

# Violent Behavior, Impulsive Decision-Making, and Anterograde Amnesia While Intoxicated With Flunitrazepam and Alcohol or Other Drugs: A Case Study in Forensic Psychiatric Patients

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It is known that many male juvenile delinquents commit violent crimes while intoxicated with flunitrazepam (FZ), often in combination with alcohol or other drugs. We have also noted the combined abuse of FZ with, for example, alcohol in male forensic psychiatric patients. Our objective was to study violent behavior, impulsive decision-making, and amnesia in male forensic psychiatric patients who were intoxicated predominantly with FZ, to increase knowledge of the abuse of FZ in vulnerable subjects. We studied five forensic psychiatric patients, all of whom were assessed in 1998. All of the subjects reported earlier reactions to FZ, including hostility and anterograde amnesia. At the time of their crimes they were all intoxicated with FZ, often in combination with alcohol or other drugs, such as amphetamine or cannabis. In contrast to their behavior based on their ordinary psychological characteristics, their crimes were extremely violent, and the subjects lacked both the ability to think clearly and to have empathy with their victims. Our observations support the view that FZ abuse can lead to serious violent behavior in subjects characterized by vulnerable personality traits, and that this effect is confounded by the concurrent use of alcohol or other drugs. It is evident that FZ causes anterograde amnesia. Previous research and the results presented herein allow us to draw the following conclusion: on the basis of the neuropsychopharmacologic properties of FZ, legal decisions, such as declaring FZ an illegal drug, are needed in countries where it is now legal.

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The purpose of the present study was to describe in detail some cases involving those who committed murder or serious assault while intoxicated with flunitrazepam (FZ), often in combination with alcohol or other drugs, at the time of the crime. The objective was to study violent behavior, impulsive decision-making, and anterograde amnesia in sub-

jects who were intoxicated with FZ, to increase knowledge of the abuse of FZ and its consequences in psychiatrically or psychologically vulnerable male subjects.

## Medical Use of Flunitrazepam

Use of FZ is legal in 64 countries. It is used for the treatment of insomnia, similar to other benzodiazepine hypnotic drugs, and as a preanesthetic. Gambi

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and colleagues<sup>1</sup> have reported that FZ is also used in Italy in psychiatric inpatients to boost the effects of antipsychotic therapy.

FZ is currently available in Sweden in 0.5- and 1-mg tablets, under the following trade names: Flunitrazepam NM Pharma (Stockholm, Sweden), Fluscand (Enapharm, Enköping, Sweden), and Rohypnol (Hoffmann-La Roche). There are other doses, often 2-mg tablets, on the illegal market in Sweden. There are several routes by which FZ is smuggled into our country. One route starts at the Hoffmann-La Roche factory in Prague (The Czech Republic) where FZ is produced, and other routes start at factories in Spain and in Lithuania.

### Neuropsychopharmacologic Properties of Flunitrazepam

Dåderman<sup>2</sup> recently reviewed the neuropsychopharmacologic properties of FZ. Briefly, FZ is a sedative-hypnotic benzodiazepine with pharmacokinetic properties that include a rapid onset and intermediate duration of action. It has a high affinity with central benzodiazepine receptors and affects them profoundly. These properties, and its profile of activity, make FZ one of the most potent benzodiazepines available and increase the probability of abuse by those who have access to it. FZ enhances the transmission of  $\gamma$ -aminobutyric acid (GABA) in the central nervous system by special benzodiazepine receptors. GABA reduces activity in vast regions of the brain, especially in the parts of the brain that are responsible for arousal (such as the limbic system, which is also related to emotions and empathy). GABA has an inhibitory effect on many important neurotransmitters, such as noradrenaline, serotonin, dopamine, and acetylcholine.

FZ causes, among other things, partial anterograde amnesia—that is, loss of the ability to recall personal experiences. People are unable to remember certain events that they experienced while under the influence of the drug. Any memory that they have of these events occurs only in flashes.<sup>3</sup>

### The Concept of Vulnerable Personality and Disposition for Abuse

Buchsbaum and colleagues<sup>4</sup> formulated the biological vulnerability hypothesis. This hypothesis

states that low platelet monoamine oxidase (MAO) activity, which is assumed to be connected to the central serotonergic function, is associated with certain personality traits. Schalling and colleagues<sup>5</sup> described the origins and implications of vulnerable traits and methods for assessing such traits. These traits, in turn, are associated with a predisposition to psychiatric or psychological vulnerability. Such constitutional vulnerability predisposes individuals to breakdown in the presence of stress or somatic disease. Support for the biological vulnerability hypothesis was provided by the findings of Coursey *et al.*,<sup>6</sup> Schalling *et al.*,<sup>5</sup> and Virkkunen *et al.*<sup>7</sup> Low platelet MAO activity has been found in male forensic psychiatric subjects who have high scores on sensation-seeking, extraversion, impulsiveness, and (to a lesser degree) aggression scales.<sup>8</sup>

