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Editorial

Prologue to the international symposium "vitamins as regulators of gene expression: biotin as a model"

During human evolution, many of the genes essential for vitamin synthesis were lost, thus causing a dependence on dietary intake. Vitamins function as coenzymes and hormones. Proper function of vitamin-dependent pathways depends on both cellular concentrations of bioactive vitamin metabolites and interactions with proteins and other molecules. Interactions between vitamins and other compounds are affected by the environment (including dietary intake) and the genetic makeup of an organism.

Recently, evidence that vitamins play important roles in gene expression has been provided. Vitamin-dependent cell signals may affect gene expression at both the transcriptional and the posttranscriptional level. These effects are mediated by numerous mechanisms; targets include nuclear proteins and *cis*-acting elements. An example is the superfamily of hormone nuclear receptors, which has 48 members in humans. Well-known examples include the vitamin D receptor and the retinoic acid receptor. Much less is known about the mechanisms that mediate some of the effects of water-soluble vitamins on gene expression. This is despite the fact that many of these nutrients are known modulators of gene expression (e.g., folic acid, riboflavin, pyridoxine and biotin).

Biotin, best known for its role as the prosthetic group of carboxylases, also controls the expression of various proteins including carboxylases, glucokinase, phosphoenolpyruvate carboxykinase, ornithine transcarbamoylase and various cytokines and oncogenes. These effects suggest the existence of a regulatory network that is controlled by biotin. Likely, this network mediates some of the effects of biotin in cell biology, embryonic development and cancer biology. These effects of biotin are physiologically important. For example, marginal biotin deficiency is teratogenic in laboratory animals. This is a concern to health professionals, given hat marginal deficiency of biotin is relatively prevalent among pregnant women.

Recently, some truly exciting progress has been made regarding roles for biotin in cell signaling, chromatin structure, gene expression and others. These findings were presented at a meeting in Ixtapa–Zihuatanejo, Mexico, on December 3 and 4, 2004, after the XXV Mexican Congress of Biochemistry. This meeting was sponsored by the Sociedad Mexicana de Bioquímica A.C.; Programa de Doctorado en Ciencias Biomédicas, Universidad Nacional Autónoma de México (UNAM); Laboratorios Roche–Syntex, México; and Instituto de Investigaciones Biomédicas, UNAM. Brief summaries of the meeting presentations are provided in these conference proceedings. We gratefully acknowledge the contributions of Janos Zempleni (University of Nebraska–Lincoln) as guest editor for these proceedings.

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