APPLICATION NOTE #201505

Controlling Sample Temperature during the Bead Milling Process with the BR-Cryo Cooling Unit

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BR-Cryo Cooling Unit (Cat #19-8010)

Bead Mill technology has become a forefront in sample preparations 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 24, function by vigorously shaking tubes containing dense bead material to disrupt samples. The impact between the beads and the sample reduces the sample 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. Omni International's BR-Cryo Cooling unit is designed to combat this problem. The BR-Cryo dissipates this heat by passing cold air (-100°C to -50°C) into the Bead Ruptor 24's processing chamber preventing the temperature increase. Here we evaluate intratube temperature after processing on the Bead Ruptor 24 coupled with the BR-Cryo Cooling unit.

Materials & Methods

Equipment

- **Bead Ruptor 24** (Cat #19-040)
- **Bead Ruptor 2ml Tube Carriage Kit** (Cat #19-010-310)
- **BR-Cryo Cooling Unit** (Cat #19-8010)
- **Hard Tissue Homogenizing Mix** (Cat #19-628)

Sample Preparation

At approximately room temperature (22°C) a 2 ml tube was filled with five 2.8 mm ceramic beads and 1 ml of DD H20 and processed on the BR-Cryo Cooling Unit at maximum speed (8 m/s). The final temperature was recorded after 10, 30, 60, 90 and 120 second processing cycles. This procedure was repeated without the use of the Cryo Unit.

Secondly, a 2 ml tube was filled with five 2.8 mm ceramic beads and 1 ml of DD H2O. The tubes were cooled to ≤ 4°C then placed in the Bead Ruptor 24. The tubes were then pre-chilled with the BR-Cryo for 20 seconds prior to processing. The tubes were then processed at maximum speed (8 m/s). The final temperature was recorded after 10, 30, 60, 90 and 120 seconds. The test was repeated without the use of the BR-Cryo unit as well as at 5 m/s with the 20 second pre-chill.

Results

The BR-Cryo Unit is designed to prevent an increase in intratube temperature during processing cycles. This is critical when processing samples for the extraction of heat sensitive molecules. Here the BR-Cryo Cooling unit was used to monitor temperatures at various speeds and at different tube temperatures prior to processing. The temperature recordings are shown in figures 1 and 2.

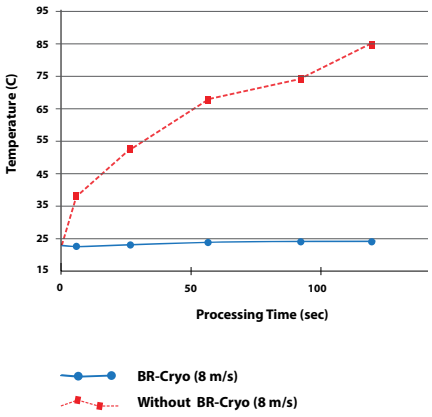

Figure 1 Sample temperature following bead milling at 8 m/s for increasing times with and without cooling using the BR-cryo cooling unit. Starting temperature at 21° C

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Results (cont.)

As seen in figure 1, the intratube temperature steadily increases as processing time increases without using the BR-Cryo. The BR-Cryo was able to maintain the intratube temperature around 22°C during all processing times without any increase in heat inside the tube.

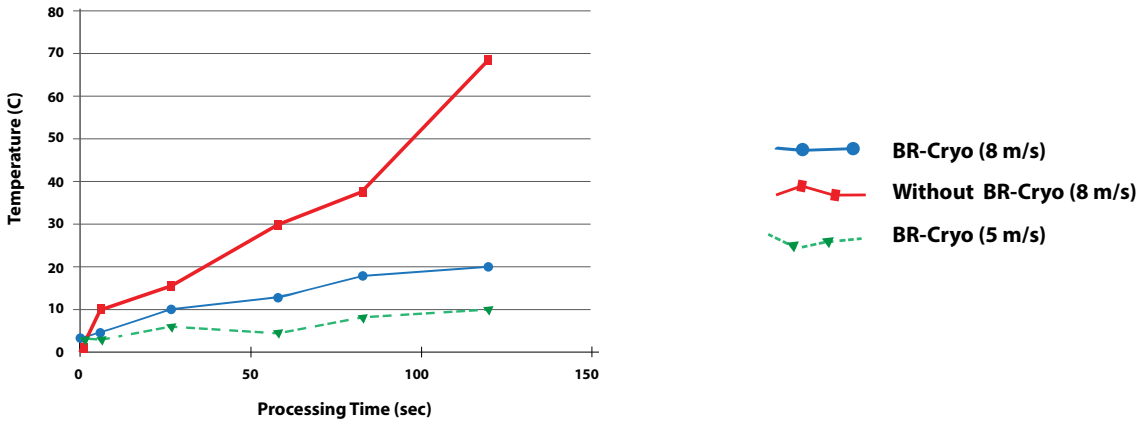

Figure 2 Sample temperature following bead milling at 8 m/s for increasing times with and without cooling using the BR-cryo cooling unit. Starting temperature at 4 C

As shown in figure 2, when the sample is precooled to 4°C prior to processing the temperature increases at the same rate as shown in figure 1 but with a lower final temperature after each time cycle. When the sample is precooled and the BR-Cryo is used, the intratube temperatures are maintained below 20°C for all processing times; even when processing is performed at 8 m/s. When the Bead Ruptor 24 is operated at a speed of 5 m/s the intratube temperature increase is slowed and when operated with the BR-Cryo the intratube temperature is maintained below 10°C for all processing times.

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