Many personality traits of male forensic psychiatric patients differ from those of randomly selected subjects from a normal population. For example, males undergoing a forensic psychiatric assessment (FPA) in Sweden with a disorder comprising abuse or dependence of alcohol in combination with other substances showed deviation on somatic anxiety, social desirability, monotony avoidance, irritability, suspicion, and socialization, measured by Karolinska Scales of Personality (KSP),<sup>5</sup> when compared with males from the same population without the disorder.<sup>9</sup> Recently, Dåderman and Edman<sup>10</sup> reported results regarding personality traits in a group of male patients who underwent an FPA during 1997 and 1998. The subjects were studied with scales from reliable and valid inventories, namely the Marke-Nyman Temperament inventory,<sup>11</sup> the Eysenck Personality Questionnaire,<sup>12</sup> the Zuckerman Sensation-Seeking Scales,<sup>13</sup> and the KSP.<sup>5</sup> (The purpose of the present study is not to analyze personality traits in FZ abusers; the reader is therefore referred to the above-noted references or to Dåderman and Edman<sup>10</sup> for a brief review of personality traits and inventories.) The study showed that male forensic psychiatric patients, compared with males from the normal population, deviated from the norm on anxiety-proneness, solidity, validity, socialization, neuroticism, and impulsiveness and also on thrill- and adventure-seeking and experience-seeking. This pattern of personality suggests that male forensic psychiatric patients may be psychiatrically or psychologically vulnerable to the development of mental disorders.

They may also be generally predisposed to the development of substance abuse.

### Worldwide Abuse of Flunitrazepam

When used illegally, FZ is often, but not always, used together with other substances, such as alcohol and cannabis. Among abusers, FZ is a popular drug due to its pharmacologic properties, rather than to other factors, such as social and cultural factors or the reputation of the drug. FZ is abused by abusers of both alcohol and other drugs, and by subjects in populations without previous disorders involving abuse or dependence on alcohol or drugs. Abuse of FZ has been reported on all continents.<sup>14–25</sup>

A recent study performed at the Department of Forensic Chemistry, University Hospital in Linköping, Sweden, showed that, between 1992 and 1995, approximately one in four car drivers stopped by the police for suspicion of driving under the influence of drugs and/or alcohol had FZ in their blood samples.<sup>26</sup> The police often stop these drivers because they drive extremely recklessly while under the influence of FZ.

It is evident that FZ is a drug commonly used by prisoners in Swedish prisons, where it is often legally prescribed.<sup>27</sup> The drug can suppress a prisoner's insight into the consequences of his or her actions, leading to violent and aggressive behavior, often promoting the verbal abuse of staff or leading to injury of other prisoners. The Swedish National Prison and Probation Services has highlighted this problem.<sup>28</sup> (Prisoners in Swedish prisons have no opportunity to obtain alcohol while imprisoned, but the possibility that they are simultaneously taking another legal drugs besides FZ, for example other benzodiazepines or cannabis, cannot be ruled out.) The case of a young man intoxicated with FZ alone, which generated significant media attention in Sweden in 1995, has recently been discussed in the medical literature.<sup>29</sup> In 1995, the man, while intoxicated with FZ, inflicted serious knife and gunshot wounds and took hostages, and he felt so invincible that he openly challenged the police. During his long-term imprisonment, FZ had been legally prescribed to him by a prison doctor, leading to his FZ abuse and dependence, which had lately lead to serious consequences for his health as well as for the security of the staff.<sup>29</sup>

### Flunitrazepam-Facilitated Date Rape

The fact that FZ causes partial amnesia is particularly dangerous when it is used to aid in the commission of sexual assault. It has been reported that FZ has been particularly implicated in date rape. This has led to FZ's being called the date-rape drug.<sup>30,31</sup> Victims may not have a clear recollection of the assault, the assailant, or the events surrounding the assault. Schwartz and Milteer<sup>32</sup> have reported that free drug tests to detect FZ in urine samples have been arranged recently in cases of sexual assault.

### Abuse of Flunitrazepam by Adolescents and Juvenile Delinquents

FZ is commonly abused by street children in Brazil.<sup>33</sup> Many street children see their use of FZ and other drugs as an escape—a way to dull their hunger and facilitate acts of prostitution and crime.

A study performed in Austin and South Texas by Calhoun and colleagues<sup>34</sup> showed that FZ can be used alone by students, to become intoxicated at school. The adolescents reported that they become more talkative, more at ease, or more comfortable, particularly in situations in which they would otherwise be uncomfortable. They want to “go out and do things” (Ref. 34, p 187). Males engage in violent behavior while under the influence of FZ more often than females. Calhoun *et al.* also described that intoxication with FZ while fighting does not produce the expected effect (cf. the “Rambo syndrome” described later), because the subject does not feel the pain of injury and can be angered over trivial matters. Judgment was impaired while intoxicated with FZ: “Even when they were stealing in plain view of others, they felt they could not be seen or caught” (Ref 34, p 188).

