

SampleMatrix™ protects genomic DNA under high pressure and temperature

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Introduction

SampleMatrix™ is a novel, proprietary medium, which allows the storage of complex molecules at ambient temperatures, eliminating the need for costly, large freezers and shipment of samples under cold conditions. The most common storage technique for biologically sensitive materials such as nucleic acids is cold storage at various temperatures from liquid nitrogen to 4°C. This technique is a time tested albeit not efficient storage method. Large refrigerators and freezers use up enormous and valuable lab space as well as incur substantial energy costs. Machines are prone to failure, power fluctuations can cause inconsistent temperatures, and replacement of high-pressure refrigerant gas is very costly. Biomatrix, Inc. has developed a proprietary SampleMatrix™ that allows the long-term storage of DNA at room temperatures under anhydrous conditions. The data presented show that storage even under extreme conditions in SampleMatrix™, such as autoclaving, maintains DNA integrity, while autoclaving water stored genomic DNA results in degraded nucleic acid.

Materials and Methods

Stress test and PCR analysis: Various amounts of human genomic DNA (500ng, 200ng, 100ng, 50ng and 4ng) were spotted onto SampleMatrix™ or into empty microfuge tubes and allowed to dry in a laminar flow hood. Samples were then placed in an Erlenmeyer flask covered with aluminium foil and subjected to a dry cycle autoclave run. Autoclaving occurred at 250°F/121°C for 15 min at 15lb/in² and dried for 30min at 150°F/66°C. Samples were removed from the autoclave and allowed to cool. The DNA was hydrated in 10 µl water for 15 min on the bench top. Samples were used to amplify the human β-actin (hβactin) gene by PCR using 2.5 U Taq DNA polymerase (NEB), 3µl 10x thermopol reaction buffer (NEB), 0.5 µl dNTPs (10µM each nucleotide), hβactin forward (5' CTACCTCATGAAGATCCTCACC 3') and hβactin reverse (5' GTACTTGCGCTCAGGAGGAGC3') in a final volume of 30 µl. Cycling parameters were denaturation at 94°C for 5 min followed by 40 cycles of 94°C for 15 sec, 55°C for 30 sec and 72°C for 30 sec. 10 µl of PCR reactions was run on a 0.8% agarose gel.

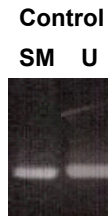


Figure 1: 500 ng gDNA were amplified in water (U) or SampleMatrix™ (SM) using hβactin primers.

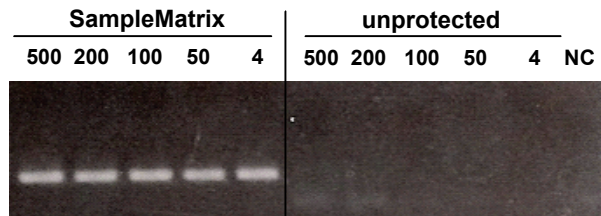


Figure 2: Various amounts (500ng; 200ng; 100ng; 50ng; 4ng) of gDNA were spotted and dried with or without (unprotected) SampleMatrix™ and subjected to autoclaving. Hydrated DNA was PCR analyzed using hβactin primers. Ng: no template control.

Results and Discussion

The protective properties of SampleMatrix™ are so revolutionary that exposure of gDNA to extreme conditions such as high pressure and heat for prolonged periods does not denature DNA. We first tested the SampleMatrix™ under PCR conditions and concluded that there was no noticeable difference in amplification of gDNA when using SampleMatrix™ as compared to water (Figure 1). We then subjected various amounts of gDNA to autoclaving conditions. The gDNA was either spotted and dried in SampleMatrix™ or left unprotected and autoclaved in a dry cycle. The absence of SampleMatrix™ caused the total denaturation of gDNA under the severe autoclaving conditions and no visible product was amplified, whereas the SampleMatrix™ fully protected the gDNA resulting in a robust amplification. Even minute amounts of gDNA such as 4 ng remained viable and could be PCR amplified.

The revolutionary SampleMatrix™ is a new invention for the long-term storage and cataloging of precious DNA samples. The exceptional protective property of the SampleMatrix™ allows the storage and transport of genomic DNA at room temperatures without denaturing the DNA. Samples can be stored with minimal effort in shelves, drawers or boxes, greatly reducing the need for costly freezers, where samples easily get lost due to displaced labels. Furthermore, the SampleMatrix™ is very useful for the transport and shipment of precious DNA. The fluctuating and inconsistent temperatures during shipment will not affect the DNA dry stored in the SampleMatrix™. Individual tubes or plates can be slipped into envelopes and sent without the need for styrofoam packaging and dry ice, greatly reducing the cost of shipments.