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

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Abstract. Heart muscle, liver and lung specimens collected during autopsies of five persons aged 20–30 years were incubated up to 56 days at 21 °C in sand or garden peat soil. DNA was extracted by organic method from tissue samples collected in 7-day intervals and subsequently typed using SGM Plus kit and ABI 310. Heart muscle specimens were typeable in all SGM Plus systems within 35 days of incubation in sand. Incubation of heart muscle specimens in peat soil resulted in faster DNA degradation. Incubation of liver and lung specimens in peat soil and sand resulted in similar typeability patterns, respectively. Full SGM Plus profiles were obtained from all lung samples collected within 7 days of incubation. In samples with negative genotyping results no DNA was found by quantitation with human DNA-specific probe hybridization. Quick DNA degradation in peat soil environment may result from acid pH and action of microorganisms. © 2005 Published by Elsevier B.V.

Keywords: Tissue decomposition; Soil environment; DNA typing

1. Introduction

Processes of autolysis and decomposition have always been a concern to forensic specialists. In cases of decomposed bodies, estimation of time of death–very crucial for evidential reasons–is often impossible due to effect of detrimental environmental

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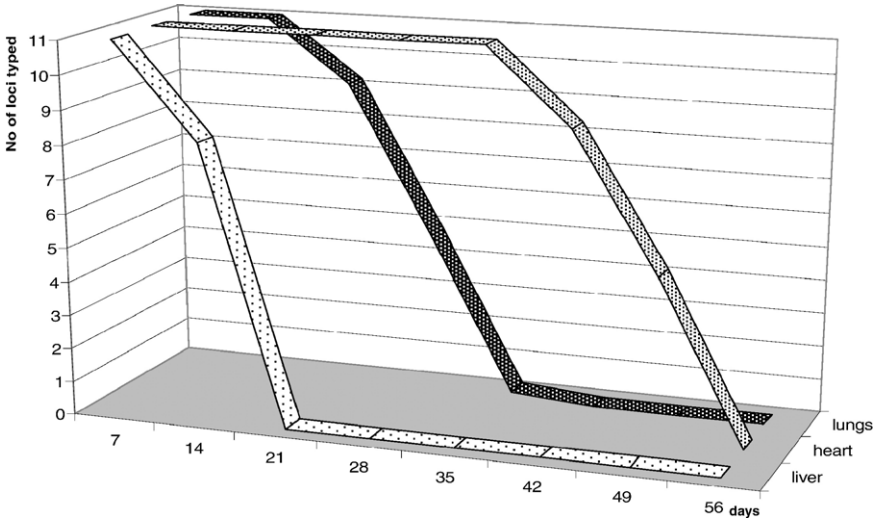

Fig. 1. Detectability of SGM Plus loci in tissue material incubated in sand.

conditions. The authors attempted to assess typeability of AmpFlSTR SGM Plus loci in tissue material incubated in peat soil and sand.

2. Material 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 specimens of dimensions $2 \times 2 \times 2$ cm were incubated at 21 °C in 40 ml containers filled with sand or garden peat soil. DNA was extracted by organic method from 5 samples of

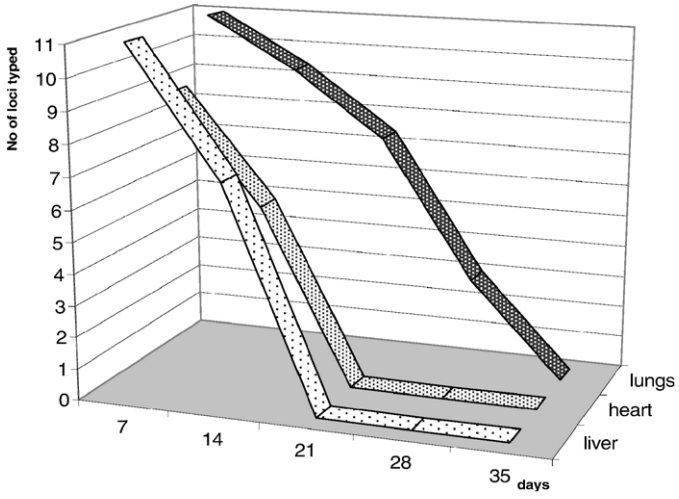

Fig. 2. Detectability of SGM Plus loci in tissue material incubated in peat soil.

each tissue collected in 7-day intervals. 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

Detectability rates for SGM Plus loci in the tissue material incubated in both environments are presented in Figs. 1 and 2. Heart muscle specimens were typeable in all SGM Plus systems within 35-day incubation time in sand. Gradual decline of longer amplicons and subsequent lack of profiles was noted up to day 56. Incubation of heart muscle specimens in peat soil resulted in faster DNA degradation reflected by early drop-out of larger alleles and subsequent lack of profiles after 21 days. Incubation of liver and lung specimens in peat soil and sand resulted in similar typeability patterns, respectively. All liver specimens were readily typeable within 14 days of incubation with subsequent decline of longer fragments and no signal peaks observed after 21 days. Full SGM Plus profiles were obtained from all lung samples collected within 7 days of incubation. Gradual decline of longer amplicons was noted in specimens incubated in peat soil and in sand following 14 days and 21 days, respectively. No allele peaks except amelogenin were seen in a single sand-incubated specimen after day 35.

4. Discussion

Attempts to assess time of death by postmortem DNA degradation have been reported in literature [1]. In homicide cases, it is not uncommon to reveal victim's body concealed for several months in the ground of a secluded place. Soil conditions are reported to decelerate postmortem processes, on the other hand its organic substances, humus acids in particular, may inhibit enzymatic DNA amplification [2]. Attempts to remove these inhibitors have been reported [3–5]. The authors employed standard organic extraction with no additional clean-up. In samples with negative genotyping results no DNA was found by quantitation with human DNA-specific probe hybridization. It is concluded that quick DNA degradation in peat soil environment may result from acid pH and action of microorganisms.

Acknowledgements

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