



# Disguised Dangers:

## Gummies, Snacks, and Supplements

***Sandra C. Bishop-Freeman***  
**Chief Toxicologist**

North Carolina Office of the Chief Medical Examiner



# Agenda

## CBD

- Edibles: CBD vs. delta 9 vs. delta 8

## Vape

- Nicotine
- Phytocannabinoids
- Other

## Supplements

- Iron
- Amygdalin
- Melatonin

This presentation is for educational use only. Mention of any brands, products are for fair use.

# NC OCME Toxicology

- We are the **only** postmortem tox laboratory in North Carolina.
- We do toxicology testing for all **100** counties
- In the last 10 years our workload has increased from less than 10,000 cases a year to over **15,000** cases in 2022
- We do this with a **limited staff of 22** people, ¼ temporary/grant positions





# CBD

## Cannabidiol

(and other usual suspects)



# How do young children gain access to cannabis?

- A child found and ate a cannabis **chocolate** bar in the glove compartment of the car.
- A family friend was visiting, hung his coat on the back of a kitchen chair and a toddler found a cannabis **sucker** in the jacket pocket and ate some of it.
- A babysitter found a container of **cookies** up in the cupboard and not knowing they contained cannabis, shared this snack with the child in her care.
- A young child began staggering, and the mother realized that the leftover cannabis **cupcake** from the plate on the kitchen counter was missing.

**FACT:** CBD and THC are both cannabinoids found in cannabis plants.

<https://childsafetylink.ca/news/edible-hazard-cannabis-food-your-childs-safety>

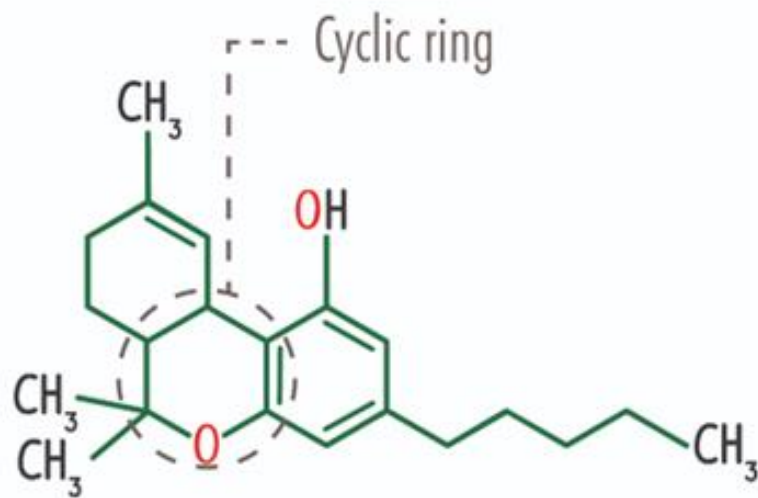
Image from: <https://www.chillhouse.de/headshop/lifestyle/food/cannapops-cannabis-suckers-bubble-gum>

Disguised Dangers

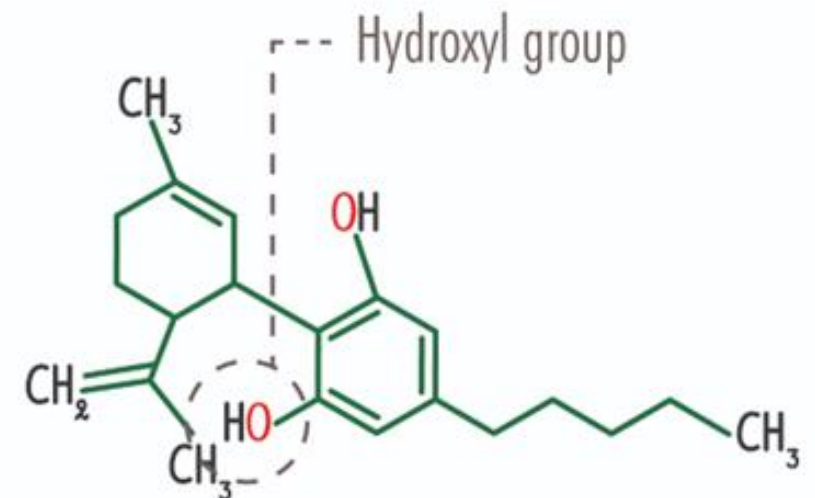


# CBD: What is it, What it is not

- Cannabidiol (CBD) and tetrahydrocannabinol (THC) are both naturally occurring compounds found in plants in the cannabis genus.
- **CBD is non-psychoactive** and therefore does not illicit a “high” whereas THC is psychoactive does illicit a “high”.



Tetrahydrocannabinol (THC)



Cannabidiol (CBD)

# Hemp CBD vs. Cannabis CBD

- Public interest in and the availability of CBD have grown due to its *promising* health benefits.
- **Scientific studies have not confirmed CBD's usefulness** for all these conditions companies promise it will treat.
- Hemp is a specific variety of **C. sativa**.
  - In most cases, manufacturers use the leaves and flowers of the hemp plant to make CBD products.
- There are three standard varieties of cannabis plants: **C. indica**, **C. sativa**, and **C. ruderalis**. There is also a range of hybrid plants that are a mix of these three strains.
  - These cannabis plants contain much higher and varying levels of THC than hemp plants.

Hemp and cannabis contain different amounts of CBD and THC.

**Cannabis contains more THC, and less CBD.**  
**Hemp contains more CBD and less THC.**



# THC in Edibles vs. CBD in Edibles

CBD EDIBLES vs THC EDIBLES:  
**WHAT IS THE DIFFERENCE?**

- Not to be confused with marijuana/cannabis that is smoked, **CBD oil is legal**
- CBD has been known to relax the muscles, studied for anxiety, cognition, movement disorders, pain
- All CBD food supplements are restricted for sale to those aged 18 years and above
- THC gummies can contain more than 20% THC while **CBD gummies legally must contain less than 0.3% THC**

“There is a common theme of not knowing what THC gummies are or what the effects might be and confusing them with real candy. One parent mistakenly offered the gummy to their child thinking it was candy.”



.....however, products are confusing

- **Full-spectrum products** derived from cannabis use all of the cannabinoids, terpenes, and molecular compounds within the cannabis plant, which includes THC—sometimes in very small, almost trace amounts, but sometimes in significant doses.
- **Broad-spectrum CBD products** contain all of the cannabinoids of the cannabis or hemp plant they are sourced, but have had the THC removed.
- **CBD isolate products** consist of nothing except CBD. No other cannabinoids, no terpenes, no nothing but **pure CBD**. These too, are often made from industrial hemp, instead of actual cannabis.

# These products are on-line and in stores



25 mg  
CBD  
+  
15 mg  
CBN



**FEEL THE EFFECTS**  
Take a full cube  
or less to start.

50 mg  
CBD  
+  
30 mg  
CBN



**NEEDING MORE?**  
Take up to two  
depending on  
tolerance.

Nighttime Gummies

Nutrition Facts		
Serving Size: (4g) 1 Gummy		Servings Per Container: 30
Amount Per Serving		% Daily Value*
Calories	15	**

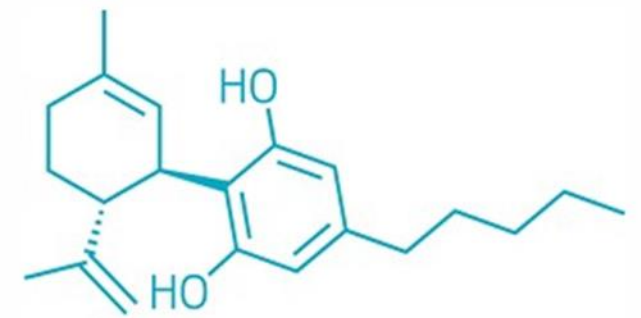
Cannabidiol ([CBD](#)) and cannabitol (CBN)

**Sleep aid.** CBN has shown to have sedative properties that could relieve conditions like insomnia. However, more research is required.

Unlike CBD, which is entirely non-psychoactive, CBN in larger doses can produce mild psychoactive reactions.

