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APPLICATION OF RAMAN SPECTROSCOPY AS A POTENTIAL FAST SCREENING TECHNIQUE OF TATTOO INKS AND REACTIONS IN SKIN BIOPSIES

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Aim: The purpose of this study was to evaluate whether Raman spectroscopy could be applied as a potential fast screening technique of problematic tattoos and inks; this in order to within minutes being able to non-invasively identify ink source(s) and possible pigment decomposition.

Methods: Shave cuts (biopsies) of tattooed areas from 13 persons, 10 inks and 3 primary aromatic amine (PAA's) standards were analyzed with Raman spectroscopy. A 785-nm 300 mW diode laser was used for Raman excitation and at least five spots were analyzed on each sample for evaluation of sample homogeneity.

Results: All ten inks and the three PAA's analyzed could be discriminated using Raman spectroscopy. Also 11/13 biopsies provided clear fingerprint Raman signals which differed significantly from skin background, and Raman spectra of 9/13 biopsies perfectly matched recorded database ink spectra.

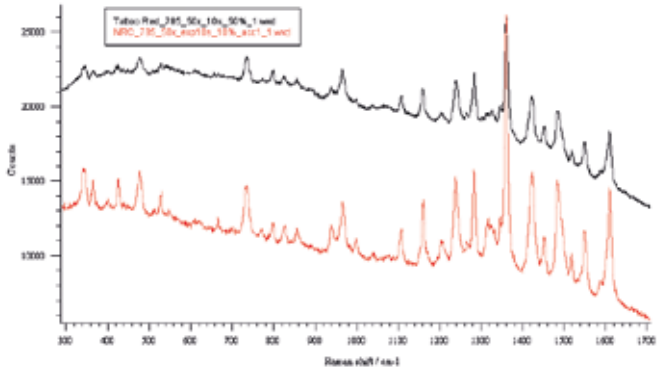

Figure 1: Raman spectrum of biopsy (red) compared with spectrum of the ink "Tattoo" Red (black).

The red ink brand name "Tattoo" from an unidentified manufacturer labelling origin Taiwan as origin (or an ink with identical Raman spectrum) was with high probability identified in 5/13 biopsies and strong indications of the inks "Intenze Bright Red" and "Starbrite Grimson Red" were seen in other four biopsies. The 3 PAA's (aniline, o-anisidine and 3,3'-dichlorobenzidine) could not be identified in any of the analyzed biopsies.

Conclusions: Based on this study it is concluded, that Raman spectroscopy is a very promising technology for quick identification by fingerprint of tattoo ink in skin as well as in tattoo ink stock products. PAAs were not found in biopsies taken from tattoo reactions.