Behavior while intoxicated with FZ is called the Rambo syndrome in Australia, because of the effect that FZ has on persons, making them overconfident and violent. Dobbin<sup>24</sup> reported that both juvenile delinquents and adult criminals in Australia who take FZ display violent and aggressive behavior, possess feelings of enormous strength, and become cold-blooded and ruthless. Dobbin includes several opinions of medical and other professionals about FZ in his report. One employer from The Australian Youth Parole Board says:

Young parolees have easy access to prescribed medication, and FZ causes the most problems. Individuals take considerably

more than the prescribed dose, and find themselves in the cells without remembering what they have done. They commit violent and reckless crimes such as assault, high speed car chases, theft, burglary and recklessly causing injury. If individuals who have a propensity for violence take FZ, they are more likely to assault or react violently (Ref. 24, p 40).

In Sweden, daily newspapers have reported that high school students use FZ, commonly to enhance the effects of alcohol. Moreover, Hermansson,<sup>35</sup> from the Swedish National Criminal Investigation Department, has recently described some serious violent crimes committed by FZ abusers and reported that youngsters use FZ for intoxication. For example, in one incident in 1997, a group of teenagers—all but one with no previous criminal record—took FZ and then robbed the church choir in Uppsala. After tying one of the members of the choir with ropes, an elderly man in a wheelchair, they forced him to swallow 6 mg of FZ.

One Swedish study of juvenile delinquents in four Swedish correctional institutions suggests that FZ abuse is very common (40% of the sample were FZ abusers).<sup>25</sup> The desire for the drug is related to an increased feeling of power and self-esteem, reduction of fear and insecurity, and stimulation of the belief that nothing is impossible.<sup>25</sup> The juveniles reported that they could obtain FZ very easily (by stealing from a pharmacy, other drug addicts, or senior citizen departments or from a supplier at parties).

### **Abuse of Flunitrazepam in the Male Forensic Psychiatric Population in Sweden**

Recently, Elmgren<sup>36</sup> described the cases of some men who had been admitted for forensic psychiatric reassessment in Sweden in 1993. These men had previous convictions for murder and had committed new murders while intoxicated with FZ and alcohol. The cases were referred for forensic psychiatric reassessment, either by an assessing forensic psychiatrist or by a defense counsel, because the court was unable to agree on whether the crimes were committed under the influence of a severe mental disorder. The cases can be regarded as examples of how FZ influences vulnerable persons—for example, those with impulsive personality traits or those who may have a weak serotonergic system. When intoxicated with FZ, all the men described by Elmgren behaved as if they had psychosis, and the court was unable to decide whether the offenders who experienced psychosis while under the influence of FZ could be sen-

tenced to prison. Thus, although abuse of FZ in Sweden is not a mitigating factor when committing a crime, intoxication with FZ has been an important legal issue in several cases—the question was whether psychosis experienced under the influence of FZ should be regarded as a severe mental disorder.

Two of the cases described by Elmgren,<sup>36</sup> leading to different legal decisions, can be taken as examples (the referenced publication is not available in English, and therefore we provide a brief summary). In both cases, the results of the initial FPA had caused the examiner to reach the conclusion that the perpetrator did not have a severe mental disorder when the crime was committed. One subject, E., was charged with attempted murder after an unprovoked, frenzied attack on a stranger. E. remembered nothing of the event, which had taken place while he was under the influence of 1.5 mg of FZ and a small amount of alcohol. The initial FPA had resulted in a diagnosis of borderline personality disorder and dependence on anxiolytics. The reassessment suggested a diagnosis of mental disorder with several serious symptoms. In particular, it emphasized that E. behaved as if he was psychotic when he committed the crime. Another man, F., committed murder. Again, the initial FPA showed that F. did not have a severe mental disorder at the time of the crime. The reassessment results emphasized F.'s dependence on alcohol and benzodiazepines, which negatively influenced his vulnerable personality. The reassessment showed that the crime was an impulsive outbreak of aggression based on uncomplicated self-inflicted intoxication. There were no psychotic symptoms when the crime was committed, and the reassessment showed that F. did not have a severe mental disorder at the time of the crime.

We have noted during FPAs of offenders that they committed some of their violent crimes while under intoxication by FZ. Dåderman and Edman<sup>10</sup> have recently reported that approximately 30 percent of the young male offenders who are subjected to FPAs were intoxicated with FZ at the time of their crimes. In-depth interviews were conducted to assess the extent and severity of violence during intoxication with FZ. The subjects reported that they obtained FZ from general practitioners, who prescribe the drug without appropriate assessment of the patients. They reported that, while intoxicated with FZ, they easily became aggressive and committed serious offenses



(including murder, manslaughter, and robbery) and had no memory of their actions.

