

Forensic DNA Preservation, Storage and Analysis

Rolf Muller, Ph. D., Omoshile Clement, Ph. D., and Judy Muller-Cohn, Ph. D.

Biomatrica, Inc., 5627 Oberlin Drive, Suite 120, San Diego, CA 92121, USA.

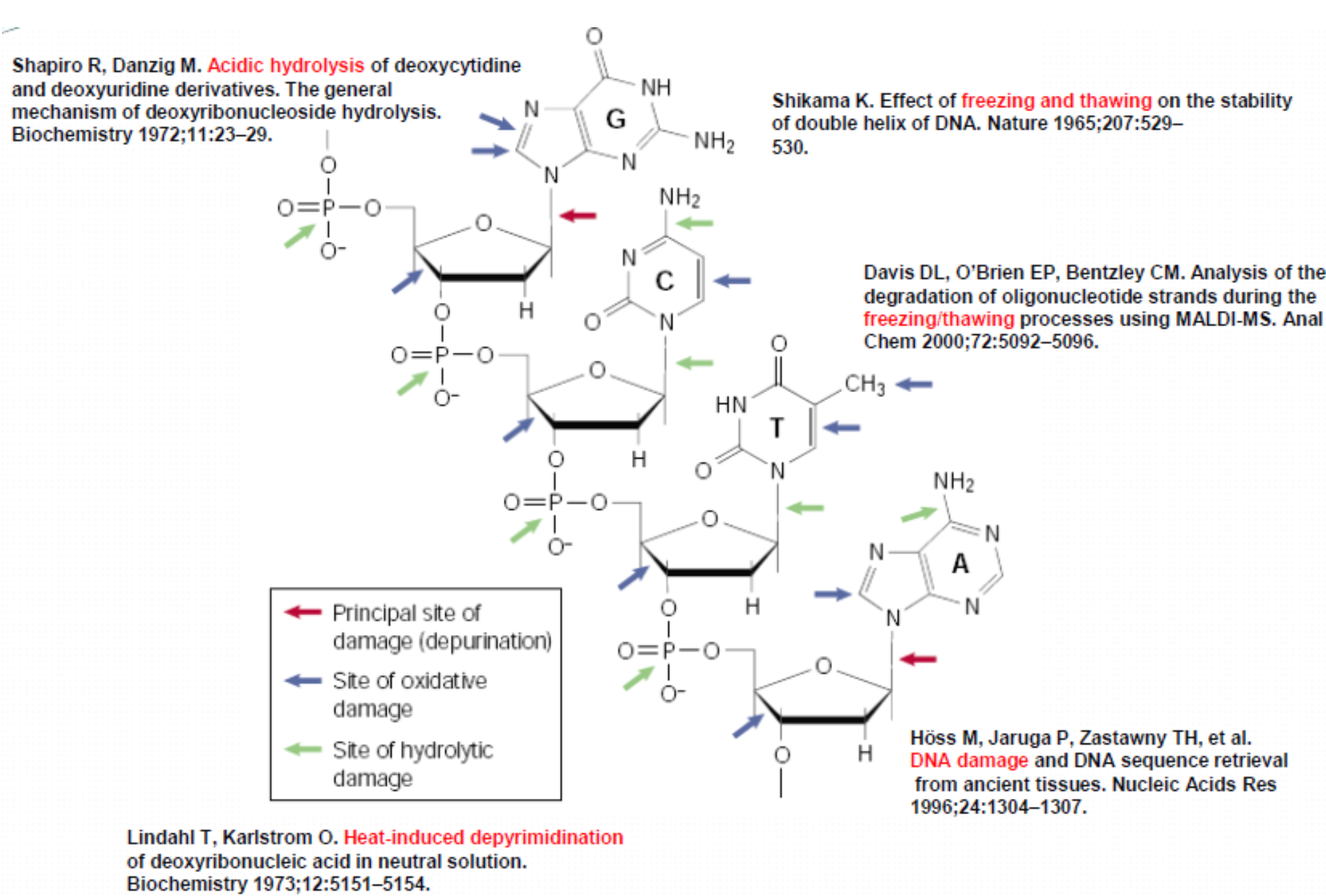
Introduction

This presentation describes a novel and highly cost-effective approach to handling forensic DNA samples isolated from materials collected at a crime scene or from donors.

