

PROCEEDINGS

2012

23rd ANNUAL FLORIDA RUMINANT NUTRITION SYMPOSIUM

**January 31 & February 1, 2012
Best Western Gateway Grand Hotel
Gainesville, Florida**

**Department of Animal Sciences
University of Florida
Institute of Food and Agricultural Sciences
Gainesville, Florida 32611**

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University of Florida, IFAS

Tuesday, January 31, 2012—Pre Conference Symposium (Adisseo)

- 8:45AM Program Introduction — **Dr. Dan Luchini** — Adisseo
- 9:00AM The Principles of Balancing Diets for Amino Acids and Their Impact on N Utilization Efficiency — **Dr. Chuck Schwab**, University of New Hampshire
- 10:00AM Balancing for Rumen Degradable Protein and Post-Ruminal Requirements for Lactating Cattle Using the CNCPS as a Basis for Evaluation — **Dr. Mike Van Amburgh**, Cornell University
- 11:00AM Feeding Low Crude Protein Rations to Dairy Cows – What Have We Learned? — **Dr. Larry Chase**, Cornell University
- 11:45AM Buffet Lunch

Tuesday, January 31, 2012

- 9:00AM Registration (until 5:30PM)
- 11:45AM Buffet Lunch
- 1:00PM Welcome — **Dr. Geoffrey Dahl**, University of Florida
- 1:10PM Inflammation and Nutrient Metabolism in Ruminants — **Dr. Clint Krehbiel**, Oklahoma State University
- 1:50PM Impact of Stressors on Performance of Weaned Calves — **Dr. John Arthington**, University of Florida
- 2:30PM Quantifying Heat Stress and its Impact on Metabolism and Performance — **Dr. Bob Collier**, University of Arizona
- 3:10PM Refreshment Break
- 3:40PM The Role of Energy Balance and Metabolism on Reproduction of Dairy Cows — **Dr. Ron Butler**, Cornell University
- 4:20PM The Role of Liver Metabolism During Transition on Postpartum Health and Performance — **Dr. Shawn Donkin**, Purdue University
- 5:00PM Welcome Reception

Wednesday, February 1, 2012

- 6:30AM Breakfast
- 8:00AM Importance of Nitrogen Recycling to Beef Cattle Grazing Low-Protein Forages — **Dr. Evan Titgemeyer**, Kansas State University
- 8:40AM Nutritional Practices to Reduce the Environmental Impact of Grazing Beef Cattle — **Dr. Andy Cole**, USDA Bushland TX
- 9:20AM A Microbiologist's View on Improving Nutrient Utilization in Ruminants — **Dr. T.G. Nagaraja**, Kansas State University
- 10:00AM Refreshment Break
- 10:30AM Forage Digestibility: The Intersection of Cell Wall Lignification and Plant Tissue Anatomy — **Dr. Hans Jung**, *University of Minnesota*
- 11:10AM Role of K on Rumen Fermentation and Milk Fat Synthesis — **Dr. Tom Jenkins**, Clemson University
- 11:50AM Ruminant Nutrition Symposium Adjourn

Additional copies of these proceedings are available at \$15 per copy. Make checks payable to: Florida Ruminant Nutrition Symposium.

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Symposium Speakers

Guest

Ron Butler, Cornell University, Ithaca, NY
Larry Chase, Cornell University, Ithaca, NY
Andy Cole, USDA, Bushland, TX
Bob Collier, University of Arizona, Tuscon, AZ
Shawn Donkin, Purdue University, West Lafayette, IN
Tom Jenkins, Clemson University, Clemson, SC
Hans Jung, UDA-ARS, University of Minnesota, St. Paul, MN
Clint Krehbiel, Oklahoma State University, Stillwater, OK
R.G. Nagaraja, Kansas State University, Manhattan, KS
Chuck Schwab, University of New Hampshire, Durham, NH
Evan Titgemeyer, Kansas State University, Manhattan, KS
Mike Van Amburgh, Cornell University, Ithaca, NY

University of Florida Department of Animal Sciences

John Arthington, Professor

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23rd Annual Florida Ruminant Nutrition Symposium

