in-feed supplementation of β-resorcylic acid and trans-cinnamaldehyde.
Indu Upadhyaya¹, Samantha Fancher¹, Hsin Bai Yin¹, Meera Surendran Nair¹, Chi-Hung Chen¹, Deepti Karumathil¹, Varun Kumar Bhattaram¹, Abhinav Upadhyay², Mazhar Khan¹, Michael J. Darre¹, Annie M. Donoghue³, Dan J. Donoghue³, and Kumar Venkitanarayanan¹, ¹University of Connecticut, Storrs, CT, ²University of Arkansas, Fayetteville, AR, ³USDA-ARS, Fayetteville, AR.

Direct and indirect transmissibility of attenuated and virulent *Mycoplasma gallisepticum* strains among caged layers.
Jeffrey D. Evans*, Scott L. Branton, Joseph L. Purswell, Spencer A. Leigh, and Stephanie D. Collier, USDA-ARS Poultry Research Unit, Mississippi State, MS.

Microbial changes in young turkeys after transportation stress.
Samantha M. Anderson*, Evan Hutchison, Rebecca Kangas, Josh Rehberger, Alexandra Smith, Eric Vang, and Thomas Rehberger, Agro Biosciences Inc., Milwaukee, WI.

An investigation of microbial differences between commercial breeder flocks that historically produce high and poor preforming progeny.
Rebecca Kangas*, Samantha Anderson, Evan Hutchison, Joshua Rehberger, Alexandra Smith, Eric Vang, and Thomas Rehberger, Agro Biosciences Inc., Wauwatosa, WI.
Analysis of the vertical transmission of gut microbiota from hen to chick in commercial broiler systems.
Eric Vang*, Evan Hutchison, Samantha Anderson, Rebecca Kangas, Alexandra Smith, Josh Rehberger, and Tom Rehberger, Agro Biosciences, Wauwatosa, WI.

Efficacy of octenidine hydrochloride in reducing Salmonella Enteritidis on chicken.
Hsinbai Yin*, Chihung Chen, Michael J. Darre, and Kumar Venkitanarayanan, University of Connecticut, Storrs, CT.

Assessment of microbiome populations on chicken carcasses at various first processing steps using a next-generation sequencing approach.
Sun Ae Kim¹, Si Hong Park¹, Sang In Lee¹, and Steven C. Ricke*¹,², ¹Center for Food Safety, Department of Food Science, University of Arkansas, Fayetteville, AR, ²Department of Poultry Science, University of Arkansas, Fayetteville, AR.

Antimicrobial resistance patterns of Salmonella isolated from poultry farms.
Carmen G. Velasquez*¹ SC, Matthew Bailey¹, Sydney Corkran¹, Kenneth S. Macklin², and Manpreet Singh¹, ¹Purdue University, West Lafayette, IN, ²Auburn University, Auburn, AL.

Molecular and Cellular Biology

Oxidative stress alters the expression of orexin and its related receptors in avian muscle cells.
Phuong H. Nguyen*¹, Elizabeth Greene¹, Adil Al-Ogaili¹, Peter Ishola¹, Annie M. Donoghue², F. Dustan Clark¹, Nicholas B. Anthony¹, and Sami Dridi¹, ¹Center of Excellence for Poultry Science, University of Arkansas, Fayetteville, AR, ²USDA, Agricultural Research Service, Poultry Production and Product Safety Research Unit, Fayetteville, AR.

Effect of serotonin imprinting on the development of the brain serotonergic system in chickens.
Xiaohong Huang*¹ SC and Heng-wei Cheng², ¹Purdue University, West Lafayette, IN, ²Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.

