

Unintentional THC Intoxication Associated with Consuming Food from a Local Restaurant – Las Vegas, Nevada, 2022

PUBLIC HEALTH INVESTIGATION FINAL REPORT

This report presents the findings of the Southern Nevada Health District's investigation into reports of unintentional acute tetrahydrocannabinol (THC) intoxication after consuming food or drink from Secret of Siam Thai Cuisine restaurant in Clark County, Nevada, during January and February 2022.

Acknowledgements

We gratefully acknowledge the staff from the following offices and agencies for their contribution to this investigation and for their continuing collaboration.

- Office of Informatics and Epidemiology
- Office of Acute Communicable Disease Control
- Division of Environmental Health
- Office of Communications
- Las Vegas Metropolitan Police Department
- City of Las Vegas Business Licensing
- State of Nevada Cannabis Compliance Board
- Federal Bureau of Investigation
- Centers for Disease Control and Prevention

INTRODUCTION

This is a report of an outbreak investigation conducted by the Southern Nevada Health District's (SNHD) Disease Surveillance & Control Division (DSC) and Environmental Health Division (EH) following reports of acute THC intoxication from patrons who consumed food or drink from a local restaurant during January and February 2022. THC is the primary psychoactive ingredient found in cannabis. The effects of THC can vary based on the concentration of THC absorbed in an individual's body and the route of administration. 1,2

On Tuesday, February 8, 2022, DSC received two illness complaints regarding the Secret of Siam Thai Cuisine restaurant in Las Vegas, Nevada. An additional complaint was received by EH on Saturday, February 12, 2022. The complainants reported dizziness, hallucinations, elevated blood pressure, and increased heart rate after consuming food from the restaurant. Complainants reported testing positive for THC on a toxicology screen at a local hospital and denied any prior marijuana use during the 30 days before illness onset. Review of crowdsourced websites (Google, Facebook, and Yelp) suggested additional patrons shared similar experiences after consuming food or drink from the same restaurant. An outbreak investigation to assess a possible association between consumption of food or drink from this restaurant and unintentional THC intoxication was initiated.

INVESTIGATION METHODS

SNHD's investigation consisted of the following activities:

- Case Investigation:
 - Telephone interviews with restaurant patrons who self-reported symptoms
 - Review of responses from a public, web-based self-reporting survey tool
 - Medical record review of ill patrons who reported positive THC screening results
- Case-Control Study:
 - Public, web-based self-reporting survey tool design and implementation
 - Statistical analysis of survey responses
- Review of Restaurant Sales Data
- Review of Nevada call center data concerning marijuana from Rocky Mountain Poison Control Center
- Environmental Health Investigation:
 - Onsite investigations
 - Onsite interviews and cooking demonstrations
 - Invoice review
 - Food vendor interviews
- Multiagency Coordination:
 - Las Vegas Metropolitan Police Department (LVMPD)
 - City of Las Vegas Business Licensing (CLVBL)
 - Federal Bureau of Investigation (FBI)

Case Investigation:

DSC utilized multiple methods for case finding including reviewing SNHD's foodborne illness complaint database, conducting telephone interviews, distributing a confidential online survey, and releasing a Health Alert Network (HAN) notification to encourage local healthcare providers to report potential cases.

The survey instrument was created using Alchemer (2021.12.15) and was used for case finding and a case-control study. It included questions about demographics, symptoms experienced, menu items consumed, and whether the respondent received a medical evaluation by a healthcare provider with laboratory screening for THC. Completion of this survey was voluntary; data was used in compliance with NRS 441A. The survey was launched on February 28, 2022, with a link published on SNHD's website.

DSC staff also received a list of patrons who purchased food or drink from the restaurant during January and February 2022 and disseminated an automated mass text message to patrons who made purchases during the timeframe of interest, from January 28, 2022, through February 14, 2022. The text message asked recipients to complete the survey regardless of whether they experienced symptoms and to encourage anyone they knew who had consumed food or drink from the restaurant during the same timeframe to complete the survey.

Microsoft Excel was used to document complaints received by telephone. Telephone interview data was then entered into the survey tool by DSC staff.

On February 28, 2022, DSC released a HAN to local healthcare providers to alert them of the outbreak, provide background information, screening recommendations, and request that possible cases be reported to SNHD. A link to the self-reporting survey was also provided.

