

Gamma-butyrolactone (GBL)

Pre-Review Report

Expert Committee on Drug Dependence
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**World Health
Organization**

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Summary

Gamma-Butyrolactone (GBL) has widespread industrial use. It is a common solvent and reagent in chemistry and is used as an aroma compound, as a stain remover, as a superglue remover, as a paint stripper, and as a solvent in some wet aluminium electrolytic capacitors.

Since the end of the 1990s, GBL is also ingested by certain individuals for the purpose of intoxication. The epidemiology of the use and abuse of GBL is intrinsically linked to that of gamma-hydroxybutyrate (GHB). It is rapidly metabolized to and reported forensically as GHB - there is no need first to convert it chemically into some other substance. Furthermore, GHB can be easily manufactured from GBL. Deaths have been documented, but owing to this metabolism it is difficult to establish whether the deceased person had consumed GHB or GBL. Indeed, forensic samples of blood and other tissues are generally analyzed for GHB not its precursor. GBL appears to be mainly used and abused in the United States, Europe and Australia.

The amount needed to be taken in order to produce intoxication varies slightly among the substances; GHB is more potent than gamma-butyrolactone (GBL), which is more potent than 1,4-BD, another GHB precursor. On the substance market, the substance is usually sold mixed with distilled water at different concentrations. The doses of abuse are small: 100 – 200 ml, usually mixed with a taste-giver, such as a soft drink. Margins are small between normal and excess doses, entailing great overdose risks. Visually, the substances are very similar. It is difficult to tell them apart and to identify a sample with the naked eye.

In March 2001, GHB was added to Schedule IV of the 1971 UN Convention on Psychotropic Substances. Therefore, all Member States were bound to control it under their legislation addressing psychotropic substances. The new controls rapidly curtailed the previously open sale of GHB. They may also help to explain the emergent use of GBL, which does not fall under the controls of the international drug control convention.

In view of concerns about the diversion of GHB from the domestic distribution channel and illicit trade of GBL, some Member States have chosen to control one or both precursors under drug control or equivalent legislation. Furthermore, the European Community and the Member States have taken additional voluntary measures to prevent its diversion. This includes guidance for operators to be vigilant when placing this substance onto the international market.

However, the crucial issue remains how to do this without affecting industrial use. GBL is used in tons in the industry, while the doses for abuse are very small. Still, even if supervision of GBL was to be reinforced through its listing in the 1988 Convention, it would remain available to most citizens.

1. Substance Identification

A. *International Non-proprietary Name (INN)*

None.

B. *Chemical Abstract Service (CAS) Registry Number*

96-48-0

C. *Other chemical names*

1,2-butanolide, 2,3-dihydro furanone, 2(3H)-furanone dihydro, 3-hydroxybutyric acid lactone, 4-butanolide, 4-butyrolactone, 4-hydroxybutanoic acid lactone, butyrolactone, butyrolactone gamma, dihydro-2(3H)-furanone, gamma butyrolactone, gamma hydroxybutyric acid lactone, tetrahydro-2-furanone.

D. *Trade Names*

GBL was sold as a dietary supplement and illegally marketed as a substance to induce sleep, release growth hormone, enhance sexual activity and athletic performance and prolong life. Due to a large number of adverse reactions associated with its use, the United States Food and Drug Administration requested manufacturers to voluntarily recall these products (1-3). Some international clandestine distribution remains, especially via the Internet.

Some of the trade names used include:

Blue Nitro, Renewtrient, Reviverant, Vitality, GH Revitalizes, Gamma G, Remforce, Verve Tolt.

E. *Street names*

GBL has been associated with street names including “GBL”, “Blue Nitro”, “Firewater”, “G3”, “Gamma G”, “G.H. Revitalizer”, “Insom-X”, “Invigorate”, “Paint Stripper”, “Remforce”, “Renewtrient”, “Revivarant”, “Serenity 2”, “Thunder”, “Verve”, “Weigh Belt Cleaner”. “Paint stripper” is a reference to the use of GBL

One should be aware of the fact that street names are not always exclusive for just one substance.

F. Physical properties

GBL is a colorless oily liquid. GBL has a distinctive taste and odour, described as stale water or burnt plastic.

