

# Treatment of a Young Adult Taking Gamma-Butyrolactone (GBL) in a Primary Care Clinic

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Gamma-butyrolactone (GBL) has become the new drug of choice for young adults to abuse.<sup>1-4</sup> The effects it induces include euphoria, disinhibition, depressed levels of consciousness, and eventual respiratory depression.<sup>5</sup> GBL is metabolized into gamma-hydroxybutyrate (GHB), which is also a recreational drug and is now a schedule I drug in some states.<sup>5,6</sup> Both GBL and GHB are used in social settings similar to those where ecstasy (methylenedioxymethamphetamine, or MDMA) is used, although GBL and GHB are chemically distinct from ecstasy.<sup>7</sup>

Recent reports have been published describing toxic effects of GBL that lead to emergency department visits and death.<sup>3</sup> The overall prevalence of GBL use in America is unknown, although it is suspected to be high because the drug is available through underground sources. GBL is also readily available from Internet sources, where it is touted for its ability to induce sleep, enhance libido and sexual performance, and increase lean muscle mass.<sup>8,9</sup> Despite numerous warnings about the harmful side effects, young adults who continue to use this drug can experience physical and psychological addictions, as well as acute altered mental status and severe respiratory depression. The widespread use of GBL suggests that primary care physicians should become more aware of its potential adverse effects and develop modes of treatment for drug-using patients who attend their clinics. We report a case of a young man seeking medical care because of GBL addiction.

## Case Report

A 27-year-old male body builder in good health came to the family medicine clinic with the chief complaint of addiction to GBL and a desire to be

withdrawn from its use. The patient had begun using GHB then GBL recreationally 4 years earlier, after learning about it from his college and gym acquaintances. He reported that GHB and GBL were widely available, and their use was pervasive in those two settings. In addition to producing euphoria, GBL helped with his insomnia. He did not use tobacco products or alcohol, and he had no history of cocaine, marijuana, narcotics, or prescription drug abuse. When he had first started using GHB and GBL, he also had experimented briefly with ecstasy and anabolic steroids.

His use of GBL increased so that at time of his visit he was taking 1 oz every 2 hours. Attempts to discontinue use would aggravate his insomnia and cause craving, dysphoria, sweating, generalized tremors, and palpitations, but he reported no abdominal pain, nausea, vomiting, diarrhea, shortness of breath, or chest pain. When examined, he was a well-developed muscular man, 5 feet 9 inches tall, who weighed 240 pounds. His temperature, blood pressure, respirations, and heart rate were normal, and he had a slightly depressed mood. Laboratory studies, including a complete blood count, lipid profile, chemistry profile, thyroid function test, and urinalysis, were all normal.

The patient agreed to be withdrawn from the GBL if prescription medications could be used to ameliorate his symptoms. Clonidine, 0.1 mg three times a day, was prescribed, which lessened his craving and dysphoria. Two weeks later, however, he complained of continued sweating, tremors, and palpitations; these symptoms responded to propranolol, 20 mg three times a day. Because his insomnia did not respond first to amitriptyline, 25 mg, or zaleplon, 5 mg, the patient continued using 1.5 oz of the GBL at bedtime. Seven of his nine depressive symptoms had responded positively, and paroxetine, 30 mg, was prescribed. Although his mood, self-image, and energy level improved after 4 weeks of treatment, his insomnia persisted. Diazepam, 5 mg, at bedtime was added, which allowed the patient to taper off the remaining 1.5 oz of GBL.

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## Discussion

Although this patient sought medical care, clinicians should inquire about GBL or GHB use in high-risk populations and in those who complain of possible symptoms of withdrawal. GBL is the precursor to GHB, a schedule I drug. GBL can be obtained easily from Internet sources, an avenue by which our patient obtained it. The scientific name of GBL is 2(3H) dihydro furanone, and it is metabolized into 4-hydroxybutyrate (GHB). GHB is a naturally occurring fatty-acid derivative of  $\gamma$ -aminobutyric acid (GABA).<sup>10</sup> It is believed to have inhibitory effects on GABA receptors in the central nervous system, producing sedating effects. Insomnia was the reason that our patient gave for beginning his drug use. Dopamine synthesis is increased in GHB and GBL users, probably as a result of tyrosine hydroxylase stimulation, the enzyme involved in the initial steps of dopamine synthesis.

Acute ingestion can cause symptoms of central nervous system depression, respiratory depression, bradycardia, and involuntary movements, requiring emergency management.<sup>6,11</sup> Chronic use of these drugs can lead to several neurotoxic effects, including anxiety, depression, tremor, and insomnia, all of which were reported in our case. An example of the effects of physical dependence, Wernicke-Korsakoff syndrome, has been reported in a chronic user.<sup>12</sup> Despite the increased possibilities of these adverse events, the ability of GHB and GBL to induce a euphoric state has made these drugs a favorite among young adults on the party scene.