DSC staff followed up with individuals who reported ongoing symptoms to inquire about the symptoms and whether the person had seen a health care provider.

Case Definitions:

Probable:

A probable case was defined as an illness with onset between January 28, 2022, through February 14, 2022, with symptom onset within three hours of consuming food or drink from the Secret of Siam Thai Cuisine, Centennial Hills location that included two or more of the following self-reported symptoms: hallucinations, blurry vision, increased heart rate, disorientation or confusion (for example, inability to think clearly or quickly), dizziness or vertigo (for example, room spinning or lightheadedness), loss of consciousness, dry mouth, numbness or tingling in extremities.

Confirmed:

A confirmed case was defined as an illness meeting the Probable Case criteria in an individual with evidence from an accredited laboratory of THC in urine or blood within five days after consuming food or drink from the Secret of Siam Thai Cuisine, Centennial Hills location, with no known marijuana use during the 30 days before the positive test.

Case-Control Study:

The Office of Informatics and Epidemiology used a case-control design to investigate the potential source of illness among food or drink items consumed by complainants. Individuals with illnesses meeting the probable or confirmed case definitions were considered case patients. Respondents who completed the survey, consumed food or drink from the restaurant during January 28, 2022–February 14, 2022, and reported no symptoms were included as controls. The restaurant provided dish ingredient information which was used to create composite variables (i.e., coconut milk consumed in any dish). Attack rates among case patients and controls were calculated for each menu item, food groups (e.g., any curry dish, any stir fry dish) and individual ingredients of interest, which were informed by preliminary results. Odds ratios (OR) were calculated to compare the odds of having consumed menu items between survey respondents who were ill and those who reported no symptoms. Zero values in contingency tables were adjusted by applying a correction factor of 0.5 to all cells.³ Statistical analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA).

Review of Restaurant Sales Data

The restaurant provided the Office of Informatics and Epidemiology with a list of purchases from January 28, 2022, through February 12, 2022. Sales of menu items were tallied.

Rocky Mountain Poison Control Data Query:

DSC receives call data throughout Nevada from the Rocky Mountain Poison Control Center (RMPCC). This data captures all poison related calls made from the public and medical providers. The data can be filtered by product groups which include related products. For example, the terms "marijuana," "cannabis," "THC," and others are all captured in the marijuana product group. A query of the marijuana product group was performed to determine the number of calls concerning marijuana in Nevada from January 1, 2022, to March 31, 2022, and to determine whether the number of marijuana-related calls increased during this period.

TIMELINE

The following is a summary of the major events in the investigation:

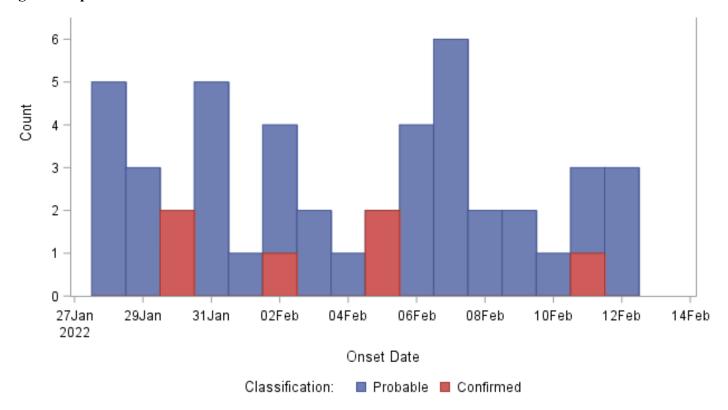
- 02/08/2022: First complainant reports to DSC
- 02/10/2022: Initial EH complaint investigation at the restaurant
- 02/14/2022: Joint site investigation with SNHD EH, LVMPD, City Business Licensing resulting in restaurant closure
- 02/18/2022: Self-reporting survey opened
- 02/25/2022: SNHD investigation update released online; Local HAN released
- 02/28/2022: Patron list and sales information received from restaurant
- 03/07/2022: Consultation with the Nevada Cannabis Compliance Board
- 03/07/2022: Follow up EH site visit
- 03/23/2022: Restaurant approved by SNHD to re-open
- 05/08/2022: Survey closed

EPIDEMIOLOGIC RESULTS

Case Investigation:

A total of 201 patrons completed the survey or phone interview. Forty-five probable and six confirmed cases were identified with illness onset during January 28, 2022, through February 12, 2022. Between one and six cases occurred daily during this timeframe (Figure 1).