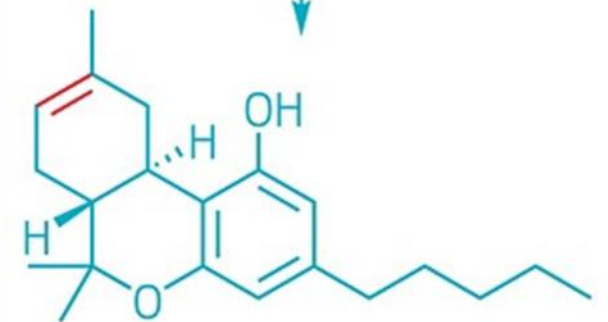
# CBD to Delta-8 THC

- Delta-8 THC is an active ingredient (cannabinoid) of the cannabis plant. **But most delta-8 products are man-made from converted CBD oil.**
- The biggest risk of delta-8 THC is that it's **not regulated**, which means that **safety, purity, and strength can't be guaranteed.**
- Delta-8 THC products likely expose consumers to much **higher levels** of the substance than are naturally occurring in hemp cannabis raw extracts.



**Cannabidiol**

Acid catalyst,  
solvent, heat



**$\Delta^8$ -Tetrahydrocannabinol**

# Delta-8-THC craze concerns chemists

Unidentified by-products and lack of regulatory oversight spell trouble for cannabis products synthesized from CBD

by **Britt E. Erickson**

August 30, 2021 | A version of this story appeared in **Volume 99, Issue 31**

Move over cannabidiol (CBD). The popularity of another cannabinoid,  $\Delta^8$ -tetrahydrocannabinol (delta-8-THC), is on the rise. **Found in gummies, vape cartridges, tinctures, and other products, delta-8-THC is popping up in gas stations, convenience stores, tobacco shops, and cannabis dispensaries throughout the US and beyond—often with no age restrictions.**

But with no regulatory oversight and limited laboratory testing, most products sold as delta-8-THC are not actually pure delta-8-THC. Such products typically contain a high percentage of delta-8-THC and small amounts of other cannabinoids, including delta-9-THC, and reaction by-products. Some of the cannabinoids are not naturally found in cannabis. In most cases, nothing is known about the health effects of these impurities.

“**A lot of irresponsible production is going on.**

— **Kyle Boyar**, research associate, University of California San Diego,  
Center for Medicinal Cannabis Research

# Delta-8 Debate: The 2018 Farm Bill gave rise to an unlikely intoxicant



By **Omar Sacirbey**, Reporter

February 1, 2022 - Updated April 14, 2022

- When Congress passed the Farm Bill, hemp cultivators and processors were sitting on loads of CBD oil that, until then, was hard to move in a marketplace limited by lack of federal clarity on CBD. The new regulations undammed that supply, with CBD distillate unleashed along with a new wave of entrepreneurs looking to enter the industry.
- CBD prices dropped from \$25,000 per kilogram to as little as \$500 after the Farm Bill's passage. Suddenly, converting CBD into delta-8 THC was economically feasible.
- One of the reasons this didn't happen earlier is because anytime you have to do a conversion, it's an added expense. **When CBD prices went through the floor, this raw material became really cheap.** Previously, the barrier to doing this had been cost. And now that cost barrier was gone.
- In its effort to legalize and regulate hemp-derived CBD, the **2018 Farm Bill** stated that any cannabinoid derived from hemp—defined as cannabis containing less than 0.3% delta-9 THC—was a legal product.

- **Yet by specifying delta-9, the bill's authors unwittingly left other cannabinoids outside the realm of regulation.**

<https://mjbizdaily.com/delta-8-debate/>

# Not your parents' pot: North Carolina legislators and law enforcement agencies attempt to get delta-8 THC out of the hands of children



by **Lucas Thomae**

August 3, 2023

*Many manufacturers and distributors have been using loopholes to sell products that are far more potent than state and federal law intended.*

“Parents call me and say, ‘You know, these kids are coming home high as a kite, you can’t talk to them, so on. Do something about it,’” Sasser told NC Health News on June 21.

## Legislation introduced, but future unclear

Sasser and McNeely are the primary sponsors of the [Regulate Hemp-Derived Consumables & Kratom](#) Act, which they say is intended to limit minors’ access to these products.

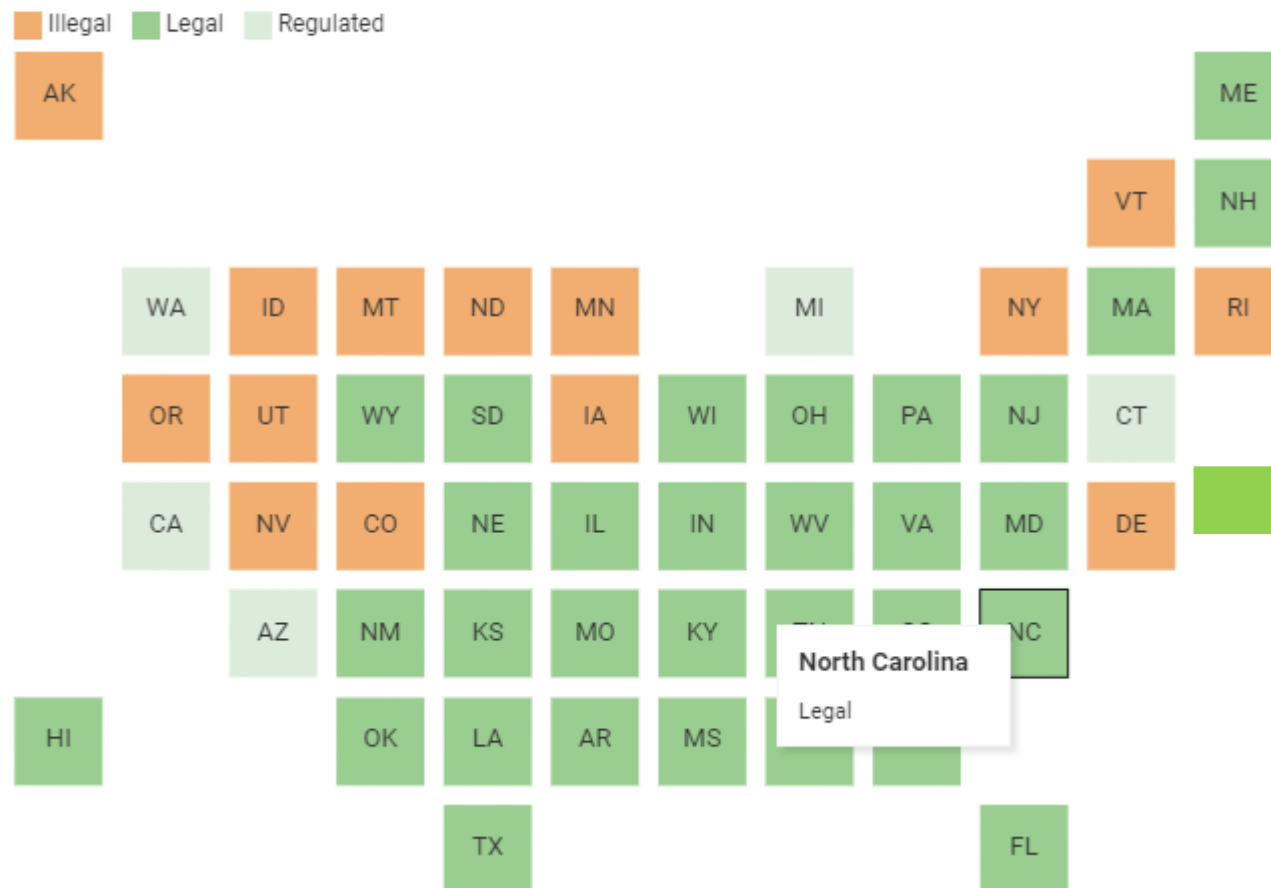
<https://www.northcarolinahealthnews.org/2023/08/03/nc-legislators-law-enforcement-want-crack-down-delta-8-thc/>



# Is Delta 8 THC Legal in My State?


Delta 8 THC is legal on a federal level, but as with any federal law, states can accept the provisions of the 2018 Farm Bill or place their own restrictions on the legality of delta 8 THC products.

Here's what delta-8 THC laws look like in each state:



## Delta-8 Legality a National Patchwork of Irony

### FDA, FTC warn 6 companies allegedly selling delta-8 THC infused foods with confusing labeling

By ABC7 Chicago Digital Team   
Wednesday, July 5, 2023



The FDA and FTC claim the companies' products have label and logos that could be mistaken for common snack foods that are not infused with delta-8, and could be accidentally eaten by children.