Promotion of adipogenesis by neuropeptide Y during the later stages of chicken preadipocyte differentiation.
Steven L. Shipp*, Mark A. Cline, and Elizabeth R. Gilbert, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Effect of adipogenic cocktail and different levels of oleic acid on adipogenic differentiation of primary mesenchymal stem cells isolated from broiler compact bones.
Roshan Adhikari* and Woo Kyun Kim, University of Georgia, Athens, GA.
Fasting and refeeding affect plasma non-esterified fatty acids and adipose tissue mRNA abundance in Japanese quail, *Coturnix japonica*. Guoqing Wang*, Betty R. McConn, Mark A. Cline, and Elizabeth R. Gilbert, Virginia Polytechnic and State University, Blacksburg, Virginia, USA.

Effect of 20(S)-hydroxycholesterol in ovo injection on developmental transcripts at the early stage of chick embryo development. Roshan Adhikari*, Robert B. Beckstead, and Woo Kyun Kim, University of Georgia, Athens, GA.

Establishment of quail embryonic stem-like cells. Mikiharu Nakano*, Saki Soeda, Hiroyuki Horiuchi, and Yoichi Matsuda, 1Avian Bioscience Research Center, Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya, Aichi, Japan, 2Laboratory of Animal Genetics, Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya, Aichi, Japan, 3Graduate School of Biosphere Science, Hiroshima University, Higashihiroshima, Hiroshima, Japan.

### Physiology and Reproduction

Expression and regulation of prolactin-like protein (PRL-L) in hen ovarian follicles. Shenqiang Hu*, Raj Duggavathi, and David Zadworny, McGill University, Ste-Anne-de-Bellevue, Quebec, Canada.

Effects of virginiamycin in laying hens: lack of egg residues following 21-day exposure. José E. Butolo, Lilian M. Pulz, Cesar A. Lopes, Michael U. Segal, and Kenneth W. Bafundo, 1JEB Agropecuária Ltda, Mogi Mirim, SP, Brazil, 2Phibro Animal Health Corp., Teaneck, NJ.

Influence of different housing systems on laying hen keel bone. Victoria Q. Mutch*, Prafulla Regmi, Cara I. Robison, and Darrin M. Karcher, Michigan State University, East Lansing, MI.

Ileal microbiota of broilers showed a diet-related composition of *Lactobacillus* spp. Emma Galster, Katharina Burbach, Janka Petrilla, Gabor Matis, Zsuzsanna Neogrady, Jana Seifert, and Korinna Huber, 1Institute of Animal Science Faculty of Agricultural Sciences, University of Hohenheim, Stuttgart-Hohenheim, Baden-Württemberg, Germany, 2Institute of Physiology and Biochemistry, Faculty of Veterinary Sciences, Budapest, Hungary.

Bioinformatic integration of two independent studies on gene expression of breast muscles in modern broiler pedigree chickens compared with unselected heritage chickens. Byung-Whi Kong, Dongwon Seo, Nicholas Hudson, Buhwan Khatri, and Walter G. Bottje, 1University of Arkansas, Fayetteville, AR, 2The University of Queensland, St. Lucia, Australia.
505P Association of live parameters with white striping at various ages in male broiler chickens.
Karen D. Christensen¹, Shawna L. Weimer¹, Barbara A. Mallmann¹, Xiao Sun¹,², Casey M. Owens¹, and Dawn A. Koltes*¹, ¹University of Arkansas, Fayetteville, AR, ²Nanjing Agricultural University, Nanjing, Jiangsu, China.

Gurueswar Nagarajan*, Seong W. Kang, and Wayne J. Kuenzel, University of Arkansas, Fayetteville, AR.

507P Thermal manipulation during pre- and post-hatch on thermotolerance of male broiler chickens exposure to chronic heat stress.
Gholam R. Zaboli¹, Shaban Rahimi*¹, Farid Shariatmadari¹, Mohammad A. Karimi Torshizi¹, and Ali Baghbanzadeh², ¹Tarbiat Modares University, Tehran, Iran, ²Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

508P Effect of thermal manipulation during pre and post hatch on intestinal bacterial populations in male broilers challenged by chronic heat stress.
Gholam R. Zaboli¹, Shaban Rahimi*¹, Farid Shariatmadari¹, Mohammad A. Karimi Torshizi¹, and Ali Baghbanzadeh², ¹Tarbiat Modares University, Tehran, Iran, ²Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

509P Transfection of human granulocyte colony stimulating factor gene via sperm for production of transgenic chickens using artificial insemination.
Mahin Rahimi¹, Shaban Rahimi*¹, Abdol H. Shahverdi², and Mohsen Sharafi¹, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute, Tehran, Iran.

