A53 Optimizing DNA Storage at Room Temperature: Teflon vs. Polypropylene Tubes With and Without Polymers

Erica DiNaro, BS, Clarissa Trogdon, BS, and Steven B. Lee, PhD, San Jose State University, One Washington Square, Macquarrie Hall 521, San Jose, CA 95192*

After attending this presentation, attendees will have a better understanding of technologies used for long term storage of low quantity, low quality DNA samples at room temperature as compared to -20 °C freezer storage. Attendees will also learn how teflon coated storage tubes may have an affect on the retention of DNA samples and also how newly designed polymers are able to aid in the recovery and stabilization of low quantity, low quality DNA samples over time.

This presentation will impact the forensic science community as results from this project may provide a more cost efficient way of storing low quantity, low quality DNA samples. A combination of commercially available polymers and teflon coated tubes appear to protect the samples at room temperature from damage and maximize recovery. Furthermore, replacement of cold with room temperature storage will result in reduced energy consumption.

Storage of DNA samples is of paramount importance in forensic DNA, epidemiological, clinical and virtually any genetic database laboratory. There is always the possibility that cases may be re-opened and any stored DNA sample may need to be re-tested. This is especially important when the amount of sample is limited.

Biological evidence may be consumed with the result that the DNA extracts may be the only remaining genomic resource to retest and test with new technologies for retrospective and prospective testing. Optimal storage of DNA is therefore critical to retrospective (retesting) or prospective (downstream analysis with additional or new genetic markers) testing. In addition to sample quantity, intrinsic differences in sample types resulting in differences in quality, extrinsic differences in the storage buffers especially ionic strength, tube surface type, exposure to UV and temperature of storage may lead to differences in the ability to recover and re-test the sample.

Previous DNA storage studies indicate that DNA samples stored in polypropylene tubes resulted in a lower DNA recovery than when stored in Teflon. One potential explanation is that DNA may be retained within the chemical lining of the polypropylene tubes. Additionally, DNA storage in a new polymer, SampleMatrix (SM), at room temperature has been found to result in higher DNA recovery than those frozen without

SM.[1] Thus, the hypothesis states that Teflon tubes with SM will preserve samples more efficiently and increase the amount of DNA recovery versus those stored in polypropylene tubes.

Replicate dilutions of control DNA at 0.5, 0.25, and 0.05 ng/µL were prepared and quantified by qPCR to provide a starting baseline concentration of the amount of DNA. Enough replicates were prepared to be sampled at three days, seven days, three months, six months and one year in either Teflon or polypropylene tubes with and without SM at room temperature or as frozen liquid extracts at -20°C. Temperature and humidity were controlled in an environmental dry storage chamber with desiccant and electronically monitored over time with an electronic humidity and temperature logger.

Quantity and quality of the recovered DNA samples were evaluated using agarose gel electrophoresis; qPCR and fluorescent multiplex short tandem repeat amplification followed by capillary electrophoresis. Comparison of peak heights from replicate samples stored under different conditions was performed to evaluate differences in quality and quantity of recovered DNA. It is expected that recovery of DNA samples stored in Teflon with SM will outperform either treatment alone and will be better than those stored at -20°C.

Results from the first two time points were unexpected: Samples stored in polypropylene tubes at -20°C had a higher overall rate of DNA recovery than samples stored in Teflon with or without SM at room temperature and -20°C. Surface tension of DNA samples stored within the Teflon may have resulted in inaccurate recovery of the DNA. Results from the additional analyses of replicates stored for three months and six months will be reported.

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Reference:

1. Lee SB, Crouse CA, Kline MC: Optimizing storage and handling of DNA extracts; Forensic Sci Rev 22:131; 2010.

DNA Storage, Room Temperature, SampleMatrix, DNA Stable

 ** Presenting Author*