Several other studies have been conducted in this population, but the results have not yet been published. One of them, performed by Dåderman during 1997, examined approximately 80 selected forensic psychiatric files of men (less than 30 years old) who had been assessed at the Stockholm forensic unit in 1991 and 1992. This study showed that many of the violent situations occurred while the offenders were intoxicated with FZ. A series of violent crimes had been committed in several cases. It was noteworthy that the offenders in many of these cases were intoxicated with both FZ and alcohol.

### Experiences With Flunitrazepam and Legal Issues in Some Countries

The United States realized the dangers of FZ at an early date and banned it. FZ has never been approved for medical use in the United States, and it cannot be prescribed or sold. It is, however, illegally used in the United States, into which it is smuggled mainly from Mexico.<sup>37</sup> Approximately 25 other countries have been identified from which FZ has been directly smuggled into the United States. In 1984, the United States placed FZ into Schedule IV of the Controlled Substances Act, because of international treaty obligations. Under the Drug-Induced Rape Prevention and Punishment Act, passed by the U.S. Congress in 1996, the use of FZ for purposes of rape is punishable by a fine and prison sentence. Distribution or surreptitious administration of FZ is punishable by up to 20 years in prison. In 1997, Oklahoma classified FZ as a Schedule I drug (that is, drugs with no medical purpose), which places it in the same category as cocaine, heroin, and lysergic acid diethylamide (LSD). Other states may do the same.<sup>34</sup> In Florida, a new law allows screening for FZ if a driver seems impaired but has a low blood alcohol level. FZ is not legal in Canada, even with a prescription.

Several countries have made some legal decisions leading to several minor restrictions in the supply of FZ, because of negative experiences with it. Such experiences include an increase in the use of FZ by school children and its use as a party drug, street drug, and date drug. For example, the 2-mg tablet has been removed from the market in several countries. In Germany, the 2-mg dose of FZ has recently been removed from retail distribution and has been restricted to hospital use only.<sup>38</sup> Several countries

have removed double packs of the FZ tablets from the market, because many users erroneously believe that FZ is a safe drug. This belief arises from the observation that only unadulterated, legal, and safe drugs are commonly marketed in this way. In France, FZ indications were restricted in 1996 to severe sleeping disorders, and in 1999 the 20-tablet pack was changed to 14- and 7-tablet packs.<sup>39</sup> A new preparation of FZ has recently been introduced, which is dyed blue and is less soluble in water. When FZ is dissolved in a drink, it is odorless and tasteless.

Moreover, due to widespread forgery of prescriptions, there are currently special prescription forms in several countries. For example, a prescription for FZ in Sweden must be written on a special prescription form with a watermark and a serial number. In France, all FZ prescriptions must be written on a secure prescription form with a 14-day dose as the maximum prescription.<sup>38</sup>

No reports have been published describing the experiences of countries that have previously approved prescriptions of FZ and subsequently withdrawn approval. In Finland, approval to use FZ was withdrawn in 1991.<sup>38</sup> It appears that FZ has been subjected to tighter control in Australia, France, Sri Lanka, and Sweden at least.

In Australia, Dobbin<sup>24</sup> wrote a report for the Australian National Drugs and Poisons Schedule Committee that resulted in FZ's being rescheduled as a Schedule 8 drug (Drugs of Addiction). This schedule includes morphine, methadone, amphetamines, methylphenidate, and barbiturates.

The French authorities have recently decided to subject FZ to the same prescribing restrictions as narcotics because of its continuing abuse.<sup>39</sup> In Sri Lanka, FZ registration will not be renewed because of the problem of abuse.<sup>38</sup>

In 1997, the Swedish Citizens Commission on Human Rights requested that the Swedish Medical Products Agency remove FZ from the Swedish market. (The Swedish Medical Products Agency is the equivalent in Sweden to the U.S. Drug Enforcement Administration and decides which drugs can be introduced into or withdrawn from the Swedish market.) Furthermore, the Swedish National Board of Forensic Medicine and the National Board of Health and Welfare in Sweden requested in 1999 that the Swedish Medical Products Agency remove all FZ compounds from the market because of their violence-enhancing effects. As recently as April 10,

2001, the Swedish Minister for Justice, Thomas Bodström, stated that he would like to prohibit FZ totally, as: “. . .together with one beer, it converts adolescents into a murder-machine.”<sup>40</sup> On May 1, 2001, after an intensive debate involving several researchers and Thomas Bodström, Lars Engqvist (Minister for Health and Social Affairs) and Maud Ekendahl (a member of the Swedish Parliament), the Swedish Medical Products Agency rescheduled FZ as a Schedule II preparation. This schedule is used for serious drugs with a possible medical purpose, and includes methadone, morphine, amphetamines, and cocaine.

