The overall objective of this work was to look for proteins that are up- or down-regulated following exposure to whole-body ionizing radiation (IR). The objective is to use these proteins as potential biomarkers of exposure to ionizing radiation of 2 Gy or greater which is the tolerance level for radiation sickness. Once these protein biomarkers are obtained, their antibody could be put inside a self-administered oral test strip, called a lateral flow device, to triage victims of a radiological dispersal device or nuclear detonation. Mice were radiated with 2 Gy, 4 Gy and 7 Gy and sacrificed at 1 hour, 24 hours and 72 hours. Also, mice were injected with lipopolysaccharide (LPS) endotoxin (10 µg) to induce an inflammatory response to see if this response affects the up- or down-regulated proteins. The LPS injected mice were sacrificed at 1 hour, 24 hours and 72 hours. The tongue was chosen for this work because it is a radiosensitive tissue. The final set of experiments was the generation of controlled bovine carbonic anhydrase (BCA) spike samples to demonstrate BCA identification and quantitation. Two-dimensional (2D) gel electrophoresis was used to separate the proteins extracted from the tongue samples and MALDI TOF-TOF analysis used to identify the proteins. Adsorption measurements of the 2D gel was used to quantify the proteins. IR induced up-regulated or down-regulated proteins found only in the samples exposed to radiation were troponin I, skeletal, fast 2 (up-regulated), aconitate hydratase, mitochondrial precursor (down-regulated), alpha-actinin-2 (down-regulated), pyruvate kinase isozymes M1/M2 (down-regulated) and ATP synthase subunit beta, mitochondrial precursor (down-regulated).