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Dr. Chuck Schwab is Professor Emeritus of Animal Sciences at the University of New Hampshire where he was a professor for 34 years. He received a B.S. degree in Animal Sciences in 1969 at the University of Wisconsin–Platteville and a M.S. degree in Dairy Sciences in 1970 and joint Ph.D. degrees in Dairy Sciences and Nutritional Sciences in 1974, all at the University of Wisconsin–Madison. In addition to his teaching and research responsibilities at UNH, Chuck provided faculty leadership for numerous departmental and college initiatives, including a revision of the undergraduate curriculum in Animal Sciences, the development of a Ph.D. program in the department, the design and construction of the UNH Dairy Teaching and Research Center, the development of the Dairy Management Major and its acceptance as a New England Regional Program, the building of the Dairy Nutrition Research

Center, and the development of the UNH Organic Dairy Research Farm. Chuck is recognized nationally and internationally for his research on amino acid nutrition of dairy cattle and was a member of the committee responsible for publishing Dairy NRC (2001). As the principal at Schwab Consulting LLC, Dr. Schwab has been working as a dairy nutrition consultant since 2009...helping to educate dairy nutritionists and producers around the world on advances in protein and amino acid nutrition and its implications of milk component production and efficiency of N utilization.



Dr. Mike Van Amburgh is an Associate Professor in the Department of Animal Science at Cornell University where he has a dual appointment in teaching and research. His undergraduate degree is from The Ohio State University and his Ph.D. is from Cornell University. He teaches multiple courses and works extensively with the Dairy Fellows Program, advises approximately 50 undergraduate students and is the advisor for the Cornell Dairy Science Club. A major focus of Mike's research

program for the last 14 years has been the nutrient requirements of dairy calves and heifers and aspects of endocrine control of developmental functions such as mammary development and puberty. A major focus of his current work is whole animal and ruminal nitrogen metabolism and regulation of milk protein synthesis and the interaction between forage and feed chemistry, rumen function and nutrient supply. He currently leads the development of the Cornell Net Carbohydrate and Protein System, a nutrition evaluation and formulation model used by over 2,000 professionals worldwide and through that effort is focused on enhancing the efficiency of nutrient use by ruminants to improve the environmental impact of animal food production. He has authored and co-authored over 50 peer review articles and many conference proceedings and is the recipient of several awards including the American Dairy Science Association Scholar Award, the Land O'Lakes Teaching and Mentoring Award from ADSA, the AFIA Award for Research and the CALS Professor of Merit Award.



Dr. Larry Chase is a Professor of Dairy Cattle Nutrition at Cornell University. He has a joint-extension research appointment and is the Department Extension Leader. His extension program includes educational programming and support for dairy producers, extension educators, agriservice personnel and veterinarians. A major component of the program is training and support of feed industry personnel. Larry is also general chairman of the Cornell Nutrition Conference. He has presented lectures and seminars in 15 foreign countries. His current research efforts are related to lowering ration protein levels to decrease nitrogen excretion to the environment and improve dairy farm profitability. An integral component of this effort is field application of the CNCPS (Cornell Net Carbohydrate and Protein System) model. In 2000, Larry received the DeLaval Dairy Extension award from the American Dairy Science Association. The Northeast Ag & Feed Alliance presented him with a Distinguished Service award in 2009.



Dr. Clint Krehbiel is Professor and Dennis and Marta White Endowed Chair in Ruminant Nutrition and Health at Oklahoma State University. Dr. Krehbiel holds an A.A.S. degree from Hutchison Community College (1986), B.S. (1988) and M.S. (1990) degrees from Kansas State University, and a Ph.D. degree (1994) from the University of Nebraska. Dr. Krehbiel was a postdoctoral fellow at the Roman L. Hruska U. S. Meat Animal Research Center, Clay Center, NE. He spent 3.5 years on the faculty at New Mexico State University before joining the faculty in the Department of Animal Science at Oklahoma State University in January 2000. Dr. Krehbiel holds a split appointment between teaching (~20%) and research (~80%). His research interests include understanding relationships involving ruminal fermentation, gastrointestinal tract metabolism, and net nutrient flux to improve animal health, growth, feed efficiency and quality of beef cattle. Dr. Krehbiel has authored or co-authored over 400 refereed journal articles, book chapters, abstracts of papers presented at scientific meetings, research reports of the Agricultural Experiment Stations, and papers published in conference proceedings. He teaches graduate courses in Rumenology, Laboratory Techniques in Animal Nutrition, and co-teaches a Protein Nutrition course. Clint and his wife Shelly have three daughters, Madison, Megan, and Emma.