We also highlight several published validation studies conducted by forensic scientists in crime laboratories, as well as adoption and integration of these technologies into case work protocols.

DNA Preservation & Storage

DNA instability



Why is DNA stabilization/storage important?

- To maintain sample integrity
- To re-test samples
- Critical especially for low quality and low quantity DNA samples (e.g., bone, teeth, touch, etc)
- Pivotal when sub-optimal conditions may compromise DNA quality
 - high T, chemical contaminants, repeated freeze-thaw, environmental damage, etc..

An efficient long-term DNA storage solution is a key need in forensic DNA analysis

DNA biostabilization reagent – DNASTable® - and storage cabinets for evidence preservation



DNASTable® in a 96-well plate



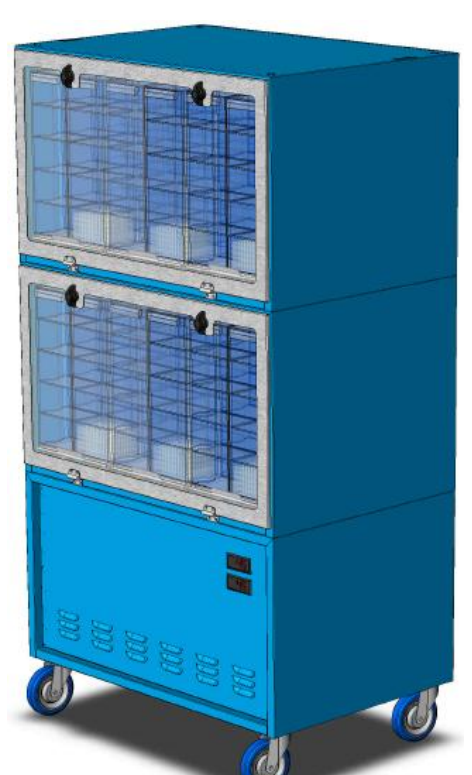
DNASTable® LD (liquid-to-dry format)



DNASTable® in a 1.5ml tube



Custom-fill 2D barcoded or Alphanumeric 96-tube plates



Storage cabinet (active humidity control)

