Forensic Science International 275 (2017) 224–233

Contents lists available at ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forsciint

Work place drug testing of police officers after THC exposure during large volume cannabis seizures

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ARTICLE INFO

Article history:
Received 28 December 2016
Received in revised form 20 February 2017
Accepted 27 March 2017
Available online 2 April 2017

Keywords:
Police
THC
Cannabis
House
Forest
Urine

ABSTRACT

Police officers responsible for the seizure and removal of illegally grown cannabis plants from indoor and outdoor growing operations face the prospect of THC exposure while performing their work duties. As a result, a study investigating the amount of THC on hands and uniforms of officers during raids on cannabis growing houses (CGHs) and forest cannabis plantations (FCPs) and in the air at these sites was conducted. Swabs of gloves/hands, chests, and heads/necks were collected and analysed for THC. Results of hand swabs indicated that officers removing plants from FCPs were exposed to THC concentrations up to 20 times those involved in raids at CGHs, which was mainly associated with the number and size of plants seized. Air samples collected inside cannabis houses showed no detectable THC. Air samples collected inside the cargo area of the storage trucks used during FCP raids indicated that THC can be volatilised when lush plants are compressed by other seized plants loaded on top of them in the truck over a period of several days, allowing composting of plants at the bottom of the load to commence. The elevated temperature and humidity inside the truck may assist the decarboxylation of THCA to THC, as well as increasing the rate of volatilisation of THC. More than 100 urine samples were collected from officers in raids on both CGHs and FCPs and all tested negative for THC. Removal of cannabis plants by officers often resulted in cuts, abrasions and ruptured blisters on exposed skin surfaces, particularly at FCPs. The results in this study suggest that even when small areas of damaged skin are directly exposed to THC by contact transfer, the likelihood of showing a positive THC urine test is low.
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1. Introduction

In Australia, illegal plantations of marijuana or cannabis are traditionally grown in isolated, open-air environments, such as forest clearings, farms and backyards. In more recent years, an expansion of cannabis production of using indoor systems (hydroponic or potted soil) has occurred [1], as it offers many advantages to improve crop yield and quality, including the ability to extend the growing day, no seasonal limitations, faster production time, reduction of pathogens, higher density planting, the ability to meet optimal nutrient and water demands of plants, suburban rather than rural production, and most importantly, improved crop concealment [2,3]. Interception of illegal cannabis at post-production stage reduces the risk of Δ^9-tetrahydrocannabinol (THC) exposure to police officers because the cannabis has already been processed and packaged. Seizure of plants during production is a more efficient process as it ensures the entire crop is seized, as well as the infrastructure used to produce the crops (lights, pumps etc.). However, intact plants pose a greater risk of THC exposure for police as plants require mechanical removal and repeated handing of seized plants has the potential to increase the likelihood THC may be unintentionally absorbed or ingested.

Police entering cannabis houses and forest plantations may be exposed to environments containing high concentrations of volatile chemicals that may be detrimental to human health after long term exposure. Over 200 chemicals have been reported to be emitted from cannabis, including limonene, α-pinene, β-pinene, β-myrcene, β-caryophyllene, acetone and toluene [4–6], but do not contribute to the depressant effects of cannabis. THC is the illicit component of cannabis sought by recreational drug users, but is not considered volatile and requires chemical derivatisation, heat from plant burning or steam vaporisers to volatilise the THC

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http://dx.doi.org/10.1016/j.forsciint.2017.03.023
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for inhalation, and is therefore unlikely to be present in air but quite likely to be found on surfaces.

While identified as toxic to police drug dogs after acute exposure [7], THC is not considered toxic to humans. A study of 30 indoor marijuana grow operations investigated a variety of pollutants including fungal spores, VOCs and THC, and the risk to police [8]. The authors considered fungal spores, CO_2, agricultural chemicals and electrocution posed a far greater risk than THC, despite detecting THC on surfaces and hands. However, the work did not include hair or urine testing to determine whether THC had been ingested or absorbed through skin or open wounds on hands. In another study, exposure of 27 laboratory staff who complained of health problems while being routinely exposed to bulk drug exhibits in a police analytical laboratory was investigated, but weekly urine samples were all negative to drugs, including THC [9]. In a study investigating the health of children removed from drug-producing homes, hair from 15 of the 72 children who were tested for drugs were positive for cannabinoids, even though only 61 of the children were removed from cannabis houses [10]. Eight of the children presented results in the 100–600 pg/mg range, while three more showed trace levels. These results indicate that environmental exposure occurred, but the authors did not identify whether the source was external contamination from smoke or contact, or whether it was from ingestion. As these positive results were obtained from young children, who have a tendency to place foreign objects in their mouths, ingestion cannot be rules out without further evidence. However, a study in which people rolled cannabis cigarettes but not smoking them, yielded THC and THC-A concentrations in hair up to 93 and 1800 pg/mg, respectively [11]. Positive concentrations were attributed to contaminated hands causing external contamination of the hair in the participants, or potential ingestion if poor personal hygiene was present. These results demonstrate a potential problem for police if they routinely handle cannabis with bare hands and do not ensure appropriate hygiene practices are followed. Likewise, people exposed to synthetic cannabinoids by external contamination, showed positive for at least one synthetic cannabinoid [12] and THC by smoke contamination [13].

