Investigation of Aged Blood Samples by Means of Single-Locus DNA Probes

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In cases of drunken driving, optimal evidence can be obtained by drawing of blood samples followed by the determination of ethanol. This procedure is superior to any other method.

This is why suspects sometimes challenge the identity of a blood sample and the forensic geneticists is asked to give an expert opinion (3,4).

In the past years, respective hemogenetic analyses have been carried out by means of conventional blood group systems, which means that genetic markers have had to be typed in up to 2 years old blood samples. The results were then compared with those obtained from a fresh drawn blood specimen. The similarity between this task and a stain analysis is obvious. It is not unusual that difficulties arise when aged and more or less decomposed blood samples have to be typed. Bacterial contamination, protein degradation, and hemolysis may have the impact that genetic markers become untypable or worse: genetic markers appear either false positive or false negative (2,6,7,8,10)!

The experienced serologist is acquainted with such problems and extended typings are then required allowing a conclusion whether a non-identity is due to artificial or to genetic reasons. If such a clear-cut conclusion cannot be reached the expert witness should have the integrity and the personal independence to deliver respective testimony.

A powerfull new tool in these investigations are DNA probes (1). We prefer to use the single-locus probes MS1, MS31, MS43, and G3 described by Jeffreys and co-workers (11,12) and also probe YNH24 described by Nakamura and colleagues (5).

In 17 out of 175 expertises on the identity of a blood sample we additionally worked with the probes mentioned. In 12 cases we successfully could extract high molecular weight DNA from the aged samples by means of a phenol-chloroforme extraction procedure (9).The DNAs were then passed on to Hinf I digestion, Southern transfer and hybridization.

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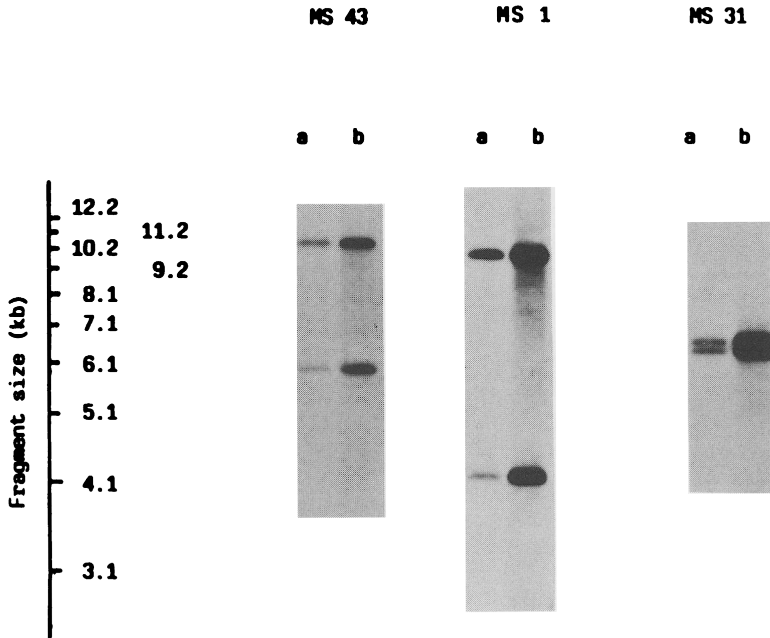

Fig. 1 shows the results of hybridization experiments. A Hinf I digested DNA sample from a fresh blood (a) was electrophoretically seperated side by side along with the DNA from the appropriate aged blood sample (b). After hybridization with one probe and autoradiographic documentation the probe was stripped-off in order to allow hybridization with another probe.

The appearence of artificial extra-bands is not unusual. Smaller and faint extra-bands are obviously due to a certain degree of partial degradation of DNA in aged samples. This means that a normal restriction fragment which still carries the entire minisatellite sequence becomes artificially smaller. Therefore, these extra-bands are both the genuine and unique expression of ageing and decomposition and they are hardly attributable to a contamination of DNA probes.

Last, but not least, it should be mentioned that in 8 = 4,5 % of our 175 cases a genetically conditioned non-identity could be established. All of these non-identities were not due to an erroneous mix-up but to different kinds of criminal manupulations in order to avoid prosecution.

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