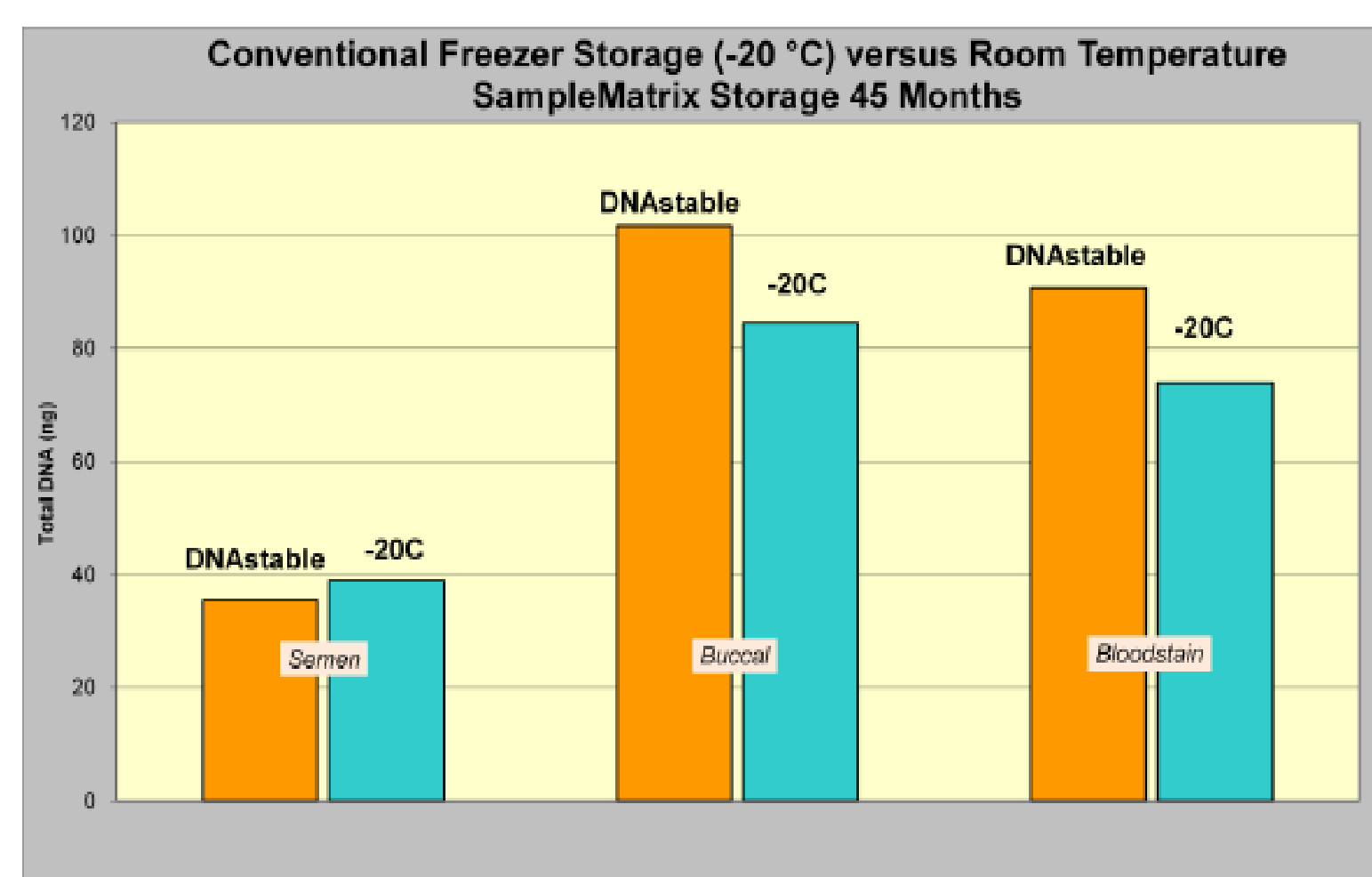


Storage cabinet (passive humidity control)

