

## EVIDENCE BRIEF

# Odours from cannabis production



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## Key Messages

- No studies on health effects associated with exposure to cannabis odours were identified in the scientific or grey literature.
- Odours can result in annoyance and complaints from nearby residents. Current practices recommend the use of appropriate ventilation and filtration systems at cannabis production/cultivation facilities to mitigate the release of substances that may result in odours.
- A system to report and track odours could help inform on timing and extent of the occurrence of odour to assist local authorities to remedy potential problems.

## Issue and Research Question

Although medical cannabis production facilities already exist, the legalization of recreational cannabis will likely result in an increase in the number of facilities, or the scale of existing cannabis production facilities. Under the *Proposed Approach to the Regulation of Cannabis*, the production of cannabis will be permitted at both large- and small-scale commercial facilities (cultivators and processors) as well as

in private residences in smaller amounts. These facilities may produce emissions that result in odour complaints from neighbours. Based on inquiries from multiple health units, Public Health Ontario conducted a search of the scientific and grey literature to assess potential health effects related to odour producing emissions associated with cannabis production facilities. Health effects from cannabis smoke inhalation, cannabis consumption and other potential environmental hazards identified in cannabis cultivation (such as biological pathogens, pesticides and other chemicals) were not considered within the scope of this evaluation.

## Methods

A literature search was conducted by PHO Library Services using relevant databases (MEDLINE, Embase, Environment Complete, and Scopus), with a combination of pre-defined search terms related to cannabis production and odours. A total of 334 records were returned and reviewed for relevance, with a focus on articles with information about the health effects of these odours. In addition, a grey literature search in Google with a focus on the health effects of odours related to cannabis production was conducted. The detailed search strategy and complete results are available upon request.

## Main Findings

### Cannabis odours

The characteristic odour associated with cannabis is attributed to the release of chemical compounds into the air known as volatile organic compounds (VOCs). A study by Rice *et al.* identified over 200 different VOCs from packaged cannabis samples.<sup>1</sup>

An important consideration when sampling for odorous compounds is the possibility that compounds emitted at higher concentrations may not necessarily be responsible for the overall characteristic of the odour.<sup>1</sup> In addition, the overall odour of cannabis can be time dependent as chemical volatilization occurs at different rates for different compounds. While both fresh and dry cannabis can be associated with odours it is possible that the VOCs responsible for the aroma profiles may be different due to different rates of chemical volatilization.<sup>1</sup> As a result, it is difficult to identify one or a select number of chemicals to measure from a facility to potentially monitor odour on a continuous basis. One approach used for characterizing odour mixtures is the use of the odour unit, which is the ratio between the amount of odourant present in a volume of a neutral (odourless) gas at the odour detection threshold of the odour evaluation panelists. The odour unit is used by the Ontario Ministry of Agriculture, Food and Rural Affairs to categorize odours under the *Nutrient Management Act* and by the Ontario Ministry of the Environment and Climate Change to determine the compliance of industrial facilities with regulations under the *Environmental Protection Act*.<sup>2,3</sup> Guidance and procedures for determining odour emissions from industrial facilities are provided under the Ontario Source Testing Code.<sup>3</sup>

The processing of cannabis and production of cannabis products can also result in odour emissions. Activities such as cannabis oil extraction/concentration can involve the use of chemical solvents such as butane or distillation using alcohol which can also contribute to the overall odour emitted from a production facility.<sup>4</sup> Disposal of cannabis waste products is not expected to contribute to odour as proper disposal involves rendering the waste unusable by grinding and combining with other waste products (food, yard, paper, or plastic wastes, or soil) which will mask or dilute odour producing compounds. This waste is then disposed of according to local ordinances, which can include landfills or municipal waste incinerators which themselves are operated under licenses that specify engineering controls for odour.<sup>5-7</sup> In Canada, personal cannabis producers are advised to dispose of excess cannabis by mixing with water and kitty litter to mask odour prior to disposal in household garbage.<sup>8</sup>

## Health effects from odours

No studies on health effects associated with exposure to cannabis odours were identified in the scientific or grey literature. The perception of odour is not a reliable way to determine the risk of health effects. Some odorous compounds are noticeable at low concentrations where the risk for health effects is very low (e.g. odourants added to natural gas to aid in leak detection), while other chemical compounds (e.g., carbon monoxide) do not result in odours at any concentration, even when there is the potential for people to be exposed at dangerous levels.<sup>9</sup>

In general, most substances responsible for odours in the outdoor air are not present at levels that can cause long-term health effects.<sup>10</sup> However, exposure to unpleasant odours may affect an individual's quality of life and sense of well-being. Exposure to odorous compounds can potentially trigger physical symptoms, depending on the type of substance responsible for the odour, the intensity of the odour, the frequency of the odour, the duration of the exposure, and the sensitivity of the individual detecting the odour.<sup>11,12</sup>

## Odour mitigation guidelines

In Canada, Health Canada regulates medical cannabis producers and requires that facilities are equipped with an air filtration system to prevent the escape of odours under Provision 61 of the *Access to Cannabis for Medical Purposes Regulations*.<sup>13</sup> An air filtration system using a H13 high-efficiency particle air (HEPA) filter is given as an example of such a system by Health Canada.<sup>14</sup>

Other jurisdictions have gone through the process of cannabis legalization and implemented guidelines and procedures to address potential odour issues from production facilities. The following is a summary of the existing guidelines gathered from various agencies in Colorado, Alaska and California.

