

Chair Animal Anatomy, Nutrition and Resources

2.4.8 Laboratory: Nutritional Science for Animals

Member Professor	Matsui, Tohru, Dr. Agric. Sci.
Associate Professor	Funaba, Masayuki, Dr. Agric. Sci.
Assistant Professor	Torii, Shinichiro, Dr. Agric. Sci.
Doctor's program	2
Master's Program	8
Undergraduate	3

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Vitamin nutrition and metabolism

We study vitamin nutrition and metabolism using animals and cultured cells. Our goal is to develop optimal supply of vitamins for animal production and health. This year, we focused on the effects of supplementation of vitamin K analogues in Thoroughbred horses. Main results are summarized as follows. 1) Plasma concentrations of menaquinone-4 were low in horses compared to other mammals; 2) Plasma concentrations of menaquinone-4 were increased by menadione supplementation but not by phylloquinone supplementation, suggesting that the conversion of phylloquinone to menadione was not efficient in horses; 3) Supplementation of menadione to mares just after delivery increased menaquinone-4 concentrations in milk and in plasma of their offspring.

b) Mineral nutrition and metabolism

We study mineral nutrition and metabolism using animals and cultured cells. Our goal is to develop optimal supply of minerals for animal production and health. This year, we focused on effects of dietary zinc concentration on tissue mineral levels in growing rats. Main results are summarized as follows. The weight of the pancreas was significantly lower in rats fed diet with zinc concentration at > 1,000 ppm than in rats fed diet with zinc concentration at 24 ppm. In addition, zinc deficient diet did not affect magnesium concentrations in the kidney and bone, which contradicted to the previous results- a previous study reported that feeding with zinc deficient diet decreased magnesium concentration in these tissues. To understand effects of zinc nutrition on tissue mineral concentrations comprehensively, we developed metallomic approach by use of ICP-MS. We surveyed trace mineral concentrations in feeds for beef cattle in 231 cow-calf operations, indicating that half of cow-calf operations gave feeds containing copper less

c) Roles of the TGF- β family in mesenchymal cells

Members of the TGF- β family regulate cell growth and differentiation. We study function and signal transduction of the TGF- β family in mesenchymal cells in muscle and fat. Our goal is to provide basic information on animal growth. This year, we examined the role of the TGF- β family during myotube differentiation. Endogenous BMP activity was higher prior to differentiation stimulation, and it was required for efficient myotube differentiation.

A-2.Publications and presentations

a) Publications

Books

- Matsui T.: Animal Feeding (Ishibashi, T., H. Itabashi, S. Sukemori, T. Matsui and T. Morita, eds). Yokendo, Tokyo 2011 (in Japanese)

Original Papers(including book-reviews)

- Furutani, Y., T. Umemoto, M. Murakami, T. Matsui and M. Funaba: Role of endogenous TGF- β family in myogenic differentiation of C2C12 cells. J Cell Biochem 112; 614-624, 2011

- Ogawa, K., M. Funaba and M. Tsujimoto: The effects of TGF- β 1 on the expression of type IV collagenases in mouse peritoneal macrophages. Mol Biol Rep 38; 1451-1456, 2011

- Hattori, R., S. Torii, M. Funaba and T. Matsui: Determination of true absorption and fecal endogenous loss of zinc in goats. Anim Sci J 81; 564-568, 2010

- Murakami, M., M. Suzuki, Y. Nishino and M. Funaba M: Regulatory expression of genes related to metastasis by TGF- β and activin A in B16 murine melanoma cells. Mol Biol Rep 37; 1279-1286, 2010

- Suenaga, M, T. Matsui and M. Funaba: BMP inhibition with dorsomorphin limits adipogenic potential of preadipocytes. J Vet Med Sci 72; 373-377, 2010

- Sugiyama, K., R. Ooishi, Y. Nishino, M. Funaba and M. Murakami: Nucleotide sequence of canine Smad3. Biochem Genet 48; 202-207, 2010

- Torii, S., T. Matsui , A. Tsuruta and T. Sakurai: Survey of zinc concentration of feed ingredients and final diets in commercial cow-calf operations and finishing beef cattle farms in Japan. Bulletin of Beef Cattle Science 89; 7-12, 2010 (in Japanese)

- Torii, S., T. Matsui , A. Tsuruta and T. Sakurai: Survey of iron concentration of feed ingredients and final diets in commercial cow-calf operations and finishing beef cattle farms in Japan. Nihon Chikusan Gakkaiho 81; 47-52, 2010 (in Japanese with English abstract)

Reports,others

- Matsui, T: AAAP Woogene B&G Award

- Torii, S.: Maintain cow health with adequate trace minerals. Dairyman 60(3); 34-35, 2010 (in Japanese)

