

# Episode 89: Absinthe: Thujone, Toxicity and the Myths of the Green Fairy

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## Transcript

Hi everyone, welcome back to the Tox Lab. I'm Rebecca. I'm Rob. On the 28th of August 1905, Jean Lunefray drank 7 glasses of wine, 6 glasses of cognac, coffee laced with brandy, 2 creme de mints and 2 glasses of absinthe. That evening, he shot and killed his pregnant wife and his two daughters before attempting to kill himself.

But when the case went to trial, there was one drink that became the focus of the blame. Absinthe. The question is, why? And to understand that, we need to understand the drink that became known as the Green Fairy.

And I'm sure you've already guessed, this week we're going to be looking at absinthe. Absinthe is, in my mind, iconic. It was always a mystical drink when I was a young adult. It had a fearsome reputation, something that could make you see colours, a history of being banned and outlawed, and really, it is a drink with so much lore behind it.

Yeah. And so we thought we were going to do an episode having a look at this in particular. It's unusual actually, isn't it? Because we're normally talking about the drugs themselves.

Yeah. Rather than one very specific type of alcoholic drink. But there is a reason, and we'll come on to that a little bit later on. If you want to stay up to date with our content, you can find us on Instagram at @the\_tox\_lab.

We also have a page on LinkedIn, and we're fairly active over there. And for those of you who don't use social media but still want to get in touch with episode suggestions or have comments about episodes, you can get in touch with our new website at [thetoxlab.co.uk](http://thetoxlab.co.uk). So what is absinthe? Why don't we start there?

This mythical green drink. So absinthe is an anise-flavored spirit created in Switzerland in the late 18th century by French physician Pierre Ordinaire. And it's traditionally derived from a re-distillation of a white grape spirit and botanicals including the flowers and leaves of the plant, *Artemisia absinthium*, also known as common wormwood, green anise, and Florence Fennel, and this is often referred to as the holy trinity. And these are added to the alcohol to produce a green spirit that's highly alcoholic with an alcohol content between 45 and 74%.

And some modern Franco Swiss absinthes are bottled at up to 83%. So really, really high percentage alcohol. Now absinthe is a very unique color because it's this botanical extract, effectively. It's got a really nice green color.

Yeah. And that green color actually got it a rather odd nickname. It became known as lefièvre or the translation the green fairy. And this was partly because of its color, but also partly because of its rather supernatural reputation.

So there is quite a ritual that goes on with the preparation of absinthe before you drink it. So the traditional French preparation involves placing a sugar cube on a specially designed stotted spoon over a glass containing a measure of absinthe. And then ice water is then dripped over the sugar cube. And

the final preparation contains roughly one part absinthe to three to five parts water.

And this process turns the absinthe quite cloudy due to the components in the botanicals. So the terpenoids, which have pure water solubility, so they come out of solution. And this also allows the herbal aromas to possum or bloom. And we really went to town preparing for this episode.

We did. We managed to track down a bar that actually had a specialist absinthe menu. And we were very privileged. They actually broke out the absinthe fountain and recreated this traditional pour for us.

So shout out to cases in Hove, hashtag not sponsored, but we really appreciated coming down and trying the absinthe. It was quite an experience, wasn't it? It was. Yeah, for sure.

It's got such a distinctive aniseedy taste. But I must admit, I kind of went in not really sure what to expect. I thought I'd hate it because I generally really don't like aniseedy flavored things, but it was actually quite enjoyable in the end. It was really nice to the point where we actually had a second one, which was not part of the plan.

So it really was quite a pleasant drink, actually, despite its very high alcohol content. Suspiciously drinkable. So in 19th century Parisian cafes, absinthe fountains were used, which are these ornamental ice water drip dispensers, which basically consist of a glass globe with multiple taps to allow multiple measures of absinthe to be prepared at once. And these can be quite elaborate if you do some giggling.