Forensic Evaluations of DNASTable®

Gregory M. Hadinoto
Senior Criminalist, Los Angeles Sheriff's Department

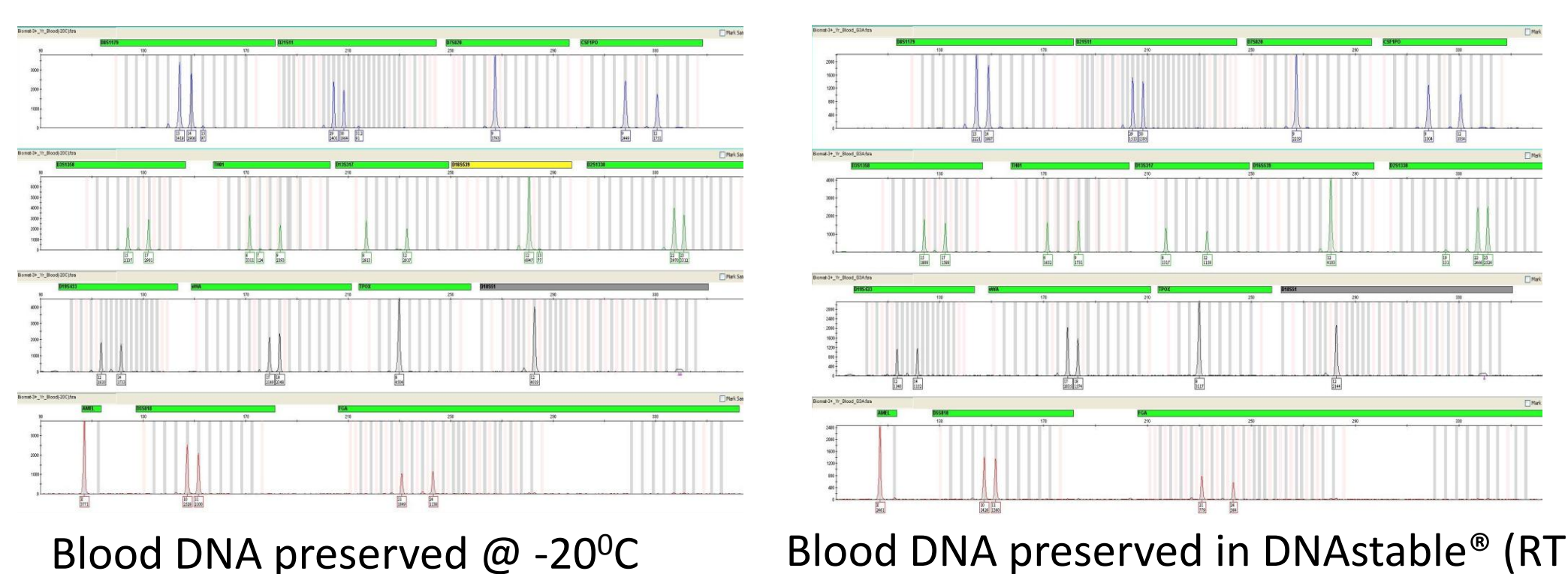
Study Period: 2006 – 2011



