

## James C. Matthews, Ph. D.

### Office Address

Dept. of Animal Sciences  
808 W. P. Garrigus Bldg  
University of Kentucky  
Lexington, KY 40546-0215

Telephone: (859) 257-7513  
Telefax: (859) 257-3412  
e-Mail: [jmatthew@uky.edu](mailto:jmatthew@uky.edu)

### Current Status

Assistant Professor in Animal Sciences in the area of beef/ruminant nutrition at the University of Kentucky, Lexington (since January 1998), with an 80/20% research/teaching appointment. My program of research and teaching in nutritional physiology studies nutrient and drug transporters, enzymes that metabolize transported substrates, and regulatory proteins that coordinate the expression and activity of transporter/enzyme 'functional units'.

### Productivity Summary

#### Publications

Papers	20	Book Chapters	5
Abstracts	26	Invited Symposia	3
GenBank Deposits	7	Reports/Outreach	5

#### Research Funding

Total	\$485,003	Extramural	\$411,573	Intramural	\$73,430
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#### Teaching

<u>Course (credits)</u>	<u>Position</u>	<u>Responsibility</u>	<u>Semesters</u>
ASC 689/580 (3)	Instructor	100%	4
ASC 683 (2)	Instructor	100%	2
ASC 680 (4)	Guest Instructor	10%	3
GEN 300 (1-2)	Guest Instructor	13%	3
ABT, ASC, BIO 395	Research Mentor	100%	8 (for 32 credits) plus 3 summer fellowships

#### Educational History

**Postdoctoral Research Fellow** - University of Florida College of Medicine, Gainesville, FL. May 1995 to Dec 1997. Department of Biochemistry and Molecular Biology and the Department of Pediatrics. Mentors: Michael S. Kilberg, Ph.D.; Donald A. Novak, M.D.

NIH Individual Research Service Award (No. 1-F32-DK09703-01).

NIH Institutional National Research Service Award (No. 5T32-DK07667-02).

**Ph.D. & M.S.** - Virginia Tech, College of Agriculture and Life Sciences, Blacksburg, VA. Sept 1989 to May 1995. Animal Science (Ruminant Nutrition). Major advisor: Kenneth E. Webb, Jr., Ph.D.

**B.S.** - Rutgers University, Cook College, New Brunswick, NJ. Sept 1985 to Dec 1988. Animal Science (Preparation for Research)/Nutrition. Research mentor: James E. Wohlt.

**Part-time** - University of Southern Maine, College of Arts and Sciences, Portland, ME. Sept 1983 to May 1985. Biology.

### **Teaching Program**

*Physiology of Digestion and Nutrient Absorption (ASC 689, 3 credits, every spring)* - Instructor (100%). Graduate-level course that compares and contrasts the tissue, cellular, and molecular mechanisms involved with the digestion and absorption of feedstuffs and nutrients in livestock (primarily) and avian species. Prerequisite: BCH 601 or equivalent.

*Protein Metabolism (ASC 683, 2 credits, fall of odd years)* – Instructor (100%). Graduate-level course that emphasizes the coordinated expression and activity of proteins (structural, enzymatic, transport) to support amino acid metabolism by animal tissues. Prerequisite: BCH 601 or equivalent.

*Lab Methods for Nutritional Sciences (ASC 680, 3 credits, fall 1999, 2000, 2001)* - Co-instructor (10%). Conduct gel electrophoresis, cell culture, and transport labs for a graduate-level research methods course. Prerequisite: graduate student.

*Companion and Exotic Animal Nutrition (GEN 300, 2 credits, spring 2000, 2001, 2002)* – Co-instructor (20%). Responsible for comparative physiology lectures for this undergraduate course. Prerequisite: ASC 378.

### **Advising Program**

#### ***Post-doctoral Students***

Kendall Swanson (fall 2000- spring 2001, co-advisor: D. L. Harmon); Judith Benson (2002, co-advisor: D. L. Harmon).

*Graduate Students* (since summer, 1998)

Advisor - Julie Howell, M.S. (completed summer 2000); Chad Woods, M.S. (completed fall 2001); Sonya Gissendanner, M.S. (2nd year, in progress); Brian Zanghi, Ph.D. (2nd year, in progress); Geri Sipe, M.S. (1st year, in progress).

