

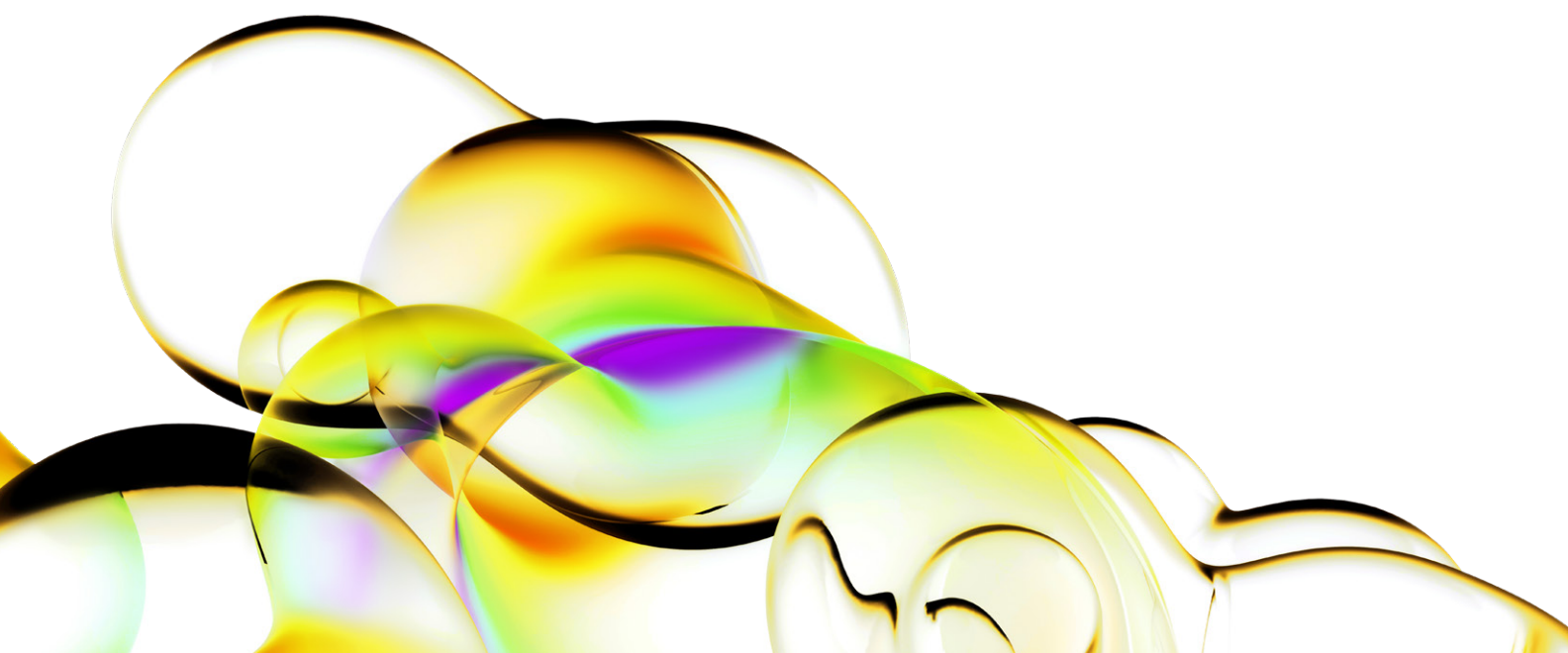
# Dry grinding hair using the Omni Bead Ruptor Elite bead mill homogenizer

## Summary

Hair is a sample matrix that allows for non-invasive, fast and simple sampling. Small molecules including drug metabolites and hormones, proteins, and DNA can be extracted from hair samples from a wide variety of species. Extraction efficiency is low, so laboratories often turn to bead mill homogenization to reduce particle size prior to carrying out further sample preparation procedures.

The Omni Bead Ruptor Elite™ bead mill homogenizer has been used in labs around the world to increase extraction efficiency and semi-automate laboratory sample prep procedures related to hair analysis. These protocols provide starting points for optimizing a hair dry grinding procedure which can be used prior to downstream analysis by GC-MS, LC-MS/MS, DNA sequencing, and other methodologies. Up to 720 hair samples can be processed in only one hour using the Omni Bead Ruptor Elite bead mill homogenizer with 2 mL Tube Carriage Kit.

For research use only. Not for use in diagnostic procedures.



## Materials and methods

### Equipment

- Omni Bead Ruptor Elite bead mill homogenizer (Cat # 19-042E)
- Omni Bead Ruptor Elite 2 mL Tube Carriage (Cat # 19-373)
- Hard Tissue Homogenizing Mix 2.8 mm Ceramic (2 mL) (Cat # 19-628)
- Hard Tissue Grinding Mix 2.4 mm Metal (2 mL) (Cat # 19-620)
- Omni Bead Ruptor Elite 7 mL Tube Carriage (Cat # 19-374)
- Hard Tissue Homogenizing Mix 2.8 mm Ceramic (7 mL) (Cat # 19-678)
- Hard Tissue Grinding Mix 2.4 mm Metal (7 mL) (Cat # 19-670)
- Omni Bead Ruptor 12 bead mill homogenizer (Cat # 19-050A)
- Optional Omni Bead Ruptor Cryo Cooling Unit (Cat # 19-8005)



### Procedure

Various animal species hair samples were milled using the Omni Bead Ruptor Elite bead mill homogenizer with 2 mL and 7 mL tube carriages. Both inert ceramic bead media and stainless-steel bead media were used in these protocol optimizations. Only dry grinding protocols are described below in Table 1. Wet grinding may also be a useful sample preparation method. Sample washing was not conducted in these studies, but can be done by rinsing hair samples with isopropanol and drying prior to homogenization.

Table 1: Sample homogenization summary

Sample type	Method	Diluent & Volume	Bead kit	Speed (m/s)	Time (sec)	Cycles	Dwell time (sec)
Bull hair, 50 mg	Dry grinding	None	PN 19-620	6.95	50	2	15
Coyote hair, 3 mm pieces	Dry grinding	None	PN 19-628	6.8	50	4	15
Horse hair, 100 mg	Dry grinding	None	PN 19-678	5.0 Omni Bead Ruptor 12	30	5	30
Horse hair, 100 mg	Dry grinding	None	PN 19-670	6.80 Omni Bead Ruptor Elite	50	3	180



Figure 1: Image of sample before and after homogenization

## Discussion

Hair samples ranging from 50-200 mg were processed into a fine powder using the Omni Bead Ruptor Elite bead mill homogenizer with ceramic and stainless-steel bead kits. High bead speeds are required to apply enough force to pulverize the fine, brittle hair sample matrix. Dwell times were used to control sample temperature. Various steroid hormone, drug metabolite, and DNA fragments have been extracted and analysed and proved stable using these protocols. A Cryo Cooling Unit may be added to the procedure to further reduce sample temperature during the dry grinding process.

The Omni Bead Ruptor Elite bead mill homogenizer can be used to semi-automate the hair grinding process. Dwell times (pauses) can be automated, allowing laboratorians to perform other sample prep tasks during the homogenization process. Sample throughput is increased compared to traditional grinding methods where up to 24 samples can be pulverized in as little as two minutes.



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