

DNA EXTRACTION FROM HAIR USING PRESSURE CYCLING TECHNOLOGY

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Current methods for extracting DNA from hair shafts involve extensive sample preparation and processing. In most cases, the process requires the use of hazardous chemicals. Even though most extraction methods employed at UNTCHI include a post clean-up or concentration step, PCR inhibitors can still be present and interfere with downstream sample processing and analyses.

Pressure Cycling Technology (PCT) uses cycles of alternating high hydrostatic and ambient pressures to extract DNA from a variety of sample types, including but not limited to swabs, hairs, soft and hard tissues, and liquid samples. The severe changes in pressure allow for molecular interactions to be controlled, resulting in baroporation and the release of DNA into solution while still maintaining the sample's morphological integrity. Some inhibitors may also be released upon barocycling but may be more effectively removed using a clean-up step prior to PCR amplification compared with current procedures.

A set of experiments was conducted to assess how well various PCT methods performed in extracting mtDNA from hair shafts compared with current extraction methods. Commercially available buffers and manufacturer-recommended digest solutions were used in conjunction with the PCT method in PULSE™ tubes on the Barocycler® NEP 3229 (Pressure BioSciences, Inc., South Easton, MA). When followed by a clean-up step using the DNA IQ™ Casework Sample Kit for Maxwell 16® (Promega Corporation, Madison, WI), PCR inhibitors were effectively removed and the samples were processed for mitochondrial DNA analysis. Reduced volume extractions were performed in MicroTubes™ (Pressure BioSciences, Inc., South Easton, MA) on the Barocycler® NEP 3229. Hairs were examined microscopically before and after barocycling for any morphological changes due to the PCT process.

Compared with extraction methods currently in use for hair samples, the PCT method both in full volume and reduced volume reactions can serve as a practical option for extraction. PCT provides the benefits of faster sample processing and reduced use of hazardous reagents, while often retaining sample morphology.