The New South Wales Police Force (NSWPF) is one of eight state, federal and territorial police forces in Australia, and is responsible for policing the state of NSW. Their duties include identifying and removing illegal indoor and outdoor cannabis growing operations, resulting in large and frequent workplace exposure to cannabis and THC at various stages of production, especially for specialist drug units. The following work reports a study conducted on exposure of police officers to THC during cannabis eradication at indoor and forest locations, and relates THC detected on surfaces (vehicles, human etc.) to results from urine and hair testing.

2. Materials and methods

2.1. Sampling sites—cannabis houses

Cannabis growing houses (CGHs) and forest cannabis plantations (FCPs) were chosen as field sites because they provided different environmental and operational dynamics, which in turn, would provide the broadest potential exposure to police officers. Four CGHs in suburban Sydney that were raided by the Region Enforcement Squad (RES) were chosen for the study. After the house was entered and any occupants removed, the house was rendered electrically safe and then windows opened to improve air flow because these houses usually have air filtration systems that are rendered inoperable during the process of making the house electrically safe. Plants were removed, inventoried and then secured in large paper evidence bags for transport by truck to the nearest storage facility. Following appropriate legal processes, cannabis was transported by truck for incineration. Cannabis plants in these environments tend to be less than 1.5 m tall, with newer varieties tending to be shorter, bushier and producing more plant head and therefore potentially more THC-laden resin. Plants were grown hydroponically or in soil using pots either placed on the floor or on tables, depending on the variety. Pots were placed as close to each other as possible to maximise production, resulting in dense foliage when plants are mature and unavoidable contact with foliage when moving through the site.

2.2. Sampling sites—forest operations

Three forest operations were conducted by the NSWPF Drug Squad—Cannabis Eradication Team (CET) in the forests of in northern NSW. Each five day operation consisted of four days of plant seizures and involved driving, hiking or being helicoptered into remote locations to remove plants. Seized plants were carried on shoulders, on the roofs of cars, or airlifted out by helicopter from remote locations to an interim base of operations. Plants were unloaded at the base and bundled in groups of 5 or 10 plants to allow inventory. Intact plants were loaded directly into storage trucks. The fifth day of each operation was dedicated to destruction by incineration at an available site, such as a timber mill. Plants were again handled manually by police when they were unloaded from truck and laid on the ground for confirmation of identity by an agronomist. Plants were then loaded directly onto an open fire, or a conveyer belt into an incinerator. Leather gloves and respirators were available to officers on all occasions, but the use of these was variable depending on the environmental conditions (heat, humidity, level of exertion required).

2.3. Surface sampling and analysis

Surfaces suspected of coming in direct contact with cannabis plants, or contaminated with THC by contact transfer from other contaminated objects were wiped with cotton swabs, and then analysed by LC–MS/MS using methodology previously described [14]. In brief, methanol (3 mL) for inanimate surfaces and ethanol (3 mL) for human surfaces were applied to cotton swabs. Surfaces were wiped, swabs were placed in disposable plastic tubes, and tubes were stored on ice for transfer to a deep freeze (−20 °C). Swabs were extracted with methanol and concentrated for analysis by LC–MS/MS. Inanimate surfaces included steering wheels, gear selectors, park brake handles, interior and exterior door handles, and interior walls of transport trucks. Human surfaces included palms of gloves or hands, forearms, lapels or shoulders of overalls, and the back of the head and neck.

2.4. Air sampling and analysis

Temperature and relative humidity inside CGHs were measured by members of the entry team who wore an Easylog EL-USB-1 temperature and humidity logger (Lascar Electronics), which allowed the conditions inside the house to be measured at the point of entry, and prior to change when doors and windows were opened to improve ventilation. Temperature and humidity was also regularly monitored inside the cannabis storage truck during two of the FCP raids.

Volatile compounds in air were monitored at all raids using Anasorb CSC air sampling tubes packed with Coconut Charcoal (110 × 8 mm) made from coconut husk (Airmet, Sydney). Tubes were connected in parallel to allow duplicate samples for each sampling event. Air was sampled at a rate of 30 mL/min for time

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