

Controlling Sample Temperature during Bead Milling using Passive Cooling with the new 7 mL Carriage

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Summary

Bead Mill technology has become a forefront in sample preparation for a variety of sample matrices. From tissues, bone, soil and microbes, bead milling is one of the quickest and most efficient ways to disrupt samples for scientific analysis. Bead mill homogenizers, such as the Omni Bead Ruptor Elite™ Bead Mill Homogenizer, function by vigorously shaking tubes containing dense bead material to disrupt samples. The impact between the beads and the sample reduces the sample particle size and creates a homogenous mixture. While bead milling is an efficient method for homogenization, for some, the addition of the bead media can be a drawback. The kinetic energy that is generated by movement of the beads within the tube and sample material increases sample temperature. In some cases, heat sensitive analytes can be affected. Herein we evaluate intra tube temperature after processing on the Bead Ruptor Elite™ Bead Mill Homogenizer coupled with the new 7 mL Tube Carriage.

Materials and Methods

Equipment

- Bead Ruptor Elite™ Bead Mill Homogenizer (PN 19-042E)
- Bead Ruptor Elite™ Finger Plate (PN 19-370)
- Bead Ruptor Elite™ 7 mL Tube Carriage (PN 19-374)
- Hard Tissue Homogenizing Mix (7 mL Tubes) (PN 19-678)



Bead Ruptor Elite™ Bead Mill Homogenizer



Finger Plate & 7 mL Tube Carriage



7 mL Tube

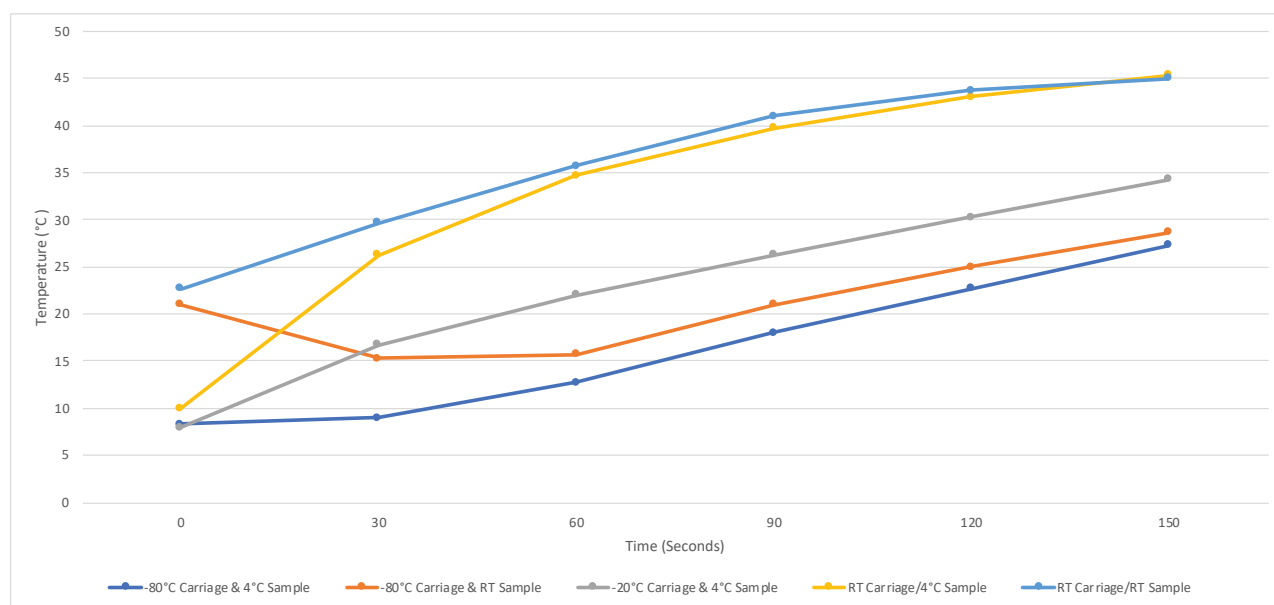
Procedure

For the five experiments conducted within this technical note, the 7 mL carriage was equilibrated at -80°C , -20°C and room temperature for one hour. Two stocks samples of deionized water were also prepared, one stock was equilibrated in a $4\text{--}8^{\circ}\text{C}$ refrigerator the second stock was left at room temperature.

To evaluate the passive cooling effect of the 7 mL carriage on samples, 4 mL of deionized water was added to a 7 mL tube containing a hard tissue homogenizing mix. The temperature of the deionized water in the tube was recorded using a digital thermometer. The tube was then processed on the Bead Ruptor Elite™ Bead Mill Homogenizer at 5 m/s for 30 seconds. After each 30 second run had completed, the temperature of the deionized water in the tube was recorded using a digital thermometer. Processing at 5 m/s for 30 seconds followed by subsequent temperature measurement was repeated until a total of 150 seconds had elapsed (five processing cycles). All experiment were carried out in triplicate.

Results

The temperature readings of the five experiments are plotted below.



Samples remained the coldest when processing in the carriage equilibrated at -80°C compared to carriages equilibrated at -20°C or room temperature. Using chilled buffers alone did not keep samples below 15°C during the first 30 seconds of processing. Using cooled buffers in combination with a carriage equilibrated at -80°C provided the coldest recorded samples at all tested time points.

The data shows that the -80°C equilibrated carriage has a cooling effect on the room temperature samples.

Passive cooling can be accomplished using the new 7 mL carriage if appropriate processing parameters are employed. The carriage should be equilibrated at -80°C for at least 1 hour before use. Chilled buffers aid in keeping processing temperatures below 15°C for up to 1 minute of processing time.

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