Committee Service - Two Ph.D. and three M.S. students.

#### ***Undergraduate Students***

Academic Advisor (each year since 1999) – 3 to 6 Agricultural Biotechnology students.

Research Mentor (since 1999) - 2 students for 9 BIO 395 credits, 3 students for 12 ASC 395, 3 students for 11 ABT 495 research credits. Also, 1 Howard Hughes Medical Institute Undergraduate Initiative summer project (summer 1999), 1 Undergraduate Research and Creativity Grant summer project (summer 2000), and 1 Kentucky Young Scientist research project (summer 2001).

### **Publications**

#### ***Journal articles, Book chapters, and Invited Symposia***

D. A. Novak and **J. C. Matthews**. Glutamate transport by Rcho-1 cells derived from rat placenta. 2003. Pediatric Research (accepted November 2002).

J. A. Howell, A. D. Matthews, T. C. Welbourne, and **J. C. Matthews**. 2003. Content of ileal EAAC1 and hepatic GLT-1 high-affinity glutamate transporters is increased in growing versus non-growing lambs, paralleling increased tissue concentrations of D- and L- glutamate and plasma glutamine and alanine. J. Anim. Sci. (accepted November 2002).

C. R. Krehbeil and **J. C. Matthews**. Absorption of Amino Acids and Peptides. 2003. In: J. P. F.

- D'Mello (Ed.) *Amino Acids in Animal Nutrition*, 2<sup>nd</sup> edition. CAB International, Wallingford. (in press).
- K. C. Swanson, **J. C. Matthews**, C. A. Woods, and D. L. Harmon. 2002. Influence of substrate and/or neurohormonal mimic on in vitro pancreatic enzyme release from calves postruminally infused with partially hydrolyzed starch and/or casein. *J. Anim. Sci.* (in press).
- K. C. Swanson, **J. C. Matthews**, C. A. Woods, and D. L. Harmon. 2002. Post-ruminal administration of partially hydrolyzed starch and casein influences pancreatic  $\alpha$ -amylase expression in calves. *J. Nutr.* 132:376-381.
- J. C. Matthews** and K. J. Anderson. 2002. Recent advances in amino acid transporters and excitatory amino acid receptors. *Curr. Opin. Nutr. Metab. Care.* 5:77-84.
- J. A. Howell, A. D. Matthews, K. C. Swanson, D. L. Harmon, and **J. C. Matthews**. 2001. Molecular Identification of High-Affinity Glutamate Transporters in Sheep and Cattle Forestomach, Intestine, Liver, Kidney, and Pancreas. *J. Anim. Sci.* 79:1329-1336.
- D. L. Harmon, C. J. Richards, K. C. Swanson, J. A. Howell, **J. C. Matthews**, G. B. Huntington, A. D. True, S. Gahr, and R. W. Russell. 2001. Influence of Ruminant or Postruminal Starch on Visceral Glucose Metabolism in Steers. In: A. Chwalibog and K. Jakobsen (Eds.) *Energy Metabolism in Animals* p 273-276. Proceedings of the 15<sup>th</sup> International Symposium on Energy Metabolism, Snekersten, Denmark. Wageningen Pers, Wageningen, The Netherlands.
- J. C. Matthews**. 2000. Mechanisms of Peptide and Amino Acid Transport. In: J. P. F. D'Mello (Ed.) *Farm Animal Metabolism and Nutrition: Critical Reviews*. Chapter 1, 3-23. CAB International, Wallingford.
- J. C. Matthews**. 2000. Peptide Absorption: Where Peptides Fit in Protein Nutrition and Metabolism. In: T.P. Lyons and K. A. Jacques (Ed.) *Biotechnology in the Feed Industry*. Proceeding's of Alltech's Sixteenth Annual Symposium. Nottingham University Press, Nottingham p. 357-368.
- K. C. Swanson, **J. C. Matthews**, A. D. Wilson, J. A. Howell, C. J. Richards, and D. L. Harmon. 2000. Influence of Dietary Carbohydrate Source and Energy Intake on Pancreatic  $\alpha$ -Amylase Expression in Lambs. *J. Nutr.* 130:2157-2165.
- J. C. Matthews**, M. J. Beveridge, E. Dialynas, A. Bartke, M. S. Kilberg, and D. A. Novak. 1999. Placental Cationic and Anionic Amino Acid Transporter Expression in Growth Hormone Overexpressing, Null IGF-II or Null IGF-1 Receptor Mice. *Placenta* 20:639-650.
- M. S. Kilberg and **J. C. Matthews**. 1999. Amino Acid Transporters. In *Embryonic Encyclopedia of Life Sciences*. Nature Publishing Group, London [www.els.net](http://www.els.net).
- Welbourne, T., and **J.C. Matthews**. 1999. Glutamate Transport and Renal Function. *Am. J. Physiol.* 277(Renal Physiol. 46):F501-F505.
- J. C. Matthews**, M. J. Beveridge, M. S. Malandro, J. D. Rothstein, M. Campbell-Thompson, J. E. Verlander, M. S. Kilberg, and D. A. Novak. 1998. Activity and Protein Localization of Multiple Glutamate Transporters in Gestation Day 14 Versus Day 20 Rat Placenta. *Am. J. Physiol.* 274 (Cell Physiol. 43):C603-614.
- J. C. Matthews**, M. J. Beveridge, M. S. Malandro, M. S. Kilberg, and D. A. Novak. 1998. Response of Placental Amino Acid Transport to Gestational Age and Intrauterine Growth Retardation. *Proc. Nutr. Soc.* 57:257-263.
- K. E. Webb, Jr. and **J. C. Matthews**. 1998. Peptide Absorption and its Significance in Ruminant Protein Metabolism. In: G. Grimbel and C. Backwell (Ed.) *Peptides in Mammalian Protein*

