

Vitamin A deficiency-induced alterations and the protective role of Vitamin A supplementation in protein secondary structure of rat hippocampus

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The aim of this study is to examine the vitamin A deficiency-induced protein secondary structural alterations and the potential protective role of dietary Vitamin A supplementation on the altered pathology in rat hippocampus using Fourier transform infrared (FTIR) spectroscopy together with chemometric methods. Brain as compared to other organs is more susceptible to oxidative damage and these damages can be monitored by FTIR spectroscopy. Adult rats were divided into control (C), vitamin A-deficient (VAD) and vitamin A-supplemented (VAS) groups. Protein secondary structural changes were determined from the spectral and neural network (NN) analysis of amide-I band (1700-1600 cm^{-1}). Furthermore, principal component analysis (PCA) was carried out to differentiate the studied groups. The results revealed that a significant shift was observed in the frequency of amide I band for the VAD group as compared to the C group, indicating the structural changes in proteins. Neural network results revealed a significant decrease in alpha helix content and an increase in beta-sheet and turn contents in VAD group. Supplementation of Vitamin A restored these changes. Moreover, PCA analysis showed that the C and VAS groups were successfully discriminated from VAD group. These findings show that FT-IR spectroscopy with bioinformatic tools such as NN and PCA, allowed us to determine the Vitamin A deficiency-induced secondary structural changes in rat hippocampal proteins. Since structure is directly related with function, the restoring effect of vitamin A indicates that Vitamin A is essential for brain function.

Biography

Mete Severcan received BS and MS degrees in electrical engineering from Middle East Technical University (METU) and Ph.D. degree from Stanford University. He is currently working as a professor in the Electrical and Electronics Engineering Department at METU. He visited Stanford University as a Fulbright scholar, and later taught in UC Berkeley and San Francisco State University. He worked as a visiting scientist at De-Montfort University and University of Perugia. His current interests include telecommunications, signal processing, protein secondary structure determination and application of chemometric methods to biology.

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