510P Cloning and transfection of human follicle stimulating hormone gene via sperm and production possibility of transgenic chickens by artificial insemination.
Sahar Bazgir¹, Shaban Rahimi*¹, Abdol H. Shahverdi², and Mohsen Sharafi¹, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute, Tehran, Iran.

511P Culture of embryonic germ cells for chimeric quails production.
Saeed Yakhkeshi¹, Shaban Rahimi*¹, Hossein Baharvand², Seyyedeh N. Hassani², Mohsen Sharafi¹, Abdol H. Shahverdi², and Paul E. Mozdziak³, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute, Tehran, Iran, ³North Carolina State University, Raleigh, NC.

512P Human chorionic gonadotropin gene transfection using sperm for production of transgenic chickens by artificial insemination.
Mehdi Noorani¹, Shaban Rahimi*¹, Abdol H. Shahverdi², and Mohsen Sharafi¹, ¹Tarbiat Modares University, Tehran, Iran, ²Royan Institute, Tehran, Iran.
Effects of scalding method and sequential tanks on broiler processing wastewater loadings.
Caitlin E. Harris*, Dianna V. Bourassa, R. Jeff Buhr, and Brian H. Kiepper. 1University of Georgia, Athens, GA, 2USDA-ARS US National Poultry Research Center, Athens, GA.

Spatial influence on breast muscle morphological structure, myofiber size, and gene expression associated with the wooden breast myopathy.
Daniel L. Clark* and Sandra G. Velleman, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, OH.

Effect of probiotic supplementation on meat quality attributes of broilers exposed to chronic heat stress.
Traci Cramer*, Hyun-Wook Kim, Derico Setyabrata, Wei-Chao Wang, Fei-Fei Yan, Heng-Wei Cheng, and Yuan H. B. Kim. 1Department of Animal Sciences, Purdue University, West Lafayette, IN, 2Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.

Assessing the microbiomes of scalder and chiller tank waters throughout a typical commercial poultry processing day.

Effect of late heat stress on breast meat quality fed different sources of zinc and manganese.
Danny Portillo*, Marco A. Rebollo, Christine Z. Alvarado, and Jason T. Lee. 1Texas AgriLife Research, College Station, TX, 2Zinpro Corporation, Eden Prairie, MN.

Marination performance of broiler breast fillets.
Brian Bowker* and Hong Zhuang, USDA-ARS, US National Poultry Research Center, Athens, GA.

Effect of myopathies on meat quality and protein characteristics of broiler breast meat. Brian Bowker* and Hong Zhuang, USDA-ARS, US National Poultry Research Center, Athens, GA.

Low pH processing aid to lower the presence of naturally occurring Campylobacter on whole broiler carcasses.
Melissa A. Landrum*, Nelson A. Cox, Mark E. Berrang, Douglas E. Cosby, and Gene M. Pesti. 1Department of Poultry Science, University of Georgia, Athens, GA, 2USDA, US National Poultry Research Center, Athens, GA.
Effect of dietary flax seed and carbohydrase enzyme on muscle lipid quality in broiler chickens.
Francine Vercese and Gita Cherian*, Oregon State University, Corvallis, OR.

Relationship of strain and age on meat quality measurements in broiler breast meat.
Jessica L. Solo¹, Barbara A. Mallmann¹, Xiao Sun¹², Famous L. Yang¹, and Casey M. Owens*¹, ¹University of Arkansas, Fayetteville, AR, ²Nanjing Agricultural University, Nanjing, Jiangsu, China.

