REPRODUCIBILITY OF DNA PROFILES FROM MIXED BLOOD SAMPLES

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Recently, we worked on a criminal case, where porcine blood was used to defile two cemeteries. The STR analysis showed that the blood traces came from several animals and thus, cannot be traced back to a single individual animal.
Usually genetic analysis of mixed samples aims to include or exclude the suspects by the identification of the individual marker profile within the mixed profile. However, in this case, we aimed to identify that the mixture of blood samples collected at the two crime scenes is the same mixture of blood as on a receipt presented by a butcher who had sold blood a few days before the crime.

Therefore, we analysed the STR DNA profiles, compared the alleles, the allele peak heights and finally the ratio of the allele peak heights (ROAPH). The alleles present in the profiles were identical in all three samples. The highest number of alleles per marker was 8, thus the blood-mixture consisted of blood from at least 4 different animals. The total peak heights differ, due to different overall DNA input, whereas the ROAPH over different alleles were almost identical in all three blood samples. We came to the conclusion that the blood found at the crime scenes and on the receipt consisted of the same mixture of blood.
One problem of our work presented here, was how reproducible the analysis of DNA profiles and ROAPH of DNA are from mixed samples. To clarify this, we performed STR analyses with DNA extracted from various blood mixtures of different animal species (e.g. goats, pig, etc.) and compared the results:

DNA extracted three times from identical blood mixtures was amplified four times in parallel and ROAPH were compared. To proof the influence of total DNA input to PCR and to ROAPH, analyses were performed four times in parallel with DNA from same admixtures in different concentrations.

We found high reproducibility of ROAPH over a wide range of DNA amounts amplified and at all species tested. Therefore we conclude that DNA profiles from mixed animal blood samples are as reproducible and individual as DNA profiles from a single source and can be used in forensic casework to link different crime scenes and suspects.