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PROFESSIONAL BACKGROUND

1989-1991 Nutrition, Technical Support, and Product Development, Sunglo Feeds, Inc.
1991-1993 Nutritionist & Livestock Products Manager, Hubbard Milling Company
1993-1995 Director of Research and Product Development, Hubbard Milling Company
1995-2000 Assoc. Professor and Faculty Director of KSU Beef Cattle Research Center
2000-present Professor and Faculty Director of KSU Beef Cattle Research Center
2002-present Faculty Director of KSU Preharvest Food Safety/Microbiology Laboratory

EDUCATION

Ph.D. in Ruminant Nutrition. 1989. University of Nebraska-Lincoln
Master of Science in Production Management. 1986, University of Florida
Bachelor of Science in Animal Science. 1985. University of Florida

AWARDS

2020 Kansas State University Professorial Performance Award
2014 Kansas State University Professorial Performance Award
2013 American Feed Industry Association Award in Ruminant Nutrition Research
2009 Kansas State University Professorial Performance Award

TEACHING RESONSIBILITIES

ASI 890/990: Graduate Seminar in Ruminant Nutrition, Growth, and Management; Fall/Spring.
ASI 682: Formulation of Livestock and Poultry Diets; Fall.
ASI 684: Nutrition of Feedlot Cattle; Spring.

GRANTS AWARDED IN 2019/2020

Targeted Durations of Tylosin Phosphate Use in Feedlot Cattle for Control of Liver Abscesses. J.S. Drouillard (PI) and S. Gragg. Department of Health and Human Services, U.S. Food and Drug Administration.
Addressing challenges of water scarcity in the High Plains Production System: the Nexus Between Cattle Feeding and Sorghum (NexFeed). J.S. Drouillard (PI), D. Rhodes, S. Sexton-Bowser. United States Department of Agriculture.
Determining Effects of Direct-fed Microbials on Ruminant pH, Liver Abscess and Performance in Finishing Beef Steers. J.S. Drouillard (PI). DuPont Biosciences.
Site and Extent of Digestion of Ensiled High-Amylase Corn in Feedlot Cattle. J.S. Drouillard (PI). Syngenta Crop Protection.
Fermentation Characteristics and Aerobic Stability of High-Moisture Corn Prepared from High-Amylase Corn Hybrid (Enogen) or an Isoline Control. J.S. Drouillard (PI). Syngenta Crop Protection.

High-amylase corn (Enogen Feed Corn) in Pelleted Diets for Broiler Chickens. J.S. Drouillard (PI), J. Lattimer, and C. Paulk. Syngenta Crop Protection. .
Acceptability of Horse Feeds Containing Milne Blueberry Juice Concentrate 65 Brix and Blueberry Puree Concentrate 30 Brix. J. Lattimer (PI), T. Douthit, and J.S. Drouillard. Milne Fruit Products. Effect of Application Method of Vista PreT to a Dairy Total Mixed Ration on Ruminant In Vitro Fermentation Parameters. J. Lattimer (PI), B. Bradford, and J.S. Drouillard. AB Vista.

PERSONAL STATEMENT

Throughout my 25 years as a researcher at Kansas State University I have been engaged in a broad range of research projects relating to nutrition and management of beef cattle, with emphasis on feedlot cattle production. My research has largely been of a multidisciplinary nature, and I frequently work with colleagues in my home department, other departments and colleges within Kansas State University, domestic and foreign academic institutions, and corporate scientists. I have made a conscious effort to establish and maintain close connections to beef producers and members of allied industries, which has proven useful in developing a clear understanding of challenges faced by the industry, often providing focus for my research agendas. I have served as major professor for more than 40 master of science and doctoral student programs, participated as a member of the supervisory committee for dozens of other graduate students, and have mentored dozens of undergraduate student researchers. My research activities have been mostly of an applied nature, spanning topics such as development and implementation of feed processing technologies; byproduct feed utilization; nutritional factors influencing meat quality and composition (mostly based on dietary lipids); evaluation of exogenous growth promotants; preharvest intervention strategies for control of food-borne pathogens; antimicrobial use (including antibiotics and heavy metals) and characterization of resistance to antimicrobial compounds; and development and application of probiotic organisms in feedlot cattle.

