



K38 Gamma Hydroxybutyrate (GHB)-Related Deaths: Review of 194 Cases

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After this presentation, attendees will understand the nature/range of lethal risks posed by gamma hydroxybutyrate (GHB) and will be familiarized with toxicological/pathological findings on 194 GHB-related deaths. The presentation will raise awareness among law enforcement, clinicians, and the public regarding the lethality of GHB and aid in recognition and confirmation of GHB-related deaths and in harm reduction through public education.

GHB and its analogs, gamma butyrolactone (GBL) and 1,4 butanediol (BD), are drugs of abuse that have been sold as dietary supplements for purported health benefits. GHB/analogues have resulted in overdoses, addiction and lethal withdrawal, and have been used to facilitate drug-facilitated sexual assault (DFSA).

Medical Examiners and coroners across the U.S. and abroad were contacted to request searches for cases of GHB-related deaths and specific cases identified through the Project GHB website and media reports. Toxicology findings were requested and, whenever possible, autopsy reports with investigative summaries. GC/MS cut-offs of 50 mg/L in postmortem blood, 5 mg/L in antemortem blood, and 10 mg/L in urine were used for inclusion of cases.

194 GHB-related deaths were identified from 1995-2005; case identification is incomplete due to non-searchable records and confidentiality restrictions. Decedents included 133 men (69%) and 61 women (31%), ages 15-53 yrs (mean=27.9 yrs). 183 (94.5%) had cardiopulmonary arrest (29 with aspiration or asphyxiation), 6 (3%) drowned in hottubs/bathtubs, 4 (2%) died in lethal motor vehicle collisions, and 1 (0.5%) died of smoke inhalation from a fire started while GHB-intoxicated. One case involved DFSA, as supported by history and pathological findings.

179 had autopsy reports with toxicology, 2 had external exam findings with toxicology, and 13 had toxicology data only. Of 179 with autopsy findings, 150 had pulmonary edema/congestion. 59 had autopsies noting an enlarged heart; of these, 37 had LVH, 1 had RVH, 1 had LVH/RVH, and 20 had cardiomegaly without LVH/RVH noted. Analysis will be done to assess for correlation with chronic GHB use/dependence and histories of use of anabolic steroids, GHB, and other drugs including methamphetamine and cocaine.

Of 194 deaths, 177 had GHB confirmed with blood GHB levels, 16 with urine GHB levels only, and 1 with a chest fluid GHB level. Of 177 deaths with confirmatory blood GHB levels, there were 60 deaths (34%) with GHB as the sole intoxicant, 61 deaths (34.5%) with >1 depressant co-intoxicants, 25 (14% of total) with > 1 stimulant co-intoxicant, and 31 (17.5%) with both stimulant and depressant co-intoxicants. See Table 1 for toxicology findings.

K 38 - Table 1. Toxicology findings for 177 deaths confirmed by blood GHB and/or BD levels

	#deaths (%)	# blood samples	Postmortem (PM) GHB mean and range	Antemortem (AM) GHB mean and range	Postmortem (PM) BD mean and
GHB only	60 (34%)	71 total 69 PM, 2 AM	Mean 560.7 mg/L Median 319 mg/L Range 66-4400 mg/L	Mean 334.5 mg/L Range 159-510 mg/L	Mean 164.5 mg/L Range 7.6-220 mg/L
GHB and >1 depr. co-intox	61 (34.5%)	65 61 PM, 4 AM	Mean 442.5 mg/L Median 286 mg/L Range 59-2300 mg/L	Mean 262.2 mg/L Range 17-562 mg/L	None
GHB and >1 stim. co-intox	25 (14%)	28 26 PM, 2 AM	Mean 525.3 mg/L Median 346.0 mg/L Range 210-2900 mg/L	Mean 317.0 mg/L Range 190-444 mg/L	None
GHB and stim/depr co-intox	31 (17.5%)	33 31 PM, 2 AM	Mean 455.5 mg/L Median 259 mg/L Range 67-1550 mg/L	Mean 715 mg/L Range 700-730 mg/L	None

An additional 16 deaths were confirmed with urine GHB levels only (mean urine GHB 1544 mg/L, range 67-5950 mg/L). These included 3 deaths (19%) with GHB and no co-intoxicants, 7 deaths (44%) with > 1 depressant co-intoxicants, 2 deaths (12%) with > 1 stimulant co-intoxicants, and 4 deaths (25%) with both stimulant and depressant co-intoxicants. One death was confirmed with chest fluid GHB levels only (316 mg/L); this death occurred with a depressant co-intoxicant.

GHB concentrations exhibit unpredictable variability between collection sites. Heart/femoral blood



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ratios ranged from 0.6 to 1.93 in 11 cases. 31 vitreous samples contained an average GHB 280.6 mg/L, range 9-1300 mg/L.

In conclusion, data collection is ongoing and additional analysis will be performed on multi-site sampling data and to investigate correlations between pathologic findings and use patterns. The series demonstrates that GHB may be lethal, even without co-intoxicants, in a variety of ways, and the public, clinicians, and law enforcement must be made aware of these risks.