International Congress Series 1288 (2006) 532–534

www.ics-elsevier.com

Detectability of SGM Plus profiles in selected tissue samples incubated in water environment

A. Niemcunowicz-Janica [a], W. Pepinski [a,*], J.R. Janica [b], M. Skawronska [a], J. Janica [a], E. Koc-Zorawska [a], I. Soltyszewski [c]

[a] *Department of Forensic Medicine, Medical University of Bialystok, Poland*
[b] *Department of Radiology, Medical University of Bialystok, Poland*
[c] *Central Forensic Laboratory of Police, Warsaw, Poland*

Abstract. Heart muscle, liver and lung specimens collected during autopsies of five persons aged 20–30 years were incubated up to 140 days at 21 °C in pond water or in salty water. Tissue samples were collected in 7-day intervals. The specimens were submitted to macroscopic evaluation. DNA was extracted by organic method and subsequently typed using SGM Plus kit and ABI 310. The longest typeability period was recorded for lung specimens and heart specimens incubated in pond water and salty water, respectively. Genetic identification of decayed tissue specimens may be effective despite macroscopic features of severe decomposition.

Keywords: Tissue decomposition; Water environment; DNA typing

1. Introduction

The process of DNA typing in anonymous corpses is commonly complicated after mass disasters resulting in defensive body dismemberment [1,2]. Postmortem changes caused in recovered body parts by environmental conditions affect identification success. The authors attempted to assess typeability of SGM Plus loci in tissue material incubated in different water environments.

2. Materials and methods

Tissue specimens were collected during autopsies of five persons aged 20–30 years with time of death determined within the limit of 14 h. Heart muscle, liver and lung

* Corresponding author. Tel.: +48 85 7485948; fax: +48 85 7485985.
E-mail address: pepinski@amb.edu.pl (W. Pepinski).

0531-5131/
doi:10.1016/j.ics.2005.08.033

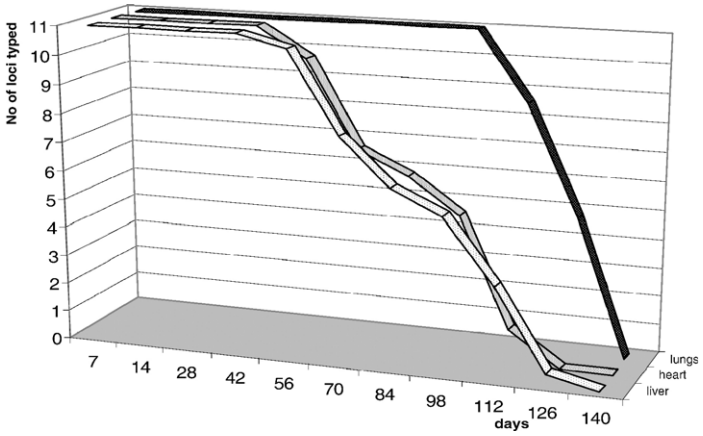

Fig. 1. Detectability of SGM Plus loci in tissue material incubated in pond water.

specimens of dimensions $2 \times 2 \times 2$ cm were incubated at 21 °C in 40-ml containers filled with pond water or salty water (0.8% NaCl). DNA was extracted by organic method from five samples of each tissue collected in 7-day intervals. Prior to DNA extraction, the specimens were submitted to macroscopic evaluation. Recovered DNA was quantitated fluorometrically and by hybridization with human DNA-specific probe (QuantiBlot) with chemiluminescent detection. DNA quality was assessed by 2% ethidium bromide agarose gel electrophoresis. AmpFlSTR SGM Plus and ABI 310 were used following the manufacturer's instructions. Numbers of successfully typed STRs in SGM Plus profile were assessed. As a threshold value, a signal of ≥ 150 RFU was assumed.

3. Results

On macroscopic examination of water-incubated tissue specimens, liver tissue was significantly lighter coloured, of decreased solidity, although preserved in one piece throughout the study period.