I have maintained a prolific publication record that utilizes a variety of venues aimed at disseminating information to peer scientists, consulting nutritionists and veterinarians, allied industry representatives, and beef producers. This includes six patents, 125 peer-reviewed manuscripts, more than 200 scientific abstracts, in excess of 200 reports directed to industry practitioners and lay audiences, and dozens of invited presentations across six continents and in more than a dozen countries.

CONTRIBUTIONS TO SCIENCE

A major area of focus of my research program has related to feed processing technologies, including hydrothermal processing of cereal grains; molasses block production; extrusion processing; nutrient encapsulation strategies; non-enzymatic browning; liquid feed manufacturing; and other processes. Several of these efforts have led to patented technologies that now are licensed by Kansas State University to commercial partners in the U.S. and abroad. Grain processing and its impact on cattle performance, cattle health, carcass characteristics, and fecal shedding of food borne pathogens has been the subject of several graduate research programs that I have supervised. This includes work with sorghum, corn, and wheat, and with processes such as steam flaking, extrusion, dry grinding, and high-moisture ensiling.

Exogenous growth promoters-- including steroid-based implants, beta agonists, and other compounds-- have comprised another important area of my research program. I have worked with graduate students, faculty, and allied industry representatives in completing to evaluate impact of exogenous growth stimulants on cattle growth, efficiency, meat quality, and meat composition.

Research with beta agonists and implants demonstrates very clear and substantial benefits for animal growth efficiency. Studies with crystalline menthol compounds have yielded growth responses similar to those achieved with beta agonists, but these improvements also have been accompanied by deleterious effects on tenderness.

Since 2003 I have worked on development of *Megasphaera elsdenii* as a probiotic for grain-fed ruminants. This work formed the basis for FDA approval of the organism as a direct-fed microbial in 2010, and has led to several applications for patents with uses defined not only for ruminants, but also for non-ruminants, forage preservation methods, and for methods to enhance cultivation and preservation of the organism. These studies have provided guidance to industry for commercial application of the organism in feedlot cattle to accelerate transition to high-grain diets while avoiding metabolic dysfunction.

Another key area of emphasis has been devoted to understanding impact of lipids on cattle health, performance, meat quality, and fatty acid composition of beef. This work was initiated in the mid-1990s in an attempt to characterize effects of dietary fats on inflammatory responses in cattle. Flaxseed quickly surfaced as a source of supplemental lipid that could favorably alter immune status, and later we identified potential for altering omega-3 fatty acid content of meat via diet manipulation. Subsequent research focused on use of marine sources of fatty acids, as well as preventing biohydrogenation of polyunsaturated fats using various methods of encapsulation. Results of these experiments have been adopted by several commercial entities as a means of improving beef value.

PATENTS AWARDED

Drouillard, J.S., D.A. Klamfoth, and K.D. Ingram. 2016. Method and composition for increasing the proportion of dietary ingredients that are resistant to degradation by ruminal microorganisms. No. WO2013/082035A1.

Drouillard, J.S., T.J. Herald, and M.A. Greenquist. 2014. Method for encapsulation of orally ingested materials to alter site of digestion, site of action, and(or) stability. No. 8,828,421

Drouillard, J. S. 2013. Method for altering blood lipid profiles in livestock. No. 8,377,465.

Drouillard, J.S., J. Henry, and D. Sattler. 2007. Self-cleaning animal watering device. No. 7,762,212.

Drouillard, J.S. and C. M. Coetzer. 2003. Method of manufacturing a ruminant feedstuff with reduced ruminal degradability. No. 6,506,423.

Sun; X. S., P. Seib, G. S. Karr, and J. S. Drouillard. 2002. Biodegradable and edible feed packaging materials. U.S. Pat. No. 6,337,097.

