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Introduction

DNA extraction from bone samples remains a significant challenge for forensic scientists worldwide, particularly in cases of mass disasters, criminal cases, missing persons, or historical war crimes. Factors such as UV exposure, heat, and microbial activity affect sample preservation. As degradation progresses, it becomes difficult to type STR profiles. Samples may also be structurally damaged, including cross-linkage or contamination. This study compares HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor and Applied Biosystems™ AutoMate Express Forensic DNA Extraction System in bone samples.

Objective

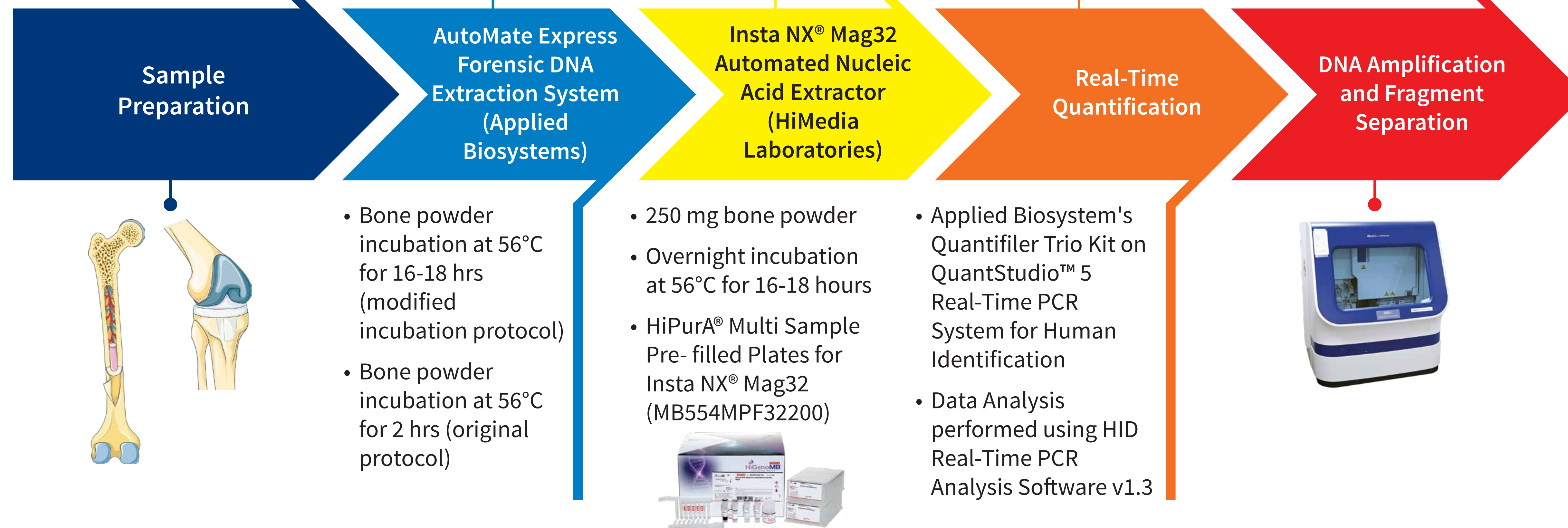
The objective of the study was to compare two automated nucleic acid extraction systems for bone samples i.e., HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor and Applied Biosystems™ AutoMate Express Forensic DNA Extraction System.

Materials and Methods

- Six samples were selected for this study
- Bone samples were cleansed and dried
- Bone samples were powdered using Qiagen's Tissue Lyser II



- GlobalFiler™ PCR Amplification Kit on a 3500XL CE instrument



Results

Figure 1 Average concentration of small autosomal target quantified from bone samples