DNA samples from
Blood
Buccal swabs
Semen

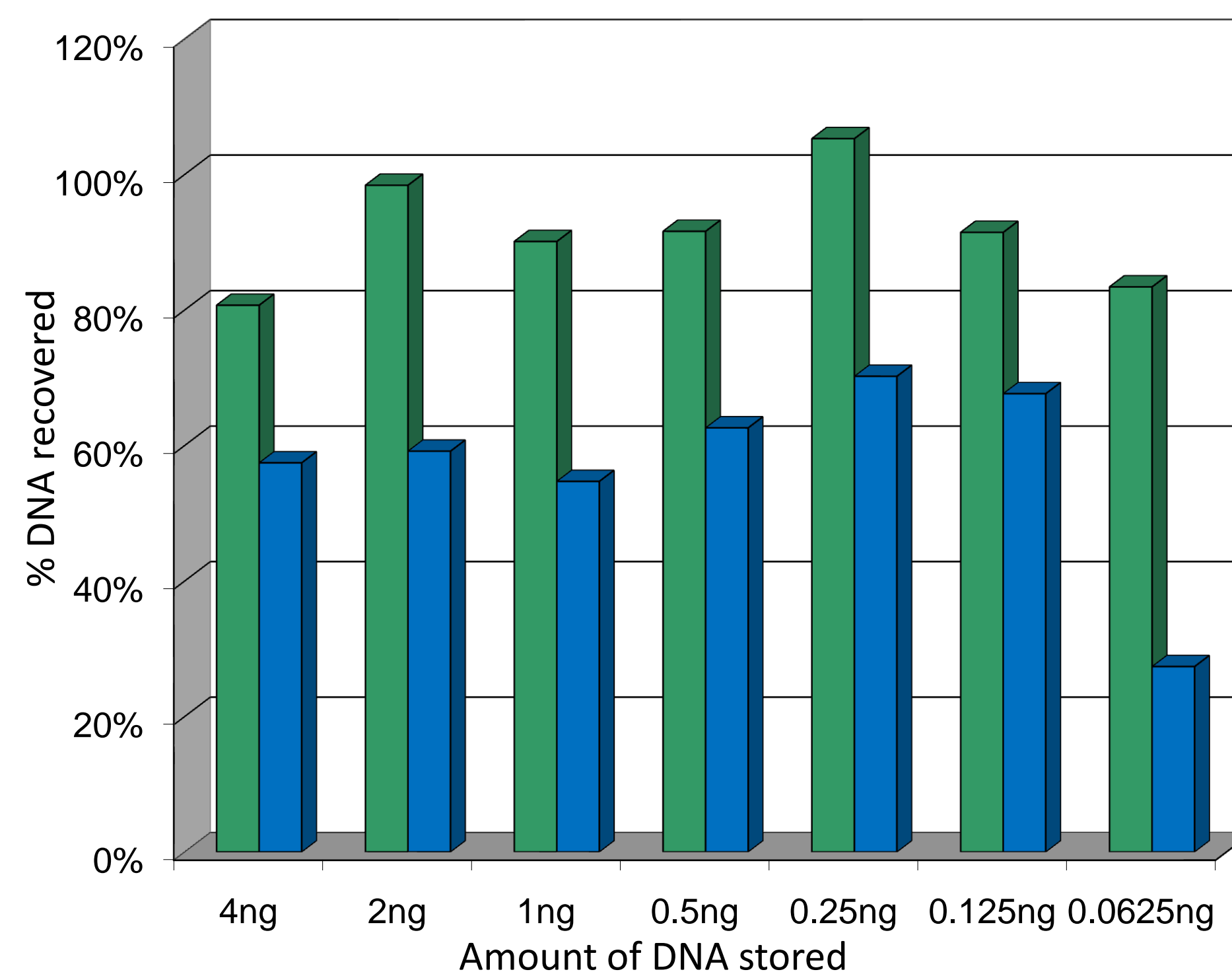
Storage time-points
1-month
3-months
6-months
12-months
18-months
24-months
60-months

