

## REGULAR ARTICLES

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# Use of GHB Compounds by HIV-Positive Individuals

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*Gamma hydroxybutyrate (GHB) has been used by body-builders to enhance performance and by young adults in rave parties. Warnings have been posted about its addictive potential. The use of these dietary compounds is currently banned by the Food and Drug Administration, but they are widely available through the Internet and in certain communities. The purpose of the study was to examine the use of these compounds by HIV-positive individuals and to investigate their knowledge of the addictive potential of GHB and its related dietary compounds. One hundred HIV-positive individuals from the UCSD outpatient HIV clinic responded to an anonymous survey that inquired about their knowledge, use, and effects produced by GHB containing dietary compounds. The most common reported dietary compound beside GHB was Growth Hormone Release Extract (GHRE). Fifty-two percent of individuals reported using at least one GHB containing dietary compound. Gay subjects reported the highest use of GHB compounds (76.9%;  $p \leq 0.001$ ). The most common effect reported by users was increased energy (71%). Only 24% of the total responders knew about GHB's addictive potential. Among reported users of GHB containing compounds, fourteen (27%) knew about its addictive potential and nine (17%) knew that the compound is illegal. This study shows that HIV-positive gay individuals attending our clinic are using GHB compounds. Reported GHB users have limited knowledge about its addictive potential and serious adverse effects. More controlled studies are needed to evaluate long-term effects of dietary compounds containing GHB, especially among HIV-positive individuals who are actively receiving antiretroviral treatment. (Am J Addict 2004;13:120–127)*

The increased use of “synthetic drugs” has emerged in recent years. The era of these synthetic addictive substances

emerged in 1980 with the abuse of substances such as MDMA or “Ecstasy.”<sup>1</sup> More recently, other synthetic compounds

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such as gamma-hydroxybutyrate (GHB) have been abused by young people at all-night rave parties.<sup>2,3</sup>

Circuit parties, which are different from rave parties, are usually attended by homosexual men.<sup>4</sup> A recent study reported that the use of club drugs (GHB, Ecstasy, and Ketamine) was >50% among attendees to circuit parties and that 29% of gay/bisexual men who attended these parties abused GHB. Attendees to circuit parties' reported being "wild and uninhibited"; such behavior was associated with higher levels of unprotected sex, thus putting them at risk for contracting HIV.<sup>4,5</sup>

GHB is a product of the metabolism of both gamma butyrolactone (GBL) and 1,4-butanediol (1,4-BD). It is described as a naturally occurring substance in the mammalian brain, with a structure similar to gamma-aminobutyric acid (GABA) and possible agonist activity at the GABA (B subtype) receptors.<sup>6-8</sup>

GHB has a thirty-year history of use in medicine, particularly in Europe. It has been used in the experimental treatment of alcohol dependence and opiate withdrawal.<sup>9-11</sup> In the United States, it was developed as a possible anesthetic, but its authorization for medical use was removed in 1990 because of severe side effects such as nausea, vomiting, and seizures.<sup>8,12</sup>

The use of GHB has become popular as a bodybuilding aid. It has been reported that it enhances the release of growth hormone. It has also been used as a sleeping aid, a recreational drug with euphoric properties, and a dietary supplement.<sup>13-15</sup> Dietary supplements containing GHB were widely available until the Food and Drug Administration removed its legal use from the market.<sup>16,17</sup> Additionally, the Drug Enforcement Administration placed GHB and its precursors as a List I chemical subject to the requirements of the Controlled Substances Act, based on the increased cases of poisoning and sexual assaults or "date rapes" related to GHB.<sup>18-20</sup>

GHB precursors are still available for purchase on the Internet for mood enhancement, sleep induction, and bodybuilding. One of the common ones is Blue Nitro, which contains gamma butyrolactone (GBL), one of GHB's precursors. Other products containing another GHB precursor, 1,4-Butenediol, are sold by the brand names of Serenity, GHRE (Growth Hormone Release Extract), SomatoPro, Revitalize Plus, Enliven, NRG3, Thunder Nectar, and Weight Belt Cleaner.<sup>13</sup> GHB is also available on the street in the form of powder, capsules, or in small bottles containing approximately 40cc of colorless, odorless liquid composed of up to twenty grams of the drug.<sup>21</sup> The street cost of a gram of GHB is about \$2-3, and dietary compounds containing GHB (16oz bottles) could be purchased on the Internet for \$70.

