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Running title: Recreational use of naturally occurring dimethyltryptamine – contributing to psychosis?

Recreational use of naturally occurring dimethyltryptamine – contributing to psychosis?

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Dimethyltryptamide, acacia, psychosis, schizophrenia

The effect of substance abuse on mental health is a pressing issue in modern psychiatric practice, prompting legislation to limit the accessibility of naturally occurring psychoactive substances. In 2011 the Australian Attorney-General's Department submitted the discussion paper 'Implementation of model schedules for Commonwealth serious drug offences'. The document proposed that all plant species containing the substance N,N-Dimethyltryptamine (DMT) be listed as controlled plants, provoking outcry from nurseries and gardening societies (Thompson, 2011, Nankervis, 2011). DMT is an endogenous hallucinogen present in many native Australian plant species. Interest in recreational DMT use is rising in the United States and Australia, particularly among users of other hallucinogens and cannabis (Cakic et al., 2010). Easily accessible Internet forums provide detailed information on the acquisition, extraction and use of DMT. This is a concerning trend considering the limited awareness of DMT use among psychiatrists.

A 24-year-old Caucasian male from rural South Australia was admitted to hospital for a first-episode psychosis. Extensive prior substance abuse, including of DMT, tobacco, cannabis and methamphetamines, and a family history of psychotic illness were noted. Over the six months preceding admission the patient had developed a complex delusional spiritual belief system and was pursuing enlightenment. His goal was to open his internal 'third eye', which he associated with the pineal gland of the brain. The patient became aware of the drug DMT through friends in his substance abuse circle and Internet forums. The attraction of DMT use was the alkaloid's endogenous presence in the pineal gland, natural availability and reported psychospiritual effects. He collected leaf tips, bark and seeds from acacia and *Phalaris aquatica* (bulbous canarygrass) plants, dried the material and ground it into a fine powder that he added to his regular tobacco and cannabis pipe. The patient was using this plant matter with increasing frequency in the year leading up to his presentation with positive symptoms of schizophrenia.

Australian plant species that contain DMT include *P. aquatica*, *Acacia maidenii* (Maiden's Wattle), *Acacia phlebophylla* (Buffalo Sallow Wattle) and *Acacia obtusifolia*. A 1990 CSIRO study tested 127 species of acacia in Australia, with alkaloids such as DMT detected in 59 of these species (Collins, 1990). The alkaloid content of *P. aquatica* and *A. maidenii* was found to be 0.06 and 0.71% respectively. A 20 mg smoked dose of pure DMT is sufficient to produce moderate psychogenic effects. This dose may be achieved by smoking just 2.8 grams of *A. maidenii* bark.

Smoking is the preferred route of DMT consumption and is claimed to produce potent psycho-spiritual effects. These include a dream-like state, euphoria and colourful visual hallucinations (Cozzi et al., 2009), which peak after a few minutes and resolve within thirty minutes (Cakic et al., 2010). Smoking of DMT-containing acacia plants has been reported among Indigenous Australian males during cultural ceremonies (Watson, 1983). DMT is also the psychoactive ingredient in 'Ayahuasca', a beverage ritually consumed by Indigenous populations in the Amazon Basin (Pomilio et al., 1999).

DMT acts as an agonist of endogenous 5HT_{2A} receptors and sigma-1 receptors (Cozzi et al., 2009). In mammals endogenous DMT is synthesised through methylation of tryptamine. Osmond and Smythies' transmethylating hypothesis of schizophrenia (1952) proposed that increased transmethylating activity in the brain resulted in the production of hallucinogenic methylated amines that played a role in the pathogenesis of positive symptoms. According to this hypothesis there may be high levels of tryptamine methylation and therefore increased cerebral DMT in patients with schizophrenia. This is substantiated by the abnormal presence of DMT in the urine of unmedicated, acutely psychotic patients (Pomilio et al., 1999), suggesting a correlation between high DMT levels and schizophrenia. Furthermore, DMT administration produces a mental state that mimics positive symptoms of schizophrenia (Heereken et al., 2008), including altered perception and affect and formal thought disorder. The possible role of DMT in schizophrenia and the psychiatric consequences of recreational DMT use require further research.

Control and monitoring of recreational DMT use is difficult because of its widespread natural availability. Approximately one quarter of DMT users report personally extracting the substance from plant material (Cakic et al., 2010), which may also contain toxic hydrogen cyanide. Instructions for DMT extraction are readily available on Internet forums and recommend use of harmful chemicals, with a high risk of contamination.

DMT's easy accessibility for recreational use, hazardous extraction process, co-occurrence with toxic plant chemicals and links to psychotic illness warrant significant medical concern. DMT is not detected in routine drug screens and its

use is likely under-recognised by psychiatrists. An increased awareness of the existence of DMT abuse and systematic research into the chemical's actions in the brain are encouraged.

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