



# Gamma-hydroxybutyrate (GHB)/Sodium Oxybate

- **Alternative names:** liquid ecstasy, liquid X, liquid F, goop, GBH= Grievous Bodily Harm, Easy lay, Ghost Breath, G, Somatomax, Gamma-G, Growth Hormone Booster, Georgia home boy, nature's Quaalude, G-riffick, Soapy, Salty Water



<b>Characteristics</b>	<ul style="list-style-type: none"> <li>• Produced naturally in the body and is a metabolite of gamma aminobutyric acid (GABA)<sup>1</sup></li> <li>• Stimulates slow-wave sleep (stages 3 and 4) and decreases stage 1 sleep; with continued use, decreases REM sleep.<sup>1</sup></li> <li>• Shown to increase dopamine levels in the basal ganglia</li> <li>• At 10mg/kg produces anxiolytic effect, muscle relaxation, and amnesia</li> <li>• At 20-30mg/kg increases REM and slow-wave sleep</li> <li>• Doses &gt; 60mg/kg can result in anesthesia, respiratory depression and coma</li> <li>• Onset of action is within 30min</li> <li>• Elimination half-life is approximately 20-30min; no longer detected in blood after 2-8h and in urine after 8-12h<sup>1</sup></li> <li>• GHB is absorbed rapidly and reaches peak plasma concentrations in 20–60 minutes.<sup>3</sup></li> </ul>																											
<b>Presentation during intoxication</b> (Symptoms usually resolve within 7 hours, but dizziness can persist up to 2 weeks)	<p><b>Common signs and symptoms during intoxication can include</b><sup>3</sup></p> <table style="width: 100%; border: none;"> <tr> <td>Disinhibition</td> <td>Confusion</td> <td>Amnesia</td> </tr> <tr> <td>Euphoria</td> <td>Hallucinations</td> <td>Agitation</td> </tr> <tr> <td>Placidity</td> <td>Feeling of well-being</td> <td>Poor concentration</td> </tr> <tr> <td>Relaxation of voluntary muscles</td> <td></td> <td></td> </tr> </table> <p><b>Adverse reactions may include</b><sup>3</sup></p> <table style="width: 100%; border: none;"> <tr> <td>Drowsiness</td> <td>Headache</td> <td>Ataxia</td> </tr> <tr> <td>Dizziness</td> <td>Hypotension</td> <td>Nystagmus</td> </tr> <tr> <td>Nausea</td> <td>Bradycardia</td> <td>Hypotonia</td> </tr> <tr> <td>Vomiting</td> <td>Hypothermia</td> <td>Tremors</td> </tr> <tr> <td>Muscle spasms</td> <td>Seizures</td> <td>Decreased respiration</td> </tr> </table> <p><b>Extreme intoxication signs and symptoms may include</b><sup>3</sup></p> <ul style="list-style-type: none"> <li>• Bradycardia, seizures, apnea, sudden (reversible) coma with abrupt awakening and agitation<sup>1</sup></li> </ul> <p>*Overdoses can occur due to unknown purity and concentration of ingested product</p>	Disinhibition	Confusion	Amnesia	Euphoria	Hallucinations	Agitation	Placidity	Feeling of well-being	Poor concentration	Relaxation of voluntary muscles			Drowsiness	Headache	Ataxia	Dizziness	Hypotension	Nystagmus	Nausea	Bradycardia	Hypotonia	Vomiting	Hypothermia	Tremors	Muscle spasms	Seizures	Decreased respiration
Disinhibition	Confusion	Amnesia																										
Euphoria	Hallucinations	Agitation																										
Placidity	Feeling of well-being	Poor concentration																										
Relaxation of voluntary muscles																												
Drowsiness	Headache	Ataxia																										
Dizziness	Hypotension	Nystagmus																										
Nausea	Bradycardia	Hypotonia																										
Vomiting	Hypothermia	Tremors																										
Muscle spasms	Seizures	Decreased respiration																										
<b>Monitoring and support during intoxication</b>	<p><b>Goal</b><sup>11</sup></p> <ul style="list-style-type: none"> <li>• Prevent severe respiratory depression</li> </ul> <p><b>Monitor</b><sup>1,2,3,4,11</sup></p> <ul style="list-style-type: none"> <li>• Assess level of disorientation and if possible time of last ingestion and amount consumed</li> <li>• Monitor for falls risk</li> <li>• Monitor vitals every 15 minutes initially and less frequently as acute symptoms subside</li> <li>• Ensuring adequate respiratory function</li> <li>• Maintain comprehensive physiological and cardiac monitoring</li> </ul> <p><b>Supportive Interventions</b></p> <ul style="list-style-type: none"> <li>• Ensure a quiet private space</li> </ul>																											



