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PROTECTIVE EFFECT OF PYRUVATE AGAINST RADIATION-INDUCED DAMAGE IN COLLAGENIZED TISSUES

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Exposure to high doses of ionizing radiation produces both acute and late effects on the collagenized tissues and have profound effects on wound healing. Because of the crucial practical importance for new radioprotective agents, our study has been focused on evaluation of the efficacy of non-toxic naturally occurring compounds to protect tissue integrity against high-dose gamma radiation. Here, we demonstrate that molecular integrity of collagen may serve as a sensitive biological marker for quantitative evaluation of molecular damage to collagenized tissue and efficacy of radioprotective agents. Increasing doses of gamma radiation (0-50kGy) result in progressive destruction of the native collagen fibrils, which provide a structural framework, strength, and proper milieu for the regenerating tissue. The strategy used in this study involved the thermodynamic specification of all structural changes in collagenized matrix of skin, aortic heart valve, and bone tissue induced by different doses and conditions of g–irradiation. This study describes a simple biophysical approach utilizing the Differential Scanning Calorimetry (DSC) to characterize the structural resistance of the aortic valve matrix exposed to different doses of g-irradiation. It allows us to identify the specific response of each constituent as well as to determine the influence of the different treatments on the characteristic parameters of protein structure. We found that pyruvate, a substance that naturally occurs in the body, provide significant protection (up to 80%) from biochemical and biomechanical damage to the collagenized tissue through the effective targeting of reactive oxygen species. The recently discovered role of pyruvate in the cell antioxidant defense to O_2 oxidation, and its essential constituency in the daily human diet, indicate that the administration of pyruvate-based radioprotective formulations may provide safe and effective protection from deleterious effects of ionizing radiation.