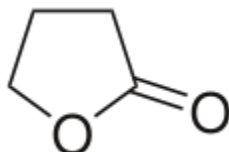
G. WHO Review History

During the discussion of gamma-hydroxybutyric acid (GHB) at the 34th Meeting of the WHO Expert Committee on Drug Dependence, the Committee “noted information relating to the abuse of GBL itself (convertible to GHB in the body) and suggested this substance for pre-review.” (4)

2. Chemistry**A. Chemical Name**

IUPAC Name: oxolan-2-one

CA Index Name: butyrolactone

B. Chemical Structure

Molecular formula: C₄H₆O₂
Molecular weight: 86.09 g/mol
Boiling point: 204-205 °C
Melting point: - 45 °C
Density: 1.12 g/ml (15 °C)
Refractive index (nd): 1.4355 – 1.4375
Acidity (pK_a): 4.5
Viscosity: 1.7 cp (25 °C)

C. Stereoisomers

No data.

D. Synthesis

GBL can be synthesized from *gamma*-hydroxybutyric acid (GHB) by removal of water or by distillation from such a mixture. It may also be obtained via oxidation of tetrahydrofuran (THF). One such process, which affords GBL in yields of up to 80%, utilises bromine generated *in situ* from an aqueous solution of sodium bromate and potassium hydrogen sulfate (5).

Despite federal efforts to curb GHB and GBL abuse, the clandestine chemists are finding new ways to obtain the desired substance. Since THF is a common solvent in most chemical laboratories and 1,4-butanediol (1,4-BD) is still readily available, the above oxidation and dehydration reactions offer a high potential for synthesizing GBL for either direct ingestion or subsequent conversion into GHB (6).

E. Chemical description

GBL is a lactone. It is hydrolyzed under basic conditions, for example in a sodium hydroxide solution into sodium *gamma*-hydroxybutyrate, the sodium salt of *gamma*-hydroxybutyric acid. Under acidic conditions it forms an equilibrium mixture of both compounds. These compounds then may go on to form a polymer.

F. Chemical properties

GBL is soluble in methanol, ethanol, acetone, ether and benzene. It is completely miscible in water and is rapidly hydrolyzed by hot alkaline solution.

G. Chemical identification

GC-MS methods with good sensitivity and selectivity are available for its analysis (7, 4, 8).

3. Convertibility into controlled substances

GBL is readily converted both chemically and in the body to *gamma*-hydroxybutyrate (GHB). GHB is placed in Schedule IV of the 1971 Convention a controlled substance.

4. General pharmacology

Early in the investigation of GBL, it became evident that most of its pharmacological and toxicological effects were mediated through a metabolite, GHB (9, 10). Further research activity was sporadic until concern arose in the late 1990s about the widespread abuse of GHB, especially in young people. National and international controls of GHB prompted substitution of GBL for GHB among the young abusers. This popular trend paralleled the rise in the use of the internet for the exchange of information. Thus, at the request of the WHO, the College on Problems of Drug Dependence initiated comprehensive studies on GBL, which, in turn, aroused interest by other investigators. These are detailed below.

At the 2002, CPDD Meeting, Aceto *et al.* (11) reported that the compound was inactive as an analgesic in a variety of mouse models and neither substituted for morphine nor exacerbated withdrawal in the morphine-dependent rhesus monkey. At the same meeting, preliminary drug discrimination results were presented. These were later published as full papers. For instance, McMahan *et al.* (12) reported that in monkey self-administration studies, GBL was not self-administered. In drug discrimination studies GBL did not substitute for pentobarbital, midazolam or flumazenil.

4.1. Pharmacodynamics

Animal studies

As would be expected from its rapid conversion to GHB, GBL produces mixed depressant and stimulatory effects in a wide variety of tests in rodents (13-19). A mechanistic relationship to the (GABA)_B receptor system has been described (15, 17, 18). Of particular interest was the recent report that GBL given directly to the brain of a rat (ICV) lacked the typical behavioral response seen with GHB. These data suggest that GBL is not metabolically converted to GHB in the brain and that enhanced brain penetration cannot account for potency differences between compounds (16).