We investigated the use of GHB and its related compounds among HIV-positive individuals and their knowledge about GHB's addictive potential and dangerous side effects.

## METHODS

Patients from the University of California, San Diego (UCSD) outpatient HIV clinic were asked to complete an anonymous survey about the use of dietary supplements containing GHB. The clinic has approximately 2,300 active patients with a range between eighteen and 73 years of age. Fifty-nine percent are Caucasian, 20% are Hispanics, 14% are African-American, 3% are Asian-Pacific, and 4% are unknown. Fifty-eight percent are diagnosed with HIV alone, 41% are diagnosed with AIDS, and 1% are not diagnosed with HIV or AIDS. Patients randomly answered the survey and left it in a sealed box. The number of patients who refused to answer the questionnaire was not recorded. The data collection was stopped once a total of 100 individuals responded to the survey. The information was collected over a period

of three months. The UCSD Human Research Protection Program approved the survey.

The purpose of the survey was to investigate if the participants knew which dietary supplements contained GHB and the effects they expected when taking any of the supplements. Subjects were asked about their age (reported in range for confidentiality purposes), gender, years of education, and sexual orientation. The survey included nine multiple-choice questions divided into two parts. The first part of the survey listed 11 dietary supplements known to contain GHB or chemical precursors of GHB: Serenity<sup>®</sup>, Revitalized-Plus<sup>®</sup>, Growth Hormone Release Extract (GHRE), Somato-Pro<sup>®</sup>, Enliven<sup>®</sup>, NRG3<sup>®</sup>, Thunder Nectar<sup>®</sup>, W.B. Cleaner<sup>®</sup>, and Gamma hydroxybutyrate (GHB) and its chemical precursors gammabutyrolactone (GBL) and 1,4-butanediol (1,4-BD). Subjects were asked if they recognized any of these compounds, if they had ever used any of these compounds, and the frequency of their use over the past six months. The objective of the first part of the survey was to investigate the use of GHB compounds among the studied individuals.

The second part of the survey was aimed at identifying the effects and behavior produced by the use of any of the GHB-containing compounds. Subjects were asked to check the effects (both positive and adverse) produced by GHB compounds. The effects listed in the survey were euphoria, irritability, increased energy, weight loss, spending money, decreased need for sleep, slurred speech, sedation, dizziness, nausea, vomiting, seizures, and coma. They were also asked if they engaged in dangerous behaviors because of the use of GHB or if they spent considerable amount of time or money looking for the compound. Additionally, subjects were asked to identify any of the compounds that they believed were addictive or illegal (see Table 1).

## RESULTS

A total of one hundred HIV-positive individuals responded to the anonymous survey. Eighty-nine percent (89%) of the participants were male, and 11% were female. Fifty-seven percent were between the ages of 26 and 39, and 39% were between 40 and 55 years old. In our sample, 56% of the responders described their sexual orientation as homosexual and 33% as heterosexual. Eleven people did not report their sexual orientation.

GHB and GHRE were reported to be the most commonly used dietary compounds. Fifty-eight percent of the total participants considered GHB a dietary supplement, and thirty-seven percent considered GHRE as a dietary supplement. Our survey also showed that 52% of the participants have used a GHB containing dietary supplement at least once in their lives, and 43% percent described using at least one of these dietary supplement in the past six months. Of these 43%, 38 people used the drug between one and ten times, and three individuals reported using GHB compounds 16–20 times.

