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Nutrigenomics: A system biology tool for animal health

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Nutrigenomics and nutrigenetics involve scientific understanding of human or animal genomic/genetic contributions and responses to diet/ feed. The nutrigenomics considers how things in diet influence individuals genome, and how this interaction modifies phenotype, i.e., how diet alters biological systems to promote either health or disease. Nutrigenetics, on the other hand, aims to figure out how any one of us is genetically programmed to respond in a particular way to a given dietary nutrient. For example, a thrifty genetic trait can make someone respond extremely rapidly (in terms of weight gain) to a diet with too much fat, increasing risk for obesity and diabetes. The underlying genetic variation (or gene polymorphisms) harmonizes our response to specific nutrients. Ultimately, the nutrigenomics is concerned with the impact of dietary components on the genome, the transcriptome (the sum total of all mRNAs) the proteome (the sum of all proteins), and the metabolome (the sum of all metabolites).

Application of nutrigenomics could help enhance our understanding of how nutrition influences various biological pathways and homeostatic control; how this regulation is disturbed in the early phase of diet-related/ deficiency diseases and to what extent individual genetic makeup contribute to such diseases. Numerous studies in humans, animals, and cell cultures have demonstrated that macronutrients (e.g., fatty acids and proteins), micronutrients (e.g., vitamins), and naturally occurring bioactive chemicals (e.g., phytochemicals such as flavonoids, carotenoids, coumarins, and phytosterols; and zoochemicals such as eicosapentaenoic acid and docosahexaenoic acid) regulate gene expression in diverse ways. Although relatively new technologies, the various genomics applications searching for new biomarkers (molecules, receptors and pathways) already have found their way to many nutritional applications.

Nutrigenomics can be used to identify the specific markers to manipulate gene expression through use of nutrients or their combinations so as to improve productive as well as overall animal performance. Nutrigenomics will be a path breaking tool through identification of pathways and candidate genes responsible for dietary induced diseases and ultimately reduction in production losses due to these diseases in animals.

Biography

R V S Pawaiya did his BVSc & AH (1990) from Veterinary College, Jabalpur and MVSc (1993) and PhD (2004) in Veterinary Pathology from IVRI, Izatnagar, UP. He is presently serving the ICAR, Govt. of India as Principal Scientist. He received Jawaharlal Nehru Award of ICAR in 2005 for his doctoral research work. He has published more than 60 papers in reputed journals and currently serving as Chief Editor of the Indian Journal of Veterinary Pathology, a quarterly publication of the Indian Association of Veterinary Pathologists.

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