The designs are actually quite pretty. The five o'clock became associated with le vert, or the green hour, and this was the traditional time for an afternoon absinthe in these Parisian cafes. The bohemian method of preparing absinthe involves the sugar cube being soaked in absinthe and then set alight before dropping into the glass to allow the absinthe to ignite and then dropping a shot glass of water on it to extinguish the flames. So it's quite dramatic.

But that came a lot later. That was sort of absinthe reinvention, really. And absinthe became very popular among artists and writers, and some notable absinthe drinkers include Ernest Hemingway, Lewis Carroll, James Joyce, Charles Baudelaire, Henry D. Toulouse, Lautrec, Oscar Wilde, and Vincent Mango.

I don't know about you. It just really captures my imagination. These 19th century Parisian cafes filled with artists and poets drinking these really fancy green drinks poured from these elaborate fountains. It really was the hipster drink of the time.

Yeah. And I can see why having tried it, as I say, you know, really quite drinkable, quite pleasant, could easily go for another one. So what happened then? This was a very popular drink.

Lots of people were enjoying it. Why does it now have such a reputation? So next we're going to spend a little bit of time talking about Jean Lanfret. And Jean was a French labourer who was living in Switzerland.

And on the 28th of August, 1905, he had a sandwich for lunch and then consumed this ridiculous amount of alcohol that we listed at the beginning. So some sources say seven glasses of wine, six glasses of cognac, coffee with brandy, creme de mints, and importantly, two glasses of absinthe. He returned home with his father and got into an argument with his wife before asking her to polish his shoes for him. When she refused, he grabbed a rifle and shot his pregnant wife in the head, killing her instantly.

He then shot and killed both his daughters before shooting himself in the jaw. He was taken to hospital where he recovered and he was put on trial for the murders on the 23rd of February, 1906. And it was quite an interesting murder trial. It was argued that the two glasses of absinthe he had consumed were to blame and that he'd suffered from a classic case of absence madness.

This didn't really stick, though, and he was found guilty on three counts of murder. But this murder set off kind of a widespread panic in Switzerland and other European countries. The petition to ban absinthe received 82,000 signatures and its sale was banned in 1910 with another ban coming in the following years to prohibit the manufacture or possession in Switzerland. So there was a general fear that absinthe could turn you mad.

Yeah. And there must have been more to it than that. It kind of just been this murder trial. There must have been a background there that led to the defence suggest that it was the absinthe that turned him mad.

I think there are lots of other cases of people experiencing what was termed absintheism. So this is the term used to explain the chronic health issues thought at the time to have been caused specifically by drinking absinthe. And this included seizures, speech impairment, sleep disorders, extreme mental fatigue, rapid physical mental decline, auditory and visual hallucinations and death. So quite extreme.

Quite dramatic. And absinthe wasn't just banned in Switzerland. This ban extended to many European countries and the US. And by 1915, it was banned in the majority of places.

So one of the complications with absinthe is there is at the very least a potential pharmacological reason for why absinthe over other alcoholic beverages may have had some potential impact on people's health, mental state and so on. And that is to do with compounds found in that key ingredient, that wormwood plant. So thujane is a ketone found in a number of different plants, including *Artemisia absinthium*. And it occurs in two stereo isomers.

So you get an alpha and a beta form and they're normally found in nature in a ratio of one to two. It was initially thought because of its structure that it might act similarly to THC and act on the cannabinoid receptor. But while it's been shown to have a low affinity for the CB1 and CB2 receptors, it was not able to stimulate the downstream G protein cascade, even at high minimal concentrations.

Thujane, however, has been found to be a GABA receptor competitive antagonist inhibiting GABA receptor activation, which can allow neurons to fire more easily, leading to muscle spasms and convulsions, which are the features that are often described in absintheism. And GABA antagonists are not drugs we come across all that often. No. So unlike GABA agonists like benzodiazepines, for example, they do the opposite.