Human studies

There have been no reported double-blind placebo controlled human clinical studies of GBL. However, given that GBL is rapidly converted to GHB in the body, the recent study by Thai *et al.* of 1,4- butandiole (1,4-BD) which is also rapidly converted to GHB may be relevant (20). They compared the pharmacology of 1,4-BD and GHB after oral administration to healthy volunteers. Vital signs were monitored and subjective mood and symptoms were assessed using a visual analog scale (VAS). Serial blood samples were taken over a 24-hr period and analyzed by GC/MS for 1,4-BD and GHB levels. Results were reported as follows: “1,4-BD was quickly absorbed and cleared, with time to maximal plasma concentration of 24±12 min, and elimination half-life ($T_{1/2}$) of 39.3±11 min. 1,4-BD was extensively converted to GHB, with a mean maximum GHB concentration of 45.6±19.7mg/l reached 39.4± 11.2 min after 1,4-BD ingestion. GHB $T_{1/2}$ averaged 32.3±6.6 min. Some subjects exhibited slow oral clearance of 1,4-BD, which tended to correlate with a variant haplotype of the alcohol dehydrogenase gene ADH-1B G143A. Mean CL/F was 151.5 ± 176.5 ml/min•kg for four subjects with variant haplotype versus 598.8 ± 446.6 ml/min•kg for four wild-type subjects (P= 0.061). Subjects reported feeling less awake and alert, less able to concentrate, and more lightheaded in the first 90 min after 1,4-BD ingestion. Pulse oximetry readings were lower 45 min after 1,4-BD dosing with a mean oxygen saturation of 98.5% with 1,4-BD versus 99.6% with placebo (P= 0.031). Transient increases in mean systolic and diastolic blood pressure were observed, but other vital signs remained unchanged. 1,4-BD was extensively converted to GHB after oral administration, but significant interindividual variability in the rate of metabolism, possibly related to variants in ADH-1B, was observed. At the modest dose studied, significant clinical effects were not seen.”

4.2. Dose and route of administration

When abused, GBL is administered orally in a liquid form. A millilitre of pure GBL metabolizes to roughly 1.6 g of GHB, so doses are measured in the single milliliter range, either taken all at once or sipped over the course of a night. GBL has a distinctive taste and odour, described as stale water or burnt plastic.

4.3. Pharmacokinetics

GBL is rapidly converted into GHB by lactonase enzymes found in the blood. GBL is more lipophilic (fat soluble) than GHB, and so it is absorbed faster and has higher bioavailability; the paradox is that this can mean that GBL has a faster onset of effects than GHB itself, even though it is a prodrug. The levels of lactonase enzyme can vary between individuals, and GBL is not active in its own right, so people who have never tried GBL before may have delayed or fewer effects than expected; however, once someone has taken GBL a few times, the production of lactonase enzymes is increased and he/she will feel the effects as normal.

Because of these pharmacokinetic differences, GBL tends to be more potent and faster-acting than GHB, but has a shorter duration; whereas the related compound 1,4-BD tends to be slightly less potent, slower to take effect but longer-acting than GHB (21).

5. Toxicology

GBL has a relatively low acute toxicity in mice (22) and rats (23) with no other clinical signs than central nervous system depression. A rat reproductive toxicity study (24) reported that no embryotic effects were seen. GBL has been extensively studied for mutagenicity as part of the International Collaborative Program. All results were negative (24). A variety of early carcinogenicity studies were carried out (25-29), most of which gave little or no positive results. However, in the late 1980s the U.S. National Toxicology Program initiated a “Toxicology and Carcinogenic Study of gamma-butyrolactone” (30). This was based on the rationale that GBL had “the potential for widespread exposure” due to its use as a chemical intermediate in the manufacture of a variety of products including polymers and herbicides. GBL has also been detected in various foods and has been used as an anaesthetic adjuvant. Sixteen-day and 13-week toxicity studies were carried out in mice and rats. The GBL was administered in corn oil by gavage. Again, lethal potency was relatively low. In the 13-week study, no lesions related to the administration of GBL occurred in mice of either sex. Based on these studies, 2-year carcinogenic studies were initiated in male and female rats and mice. Body weights and survival time in the GBL rats differed little from those of controls. Greater effects were seen in mice. For instance, survival in high-dose males was significantly lower than that of the controls. This was attributed to bite wounds and fighting in high-dose males recovering from the sedative effects of GBL. It was concluded that, under the conditions of these studies, there was no evidence of carcinogenic activity in male or female rats. There was no evidence of carcinogenic activity in the female mice. There was equivocal evidence of carcinogenic

activity in male mice. However, “the sensitivity of the study in male mice to detect a carcinogenic effect was reduced by the low survival of the high-dose group associated with fighting.”