Figure 1. Epidemic curve.



Symptom onset within three hours of consuming food or drink from the restaurant was required as part of the case definition. Among the 51 patrons with symptoms meeting the probable or confirmed case definition, median time from meal consumption to symptom onset was one hour (range < 30 minutes—three hours). The median number of symptoms reported was 11 (range 4–28). The most frequently reported symptoms included confusion (45, 88%), dizziness (39, 76%), fast heartbeat (37, 73%), and anxiety (30, 59%) (Table 1). Patrons reported symptoms lasting a median of eight hours (range 1–72 hours). Twelve case patients (24%) reported visiting a healthcare provider in relation to their symptoms.

Table 1. Symptoms reported by patrons with Probable or Confirmed cases.

Table 1. Symptoms reported by patrons with Frobable of Commined cases.						
Symptoms	Count (% of cases)					
Confusion	45 (88)					
Dizziness	39 (76)					
Fast heartbeat	37 (73)					
Anxiety	30 (59)					
Dry mouth	27 (53)					
Heaviness	27 (53)					
Nausea	24 (47)					
Stomachache	21 (41)					
Blurred vision	20 (39)					
Hallucination	20 (39)					
Loss of coordination	20 (39)					
Chest tight	19 (37)					
Difficulty speaking	18 (35)					
Shortness of breath	17 (33)					
Irregular heartbeat	16 (31)					
Difficulty walking	15 (29)					
Numbness tingling	15 (29)					
Shaking	15 (29)					
Sweating	15 (29)					
Memory loss	7 (14)					
Vomiting	5 (10)					
Fainting	3 (6)					

Case-Control Study:

Of the 201 completed survey responses, 85 did not meet the case or control definitions and were excluded from the case-control analysis. Responses from 116 patrons were included in the analysis: 51 case patients and 65 controls (Table 2). Median age was comparable between case patients (40 years, range 20–65 years) and controls (42 years, range 3–69 years). Sixty-one percent of case patients and 45% of controls reported female sex at birth, 27% of case patients and 38% of controls reported male sex at birth. Birth sex was not recorded for six case patients (12%) and 11 controls (17%). Over 50% of case patients and controls described ordering the reported meal as takeout (53% and 51%, respectively). Twenty-seven percent of case patients and 34% of controls described consuming the reported meal at the restaurant (dine in). Fourteen percent of both case patients and controls described having the meal delivered through a third-party delivery service. Three case patients (6%) and one control (1.5%) consumed the meal as leftovers (Table 2).

Table 2: Demographics and order type of survey respondents included in the case-control analysis.

	Case Patients	Controls	Total		
N (%)	51	65	116		
Median Age					
Years (Range)	40 (20–65)	40 (20–65) 42 (3–69)			
Age Unknown N (%)	6 (12%) 9 (14%)		15 (13%)		
Birth Sex N (%)					
Female	31 (61%)	29 (45%)	60 (52%)		
Male	14 (27%)	25 (38%)	39 (34%)		
Birth Sex Unknown	6 (12%)	11 (17%)	17 (15%)		
Order Type N (%)					
Delivery	7 (14%)	9 (14%)	16 (14%)		
Dine In	14 (27%)	14 (27%) 22 (34%)			
Takeout	27 (53%)	27 (53%) 33 (51%) 6			
Leftovers	3 (6%)	1 (1.5%)	4 (3%)		

Food Item Analysis:

The odds of becoming ill among individuals who consumed any curry dish were nine times as high as those who didn't consume any curry dish (OR = 9.2 [95% CI = 3.9–22]; Table 3). Statistically significant associations between curry dishes and illness were also observed for the red, green, and yellow curries individually (OR [95% CI] = 5.9 [1.2–29], 3.3 [1.07–10.2], 2.7 [1.03–7.1], respectively). This suggests that exposure to THC might have occurred by eating curry dishes. Curry is often consumed with rice. The odds of becoming ill among individuals who consumed rice were nearly six times as high as those who did not (OR = 5.7 [95% CI 2.0–16.4]). To determine whether exposure was more likely to have been due to eating the curry sauce or the rice, ORs were calculated excluding respondents who ate any curry dish. The association between consuming rice and becoming ill was not observed among individuals who did not eat curry (OR = 1.3 [95% CI = 0.3–4.9]). Additionally, the odds of becoming ill among individuals who consumed fried rise were 70% lower than those who did not (OR = 0.3 [95% CI = 0.1–0.9)]. This suggests that exposure to THC did not occur by eating rice alone. Similarly, the odds of becoming ill among individuals who consumed any noodle dish were also lower than those who did not (OR = 0.2 [95% CI = 0.1–0.6)]), suggesting that exposure to THC did not occur by eating noodle dishes.