They cause this excitatory effect. In mice, the LD50 of alpha thujane is around 45 milligrams per kilo. But pre-treatment with a GABA positive allosteric modulator like diazepam or ethanol have been shown to protect against a dose of 100 milligrams per kilogram. And it's also important to note that alpha thujane is also rapidly metabolised to metabolites that do not cause any toxicity.

How does this LD50 relate to the amount of thujane present in a bottle of absinthe? So a 2008 study using GCMS to analyse bottles of absinthe pre-ban. So between 1895 and 1910 alongside post-ban samples. So from 1915 to 1988.

Can I just unpack this a moment? Yeah. They analysed bottles pre-ban. Yeah.

So they had some antique bottles of absinthe. That they've cracked open for this exact study. Wow. I know.

That is some good science. Yeah, that's some dedication to it. You know, breaking that chain of storing really, really nice old bottles of booze. Yes, they analysed these pre-ban bottles against post-ban samples.

So these were from 1915 to 1988 and samples from the early 2000s. This found an average alpha thujane concentration to be 25.4 milligrams per litre. And there wasn't really any significant difference between the pre-ban bottles, the post-ban and the early 2000s bottles either. And these concentrations are far too low to cause someone to get anywhere near the LD50 of alpha thujane.

So it is there. It's still present, even in modern absinthe. But there's not really enough there to actually cause any significant effect. Yeah.

So it doesn't seem that alpha thujane is responsible for this absintheism. So the question is, what is? And this is kind of debated. There are a few different theories.

So the actual culprit is possibly likely to be chronic severe alcoholism from drinking absinthe. It contains very, very high ethanol content. Lots of people spend many long evenings drinking it, drinking it every day. So that I think definitely plays a role.

And some of the features seen in absintheism can be seen in quite severe alcohol withdrawal and sort of presents similarly to delirium tremens, which is something we've talked about in this podcast before. There's another thought that cheaper versions of absinthe may have also been adulterated, possibly with impure alcohol containing methanol and some possibly poisonous colorants to make that vivid green color. So a distilled absinthe does generally come out colorless. And then you can also artificially dye it to be that vibrant green color.

It's not always from the botanicals. So some colorants that might have been used include copper salts and cupric acetate, and this can cause symptoms of copper excess, including hepatic cirrhosis, tremors, depression, and psychosis. Antimony trichloride was often added to enhance that cloudy emulsion effect. So that leish effect.

And this can cause nausea, vomiting, abdominal pain, acute liver injury, and nephrotoxicity. Certainly sounds like there could be something in that, doesn't it? A combination of very high alcohol and potentially some of these potential contaminants. So as we've mentioned, there are quite a few famous names that are associated with drinking absinthe.

Vincent van Gogh was known to frequently drink absinthe, and there were some theories, some rumors that the halo effects and swells found in the painting *Starry Night* was the result of drinking absinthe. But we do know that van Gogh had many physical and mental illnesses. It's not quite known what was going on with him, so it's hard to say whether absinthe played any role in his very vivid paintings. I've heard Digitalis, Foxglove, also being responsible for some of the halo.

Yeah. Maybe have to have an unpack of that one at another point in the future. Yeah, and that's definitely on the list of things. They also think now that he suffered from acute intermittent porphyria as well, so that had a role.

So there are lots of other explanations for it. Yeah. Oscar Wilde also apparently described a phantom sensation of having tulips brush against his legs after leaving a bar at closing time after drinking absinthe, which I think is quite an interesting description. It's quite a description, isn't it?

How would you know it's tulips? Maybe he enjoyed running through fields of tulips, I don't know. So that is absinthe, but whenwood's not the only plant that contains thujone, and we have found a case study in which an individual was making a decoction of mugwort, which also contains thujone. So a 49 year old male was admitted to the University Hospital of Zurich in a manic state.

The patient stated that he habitually drank a liter a day of an infusion made from *A. vulgaris*, also known as mugwort, and had been doing this for three years. Blood samples were collected on admission and the following day, with urine also being collected the day after admission. The concentration of thujone in serum was measured and on the day of the admission was found to be a concentration of 25 micrograms per millilitre. And this was also similar the day after his admission.