Consumer sensory evaluation on woody breast from broilers of various ages.
Jessica L. Solo, Tonya P. Tokar, Han-Seok Seo, and Casey M. Owens*, University of Arkansas, Fayetteville, AR.

Effect of feed ingredients and breed of chicken on meat quality.
Tatijana Fisher*¹, Anthony Pescatore¹, Jacquie Jacob¹, Austin Cantor¹, Mike Ford¹, and Tuoying Ao², ¹University of Kentucky, Lexington, KY, ²Alltech Inc, Nicholasville, KY.

White striping: Role of genetic line, sex, body weight, and dietary protein level on striation severity incidence.
M. J. Da Costa*¹, M. A. Landrum¹, T. J. Frost², J. Halley³, and G. M. Pesti¹, ¹University of Georgia, Athens, GA, ²Wayne Farms LLC, Oakwood, GA, ³Aviagen Inc., Huntsville, AL.

3D imaging for objective detection of wooden breast meat.
Seung-Chul Yoon*, Brian C. Bowker, Hong Zhuang, and Tae-Sung Shin, USDA-ARS, Athens, GA.

Peach skin powder inhibits oxidation in cooked turkey meat.
Y. Zhang*, I. Han, W. Bridges, and P. Dawson, Clemson University, Clemson, SC.

Using air deformation of raw fillet surfaces to identify severity of woody breast in broiler breast meat.
Xiao Sun*¹², Famous L. Yang², Jessica L. Solo², Barbara A. Mallmann², Craig N. Coon², and Casey M. Owens², ¹College of Engineering, Nanjing Agricultural University, Nanjing, Jiangsu, China, ²Poultry Science Department, University of Arkansas, Fayetteville, AR.
PSA Officers, Directors, and Committees

Officers and Directors
President: David J. Caldwell
First Vice President: Randolph D. Mitchell
Second Vice President: Mark E. Cook
Secretary-Treasurer: Theresia K. Lavergne
Past President: Todd J. Applegate
Director: Joseph B. Hess (2016)
Director: Sergio R. Fernandez (2016)
Director: Gregory L. Engelke (2017)
Director: Michael E. Persia (2017)
Director: E. David Peebles III (2018)
Director: Karen Schwean-Lardner (2018)
Student Representative: Indu Upadhyaya (2016)
Student Representative: Tatijana Fisher (2017)
Executive Director: Stephen E. Koenig
Director of Business Operations: Jon A. Cole

Publication Committee for *Poultry Science*
(The Publication Committee for *Poultry Science* consists of the editor-in-chief, the section editors, and the managing editor, president, and secretary-treasurer, ex officio.)

*Editor-in-Chief:*
T. E. Porter (2016)

*Section Editors:*
Genetics and Genomics: J. B. Dodgson (2016)
Immunology, Health, and Disease: R. L. Taylor (2016)
Metabolism and Nutrition: M. Rodehutscord (2016), G. Cherian (2017), and E. Esteve-Garcia (2017)
Microbiology and Food Safety: S. C. Ricke (2016)
Molecular and Cellular Biology: G. Y. Bedecarrats (2016)
Processing and Products: C. M. Owens (2017)

*Ex Officio:*
D. J. Caldwell, President and Board Liaison
T. K. Lavergne, Secretary-Treasurer
D. Busboom, Managing Editor
Publication Committee for The Journal of Applied Poultry Research
(Publication committee for JAPR consists of the editor-in-chief, the subject editors, and the managing editor, president, and secretary-treasurer, ex officio.)

