## B80 The Effect of Time on the Quantity of Triacetone Triperoxide (TATP) on Different Surfaces

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After attending this presentation, attendees will understand the best practices for identifying the type of solvent that can be used with TATP swabbing, how long the TATP can survive before decomposition, and how the fingernail of a suspected person can be used to identify the explosives.

This presentation will impact the forensic science community by clarifying the best solvent that can be used to identify the explosives and by explaining how important the use of the suspect's fingernails is in proving that he/she touched the explosives.

In forensic science, the contribution of explosives trace detection in samples from skin, vehicles, hands, and clothes of the suspects has been essential in several forensic cases involving terrorists. Knowing the types of explosives used by terrorists can prevent future attacks by prohibiting these chemicals and controlling their precursors. The forensic analytical report could be used as evidence in judicial proceedings. Recently, the use of peroxide explosives, such as TATP and Hexamethylene Triperoxide Diamine (HMTD), has gradually increased by the terrorists around the world in the production of Improvised Explosives Devices (IEDs) due to their readily available precursors. Many studies have been published on sampling procedures for the collection of residues of firearms and explosives from suspects and/or clothing. The residues generally left inside baggage, bags, vehicle interiors, and garments are collected by a vacuum-lifting procedure and filters. Samples are usually collected by cotton swabs from smooth surfaces, such as skin, work surfaces, floors, leather, plastic, and post-blast debris. Solid Phase Extraction (SPE) is used for swabs and filters of explosives. For the efficient recovery of explosives residues, various materials are used for the sampling media; however, most forensic laboratories are using cotton-based material due to availability, ease of use, and low cost. A wide range of solvents has been reported to assist in the recovery of explosives residues in the sample media which were used.

Knowing the interval of time in which explosives may be active can play an important role in the investigation. Therefore, in this study, TATP was prepared, purified, and analyzed. A known quantity of TATP was applied to different service areas (such as hands, nails, tables, and car seats), then swabbed after different time intervals. The swabs were extracted by an organic solvent and analyzed by gas chromatography. The results disclose that the quantity of TATP left was dependent on the type of surface at a specific time.

Several solvents with different polarities were used. A known amount of TATP was applied to a clean surface of a lab bench. Johnson & Johnson® cotton pads were pre-wet with the selected solvent and directly used to swab the TATP. The pad was left in the ultrasonic for 30 minutes, the mixture was filtered and transferred into a 10mL volumetric flask, and topped with solvent in the presence of hexadecane. The results demonstrate that methanol was the best solvent, while acetonitrile was the least efficient. The excellent results with methanol can be attributed to the hydrogen bond formation with TATP rather than polarity.

A known quantity of TATP was applied to different parts of a vehicle interior when the outside temperature was 34 ºC-38ºC. The vehicle had only been used by the driver. After six hours, the TATP was swabbed and analyzed. Most of the TATP was lost from the surface areas of the car. The foot area under the passenger seat showed the best recovery as it had not been touched and did not face the sun like the dashboard.

A specific quantity of TATP was inserted under a fingernail. After a certain period of time, the fingernail was cut and the top of the finger was washed with methanol. The nail and the methanol were placed in a container and left in the ultrasonic for 30 minutes. When the fingernail was cut directly and immediately washed, the recovery of TATP was very high (97%); however, after only two hours, the TATP was found to be in the range of ca. 10%. After 48 hours, the concentration of TATP may remain under the fingernail, but in low concentrations (5%).

It can be concluded that TATP is easily decomposed; however, it can be detected from the suspect areas.

**TATP, Swabbing, Nail Analysis**