This paper is quite interesting. They looked at two different methods of detecting thujones. They used GC flame ionization detection and HPLC with the fluorescence detector as well. So what does this concentration really mean?

So there have been a couple of studies. So one of them was where two subjects had consumed 110 mL of absinthe containing 3.85 milligrams of thujone. And they did not have a detectable concentration of thujone in their blood. Another study involves volunteers consuming 300 micrograms of thujone and they have plasma levels varying from 23.4 to 39.3 nanograms per liter.

So there's quite a concentration difference between the concentrations found in the blood in this case versus the concentration in those sort of controlled studies. I think the only thing with this one that makes me question it slightly is he claims he's been doing this for years. And then suddenly presents. It's not a compound that accumulates.

It's got quite a short half life. But it is quite lipophilic. So is there some sort of tissue accumulation that's gone on? I don't know what would have precipitated it coming out of tissues to cause a sort of manic effect, but.

OK, so actually, when we say it's cleared quite fast, it might not actually be cleared that fast. It might just redistribute quite fast. But like THC. Yeah, and he had been consuming it over three years.

There was plenty of time for this to have accumulated into tissues. Interesting. That is interesting. Yeah.

And what was his symptoms? He was he presented in what they described as a manic state. So potentially associated with gabber antagonism. Yeah.

Interesting. Yeah. Very interesting. So this case study is what true absintheism would be if it were the thujone.

Yeah, if you could drink enough thujone before, I think, probably dying of ethanol toxicity, alcohol poisoning. Yes. As I say, I've always been fascinated by absence when I was a young adult. It always intrigued me.

The law that came with this drink. It definitely has a reputation. And so it was a real privilege to be able to actually enjoy it like the Parisians were. Yeah.

I can see why artists and writers would spend their evenings drinking it. So let's look a little bit at its reputation then, because some of the things I heard growing up was that it causes changes in color and hallucinations. What's the explanation for that? I mean, it's not just associated with like alcohol withdrawal and the sort of hallucinations you get with that.

And it's being blamed on absence because of this law. So it's not going to be psychedelic like hallucinations. Yeah. Well, that would make sense.

Yeah, that would make sense. This is the trouble with the word hallucination, isn't it? Because it actually means quite a few different things. Yeah.

And it means different things to different people as well. So yeah, that's quite hard to know what people are describing when they say they're experiencing hallucinations. And I've definitely met at least one person who claims to have had absence and they say they saw color. Oh, OK.

But I think that possibly is just psychological placebo effect. I mean, that is true. I think if someone tells you enough that it's going to do something, you're going to feel it a little bit, aren't you? Yeah.

So what happened to our killer at the start? He was found guilty. Yeah, yeah. He was charged with three counts of murder.

I think went to prison. And I believe I think three days later after he was charged and sent to prison, he did end up taking his own life. So never actually served his sentence that the crime he committed. And we haven't really talked about it, but absence did undergo a bit of a revival.

Yeah, many, many years later, late 90s, early 2000s. There was a drive to make absence legal again. Actually, I'm not sure it ever was officially banned in the UK. I have a feeling there was no specific law outlawing absent.

It's just a lot of places stop producing it. Yeah. And then it's hard to get hold of effectively as banned. Yeah, but it has come back.

And as I say, we had we had a great time in that at one bar, but also it becomes a little bit of a hipster ingredient in certain cocktail recipes as well, occasionally. Yeah. I can see it sort of having a bit of an ongoing kind of cult status as a drink. Yeah, for sure.

Well, I hope you've enjoyed listening to us this week as we explore this rather unusual world of Absinthe and some of the science behind it and what the science supports and what it doesn't. Do give us a like, give us a follow, share us with your friends. We'd really appreciate that. Hope you all have an amazing week and we'll see you next time.

Bye.