### Forensic Psychiatric Legislation in Sweden

Swedish legislation concerning mentally disordered offenders states that an FPA must be performed before sentencing. A sentence to forensic psychiatric care is based on the results of an FPA. There are two types of FPA in Sweden: major and minor. A major FPA includes extensive reports from a team comprising a psychologist, a forensic psychiatrist, and a social worker. Observations from the nursing staff supplement the assessment. Assessment time is approximately four weeks, and the assessment results are provided in a written statement with a recommendation to the court. There are four main forensic psychiatric units in Sweden. The largest one, which makes more than one-half of all assessments, is located outside of Stockholm (Huddinge).

If an FPA shows that the crime was committed under the influence of a severe mental disorder, a sanction within the prison system is prohibited. “Severe mental disorder” is a judicial concept and comprises all psychotic states, depression with suicidal thoughts, and serious personality disorders. In these cases, the mentally ill perpetrator of a serious crime is sentenced to forensic psychiatric care.

However, it is the practice that confusion or a psychotic state that is self-inflicted by alcohol and/or drugs is not regarded as a severe mental disorder. Thus, an FZ-induced state of confusion or psychosis does not normally mean that the defendant is sentenced to forensic psychiatric care, unless the FPA finds that a primary psychosis or serious personality disorder was the main reason for the criminal behavior and that the effect of FZ was of secondary importance.

During 1998, 1,841 perpetrators were subjected to a minor FPA and 609 to a major FPA. A total of

314 perpetrators were sentenced to forensic psychiatric care.<sup>41</sup> More than 95 percent of those who underwent an FPA were found to have a psychiatric disorder, and approximately one-half of them fulfilled the criteria for a severe mental disorder, as defined by Swedish law. Forensic psychiatric care was recommended in approximately 45 percent of cases, and probation or care by the social welfare system was suggested in 10 percent. The court nearly always approves the recommendations of the forensic team. A fellow of the Legal Aid Council at the Swedish National Board of Health and Welfare may refer FPA cases to the court for reassessment, in which case the court appoints a board of experts to present an opinion. This procedure is used in cases that are difficult to assess or are controversial and its use is necessary in approximately five percent of cases.

### Materials and Methods

In the present study, all subjects except one were admitted for an FPA and assessed at the Department of Forensic Psychiatry in Stockholm in 1998. The exception was assessed at the Department of Forensic Psychiatry in Gothenburg and reassessed in Stockholm. All subjects committed crimes in Stockholm in 1998. The FZ abuse was well-documented in police and forensic files (in the form of laboratory results, police reports, or from other sources, such as an interview). The files from the Swedish National Board of Forensic Psychiatry include information from the Swedish National Police Register, the Hospital Discharge Register of the Swedish National Board of Health and Welfare, and files from the courts. The subjects’ characteristics are presented in Table 1.

The subjects were in a group of 60 male forensic psychiatric patients (aged 16 to 35 years) who were in the final phase of FPA and who agreed to participate in a neuropsychological research project that studied, among other things, substance abuse<sup>2</sup> and personality characteristics.<sup>10</sup> The Research Ethics Committee at Huddinge University Hospital approved the project.

### Results

#### Case 1

After completing school (12 years of education), G.H. began university studies. Thus, he was a university student, but he lived a double life. He ap-

## Aberrant Behavior During Drug Intoxication

**Table 1** Forensic Psychiatric Diagnoses (DSM-IV)

Description	Case				
	1	2	3	4	5
Age in 1998 (y)	23	26	22	26	22
Actual offenses	Murder, narcotics offenses, and unlawful possession of knives	Aggravated assault, causing another's death, unlawful possession of weapon, and narcotics offenses	Murder and causing injury	Robbery and unlawful threat	Severe assault and robbery
Actual sentence	Forensic psychiatric care	6 Years	8 Years	3 Years and 6 months	3 Years and 3 months
Axis I diagnosis	1. Polysubstance dependence 2. Amphetamine abuse 3. Cannabis abuse 4. Sedative abuse	1. Sedative dependence (benzodiazepines) 2. Opioid dependence 3. Cannabis dependence 4. Amphetamine dependence 5. Alcohol abuse 6. Depressive disorder NOS	1. Sedative abuse 2. Alcohol abuse	1. Anxiety disorder NOS 2. Sedative dependence (flunitrazepam) 3. Cannabis dependence 4. Alcohol abuse	No diagnosis
Axis II diagnosis	1. Antisocial personality with pronounced narcissistic and borderline features 2. Dissociative syndrome NOS	1. Antisocial personality 2. Paranoid personality 3. Cognitive disorder NOS	1. Antisocial personality	1. Borderline personality 2. Narcissistic personality 3. Antisocial personality	No diagnosis
Axis III diagnosis	No diagnosis	No diagnosis	No diagnosis	No diagnosis	No diagnosis
Axis IV diagnosis	1. Individual-related problem NOS 2. Problems with primary support group	1. Problems with primary support group 2. Abuse among brothers 3. Unemployment	1. Unemployment 2. Social environment-related problem 3. Criminality	1. Individual-related problem 2. Social environment-related problem 3. Criminality	1. Mother's death 2. Poor social network 3. Homelessness/unemployment
Axis V diagnosis*					
GAF <sup>past year</sup>	68	49	60	45	55
GAF <sup>assessment</sup>	68	49	55	40	55