Editor-in-Chief:
J. B. Carey (2018)

Subject Editors:
Breeding and Hatcheries: G. S. Archer (2018)
Health and Disease: F. D. Clark (2016)
Layer Management: K. E. Anderson (2016)
Microbiology and Food Safety: M. E. Hume (2017)

Ex Officio:
D. J. Caldwell, President and Board Liaison
T. K. Lavergne, Secretary-Treasurer
D. Busboom, Managing Editor

Standing Committees

American Egg Board Research Award/
Maurice Stein Fellowship Award
D. Karcher, Chair (2017)
K. Bregendahl (2017)
F. G. Silversides (2017)
M. E. Persia (2017)
W. K. Kim (2017)
A. Kollanoor-Johny (2017)
P. M. Banks (2017)
D. R. Jones, AEB Representative
C. Gregory, UEP Representative and ex officio, nonvoting
K. Schwean-Lardner, Board Liaison

American Feed Industry Association Poultry Nutrition Research Award
*Poultry Nutrition Research Award (PSA)
*New Frontiers in Animal Nutrition Award (FASS)
W. A. Dozier III, Chair (2016), FASS Award Committee
R. Angel (2016), FASS Award Committee
A. Corzo (2016)
M. Blair (2017)
N. R. Augspurger (2017)
J. A. Jenza (2018)
L. F. Romero (2018)
M. E. Persia, Board Liaison
American Poultry Historical Society Award (even years)
D. E. Cosby, Chair (2016)
P. Aho (2014)
C. M. Parsons (2014)
N. G. Zimmermann (2014)
J. B. Hess, Board Liaison

Careers Committee
*Alltech Student Research Manuscript Award
*PSA Student Recruitment Award (odd years)
A. Levy, Chair (2017)
W. S. Virden (2016)
R. N. Dilger (2017)
B. Lumpkins (2017)
C. M. Owens (2017)
S. Powell (2017)
C. Gehring (2018)
K. A. Livingston (2018)
J. B. Carey, ex officio, voting (Alltech Award only)
T. E. Porter, ex officio, voting (Alltech Award only)
A. E. Sefton, Alltech Representative, nonvoting
G. L. Engelke, Board Liaison

Committee of the USA Branch of the WPSA
E. E. M. Pierson, President (2017)
C. M. Ashwell, Vice-President (2019)
R. E. Buresh, Secretary-Treasurer (2017), PSA Appointment
C. L. Novak (2017)
O. T. Bowen-Faulkner (2019)
R. L. Taylor Jr., (2019), PSA Appointment
D. J. Caldwell, President of PSA, ex officio

Committee on Animal Care
*Poultry Welfare Research Award (even years)
K. D. Christensen, Chair (2016)
A. Atencio (2016)
H. O. Pavlidis (2016)
I. Estevez (2017)
M. M. Makagon (2017)
K. Schwean-Lardner (2017)
J. B. Hess, Board Liaison

Committee on Environmental Quality
C. D. Coufal, Chair (2016)
C. S. Dunkley (2016)
T. Marsh Johnson (2017)
P. H. Patterson (2017)
H. Xin (2017)
S. R. Fernandez, Board Liaison
Committee on Fellows
R. F. Wideman Jr., Chair (2016)
S. F. Bilgili (2017)
V. L. Christensen (2017)
H. M. Engster (2018)
M. P. Lacy (2018)
D. J. Caldwell, Board Liaison

Committee on Food Safety and Health
M. Singh, Chair (2017)
J. L. Snow (2016)
K. S. Macklin (2017)
R. E. Rivera (2017)
K. Venkitanarayanan (2017)
J. A. Byrd (2018)
K. Schwean-Lardner, Board Liaison

Constitution Committee
R. D. Mitchell, Chair (2016)
D. J. Caldwell (2016)
M. E. Cook (2018)
E. D. Peebles (2016)
K. Schwean-Lardner (2016)

Evonik Degussa Award for Achievement in Poultry Science
G. M. Pesti, Chair (2018)
S. Powell (2016)
V. Ravindran (2017)
J. E. Thomson, Evonik Degussa Representative
M. E. Persia, Board Liaison

Executive Director Steering Committee
T. J. Applegate, Chair (2016)
D. J. Caldwell (2017)
T. K. Lavergne (2018)
R. D. Mitchell (2018)
M. E. Cook (2019)