PATENTS PENDING

Drouillard, J.S*., K.A. Miller, C.C. Aperce, T. Horne, T.J. Ellerman, and G.K. Herren. Methods of producing ensiled plant materials using *Megasphaera elsdenii*. International Application Number: PCT/US18/56777.

Drouillard, J.S.*, C.C. Aperce, G.K. Herren, T.J. Ellerman, C.M. Scaletti, K. Van Jordan, J.M. Lattimer, R.S. Beyer, S. Uwituze, T.L. Douthit, C.D. Gunkel, C.H. Horn, B.C. Jacobus, and A.H.

Smith. Microbial cells, methods of producing, and uses thereof. International Application Number: PCT/US18/16321.

PEER-REVIEWED MANUSCRIPTS

- Bowhay, C.M., J.S. Drouillard and J.M. Lattimer. 2020. Effects of *Megasphaera elsdenii* on growth performance and characteristics of cecal digesta in broiler chickens. *Int. J. Poult. Sci.*, 19:321-329. DOI: 10.3923/ijps.2020.321.
- Phelps, K.J., J.S. Drouillard, T.G. O'Quinn, T.A. Houser, and J.M. Gonzalez. 2020. Effects of supplementing docosahexaenoic acid-rich microalgae and antioxidants on beef longissimus lumborum steak color stability and sensory characteristics. *Transl Anim Sci.* 18;4(3):txaa135. doi: 10.1093/tas/txaa135..
- Fehlberg, L.K. J.M. Lattimer, C.I. Vahl, J.S. Drouillard, and T.L. Douthit. 2020. Digestibility of diets containing calcium salts of fatty acids or soybean oil in horses. *Transl. Anim. Sci.* 2020.4:1-12 doi: 10.1093/tas/txaa001.
- Halpin, M.Y., J.S. Drouillard, L.K. Fehlberg, T.L. Douthit, and J. M. Lattimer. 2020. Effects of sodium caseinate and varying protein sources on in vitro fermentation of forages by mixed equine cecal microorganisms. *J. Equine Veter. Sci.* 91:103127. <https://doi.org/10.1016/j.jevs.2020.103127>
- Van Cleef, E. H. C. B., S. Uwituze, C. A. Alvarado-Gilis, K.A. Miller, C.L. Van Bibber-Krueger, C.C. Aperce, and J.S. Drouillard. 2019. Elevated concentrations of crude glycerin in diets for beef cattle: feedlot performance, carcass traits and ruminal metabolism. *J. Anim. Sci.*, 97:4341–4348. <https://doi.org/10.1093/jas/skz281>
- de Melo, A.H.F, R. S. Marques, V.N. Gouvêa, J. de Souza, C. D. A. Batalha, D. C. Basto, D.D. Millen, J.S. Drouillard, and F.A.P. Santos. 2019. Effects of dietary roughage neutral detergent fiber levels and flint corn processing method on growth performance, carcass characteristics, feeding behavior, and rumen morphometrics of *Bos indicus* cattle. *J. Anim. Sci.* 97:3562–3577. <https://doi.org/10.1093/jas/skz197>
- Caetano, M., R.S. Goulart, P.M. Rizzo, S.L. Silva, J.S. Drouillard, P.R. Leme, and D.P.D. Lanna. 2019. Impact of flint corn processing method and dietary starch concentration on finishing performance of Nellore bulls. *Anim. Feed Sci. Technol.* 251:166-175. <https://doi.org/10.1016/j.anifeedsci.2019.03.006>
- Fehlberg, L.K. J.M. Lattimer, J.S. Drouillard, and T.L. Douthit. 2019. Effect of cobalt chloride on fermentation of Alfalfa and Smooth Bromegrass Hays by horse cecal microorganisms. *J. Equine Vet. Sci.* 77:75-79. <https://doi.org/10.1016/j.jevs.2019.02.020>
- Jordan, K.V, J.S. Drouillard, T.L. Douthit, and J.M. Lattimer. 2019. Effects of sodium caseinate on hindgut fermentation and fiber digestion in horses. *J. Anim. Sci.* 97:813-819. doi: 10.1093/jas/sky436.
- Van Bibber-Krueger, C.L., C.I. Vahl, S.K. Narayanan, R.G. Amachawadi, E.A. Taylor, H.M. Scott, and J.S. Drouillard. 2019. Effects of supplemental zinc sulfate on growth performance,