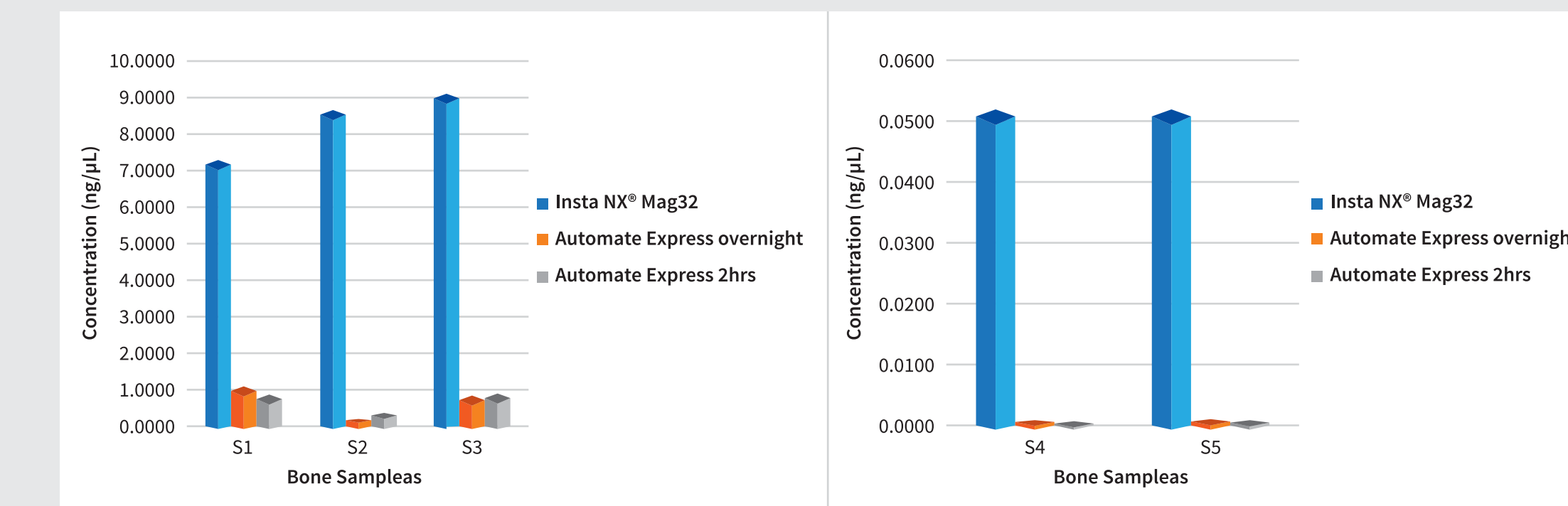
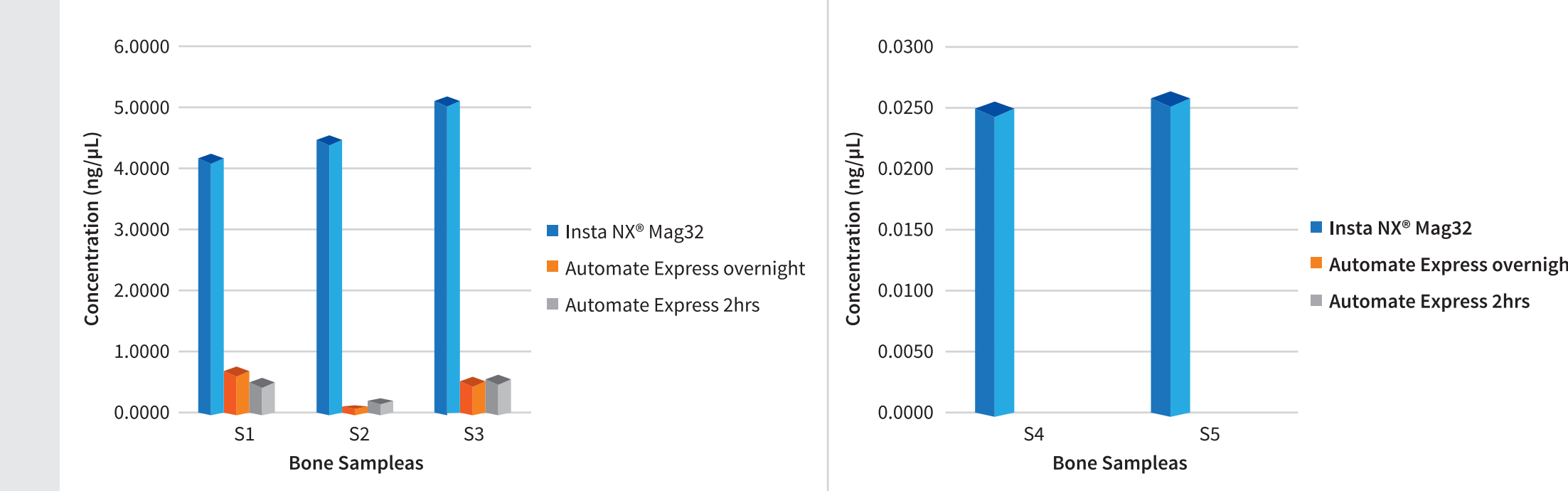