[Delta-8 Legality a National Patchwork of Irony \(greenmarketreport.com\)](https://greenmarketreport.com/)

[FDA, FTC warn 6 companies allegedly selling delta-8 THC infused foods with labeling that could be misleading - ABC7 Chicago](#)

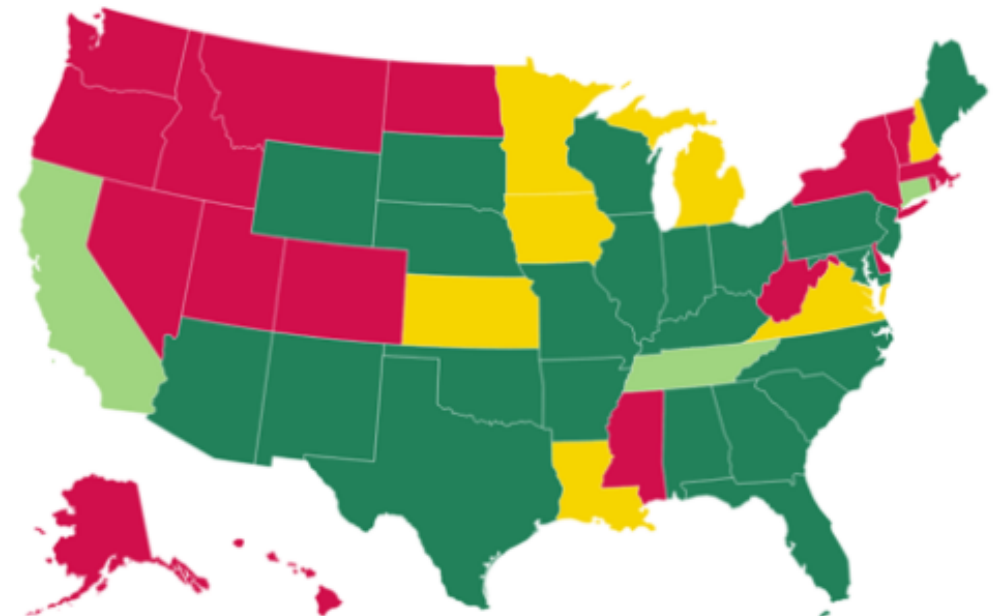
A total of 24 states have either banned or "severely restricted" delta-8 products.

With the number of states outright banning delta-8 THC goods seemingly increasing as quickly as the number that have legalized marijuana, the national patchwork of legality for hemp goods has become something of an ironic mine field for entrepreneurs.

So far, a total of 24 states have either banned or "severely restricted" delta-8 products, according to a new report from CBD Oracle, with 17 state bans in place. Where delta-8 products are legal, however, has strikingly little overlap with state-legal marijuana.

#### Delta-8 THC Legal Status by State

 Banned  Legal  Restricted  Substantial Regulations



Last fact-checked on October 13, 2023, by Neil Willner, co-chair of the RCCB law firm's cannabis group.  
Source: CBD Oracle • Created with Datawrapper



<https://www.wusa9.com/article/news/local/virginia/thc-edible-crackdown-virginia-laced-products-copy-cat-snacks/65-7f339c9a-2130-40bc-afda-ae1f9392257e>

# Stoney Patch

- Serving: **ONE PIECE**
- Less than 0.3% Delta 9 THC?
- What about Delta 8 THC?

1,000 MG of the hemp oil of your choice.

Choose to have your gummies infused with Delta 8 THC Oil Or CBD Oil.

Stoney Patch Gummies are amazing for recovery, stress relief, anxiety and more.



In North Carolina, Delta 8 is currently legal



# Products may come with a “lab report”

**ACS**  
LABORATORY | CANNABIS & HEMP  
BEYOND COMPLIANCE  
721 Cortaro Dr.  
Sun City Center, FL 33573  
www.acslabcannabis.com

License No. 800025015  
FL License # CMTL-0003  
CLIA No. 10D1094068

**Nerd Rope**  
Sample Matrix:  
CBD/HEMP  
Edibles  
(Ingestion)



## Certificate of Analysis

Compliance Test

**HIGH HARVEST HEMP  
COMPANY**  
5290 MAYO FARM RD  
OAK CITY, NC 27857

Batch # 15  
Batch Date: 2022-01-11  
Extracted From: Hemp

Test Reg State: Florida

Order # HIG220111-120001  
Order Date: 2022-01-11  
Sample # AACI892

Sampling Date: 2022-01-13  
Lab Batch Date: 2022-01-13  
Completion Date: 2022-01-18

Initial Gross Weight: 17.668 g  
Net Weight: 14.468 g

Number of Units: 1  
Net Weight per Unit: 14468.000 mg



Product Image



**Kaycha Labs**

NERDY BEARS RUN 20000

N/A

Matrix: Edible



Sample:GA10317002-001

Harvest/Lot ID: 1A4000D0003A8B9000000089

Seed to Sale #N/A

Batch Date :02/25/21

Batch#: 1A4000D0003A8B9000000089

Sample Size Received: 60 gram

Total Weight/Volume: N/A

Retail Product Size: 5.33 gram

Ordered : 03/17/21

sampled : 03/17/21

Completed: 04/02/21 Expires: 04/02/22

Sampling Method: SOP Client Method

**PASSED**

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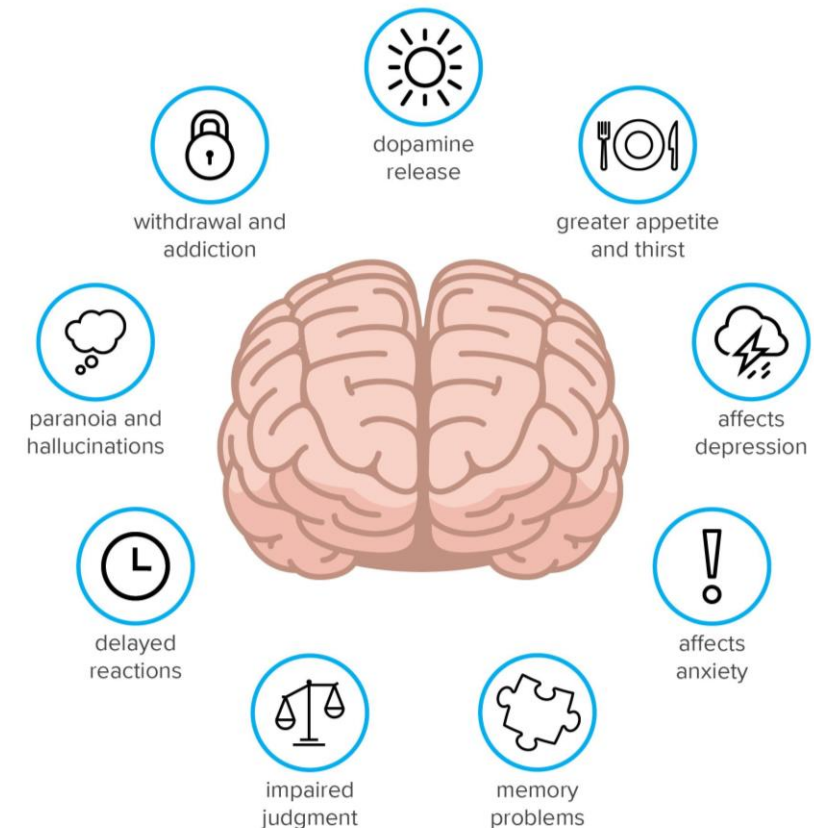


# Children who have consumed cannabis edibles may:

- **Act lethargic**
- **Feel dizzy**
- **Have trouble walking or sitting up**
- **Have an accelerated heart rate**
- **Trouble breathing**

## THC poisonings on the rise

The [American Association of Poison Control Centers](#) reports receiving 4,329 calls about poisonings for kids under 12 years involving cannabis edibles containing THC — a significant increase from 3,132 calls in 2020; 1,364 calls in 2019; and just 187 calls in 2016.



<https://health.choc.org/thc-gummies-and-other-cannabis-edibles-what-parents-should-know/>

IMAGE FROM: <https://www.medicalnewstoday.com/articles/324948#psychological-health>

## Several NC teens hospitalized after ingesting THC gummies at their middle school

Several students at a North Carolina middle school were treated Friday at a local hospital after showing signs of being impaired.

Posted 1:58 p.m. Sep 20, 2022 - Updated 5:22 p.m. Sep 20, 2022

Deputies said that during the resulting investigation, a package of THC gummies and a quantity of marijuana were seized.

Jyquante Spruill, 14, was one of the students affected. His family was alerted that he had passed out in gym class and that paramedics were on the way.

