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# IAQ Implications of Cannabis Legalization

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Laws about the cultivation, use, and distribution of marijuana are a global patchwork of legalization, decriminalization, allowed medical use, and outright prohibition. In the U.S., marijuana is currently legal in eight states and is decriminalized and/or allowed for medical use in most of the rest of the country. Enforcement of state and federal laws are also quite variable in different jurisdictions. In Canada, cannabis will likely be legalized federally later this year. Although much of the discussion on marijuana laws has focused on issues such as harm reduction, enforcement, taxation, etc.,<sup>1</sup> the implications for both private and public indoor air quality have largely been absent from the conversation.

The purpose of this column is to explore these implications. Before I go further, I feel compelled to start with some author's disclosures as they may bias my opinions. Intellectually, I am an advocate for marijuana legalization, as I see no compelling reason to have any laws against cannabis and, further, that enforcement of existing laws is often discriminatory. However, I also live in a big urban center, in a semidetached townhouse with many close neighbors, and the use of marijuana by some of these neighbors is a frequent concern, as I smell marijuana smoke odors frequently. These opinions aside, it is important to have a discussion of cannabis legalization that includes its impacts on indoor air quality.

Considerable medical and public health literature exists on cannabis. The smoking or ingestion of cannabis leads to a variety of health effects, and the magnitude and severity of those health effects vary considerably on the nature and details of the exposure route, the susceptibility of the exposed individual, and, of course, the

dose of the harmful constituents received.<sup>2</sup> There is also a relatively clear indication of mental health concerns for some individuals when cannabis is used recreationally.<sup>3</sup> For many, these are concerns for users rather than for society at large. It is generally impossible to separate these concerns from effects that arise from the illegality of marijuana, rather than from the consumption of marijuana itself.

The biggest indoor air quality concerns from cannabis use are largely about exposures of those who choose not to use marijuana. There is also a large body of evidence that prenatal and postnatal passive exposure to marijuana combustion (e.g., the analog to secondhand tobacco smoke) is harmful for a variety of fetal and infant health outcomes.<sup>4</sup> There is also some evidence that children's exposure to environmental marijuana smoke is of concern. Again, there is

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considerable diversity on the severity of these effects, but clearly no public health agencies are arguing that passive marijuana exposure is positive from a health perspective.

A secondary problem that arises from passive smoking of marijuana are the odors: some marijuana strains are high in certain terpenes that smell like a skunk. Although odor science is complex, we know that strong negative odors can affect concentration, well-being, and, in some cases, be associated with physical symptoms such as watering eyes and nausea. Another important potential impact of marijuana legalization on indoor air quality is the moisture that comes from the cultivation of marijuana. Most state legalization measures allow anywhere from 6 to 20 plants to be grown in private environments. There is plenty of anecdotal evidence and some literature that marijuana cultivation, even relatively small numbers of plants, can be linked to moisture problems, which in turn are related to health concerns.<sup>5</sup>

Also, several decades of research have made it clear that we should be interested in primary, secondary, and tertiary emissions from many indoor sources. Primary emissions are the direct emissions: in the case of marijuana smoking, these are the particulate and gaseous combustion by-products that are inhaled by both the smoker and any exposed nonsmokers (e.g., secondhand smoke). Secondary emissions are those that arise from chemical reactions and physical transformations between the primary emissions and other compounds in the environment. Tertiary emissions are those that arise from an environment where smoking happened at some time in the past, for example acid-base chemistry on surfaces. We have very limited information on primary emissions and essentially no information on other cannabis exposures, but the analogy to cigarette smoking raises serious concerns about the potential for harm.

A seemingly obvious solution to these concerns is to not allow the use of marijuana where others, particularly sensitive individuals, will be exposed. Almost all legalization efforts ban the smoking of marijuana in public places, and some have additional rules to ban the use of marijuana around children. However, the reality of modern urban life is that people live close to each other, often in attached dwellings or in multifamily buildings.

Although there is no direct research on cannabis, there is ample research on cigarette smoke that demonstrates that secondhand smoke (SHS) generally moves quite easily between units in attached dwellings.<sup>6</sup> Although compartmentalized construction is often a goal in modern buildings, it is rarely achieved, and millions of units of older construction are not well compartmentalized. Generally, if your neighbors smoke marijuana, you will be exposed to the by-products of this combustion. Again, the details of the source nature and strength, the amount of connection, the amount of dilution, etc., will all vary considerably, but there can be no doubt that passive exposure often occurs.

Given this reality, it is important to discuss solutions. It is also important to be realistic. In general, we shy away from regulating private indoor environments, and many nations lack a mechanism for such regulations. If we were going to take the big step of regulating private indoor environments, there would probably be more important targets than cannabis use in terms of overall risks to public health. There is also a huge issue in terms of other sources of indoor pollution. For example, cooking is associated with a variety of contaminants, odors, and moisture as well, but it is ridiculous to consider feasible and enforceable legislation restricting cooking activities. Even legislation that requires the installation, maintenance, and compelled use of range hood fans to address cooking pollution is incredibly challenging to implement. Thus, any possible solution has to be seen in the context of reasonableness for implementation.

One set of possible approaches are solutions that try and address the source. These might include public education and/or legislation to encourage alternatives to cannabis smoking such as vaping or edible marijuana products. However, there are still some serious health concerns with both of these alternatives. To my knowledge, there has been no direct research on cannabis vaping emissions, but the evidence from e-cigarettes is compelling in terms of the potential for very serious emissions of light aldehydes and other contaminants of concern. Many factors impact any such emissions: the power consumption/temperature of the heater coil in the vaping device, the puff profile (how it is smoked), and the constituents of the vaping liquid. But, as with many other exposure issues, there is no debate about the potential for the generation of

harmful contaminants, just about the amount and the severity of any resulting exposures. Also, some public health advocates are more favorable on the use of e-cigarettes because of their role in smoking cessation. No such benefit exists for cannabis vaping.

Edible marijuana products, particularly those not made in the home, have little or no impact on indoor air quality, but are associated with increased accidental poisonings of children in locations with legalized marijuana.<sup>7</sup>

Other technical solutions include ventilation and air cleaning. As with other contaminants, they could certainly lessen the severity of exposures, but likely not eliminate them entirely. They also have economic costs associated with their installation and upkeep.

Beyond technical solutions, there are policy interventions. Although outright bans in private indoor environments are unlikely, there could be bans in semiprivate spaces such as porches, balconies, etc., and further bans in areas where children are likely to be present (e.g., parks). Some jurisdictions have experimented with

legislation and public education campaigns for smoke-free multifamily buildings. This type of idea could be extended to cannabis legalization, although enforcement would be a challenge, particularly in light of medical marijuana laws in many jurisdictions. The indoor air quality implications of the cultivation of marijuana are another area where policy drivers may be effective, but again differentiating a marijuana plant from any other similar plant from a moisture or odor perspective would be challenging.

In the absence of clear solutions, it is important for designers and building operators to be proactive about cannabis laws and their impact on buildings. The use of positive pressurization, activated carbon filtration, and moisture control may be required with greater frequency. As with many other indoor air quality problems, a key aspect of any sustainable solution is likely to be public education. Given the considerable economic value of the cannabis trade, the public and decision makers should be wary of “Big Marijuana” entities that seek to obfuscate any potential hazards from cannabis use. A broader understanding of the nuisance and potential health impacts of residential marijuana cultivation and use may be sufficient to motivate better behavior for some cannabis users. Those involved in cannabis legislation policy should also consider the indoor air quality challenges that can arise from such policies.

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