Cannabis from the plant *Cannabis sativa* is the most widely used psychoactive substance worldwide\(^1\). The term cannabis refers to the two commonly used preparations from the female plant *Cannabis sativa*, namely, marijuana or the dried leaves and flowering tops and the compressed cannabis resin or hashish\(^2\). The United Nations Office on Drugs and Crime (UNODC) estimated that 183 million people have used the drug in 2014\(^3\). The use of cannabis is widespread among adolescents and it is estimated that 5.6% of students globally have used cannabis in the last year\(^1\). In United States and Western countries, cannabis is the most used substance during adolescence, and in conjunction with other illicit substances and precedes their use\(^1\). National surveys conducted in 2008 in Canada on students grades 7-9, reported 17% being trying cannabis\(^4\). Figures from the United States in 2013 showed that 7.5% (19.8 million) of the population over the age of 12 years have reported using the drug in the preceding month. Moreover, there has been an increase in cannabis usage since 2002 among those aged 18 years or more\(^5\). Data from National surveys from the European Union members, Norway and Turkey conducted between 2012-2015 indicated that ~25% of those aged 15-24 years are life-time users and ~15% have used cannabis in the past year\(^1\). Cannabis abuse is also a problem among school and University students in other countries as well such as Ireland\(^6\), and Egypt\(^7\). Gender difference exists where the use of cannabis is more prevalent among adolescent males compared with females\(^8\).

But what makes cannabis so popular among adolescents? The use of cannabis by adolescents seems to be driven by a number of factors that includes (i) a decrease in the awareness of the adolescent and parents of potential health consequences and other risks from the drug; (ii) the ease of obtaining cannabis for personal use especially in some countries where there has been legalization of marijuana for medical or recreational use\(^6,9\); (iii) to increase sociability and experience the euphoric and intoxicating effects\(^10\); (iv) curiosity about drug effects; (v) to cope with psychological or physical stress during work or study\(^7\).

Cannabis is known for its recreational uses and is usually smoked in cigarettes, mixing with tobacco, the so called “joint” and also in a
water pipe. Users report mild euphoria or feeling “high”, relaxation, and anxiety. There are also distortion of time perception and intensification of sensory experiences. These effects are caused by delta-9-tetrahydrocannabinol (D9-THC) which is the major psychotropic agent in the plant and were demonstrated in healthy humans following its intravenous administration. Over 120 terpenophenolic compounds similar to D9-THC and known as cannabinoids have been identified in Cannabis sativa. Most are not psychoactive and are present in very low concentrations. Examples are cannabidiol and cannabidiol13. Cannabis also contains hundreds of other chemical constituents and the effects of smoked cannabis is thus the sum of the effect of several cannabinoids and other ingredients in herbal cannabis14(Russo and McPartland 2003). Some cannabinoids exert synergistic effects whilst others are even antagonistic to the D9-THC effects [15]. The effect of the whole plant is thus likely to differ from that of only D9-THC. It has been shown that D9-THC (and other cannabinoids) exerts its effects by acting on two types of G-protein-coupled cannabinoid (CB) receptors, with CB1 receptors being expressed mainly in brain, and spinal cord and CB2 receptors present mainly on immune cells. In the brain, CB1 receptors are found in high density on neuronal terminals in areas associated with cognition, emotions, cognition, memory, appetite, and movement such as the cortex, limbic system, hippocampus, cerebellum, and basal ganglia16.

But is cannabis an innocent drug? Scientific evidence indicates that this is not the case, especially during adolescence where the brain is still in the maturation process. Results from animal experiments showed that heavy cannabis consumption during adolescence appear to induce subtle changes in brain circuits with the result of altered emotional behavior, and sensitivity towards rewarding stimuli with an increase in the likelihood for the use of more serious illicit and addictive substances17. Brain imaging studies suggested that heavy usage of cannabis is associated with structural brain changes such as thinning of cortices in temporal and frontal regions18 and reduced volumes of orbitofrontal gyri19. The impact of adolescence use of cannabis is maintained into later life. Older adults with a history of early life use of cannabis showed reduced hippocampus thickness20. Studies in healthy volunteers showed that oral D9-THC impairs both episodic memory and learning with the effect being a dose-dependent one21. Users of cannabis exhibit memory problems eg., altered neuronal functioning during visuospatial working memory22. In those who started using cannabis at an early age and continued into later adulthood, there were evidence of neurophysiological decline and cognitive problems with these effects being dependent on cannabis dosage23. The most disastrous consequence of cannabis in adolescence is undoubtly the risk of developing psychotic events later in life. There is an increasingly accumulating evidence which suggests a link between the use of cannabis and schizophrenia24. Using cannabis was also associated with an earlier age at the first psychotic event25. This psychotic potential of cannabis has been shown in healthy subjects with no prior history of exposure to cannabis. These individuals developed transient schizophrenic-like symptoms when intravenously dosed with D9-THC (12. Transient psychotic symptoms eg., depersonalization, and paranoid feelings could also be induced in healthy subjects following oral ingestion of synthetic D9-THC or THC decoction26.

Results from animal studies have shown that cannabis or D9-THC is toxic to neurons27. Cannabis is thus a major health problem, especially among adolescents, a period which is marked by rapid increase of the mental and physical capabilities of the individual and where the brain is vulnerable to the cannabis effects. This is because: (i) adolescence represents a critical period for brain development (neuronal maturation, myelination, synaptic pruning, dendritic plasticity, volumetric growth etc…)28; (ii) there is an increase in social behavior and also “reckless” behavior and in risk and sensation seeking and consequently drug abuse29,30. The use of cannabis in adolescents is associated with poor physical health status31, poor performance at school, decreased academic achievement and an increase in the likelihood for dropout32. Moreover, cannabis is a likely “gateway” for other addictive substances33.

Measures should therefore be taken to discourage the use of cannabis during adolescence. There is a need for educating both the adolescent and the family better understanding of the potential risks of cannabis. Smoking cigarettes including the
e-cigarettes has been identified as a confounding factor in cannabis usage\(^\text{13}\), thereby, necessitating taking measures to reduce smoking in schools. More oriented research into the field of cannabis will help delineate the biological targets, and effects of herbal cannabis on brain structure and functioning and the pathways by which cannabis affect the maturing brain.

**REFERENCES**

Cannabinoid Research **208**: 3.1: (2018).