Dr. John Arthington is a graduate of the Animal Sciences programs of Purdue and Kansas State Universities. Currently, he serves as the Director of the UF-IFAS, Range Cattle Research and Education Center (RCREC) in Ona. In addition to the Center Director responsibilities, he holds the rank of Professor in the UF Department of Animal Sciences. His majority academic efforts focus on the relationships among production stress and subsequent immune competence, well-being and productivity of beef cattle. These models have specifically focused on inflammatory reactions and stress tolerances to normal cattle management practices including weaning, commingling, and transportation. To date, this program has contributed over 70 peer-reviewed journal manuscripts to the body of science supporting this field of study. His academic program is also committed to the extension

education mission of the Center and Institute through participation and leadership in multidisciplinary and multi-state collaborations and services to our science and state and national clientele.



Dr. Robert Collier received his B.S. degree in Zoology from Eastern Illinois University in 1969. After service in the Army Medical Corps he obtained his Master's Degree in Zoology from Eastern Illinois Univ. in 1973 and his Ph.D. in Dairy Sci. from the Univ. of Illinois in 1976. In 1976, he accepted an NIH post-doc at the Dairy Sci. Dept. of Michigan State Univ. In Sept. 1976, he joined the Dairy Sci. Dept. at the Univ. of Florida as an Asst. Professor. He was promoted to Assoc. Prof. in 1981. In July, 1985, he joined Monsanto Co. as a Sci. Fellow. He was promoted to Dairy Research Director & Fellow in 1987 and from 1989-1999 was Dairy Research Director and Senior Fellow. From 1987-1999, he was an Adjunct Prof. of the Ani. Sci. Dept. at Univ. of Missouri. In Sept. 1999, he joined the faculty of the Ani. Sci. Dept., Univ. of Arizona as Prof. of Envir. Physiology.

From July 2001 to December 2005 he was Head of the Ani. Sci. Dept. He is presently Prof. Environmental Physiology and Director of the Agric. Research Complex in the Ani. Sci. Dept. In 1990, he was appointed an Honorary Fellow of the Hannah Res. Inst., Ayr, Scotland. In 1991, he received the ADSA Upjohn Physiology Award and in 1992 was selected as Alpha Omega Alpha visiting prof. at the Univ. of Indiana. In 2006, he received the Univ. of Illinois, College of Agric. Alumni Recognition Award. In 2007 he was inaugural Thatcher Lecturer at the Univ. of Florida and in 2008 was awarded the Land O Lakes Award from ADSA. He served on the Biotechnology Adv. Board for the European Economic Community as well as the Univ. of Iowa. He served on both the Nutri. Sci. Adv. Committee and the Ani. Sci. Adv. Board for the Univ. of Illinois and Eastern Illinois Univ. He is author or coauthor of 190 journal articles, chapters and reviews, 156 abstracts, 52 popular articles and 8 U.S. Patents. His areas of expertise include environmental and lactation physiology, endocrinology and molecular biology.



Dr. W.R. (Ron) Butler is Professor and Chairman of the Department of Animal Science at Cornell University. He received a B.S. degree in Dairy Science and M.S. in Reproductive Physiology from The Ohio State University and a PhD in Reproductive Physiology from Purdue University. His research and teaching career (36 years) has been directed at regulation of ovarian follicle development, ovulation, and fertility in dairy cattle and other species. Nutrition and reproduction are interrelated and, in particular, negative energy balance in postpartum dairy cows affects metabolic hormones and gonadotropin secretion that determine subsequent health and reproductive performance. The challenge for his current

research is to explore molecular, genetic and hormonal mechanisms in ovarian and liver tissues as most affected by changes in metabolic activity during the transition period and early lactation. The overall goal of his research is to combine dietary strategies and technology for enhancing reproductive efficiency, health, and profitability of dairy cattle while achieving high milk production.