\* Diagnoses were assigned in the five subjects at the time of the FPA. All committed violent crimes while intoxicated with FZ. The reporting of overall functioning on Axis V is scored using the GAF scale, on a hypothetical continuum from a score of 100 (superior) to 0 (no information). GAF considers psychological, social, and occupational functioning, not impairment in functioning due to physical or environmental limitations. GAF<sup>past year</sup>, highest level of GAF during the past year; GAF<sup>assessment</sup>, ratings on the GAF scale at the time of the FPA; NOS, not otherwise specified.

peared to function well in society, and managed to keep a serious drug habit relatively well hidden. The positive side of his life was that he had a job (when not studying), he had a girlfriend, and he was interested in sports, particularly in bodybuilding. While at the university, he committed the first murder, that of an elderly alcoholic. This crime remained unsolved while G.H. continued his studies, commencing a course in social anthropology and pedagogics at an institute of education. At this time he committed a double murder.

G.H. started to use cannabis when he was 12 years old. He added amphetamine and FZ abuse to the cannabis abuse when he was 14 years old and a doctor

prescribed FZ for G.H.'s anxiety and sleep disturbances. On several occasions he had experienced 24-hour periods of amnesia when influenced by FZ. He had two earlier convictions, one for drug-related crime and possession of an illegal weapon (a knife) and another for a violent crime: an assault with sudden hostility and a blackout.

During a two-year period, G.H. stabbed three victims to death. Two of the victims—a young couple—were his friends. They were found murdered in their apartment in a suburb of Stockholm. Both victims had been stabbed to death, and their dog was found dead with its throat cut. The double murder had a specific and bizarre signature: The victims had

been stabbed in the eyes. This fact made the police relate the crime to a murder that had taken place two years earlier, when a 73-year-old alcoholic was found in his home with wounds caused by a knife in one of his eyes. Four days after the double-murder the police arrested G.H., who at the time of arrest was severely intoxicated. A blood sample showed the presence of FZ. In his home, 340 mg of FZ was found.

During the investigation, G.H. claimed that when he had committed the first murder, he had not slept for two days and that he had used FZ, cannabis, and amphetamine. He had met a stranger on the street and followed him to his home where they played chess and drank spirits. While intoxicated with FZ, he became furious and sadistic toward the victim. G.H. knocked the elderly man down and strangled him with a belt. Later, he raised the victim behind his back, still with a belt around the victim's throat, in such a way that the victim's feet were off the floor. Then G.H. let the victim down onto the floor, stabbed him in the eye, and forced a fish knife down his throat. He completed the attack by driving a screwdriver into the victim's body using a hammer. He also used the full force of his body weight on a broom handle to drive the eye of the victim into the brain. He then spent approximately six hours in the apartment, watching television and looking for articles of value to steal.

Before the double murder, except for FZ, G.H. had abused diazepam (in the form of Valium, another sleeping pill) and amphetamines for three or four days, had smoked hashish and drunk alcohol, and had not slept or eaten. He was tired and paranoid, had a distorted perception of reality, and heard voices. The male friend refused to participate in a fraud, causing G.H. to become enraged and stab the man several times with a carving knife. The man's girlfriend tried to aid him, armed with a hammer. G.H. disarmed her, killed her with the hammer, and stabbed her in the eye with the knife. The victims' dog started to bark, and G.H. cut the dog's throat. He then spent a lengthy time (it is not known how many hours or days) in the apartment.

Although G.H. could only remember some experiences in flashes and not in a logical order, he confessed both to the double murder and to the earlier murder. However, he did not remember committing the double murder. He could not provide a logical explanation for the acts. Two of the victims were

known to G.H., and he liked both of them. He had no motive for murdering his victims.

G.H.'s psychological characteristics included some vulnerability traits (impulsiveness combined with low self-esteem). During his childhood, he had been very shy.

## Case 2

N.A.H. finished nine years of compulsory schooling and commenced a two-year course at a sixth-form college, studying vehicle mechanics. He left the course after six months. He had a number of jobs in the following years (mail sorter, bookbinder, and printer and jobs with the park service), continued his education, and established a relationship with a woman.