“Slurred speech, stumbling, falling asleep, you know in severe cases if you took a lot of them, they could be life-threatening things like respiratory depression, shallow breathing,” Ledoux said. “It could also cause things like vomiting and things that are much more life-threatening than just a mild intoxication.”



## 3 students hospitalized after eating edibles on school bus in Fayetteville

Three middle school students were hospitalized Wednesday after they ate edibles on a school bus, according to school leaders.

Posted 10:02 a.m. Today - Updated 10:02 a.m. Today

Three middle school students were hospitalized Wednesday after they ate edibles on a school bus, according to school leaders.

Leaders told WRAL News one girl and two boys ate the edibles on the way to Douglas Byrd Middle School. The students were taken to Cape Fear Medical Center by ambulance.

# NC lawmakers want to regulate what's in CBD products, how they are marketed

Lawmakers say it's time to regulate the cannabinoid industry in North Carolina.

Posted 6:27 p.m. Jun 21 - Updated 1:03 p.m. Jun 22



NORTH CAROLINA

## NC legislators consider law that would regulate Delta 8, hemp-derived products

by: [Kaci Jones](#)  
Posted: Sep 25, 2023 / 06:06 PM EDT  
Updated: Sep 26, 2023 / 03:48 PM EDT

GENERAL ASSEMBLY OF NORTH CAROLINA  
SESSION 2023

H

4

HOUSE BILL 563  
Committee Substitute Favorable 6/21/23  
Committee Substitute #2 Favorable 8/16/23  
Committee Substitute #3 Favorable 9/21/23

Short Title: Regulate Hemp-Derived Consumables & Kratom. (Public)

House Bill 563 (Public) Filed Tuesday, April 4, 2023  
AN ACT TO REGULATE THE SALE AND DISTRIBUTION OF HEMP-DERIVED CONSUMABLE PRODUCTS AND KRATOM PRODUCTS, AND TO BAN THOSE PRODUCTS FROM SCHOOL GROUNDS.

NORTH CAROLINA NEWS

## Hemp industry regulations pass NC House, await Senate talks

by: [Lillian Donahue](#)  
Posted: Sep 26, 2023 / 10:52 PM EDT  
Updated: Sep 26, 2023 / 11:17 PM EDT

# Chinese hemp food maker invests \$10 million in North Carolina factory soon to open

November 10, 2023 / China, Farming, Food & Drink, Investment, News, North America, Processing, USA

Q-Power, Inc. said it has put \$10 million into a facility that will produce seed-based products at its complex in Louisburg, N.C., and plans further investments.

# THC Contributions

Rarely considered in the forensic literature as a significant contributory or causal factor in sudden unexpected death.

Cannabis as a cause of death: A review

Forensic Science International

Volume 298, May 2019, Pages 298-306

- Smoking cannabis has been associated with **acute myocardial infarction**.
- Some deaths have been attributed to smoked cannabis.
- Thrombus formation and stroke** has been associated with use of cannabis.
- Acute use of cannabis should be considered as **contributory** to death in some cases.

Fall, drowning, MVA, Drug-drug interactions

# Police: Mother charged with neglect after 2-year-old overdoses on THC

Traci L. Miller  
The Herald Bulletin May 13, 2021

- 2-year-old daughter was given “Apple Jackz,” a sweetened, apple and cinnamon flavored cereal with 500mg of THC “per treat.”
- In the care of her grandmother, the woman said she gave the child the cereal from a diaper bag and thought it was the breakfast cereal Apple Jacks.
- The child ate eight or 10 of the treats before the grandmother realized something was wrong. The woman said the toddler’s eyes began to roll to the back of her head and she called her husband who came home and then called 911.
- The 2-year-old was admitted to the hospital and an EKG had to be performed on her every two hours, according to the probable cause.

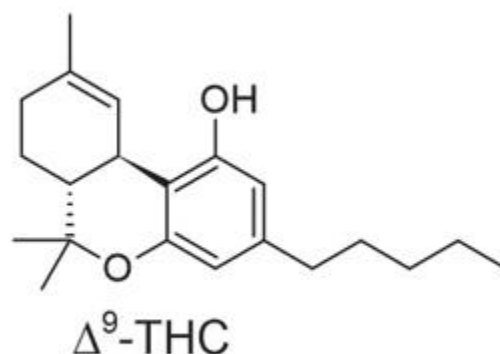
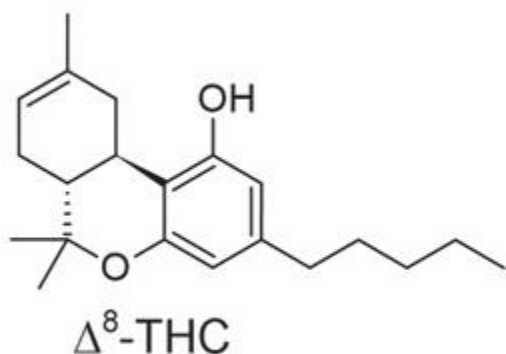


Apple Jack's 500mg THC

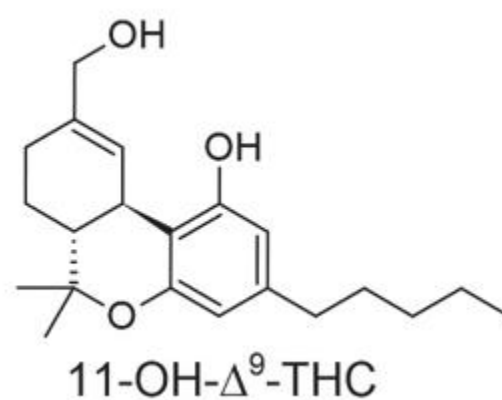
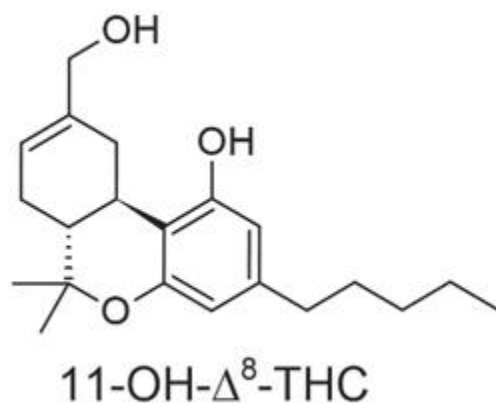
# Virginia mother charged with murder after 4-year-old son dies from eating THC gummies

- 4-year-old son died from eating THC gummies.
- Authorities said Clements **failed to get her son help quickly enough** after the boy ingested a **"large amount"** of the gummies.
- An autopsy found THC – the ingredient in marijuana that gets people high – was the cause of death.
- A doctor told detectives that the boy **could have been saved if he received medical attention sooner**, according to authorities.
- Mother claimed she called poison control after the **boy ate half of a CBD gummy** and that officials told her he would be fine, NBC Washington reported.
- But police say claims did not match evidence, where a detective reported finding an **empty THC gummy jar** in the house where he was found.

# Forensic analytical methods will need to catch-up



- Urine metabolites  
11-COOH- $\Delta^9$ -THC  
vs.  
11-COOH- $\Delta^8$ -THC



- Blood analysis

"I believe that delta-8 has a legitimate place in therapeutics and potentially adult use," Hudalla adds. "But I just don't see anybody doing it appropriately. It's all bathtub gin."

# Regardless of Opinions on Lethality, so many unknowns

## How to keep marijuana edibles out of the hands of kids?

- **Don't have them in the home**
- Store them safely
- Use Edibles with Caution
- Avoid buying THC edibles that come in packages that look just like real candies
- Talk to family members, friends, caregivers

The body takes longer to process ingested THC than inhaled THC, Kraft said. Symptoms of marijuana poisoning, such as vomiting, slurred speech and breathing difficulties, may not appear until hours after the edible is consumed, Kraft said.