Additional analyses were performed to try to determine whether particular ingredients used in the curry dishes were associated with becoming ill. Upon request, the restaurant provided a list of ingredients used in the curry dishes. Five ingredients were found to be used in the red, green, and yellow curry dishes: coconut milk, palm sugar, fish sauce, chicken powder, and MSG. Restaurant staff reported using coconut milk primarily for the curry dishes, though it was also used in smaller quantities in tom kha soup and coconut smoothies. Staff reported using palm sugar in the curries and the pad Thai. The odds of becoming ill among individuals who consumed any foods that contained coconut milk or palm sugar were higher than individuals who did not (OR

[95% CI] = 9.2 [3.7–22.7] and 5.1 [2–16.4], respectively). No association between consuming any dish with fish sauce, chicken powder, or MSG and becoming ill were observed.

Table 3. Food-specific attack rates (% ill) and odds ratios (OR) among survey respondents included in the case-control analysis.

Among all case patients & controls (n = 116)	Individuals who consumed the food item			Individuals who did not consume the food item								
Food Item	III	Well	Total	% III	III	Well	Total	% III	OR	Lower 95% CL	Upper 95% CL	p-value
Curry (all)	41	20	61	67%	10	45	55	18%	9.2	3.9	22	<.0001
Coconut Milk (in any dish)	43	24	67	64%	8	41	49	16%	9.2	3.7	22.7	<.0001
Red Curry (excluding vegan)	8	2	10	80%	43	63	106	41%	5.9	1.2	29	0.03
Rice (in any dish)	46	40	86	53%	5	25	30	17%	5.7	2	16.4	0.0011
Palm Sugar (in any dish)	44	36	80	55%	7	29	36	19%	5.1	2	12.9	0.0007
Green Curry	11	5	16	69%	40	60	100	40%	3.3	1.07	10.2	0.0384
Yellow Curry	14	8	22	64%	37	57	94	39%	2.7	1.03	7.1	0.0434
Fried Rice (all)	3	13	16	19%	48	42	100	48%	0.3	0.1	0.9	0.0388
Noodle Dishes (all)	9	31	40	23%	42	34	76	55%	0.2	0.1	0.6	0.0011
Pad Thai	4	20	24	17%	47	45	92	51%	0.2	0.1	0.6	0.0048

Review of Restaurant Sales Data

During January 28, 2022, through February 12, 2022, 1,060 unique orders were placed, including 401 curry dishes, 244 fried rice dishes, and 629 noodle dishes. Of the curries, the yellow curry was most frequently ordered (159 orders) followed by panang (119 orders), red (56 orders) and green (53 orders). On average, 25 curry dishes were sold per day (range 14–39).

Review of Rocky Mountain Poison Control Center (RMPCC) Data

A total of 59 calls pertaining to marijuana were recorded in the Nevada call data from the RMPCC between January 1, 2022 through March 31, 2022. This represents a 26% increase from the same period in 2021 and a 31% increase from the previous three months. It is unknown if this increase was due to the outbreak event.

ENVIRONMENTAL HEALTH INVESTIGATION

The first contact at the restaurant was on February 10, 2022. SNHD EH conducted an unannounced risk-based inspection resulting in a passing A grade. A complaint investigation was also conducted regarding reports of THC contamination in the food. SNHD EH reviewed food ingredients and spices and did not find any THC products or any ingredients from unapproved sources. The restaurant was allowed to continue operation.

After additional illnesses were reported, SNHD EH returned to the restaurant on Monday February 14, 2022, in a joint investigation with LVMPD and CLVBL. SNHD EH searched for possible routes of purposeful or accidental THC contamination of the food. SNHD EH again reviewed food ingredients and all parts of the kitchen and storage and did not find any THC products or any ingredients from unapproved sources. No unusual findings were observed upon reviewing the curry recipes and personal storage. LVMPD issued an emergency suspension on February 14, 2022, leaving the restaurant closed pending multi-agency approval to re-open.

