

## **Illegal Substitution of Industrial Solvent 1,4-Butadienol for the Herbal Ingredient Kava-kava**

### Background

On New Year's Eve 1996, over 10,000 people, many under age, attended a "rave" party at the Grand Olympic Auditorium in downtown Los Angeles. Early in the evening, individuals began reporting to event sponsored first aid stations with complaints of headache, dizziness, nausea, disorientation, and difficulty breathing. The first aid stations were soon overwhelmed with victims. Over 30 individuals (including 17 minors) were sent to local emergency rooms as probable drug overdoses of an unknown nature. Non-critically ill participants were sent home; due to the confusion, fire department paramedics triage records were not kept and symptomatology or exact numbers of the non-critically ill were not recorded.

### Methods

Medical histories and records of the most seriously ill victims were obtained from fire department paramedics and ten emergency departments to which nearly three dozen attendees were transported. Samples of the distributed drug were obtained for identification purposes.

### Results

**Product Description:** Containers were clear glass 12 ml vials, 4.5 inches long, with opaque white screw tops and black stick-on label sealed over the screw top and down the side. There were three flavors: Cherry fX Bombs, Lemon fX Drops, and Orange fX Rush. The label included the statement shown in the adjacent box. About 900 vials were distributed at the party by the manufacturer, Biolife Bioproducts, as a sales promotion.

**Medical Records:** Records were obtained for 30 victims. The male:female ratio was 1:1; half the cases were under 18 years of age (mean age 18, range 14-42). Symptoms were observed typically within an hour of consumption of the purported recreational herbal drug. All cases experienced one or more signs or symptoms such as headache, nausea, disorientation, difficulty breathing, loss of consciousness, visual hallucinations, convulsion, memory loss, chest pain, and acute myocardial infarction. Toxicological tests were performed on fifteen cases; tests were positive for any substance in eight (53%), and three individuals had multiple drugs detected. The most common drugs found were cannaboids (4/8, 50%), amphetamine (4/8, 50%), and cocaine (3/8, 38%); there was one case each of ephedrine and benzodiazepam ingestion. In addition the victims gave histories of other substances consumed, including LSD and "ecstasy," an amphetamine derivative. One victim required intubation with mechanical ventilation.

**Criminal Investigation:** A lengthy multi-agency investigation discovered that the labeled active ingredient of fX, kava-kava, was absent. When the manufacturer's shipment of kava-kava became unavailable, 1,4-butadienol and caffeine were substituted by the manufacturer in the belief that this would mimic the effects of gamma hydroxybutyrate (GHB). 1,4-butadienol is a toxic industrial chemical not meant for human consumption.

## Discussion

Kava-kava consists of dried roots of *Piper methysticum*, a large shrub indigenous to the South Pacific Islands, where its most common use is as a beverage used to induce relaxation. It produces mild euphoric changes characterized by feelings of happiness, more fluent and lively speech, and increased sensitivity to sounds. In low doses there is a numbing sensation in the mouth. At high doses it induces drowsiness and sleep; the legs become numb and there is muscular weakness and other significant motor impairment. High doses also lead to changes in visual and/or auditory perceptions. Liver impairment has been reported among abusers. It is an intoxicating non-alcoholic product which may have an abuse potential similar to or greater to that of alcohol.

1,4-butadienol, also called 1,4-butanediol, is an industrial chemical used in the manufacture of other organic chemicals. It is not considered a carcinogen. Following ingestion by animals and humans, it is rapidly absorbed and metabolized to gamma-hydroxybutyric acid.

Gamma hydroxy butyrate (GHB, also called Liquid X, "G," Liquid Ecstasy, Grievous Bodily Harm, Georgia Home Boy, Scoop, Great Hormones at Bedtime, and others) is a Schedule 1 controlled substance. This means it has a high potential for abuse and no accepted medical use in the USA, and has not been proven safe for use under medical supervision. It is a behavioral depressant and hypnotic; side effects include disorientation, nausea, coma (sometimes abrupt and profound), seizures and respiratory depression. While objective symptoms reflect a CNS depressant, its effects mimic various stages of an epileptic seizure (dose related). It is often used in conjunction with alcohol or mixed drinks as it has an unpleasant, salty taste.

## Follow-up

Due to FDA coordinated investigation, the manufacturer was found guilty of "misbranding" and distributing an unlicensed product. He was sentenced to three months in prison, three months in a halfway house, and three years probation; he was also fined \$2,000. His accomplice was sentenced to two years probation and ordered to pay a fine of \$2,000. Follow-up of the health effects of the 31 individuals hospitalized due to symptoms following consumption of fX has been referred to the California Department of Health Services.