- Torii, S.: Recommended trace mineral supplementation during reproduction, growth and fattening of beef cattle. Kochi Prefecture Beef Cattle Information 145; 4-11, 2010 (in Japanese)

- Torii, S.: Recommended trace mineral supplementation in fattening beef cattle. Kyodo Journal 41(210); 5-9, 2010 (in Japanese)

- Torii, S.: Supplementation of essential trace minerals for improvement of reproduction and growth of Wagyu beef cattle: nationwide feed survey. Kyodo Journal 42(212); 26-30, 2011 (in Japanese)

b) Conference and seminar papers presented

- The 64th Annual Meeting of Japanese Society of Nutrition and Food Science: 2 presentations

- The 27th Meeting of Japan Trace Nutrients Research Society: 2 presentations

- The 12th Meeting of Japanese Society of Pet Animal Nutrition: 1 presentation.

- The 60th Meeting of Kansai Animal Science Society: 1 presentation

- The 48th Meeting of Society of Beef Cattle Science: 2 presentations

- The 49th Meeting of Japanese Society of Nutrition and Food Science (Kinki region): 3 presentation

- The 30th Meeting of The Japanese Society for Magnesium Research: 2 presentations

- The 33rd Meeting of The Molecular Biology Society of Japan, and the 83rd Meeting of Japanese Biochemical Society: 4 presentations

- The 4th Meeting of Japanese Society of Animal Nursing (Kansai region): 1 presentation.

A-3.Off-campus activities 1

Membership in academic societies

- Matsui, T. : Japanese Society of Animal Science (Editor, Councilor), Japanese Trace Nutrient Research Society (Director, Editor), Japanese Society for Magnesium Research (Councilor), Japanese Society of Animal Nutrition and Metabolism (Councilor, Editor), Japanese Association of Pet Animal Nutrition (Director, Editor), Society of Beef Cattle Science (Councilor), Kansai Society of Animal Science (Editor), Japanese Society of Nutrition and Food Science-(Director), Japanese Society of Nutrition and Food Science-Kinki Section (Councilor)

- Funaba, M. : Japanese Association of Pet Animal Nutrition (Editor), Kansai Society of Animal Science (Secretary)

- Torii, S. : Society of Beef Cattle Science (Secretary)

A-3.Off-campus activities 2

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Grant-in-Aid for Challenging Exploratory Research : Matsui, T. : The development of methods for detection of toxic heavy metals in animal feed

2.Other Research Grants

- Sponsored Research Funds : Matsui, Tohru, Dr. Agric. Sci. : Establishment of daily allowance of trace minerals in Wagyu cattle given domestic feeds for improving reproduction and calf growth
- Core Stage Backup Grants from Kyoto University : Funaba, M. : Roles of BMPs in differentiation of preadipocytes
- Morinaga research grant : Torii, S. : Survey on essential trace mineral concentrations in the diets of beef and dairy cattle in Japan

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Basic Bioresource Science (Matsui et al), Cell Biology I (Matsui et al), Outline of Bioresource Science II (Matsui et al), Animal Physiology (Matsui et al), Animal Nutrition (Matsui, Funaba), Physiological Nutrition of Animals (Matsui, Funaba), Fundamentals for the Experiments for Bioresource Science (Matsui, Torii et al), Laboratory Course in Bioresource Science I and II (Matsui, Funaba, Torii et al), Introduction to Foreign Literature in Bioresource Science II (Funaba et al), Seminar for Applied Animal Science I and II (Funaba et al)
- Graduate level : Seminar in Nutritional Science of Animals (Matsui, Funaba and Torii), Laboratory Course in Nutritional Science of Animals (Matsui, Funaba and Torii), Metabolism and its Regulation of Animals (Funaba)

B-2.Off-campus teaching etc.

Part-time lecturer

- Matsui, T.: School of Environmental Science, University of Shiga Prefecture (Environmentology for Animal Production)

B-3.Overseas teaching 1

International students

- International students : Doctoral 1 (Republic of Korea)

C.Other Remarks

- Matsui, T.: Subcommittee of Agricultural Industry, Evaluation Committee of Incorporated Administrative Agency, The Ministry of Agriculture, Forestry and Fishery (Specialist), Selection Committee of Projects for Safety of Animal Products, The Ministry of Agriculture, Forestry and Fishery (Member), Committee on Standard Methods for Feed Analyses, Food and Agricultural Materials Inspection Center (Member), Japanese Committee on ISO TC34/SC10, Food and Agricultural Materials Inspection Center (Member), Committee on Development of Analytical Methods for Arsenic in Feeds, Japan Food Research Laboratories (Member)