World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:11, No:08, 2017

The Effects of Grape Waste Bioactive Compounds on the Immune Response and Oxidative Stress in Pig Kidney

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Abstract : Nutrition is an important determinant of general health status, with especially focus on prevention and/or attenuation of the inflammatory-associated pathologies. People with chronic kidney disease can experience chronic inflammation that can lead to cardiovascular disease and even an increased rate of death. There are important links between chronic kidney diseases, inflammation and nutritional strategies that may prevent or protect against undesirable inflammation and oxidative stress. The grape by-products either seeds or pomace are rich in polyphenols which may be beneficial in prevention of inflammatory, antioxidant and antimicrobial processes. As a model for studying the impact of grape seeds on renal inflammation and oxidative stress, we used in this study weaned piglets. After a feeding trial of 30 days with a control diet and an experimental diet containing 5% grape seed (GS), kidney samples were collected. In renal tissues were determined the expression and activity of important markers of immune respose and oxidative stress: pro-inflammatory cytokines (TNF-alpha, IL-1 beta, IL-6, IL-8, IFN-gamma), anti-inflammatory cytokines (IL-4, IL-10), anti-oxidant enzymes (catalase CAT, superoxide dismutase SOD, glutathione peroxidise GPx) and important mediators belonging to nuclear receptors (NF-kB1, Nrf-2 and PPAR-gamma). Gene expression was evaluated by qPCR, whereas protein concentration was determined using proteomic techniques (ELISA). The activity of anti-oxidant enzymes was determined using specific kits. Our results showed that GS enriched in polyphenols does not have effect on TNF-alpha, IL-6 and IL-1 beta gene expression and protein concentration in kidney. By contrast, the gene expression and protein level of IL-8 and IFN-gamma were decreased in GS kidney. Anti-inflammatory cytokines IL-4 and IL-10 gene levels were increased in kidneys collected from GS piglets in comparison with controls, with no modification of protein levels between the two groups. The activities of anti-oxidant enzymes CAT and GPx were increased in kidney by GS, whereas SOD activity was unmodified in comparison with control samples. Also, the GS diet was associated with no modulation of mRNAs for nuclear receptors NF-kB1, Nrf-2 and PPAR-gamma gene expressions in kidneys. In conclusion, our results demonstrated that GS enriched in bioactive compounds such polyphenols could modulate inflammation and oxidative stress markers in kidney tissues. Further studies are necessary to elucidate the mechanism of action of GS compounds in case kidney inflammation associated with oxidative stress, and signalling molecules involved in these mechanisms.

Keywords : animal model, kidney inflammation, oxidative stress, grape seed
Conference Title : ICCCM 2017 : International Conference on Clinical and Cellular Immunology
Conference Location : Venice, Italy
Conference Dates : August 14-15, 2017