GBL is marketed for its many positive effects on the users, including its ability to (1) induce deep sleep, (2) treat neurologic disorders (fibromyalgia), (3) increase lean muscle tissue, (4) decrease fat tissue, (5) enhance libido and sexual performance, (6) eliminate hair loss, and (7) stimulate growth hormones. A search on the Internet using a default search engine recovered various Web links to sites promoting the sale of GBL and GHB-like alternatives.<sup>8,9</sup> These products are sought out by bodybuilders, and a sizable underground market exists in this population. Young adult partygoers use GBL at rave parties; it is colorless, odorless, and almost tasteless when mixed with fluids. Because it is accessible and easy to consume, both by the aware and unaware consumer, this drug has become a preferred drug of abuse.<sup>1-5</sup>

Although acute ingestion of GBL might lead to sedation, chronic recreational use can lead to a number of neurologic problems.<sup>9,13</sup> Withdrawing patients from this illicit drug can be a challenge for the family physician. Successful treatment in our patient required a combination of medications that act on various central and peripheral receptors. The action of clonidine on the central  $\alpha$ -adrenergic receptors, inhibition of serotonin uptake by paroxetine, and peripheral  $\beta$ -adrenergic receptor blockade by propranolol were all required to reduce our patient's withdrawal symptoms. We chose oral administration for clonidine because of its ease of titration and cost convenience, although topical clonidine might have been an overall more effective method for withdrawal treatment. Stimulation of the GABA receptors by diazepam was necessary, however, for complete cessation of use. This use of a benzodiazepine is consistent with reported treatment of GHB withdrawal cited in the literature.<sup>14,15</sup> Our patient's chronic GBL use might have produced central GABA depletion with resultant increased insomnia when GBL was discontinued. Insomnia was the symptom he found to be the most objectionable.

Given the current availability and use of GBL and GHB, clinicians must have a heightened awareness of the use of these drugs among certain patients. A combination of medications might be required to help the patient successfully withdraw from use. Because of the effects of GBL on critical neurotransmitters responsible for emotions and reasoning, physicians should be aware of the potential for sustained anxiety, depression, and possibly even suicidal tendencies. With these possibilities in mind, physicians should refer patients for follow-up in a drug treatment program, where their psychosocial activities can receive additional attention, and they can be helped with continued cessation of these recreational drugs.

## References

1. Kam PC, Yoong FF. Gamma-hydroxybutyric acid: an emerging recreational drug. *Anaesthesia* 1998;53: 1195-8.
2. Smith KM. Drug used in acquaintance rape. *J Am Pharm Assoc (Wash)* 1999;39:519-25.
3. Viera AJ, Yates SW. Toxic ingestion of gamma-hydroxybutyric acid. *South Med J* 1999;92:404-5.
4. Li J. The new "Mickey Finn specials"—should GHB and ketamine be banned? *J Am Pharm Assoc* 1999; 39:442-3.

5. Ingels M, Rangan C, Bellezzo J, Clark RF. Coma and respiratory depression following the ingestion of GHB and its precursors: three cases. *J Emerg Med* 2000; 19:47–50.
6. Adverse events associated with ingestion of gamma-butyrolactone—Minnesota, New Mexico, Texas. *MMWR Morb Mortal Wkly Rep* 1998–1999;48: 137–40.
7. Klam M. Experiencing ecstasy. *New York Times Magazine* 2001;Jan 21:38–43,64,68,72,78–79.
8. Oliveira S. GHB & GBL. *Body International Magazine* 2000;1:48–51.
9. Benefits of growth hormone. Available at <http://www.furanone-growthhormone.com/benefits.htm>. Accessed 9 October 2000.
10. Tunnicliff G. Sites of action of gamma-hydroxybutyrate—a neuroactive drug with abuse potential. *J Toxicol Clin Toxicol* 1997;35:581–90.
11. Winickoff JP, Houck CS, Rothman EL, Bauchner H. Verve and Jolt: deadly new Internet drugs. *Pediatrics* 2000;106:829–30.
12. Friedman J, Westlake R, Furman M. “Grievous bodily harm:” gamma-hydroxybutyrate abuse leading to a Wernicke–Korsakoff syndrome. *Neurol* 1996;46:469–471.
13. Hernandez M, McDaniel CH, Costanza CD, Henandez OJ. GHB-induced delirium: a case report and review of the literature of gamma hydroxybutyric acid. *Am J Drug Alcohol Abuse* 1998;24:179:83.
14. Addolorato G, Caputo F, Capristo E, Bernardi M, Stefanini GF, Gasbarrini G. A case of gamma-hydroxybutyrate acid withdrawal syndrome during alcohol addiction treatment: utility of diazepam administration. *Clin Neuropharmacol* 1999;22:60–62.
15. Addolorato G, Balducci G, Capristo E, et al. Gamma-hydroxybutyric acid (GHB) in the treatment of alcohol withdrawal syndrome: a randomized comparative study versus benzodiazepine. *Alcohol Clin Exp Res* 1999;23:1596–604.