His history of substance abuse and dependence and criminality was as follows. When he was 10 years of age he began to abuse cannabis, an abuse that became regular by the age of 12 or 13. At the age of 16 he began to abuse amphetamine. A few years later he began to abuse ecstasy and LSD. He preferred cannabis, central stimulants, opiates, and benzodiazepines, and he became aggressive when drinking alcohol. He started to steal car stereo systems and mobile telephones toward the end of his teenage years, to finance his abuse. He was convicted twice for assault and theft, fined, and passed to the social services. When he was 19, he moved to his own apartment. The following year, he was convicted of threatening behavior and illegal possession of weapons and was put on probation. Three years before the crime of murder, he separated from his girlfriend and was treated with FZ for depression and anxiety. Two years later, he was arrested by the police and convicted of weapon- and drug-related crimes, leading to his being sentenced again to probation and to his undergoing a special program of treatment. At this time, he was referred to a psychiatric clinic, where he was described as an aggressive, hostile young man with psychotic characteristics. When arrested, he was intoxicated with FZ and possibly with other drugs, and the psychotic symptoms decreased during detoxification. A doctor had prescribed FZ for him, and he also obtained FZ on the illicit market. Every day he used approximately 20 mg of FZ, and occasionally smoked the drug. FZ brought on epilepsy, and he had bronchial pneumonia. During intoxication with FZ he had memory disturbances (blackouts). Some-



times he found himself in a hospital or a police station, and could not remember why he was there.

His crime of murder was reported as a side effect of the consumption of FZ to the Swedish Medical Products Agency, which regards this as possible. The sequence of events was as follows: N.A.H. and his three brothers went to a restaurant in a suburb of Stockholm. All were intoxicated with FZ, amphetamine, and cannabis. His brothers started to quarrel with some other guests in the restaurant, and N.A.H. became fed up with the situation and took a taxi home. When he arrived home he became anxious about his brothers. He took more FZ (approximately 6 mg), but his anxiety remained unchanged. He decided to go back to the restaurant. Outside his house, he saw his brothers on a bus. He had brought a gun with him, and he got the impression that there was a fight on the bus and that his brothers were involved. He entered the bus, shot into its roof, and ordered the passengers to get out. He then went toward his brothers and noticed that one of them had a knife in his hand. N.A.H. felt threatened, raised his gun, and shot the brother who held the knife. He had no memory of the crime and could not understand that his brother was dead.

He had a very deep feeling of guilt concerning the harm he had caused his relatives. He had made his brothers' four children fatherless. When arrested, he was very afraid. For example, it was impossible for him to take an ordinary blood test. During the FPA he was very shy, anxious, and depressed, with decreased impulse control. These characteristics were confirmed during the study of his life history. He was very shy during his school years and had problems with concentration and reading. His truancy from school was habitual, particularly during the seventh year.

### Case 3

J.R. describes his adolescence as satisfactory. He finished the compulsory nine years of schooling but with results below average. He completed military service without problems.

His drug abuse was intense and massive, and as a 13-year-old boy he was admitted several times for treatment. He abused cannabis, amphetamines, and various benzodiazepines, predominantly FZ. He was sentenced on two occasions for assault and on one for theft. During the months before he committed a murder at the racetrack, J.R. experienced increased

discomfort and uneasiness. Approximately four weeks before the crime, his alcohol consumption rose dramatically and remained high until the crime. Before the crime, he had taken alcohol and FZ (the dosage is not known).

His victim was a well-known Mafia boss whom J.R. met in public at a racetrack. The criminal actions of the Mafia boss comprised a threat against J.R. and his family. J.R. shot his victim in public and confessed frankly. He showed neither empathy nor anticipatory anxiety. The crime seemed to have been well planned, because J.R. was later shown to have a motive for murdering the Mafia boss. However, in these circles, many people carry arms, and it may well be that J.R. acted without prior planning.

The crime was cold and unemotional and did not correlate with the psychological characteristics of J.R. In childhood, he was restless and hyperactive and could not control impulses, which caused him to have difficulty in school. During the FPA he had an increased level of stress and anxiety. He was a shy, immature man who seemed younger than his biological age, with great uneasiness and reduced social ability, always afraid of doing something wrong. He felt diffuse discomfort and showed high impulsiveness, combined with antisocial behavior, but he showed no characteristics related to psychopathy.

### Case 4

J.B. was an ordinary schoolboy. He was only 12 years old when he began boxing. After J.B. completed his education, a total of 12 years (up to a higher school certificate), he began to work at a factory. He had a girlfriend. J.B. had had neither criminal nor psychiatric problems until he was 20 years old, when he started to abuse FZ. Then he left his job and began dealing in drugs to finance his own abuse. His girlfriend left him four years before the actual crimes.