Metabolism: Tissue Utilization and Clinical Targeting. 1-10. Portland Press Ltd., London.

- J. C. Matthews**, A. M. Aslanian, K. K. McDonald, W. Yang, M. S. Malandro, D. A. Novak, and M. S. Kilberg. 1997. An Expression System for Mammalian Amino Acid Transporters Using a Stably-Maintained Episomal Vector. *Anal. Biochem.* 254:208-214.
- D. A. Novak, **J. C. Matthews**, M. J. Beveridge, S. Y. M. Yao, J. Young, and M. S. Kilberg. 1997. Demonstration of System y<sup>+</sup>L Activity on the Basal Plasma Membrane Surface of Rat Placenta and Developmentally-Regulated Expression of 4F2hc mRNA. *Placenta* 18:643-648.
- J. C. Matthews**, E. A. Wong, P. K. Bender, J. R. Bloomquist, and K. E. Webb, Jr. 1996. Demonstration and Characterization of Dipeptide Transport System Activity in Sheep Omasal Epithelium by Expression of mRNA in *Xenopus laevis* Oocytes. *J. Anim. Sci.* 74:1720-1727.
- J. C. Matthews**, E. A. Wong, P. K. Bender, and K. E. Webb, Jr. 1996. Demonstration and Characterization of a Transport System Capable of Lysine and Leucine Absorption that is Encoded in Porcine Jejunal Epithelium by Expression of mRNA in *Xenopus laevis* Oocytes. *J. Anim. Sci.* 74:127-137.
- J. C. Matthews**, Y. L. Pan, S. Wang, M. Q. McCollum, and K. E. Webb, Jr. 1996. Characterization of Gastrointestinal Amino Acid and Peptide Transport Proteins and the Utilization of Peptides as Amino Acid Substrates by Cultured Cells (Myogenic and Mammary) and Mammary Tissue Explants. In: E. T. Kornegay (Ed.) International Symposium on Nutrient Management of Food Animals to Enhance and Protect the Environment. p 57-74. CRC Press Inc., Boca Raton, FL.
- J. C. Matthews** and K. E. Webb, Jr. 1995. Absorption of L-Carnosine, L-Methionine and L-Methionylglycine by Isolated Sheep Ruminal and Omasal Epithelial Tissue. *J. Anim. Sci.* 73:3464-3475.
- K. E. Webb, Jr. and **J. C. Matthews**. 1994. Absorption of Amino Acids and Peptides. In: M. J. Asplund (Ed.) Principles of Protein Nutrition of Ruminants. p 127-146. CRC Press Inc., Boca Raton, FL.
- K. E. Webb, Jr., D. B. DiRienzo, and **J. C. Matthews**. 1993. Recent Developments in Gastrointestinal Absorption and Tissue Utilization of Peptides: A Review. *J. Dairy Sci.* 76:351-361.
- K. E. Webb, Jr., **J. C. Matthews**, and D. B. DiRienzo. 1992. Peptide Absorption: A Review of Current Concepts and Future Perspectives. *J. Anim. Sci.* 70:3248-3257.
- R. P. Dinsmore, P. B. English, **J. C. Matthews**, and P. M. Sears. 1990. Effect of milk sample delivery methods and arrival conditions on bacterial contamination rates. *Cornell Vet* 80(3):243-250.