Among the subjects that reported using GHB compounds, 77% were between 26 to 39 years old and 23% were between 40 to 55 years old. Our sample showed that GHB users have an average of 15.8 years of education. Gay individuals reported the highest use of GHB-containing compounds. Among the eleven individuals who did not report their sexual orientation, only 4 reported ever using a GHB related compound (see Table 2).

The most common effects reported by the participants after taking any of the GHB containing compounds were: increased energy (21%), euphoria (18%), and weight loss (11%). Only one individual reported experiencing severe adverse side effects, which included insomnia, dizziness, nausea, vomiting, and seizures. None of our participants reported engaging in

**TABLE 1. Survey Distributed to Participants**

1. YOUR AGE RANGE: (18-25)----- (26-39)----- (40-55)----- (> 55)-----	13	14	15	16	17	18	19	20	21	22	23	
2. GENDER: MALE___ FEMALE___												
3. YEARS OF EDUCATION (Circle One):	1	2	3	4	5	6	7	8	9	10	11	12
	High School											
	College											
	Graduate											
	PostGraduate											
4. Do you recognize any of these Dietary Compounds? 5. Circle which of these compounds you have ever used.	6. Which compounds have you used in the last six months?											
	7. Over the last six months, on average, how many times per month have you used these compounds?											
Serenity	YES	NO										
Revitalize-Plus	---	---	• Serenity									• Serenity----
Growth Hormone Release Extract (GHRE)	---	---	• Revitalize-Plus									• Revitalize-Plus----
Somato-Pro	---	---	• Growth Hormone Release Extract (GHRE)									• Growth Hormone Release Extract (GHRE)----
Enliven	---	---	• Somato-Pro									• Somato-Pro----
NRG3	---	---	• Enliven									• Enliven----
Thunder Nectar	---	---	• NRG3									• NRG3----
Weight Belt Cleaner	---	---	• Thunder Nectar									• Thunder Nectar----
GBL	---	---	• Weight Belt Cleaner									• Weight Belt Cleaner----
1,4-BD	---	---	• GBL									• GBL----
GHB	---	---	• 1,4-BD									• 1,4-BD----
	---	---	• GHB									• GHB----
			OTHERS----									OTHERS----

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8. Which effects have you experienced when you have used any of the above compounds?
- Euphoric "high" ----
  - Irritability ----
  - Increased energy ----
  - Weight loss ----
  - Spending considerable amount of time looking for the compound ----
  - Decreased need for sleep ----
  - Slurred speech ----
  - Social or interpersonal problems associated with the use of the compound ----
  - Severe sedation associated with the compound ----
  - Placing your life in danger because of the use of the compound ----
  - Dizziness ----
  - Nausea ----
  - Vomiting ----
  - Seizure-like activity (jerky movements)
9. Which of the following compounds do you THINK has an addictive potential?
- Serenity
  - Revitalize-Plus
  - Growth Hormone Release Extract (GHRE)
  - Somato-Pro
  - Enliven
  - NRG3
  - Thunder Nectar
  - Weight Belt Cleaner
  - GBL
  - 1,4-BD
  - GHB
10. Which of the following compounds do you KNOW are illegal?
- Serenity
  - Revitalize-Plus
  - Growth Hormone Release Extract (GHRE)
  - Somato-Pro
  - Enliven
  - NRG3
  - Thunder Nectar
  - Weight Belt Cleaner
  - GBL
  - 1,4-BD
  - GHB
11. Which of these compounds do you KNOW has an addictive potential?
- Serenity
  - Revitalize-Plus
  - Growth Hormone Release Extract (GHRE)
  - Somato-Pro
  - Enliven
  - NRG3
  - Thunder Nectar
  - Weight Belt Cleaner
  - GBL
  - 1,4-BD
  - GHB
12. Would you mind describing your sexual orientation?
- Homosexual
  - Bisexual
  - Heterosexual