6. Adverse reactions in humans

For a number of reasons, one is unable to obtain precise data on the incidence of adverse effects in humans. This is primarily due to the fact most of the adverse effects reported are due to the rapid conversion of GBL to GHB. Secondly, it has rarely been determined precisely what an individual has ingested (GBL, 1,4-BD or GHB). In addition, recent survey data treat the three compounds as a single agent. Despite this, there are numerous published reports of adverse reactions (31-38). The general symptoms reported include: loss of consciousness, vomiting, urinary and fecal incontinence, agitation, convulsions, respiratory depression, coma and death. The number of adverse reports has declined over time and the incidence is currently low.

7. Dependence potential

Animal Studies

In the morphine-dependent rhesus monkey, GBL neither substituted for nor exacerbated withdrawal (11). However, Columbo *et al.* (39) reported a reproducible withdrawal syndrome for GHB and its precursor GBL in alcohol-preferring rats. Finally, in a series of papers, Goodwin *et al.* (40-42) examined the acute and chronic effect of GHB and GBL in the baboon. They clearly observed a spontaneous and precipitated withdrawal syndrome after chronic administration of both GHB and GBL and presented evidence that the (GABA)_B receptor system may be involved.

Human Studies

There is no direct evidence that GBL can produce physical dependence as demonstrated by a withdrawal syndrome when the substance is abruptly discontinued following regular chronic use. However, several cases of withdrawal from GHB and its precursors have been documented (43-48) but the clinical features have not been fully characterized (49-50). However, the withdrawal syndrome for GHB appears to be similar to other CNS depressants such as alcohol and sedative hypnotics. Indeed, there appears to be some interactions between GBL and concomitant alcohol use (51).

8. Abuse potential

Animal Studies

Since it is generally agreed that GBL owes its central nervous system activity conversion to GHB (9, 10, see Section 4) the abuse potential of the substance should essentially mimic that of GHB. Animal studies which contribute to our determination of abuse potential revolve around a compound's pharmacological resemblance to substances with known abuse liability and the substance's reinforcing or rewarding actions. The procedures used to provide this evidence most often include general pharmacology, drug discrimination studies, and self-administration studies. As indicated above, the general pharmacology of GBL most closely resembles that of GHB (see Section 4). Drug discrimination studies (12, 52, 53) indicate that GBL is not discriminated as pentobarbital or midazolam but might share some properties with ethanol and some GABA-mimetic substances. Studies on the reinforcing effects of GHB are not indicative of a highly abused substance. Extensive self-administration studies in mice, rats and primates by both the oral and intravenous routes of administration indicate that GHB is not as reinforcing as other highly abused substances. Similarly, GBL showed little reinforcing properties when evaluated on intravenous self-administration in rhesus monkeys (12).

Human Studies

The ability of a substance to produce reinforcing effects is the primary determinant of whether the substance will be abused. These effects may be described as positive reinforcers (e.g., producing pleasurable subjective effects) or negative reinforcers (e.g., alleviating negative states). For hypnotic substances, including GHB and GBL, some symptoms of withdrawal upon discontinuation (e.g., insomnia, anxiety), may accentuate the reinforcing effects of the substance. Also of importance is the adverse event (toxicity) profile of the substance. Both of these factors are used to determine relative abuse liability.

Such studies have been carried out with GHB (54), concluding that the profile of effects of GHB: "only partially overlaps with that of triazolam and pentobarbital. Although the likelihood of GHB to be abused is intermediate to triazolam and pentobarbital, the possibility of accidental overdose (greater sedation than intended) with GHB appears to be greater." No such studies exist for GBL. However, since GBL is rapidly converted to GHB in man, the abuse potential may be considered equivalent.

9. Therapeutic applications, extent of therapeutic use and epidemiology of medical use

While GBL was sold in health food stores and athletic venues as a dietary supplement and purported to induce sleep, release growth hormone, enhance sexual activity and athletic performance, there is no recognized therapeutic indication for the substance.

10. Listing on the WHO Model List of Essential Medicines

GBL is not listed.

11. Marketing authorizations (as a medicine)

GBL itself is not authorized as a medicine.

