

## Brief Report

## POISON ON LINE — ACUTE RENAL FAILURE CAUSED BY OIL OF WORMWOOD PURCHASED THROUGH THE INTERNET

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**M**YOGLOBIN released during muscle injury can precipitate acute renal failure.<sup>1,2</sup> There are many causes of rhabdomyolysis, including excessive exercise, “crush” injuries, seizures, infections, severe potassium and phosphate depletion, staphylococcal toxins, venoms, and licit and illicit drugs, including ethanol.<sup>2-4</sup> Intoxication with the liqueur absinthe (derived from oil of wormwood) has not been associated with rhabdomyolysis or acute renal failure. We report the case of a patient who was hospitalized after drinking essential oil of wormwood purchased through the Internet.

### CASE REPORT

A 31-year-old man was found at home by his father in an agitated, incoherent, and disoriented state. Paramedics noted tonic and clonic seizures with decorticate posturing. In the emergency room, he was lethargic but belligerent. His mental status improved after treatment with haloperidol, and he reported finding a description of the liqueur absinthe at a site on the World Wide Web entitled “What Is Absinthe?” (<http://www.gumbopages.com/food/misc/beverages/absinthe.html>).<sup>5</sup>

Later, the man obtained one of the ingredients described on the Internet, essential oil of wormwood. The oil was purchased electronically from a commercial provider of essential oils used in aromatherapy, a form of alternative medicine. Several hours before becoming ill, he drank approximately 10 ml of the essential oil, assuming it was absinthe liqueur.

The patient had no history of neuromuscular or kidney disease or alcohol dependence or abuse. He was afebrile, his pulse was 90 beats per minute, his blood pressure 103/52 mm Hg, with no orthostatic change, and his respiratory rate was 16 per minute. There was a small tongue laceration. The patient was listless but communicative and oriented as to person, place, and time. He had no focal neurologic abnormalities, and the remainder of the examination was normal.

Laboratory studies revealed hypernatremia, hypokalemia, and

hypobicarbonatemia (Table 1). The patient’s arterial-blood gas values while breathing oxygen were as follows: pH, 7.27; partial pressure of carbon dioxide, 43 mm Hg; and partial pressure of oxygen, 133 mm Hg. The results of lumbar puncture were normal, as were those of computed tomography of the head. Toxicologic screening tests of blood and urine were negative. The urine was yellow, with a positive (4+) dipstick test for blood. Microscopy showed tubular casts but no crystals or white or red cells. A urinary ammonium sulfate precipitation assay for myoglobin was negative. No discoloration of the serum was noted.

On the second hospital day, the patient had moderately intense, bilateral soreness of the leg muscles. The serum creatine kinase concentration was markedly elevated (Table 1). The patient was treated with intravenous sodium bicarbonate and saline. Congestive heart failure developed, which was treated with diuretics, sodium restriction, and discontinuation of alkalinization. The serum creatinine concentration increased to a peak value of 4.4 mg per deciliter (390  $\mu$ mol per liter) on the third hospital day and then declined (Table 1). At no time did the patient have oliguria, hypocalcemia, or hypophosphatemia. His muscle soreness subsided quickly. He had no further symptoms, and his serum electrolyte, creatine kinase, and creatinine concentrations were normal on day 17, nine days after discharge.

The manufacturer of the oil the patient had drunk confirmed that it consisted solely of essential oil of wormwood, unadulterated with licorice, glycyrrhizic acid, or anise.

### DISCUSSION

This patient’s seizure, probably caused by essential oil of wormwood, apparently led to rhabdomyolysis and subsequent acute renal failure. The underlying mechanism is unknown. The results of the initial studies indicated anion-gap metabolic and respiratory acidosis. The large anion gap is typical of the early phases of rhabdomyolysis and was probably due to the accumulation of lactate, ketone bodies, and other intracellular organic intermediates because of muscle injury and renal dysfunction.<sup>6</sup> Gas chromatography–mass spectrometry performed on the remaining fluid from the patient’s drink failed to reveal the ingredients, but methanol, ethanol, and ethylene glycol were not present in it or in the patient’s blood or urine. No commercial assay for essential oil of wormwood is available.