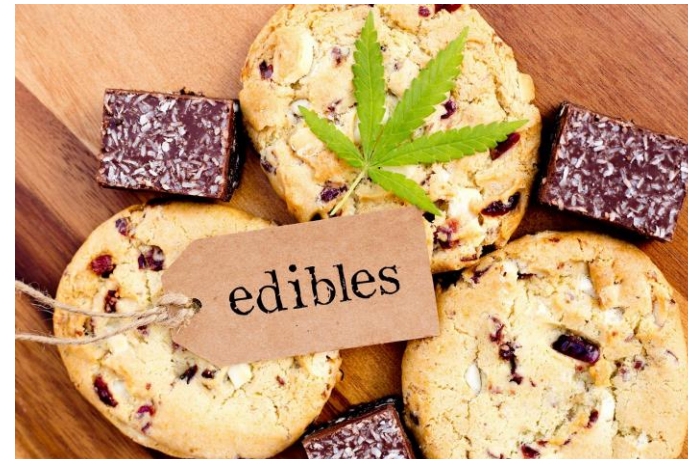
Quote from: <https://www.usnews.com/news/health-news/articles/2023-03-05/childproof-your-weed-protecting-your-kids-from-edibles>

[Edible Marijuana Dangers: How Parents Can Prevent THC Poisoning - HealthyChildren.org](https://www.healthychildren.org/parenting/articles/articles/edible-marijuana-dangers-how-parents-can-prevent-thc-poisoning)

GOOD RESOURCE: <https://www.neha.org/Images/resources/Food-Safety-Guidance-Cannabis-Infused-Products-Sept2019.pdf>

# Cannabis in the Kitchen: Not just brownies

- **Home products** will also cause confusion among children
- These infused weed foods will be even **less labeled than commercial products** unless efforts are made
- Any fat or an oil-based ingredient can be infused with cannabis.
  - Such fats include butter, ghee, lard, shortening and other vegetable or nut oils.



# **FDA Concludes that Existing Regulatory Frameworks for Foods and Supplements are Not Appropriate for Cannabidiol, Will Work with Congress on a New Way Forward**

**For Immediate Release:** January 26, 2023

**Statement From:** Janet Woodcock, M.D.  
Principal Deputy Commissioner - Office of the Commissioner



# THC Dose of Edible Cannabis Tied to Degree of Toxicity in Young Kids

— Researchers note possible thresholds for medical decisions and marijuana regulations

by [Jennifer Henderson](#), Enterprise & Investigative Writer, MedPage Today August 28, 2023

Among the 80 cases of edible cannabis ingestion, 43% of patients did not require

Furthermore, not all patients had confirmatory testing to prove cannabis exposure, and the retrospective study design was limited by the completeness of medical chart documentation.

edible was mistaken for a non-cannabis product and given to the child, and in two cases, there was co-exposure to another medication.

<https://www.medpagetoday.com/pediatrics/generalpediatrics/106069>

# NC OCME Toxicology: THC compounds

- Toxicology will need detailed notes from LE or ME regarding these products
- We do **not** routinely test for **phytocannabinoids** as they have not historically known to be lethal on its own, **we are currently only funded for cause and manner of death determination**
- We will consider adding it routinely if appropriately funded to do so
- **Currently a send-out test** to our secondary testing laboratory, which will be an additional fee to the state



# Vape

Basics  
&  
Forensic Consequences



# Vaping Basics

Invented ~2003, Increased usage driven by notion of safer than conventional nicotine products  
More increases based on celebrity popularity

- Forensic consequences will take into consideration the acute concerns from devices and direct consumption of vape fluids

**23 million likes on FB, 10 million Twitter followers**

Chris Folkerts, 32, founded Grenco in 2012, and since then the company has co-branded with artists, musicians and clothing and lifestyle companies. Their best-selling product to date is a collaboration with the rapper Snoop Dogg (\$84.95), a blue and white pen, covered by a street map of Long Beach, Calif., or "The LBC" (a homage to some of Snoop's old stamping grounds).



Child vaping risks becoming 'public health catastrophe' in UK, experts warn

New CDC report finds millions of kids are vaping

## Three main components:

1. A **liquid** cartridge used to produce the **vapor**
2. A **heating element** known as the **atomizer**
3. a rechargeable **battery** to power the atomizer

Disguised Dangers



# Marketed to Children

BAD IDEAS | MAY 1, 2018

## Government to E-Cig Companies: Stop Making Vapes That Look Like Juice Boxes

By Clint Rainey

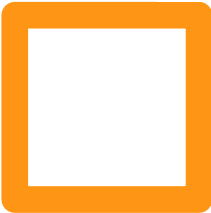
"E-liquids," as they are called, are typically a mix of nicotine, flavors and other ingredients. Ingesting them can cause nicotine poisoning - and even death - for small children.



E-liquid



Food product



<https://www.pennlive.com/life/2022/11/these-e-cigarettes-look-like-toys-candy-and-are-a-flagrant-attempt-to-target-kids-fda-says.html>

Disguised Dangers

# Vaping and schools

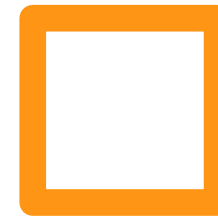
*"Smoking is gross," a high schooler said. "Juuling is really what's up."*

Products that **look like pens or highlighters** can easily be hidden by students in classrooms

**Teachers may not recognize e-cigs**, and smoke detectors won't catch the aerosol

There is **no odor**

**Note.** Some e-cigs connect to other electronic devices to play music and answer calls



# Acute Forensic Consequences:

## Vaping Explosions, Burns

- **A 15-year-old California boy** lost a half dozen teeth in **2016** when his electronic cigarette exploded in his mouth, according to the *Press Democrat*.
- **A 17-year-old boy from Baker City, Oregon** suffered injuries to his teeth, hands and face when an e-cigarette exploded in his mouth.



Image from: <https://katu.com/news/local/e-cigarette-explodes-in-teens-mouth-face-and-mouth-burned>

## Adolescent Vaping-Associated Trauma in the Western United States

Published: April 05, 2022

May 20, 2022 – A study shows that over a 4-year period, 15 teenagers were injured from exploding e-cigarettes, according to surgeons who have treated young people at nine hospitals in the United States.

Disguised Dangers

# Acute Forensic Consequences:

## Nicotine Toxicity: History

*Nicotiana tabacum* comes from the nightshade family

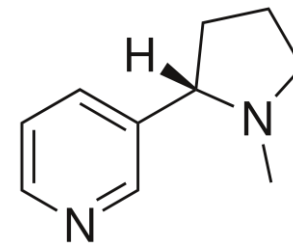


- For centuries, gardeners have used home-made mixtures of tobacco and water as a **natural pesticide** to kill insect pests
- The smoking of pipes and cigars spread quickly throughout the 1600s.
- In 1828, Wilhelm Heinrich Posselt, a doctor, and Karl Ludwig Reinmann, a chemist, both from Germany, first isolated nicotine from the tobacco plant and identified it as a poison.
- The tobacco industry exploded in 1880 when a machine was first patented to mass-produce paper cigarettes.
- Nicotine is isolated from the tobacco plant *Nicotiana tabacum* and sustains tobacco addiction



# Acute Forensic Consequences:

## Nicotine Toxicity



- **Chewing or snorting tobacco products usually releases more nicotine into the body than smoking.**
  - Low nicotine doses stimulate the neural/cardiovascular systems, awakening effect with increased heart rate and blood pressure
  - **High doses suppress the vital systems**
- Other early features of nicotine ingestion at mild to moderate toxic doses are a burning sensation in the mouth and throat, nausea, vomiting, abdominal pain, headache, confusion, dizziness, weakness, miosis, urination and defecation.
- Ingestion of higher doses leads to arrhythmias, bradycardia, convulsions, coma, respiratory failure, rapid progression to hypotension, and death
- A lethal dose of nicotine has been estimated to be as less as 40mg in adults and 1 mg/kg in children. **However, it is recommended that children who have ingested 0.2 mg/kg or more of nicotine Be Seen by a professional**
- In one case, the patient ingested 5 mL (50 mg) of liquid nicotine, which corresponded to a dose of 3 mg/kg higher than the lethal dose which directly caused cardiopulmonary arrest and hypoxic brain damage.

Nicotine E-liquids

Labeled nicotine concentrations ranging from 6-22 mg/mL

Disguised Dangers

## Case report

Korean J Pediatr 2016;59(12):490-493

<https://doi.org/10.3345/kjp.2016.59.12.490>

pISSN 1738-1061 • eISSN 2092-7258

# Accidental ingestion of E-cigarette liquid nicotine in a 15-month-old child: an infant mortality case of nicotine intoxication

An Deok Seo, MD, Dong Chan Kim, MD, Hee Joon Yu, MD, Min Jae Kang, MD, PhD

Department of Pediatrics, Hallym University Sacred Heart Hospital, Hallym University College of Medicine, Anyang, Korea

- At the time, **no regulations regarding childproof bottling and packaging** or warning signs on liquid nicotine products
- **Parents of Child provided 5mL of liquid nicotine** mistaking it for cold medicine (concentration: 10 mg/mL)
- When the emergency medical technicians arrived, she was found to have pulseless electrical activity. Spontaneous circulation was restored after approximately 40 minutes of CPR
- **The cotinine level in her urine was 1,716 ng/mL**
- Despite intensive supportive care, severe anoxic brain injury was found on computed tomography and the child ultimately died.
- This fatality highlights the need for public health efforts to minimize such accidents.