Extension/Outreach Committee
*Phibro Extension Award
*PSA Early Achievement Award for Extension (odd years)
K. W. Koelkebeck, Chair (2016)
G. P. Martin (2017)
J. Moyle (2017)
G. S. Archer (2018)
B. A. McCrea (2018)
J. Fowler (2018)
K. W. Bafundo, Phibro Representative
J. B. Hess, Board Liaison
Finance Committee
T. K. Lavergne, Chair (2016)
T. J. Applegate (2016)
D. J. Caldwell (2017)
R. D. Mitchell (2018)
M. E. Cook (2019)
J. A. Cole (ex officio)
S. E. Koenig (ex officio)

Foundation Board of Trustees
E. E. M. Pierson, Chair (2017), USA Branch of the WPSA
L. R. Bielke, Vice-Chair (2016)
J. B. Carey, Recording Secretary (2017)
J. W. Kessler (2016)
C. D. Knight (2016)
C. L. Novak, (2017), USA Branch of the WPSA
A. J. Pescatore (2017)
J. E. Fulton (2018)
M. M. Beck (honorary)
J. H. Denton (ex officio)
D. J. Caldwell (ex officio), PSA President
S. E. Koenig, Treasurer, Board Liaison

Hy-Line International Research Award/
PSA Early Achievement Award for Research (even years)
R. N. Dilger (2018)
L. R. Bielke (2018)
J. D. Starkey (2018)
T. Duong (2018)
P. Settar, Hy-Line Representative
E. D. Peebles, Board Liaison

Industry Committee for Poultry Science
*PSA Honorary Members
*USPOULTRY Distinguished Poultry Industry Career Award
*PSA Early Achievement Award for Industry (odd years)
H. M. Hellwig, Chair (2017)
B. A. Curry (2016)
R. Poureslami (2016)
M. R. Bedford (2017)
L. Mejia (2017)
A. M. Penz Jr. (2017)
K. D. Roberson (2017)
P. A. Smith (2017)
K. A. Turner (2017)
J. V. Felts (2018)
C. A. Coto (2018)
J. E. Starkey, USPOULTRY Representative
R. D. Mitchell, Board Liaison
Long-Range Planning Committee

D. J. Caldwell, Chair (2015)
R. D. Mitchell (2016)
M. E. Cook (2016)
T. J. Applegate (2016)
T. K. Lavergne (2016)
J. B. Hess (2016)
S. R. Fernandez (2016)
G. L. Engelke (2016)
M. E. Persia (2016)
M. E. Cook, Board Liaison

Membership Committee

D. R. McIntyre, Chair
A. Aburto
A. J. Calvert
E. N. Fischer
T. Fisher
M. P. Lacy
B. Lumpkins
A. M. Penz Jr.
I. Upadhyaya
M. E. Cook, Board Liaison

National Chicken Council Broiler Research Award

M. J. Darre, Chair (2017)
A. Mireles Jr. (2016)
M. I. Hannas (2017)
P. J. Rigolin (2017)
R. Loar II (2018)
E. O. Oviedo (2018)
A. B. Peterson, National Chicken Council Representative
M. E. Persia, Board Liaison

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

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

Nominating Committee

T. J. Applegate, Chair (2018), Past President
M. J. Wineland, (2016), Past President
M. T. Kidd (2017), Past President
M. O. Smith (2018), Past President
G. L. Engelke (2016), Elected
M. B. Farnell (2017), Elected
J. L. Grimes (2018), Elected

**Planning Committee for Annual Meeting**

**M. B. Farnell**, Chair (2016)
D. R. Jones (2017)
M. Singh (2018)
T. K. Lavergne (ex officio)
D. J. Caldwell (ex officio), Board Liaison