Comparison of DNA extracts recovered from different biospecimens (blood, semen & buccal swab) after 45 months storage at -20°C (■) and at room temperature in DNASTable® (■)

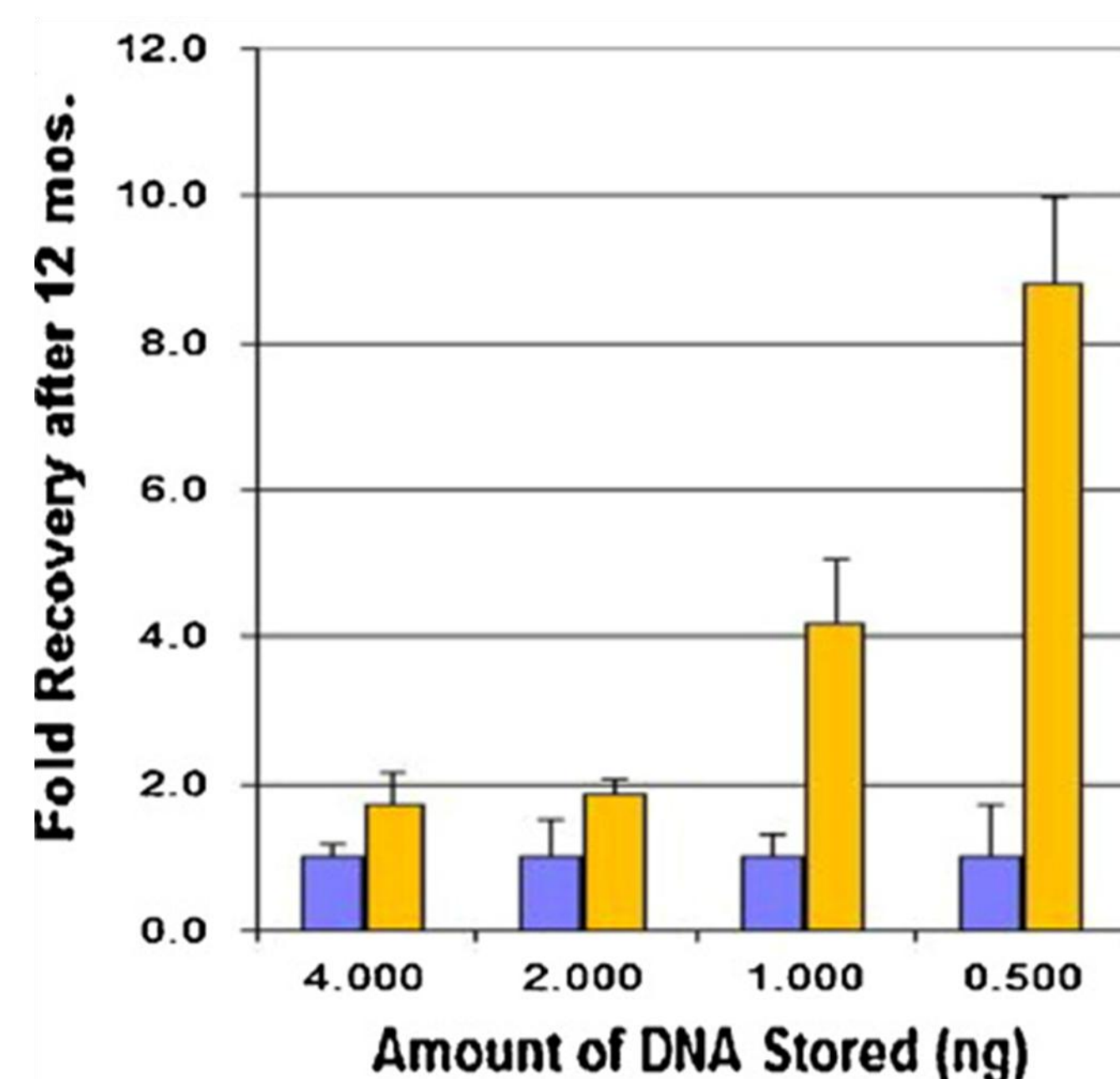


DNASTable maintains amplification and recovery of genetic profiles when compared to the corresponding freezer controls.

Cecilia A. Crouse, Ph. D.
Crime Lab Director, Palm Beach County Sheriff's Office



Comparison of DNA recovery at different dilution levels between cold-storage (-20°C; ■) and ambient-storage (DNASTable®; ■)