Dr. Shawn Donkin received the B.Sc. degree from McGill University (Montreal) in 1982 and worked in the feed industry and as a dairy herd manager before pursuing graduate education. He earned an M.S. degree in Dairy and Animal Science from The Pennsylvania State University in (1987) and a Ph.D. in Dairy Science from the University of Wisconsin- Madison (1992). He has been a member of the faculty of Purdue University since 1995 was promoted to Professor of Animal Sciences (2006). He has developed an internationally-recognized research program to determine the control of liver function and importance to food animal production, animal well-being, and human health. This research, which is both applied and basic in scope, has resulted in feeding recommendations for optimal health and productivity in dairy cattle and has created knowledge of the

underlying biology of nutrient metabolism. His laboratory was among the first to describe the molecular events that control glucose and nitrogen metabolism in dairy cattle and developing calves. Ongoing fundamental studies explore the role of nutrition, physiological changes, and environmental stressors on genes critical to health and productivity. Ongoing applied nutrition studies evaluate alternative energy and protein feeds for transition and lactating cows. He has mentored 10 Ph.D. students, 12 M.S students, and 2 postdoctoral fellows and authored over 55 referred publications, 90 abstracts, 8 extension publications, and 4 book chapters. He teaches courses in Ruminant Nutrition and Physiology, Dairy Cattle Management and Nutritional Biochemistry and Physiology.



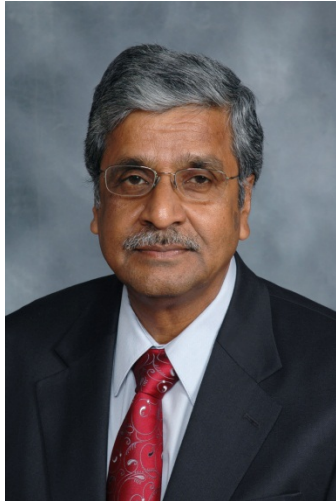
Dr. Evan Titgemeyer earned his B.S. from The Ohio State University and his M.S. and Ph.D. from the University of Illinois. He joined the faculty at Kansas State in 1992. His research program has been very productive, with 126 journal articles and nearly \$2 million in research support. His research has focused on the study of amino acid utilization of growing cattle, and it has demonstrated that the efficiencies of amino acid use for growth by cattle are often much lower than predicted by currently accepted models. He also has generated a data base on quantifying urea recycling in growing cattle. He served as a Division Editor for the *Journal of Animal Science* from 2006-2009, and is a past winner of the AFIA Award for Ruminant Nutrition Research. In addition to his research and teaching responsibilities, he currently serves as Nutrition Group leader and Research

Coordinator in the Department of Animal Sciences and Industry at Kansas State University.



Dr. Noel Andy Cole is a Research Animal Scientist (Nutrition)/Acting Research Leader for USDA-Agric. Res. Service–Conservation & Production Research Lab. He was reared on a farm near Pampa, TX. He graduated with a B.S. in Animal Science from W. Texas A&M Univ. in 1971, MS in Ani. Sci. from Oklahoma State Univ. in 1973 and PhD in Ani. Nutri. from OSU in 1975. In 1976 he became a Res. Ani. Scientist (Nutrition) for USDA-ARS in Bushland, TX. The first 20 years of his career at Bushland he conducted research on the feeding and management of feeder calves stressed by the marketing and transport system. The last 15 years, he has conducted research on the effects of beef cattle feeding operations on the environment and on

