The absinthe challenge

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In the present ‘spirituous’ challenge, the legendary absinthe is the topic. And please note that there is a prize to be won (a Springer book of your choice up to a value of €100). Please read on...

“At the Latin festival when four-horsed chariots race on the Capitol the victor drinks absinthe, because, I believe, our ancestors thought that it was an honorable reward to be given health.”

Pliny the Elder, *The Natural History*
Book XXVII, Chap. 28

Meet the absinthe challenge: the story and the myth

Absinthe is a well-known green-colored herbal spirit made chiefly from three botanicals—wormwood, anise, and fennel. Although Pliny historically mentions a wine called “absinthium” prepared by adding the herb of wormwood, the spirit drink known as absinthe was created in French-speaking Switzerland in the late eighteenth century [1, 2]. Absinthe reached a great popularity in the early nineteenth century when it became one of the most enjoyed drinks in Europe and North America. The poor grape harvest in that era contributed towards the massive consumption of absinthe over wine, and so did its lower price. Many were fond of the

“green fairy”, which included bohemian celebrities Vincent van Gogh, Paul Gauguin, Toulouse-Lautrec, Charles Baudelaire, and Edgar Allan Poe. Consequently, absinthe was celebrated in poems and paintings alike. Think of *The Absinthe Drinker* by Manet (ca.1859), Degas (1876), or Picasso (1903), just to name a few artworks that further contributed to the popularity of absinthe.

However, the popularity of absinthe took a sudden hit when it was singled out for several psychotic effects—seizures, hallucinations, or mental prostration—all of which were summarized under the term absinthism [3]. In particular, the monoterpene thujone was considered the active ingredient of absinthe. As a consequence, absinthe was banned in Belgium in 1905, and this example was soon followed by Switzerland (1908), USA (1912), Italy (1913), France (1915), and Germany (1923).

The prohibition of absinthe was caused by the belief that it was an important source for dietary intake of thujone, which in turn was considered the active ingredient of the green spirit. Indeed, there are claims of large levels of thujone in absinthe—almost ten times above the modern levels considered safe [4]. However, in the nineteenth century the determination of thujone relied on nonspecific methods such as the iodometric titration or colorimetric reaction with nitroprusside [5, 6], neither of which can tell us much about the thujone specifically. The advent of mass spectrometry opened the doors to reliable determination of thujone. In particular, gas chromatography–mass spectrometry (GC–MS) now allows the reliable determination of thujone [7, 8]. Indeed, a recent report showed that levels of thujone as determined by GC–MS in a vintage bottle of Pernod absinthe were around 2 mg/L, which is far below the levels claimed in the nineteenth century, and far below the limit currently imposed by the European Community (35 mg/L in bitters) [9, 10].

The detrimental effect of absinthe (absinthism) could very well be due to poor-quality absinthe rather than the thujone content. For example, copper sulfate and antimony chloride were sometimes added to obtain the green color and the milky opalescent effect, respectively [4]. The thujone story is indeed

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Fig. 1 Preparation of absinthe: from the green spirit to the opalescent long drink

a sad chapter in the history of science because absinthe was vilified without any scientific proof. Interestingly, large amounts of thujone are found in our kitchens.

Can you name a common kitchen herb whose oil contains ca. 40 % thujone?

After its decline in popularity, absinthe experienced a resurrection in 1988, when the European Commission allowed the processing of thujone-containing plants, such as wormwood, in alcoholic spirits [10]. A few studies have recently contributed to redeem absinthe, demonstrating the harmlessness of the green aperitif and the inconsistency of the bogus “absinthism syndrome”, which is now considered as a misunderstood alcoholism syndrome [9, 11, 12]. Ironically, there is more thujone in a modern commercial absinthe than in the century-old absinthe samples [13].

The challenge

The recipe for absinthe varies among producers yet a good absinthe always contains wormwood and an ethanol volume concentration of ca. 70 %. The production of absinthe begins with maceration of wormwood and other herbal plants (anise, fennel, hyssop, and melissa), followed by their distillation. Usually, the head and tail of the distillate are not included in the final product, because they contain substances that give unrefined taste to the spirit. At this stage, the distillate is transparent and colorless and the typical green color is achieved by adding undistilled macerate to the distillate.

Prior to enjoying absinthe, the green spirit must be diluted in cold water. The “rite” requires a classical absinthe glass (conical with a swollen bottom) and a spoon with a fancy integral sieve. A dose of absinthe is poured into the swollen part of the glass. The spoon is then set on the edge of the glass and a sugar cube is placed on top. Cold water is then slowly poured onto the sugar; the liquid percolates through the sieve and dilutes the spirit. During this process, the transparent absinthe turns milky (opalescent) (Fig. 1).

Why does the absinthe turn opalescent when cold water is added to it?

What happens when warm water is added instead?

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The next Analytical Challenge will be published in 406/12, May 2014. If you have enjoyed solving this Analytical Challenge you are invited to try the previous puzzles on the ABC homepage.