carcass characteristics, and antimicrobial resistance in feedlot heifers. *J. Anim. Sci.* 97:424–436. <https://doi.org/10.1093/jas/sky411>

- Douthit, T.L., H.R. Leventhal, S. Uwituze, M.Y. Halpin, A.L. Araujo Lopes, and J.S. Drouillard. 2018. *Megasphaera elsdenii* attenuates lactate accumulation in cultures of equine cecal microorganisms provided with starch or oligofructose. *J. Equine Vet. Sci.* <https://doi.org/10.1016/j.jevs.2018.12.013>
- Jordan, K.V., J.S. Drouillard, T.L. Douthit, and J.M. Lattimer. 2018. Effects of sodium caseinate on hindgut fermentation and fiber digestion in horses. *J. Anim. Sci.* <https://doi.org/10.1093/jas/sky436>
- Drouillard, J.S. 2018. Current situation and future trends for beef production in the United States of America: A review. *Asian-Australasian J. Anim. Sci.* 31:7:1-10.
- Müller, H.C., C. L. van Bibber-Krueger, and J. S. Drouillard. 2018. Effect of alpha tocopherol acetate and ascorbic acid on performance, carcass traits and incidence and severity of liver abscesses in feedlot cattle. *J. Anim. Sci.* 96:3878-3883. doi: 10.1093/jas/sky231.
- Müller, H.C., C.L. Van Bibber-Krueger, O.J. Ogunrinu, R.G. Amachawadi, H.M. Scott, and J.S. Drouillard. 2018. Effects of intermittent feeding of tylosin phosphate during the finishing period on feedlot performance, carcass characteristics, antimicrobial resistance, and incidence and severity of liver abscesses in steers. *J. Anim. Sci.* 96:2877-2885.
- Hoehn, A.N., E.C. Titgemeyer, T.G. Nagaraja, J.S. Drouillard, M.D. Miesner, and K.C. Olson. 2018. Effects of high condensed-tannin substrate, prior dietary tannin exposure, antimicrobial inclusion, and animal species on fermentation parameters following a 48 h in vitro incubation. *J. Anim. Sci.* 96:343-353.
- Shakeria, H., V. Volkova, X. Wen, A. Deters, J. Drouillard, C. Müller, B. Moradijamei, and M. Jaberi-Douraki. 2018. Establishing statistical equivalence of data from different sampling approaches for assessment of bacterial phenotypic antimicrobial resistance. *Appl. Env. Microbiol.* doi:10.1128/AEM.02724-17.
- Ebarb, S.M., K. J. Phelps, J. S. Drouillard, K. R. Maddock-Carlin, M. A. Vaughn, D. D. Burnett, J. A. Noel, C. L. Van Bibber- Krueger, C. B. Paulk, D. M. Grieger and J. M. Gonzalez. 2017. Effects of anabolic implants and ractopamine-HCl on muscle fiber morphometrics, collagen solubility, and tenderness of beef longissimus lumborum steaks. *J. Anim. Sci.* 95:1219-1231. doi:10.2527/jas2016.1263.
- Van Bibber-Krueger, C.L., K. A. Miller, R. G. Amachawadi, H. M. Scott, J. M. Gonzalez and J. S. Drouillard. 2017. Interaction between supplemental zinc oxide and zilpaterol hydrochloride on growth performance, carcass traits, and blood metabolites in feedlot steers. *J. Anim. Sci.* 95: 12:5573-5583. doi:10.2527/jas2017.1761.
- Van Bibber-Krueger, C.L., R. G. Amachawadi, H. M. Scott, J. M. Gonzalez and J. S. Drouillard. 2017. Interactive effects of supplemental Zn sulfate and ractopamine hydrochloride on growth performance, carcass traits, and plasma urea nitrogen in feedlot heifers. *J. Anim. Sci.* 95:46384645. doi:10.2527/jas2017.1764.

