

SampleMatrix™ protects plasmid DNA stressed at high temperature

Introduction

Scientific discoveries are at an all-time high resulting in an ever-increasing need to store and ship molecules, such as DNA, RNA and proteins. Most molecular laboratories are dependent on cold rooms and freezers for the storage of these basic molecules. Freezers and cold rooms use up valuable lab space and result in high-energy costs. The ground-breaking SampleMatrix™, developed using the natural principles of anhydrobiosis, alleviates the need of cold rooms and freezers, allowing storage of molecules at ambient lab temperatures. The data presented show that storage at increased temperatures in SampleMatrix™ maintains plasmid integrity while unprotected plasmid DNA stored in water is degraded. This result demonstrates DNA stability under accelerated ageing conditions.

Materials and Methods

Stress test: One µg puc18 plasmid suspended in ddH₂O was spotted in Eppendorf tubes either containing dry SampleMatrix™ or no SampleMatrix™. The aqueous plasmid solution rehydrates the dried SampleMatrix™, establishing a mixture of plasmid and polymer based SampleMatrix™. The plasmid in SampleMatrix™ and the plasmid control without SampleMatrix™ were allowed to air dry in a laminar flow hood. Sample tubes were closed and then placed on a heating block maintained at 70°C. Samples were removed from the heat block at 24 or 72 h. The DNA was hydrated in 10 µl water for 15 min on the bench top. Samples were run on a 0.8% agarose gel.

Transformation: Stressed samples with and without SampleMatrix™ were hydrated in 10 µl water for 15 min on the bench top. The whole sample was added to 50 µl of DH5α *E. coli* and placed on ice for 20 min. The bacteria were heat-shocked at 42°C for 30 sec and placed on ice for 2 min. 450 µl LB broth were added to each tube and the samples were placed on a shaker at 37°C for 40 min. 50 µl of transformed cells were plated on LB plates containing 10mg/ml ampicillin and grown at 37°C overnight.

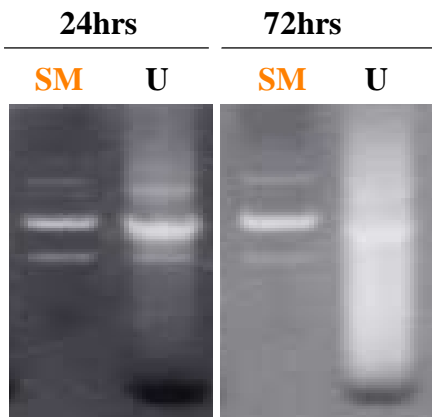


Figure 1: puc18 pDNA (1µg) dry stored in SampleMatrix™ (SM) or without protection (U) was heated at 70°C for 24 or 72 h. Samples were rehydrated in 10µl of ddH₂O and run on a 0.8% agarose gel.

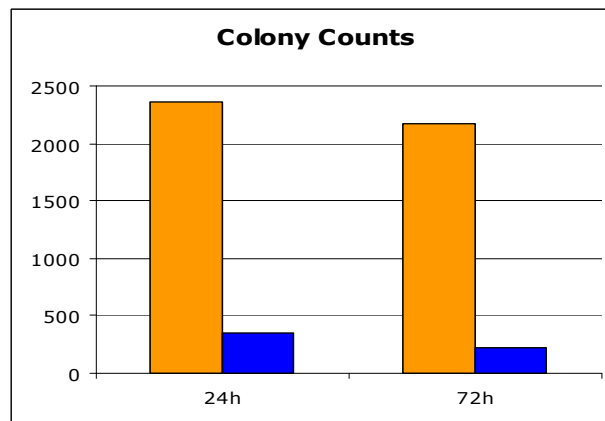


Figure 2: Heat stressed pDNA samples stored in SampleMatrix™ (orange) or without SampleMatrix™ (blue), heated for 24 or 72h, were rehydrated and used to transform competent *E. coli*. Colonies were counted after overnight incubation.

Results and Discussion

The protective properties of the novel SampleMatrix™ inhibit degradation of DNA even under extreme conditions. We heated pDNA samples maintained in anhydrous form in the SampleMatrix™ or without the protection of SampleMatrix™ for 24 or 72h at a constant 70°C. The samples were rehydrated and analyzed by gel electrophoresis. The SampleMatrix™ clearly protects pDNA even at increased temperatures over time (Figure 1, SM at 24 or 72h). Without the protective effect of the SampleMatrix™ pDNA begins to denature by 24h at increased temperature and by 72h is fully degraded (Figure 1, U at 24 or 72h). We then tested heated pDNA samples through bacterial transformation, where the same protective effect is reflected in the SampleMatrix™ samples. The SampleMatrix™ keeps the integrity of the pDNA and results in elevated colony counts after transformation (Figure 2, orange bars), while unprotected pDNA shows severe denaturation leading to few colony counts (Figure 2, blue bars).

The proprietary and revolutionary SampleMatrix™ allows the storage and transport of plasmid DNA at ambient temperatures. The protective property of SampleMatrix™ decreases degradation of pDNA even at extreme temperatures such as 70°C. Use of the SampleMatrix™ for the storage of precious DNA is a novel discovery furthermore reducing the need for freezers and cold shipment.