

ABSTRACT

Expression of α -tocopherol-associated genes and α -tocopherol accumulation in Japanese Black (Wagyu) calves with and without α -tocopherol supplementation

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The aim of the study was to clarify 1) the distribution of 6 α -tocopherol (α -Toc)-associated gene expressions in 20 major tissues, including metabolic, reproductive, endocrine, immune, and digestive and absorptive tissues, in relation to α -Toc status and 2) the change in expression patterns of the genes induced when α -Toc was orally administered to Japanese Black (JB) calves. This study examined weaned male JB calves (= 10), of which 5 calves were orally administered α -Toc for 2 wk (30 IU·kg BW·d; TOC group). The others did not receive the α -Toc supplement and were the control (CONT) group. The 20 tissues and venous blood (serum) were sampled on the final day. In both groups, the mean mRNA expression levels for α -Toc transfer protein, afamin (AFM), ATP-binding cassette transporter A1, and tocopherol-associated protein were greatest in the liver (< 0.05), whereas scavenger receptor class B, Type I (SR-BI) mRNA was greatest in the adrenal gland (< 0.05). The gene for cytochrome P450 family 4, subfamily F, polypeptide 2 was most highly expressed in the liver, testes, and adrenal gland. The α -Toc content was greatest (< 0.05) in the testes of the 20 sampled tissues in the CONT group. However, the levels in the testes and jejunum were similar and greater (< 0.05) than the levels in the other 18 tissues in the TOC group. The mean increase in α -Toc levels after oral α -Toc administration (mean α -Toc content for the TOC group divided by the CONT group content) were greater (< 0.05) in the jejunum (40.7-fold) and duodenum and liver (26.3- and 23.1-fold) than in the serum (7.8-fold). In the liver, α -Toc administration significantly increased (< 0.05) the AFM and SR-BI mRNA expression levels. The results show that the liver may play an important role in the regulation of α -Toc disposition, but other peripheral tissues that accumulate large amounts of α -Toc could moderate the local α -Toc status and functions, as inferred from the high expressions of the α -Toc-associated genes in JB calves.