ARTICLE | JUNE 01 2016

# Pediatric Exposure to E-Cigarettes, Nicotine, and Tobacco Products in the United States

- From January 2012 through April 2015, the National Poison Data System received 29,141 calls for nicotine and tobacco product exposures among children younger than 6 years, averaging 729 child exposures per month.
- Cigarettes accounted for 60.1% of exposures, followed by other tobacco products (16.4%) and e-cigarettes (14.2%). **The monthly number of exposures associated with e-cigarettes increased by 1492.9% during the study period.**
- Children <2 years old accounted for 44.1% of e-cigarette exposures, 91.6% of cigarette exposures, and 75.4% of other tobacco exposures.
- **One death occurred in association with a nicotine liquid exposure.**

## Child-resistant packaging for liquid nicotine refills

As of 2016, the federal government requires liquid nicotine to be sold in childproof packaging.

# Case closed in Fort Plain liquid nicotine death

Police: 18-month-old boy accidentally consumed e-cigarette ingredients

Keshia Clukey

April 12, 2015 | Updated: April 13, 2015 7:10 a.m.

- In 2014, an 18-month-old Montgomery County boy drank liquid nicotine
- first child in the country to die from accidentally swallowing the toxic ingredient in electronic cigarettes
- **The house was in disarray** because a family member was in the process of moving in.
- Not knowing that Eli was going to be at the house, **a relative left an uncapped bottle containing a nicotine solution on a low table** in the dining room.
- The parents had their backs turned, unaware of the open bottle, according to the summary.
- When they looked back, the toddler was holding the opaque brown bottle.
- According to the coroner's report, he died from nicotine ingestion, which caused cardiac arrhythmia.



[Image from: Case closed in Fort Plain liquid nicotine death \(timesunion.com\)](http://timesunion.com)

# Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products

- Sixty-eight deaths have been confirmed in [29 states and the District of Columbia](#) (as of February 18, 2020).
  - Some deaths in patients less than age of 18
  - E-cigarette or vaping product use-associated lung injury (EVALI)
    - Laboratory data show that [vitamin E acetate](#), an additive in some THC-containing e-cigarette, or vaping, products, is strongly linked to the EVALI outbreak.

# Lack of regulation: Synthetic Cannabinoids?

The identified components of each of the three Buzz brand e-liquid

Contents	Blueberry B Juice	Regular B Juice	Vampire B Juice
Ethanol	X	X	X
Glycerin	X	X	X
Propylene glycol	X	X	X
Flavorents	Blueberry B Juice	Regular B Juice	Vampire B Juice
Amyl isovalerate	X		
Ethyl butanoate			X
Ethyl 3-hydroxybutanoate	X		
Ethyl Isovalerate	X		
Ethyl maltol			X
Ethyl phenyl acetate		X	
Folione	X		
Glycerin	X		
Hydrocinnamic acid			X
5-Hydroxymethylfurfural		X	
Isovanillin			X
Linalool	X		
Methyl anthranilate	X		
Peach lactone			X
Raspberry Ketone	X		X
Raspberry Ketone PG	X		X
Triethyl citrate		X	
Drug (NPS)	Blueberry B Juice	Regular B Juice	Vampire B Juice
MDMB-FUBINACA	X	X	X

Michelle R. Peace<sup>a</sup>, Rose I. Krakowiak<sup>a</sup>, Carl Wolf<sup>a,b</sup>, Alphonse Poklis<sup>a,b,c</sup>, and Justin L. Poklis<sup>c</sup>

*Forensic Sci Int.* 2017 February ; 271: 92–97. doi:10.1016/j.forsciint.2016.12.031.

- This study characterized **commercially available e-liquids** with no advertised content.

- designer drugs such as MDMB-FUBINACA can be found in commercially available electronic cigarette products.

- This drug was demonstrated to aerosolize and, therefore, has the potential for respiratory delivery.

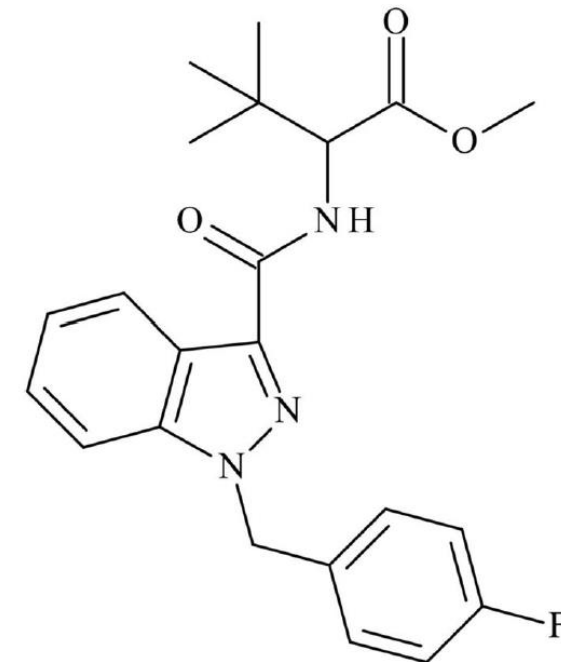
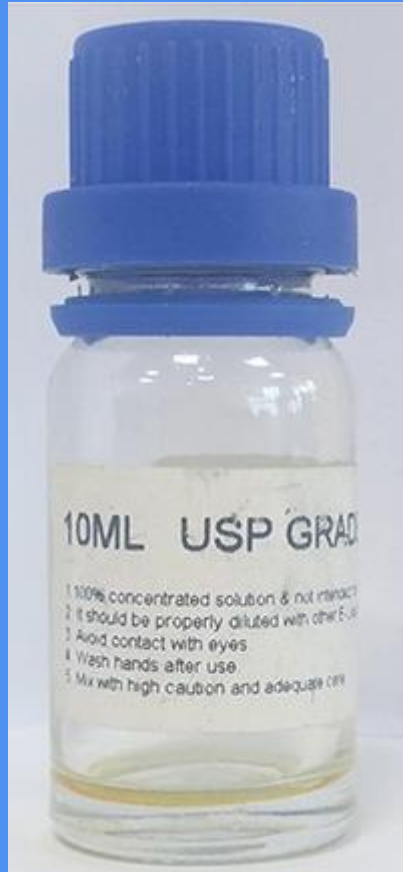


Figure 1.  
Chemical Structure of MDMB-FUBINACA

## The Emerging Method of Suicide by Electronic Cigarette Liquid: a Case Report

[Eun Jung Park](#) and [Young-Gi Min](#)<sup>✉</sup>

► [Author information](#) ► [Article notes](#) ► [Copyright and License information](#) ► [Disclaimer](#)



- Due to the large amount and the high nicotine concentration of EC liquid, the ingestion for suicide can lead to cardiac death.
- We had two patients, a 27-year-old male who ingested about 23 mg/kg of nicotine and a 17-year-old female who ingested about 30 mg/kg of nicotine.
- Both patients presented seizure-like movement and cardiac arrest. They had metabolic acidosis and transient cardiomyopathy.
- The latter patient was the first adolescent to date with an attempt of committing suicide by ingestion of EC liquid.
- They were ultimately discharged with a cerebral performance category of 2 and 4, respectively. Increasing EC use may produce more cases of medical problems or suicide by nicotine intoxication.

"We are fortunate to know the risks of cigarette smoking, based on decades of epidemiological research." Warner said. "It could take years before we know the full health impact of vaping, if indeed we ever will."

## **Public Health Benefit?** **Public Health Risk?**



# NC OCME Toxicology:

## Vaping compounds

- Toxicology will need detailed notes from LE or ME regarding these devices
- Because of COVID increases without increases to our staff, we **no longer** routinely test for nicotine unless we are still seeking a cause of death. For pediatric cases we will often add an organic base screen to capture any toxic concentrations of nicotine
- We do **not** currently routinely test for synthetic cannabinoids unless we are still seeking a cause of death.
- We are not funded for routine surveillance and cannot screen every case for SynCanns
- We are monitoring to keep up with drug trends and if needed we can send to secondary testing laboratory or not profits that can re-analyze for us.