The positive tetramethylbenzidine reaction in the urine also suggested myoglobinuria, but the ammonium sulfate precipitation test was negative. False negative results may occur with precipitation tests, in contrast to more accurate immunochemical methods, because of the rapid renal clearance of myoglobin, its poor stability in urine, or its presence in urine at a concentration below the analytic sensitivity of the assay.<sup>7-9</sup>

A French liqueur made from the wormwood plant (*Artemisia absinthium*, Fig. 1), absinthe originated in the 18th century.<sup>5</sup> The use of extract of wormwood is recorded in ancient Egypt, and its ingestion to exterminate abdominal tapeworms dates to the Middle Ages.<sup>5</sup> In the early 1800s, Henri-Louis Pernod began the production of absinthe, a distillate of wormwood, alcohol, herbs, and seeds.<sup>10</sup> Soon thereafter, the drink, known for its tart taste and dazzling

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**TABLE 1.** BIOCHEMICAL VALUES IN A PATIENT WITH RHABDOMYOLYSIS AND ACUTE RENAL FAILURE ASSOCIATED WITH INTOXICATION WITH OIL OF WORMWOOD.\*

VARIABLE	IN EMERGENCY ROOM	DAY 1	DAY 3	DAY 5	DAY 7	DAY 17
Serum sodium (mmol/liter)	155	140	141	142	143	140
Serum potassium (mmol/liter)	3.0	4.5	4.8	4.1	4	4.7
Serum chloride (mmol/liter)	106	109	109	102	102	99
Serum bicarbonate (mmol/liter)	7.7	17.6	22.7	37.2	28.9	25.6
Serum urea nitrogen (mg/dl)	10	15	29	23	18	15
Serum creatinine (mg/dl)	1.4	2.0	4.4	3	2.2	1.1
Anion gap (mmol/liter)	41	13	9	3	12	15
Serum creatine kinase (U/liter)			>80,000	54,396	12,143	134
Serum lactate dehydrogenase (U/liter)			10,694	5,164	1,302	593
Serum aspartate aminotransferase (U/liter)			626	376	185	25
Urine dipstick test for blood	+	+	+	+	-	ND
24-hr urine volume (ml)		800†	2,350	2,600	1,775	

\*To convert values for urea nitrogen to millimoles per liter, multiply by 0.357. To convert values for creatinine to micromoles per liter, multiply by 88.4. ND denotes not done.

†This value is for urine output in the first eight hours.

blue-green color, gained widespread popularity in Europe and became a favorite of artists and writers such as Vincent van Gogh, Henri de Toulouse-Lautrec,<sup>10</sup> and Oscar Wilde.<sup>11</sup>

Absinthism, a syndrome of hallucinations, sleeplessness, tremors, convulsions, and paralysis, was associated with the long-term ingestion of the liqueur.<sup>12</sup> The ingredient likely to have caused these abnormalities was thujone, an aromatic hydrocarbon found in oil of wormwood.<sup>12</sup> Scientific interest in absinthe emerged during the mid-1800s. In 1864 it was reported that Louis Merce of the Bicêtre Hospital in Paris administered small doses of essential oil of wormwood to dogs and rabbits,<sup>10,13</sup> which led to “convulsions, involuntary evacuations, abnormal respirations, and foaming at the mouth.”<sup>10</sup> In 1868, a paper entitled “Experiments and Observations on Absinth and Absinthism” appeared in the *Boston Medical and Surgical Journal*, now the *New England Journal of Medicine*.<sup>13</sup> This paper described epileptiform activity, chest effusion, and reddish urine in a patient hospitalized in Paris for absinthe intoxication and “kidney congestion” in animals given absinthe. In 1874, Dr. Valentin Magnan described alterations in consciousness and auditory and visual hallucinations in humans ingesting absinthe.<sup>14</sup> He also observed seizures in animals given large doses of essential oil of wormwood. The epileptogenic agent identified in these experiments was oil of wormwood.

Despite early warnings about the untoward effects of absinthe, strong economic interest in its produc-



**Figure 1.** Wormwood Plant in a Natural Setting. Photograph courtesy of Dr. Holly H. Shimizu, U.S. Botanical Garden, Washington, D.C.

tion precluded limiting its availability. From the 1870s until 1915, consumption of the liqueur increased substantially. Claiming that absinthe contributed to psychosis and suicide, France banned it in 1915, followed by other European nations and the United States.<sup>10</sup>

This case demonstrates the ease of obtaining substances with toxic and pharmacologic potential electronically and across state lines. Chinese medicinal herbs, some of which can cause acute renal failure,<sup>15,16</sup> are easily procured by means of the Internet.<sup>17</sup> Although absinthe liqueur is illegal in the United States, its ingredients are readily available. Absinthe is also currently a popular drink in the bars of Prague, in the Czech Republic.<sup>18</sup> The essential ingredient in this ancient potion was purchased in this case by means of up-to-the-minute technology. Should the medical community brace itself for future cases of Internet-mediated toxic diseases?

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**CORRECTION**

**Poison on Line — Acute Renal Failure Caused by Oil of Wormwood Purchased through the Internet**

Poison on Line — Acute Renal Failure Caused by Oil of Wormwood Purchased through the Internet . On page 826, the sentence that begins in line eight of the left-hand column should have read, "The ingredient likely to have caused these abnormalities was thujone, a *terpene* found in oil of wormwood," not "*an aromatic hydrocarbon*," as printed.