The primary roles for the involvement of vitamin D in Ca homeostasis have been established over the past 4 decades. More recent discoveries of extra-skeletal roles of vitamin D metabolites in cellular pathways, beyond those involved in Ca homeostasis, have rekindled interest in research to better understand the vitamin D needs of humans and animals. The objective of this Triennial Growth Symposium was to establish a foundation for the principles involved in the roles of vitamin D in animals. Ten invited speakers were selected to provide a breadth of topics concerning vitamin D. Authors from 2 abstracts selected from the general program were invited by the organizing committee for oral presentations at the symposium. All speakers were encouraged to distinguish between roles for vitamin D that can be supported by scientific principles vs. speculative roles that are not fully supported. This approach will hopefully help dispel some unrealistic hype generated by speculative inferences.

The foundation for the discovery and delineation of the vitamin D endocrine system can be mostly attributed to the meticulous research by Hector F. DeLuca (University of Wisconsin, Madison) and his coworkers over the past 6 decades. As the keynote speaker for the 2013 Triennial Growth Symposium, DeLuca provided a concise, comprehensive review that spanned 100 yr of pivotal discoveries in vitamin D research (DeLuca, 2014). Early research focused on the roles of vitamin D in Ca and Ph homeostasis, which led to the identification of the specific active metabolite and target tissues involved. The proximal convoluted tubule cells of the kidney are the primary location of the highly regulated conversion of 25-hydroxyvitamin D$_3$ ($25$-$\text{OH}$-$\text{D}_3$) to the active metabolite, 1α,25-dihydroxyvitamin D$_3$ [$1,25$-(OH)$_2$-$\text{D}_3$] by the enzyme CYP27B1. However, CYP27B1 has more recently been detected in extra-renal cells. Specific molecular signals regulated by 1,25-(OH)$_2$D$_3$ have been identified in skeletal, intestinal, and renal tissues. Verification of a direct role for 1,25-(OH)$_2$D$_3$ in the induction of these signals required identification of the target receptor, vitamin D receptor (VDR), in these tissues. The VDR was initially identified in the intestinal enterocyte, the osteoblast, and renal cells. Additional cells now known to contain VDR include parathyroid cells, keratinocytes, activated lymphocytes, islet cells of the pancreas, pituitary cells, ovarian cells, and aortic endothelial cells. Evidence from in vivo experiments to support nongenomic mechanisms for vitamin D actions that are independent of VDR-mediated responses is not convincing. DeLuca (2014) also summarized his current work focused on extra-skeletal roles of vitamin D metabolites and the use of active, synthetic vitamin D analogs to successfully treat diseases such as psoriasis, postmenopausal osteoporosis, and type I diabetes. No direct evidence to support effective roles for vitamin D in treatment of multiple sclerosis, colorectal cancer, or breast cancer has been reported, despite retrospective epidemiological studies that support the concept for therapeutic or preventive roles. Interestingly, DeLuca (2014) identified many areas of research still needed