<p><b>Monitoring and support during intoxication</b> (Continued)</p>	<ul style="list-style-type: none"> <li>• Frequently orient client to reality and surroundings</li> <li>• Promote fluid and food intake as tolerated</li> <li>• Atropine may be used for persistent symptomatic bradycardia</li> <li>• If breathing is laboured, refer to an intensive care unit.</li> <li>• No known antidote for toxicity</li> </ul>						
<p><b>Withdrawal presentation<sup>1</sup></b> symptoms occur 1-6 hours after abrupt cessation and can last 5-15 days after chronic use</p>	<p><b>Symptoms may include<sup>1</sup></b></p> <table border="0"> <tr> <td>Nausea</td> <td>Insomnia</td> <td>Confusion</td> </tr> <tr> <td>Vomiting</td> <td>Anxiety</td> <td>Tremor</td> </tr> </table> <p><b>After chronic use<sup>1</sup></b></p> <ul style="list-style-type: none"> <li>• Mild tachycardia and hypertension</li> <li>• Can progress to delirium with auditory and visual hallucinations</li> </ul>	Nausea	Insomnia	Confusion	Vomiting	Anxiety	Tremor
Nausea	Insomnia	Confusion					
Vomiting	Anxiety	Tremor					
<p><b>Monitoring and support during withdrawal</b></p>	<p><b>Monitor<sup>1,11</sup></b></p> <ul style="list-style-type: none"> <li>• Mental Status (include risk of self-harm and suicide, agitation, anxiety)</li> <li>• Physical status (vital signs, GI distress, respiratory and cardiological function)</li> <li>• Risk for falls</li> <li>• Hydration/Nutrition</li> </ul> <p><b>Supportive Interventions<sup>1,11</sup></b></p> <ul style="list-style-type: none"> <li>• Provide reassurance and calming techniques.</li> <li>• Encourage fluids and nutrition as tolerated</li> <li>• Diazepam has been used to treat GHB withdrawal</li> </ul>						
<p><b>Potential Complications</b></p>	<ul style="list-style-type: none"> <li>• Coma reported in doses &gt; 60mg/kg<sup>1</sup></li> <li>• <b>GHB overdose</b> is a real danger, usually occurring within 15–20 minutes of ingestion. Most fatalities associated with GHB occur when it is taken with other substances, most notably alcohol.<sup>3,4</sup></li> <li>• Overdose may present as<sup>3,4</sup>: <table border="0"> <tr> <td>Nausea and vomiting</td> <td>Respiratory depression</td> <td>Aggressive outbursts</td> </tr> <tr> <td>Seizures</td> <td>Coma</td> <td>Slowed heart rate</td> </tr> </table> </li> </ul>	Nausea and vomiting	Respiratory depression	Aggressive outbursts	Seizures	Coma	Slowed heart rate
Nausea and vomiting	Respiratory depression	Aggressive outbursts					
Seizures	Coma	Slowed heart rate					
<p><b>Notable Drug interactions</b></p>	<p><b>HIV medications (Ritonavir and Saquinavir)<sup>5</sup></b></p> <ul style="list-style-type: none"> <li>• Interferes with the metabolism of GHB via CYP3A4 enzymes, amplifying GHB-depressant effects which may lead to loss of consciousness</li> </ul> <p><b>With Benzodiazepines<sup>5</sup></b></p> <ul style="list-style-type: none"> <li>• GHB may alter the response of midazolam at the GABA receptors, leading to agitation and confusion</li> <li>• Enhance CNS depressant effects of GHB</li> </ul> <p><b>With Sedating antidepressants, Antipsychotics, General anesthetics, Hypnotics, Opioids, Muscle Relaxants<sup>6</sup></b></p> <ul style="list-style-type: none"> <li>• May enhance the CNS depressant effect of GHB leading to impaired consciousness and respiratory depression</li> </ul> <p><b>With Valproate and Ethosuximide<sup>7,8</sup></b></p> <ul style="list-style-type: none"> <li>• Inhibition of GHB-dehydrogenase</li> <li>• Increased serum concentration of GHB --&gt; Increased sleepiness, dizziness, nausea and cognitive impairment</li> </ul> <p><b>With Alcohol<sup>9</sup></b></p> <ul style="list-style-type: none"> <li>• Enhanced respiratory depression, greater decreases in O<sub>2</sub> sat, and hypotension</li> <li>• Adverse effects are more pronounced at higher GHB doses</li> </ul> <p><b>With Topiramate<sup>10</sup></b></p>						



