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ACCEPTED MANUSCRIPT

Differentiation of human blood from animal blood using Raman spectroscopy: a survey of forensically relevant species

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Highlights

- Human and animal blood differentiation using Raman spectroscopy and chemometrics
- Incorporation of new, forensically relevant, animal species to expand applicability
- Validation of PLSDA methodology as highly selective for human and animal blood
- Differentiation of human and animal blood possible for unknown species of animals
- ROC analysis indicated 99% accuracy of PLSDA to differentiate human and animal blood

Abstract

The identification of blood samples is a crucial facet of forensic investigations, particularly of violent crimes. One step in forensic serology (i.e., the analysis of bodily fluids) that is often skipped or overlooked is the determination that a bloodstain is of human or nonhuman origin. Typically, subsequent to identifying a stain as blood using a presumptive blood test, which have the propensity of providing false positive results, the stain is submitted for extraction of a DNA profile to compare with those in a database. It is extremely uncommon that evidentiary bloodstains are confirmed as being of human origin throughout the serological analysis. Therefore, time, money, and other resources can be wasted on obtaining a DNA profile from a bloodstain that may not be of human origin; if the intent was to obtain a human DNA profile and not that of an animal. This work demonstrates an important advancement of a previous study for nondestructive differentiation of human and animal blood using Raman spectroscopy coupled with partial least squares discriminant analysis (PLSDA). Raman spectra of blood from six

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