

Applied Animal Science

The official publication of the American Registry of Professional Animal Scientists

Editorial Board

Dr. David K. Beede (2023), *Editor-in-Chief*
Michigan State University (retired)
Dr. Kristin Hales (2022), *Associate Editor*
Texas Tech University
Dr. J. Daniel Rivera (2023), *Associate Editor*
University of Arkansas
Dr. Eric van Heugten (2021), *Associate Editor*
North Carolina State University
Miriam A. Snider, *Social Media Editor*
University of Vermont

Science and Application

Extension and Teaching

Dr. John K. Bernard (2021)
University of Georgia (retired)
Dr. Karen Waite (2021)
Michigan State University

Food Science

Dr. Jason K. Apple (2022)
Texas A&M University–Kingsville
Dr. Kayanush J. Aryana (2022)
Louisiana State University
Dr. Benjamin M. Bohrer (2022)
The Ohio State University

Forages and Feeds

Dr. Debbie Cherney (2022)
Cornell University
Dr. Ken Coffey (2022)
University of Arkansas
Mr. Martin Do Carmo (2023)
Universidad de la Republica Facultad de Agronomia, y del Centro Universitario de la Región Este
Dr. Gonzalo Ferreira (2021)
Virginia Tech University
Dr. Juan Sanchez-Duarte (2023)
Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias Centro de Investigación Regional Norte Centro
Dr. Guillermo Scaglia (2022)
Louisiana State University

Genetics and Breeding

Dr. Hannah Cunningham-Hollinger (2022)
University of Wyoming
Dr. Ana Espasandin (2023)
Universidad de la Republica Facultad de Agronomia, y del Centro Universitario de la Región Este
Dr. M. R. Vineeth (2023)
Banaras Hindu University

Health

Dr. Gregg A. Hanzlicek (2021)
Kansas State Veterinary Diagnostic Laboratory
Dr. Ian Lean (2023)
Scibus and University of Sidney

Dr. Joseph Neary (2023)
University of Liverpool

Nutrition

Dr. Terry E. Engle (2022)
Colorado State University
Dr. Jong-Su Eun (2023)
CJ CheilJedang Corporation
Dr. Vinicius N. Gouvea (2022)
New Mexico State University
Dr. Marcos Marcondes (2023)
Washington State University
Dr. Josh McCann (2022)
University of Illinois
Dr. Danielle Pogge (2023)
The University of Queensland
Dr. Dwight Roseler (2021)
Purina Animal Nutrition, Ohio
Dr. Zach Smith (2022)
South Dakota State University
Dr. Luis Tedeschi (2022)
Texas A&M University

Physiology

Dr. Amin Ahmadzadeh (2022)
University of Idaho
Dr. James D. Chapman (2021)
Phibro Animal Health Corporation, Illinois
Dr. Mandheer Kaur (2023)
Chandigarh Group of Colleges
Dr. Joseph Neary (2023)
University of Liverpool
Dr. Greg Penner (2022)
University of Saskatchewan, Canada
Dr. George A. Perry (2021)
Texas A&M University–Overton
Dr. Pablo Pinedo (2022)
Colorado State University
Dr. João Souza-Junior (2023)
Universidade Federal Rural do Semi-Arido

Production and Management

Dr. Matt Beck (2023)
Lincoln University
Dr. Leonard Bull (2021)
North Carolina State University (retired)
Dr. Whitney Crossland (2022)
Texas Tech University
Dr. Travis Mulliniks (2022)
University of Nebraska
Dr. Gabriel Ribeiro (2023)
University of Saskatchewan
Mr. G. Scott Sell (2021)
Clemson University, South Carolina
Dr. Jason Smith (2022)
Texas A&M University–Amarillo

Sustainability and Integrated Systems

Dr. Leanna Dillard (2022)
University of Auburn
Dr. Sara Place (2022)
Elanco Animal Health–Kingsville, Indiana
Dr. Ryan Reuter (2021)
Oklahoma State University
Dr. Jason Rowntree (2021)
Michigan State University
Dr. Kathy Soder (2021)
USDA-ARS, Pennsylvania
Dr. Santiago Utsumi (2022)
Kellogg Biological Station, Michigan State University

Welfare and Behavior

Dr. Courtney L. Daigle (2021)
Texas A&M University
Dr. Temple Grandin (2021)
Colorado State University
Dr. Janice Swanson (2021)
Michigan State University

Officers and Directors of ARPAS

Paul Beck, *President*
Heidi Rossow, *President-Elect*
Mike Brown, *Secretary*
John Bernard, *Treasurer*
Daryl Kleinschmit, *Past President*
David K. Beede, *Editor in Chief*
William D. Price, *Historian*
Stephen P. Schmidt, *Examining Board Chair*
Aaron Park, *Midwestern Section*
Shelby Filley, *Western Section*
Tom Hickley, *Northeast Section*
Jenny Jennings, *Southern Section*
Peter Erickson, *ACAS President*
Gregory Martin, *PSA Representative*
David Kirk, *ADSA Representative*
Mike Looper, *ASAS Representative*
Amber Moffett Krotky, *ESS Representative*
TBD, *AMSA Representative*
Alois Kertz, *Executive Vice President*

Fass Inc. Publications Department journals@assoqh.org

Susan Pollock, *Managing Editor*
Christine Horger, *Lead Technical Editor*
Ron Keller, Sharon Frick, *Journal Production*
Shauna Miller, *Editorial Administrative Assistant*
Louise Adam, Katy Henkel, Lisa Krohn, Theresa Lawrence,
Technical Editors

Membership. Applications may be obtained by writing ARPAS, 1800 S. Oak St., Suite 100, Champaign, IL 61820. Contact ARPAS@assoqh.org or visit www.appliedanimalscience.org for member rates and benefits.

Manuscripts. Submissions should be uploaded to our online peer-review system at <http://mc.manuscriptcentral.com/pas>. For assistance using the system, contact Shauna Miller (shaunam@assoqh.org). Other correspondence should be addressed to the Editor-in-Chief, David Beede, Michigan State University, email: beede@msu.edu or cowtrout@gmail.com.

News and Notes. Announcements about meetings, personnel changes, and other items of interest should be sent to the Editor-in-Chief.

Advertising. For display advertising orders or inquiries in the US and Canada, please contact Ken Senerth at 609-577-0916; by fax at 212-633-3820 (fax); or by email at kensenerth@gmail.com. For display advertising orders and inquiries, please contact Sarah Ellis at +44 207 424 4538 or by email at s.ellis@elsevier.com.

Placement. Announcements should be sent to the ARPAS Business Office, 1800 S. Oak St., Suite 100, Champaign, IL 61820. The charge for listing available positions is \$50 (minimum) for a 2-inch, one-column announcement plus \$25 for each additional inch.

Permission requests. Permissions to reprint sections of articles or an article from *Applied Animal Science* in its entirety may be sought directly from Elsevier's Rights Department in Oxford, UK. Please contact permissions@elsevier.com.

Subscriptions. Volume 38, 2022. Nonmembers can purchase a personal subscription for \$190. For 2022 institutional subscriptions prices, please contact Elsevier's Journals Customer Service team at 800-654-2452 (US/Canada); at 314-447-8871 (customers outside of the US/Canada); or by email at journalscustomerservice-usa@elsevier.com. ISSN: 2590-2865 (electronic), 2590-2873 (print).



Applied Animal Science is published by Fass Inc. and Elsevier Inc. on behalf of the American Registry of Professional Animal Scientists.