- Unruh, E.M., M.E. Theurer, B.J. White, R. L. Larson, J.S. Drouillard, and N. Schrag. 2017. Evaluation of infrared thermography as a diagnostic tool to predict heat stress events in feedlot cattle. *Am. J. Vet. Res.* 78:771-777.
- Aperce, C.C., R. Amachawadi, C. L. Van Bibber-Krueger, T. G. Nagaraja, H. M. Scott, J. Vinasco-Torre, and J. S. Drouillard. 2016. Effects of menthol supplementation in feedlot cattle diets on the fecal prevalence of antimicrobial-resistant *Escherichia coli*. *PLoS ONE* 11(12): e0168983. doi:10.1371/journal.pone.0168983
- Phelps, K.J., J. S. Drouillard, T. G. O'Quinn, D. D. Burnett, T. L. Blackmon, J. E. Axman, C. L. Van Bibber-Krueger, and J. M. Gonzalez. 2016. Feeding microalgae meal (All-G Rich™; *Schizochytrium limacinum* CCAP 4087/2) to beef heifers. I: Effects on *longissimus lumborum* steak color and palatability. *J. Anim. Sci.* 2016.94:1–14. doi:10.2527/jas2016-0487.
- Phelps, K.J., J. S. Drouillard, T. G. O'Quinn, D. D. Burnett, T. L. Blackmon, J. E. Axman, C. L. Van Bibber-Krueger, and J. M. Gonzalez. 2016. Feeding microalgae meal (All-G Rich™; *Schizochytrium limacinum* CCAP 4067/2) to beef heifers. II: Effects on ground beef color and palatability. *J. Anim. Sci.* 94:1–10. doi:10.2527/jas2016-0488.
- Van Bibber-Krueger, C. L., J. E. Axman, J. M. Gonzalez, C. I. Vahl and J. S. Drouillard. 2016. Effects of yeast combined with chromium propionate on growth performance and carcass quality of finishing steers. *J. Anim. Sci.* doi:10.2527/jas.2016-0454.
- Van Bibber-Krueger, C.L., K. A. Miller, C. C. Aperce, C. A. Alvarado-Gilis, J. J. Higgins, and J. S. Drouillard. 2016. Effects of crystalline menthol on blood metabolites in Holstein steers and in vitro volatile fatty acid and gas production. *J Anim. Sci.*;94:1170-8. doi: 10.2527/jas.2015-8779.
- Phelps, K.J., J. S. Drouillard, M. B. Silva, L. D. F. Miranda, S. M. Ebarb, C. L. Van Bibber-Krueger, T. G. O'Quinn and J. M. Gonzalez. 2016. Effect of extended postmortem aging and steak location on myofibrillar protein degradation and Warner-Bratzler shear force of beef *M. semitendinosus* steaks. *J. of Anim. Sci.* 94:412-423 doi:10.2527/jas.2015-9862.
- Ebarb, S.M., J. S. Drouillard, K. R. Maddock-Carlin, K. J. Phelps, M. A. Vaughn, D. D. Burnett, C. L. Van Bibber-Krueger, C. B. Paulk, D. M. Grieger and J. M. Gonzalez 2016. Effect of growth-promoting technologies on *Longissimus lumborum* muscle fiber morphometrics, collagen solubility, and cooked meat tenderness. *J. Anim. Sci.* 2016 0: 0:doi:10.2527/jas.2015-9888.
- Alvarado-Gilis C.A., C.C. Aperce, K.A. Miller, C.L. Van Bibber-Krueger, D. Klamfoth and J.S. Drouillard. 2015. Effects of flaxseed encapsulation on biohydrogenation of polyunsaturated fatty acids by ruminal microorganisms: feedlot performance, carcass quality, and tissue fatty acid composition. *J Anim. Sci.* 2015 Sep;93(9):4368-76. doi: 10.2527/jas.2015-9171.
- Alvarado-Gilis, C.A., C. C. Aperce, K. A. Miller, C. L. Van Bibber-Krueger, D. Klamfoth, and J. S. Drouillard. 2015. Protection of polyunsaturated fatty acids against ruminal biohydrogenation: Pilot experiments for three approaches. *J. Anim. Sci.* 2015.93:1–9. doi:10.2527/jas2014-8015.
- Gunkel, C. D., T.L. Douthit, L.W. Murray, and J.S. Drouillard. 2015. Case study: Interstitial glucose concentrations over time in horses fed sweet feed or a low-moisture, molasses-based block supplement. *Prof. Anim. Sci.* 31:175-183.

