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Detection of Dynamite Residues on the Hands of Bombing Suspects

A major problem in the investigation of bombings involves placing or connecting the type of explosive used with the suspect. This problem arose in an attempted bombing to ascertain whether or not the mere handling of dynamite would leave deposits of nitrate esters on the hands. The attempted bombing involved multiple sticks of "leaking" or "seeping" dynamite. It was reported that results were positive for nitroglycerine (NG) and ethylene glycol dinitrate (EGDN) on the hands, even after three full days had elapsed.² The lack of published information on the reliability of the procedure used led to this study.

The method involved the use of thin layer chromatography (TLC). Further studies were undertaken using TLC for the identification of nitrate esters such as nitroglycerine, ethylene glycol dinitrate, and pentaerythritol tetranitrate (PETN). These studies included rubbing the hands with the explosive substance in dynamite for several minutes and handling dynamite sticks when properly wrapped in waxed paper protective coating. Various grades of dynamite were used, especially 60 percent dynamite. Dynamite is of special importance because of its increased use in bombings and its ready availability.

An attempt was made to show the reliability of TLC as a means of identification of these nitrated esters when removed from the hands.

Method

Various explosives containing nitrated esters were used as controls, including 60 percent dynamite and PETN. The 60 percent dynamite contained both EGDN and NG which were the ingredients of principal interest in this experiment. Eastman developing apparatus (sandwich type) and Eastman alumina sheets No. 6063 with fluorescent indicator were used. These sheets were activated from $\frac{1}{2}$ to 1 h at 100 C prior to use. The method of Parihar, Sharma, and Verma³ was first selected; however, xylene as the monosolvent failed to establish different RF's for NG and PETN. This probably occurred because of using alumina sheets of different thickness than those employed in Parihar et al. The solvent system of xylene hexane 60:40 gave excellent separation and distinct RF's for these nitrated esters. (See Table 1.)

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² Confidential Laboratory Report received by Tucson Police Department, not submitted by our crime laboratory.

³ Parihar, D. B., Sharma, S. P., and Verma, K. K., *Journal of Chromatography*, JOCRA, Vol. 31, 1967, pp. 551-556.

TABLE 1—*RF values with xylene hexane 60:40.*

EGDN	0.60
NG	0.46
PETN	0.37

Small quantities of the explosive were dissolved in ethyl alcohol-acetone (1:1) and 5 to 10 μ l were spotted on the alumina sheets. The solvent was allowed to rise 12 cm (45 min) and then air dried. The sheets were then sprayed with 1 percent diphenylamine in ethanol and exposed to short-wave ultraviolet light (254 nm) to induce the yellow-green color reaction as reported by Coldwell.⁴ After exposure to short wave ultraviolet light, long wave ultraviolet light (366 nm) was used to locate the spots. The reaction appears to be specific and extremely sensitive.

Two subjects were then tested who had handled several dynamite sticks, as well as two subjects who rubbed the explosive on their hands. Removal of the nitrated esters from the hands was accomplished by rubbing small cotton swabs soaked in acetone over the suspected areas. The swabs were then placed in clean vials and extracted with four drops of the ethanol-acetone solution. After concentrating by evaporation, the extract was then spotted on the TLC sheets and chromatogrammed.

Results and Discussion

One subject who rubbed dynamite on his hands and was tested within an hour, gave a positive response even though he was allowed to wipe but not wash his hands. The person who rubbed dynamite onto his hands and came back to the laboratory 24 hours later to be tested was negative for all components. This subject stated he had a normal 24 hours during which he washed his hands several times. The subjects who merely handled properly enclosed dynamite (4 sticks) and were tested within one hour failed to give a positive response.

It appears unlikely that residues from the hands can be detected by TLC if more than 24 h have elapsed. However, depending upon circumstances, a positive TLC test may be obtained on a suspect involved in a bombing if apprehended within a short interval.

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⁴ Coldwell, B. B., *Analyst*, ANALA, Vol. 84, 1959, pp. 665-667.