### **Abstracts**

- S. J. Gissendanner, N. M. P. Etienne, and **J. C. Matthews**. 2003. Differential expression of EAAC1 and GLT-1 glutamate transporters by bovine epithelial tissues is not altered by physiological development. *FASEB J.* (submitted November 2002).
- S. J. Gissendanner, N. M. P. Etienne, K. R. McLeod, and **J. C. Matthews**. 2003. The pattern of EAAC1 and GLT-1 glutamate transporter expression by skeletal muscle and adipose tissues of fattening cattle differs from that of glutamine synthetase. *FASEB J.* (submitted November 2002).
- M. Z. Fan, **J. C. Matthews**, D. G. Burrin, and D. Lackeyram. 2003. EAAC1 is the major high-affinity L-glutamate transporter and expression is upregulated during differentiation of neonatal

- porcine enterocytes. *FASEB J.* (submitted November 2002).
- J. A. Benson, K. C. Swanson, **J. C. Matthews**, and D. L. Harmon. 2002. Influence of starch hydrolysate and/or casein on pancreatic exocrine secretion and plasma hormone concentrations in beef steers. *J. Anim. Sci.* 80 (supplement 1):272.
- S. Gissendanner and **J. C. Matthews**. 2002. Relative expression of EAAC1 glutamate transporter by tissues of suckling, weanling, and backgrounded steers. Oral presentation, April 5, MANRRS 17<sup>th</sup> Annual National Career Fair and Training Conference, Portland, OR.
- K. C. Swanson, **J. C. Matthews**, C. A. Woods, and D. L. Harmon. 2001. Influence of post-ruminal partially hydrolyzed starch and casein on pancreatic  $\alpha$ -amylase expression in calves. *J. Anim. Sci.* 79(supplement 1):80.
- Bryant, A. L. and **J. C. Matthews**. 2001. Identification of an immortalized cell line to study bovine hepatocyte-like glutamate transport. Fifteenth National Conference on Undergraduate Research. The University of Kentucky, Lexington, KY. March 15-17.
- C. A. Woods, A. D. Matthews, N. M. P. Etienne, G. M. Davenport, and **J. C. Matthews**. 2001. Molecular identification and biochemical characterization of canine PepT1 function in MDCK cells. *FASEB J.* 15:A829.
- K. C. Swanson, **J. C. Matthews**, C. A. Woods, and D. L. Harmon. 2001. Substrates and neurohormonal mimics influence in vitro pancreatic enzyme release from calves post-ruminally infused with partially hydrolyzed starch and/or casein. *FASEB J.* 15:A821.
- K. C. Swanson, **J. C. Matthews**, C. J. Richards, and D. L. Harmon. 2000. Determination of enzyme secretion from bovine pancreas using an in vitro tissue model. *J. Anim. Sci.* 78 (supplement 1):300.
- J. A. Howell, A. D. Matthews, T. C. Welbourne and **J. C. Matthews**. 2000. Expression of EAAC1 versus GLT-1 Transporters Parallels Tissue Concentration of L- versus D-Glutamate in Sheep. *FASEB J.* 14:A237.
- J. C. Matthews** and T. Welbourne. 2000. D-Glutamate Removal associated with GLT-1 and Renal Acidification. *FASEB J.* 14:A353.
- J. C. Matthews** and T. Welbourne. 1999. Presence and Role of Glutamate Transporter GLT1 in Functioning Rat Kidney. *J. Am. Soc. Nephrol.* 10:6A.
- J. A. Howell, A. D. Matthews, K. C. Swanson, D. L. Harmon, and **J. C. Matthews**. 1999. Expression of multiple glutamate transport proteins in sheep and cattle epithelial tissue. *J. Anim. Sci.* 77:266.
- K. C. Swanson, **J. C. Matthews**, C. J. Richards, and D. L. Harmon. 1999. A primary cell culture method for bovine pancreatic acinar cells to study  $\alpha$ -amylase secretion. *J. Anim. Sci.* 77:266.
- C. J. Richards, K. C. Swanson, J. A. Howell, **J. C. Matthews**, D. L. Harmon, A. D. True, G. B. Huntington, S. Gahr, and R. W. Russell. 1999. Ruminal versus abomasal carbohydrate infusion alters glucose metabolism in steers. *J. Anim. Sci.* 77:268.
- K. C. Swanson, **J. C. Matthews**, A. D. Wilson, J. A. Howell, C. J. Richards, and D. L. Harmon. 1999. Influence of dietary carbohydrate source and energy intake on pancreatic  $\alpha$ -amylase expression in lambs. *FASEB J.* 13:A257.
- C. J. Richards, K. C. Swanson, J. A. Howell, **J. C. Matthews**, D. L. Harmon, G. B. Huntington, S. Gahr, and R. W. Russell. 1999. Effects of site of starch infusion on kinetics of glucose metabolism in steers. *FASEB J.* 13:A257.
- J. C. Matthews**, M. J. Beveridge, E. Dialynas, A. Barke, A. Efstratiadis, M. S. Kilberg, and D. A.