TABLE 2. Description of GHB Use

<i>n</i> = 100	Ever use ( <i>n</i> = 52)	Never use ( <i>n</i> = 48)	$\chi^2$	<i>p</i>
<b>Age category</b>				
18–25	0	3	Insufficient data	
26–39	40	18	8.3	0.04
> 40	12	27	5.7	0.01
<b>Gender</b>				
Male	48	41	0.7	0.39
Female	4	7	1.33	0.24
<b>Sexual orientation</b>				
Homosexual	40	16	10.2	0.01
Heterosexual	7	26	10.9	0.01
<b>Average years of education*</b>	15.8	15.7		0.06

\*t-test = 2.8.

dangerous situations because of the use of the dietary compounds. Additionally, none of the subjects reported spending considerable amount of time or money looking for the compound. Only 24% of the total responders knew about GHB's addictive potential, and only 19% acknowledged that GHB is an illegal compound. Among reported users of GHB-containing compounds, 14 (27%) knew about its addictive potential and 9 (17%) knew that the compound is illegal.

## DISCUSSION

This study showed that GHB and its related compounds are being used by HIV-positive individuals, particularly HIV-positive gay individuals. Current literature describes several cases of serious side effects, including coma, intoxication, respiratory depression, and death associated with the use of GHB.<sup>13,22,23</sup> The literature also reports cases of neuropsychiatric complications such as delirium and life-threatening interactions between protease inhibitors and the use of GHB.<sup>24–26</sup> To our knowledge, this is the first report of GHB use among

HIV-positive individuals receiving outpatient care.

The results also showed limited knowledge about GHB's addictive potential among users. A recent study done by Miotto and the UCLA addiction group found that GHB is frequently abused by individuals with other substance use disorders. They also described patients using multiple daily doses around the clock and experiencing severe withdrawal symptoms after the discontinuation of GHB.<sup>27</sup> Furthermore, recent reports from the National Institute on Drug Abuse Community Epidemiology Work Group described increased nationwide abuse of GHB and its precursors (GBL and 1,4-butenadiol) in dance clubs and raves with associated mortalities.<sup>28,29</sup> Even though there is information available about the addictive potential of club drugs,<sup>30</sup> more outreach in local communities is needed to teach children and young adults about the serious side effects associated with the use of GHB and related compounds. Additionally, professionals treating HIV-positive individuals should ask their patients about their GHB use as part of a regular history and physical

examination. Consideration should be placed on possible interactions, if any, between GHB compounds and ongoing medications received by HIV-positive individuals.

As our report is a preliminary study, it has some limitations. First, we have no information on HIV-positive individuals who chose not to complete the survey. Second, we did not record information about the participant's socioeconomic status, and we only compare the use of GHB among individuals according to self-reported educational background. Even though 30% of the GHB users did not report their education background, the number of college-educated individuals (46%) who reported using GHB is striking. Future studies will attempt to determine if gay individuals who are using club drugs (GHB, Ecstasy, and Ketamine) are at increased risk for acquiring HIV compared to a more diverse population. Our main purpose in this preliminary study was to investigate the general use of GHB among HIV-positive individuals, regardless of their socioeconomic background. A third limitation is that we

did not ask how many individuals were using GHB in a rave or circuit party as opposed to using GHB as a dietary supplement. This could account for the low knowledge about GHB's addictive potential. Finally, we did not ask if the participants were taking any antiretrovirals.

The important message of this study is the increased use of a known addictive compound among HIV-positive gay individuals. Future studies might also examine possible therapeutic effects of GHB-related compounds for the treatment of chronic conditions, given that our sample believed that the predominant effect of GHB was to improve levels of energy and promote euphoria and weight loss. While GHB use is not likely to be advocated due to the numerous reported adverse reactions, the effects elicited by GHB may guide further clinical investigations. Research would need to focus on concerns of lack of energy, lack of positive mood, and desire for weight loss in HIV individuals and possible psychopharmacologic interventions.

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