DEVELOPING BIOMARKERS TO VERIFY INSECTS HAVE BEEN IRRADIATED

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Ionizing radiation is emerging as an alternative to methyl bromide for the disinfestation of insect pests from fresh commodities. Irradiation causes DNA damage that can directly kill insects at the time of treatment, but at some doses irradiated insects do not die immediately. Instead irradiation leaves live insects that are either unable to move on to the next life stage because metamorphosis is blocked or that may be apparently healthy yet sterile. After an irradiation treatment, live insects that are destined for death or sterility may be found alive on a shipment (e.g., so called “wigglers”). Because these insects are destined for death or are alive but unable to reproduce they pose no threat. However, these live insects may show no outward physical signs of irradiation, thus calling into question whether an irradiation treatment has been properly applied.

There is a critical need for a diagnostic test to verify whether live insects found during the inspection of a commodity have been irradiated. In this talk, we will outline the current strategies to develop a biomarker of irradiation. Biomarker development has focused on detecting DNA damage—the primary cause of death and sterility following irradiation. Promising indicators of irradiation-induced damage to DNA include markers of DNA oxidation and repair such as histone phosphorylation and antibodies to oxidized Guanine nucleotides. Finally, we will discuss the key requirements for a successful biomarker of irradiation and future avenues for research.