- Novak. 1998. Expression of Anionic and Cationic Amino Acid Transport Proteins in the Placentas of Wild-Type Versus Growth Hormone Over-Expressing and Null IGF-II and IGF-I Receptor Mice. *FASEB J.* 12:A1018.
- J. C. Matthews**, M. S. Malandro, M. J. Beveridge, J. D. Rothstein, M. S. Kilberg, and D. A. Novak. 1996. Differential Expression of Glutamate Transport Proteins in Developing Rat Placenta. *Mol. Biol. Cell.* 7(5):258 (Abstr.).
- J. C. Matthews**, E. A. Wong, P. K. Bender, and K. E. Webb, Jr. 1995. Demonstration of Dipeptide Transport System Activity in the Omasal Epithelium of Sheep by Expression of mRNA in *Xenopus laevis* Oocytes. *J. Anim. Sci.* 73(1):269 (Abstr.).
- M. Q. McCollum, **J. C. Matthews**, and K. E. Webb, Jr. 1995. Absorption of Lysine by Sheep Ruminal and Omasal Epithelia. *J. Anim. Sci.* 73(1):270 (Abstr.).
- J. C. Matthews**, E. A. Wong, P. K. Bender, and K. E. Webb, Jr. 1995. Identification and Characterization of a Transport System Capable of Lysine and Leucine Uptake in Porcine Jejunum by Expression of mRNA in *Xenopus laevis* Oocytes. *FASEB J.* 9:A306.
- J. C. Matthews**, E. A. Wong, and K. E. Webb, Jr. 1994. Demonstration of  $b^{0,+}$ -like Amino Acid Transport System Activity in Porcine Jejunum by Expression of mRNA in *Xenopus laevis* Oocytes. *J. Anim. Sci.* 70(1):278 (Abstr.).
- J. C. Matthews** and K. E. Webb, Jr. 1993. Absorption of L-Methionine and L-Methionylglycine by Sheep Ruminal and Omasal Epithelia. *FASEB J.* 7:A532.
- J. C. Matthews** and K. E. Webb, Jr. 1992. Absorption of the Dipeptides L-Carnosine and L-Methionylglycine by Sheep Ruminal and Omasal Epithelia. *FASEB J.* 6:A1962.

#### *Dissertation and Thesis*

- J. C. Matthews**. Demonstration of Peptide and Free Amino Acid Absorption by Sheep Forestomach Epithelium using Parabiotic Chambers and Identification of  $H^+$ /Peptide and Free Amino Acid Transport Proteins in Sheep Omasal Epithelium and  $b^{0,+}$  Amino Acid Transport Proteins in Pig Jejunal Epithelium by Expression of mRNA in *Xenopus laevis* Oocytes. 1995. Ph.D. Dissertation, Virginia Tech, Blacksburg.
- J. C. Matthews**. Absorption of Carnosine and Methionylglycine by Sheep Ruminal and Omasal Epithelia. 1991. M.S. Thesis, Virginia Tech, Blacksburg.