The Colorado Springs Fire Department provides guidance to licensed cannabis production facilities based on the recommendations in the Cannabis Facility Guidance document from the Fire Marshals Association of Colorado.<sup>15</sup> The guidance recommends that appropriate ventilation and filtration systems be implemented and maintained to satisfy applicable local odour nuisance standards. In addition, the

adoption of best practices and state-of-the-art technologies in odour mitigation are strongly encouraged.<sup>16</sup> In situations where odour is inadequately mitigated and is perceived to be excessive, residents in Denver, Colorado are asked to file a nuisance odour complaint with the Denver Department of Environmental Health.<sup>17</sup>

The city of Denver, Colorado has released a Best Management Practices document for commercial medical cannabis producers, wherein a number of odour control technologies are described.<sup>18</sup> Carbon filtration has been recommended as the best control technology for cannabis cultivation facilities and producers of cannabis-infused products.<sup>18</sup> Other recommended technologies include negative ion generators/electrostatic precipitators, air scrubbers, masking agents, and the use of negative pressure to keep odours within the facility.<sup>15,20,21</sup> Regardless of which technologies are used to control odour, it is important that these systems are properly maintained according to specifications to provide optimal performance.

Applications for cannabis cultivation facilities in Alaska must submit an operating plan that includes odour control to ensure that cultivated cannabis does not emit odour detectable by the public from outside the facility.<sup>22</sup> Similarly, regulatory permit applications for medical cannabis facilities in Hollister, California are evaluated based on an adequate odour management plan which must include a detailed description of the ventilation system that will be used in the facility.<sup>21</sup> In Sacramento, California, permitted cannabis producers are required to prevent all odours generated from the cultivation and storage of cannabis from escaping from the buildings on the cultivation site, such that the odour cannot be detected by a reasonable person of normal sensitivity outside the buildings.<sup>23</sup>

## Discussion and Conclusions

The upcoming legalization of cannabis in Canada is expected to result in an increase in cannabis production or cultivation in both large- and small-scale commercial facilities, and private residences. There is a potential that operation of these facilities will result in the release of odour and odorous compounds into the surrounding environment. However, environmental odours are regularly encountered from agricultural and industrial operations and odour control technologies are both readily available and widely used in these industries.

Although regulations and guidelines are still being developed for the province of Ontario, other jurisdictions have already legalized cannabis production and developed best practices and procedures to address odour issues. In general, cannabis production facilities can implement and maintain appropriate ventilation and filtration systems to satisfy applicable local odour nuisance standards. A formal system for residents to document and report nuisance odours can facilitate the enforcement of these standards or municipal bylaws. As part of the permitting process, odour control plans can be reviewed to determine whether emissions are adequately treated such that cannabis odours are not perceptible outside the exterior of the building.

Studies linking health effects to neighbourhood exposure to emissions from cannabis production facilities were not found through the literature search. Detection of unpleasant odours may affect an individual's sense of well-being by triggering a physiological response.

## Implications for Practice

Although studies on health effects from neighbourhood exposure to emissions from cannabis production have not been published, these emissions of volatile organic compounds would be broadly comparable to those produced by other agricultural operations. In general, the substances responsible for odours may result in reports of responses such as headaches or irritation depending on individual tolerance of particular odours.

Based on existing guidance from Health Canada and elsewhere, odour control technologies are available for production facilities to prevent the release of odours from site buildings.

Following other jurisdictions, a system to report and track nuisance odours could be implemented in the event that the odour control at a cannabis production facility is not effective. Such a system can help to inform local authorities on timing and extent of the occurrence of odour, and inform decisions through which authorities can intervene to remedy potential problems. Health Canada, through the regional Controlled Substances Program, conducts inspections of licenced producers to verify their ongoing compliance with the *Access to Cannabis for Medical Purposes Regulations* (ACMPR).<sup>24</sup> A similar inspection system may be useful to encourage and monitor compliance with the requirement for air filtration and odour control under the ACMPR.

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## Specifications and Limitations of Evidence Brief

The purpose of this Evidence Brief is to investigate a research question in a timely manner to help inform decision making. The Evidence Brief presents key findings, based on a systematic search of the best available evidence near the time of publication, as well as systematic screening and extraction of the data from that evidence. It does not report the same level of detail as a full systematic review. Every attempt has been made to incorporate the highest level of evidence on the topic. There may be relevant individual studies that are not included; however, it is important to consider at the time of use of this brief whether individual studies would alter the conclusions drawn from the document.



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