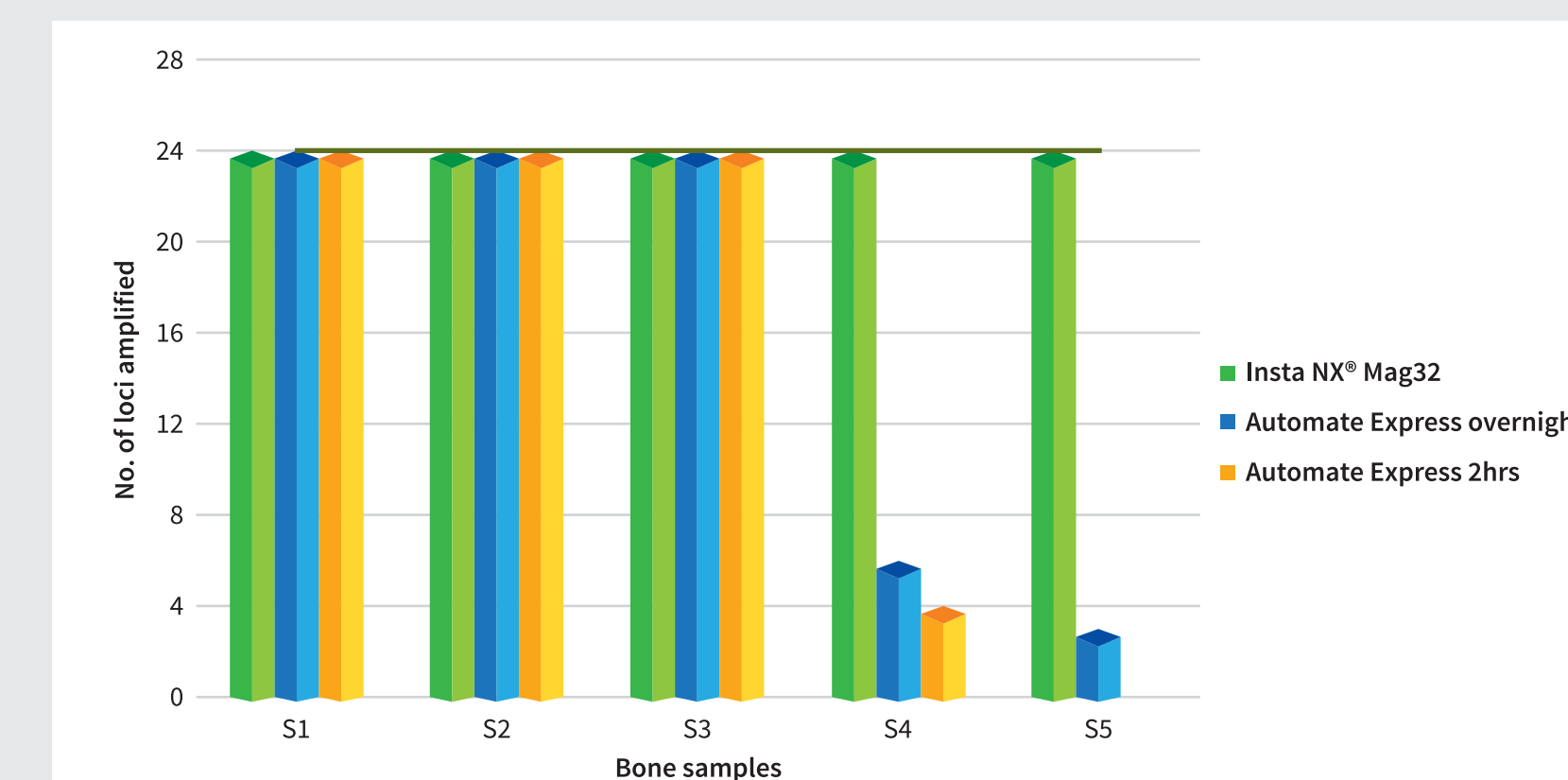