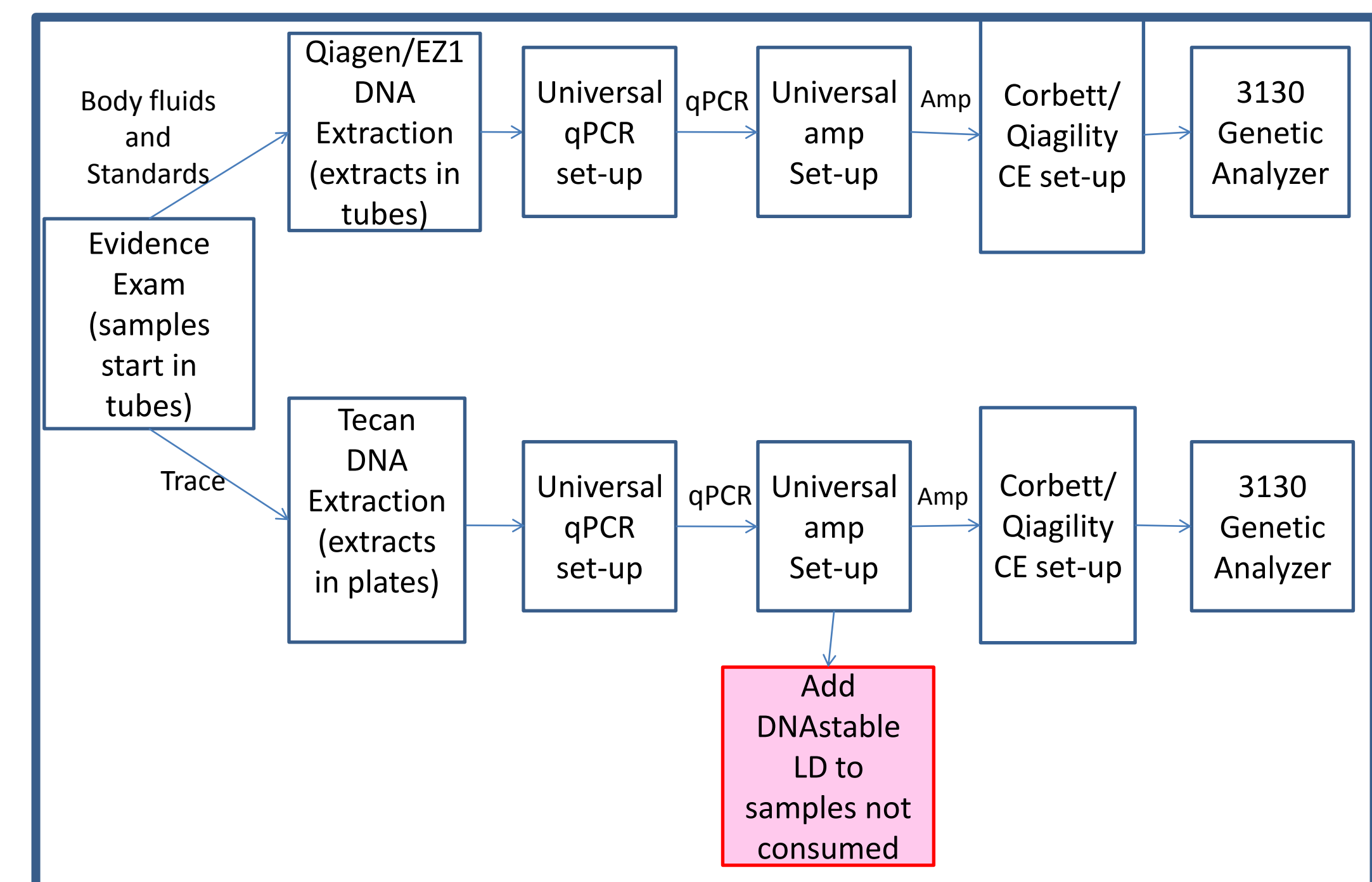


Plot showing magnitude difference in DNA recovery between cold-stored (-20°C; ■) and ambient-stored (DNASTable®; ■) extracts.

Reference:
Lee, S.B., Clabaugh, K.C., Silva, B., Odigie, K.O., Fournay, R.M., Stevens, J., Carmody, G.R., Coble, M.D., Loreille, O., Scheible, M., Parsons, T.J., Pozder, A., Eisenberg, A.J., Budowle, B., Taha A., Miller, R.W., McGuckian, A.B., Conover-Sikorsky, J., and Crouse, C.A. *Assessing a novel room temperature DNA storage medium for forensic biological samples.* 2011. Forensic Science International – Genetics, in press.

Forensic Evaluations of DNASTable®

Elizabeth Thompson
DNA Lab Director, Orange County Crime Lab.



High Volume DNA analysis workflow operated at the Orange County Crime Laboratory showing incorporation of DNASTable LD for long-term preservation of casework DNA extracts.

DNASTable Validation Kit

Validation Kit for Forensic Laboratories

- New kit for validating quality and recovery of stored DNA extracts in ambient temperature-based stabilization reagent - DNASTable®
- Kit (as shown) meets SWGDAM and FBI/QAS requirements
- Includes:
 - biostabilization reagents
 - genomic DNA standards
 - storage pouches
 - contamination assessment plates
 - protocol



References

Peer-reviewed articles (2009-2011)

1. Davis, M.C., Le, L., Clabaugh, K., Trogdon, C., Nhan, P., Odigie, K., Lee, S., Hampikian, G. *The PCR enhancer STRBoost™ overcomes inhibitors in STR and mitochondrial microsequencing reactions.* Forensic Science International Genetics, 2011, submitted.
2. Lee S.B., Crouse, C.A. and Kline M.C. *Optimizing Storage and Handling of DNA extracts;* Forensic Sci. Rev., 2010, 22(2): 131-144.
3. Fripiat, C., Zorbo, S., Leonard, D., Marcotte, A., Chaput, M., Aelbrecht, , Forensic Sci. Int. – Genetics, 2010.
4. Budowle, B., van Daal, A. *Extracting evidence from forensic DNA analyses: future molecular biology directions,* Biotechniques, 2009, 46 (5), 339-350.

Acknowledgements

1. Cecilia A. Crouse, Ph. D.
2. Steven B. Lee, Ph. D.
3. Angela van Daal, Ph. D.
4. Bruce Budowle, Ph. D.
5. Gregory M. Hadinoto
6. Gary Shutler, Ph. D.
7. Gregory Hampikian, Ph. D.
8. Julie Sikorsky, M.S.
9. Elizabeth Thompson
10. Michelle Madrid