EFFECTIVE POWDER-FREE DNA EXTRACTION WORKFLOW FOR SKELETAL SAMPLES USING THE PREPFILER® BTA™ AND AUTOMATE EXPRESS™ SYSTEMS

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In missing persons' cases, fire fatalities, mass disasters, and some forensic casework, skeletal samples are commonly used for human identification (HID) purposes. Bone and tooth samples are not routinely processed by all forensic laboratories, as the laboratory may not have the resources required such as bone grinding equipment, adequate lab facilities, or experienced analysts. Alternatively, specialized DNA analyses (e.g. mitochondrial analysis) may also be required. Due to the more complicated nature of these samples, skeletal remains may be sent to regional "hub" laboratories for processing.

Traditional DNA extraction protocols involve the powdering of bone followed by a lengthy digestion (e.g. total demineralization) and DNA purification (e.g. organic or silica-based). While many laboratories that process skeletal remains prefer to process bone samples manually using their own in-house protocols, several commercial DNA extraction kits are available to standardize the process and improve sample throughput. However, these kits still require bone to be ground into a fine powder. This study explored the efficacy of a commercial DNA extraction kit and automated platform to purify DNA from small bone fragments in order to eliminate the need to crush the bone into a powder. This option has the potential to save time, reduce the risk of contamination, conserve evidence, and more effectively triage samples while also retaining the ability to automate the process (if desired).

Twenty bones and five tooth fragments were collected from nine sets of skeletal remains that have been environmentally challenged (fire exposure, embalming, burial, and advanced decomposition). The results of this study show that although slightly less DNA was recovered from the whole bone chips and tooth fragments, STR success rates were similar to the powdered samples. The processing of bone chips also offers the unique possibility for further testing, as a second round of extraction can be performed on the remaining partially digested bone chip. Additionally, an automated extraction of bone chips could provide less-specialized labs a simple and affordable means of screening (or processing) skeletal remains in-house with their existing chemistry.