Biomatrica®
THE BIOSTABILITY COMPANY

# DNAstable® protects plasmid DNA from UV-C irradiation

## Introduction

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. While this technique is a time tested storage method, it is not the most effective method in terms of use of limited lab space, rising energy and capital equipment costs, all of which consume valuable resources that could be better used elsewhere. Mechanical refrigeration devices are particularly vulnerable to temperature fluctuations, break-downs and power-outages, all or which lead to substantial costs not only in repair or replacement, but also loss of precious samples and research effort. To meet the critical need for an efficient, reliable and easy-to-use storage medium for biological samples, Biomatrica®, Inc. has combined extremophile biology and synthetic chemistry to develop DNAstable®, an alternative to traditional cold-storage methods. The data presented demonstrate that storage even under severely denaturing conditions (*e.g.* UV-C irradiation) in DNAstable maintains plasmid integrity, while unprotected DNA stored under identical conditions is completely degraded.

## Materials and Methods

*Stress test*: Aliquots of pUC18 plasmid (2 µg) were spotted onto DNAstable or into an empty tube and allowed to dry in a laminar flow hood. Samples were then placed at a 10 cm distance from a UV-C bulb (Phillips, 30W) for 18 hours. Samples were removed from UV-C irradiation and the DNA was re-hydrated in 10 µl water for 15 min at room temperature for subsequent transformation experiments.

*Transformation*: The re-hydrated samples (dry stored in DNAstable or unprotected) were added to 50 µl of competent 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. LB media (450 µl) was added to each tube and the samples were placed on a shaker at 37°C for 40 min. Aliquots (50 µl) of transformed cells were plated on LB plates containing 10 mg/ml ampicillin and grown at 37°C overnight.

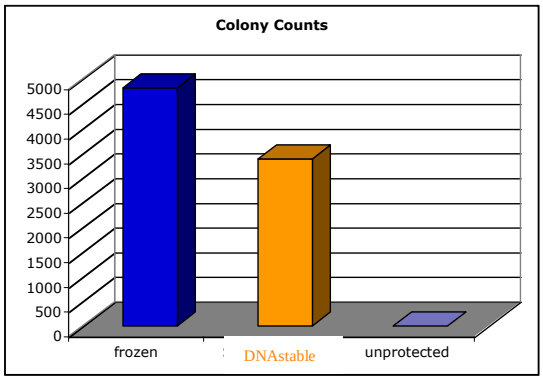


**Figure 1:** Competent bacteria were transformed using pUC18 DNA dry stored either in DNAstable or unprotected and then exposed to overnight irradiation with UV-C light. DNA samples were removed from irradiation, re-hydrated with water and then used for transformations. A frozen aliquot of pUC18 was used as a positive control (frozen).

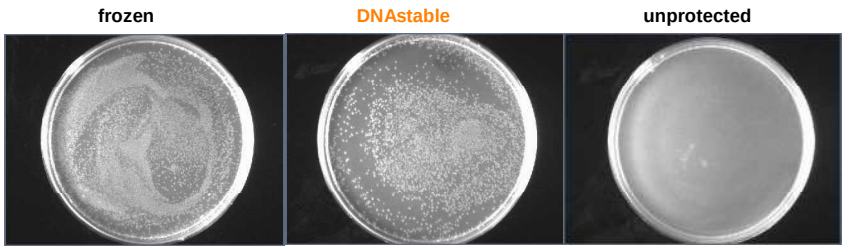


**Figure 2:** Transformed bacteria were spread on LB plates containing ampicillin and colony growth photographed after 18 h incubation at 37°C. Control transformations using DNA stored at -20°C (frozen), DNAstable protected samples and unprotected sample plates are shown.

## Results and Discussion

We exposed pUC18 plasmid DNA either protected under anhydrous conditions in DNAstable or without protection to UV-C light. The irradiated DNA was re-hydrated and used to transform competent bacteria. Transformation results underscore the total degradation of irradiated DNA stored unprotected by DNAstable; no colonies were detected (Figures 1 and 2). In contrast, DNAstable protected plasmid DNA from degradation, as indicated by significant colony growth that is comparable to frozen control colony counts. The protective properties of DNAstable significantly inhibit degradation of DNA even under extreme conditions, including continuous irradiation of DNA by UV-C light.

The DNAstable technology allows the storage and shipment of plasmid DNA at ambient temperatures, eliminating the need for energy and space consuming freezers and costly cold-pack shipments. The protective properties of DNAstable are effective even under harsh conditions such as prolonged exposure to highly toxic UV-C wavelengths.