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Diet- and age-dependent changes of intestinal injury in rats

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A high-sugar diet is associated with an increased risk of chronic intestinal disease¹, but the capacity of the gut to adapt to dietary changes in young and adult rats is unknown. Therefore, the effects of an 8-week dextrose-enriched diet (20% or 60%) on intestinal histology, antioxidative defence status, and the expression pattern of high mobility group box-1 (HMGB1), a mediator of the inflammatory response², were investigated. Numerous signs of tissue damage were associated with decreases in villus height (Vh), crypt depth (Cd), villus surface area (VSA), and muscle thickness (Mt) in adult rats fed with 60% dextrose. While the decrease in Vh and Cd was affected by age, the decrease in VSA and Mt was interactively affected by age and treatment. Structural changes were associated with decreased activity of antioxidative defence enzymes, particularly catalase, which is affected by treatment, and CuZnSOD, which is interactively modulated by age and treatment. Moreover, massive translocation of HMGB1 from the nucleus to the cytoplasm was detected in epithelial cells in the same group (interactive effect of age and treatment). We concluded that supraphysiological dextrose concentrations induce changes in the oxidative state, possibly leading to redox modification of HMGB1 and consequent tissue damage. The intestine undergoes dynamic functional and morphological changes with age that are more pronounced under high dextrose concentrations.

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