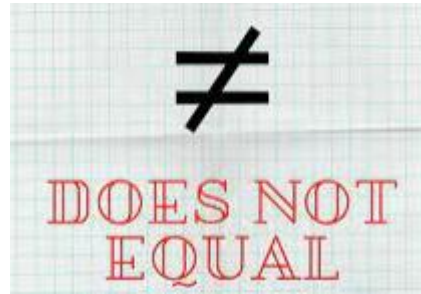




# Supplements

**Iron, Amygdalin, Melatonin**

# Dietary Supplements Vitamins



## Completely Safe



## Toddler Deaths Resulting from Ingestion of Iron Supplements -- Los Angeles, 1992-1993

- During June 1992-January 1993, five children aged 11-18 months in the Los Angeles area died after ingesting iron supplement tablets
- An 11-month-old girl died in December 1992. A 2-year-old sibling had fed the younger child 30-35 **prenatal iron tablets**.
- Acute onset of gastrointestinal symptoms (i.e., vomiting and diarrhea) that may progress to shock, coma, seizures, and death.
- Hepatic and renal failure and cardiovascular collapse
- Gastrointestinal obstruction and hepatic cirrhosis

February 19, 1993 / 42(06);111-113

**Morbidity and Mortality Weekly Report**  
Centers for Disease Control and Prevention  
1600 Clifton Rd, MailStop E-90, Atlanta, GA 30333,  
U.S.A

Disguised Dangers



## Acute Cyanide Toxicity from Amygdalin

Laetrile, also known as vitamin B17, is a semi-synthetic form of amygdalin isolated from the seeds of apricots. Clinical data does not support claims that it is of benefit for cancer. **Banned in the U.S. by the FDA due to lack of effectiveness and potential for serious adverse effects, it is still possible to buy laetrile on the internet.** Fruit kernels can also be purchased on the internet and in health food stores as vitamin supplements.

Vital sign abnormalities from cyanide include tachypnea, Kussmaul's respiration, respiratory arrest and hypotension. Patients experience vomiting, diarrhea, abdominal pain, dyspnea, weakness, lightheadedness and cyanosis, which then can progress to coma, seizures, dysrhythmias and cardiovascular collapse.

<https://archive.hshsl.umaryland.edu/bitstream/handle/10713/6232/October%202017%20ToxTidbits.pdf;jsessionid=357322A3F864D5474C5282578197B70B?sequence=14>

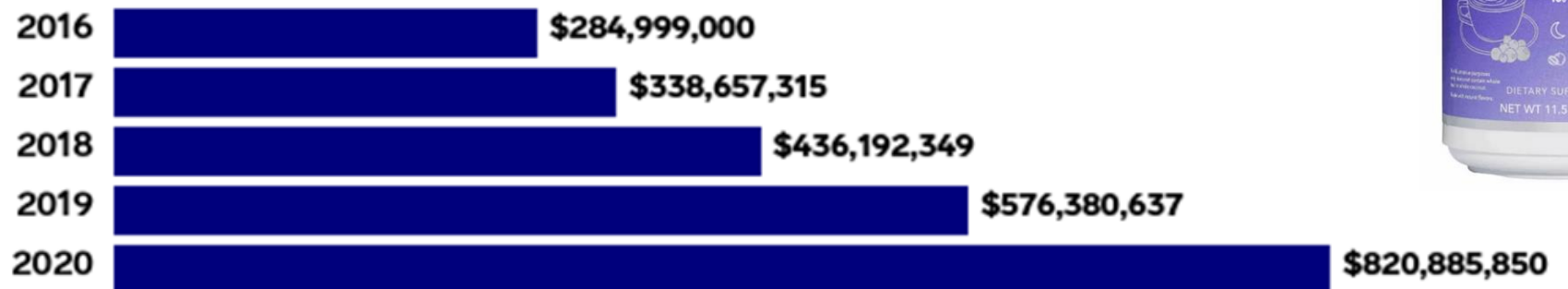
# Supplement Disclosure

- I have no financial disclosure or conflicts of interest with the presented material, including OTC products discussed.
- These are *my views* and do not reflect the views of my employer.
- **I am not a prescribing physician.** I am a board-certified forensic toxicologist. **My views on melatonin relate to the pediatric postmortem population.** Any questions about supplements should be taken to your primary care physician.

# Melatonin and COVID

- Sales of melatonin supplements skyrocket as consumers seek sleep help
- Experts worry high demand, little federal oversight, and insufficient data leave the industry ripe for scams.

**Melatonin sales, 2016–2020**



# Melatonin companies advertise for parents and kids



- Safe & effective gummies, promotes peaceful sleep, no drugs
- **Nighty-night, sleep tight, doctor founded, chocolate supplement**
- Helps you fall asleep faster, stay asleep longer
- *Healthy Sleep. Happy Family.*
- Helps your child fall asleep naturally, drug free and non-habit forming
- **Mommy's BLISS, KIDS SLEEP**
- Soothing sleep support, Healthy, Restful Deep Sleep Cycles
- **Sleep-a-saurus healthy sleep cycle support**



# American Academy of Pediatrics, Hospital advice on Melatonin

- Boston Children's Hospital does not recommend melatonin for healthy, typically developing children under the age of 3.
- The American Academy of Pediatrics (AAP) encourages parents to talk with their pediatrician before their child takes melatonin supplements. Pediatricians can answer questions and offer guidance on how and when to use melatonin.

My pediatrician's office told me that the doctors should be following what the American Academy of Pediatrics says.



# Melatonin and childcare in the news

LPD: Nanny fed children Melatonin gummies mixed with Jell-O

Texas

Cincinnati Recreation Center employee quits after being caught giving kids melatonin

Ohio



Three daycare workers were arrested after allegedly giving children melatonin before naptime — here's why that's a terrible idea

Illinois

*Ex-Day Care Director Fed Children Melatonin, Police Say*

church day care in Indiana

Four daycare workers arrested for allegedly giving 27 children melatonin without parents' knowledge

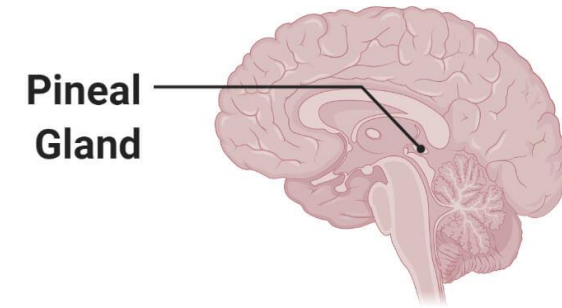
Tennessee

California day care worker gave children Melatonin to 'help them sleep': Officials

Her son, Julius, told the station that he had been handed a red drink with white flakes in it before nap time.

California

# Melatonin Facts



- Neurohormone developed in pineal gland
  - **Pineal gland develops completely postpartum**
  - Newborn infants don't make endogenous melatonin (supplied through placenta and milk).
    - At **peak** circadian rhythm, human breast milk will contain ~24 pg/mL
    - Melatonin secretion, sleep-wake rhythms and body temperature rhythm do not exhibit circadian variation in a child until **9-12 weeks of age**



Question: My baby has 12 months, can she use it?

Answer: It's recommended for ages 2+, I read on it and if given to smaller children in regular doses it can cause child to have seizures in their sleep since it is adding more of a "sedative" to the brain than their tiny bodies already produce. It is safe if you give less than the recommended dosage. We give about 25% of the recommendation to our 18 month old and we've been using it that way since he was about 12 months. Hope this helps. [see less](#)

By Johnny on July 7, 2021

Absolutely. I give it to my son, whose 15 months now. I've been using this for quite a while. It's all natural, healthy, & very beneficial. It helps my baby calm down into a very peaceful sleep. I highly recommend it.

By Amazon Customer on May 19, 2021

I used it for my 10 month old who developed sleeping habits of a new born and it had no effect on him.



