Indian Internet Journal of Forensic Medicine & Toxicology
Vol. 10, No. 4 October-December 2012, 110-112
DOI : 10.5958/j.0974-4487.10.4.032

Case Report

Detection and Identification of Oily Stain on Clothes in Sexual Assault Case: A Case Study

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ABSTRACT

The presence of semen on the victim's clothes may be suggestive of sexual intercourse by the accused with the victim, but the presence of some additional material along with semen stains becomes a vital clue in the sexual assault cases. The present communication deals with the detection and identification of the oily stain on the clothes.

Keywords: Oily stains, rape, oil in sexual assault

INTRODUCTION

In sexual assault cases, non-ultimate samples such as undergarments of both accused and victims are usually sent for examination of semen/blood. The presence of semen on the victim's garments may be suggestive of sexual intercourse. In the sexual assault cases, sometime it is very difficult to prove rape. But there are greater chances of conviction when scientific evidence remains available. The presence of semen stains along with some additional material can be a vital clue in rape cases[1,2].

The examination of oils and fats is based on their composition. Oils and fats are tri-glycerides of fatty acids of saturated and unsaturated acids (oleic, linoleic, linolenic) in varying proportions. These may contain fatty acids of definite carbon number in higher proportion in some oils viz., arachidic acid (in arachis oil, groundnut, nut and peanut oil), crucic acid (in mustard, rapeseed and rape oil), normal iso-propionic and butyric acid (in butter and ghee both of animal fat), or vary in the percentage of free acids (due to hydrolytic splitting of glycerides of enzymes), vary in the nature and percentage of sterols in the unsaponifiable matter in animal fats and vegetable oils (cholesterol in animal fat and phytosterols in vegetable oils), vary in drying properties (the tendency to form solid film due to unsaturation) or vary in their tendency to undergo addition with iodine or iodine monochloride (due to variation in unsaturation present).

The above variation in fatty acid profile and other non-fatty acid or non-glyceride constituent (unsaponifiable matter, i.e., sterols: higher alcohols) are responsible to impart effect on their physical and their chemical properties viz., colour, refractive index, melting point, saponification point, alkaline hydrolysis behaviour, additive reactions, etc., the differences in physical behaviour and parameters based on chemical characteristics (saponification value, acid value, acetyl value, Reichert–Meissel value, polenske value, etc.) provide analytical guidelines or clues to the classification or characterisation of different oils and fats. Chemical tests are often performed to detect adulteration or rancidity.

The present communication deals with the detection and identification of oily stain in a sexual assault case using simple thin-layer chromatographic (TLC) and FT-IR method.

Brief study of case

In one of the cases, a mother lodged a complaint in police station that a person raped her 8-year-old daughter by

applying some oily material. Police nabbed the accused and seized some of the physical evidences like undergarments and an oil pouch. These seized articles were sent for the forensic examination with queries like whether the undergarments contain spermatozoa and oily stains.

MATERIALS AND METHODS

1. Semen/oil-stained garments of accused and victims.
2. A pouch of oil seized from accused.
3. A standard (similar) type of pouch procured from local market.