12. Industrial use

GBL has widespread industrial use. For instance, it is an intermediate in the synthesis of polyvinylpyrrolidone, DL-methionine, piperidine, phenylbutyric acid and thiobutyric acid. It is used as a solvent for polyacrylonitrile, cellulose acetate, methylacrylate polymers, and polystyrene. It is a constituent of paint removers, textile aids and drilling oils.

13. Non-medical use, abuse and dependence

The epidemiology of the use and abuse of GBL is intrinsically linked to that of GHB. It is rapidly metabolized to and reported forensically as GHB. Indeed, forensic samples of blood and other tissues are generally analyzed for GHB not its precursors. GBL appears to be mainly used and abused in the United States, Europe and Australia. Some data from a recent Draft Critical Review of GHB would be relevant to this pre-review of GBL.

The Drug Abuse Warning Network (DAWN) is a public health surveillance system that monitors drug-related emergency department (ED) visits for United States. For Q3-Q4, 2003 DAWN reports a total of 627923 drug-related ED visits, of which only 990 involved GHB. Later DAWN data (55) indicates a continued low incidence of GHB ED visits and a continued downward trend. Thus, in 2004 there was a total of 1253956 misuse/abuse ED visits. Of these, 2340 were attributed to GHB (0.19%). In 2005, the total number of ED visits was 1449154. Of these, 1861 were attributed to GHB (0.13%).

Additional United States trend data can be found in the NIDA Proceedings of the Community Epidemiology Work Group (56). In this data set, GHB/GBL are combined with MDMA and ketamine under the classification of "Club Drugs." In general, the incidence of GHB/GBL use is low and has been trending down in recent years. This publication also includes DAWN ED, mortality and NFJLS data. In all categories, MDMA reports dominate with only a small number of reports for GHB/GBL.

Reports to various substance monitoring centres indicate that the use and abuse of GHB or related products is far reaching across Europe. GHB continues to be monitored through the European early-warning system (EWS). The main aim of the EWS is the rapid collection, analysis and exchange of information on new synthetic substances as soon as they appear in Europe. Although indicators suggest that GHB use could spread significantly through recreational venues, there is insufficient data to establish prevalence or to identify trends at the EU level. Seizures of GHB, including its precursors GBL and 1,4-BD, have been reported in Belgium, the Czech Republic, Denmark, Estonia, France, the Netherlands, Sweden, Finland, the United Kingdom and Norway (57). The latest report from the European Monitoring Centre for Drugs and Drug Addiction (ECMDDA) (58) states that: "A lack of information makes trends in GHB use difficult to assess, although the available evidence suggests that use of GHB remains limited to some small subpopulation groups."

Data from dance music surveys from Belgium, the Netherlands, and the United Kingdom suggest that use of GHB may have peaked around 2000-2003 and declined subsequently. However, the extent to which this finding would apply to other subgroups is unclear. It might be noted that in 2005, drug telephone help lines in Finland reported calls about GBL for the first time. The EMCDDA also recently published a thematic paper on “GHB and its precursor GBL: an emerging trend case study” which presents a comprehensive review of the status of this substance (59).

It should be noted that prevalence of the use of GHB among Eight, Tenth, and Twelfth Graders, College Students and Young adults (Ages 19-28) in the United States over the years 2002-2006 was lower and trended down over time (60). Recent 2007 survey data on adolescent substance use (61) confirm this trend in this population. Equivalent data for GBL are not available.

14. Nature and magnitude of public health problems related to abuse and dependence

GBL is an oily liquid completely miscible in water. The material is most often found on the street as a solution in water and the primary route of administration is oral. Early in its history as a substance of abuse, GBL was widely available as a dietary supplement mixed with a variety of other substances, such as vitamins and minerals. Following the international and national control of GHB, GBL began to replace it on the street. GBL’s use as a “date rape” substance has been widely reported, especially in the lay press. The compound is manufactured in ton quantities and is readily available in most countries and via the internet.

As indicated in Section 5, the precise incidence of adverse reactions to GBL is not available. However, some fatalities have been reported.

In summary, the nature and magnitude of public health problems related to the abuse and dependence on GBL has not reached those associated with GHB. Indeed, the magnitude of the problems appears to have decreased over the past several years.

