Physiology and Endocrinology Symposium:
The next generation of metabolic endocrinology

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The Physiology and Endocrinology Symposium titled “The next generation of metabolic endocrinology” was held at the Joint Annual Meeting of the American Dairy Science Association and American Society of Animal Science (ASAS) in Indianapolis, IN, July 8 to 12, 2013. The symposium was organized by the Physiology and Endocrinology Committee that included Jose Santos (University of Florida, Gainesville), Kyle Caires (Berry College, Mount Berry, GA), Russell Hovey (University of California, Davis), Jason Ross (Iowa State University, Ames), and Kevin Harvatine (committee chair; Pennsylvania State University, University Park). The purpose of the symposium was to discuss recently identified endocrine factors that regulate metabolism. Continued discovery and characterization of novel endocrine factors originating from non-traditional endocrine tissues provide insight into the crosstalk and coordination of metabolism. Many of these factors impact insulin signaling and lipid synthesis and mobilization with significant impacts on animal growth, nutrient partitioning, and metabolic diseases. The symposium included three invited presentations and three original research presentations selected from submitted abstracts.

The first presentation of the symposium titled “Novel insights into the biology of the emerging regulator FGF21” was presented by A. C. Adams (Eli Lilly & Co. Indianapolis, IN). First, the important metabolic effects of the recently discovered hepatic endocrine factor fibroblast growth factor 21 (FGF21) were introduced and the critical components of the signaling system overviewed (Antonellis et al., 2014). Although the effect of FGF21 was previously well described, the mechanism of FGF21 had been more difficult to determine. Experiments conducted by the authors using a complementary set of tissue specific transgenic mouse models were then discussed. The authors concluded that FGF21 has a direct effect on adipose tissue and an indirect effect on the central nervous system through mechanisms linked to altered adipokine secretion (Antonellis et al., 2014).

The second speaker of the symposium was Y. R. Boisclair (Cornell University, Ithaca, NY) discussing the “Biology of the novel hormone fibroblast growth factor-21 in the transition dairy cow” (Boisclair et al., 2013). He provided insight into FGF21 regulation during the transition to lactation in the dairy cow, which is a metabolically-challenging phase when regulation of lipid mobilization and hepatic oxidation are very important. Recent experiments by the speaker demonstrate that plasma FGF21 is low in late pregnancy and increases during early lactation and that liver and adipose tissue have a full complement of receptors required for FGF21 signaling. The speaker concluded that FGF21 has the potential to explain metabolic adaptations in nutrient partitioning during early lactation and further identification of factors regulating its synthesis and signaling may be important to managing metabolic disease during this period.

The last invited presentation, by R.S. Ramachandran, (Pennsylvania State University, University Park) discussed the “Role of adiponectin and visfatin in chicken growth and reproduction” (Ramachandran et al., 2013). Adiponectin is known to improve glucose and lipid metabolism in other experimental models and the speaker described identification and characterization of adiponectin and its receptor in the chicken. This was followed by presentation of in vivo and in vitro regulation of adiponectin signaling in the chicken. He then discussed visfatin and showed that it is increased in pubertal broiler chickens and has a role of in myogenesis in vitro. The presentation highlighted the potential for adiponectin and visfatin to improve growth or reproduction of the chicken and also demonstrated
the need to validate systems and reagents when working with new candidate systems in production animals.

The symposium concluded with 3 original research abstracts. Singh et al. (2013) reported changes in serum adiponectin during the course of lactation in dairy cows and that supplementation with a mixture of conjugated linoleic acid isomers that reduced milk fat synthesis also decreased serum adiponectin. Next, Farney et al. (2013) presented that injection of tumor necrosis factor α decreased milk yield and increased health disorders in early-lactation dairy cows. Lastly, Khan et al. (2013) reported changes in inflammation and endoplasmic reticulum stress genes during the transition to lactation in dairy cows fed high and low energy diets.

The presentations and discussion at “The next generation of metabolic endocrinology” symposium emphasized the importance of the communication between tissues by multiple signals to regulate growth, adiposity, and metabolic adaptations. It is increasingly clear that neither one tissue nor one signal is dominant, but the interaction among tissues and signaling systems is key. The symposium also highlighted complementary basic metabolism research identifying signals and fundamental aspects of the system and animal science research verifying the system and determining its regulation during physiologically relevant states in production animals. As we continue to understand the details of the current generation of endocrine factors, we anxiously await identification of the next generation and the insight they will provide to production efficiency, metabolic diseases, and animal welfare.

**LITERATURE CITED**