Extraction of oily stains from cloths

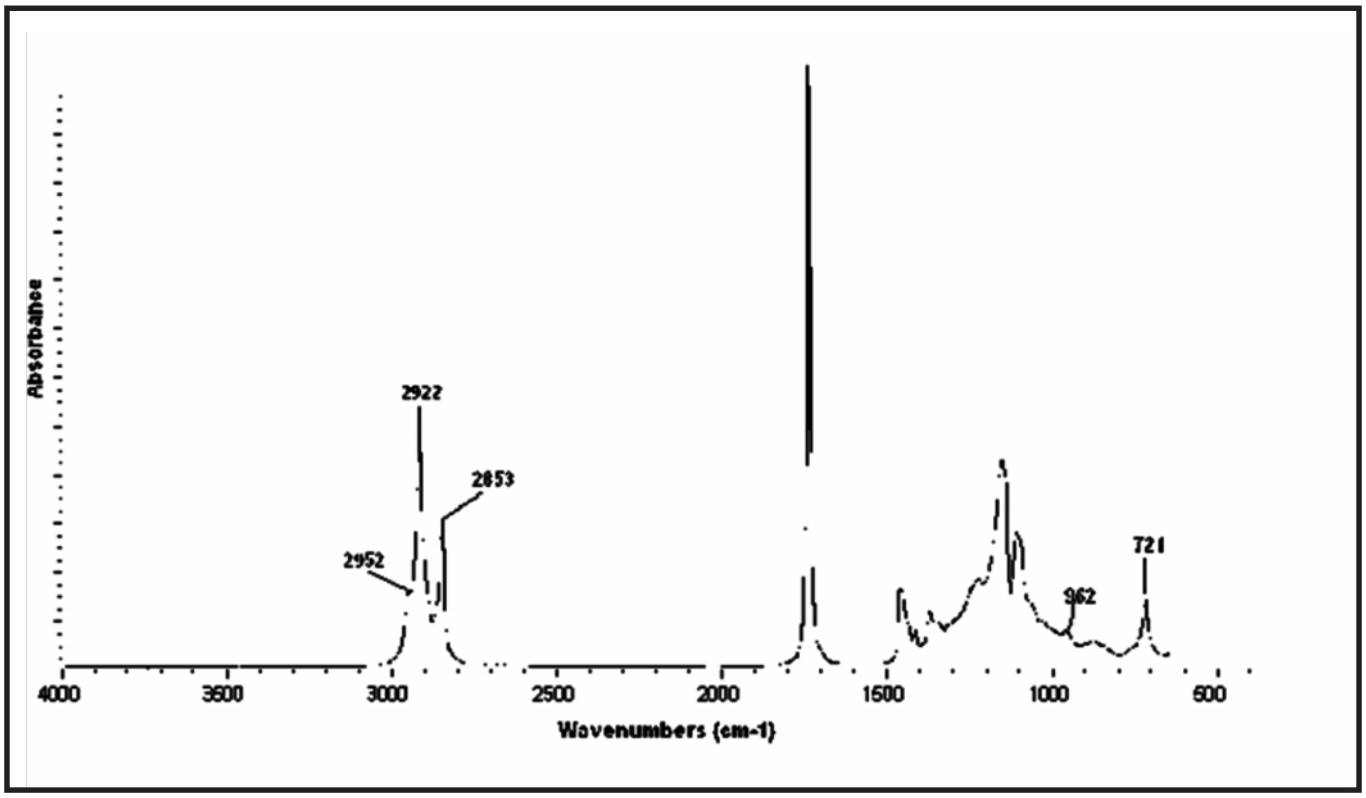
After routine semen examination the oil-stained garments were extracted with petroleum ether (60–80°C). The extract was then concentrated and used for TLC analysis. Similar extract was also prepared from oil pouch seized from accused and similar oil pouch procured from local market.

TLC Analysis[3]

Standard glass TLC plates were coated with slurry of silica gel G water to a uniform thickness of 0.25 mm. The plate was activated by heating in an oven at 110°C for about 1 h. An aliquot of above-mentioned extract and extract of pouch seized from culprit along with extract of oil pouch procured from local market were spotted on to the plate, which was prepared using petroleum ether/ diethyl ether/acetic acid (90:20:1ml) in a pre-saturated TLC chamber to a height of 10 cm. The plate was removed from the chamber, dried in air sprayed by 50% sulphuric acid and heated in an oven for 1 h and the brownish black-coloured spots were appeared at 2.0, 6.0 and 9.0 cm against the white background.

FT-IR Spectroscopy

FT-IR spectra studies were performed on the Perkin Elmer spectrophotometer using universal ATR accessories. Spectrum was recorded between 600 and 4,000 cm^{-1} and the obtained spectrum was compared,



which showed no deviation in both the samples. Major peaks (cm^{-1}) of both of the oils were at 2,952, 2,922, 2,853, 1,739, 1,466, 1,418, 1,378, 1,228, 1,161, 962 and 721.

RESULTS AND DISCUSSION

We utilised petroleum ether (60–80°C) for extraction of oily stains[4], which is a good solvent for oils and do not affect the cloth under examination, similarly, oils that are made up of fatty acids gives brownish black spots with 50% sulphuric acid solution on heating. In the present study, the extract of garment and oil pouch showed similar results[5].

CONCLUSION

The reported FT-IR procedure and reagents for TLC detection and identification of above oily stains are simple, sensitive and can be routinely used in forensic casework.

ACKNOWLEDGEMENT

We are thankful to the Director of State Forensic Science Laboratory, Sagar, and Joint Director Regional for providing necessary facilities and encouragement.

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