Food invoices were reviewed, and all vendors appeared to be properly permitted. SNHD EH called all food vendors to alert them to the investigation and interview them about any other known issues. No food vendors reported similar complaints from other restaurant clients that they served.

On March 7, 2022, SNHD EH returned to obtain finer details on the curry recipes, ingredients, processes, and equipment. Restaurant staff demonstrated the green curry recipe which consisted of curry paste, palm sugar, fish sauce, coconut milk, chicken powder, MSG, and chili powder cooked together in a pot on the stove, then transferred to a steel pan for cooling in an ice bath before being covered and placed in a walk-in refrigerator. Then the curry would be placed in the reach-in cooler on the prep line to be reheated with the protein and vegetables of choice per order. A new batch of each type of curry was reported to be made every few days, leaving the restaurant to make one kind of curry batch per day on average.

Food orders were delivered twice a week or purchased at local grocery stores as needed in between deliveries. Restaurant management reported experiencing some supply chain issues as the COVID-19 pandemic had strained resources, however they stated that if they could not find the ingredient from their first-choice vendor, they would try another permitted vendor or remove the recipe from the menu until the proper ingredients were available.

Restaurant staff demonstrated their process for washing, rinsing, and sanitizing equipment between uses. SNHD EH observed the equipment used to cook, cool, store, and serve the food, as well as the locations within the kitchen that these processes took place. No obvious contamination issues with the curry recipe, the equipment used to make the curry, the to go containers used to package the curry, or the areas of the kitchen used to prepare, store, and serve the curry were identified.

LIMITATIONS

This investigation was subject to several limitations. Not all patrons who visited the restaurant during the timeframe of interest completed a survey or interview. As such, the number of individuals at risk and the total

number of individuals affected could not be determined. Attack rates therefore reflect the proportion of survey respondents who became ill, rather than the proportion of individuals at risk who became ill.

Most information gathered from patients was self-reported and is subject to the accuracy of respondents' memory and reporting. Medical records were only reviewed if a patient reported they tested positive for THC. Few complainants reported seeking healthcare, so a diagnosis of THC intoxication could not be confirmed for most cases. Respondents were only asked about recreational marijuana use if they tested positive for THC through urine or blood screen. This was due to concerns about reduced participation with this line of questioning. Repeated exposure to THC is known to contribute to tolerance. The possibility that individuals who reported symptoms and individuals who did not report symptoms (controls) differed in recreational marijuana use cannot be excluded. If controls were more likely to have used marijuana recreationally, they may have been less likely to develop symptoms if they were exposed. This could have affected the results of the food item analysis.

DISCUSSION

This multidisciplinary investigation identified 45 probable and six confirmed cases of THC intoxication associated with consumption of food or drink from Secret of Siam Thai Cuisine restaurant in Centennial Hills. Analysis of items consumed by survey respondents showed that individuals who became ill were more likely to have consumed a curry dish compared to those who did not become ill. Two ingredients used in the curry dishes were also associated with higher odds of becoming ill, coconut milk and palm sugar. It is unknown whether THC was introduced to the curry dishes through these ingredients or another mechanism.

Between February 25, 2022, and March 3, 2022 there were two separate reports of U.S. Customs and Border Protection seizure of illicit drugs disguised as food products. ^{5,6} As such, the possibility of an adulterated ingredient was considered. Invoice review did not reveal any purchases of coconut milk, palm sugar, or other ingredients from unapproved vendors, and site inspection did not reveal concerns with storage or use practices. Ingredient batches or lots used during the timeframe of interest were not available for collection and testing. Though this is not uncommon given the rapid rate at which restaurants often use supplies, testing raw ingredients used for the dishes found to be associated with probable THC intoxication could have offered insight into the mechanism of contamination.

Private consumption of marijuana and THC products by individuals aged 21 years and over is decriminalized in the State of Nevada. Businesses must be licensed by the State in order to distribute cannabis products. During this investigation, Secret of Siam Thai Cuisine was not licensed for cannabis distribution and employees reported no knowledge of plans to pursue consumption lounge licensing.