nutritional means to decrease adverse effects on air and water quality. He is currently the Acting Research Leader of the Renewable Energy and Manure Management Research Unit at Bushland. He is a member of ASAS, the Amer. Registry of Prof. Ani. Scientists (Secretary, 2009-2011), and the Plains Nutrition Council (President 1989-1990). He has authored or coauthored over 260 publications including 80 referred journal papers and 9 book chapters, and has given over 100 invited presentations to producer and scientific groups. He served on the editorial boards of the *Journal of Ani. Sci.*, and *Professional Animal Scientist*, and as Section-Editor of the *Journal of Animal Science*. He is a Charter Diplomate of the Amer. College of Ani. Nutrition–1995. He received a number of awards including the following: 1) Amer. Soc. of Ani. Sci.-Ani. Management Research Award–2005; 2) Div. of Agric., W. Texas A&M Univ., Graduate of Distinction–2006; 3) Dept. of Ani. Sc., OSU, Adv. Degree Graduate of Distinction–2007; 4) Amer. Society of Ani. Sci., Res. Fellow–2009; 5) USDA-ARS- Southern Plains Area, Sr. Scientist of the Year–2010; and 6) W. Texas A&M Univ.–Distinguished Alumnus Award–2011.



Dr. T.G. Nagaraja is a University Distinguished Professor of Microbiology in the Department of Diagnostic Medicine/Pathobiology in the College of Veterinary Medicine at Kansas State University. His research has focused primarily on microbiology and fermentation of the rumen, ruminal digestive disorders, and, in the past 8 years, on *Escherichia coli* O157:H7, a major food-borne pathogen.

Nagaraja is a native of Bangalore, India, where he obtained Bachelors in Veterinary Science and a Master's in Veterinary Microbiology. He obtained his Ph. D. in Microbiology at Kansas State University and joined the Department of Animal Sciences as an Assistant Professor in 1980. In 1998, he moved to the Department of Diagnostic

Medicine/Pathobiology. In his 30 years of research at K-State, Nagaraja and his associates have made contributions on the use of antibiotics in feeds, on causes and preventions of digestive disorders such as acidosis, bloat, and liver abscesses, and on the ecology of *E. coli* O157:H7 in cattle. He has mentored 16 Ph. D and 16 M. S. students and several post docs and visiting scientists. His research has resulted in five US patents and one of which has led to the development of a vaccine for the control of liver abscesses. Nagaraja and his associates have published several book chapters and invited review papers, and over 150 peer-reviewed journal papers.



Dr. Hans Jung received his Ph.D. in animal science from the University of Illinois in 1982. He has been employed as a Research Animal Scientist by the USDA-Agricultural Research Service for 29 years; first for four years at the U.S. Meat Animal Research Center in Clay Center, NE and since 1986 as a member of the Plant Science Research Unit located at the University of Minnesota in St. Paul. Dr. Jung is also affiliated with the U.S. Dairy Forage Research Center in Madison, WI as a Cluster Scientist and he is an Adjunct Professor in the Department of Animal Science and the Department of Agronomy and Plant Genetics at the University of Minnesota. Dr. Jung's research career

has focused on how plant cell wall lignification and development limit forage digestibility by ruminants. In recent years he has become actively involved in research on proposed cellulosic ethanol systems. Dr. Jung collaborates with many scientists both in the USA around the world, and has spent time in Australia, The Netherlands, and Sweden conducting research. In his research Dr. Jung strives to provide mechanistic explanations for the observed patterns in forage digestion based on an understanding of cell wall and plant tissue structure interactions with rumen microbiology and physiology. He also works extensively with plant geneticists to improve fiber digestion of alfalfa, corn silage, and perennial grasses. Dr. Jung has published 122 peer-reviewed journal articles, 11 book chapters, edited two books, and many abstracts and proceedings.



Dr. Tom Jenkins attended Penn State University for his BS and MS degrees, and received a Ph.D. at Cornell University. After a postdoc at The Ohio State University, he then moved to Clemson University where he is now Professor in the Department of Animal & Veterinary Sciences. Dr. Jenkins teaches undergraduate and graduate courses in nutrition and coordinates a research program on use of fat in diets for dairy cattle including basic work on rumen lipid metabolism. His publications number over two hundred in scientific journals, patents, and conference proceedings, and he

has given dozens of invited presentations on lipid metabolism in dairy cattle and the practical aspects of fat feeding across eight countries. Dr. Jenkins received the American Feed Industry Award from ADSA for outstanding research in dairy cattle nutrition in 1999, the Godley-Snell Award for excellence in Agricultural Research by Clemson University in 2005, and the Nutrition Professionals Applied Dairy Nutrition Award from ADSA in 2011.