15. Licit production, consumption and international trade

No country out of the 58 countries reported authorized GBL as a medical or veterinary product. 11 countries legitimated the substance for technical use. (Annex 1- report of the WHO questionnaire for review of psychoactive substances for the 35th ECDD) There are no international statistics showing the amounts of GBL in circulation in the European Union (EU) or in the world.

16. Illicit manufacture and traffic and related information

See the report of the WHO questionnaire for review of psychoactive substances 2008 (Annex 1). Seven countries have tracked illicit activities involving the substance. Clandestine manufacturing is reported one time. Smuggling is reported 3 times and diversion is reported 5 times.

17. Current international controls and their impact

GBL is not currently under international control.

18. Current and Past National Control

Canada: GBL is a Controlled Substance under Schedule VI of the "Controlled Drugs and Substances Act" in Canada. Schedule VI of the "Controlled Drugs and Substances Act" requires vendors to collect information regarding purchases of GBL. It is not illegal for an individual to possess GBL in Canada.

United Kingdom: GBL will be classified as a Class C drug from 23 December 2009, with a prison term of up to two years for possession and 14 years for dealing, by the end of 2009 (62).

Norway: GBL is covered by the derivatives rule and is thus controlled under the Ordinance on Narcotics (Forskrift om narkotika), in which GHB is listed.

Sweden: GBL is not classified as a drug but as a health-endangering substance (63).

Italy: GBL is controlled under a 1999 law on drugs and addiction. The rationale is said to have been GBL's role as a starting substance in the production of GHB. A permit issued by the Health Ministry is now required for the production of GBL, and the import and export of the substance are regulated by means of licenses issued by the same ministry. Enforcement is the responsibility of the customs authorities.

Australia: GBL is a border controlled substance and is illegal to import into Australia without a permit. The importation of a commercial quantity of a border controlled drug (over 2kg of GBL) is punishable by up to life imprisonment and/or an \$825000 fine (64).

United States: Under the United States legislation on analogous substances, GBL is treated as a controlled narcotic substance and can form the basis of prosecution just like the controlled substance GHB. A prerequisite, however, is that the substance must be intended for human use, which in most cases does not seem an easy matter to prove.

In the report of the WHO questionnaire for review of psychoactive substances 2008 (Annex 1) 7 countries control GBL under legislation that is intended to regulate availability of substances of abuse.

19. Other medical and scientific matters relevant for a recommendation on the scheduling of the compound

Serious consideration should be given to whether the GBL should be scheduled under the Psychotropic Convention (65) or controlled under the Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (66).

The U.S. Drug Enforcement Administration (DEA) issued an “Exempt chemical mixtures containing gammabutyrolactone Final Rule” in 2010 [Fed. Reg. (124) 37301-07]. This regulation made GBL chemical mixtures, in concentrations greater than 70%, subject to List I chemical regulatory requirements of the CSA, except if exempted through an existing categorical exemption. DEA took this action because there is a serious threat to the public safety associated with the ease by which GBL is chemically converted to the Schedule I controlled substance GHB.

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ANNEX 1: WHO Questionnaire for Review of Psychoactive Substances for the 35th ECDD: Gamma-butyrolactone (GBL)

The 2008 WHO questionnaire for the preparation of the thirty-fifth Expert Committee on Drug Dependence was responded for gamma-butyrolactone (GBL) by 58 countries.

LEGITIMATE USE

No country out of the 58 countries reported authorized GBL as a medical or veterinary product. There are several countries that reported GBL as a precursor chemical of gamma-hydroxybutyric (GHB). 11 countries legitimated the substance for technical use. It is used for forensic analysis, as a solvent (in laboratory), as a cleansing agent, as an industrial chemical and as a paint stripper and cleaner. 3 countries authorized the substance for other legitimate use. In Australia it is a common solvent and reagent in the chemistry and it is used as an aroma compound, as a stain remover, as a solvent and paint stripper. In Denmark it is used industrially for manufacturing of IT components, cleaning of ink, graffiti, glue, etc. In Germany GBL has a wide range of legal usages, such as cleaning agent, solvents in printer links or softener in plastics and applications in the aroma, photographic, electronic and tobacco industries. GBL is also a precursor chemical of GHB. It is one of the two chemicals used to synthesize GHB and often used to bypass GHB restriction laws. In the Netherlands it is a cleaning product. In Thailand it is used as a flavouring agent and it is used in the production of electronic parts. It is also used in the plastic production industry.