Delta-9-THC is the primary psychoactive compound that occurs naturally in marijuana plants,⁸ while large quantities of delta-8-THC are more commonly associated with synthetic products.⁹ THC is fat soluble¹⁰ and can be distilled into highly concentrated products including oils, which can be pale yellow to light brown in color, and powders, which can be white or yellow.¹¹ If processed under specific conditions these distilled products can be free of identifiable tastes or smells.¹¹ Cannabis products are known to de-homogenize easily when mixed with other substances, meaning that concentrations might not be uniform throughout one batch of infused food product.¹¹

Among individuals who do not use marijuana products, ingestion of 5–20 mg can produce psychotropic effects. The high number of symptoms reported by case patients suggests that many were exposed to a large dose of THC. However, the relatively low number of cases reported compared to the number of curry dishes sold each day suggests inconsistent exposures among those who consumed associated food items. Hypotheses regarding this apparent inconsistency include that THC was present in a garnish or consumer-controlled additive or that higher doses were served in some plates due to the propensity of THC to de-homogenize. Restaurant staff and case patients were questioned about garnishes and additions, but an item likely to have been the vehicle for THC was not identified.

Secret of Siam Thai Cuisine was cooperative throughout the investigation. The restaurant was approved by SNHD to reopen on March 23, 2022, after discarding all remaining food and providing new food purchase invoices to SNHD for review for the following 60 days. As of November 16, 2022, no additional cases were reported after reopening.

In conclusion, this investigation found a statistically significant association between unintentional THC intoxication and consumption of curry dishes from the restaurant Secret of Siam Thai Cuisine in Centennial Hills during January 28, 2022, through February 12, 2022. The mechanism of contamination was not determined.

RECOMMENDATIONS

- Interagency cooperation and collaboration are critical in public health investigations involving establishments with licenses and permits from multiple agencies within a jurisdiction.
- The public, businesses, and healthcare providers should be aware of cannabis regulations, the availability of consumable cannabis products in Nevada, and signs and symptoms of cannabis intoxication.

REFERENCES

- 1. Turner AR, Spurling BC, Agrawal S. Marijuana Toxicity. StatPearls. 2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430823/
- 2. Millar SA, Stone NL, Yates AS, O'Sullivan SE. A Systematic Review on the Pharmacokinetics of Cannabidiol in Humans. Front Pharmacol. 2018; 9:1365. doi:10.3389/fphar.2018.01365
- 3. Deeks JJ, Higgins J. Statistical algorithms in Review Manager 5. The Cochrane Collaboration. 2010. Available from: https://training.cochrane.org/handbook/current/statistical-methods-revman5
- 4. Singla S, Block R. Effect Compartment Model for Evaluation of Tolerance to Psychological Highness following Marijuana Smoking. Journal of Clinical Pharmacology [Accepted Article]. 2022. https://doi.org/10.1002/jcph.2109
- 5. U.S. Customs and Border Protection. CBP Officers Seize Meth Disguised as Onions. February 25, 2022. Available from: https://www.cbp.gov/newsroom/local-media-release/cbp-officers-seize-meth-disguised-onions?language content entity=en
- 6. U.S. Customs and Border Protection. Philadelphia CBP tells Miami Resident: 'No Soup for You'. March 3, 2022. Available from: https://www.cbp.gov/newsroom/local-media-release/philadelphia-cbp-tells-miami-resident-no-soup-you?language content entity=en
- 7. Cannabis Compliance Board. 2020. Available from https://ccb.nv.gov
- 8. Wang GS. Synthetic cannabinoids: Acute intoxication. UpToDate. 2021. Obtained from: https://www.uptodate.com/contents/synthetic-cannabinoids-acute-intoxication?search=THC&topicRef=97099&source=see link
- 9. U.S. Food and Drug Administration. 5 Things to Know about Delta-8 Tetrahydrocannabinol Delta-8 THC. 2022. Available from: https://www.fda.gov/consumers/consumer-updates/5-things-know-about-delta-8-tetrahydrocannabinol-delta-8-thc
- 10. Wang. GS. Cannabis (marijuana): Acute intoxication. UpToDate. 2022. Obtained from: https://www.uptodate.com/contents/cannabis-marijuana-acute-intoxication?search=THC&topicRef=7797&source=related link
- 11. Nevada Cannabis Compliance Board. [WebEx Meeting]. March 7, 2022.