<b>Notable Drug interactions</b> <i>(Continued)</i>	<ul style="list-style-type: none"><li>• Topiramate increases GABA activity at its neuroceptors</li><li>• May increase serum concentration of GHB --&gt; Myoclonic jerks, miosis, rapid onset of coma</li></ul> <b>With Cannabis</b> <ul style="list-style-type: none"><li>• Increased pharmacological effects<sup>1</sup></li></ul> <b>With Stimulants</b> <ul style="list-style-type: none"><li>• Increased pharmacological effects<sup>1</sup></li></ul>
<b>Psychiatric effects</b>	<ul style="list-style-type: none"><li>• In small doses, it leads to feelings of well-being, lowered inhibitions, sedation, poor concentration, confusion, amnesia, euphoria and hallucinations. It may lead to agitation and aggression<sup>1</sup></li></ul>



## References

1. Bezchlibnyk-Butler, K., Jeffries, J., Procyshyn, R., Virani, A. (2014). *Clinical Handbook of Psychotropic Drugs* (20th ed). Toronto: Hogrefe Publishing
2. National Centre for Education and Training on Addiction (NCETA) Consortium. (2004), *Alcohol and Other Drugs: A Handbook for Health Professionals*. Retrieved on April 2, 2015, from [http://www.health.gov.au/internet/main/publishing.nsf/Content/E5203E6D5CBAA696CA257BF0001E02ED/\\$File/aodgp.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/E5203E6D5CBAA696CA257BF0001E02ED/$File/aodgp.pdf)
3. Drug Enforcement Agency. (2011). *Drugs of Abuse*. Retrieved on April 1, 2015 from [http://www.dea.gov/pr/multimedia-library/publications/drug\\_of\\_abuse.pdf#page=54](http://www.dea.gov/pr/multimedia-library/publications/drug_of_abuse.pdf#page=54)
5. Lindsey WT, Stewart D, Childress D. Drug interactions between common illicit drugs and prescription therapies. *Am J Drug Alcohol Abuse*. 2012;38(4):334-43.
4. Lindsey, W. T., Stewart, D., & Childress, D. (2012). Drug interactions between common illicit drugs and prescription therapies. *The American journal of drug and alcohol abuse*, 38(4), 334-343.
5. Food and Drug Administration. (2012). *Xyrem (sodium oxybate): Drug Safety Communication - Warning Against Use With Alcohol or Drugs Causing Respiratory Depression*. Retrieved on April 3, 2015, from <http://www.fda.gov/Safety/MedWatch/SafetyInformation/SafetyAlertsforHumanMedicalProducts/ucm332430.htm>
6. Eller, M., Wang, Y., Wesnes, K., Alvarez-Horine, S., Benson, B., & Black, J. (2013). Evaluation of drug–drug interactions of sodium oxybate with divalproex: Results from a pharmacokinetic/pharmacodynamic study. *Sleep Medicine*, 14(1), e302-e303.
7. Hechler, V., Ratomponirina, C., & Maitre, M. (1997).  $\gamma$ -Hydroxybutyrate conversion into GABA induces displacement of GABAB binding that is blocked by valproate and ethosuximide. *Journal of Pharmacology and Experimental Therapeutics*, 281(2), 753-760.
8. Thai, D., Dyer, J. E., Benowitz, N. L., & Haller, C. A. (2006). GHB and ethanol effects and interactions in humans. *Journal of clinical psychopharmacology*, 26(5), 524.
9. Weiss, T., Müller, D., Marti, I., Happold, C., & Russmann, S. (2013). Gamma-hydroxybutyrate (GHB) and topiramate—clinically relevant drug interaction suggested by a case of coma and increased plasma GHB concentration. *European journal of clinical pharmacology*, 69(5), 1193-1194.
10. Townsend, M.C. (2015). *Psychiatric Nursing: Assessment, Care Plans, and Medications*. Oklahoma: F.A. Davis Company.