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Grinding of Elephant Tusk

APPARATUS: Freezer/Mill®

APPLICATION: Cryogenic Grinding of Elephant Tusk for DNA Analysis

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Abstract

The illegal ivory trade continues to drive elephant poaching. Large ivory seizures in Africa and Asia are still commonplace. Wildlife forensics is recognized as a key enforcement tool to combat this trade. Our Freezer/Mill, model CG-400, aids the process. DNA analysis of an ivory seizure is of vital importance in this regard. It involves pairing and sorting the tusks, sampling the tusks, powdering the sample, de-calcification, then DNA extraction. By employing a systematic approach, our CG-400 Freezer/Mill model aids the process of powdering and sampling, further facilitating the ease and efficiency in the DNA extraction process.

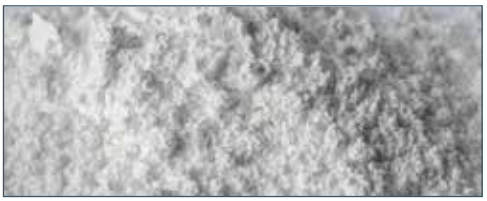
Introduction

Elephant tusks, which are elongated incisor teeth, are composed of dentin, enamel, and cementum. The toughness of an elephant tusk is a result of the combination of these materials. The dentin provides the structural integrity and strength, while the enamel offers hardness and protection.

Methods

- **Sample Collection**: Begin by collecting a representative sample of elephant tusk. Ensure the sample is free from contaminants and stored appropriately before processing.
- **Preparation of Sample**: Weigh the desired amount of tusk for analysis. Generally, 60-70% of the vial capacity is filled for grinding the sample. Here, 15 grams of sample was used for grinding.
- **Pre-Cooling the Freezer/Mill**: Ensure the Freezer/Mill is adequately pre-cooled. Average cooling time used for tusk is 15 minutes. This step is crucial for maintaining the integrity of the sample during grinding.
- **Loading the Sample**: Place the weighed tusk sample into the pre-cooled grinding chamber of the Freezer/Mill.
- **Grinding Parameters**: Set the grinding parameters on the Freezer/Mill. For grinding tusk, parameters are as follows:
    - Run Time: 15 mins
    - Cycles: 2
    - Speed: 15
    - Pre-cool: 15 mins
    - Type of vial used: stainless steel vial
- **Grinding Process**: Initiate the grinding process, allowing the Freezer/Mill to reduce the tusk to a fine powder. Monitor the process to prevent excessive heating and adjust parameters if needed. To prevent heating, resting time of 1 minute can be given between the cycles.
- **Sample Retrieval**: Once the grinding process is complete, retrieve the powdered tusk sample from the grinding chamber. Be cautious to minimize exposure to ambient temperature.
- **Storage of Ground Sample**: Transfer the ground tusk sample into a suitable container and store it at a low temperature, such as –80 °C, to maintain sample integrity until further analysis.
- **Cleaning the Freezer/Mill**: Thoroughly clean the grinding chamber and any components that came into contact with the sample to prevent cross-contamination in subsequent analyses.
- **Quality Control**: Implement quality control measures by periodically checking the particle size distribution of the ground sample to ensure consistency.

Before and After



Results

Micron range of particle size reduction with utmost homogeneity and preserved analytes for efficient sample extraction and consistent sampling.

Conclusion

The success of this method positions it as a valuable tool for researchers and analysts working with tusk in various fields, including genetics, DNA analysis, and forensic studies. However, it's essential to note that specific outcomes may depend on factors such as tusk composition, characteristics, Freezer/Mill specifications, and intended downstream applications. Regular quality control checks are recommended to validate and ensure the continued efficacy of the grinding process. Overall, the optimized sample preparation protocol presented in this application note serves as a robust foundation for obtaining reliable and high-quality results from tusk samples.

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