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- Van Bibber-Krueger, C.L., K. A. Miller, G. L. Parsons, L. K. Thompson, and J. S. Drouillard. 2015. Effects of zilpaterol hydrochloride on growth performance, blood metabolites, and fatty acid profiles of plasma and adipose tissue in finishing steers. *J. Anim. Sci.* 2015.93:1–9. doi:10.2527/jas2015-8771.
- Phelps, K.J., J. S. Drouillard, J. S. Jennings, B. E. Depenbusch, C. L. Van Bibber-Krueger, K. A. Miller, M. A. Vaughn, D. D. Burnett and J. M. Gonzalez. 2015. Effects of the Programmed Nutrition Beef Program on feedlot performance and carcass characteristics. *J. Anim. Sci.* 93:1298-1308. doi:10.2527/jas.2014-8661.
- Amachawadi, R.G., H.M. Scott, C.C. Aperce, J. Vinasco, J.S. Drouillard, and T.G. Nagaraja. 2015. Effects of in-feed copper and tylosin supplementations on copper and antimicrobial resistance in fecal enterococci of feedlot cattle. *J. Appl. Microbiol.* 2015 Mar 4. doi: 10.1111/jam.12790. [Epub ahead of print]
- Van Bibber-Krueger, C.L., K. A. Miller, and J. S. Drouillard. 2015. Manipulation of dietary calcium concentration to potentiate changes in tenderness of beef from heifers supplemented with zilpaterol hydrochloride. *J. Anim. Sci.* doi:10.2527/jas2014-8749.
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- Alvarado-Gilis, C.A., C.C. Aperce, K.A. Miller, C.L. Van Bibber-Krueger, S. Uwituze, J.S. Drouillard, and J.S. Higgins. 2014. Effects of feeding diets rich in α -linolenic acid and copper on performance, carcass characteristics, and fatty acid profiles of feedlot heifers. *J Anim. Sci.* 2014 Dec;92(12):5612-21.
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- Aperce, C.C., C. A. Alvarado, K. A. Miller, C. L. Van Bibber-Krueger, and J. S. Drouillard. 2014. Transit effects on fecal *Escherichia coli* O157 prevalence and coliform concentrations in feedlot cattle. *J. Anim. Sci.* 92:676-82.
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- Phelps, K.J., J.S. Drouillard, J.S. Jennings, B.E. Depenbusch, C.L. Van Bibber-Krueger, K.A. Miller, M.A. Vaughn, D.D. Burnett, S.M. Ebarb, T.A. Houser, S.E. Johnson, and J.M. Gonzalez. 2014. Effects of PN beef program on meat quality characteristics. *J. Anim. Sci.* 92:1780-91.

- Miller, K.A., C.L. Van Bibber-Krueger, L.C. Hollis, and J.S. Drouillard. 2013. *Megasphaera elsdenii* dosed orally at processing to reduce BRD and improve gain in high-risk calves during the receiving period. *Bovine Prac.* 47(2):137-143.
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