B107 Development of a New DNA Screening System of Criminal Samples Using ForensicGEM™ and Adhesive Sheets

Shinichiro Akase, PhD, Forensic Science Laboratory, Kagoshima Pref.Police, Kamoike shin-machi 10-1, Kagoshima City, Kagoshima Prefecture 890-8566, JAPAN; Gregory S. Hummel, MS, Kansas City Police Crime Lab, 6633 Troost, Kansas City, MO 64131; Yasuhide Iwata, Forensic Science Laboratory Saga Pref.Police, Matsubara 1 Choume 1-1, Saga City 840-8540, JAPAN; Yuki Kariya, MS, Forensic Science Lab Kagoshima Pref.Police, 10-1 Kamoike shin-machi, Kagoshima City 890-8566, JAPAN; Takeshi Yoshikawa, Faculty of Fisheries, Kagoshima University, 4-50-20 Shimoarata, Kagoshima 890-0056, JAPAN; and Kazumasa Sekiguchi, PhD, 6-3-1 Kashiwanoha, Kashiwa 277-0882, JAPAN*

After attending this presentation, attendees will understand the concept of obtaining a simple idea from the everyday work of a criminalist and the importance of providing inter-agency training.

This presentation will impact the forensic science community by showing the practical possibilities of a new screening system.

For many years, numerous Short Tandem Repeat (STR) analyses have been performed on crime scene biological samples such as blood, saliva, and human body tissue. The information obtained from these analyses is utilized as evidence during criminal investigations. The high number of required analyses causes problems in terms of cost and labor for almost all crime laboratories. One reason for this is that it is impossible to know which analysis will be useful beforehand. In other words, many wasteful analyses are performed to obtain useful results. In a case with numerous blood stains from the offender and the victim, such as murder and injury, it is difficult to find the offender's blood without consuming a large amount of STR reagents and labor as there may also be several victims' stains, mixed stains, and degraded stains at the scene. If the positions of these different types of stains could be known before STR analysis, the number of target stains requiring analysis could be narrowed down. In order to simultaneously extract DNA from many samples present on crime scene material, such as a T-shirt, a new system was designed using a DNA extraction reagent (ForensicGEM™) and an adhesive sheet (polyvinyl chloride).

The essence of this system is as follows: (1) many samples are simultaneously collected on the adhesive sheet; (2) multiple DNA extractions are performed directly on the sheet by ForensicGEM™; (3) multiple DNA extracts are simultaneously subjected to quantitive Polymerase Chain Reaction (PCR); and, (4) the results of quantitive PCR are simultaneously indicated by computer graphic software.

In this study, basic experiments were performed to evaluate the efficiency and accuracy of this procedure for blood stains, saliva stains, and human body tissue samples. In conclusion, sufficient DNA can be extracted from blood and saliva in this manner, but body tissues were less effective. Both blind and situational tests were conducted with hypothetical samples. The results of these tests suggest the possibility of practical use of forensic DNA analysis in the field.

This presentation will also show the application of a bio-robot for attempting to move the solutions from the adhesive sheet to a 96-well plate automatically.

ForensicGEM™, Adhesive Sheet, DNA Screening

*Presenting Author