Figure 2 Average concentration of large autosomal target quantified from bone samples



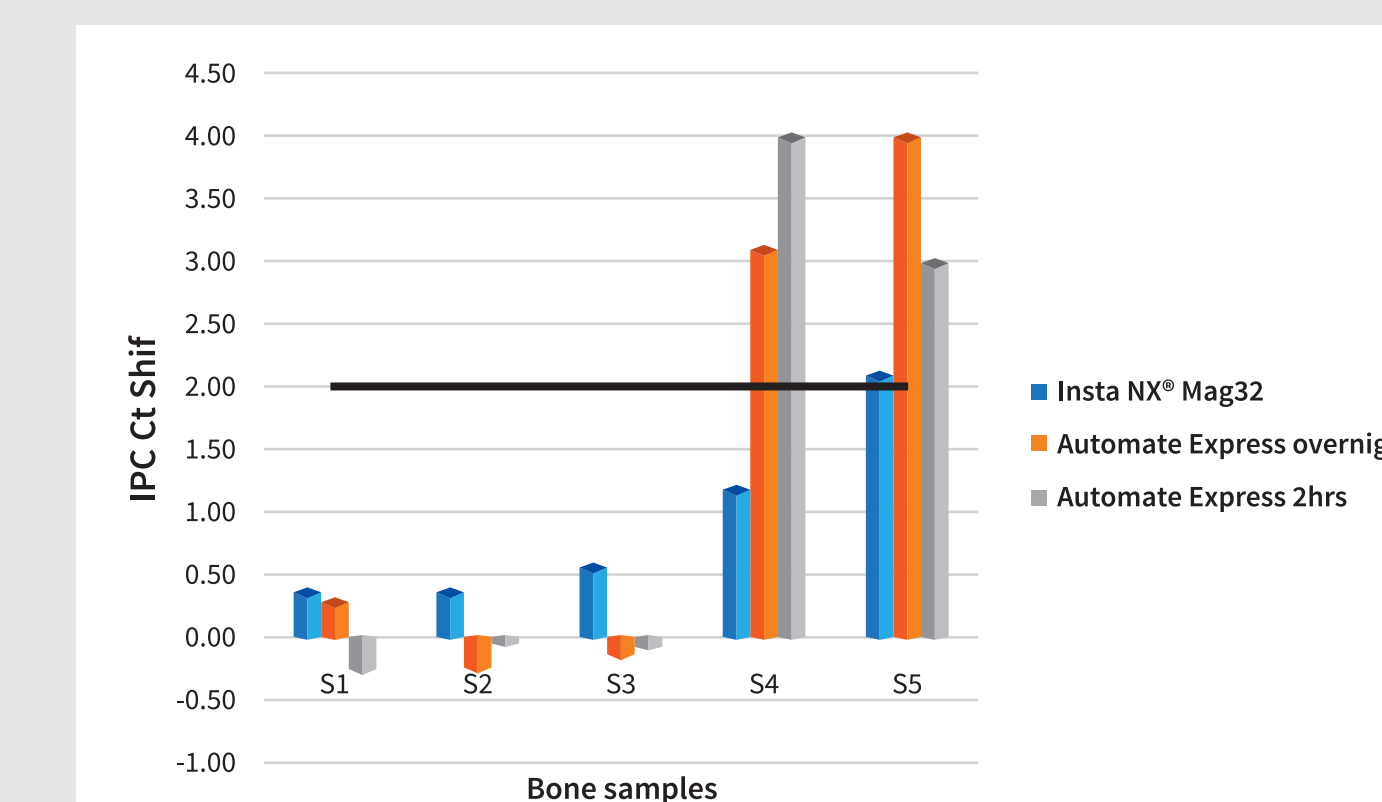
Statistical analysis was done on MS Excel (Office 365) using Anova: Single Factor method. There were significant differences in the concentration obtained. The small and large autosomal DNA concentration achieved using the HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor were higher as compared to Applied Biosystems™ AutoMate Express Forensic DNA Extraction System ($p < 0.05$).

Figure 3 Total loci amplified in bone samples



STR Profiling performed using GlobalFiler™ PCR Amplification Kit on a 3500XL CE instrument. The X-axis represents the bone samples processed in the two extraction systems. The Y-axis represents the total loci amplified. The black line represents the total loci of 24.

Figure 4 IPCCT shift results of bone DNA samples from different extraction systems



The X-axis represents the bone samples processed in the two extraction systems. The Y-axis represents the IPC Ct shift. The black line represents the default IPC Ct threshold of 2.

Conclusion

1. HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor showed high DNA yield as compared to Applied Biosystems™ AutoMate Express Forensic DNA Extraction System.
2. The purity of DNA extraction was assessed by analyzing the IPCCT value of the sample.
3. Except for sample S5, all the impurities in the samples S1 to S4 were removed using HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor. **However, sample S4 exhibited IPCCT shift from Applied Biosystems™ AutoMate Express Forensic DNA Extraction System.**
4. This proves that HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor extracts DNA with highest purity.
5. In samples S4 and S5, very low yield was obtained from AutoMate Express Forensic DNA Extraction System which resulted in either partial or no profile from STR profiling. For the same samples, HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor showed good DNA concentration thus exhibiting 24/24 loci positive from STR profiling.
6. The results showed that the HiMedia's Insta NX[®] Mag32 Automated Nucleic Acid Extractor provided the highest yield and purity of DNA from bone samples and that the system is suitable for use within a forensic laboratory.

References

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