DEMONSTRATING THE EFFICACY OF ETHYLENE OXIDE DECONTAMINATION FOR THE REDUCTION OF DNA IN PLASTICS USED FOR DNA EXTRACTION

Ryo Hasegawa, B.S., John Dektar, Ph.D., Liwei Qi, M.S., Harmandeep Gill, Ph.D., Yingjie Liu, Ph. D. and Lisa Calandro, M.P.H.
Life Technologies, HID, 850 Lincoln Center Dr, Foster City, CA 94404, USA

Over the past several years, DNA analysis methods have become increasingly more sensitive with regard to the detection of very low quantities of DNA. Many laboratories have moved away from manual extraction methods such as phenol:chloroform extraction in favor of automated bench top or high throughput systems. The trend toward automated extraction methods has increased the burden on manufacturers of forensic products to ensure that collection devices and system consumables are free of extraneous DNA. A joint publication issued by the ENFSI, SWGDAM and BSAG organizations (Forensic Science International: Genetics 4 (2010) 269–270) highlights the need for controls in the manufacture of consumables used for DNA analysis in order to minimize the introduction of human DNA. We have recently performed a series of studies to evaluate the efficacy of various decontamination methods including gamma irradiation, ultraviolet, electron beam and ethylene oxide (EtO) sterilization for the removal of DNA from plastics used for DNA extraction. Ethylene oxide is a widely accepted gas phase sterilization technique in the medical industry for the elimination of viable micro-organisms from medical devices and has recently been demonstrated to effectively minimize the presence of amplifiable DNA. In order to evaluate these sterilization methods we spiked applicable samples with extracted DNA and cellular material to mimic conditions of contamination. The spiked samples were provided to various sterilization vendors for treatment and then compared to untreated samples. The efficacy of DNA removal was evaluated using real-time PCR and STR-based detection methods. Our studies demonstrated significant reductions in contaminating DNA from samples spiked with extracted DNA or cellular material using dual-cycle ethylene oxide treatment. Gamma irradiation, ultraviolet and electron beam treatment were less effective at reducing the presence of contaminating DNA. Further studies were performed to determine whether the ethylene oxide treatment would result in any deleterious effects on downstream sample processing for samples extracted with EtO-treated plastics. Treated and untreated plastics were used to extract a range of sample types. The extracts were subjected to downstream processing with real-time PCR and STR-based detection methods. Ethylene oxide treatment was demonstrated to significantly reduce the risk of human DNA contamination without detrimentally affecting downstream results. ⌘