★★★★☆ try it n see it would work

Reviewed in the United States on September 16, 2020

Size: 2 Fl Oz (Pack of 1) | **Verified Purchase**

I've read all the reviews for this thinking this could help my 2 year old grandson who refuses to sleep no matter what we tried. His pediatrician even recommended this product to help... First time, it worked great, second night it took longer, in rest of the week, no longer working.. I feel bad for my grandson, he doesn't get any naps in the afternoon so thinking bedtime he would definitely sleep. between Melatonin bath time n then do the drops together would have some help... 😊 but still nothing

★★★★★ This stuff is magical

Reviewed in the United States on August 18, 2020

Size: 2 Fl Oz (Pack of 1) | **Verified Purchase**

Whether your child has a hard time sleeping or staying asleep, believe me when I say this stuff WORKS. My young daughter was taking 20mg of melatonin a night and still waking up several hours after bed. The first night we used this, she slept all night and awoke refreshed, for the first time in several years. The taste is a bit sour at first, but after a week of using it she asks for it before bed. I've eliminated melatonin and Benadryl completely, and she's super sleepy within 30 minutes of taking it.

★★★★★ Life saver

Reviewed in the United States on January 16, 2019

I love this product! It settles my 26m old in 15 minutes she is ready to cuddle and fall asleep! Before I found this product she would be up for hours even while laying in the dark with her it's like she had no off switch. This sleep berry is magic, so glad our bedtime is now 8pm & not midnight!

280 people found this helpful

- Many products recommend for ages 2+
- Some reviews: doctor and pediatrician recommended
- Lots of opinions!

# Melatonin information

JOURNAL ARTICLE

## Melatonin Supplementation in Undetermined Pediatric Deaths [Get access >](#)

Sandra C Bishop-Freeman ✉, Kerry A Young, Laura M Labay, Michael C Beuhler, Jason S Hudson

*Journal of Analytical Toxicology*, Volume 46, Issue 8, October 2022, Pages 808–816,  
<https://doi.org/10.1093/jat/bkac033>

**Published:** 27 May 2022 **Article history** ▼

**(Endogenous human breast milk at peak concentration: ~24 pg/mL)**

**(Endogenous peak plasma for young adult during darkness: ~0.09 ng/mL)**

**(Exogenous peak serum in adult after 80 mg dose: ~33 ng/mL)**

Qualitative screen at NC OCME in Organic Base Extraction, Quantitation from secondary laboratory.

*The Atlantic*

## Something Weird Is Going On With Melatonin

Pediatric overdoses have increased by 530 percent over the past decade.

BY JACOB STERN



## Sleep experts caution against melatonin supplements for small children

*While it's tempting to give kids a supplement, it turns out better sleep habits are more helpful than melatonin, which can cause issues in children.*



by **Taylor Knopf**

October 17, 2022

## The Toxpod

5 in 30 (Mushrooms, chemical warfare, and machine learning)

MARCH 07, 2023



LISTEN ON



SHARE EPISODE



NEWS

## NC Poison Control discusses melatonin dangers in kids as poisonings jump nationwide

by: **Liz Ortiz**

Posted: Jul 19, 2022 / 05:30 PM EDT

Updated: Jul 19, 2022 / 06:04 PM EDT

Bishop-Freeman, S. et al. Melatonin supplementation in undetermined pediatric deaths. (2022) Journal of Analytical Toxicology, <https://doi.org/10.1093/jat/bkac033>.

# Melatonin and Unsafe sleeping Questions

- UNC Pediatric Sleep expert said: A melatonin supplement is not a sedative!
- Literature said: Melatonin's mechanism remains unknown.
- Does exogenous melatonin impact a baby's ability to correct sleeping position?
  - Is there an increased odds of suffocation from unsafe sleeping position?

**"It's a prescription of desperation really; doctors don't know what to do about sleep and feel they have no alternatives," Stanley said. "That is terrible as it affects all body clocks and it will affect children's developmental clocks and we have no idea what that does."**

Quote from: Marsh, Rise in melatonin use to help children sleep leads to safety warning, The Guardian, Nov 2018.

Image from: <https://amotherfarfromhome.com/infant-safe-sleep/?nowprocket=1>



# Melatonin (re)considerations from the literature

- In Europe, melatonin is a “neurohormone” and **cannot be sold OTC**
- Listed as “possibly safe” for children when taken by mouth for a **short period of time**,  
but “should be reserved for children with a medical need.”
- Considering extensive and yet not known effects on development, it **should not be used by pregnant or breast-feeding women before further studies**.
- Further studies are required to confirm that there are no **late onset adverse reactions in adult life**
  - “Should endocrine or other abnormalities appear in the future in children previously treated with melatonin, it will not be tenable to argue that we were surprised.”



Role of melatonin in embryo fetal development (2014) *Journal of Medicine and Life*, 7, 4, 488-492

Kennaway, DJ. Potential safety issues in the use of the hormone melatonin in paediatrics (2015) *Journal of paediatrics and child health*, 51, 6, 584-589.

# NC OCME Toxicology:

## Melatonin

- Toxicology will need detailed notes from LE or ME regarding these products
- We do **not** routinely test for melatonin at exogenous concentrations unless requested because of scene evidence
- Cases of exogenous melatonin in pediatric cases will be missed unless we lower our limits of detection AND receive increased funding to help routinely test. Method development/validation work will require dedicated staff positions we do not have.
- Currently a send-out test to quantitate melatonin



## HEALTH

## Thousands of kids are getting sick from downing melatonin pills

June 3, 2022 · 1:38 PM ET

THE ASSOCIATED PRESS



# Melatonin UPDATE

More kids are ingesting melatonin. Here's what parents should know.



By Elizabeth Chang

June 20, 2022 at 8:00 a.m. EDT

## Lawsuit Alleges Zarbee's Kids Melatonin Contains Higher Doses Than Claims

by [Kristen Fischer](#) | Updated: August 4, 2022

## Melatonin doled out to American kids in record numbers even as experts warn of possible dangers

By Alex Mitchell

Published Nov. 21, 2023, 3:17 p.m. ET

## Nearly 1 in 5 adolescents now using melatonin to sleep, researchers say

Younger children — including 18 percent of elementary school kids — are being given melatonin by their parents as a sleep aid, too

By Linda Searing

November 27, 2023 at 5:30 a.m. EST

[Regular melatonin use to help kids sleep now 'exceedingly common' - The Washington Post](https://www.washingtonpost.com/parenting/2022/06/20/melatonin-kids-ingestion-safety-parents/)

<https://www.washingtonpost.com/parenting/2022/06/20/melatonin-kids-ingestion-safety-parents/>

<https://www.npr.org/2022/06/03/1102933012/melatonin-poisoning-kids-sleep-aid-overdose>

<https://sleepopolis.com/news/lawsuit-zarbees-kids-melatonin/>

# Summary

We need to do better for our children.

Increase education.

Stop disguising CBD products and e-liquids.



Melatonin is an **undetermined** danger for young infants and children



Disguised Dangers



# Other Pediatric Highlights from NC OCME

## Pediatric Opioids

- Increase in pediatric fentanyl overdoses
- Mirrors adult trends
- Adult drugs found in adult beds

## Benzonatate

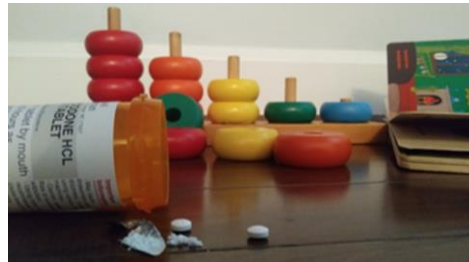
- Risk for pediatric overdoses
- Narrow margin of safety
- Understudied medication

## False-positive ethanol

- Perimortem samples from 2 pediatric cases have demonstrated a false ethanol positive hospital result not confirmed by direct analysis at NC OCME
- Accusations of giving alcohol to children based on indirect methodology have major consequences

JOURNAL OF  
FORENSIC SCIENCES  
2021 Noteworthy Articles

| Pathology/ Biology



**Pediatric opioid fatalities: What can we learn for prevention?**

Sandra C. Bishop-Freeman PhD, Kerry A. Young MS, Michelle B. Aurelius MD, Jason S. Hudson PhD

Journal of Forensic Sciences | First Published: 23 April 2021

# NC OCME Forensic Toxicology: going the extra mile

The customer service-oriented approach in toxicology

**Focuses on its customers and prioritizes customer service out of all its efforts**

The customer could be different people: the pathologist, family members, the forensic community

**Many customers have benefited from the knowledge gained through our research and dedication to postmortem pediatric research.**

## The ultimate Customer: Children, future generations



*Look for the Helpers.  
You will always find  
people who are helping.  
- Fred Rogers*

THANK  
YOU

*Sandra C. Bishop-Freeman*

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919-743-9026