In total 10 countries indicated that they import the substance. Germany and the USA are the only countries who manufactured and imported the substance.

ABUSE

Of the 58 countries responding, 10 countries reported on the use of GBL in a harmful way and 4 countries reported on the extent of the harmful use. GBL is a similar or substitute substance for GHB. When abused, GBL is administered orally in a liquid form. It is used as a recreational substance and abused as anaesthetic rape substance. Germany reported a few cases of death in the last years which were related to GBL/GHB and often other synthetic substances and/or alcohol (mixed intoxication). Because of the metabolism of GBL to GHB in the body (in both cases only GHB can be identified in the body) the differentiation is difficult if GBL or GHB was consumed before the death. Poland reported a young woman who tried to commit suicide by overdosing the substance. The USA reported one death which involved GBL. It was a woman who had ingested GBL, which she had obtained via the internet. The bottle was labelled as an automotive product. The cause of death was indicated to be pneumonia and anoxic ischemic encephalopathy secondary to alcohol and GHB intoxication. The Republic of Korea reported that the substance is abused as substitute substance of GHB with similar dependencies.

4 countries reported on the extent of public health or social problems associated with the harmful use of GBL, while one country reported not having information or data related to public health or

social problems associated with the harmful use of GBL. Germany indicated that the substance, if ingested undiluted through the oral route, GBL can irritate the internal organs of the body. It is possible for oral ingestion of GBL to cause nausea and other similar problems, possibly more than with GHB. GBL overdose can cause severe sickness, coma and death.

CONTROL

7 countries reported GBL is controlled under legislation that is intended to regulate availability of substances of abuse. Coincidentally also 7 countries have tracked illicit activities involving the substance. Clandestine manufacturing is reported one time. Smuggling is reported 3 times and diversion is reported 5 times. Other illicit activities are reported one time.

Denmark, Germany, Norway and the USA reported on the quantity of the seizures. 6 litres were seized in Denmark from 2000-2007. Norway seized in 2005, 0.9 l./3 seizures, in 2006, 14.2 l./11 seizures and in 2007, 30.4 l./24 seizures. The USA seized 29595 ml in 18 seizures.

Germany reported that due to the small number of cases, the lack of classification as a legally controlled narcotic substance and the fact that not all cases were statistically recorded, it is not possible to give detailed figures for a total quantity of seized GBL. Available is only the quantity of GBL, which was seized in drug laboratories. 1,0 litre of GBL was seized in drug laboratories in 2007. In 2006 this figure was 1,7 litres, and 28,0 litres in 2005. Further Germany reported that they prevented several illicit activities. According to the case figures of the voluntary monitoring 10 cases of diversion involving GBL were reported in the course of the monitoring in 2007, and 5 deliveries were prevented. Altogether, the supply of 351 litres of GBL was prevented, as an illegal usage was assumed. 25 cases were also reported in 2006, in which the GBL ordered was to be put to illegal use, and 5 deliveries were prevented. In three cases, the supply of a total of 403 litres of GBL was prevented. In addition, 36 cases of diversion were accounted in 2005, in which approximately 28 litres of GBL was seized. The supply of approximately 611 litres of GBL was prevented in 2005.

Additionally Australia reported that 49 illicit shipments of GBL were detected at the Australian border in 2006-07. 48 were detected in postal articles and one detected in air cargo. The detections included two postal consignments of 20 litres and 10 litres each of pure GBL from the UK. While GBL has a legitimate use as a cleaning product, the actual end use of a number of shipments was in doubt. 65 percent of parcels containing GBL were sent from the UK. Other shipments were from the USA, Japan, China, Hong Kong and Poland.

Brand Name

No information

Technical Use

- Forensic analysis
- Solvent
- Cleansing agent
- Solvent in lab
- Industrial chemical
- Paint stripper
- Cleaner

The following has been reported by countries as "other legitimate use"

- Solvent and reagent in chemistry
- Aroma compound
- Stain remover
- Solvent
- Paint stripper
- Industrially for manufacturing of IT components
- Cleaning of ink, graffiti, glue, etc.
- Cleaning product
- Flavoring agent
- Use in electronic parts production
- Plastic production industry