**Program Committee (2016 Annual Meeting)**

**M. B. Farnell**, General Program Chair (2016)
D. R. Jones, General Program Chair-Elect (2017)
M. Singh, General Program Chair-Elect (2018)
H. Xin, Animal Well-Being and Behavior
T. K. Lavergne, Extension and Instruction
H. Zhou, Genetics and Genomics
M. H. Kogut, Immunology, Health, and Disease
G. T. Tabler, Management and Production
K. G. S. Wamsley (Chair), C. Gehring, J. Fowler, and J. T. Lee, Metabolism and Nutrition
M. Singh, Microbiology and Food Safety
S. Dridi, Molecular and Cellular Biology
W. D. Berry Jr., Physiology and Reproduction
H. Thippareddi, Processing and Products
R. Angel, M. Sifri, and H. M. Hellwig, Informal Nutrition Symposium
K. W. Koelkebeck, National Extension Workshop
E. E. M. Pierson and K. Schwean-Lardner, WPSA Lectureship
M. E. Cook, Board Liaison

**PSA Hatchery Advisory Committee**

**J. Tyus**, Chair (2017)
J. C. Butler (2016)
G. M. Nagel (2018)
T. Fisher, Student Director
I. Upadhyaya, Student Director, Board Liaison

**PSA Scientific Policy Committee (Ad hoc)**

**R. A. Dalloul**, Representative to FASS Science Policy Committee
M. D. Koci, Representative to the FASS Science Policy Committee, Past Chair
T. J. Applegate, Representative to FASS Science Policy Committee, Board Liaison
K. D. Christensen (Chair, PSA Committee on Animal Care)
C. D. Coufal (Chair, PSA Committee on Environmental Quality)
M. Singh (Chair, PSA Committee on Food Safety and Health)
PSA Executive Committee

**Resolutions Committee**

**A. P. McElroy**, Chair (2018)
R. D. Mitchell, Board Liaison
Strategic Plan Evaluation Committee (SPEC)

G. L. Engelke, Chair (2016)
D. J. Caldwell, PSA President (2016)
R. D. Mitchell, PSA First Vice President (2016)
M. E. Cook, PSA Second Vice President (2016)
T. K. Lavergne, PSA Secretary-Treasurer (2016)
T. J. Applegate, PSA Past President (2016)
I. Upadhyaya, PSA Student Director (2016)
S. E. Koenig, Board Liaison

Teaching Committee
*Novus International Teaching Award
*PSA Early Achievement Award for Teaching

E. R. Gilbert, Chair (2016)
J. S. Moritz (2016)
R. B. Beckstead (2018)
C. Z. Alvarado (2018)
C. D. Knight, Novus International Representative
G. L. Engelke, Board Liaison

Tyson Foods Inc. Support Personnel Award

M. J. Zuidhof, Chair (2017)
M. J. Ford (2016)
C. W. Utterback (2017)
J. T. Lee (2018)
P. A. Smith, Tyson Representative
S. R. Fernandez, Board Liaison

Zoetis Fundamental Science Award

M. Choct, Chair (2017)
J. V. Felts (2016)
S. J. Lamont (2017)
R. Walzem (2018)
C. Walk (2018)
S. R. Fernandez, Board Liaison
Poultry Science Representatives

Association for the Assessment and Accreditation of Laboratory Animal Care, International
K. E. Anderson (12/2017)

American Association for the Advancement of Science
M. A. Ottinger (02/2016)

American Feed Industry Association
W. A. Dozier III (07/2015)

American Institute of Biological Sciences
C. R. Angel (02/2016)

American Poultry Historical Society and Literature Preservation
L. C. Arrington

American Registry of Professional Animal Scientists
G. P. Martin

Board of Agriculture (National Research Council)
F. A. Bradley

Coalition for Sustainable Egg Supply
K. W. Koelkebeck

Coalition on Funding Agricultural Research Missions
W. W. Saylor

Council for Agricultural Science and Technology
R. M. Hulet (11/2018)

Institute of Food Technologists
P. A. Curtis

James E. Rice Memorial Library
R. E. Austic

Professional Animal Auditor Certification Organization
K. E. Anderson
K. D. Christensen

Southern Poultry Science Society
M. M. Beck

World’s Poultry Science Association (Canada Branch)
K. Schwean-Lardner