Rapid biodosimetry in biofluids: targeted approaches through small molecules

The increase of threats of nuclear terrorism and use of improvised nuclear devices (IND) have led to a renewed interest in characterizing the effects of simple and complex exposures, e.g. mixed fields. Radiation metabolomics and lipidomics through untargeted liquid chromatography mass spectrometry (LC-MS) have identified a large selection of small molecule candidates in biofluids for the generation of radiation specific signatures. We are now undertaking the generation of highly sensitive and quantitative targeted multiplex assays for biodosimetry. The idea behind developing such assays for radiation assessment and radiation injury in easily accessible biofluids (urine, blood, saliva) is to rapidly determine the extent of exposure of an individual and distinguish between the worried well and the exposed individuals that may require medical intervention. Our biosignatures are focusing in the first week after exposure, although efforts are underway to determine a long-term radiation signal, that can be correlated to delayed disease development and progression. In addition, pre-processing devices that aim to collect and stabilize the metabolic signature for sample processing in a clinical facility are highly desirable with many potential applications.