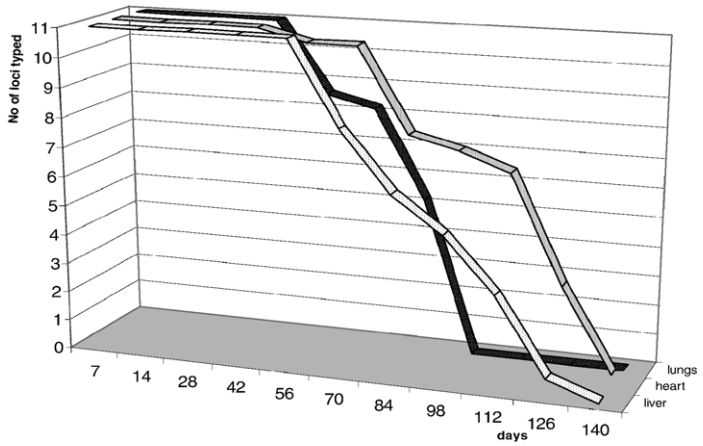

Fig. 2. Detectability of SGM Plus loci in tissue material incubated in salty water.

Heart muscle tissue was heavily defragmented, making the organ identification impossible following 126 days of incubation in pond water. On the other hand, the concurrent incubation in salty water resulted in only minor fragmentation. Following 21 days of the experiment, lung tissue was collected from the both environments as a thick suspension. Detectability rates for SGM Plus loci in the tissue material incubated in the both environments are presented in Figs. 1 and 2. Liver specimens were typeable at all SGM Plus loci in pond water and in salt water up to the day 42 and 56, respectively. Gradual decline of longer amplicons and subsequent lack of profiles was noted up to the day 126 in both water environments. Heart muscle specimens were typeable in all SGM Plus loci in both water environments within 42 days of incubation. Gradual decline of longer amplicons and subsequent lack of profiles was noted up to the day 126 in pond water and up to the day 140 in salty water. Lung specimens were typeable at all SGM Plus systems within 98-day incubation in pond water. A gradual decline of longer amplicons and subsequent lack of profiles was noted up to day 140. Incubation of lung specimens in salt water resulted in faster DNA degradation reflected by early drop-out of larger alleles after 42 days and subsequent lack of profiles after 98 days.

4. Discussion

Based on forensic experience, corpses are relatively resistant to macroscopic postmortem changes when placed in a water environment. Hoff-Olsen et al. [3] typed five of seven loci in a liver sample of 90-day-old corpse recovered from a lake and seven loci in a liver sample of 17-day-old corpse recovered from a river. Mukaida et al. [4] obtained partial STR profiles from body fragments recovered from sea two days after the plane crash. The experimental model assumed in our study does not reflect a typical process of decomposition, as the organs extracted from a corpse and placed into a water environment within a short time after death is devoid of body bacteria, contains diluted enzyme activity and is prevented from air access, which decelerates decomposition process in relation to that in an intact body. Our experiments confirm effectiveness of genetic identification of severely decomposed tissue specimens and suggest that macroscopic features are not of a prognostic value when assessing genotyping success.

Acknowledgements

This project was supported by the Medical University of Bialystok Grant No. 3-21844.

References

[1] G. Quatrehomme, et al., Facial casting as a method to help identify severely disfigured corpses, J. Forensic Sci. 41 (1996) 518–520.
[2] Y. Bilge, et al., The identification of dismembered human body: a multidisciplinary approach, Forensic Sci. Int. 137 (2003) 141–146.
[3] P. Hoff-Olsen, et al., Extraction of DNA from decomposed human tissue. An evaluation of five extraction methods for short tandem repeat typing, Forensic Sci. Int. 105 (1999) 171–183.
[4] M. Mukaida, et al., The personal identification of many samples recovered from under the sea, Forensic Sci. Int. 113 (2003) 79–85.