His drug abuse included mainly FZ but also alcohol and cannabis. During a short period in adolescence, he had used anabolic steroids. Since starting to take FZ, J.B. described how he had developed "sick thoughts about violence." He consumed 10 to 20 mg of FZ a day, prescribed by his doctor. The drug made him very active and induced a high level of arousal. This was in contrast to the doctor's expectations of the drug, which was prescribed for insomnia and anxiety. It had been documented that when he suddenly discontinued his daily consumption of FZ, his

usual reaction was delirium, including a blackout. He showed a tendency to injure himself when intoxicated. For example, he cut one of his fingers. There were many scratches on his body, particularly on his head and arms. His crimes comprised severe assault, robbery, theft, interference in a judicial matter, and drug-related crimes, leading to his being sentenced to prison. He was sentenced four times, each time for a period of between 6 months and 1.5 years. An example of his irrational, violent behavior while intoxicated with FZ occurred three years before the actual crime. He walked into a flower shop, threatened the shop assistant with a knife, and tried to obtain money by force. When the assistant fled into the street, he followed. Armed with two knives, he attacked a passerby and tried to take her handbag. When a police assistant tried to control him he slashed out with one of the knives toward the police assistant's throat. He presented clear signs of confusion.

He had been treated for FZ abuse. He had nightmares that included aggression and hostility, had frequent panic attacks, vomited, and became isolated, experiencing a fear of hearing voices. He also became afraid of small animals. However, during the four days before the crimes, his FZ and alcohol consumption rose dramatically and remained high until the crimes. Earlier on the day of the crimes, he consumed a large amount of FZ. The dose is not known but was probably very high, because empty bottles sufficient for a 14-day supply of FZ, approximately 200 mg, were found in his home.

The actual crime was a robbery and assault that occurred outside a restaurant. In the restaurant, the victim had expressed dissatisfaction with a third person who owed him a large amount of money. J.B. offered to "collect the debt" against payment but was rejected. He became very hostile toward the victim, threatening to kill both the victim and all his family. The man found the situation unpleasant and left the restaurant. J.B. followed him and, once outside the restaurant, knocked him to the ground, straddled his chest, beat him repeatedly in the face, and subsequently cut him with a knife on the face, neck, and arms, threatening to kill him. Using the knife, J.B. carved an S around one eye of the victim. The victim was severely cut in the face, and one eye was destroyed. The victim described J.B. as very aggressive, frightening, and strongly under the influence of some drug, although not obviously drunk. J.B. took the man's wallet, which contained a large amount of

money and walked rapidly away. Fifteen minutes later, with the still-bloody knife, J.B. threatened two other persons, forcing one of them to give him a valuable wristwatch. During the robbery, he said: "You have never seen it." Although it was dark at the time, J.B. wore dark sunglasses during the second crime. Immediately after the crimes, he traveled abroad to Finland. During this journey, he was suspected of the crime of attempted murder of a childhood friend, but he was later acquitted for lack of evidence.

J.B. did not confess to the crimes in Sweden. Despite clear identification of J.B. by the victims and by other witnesses, J.B. did not recognize the victims. He said: "I have never met these people; I have never been there."

In contrast to his behavior based on his ordinary psychological characteristics (depression, anxiety, apathy, discouragement), his crimes were extremely hostile and irrational. He felt unsuccessful, and he was ashamed that he had achieved nothing with his life and education.

### Case 5

After T.P. finished the nine-year compulsory education he began senior high school. When T.P. was nearly 18 years old, his mother died of cancer. She left him 250,000 SEK (corresponding to \$29,000 U.S.). T.P. exchanged his large apartment for a smaller one. He was forced to leave this new apartment after a short period, because he did not pay the rent. He was alone and depressed. Within six months, he had spent all of his mother's money, mainly on expensive clothes, alcohol, and restaurant bills. He discontinued his education.

When his money was gone, he began to break into houses and offices. During this period he was sentenced to one month's imprisonment, followed by probation, for larceny and drug-related crimes. A urine sample taken while he was in prison showed the presence of amphetamines and cannabis. The presence of FZ was not investigated. Shortly after his release from prison, he was sentenced for new crimes to six months' imprisonment. When imprisoned, he had shown violence toward prison staff. After his release from this second period of imprisonment, some months before the actual robberies, high doses of FZ were prescribed for a sleep disorder.

The actual crimes were robbery and stabbing a sales assistant in a jewelry store. The sequence of

events was as follows: T.P. pointed with a knife at the sales assistant and forced her to close the door and then to open the safe. He stole gold jewelry and cash. The next day, he attempted to rob another jeweler, in the center of Stockholm, but a witness prevented the crime. The same day he threatened the sales assistants at an optician with a knife and forced them to open the safe. He took goods and cash and tied up the sales assistants during the robbery. On the next day, early in the morning, T.P. took 5 mg of FZ and then attempted to rob another jeweler, close to his home. This time T.P. showed ruthless cold-blooded efficiency. The sales assistant tried to cry for help but did not manage to attract attention before T.P. stopped him. T.P. put a rag in the victim's mouth, stabbed him several times, and forced him to crawl at T.P.'s feet. The knife penetrated the victim's lung more than once. When T.P. tried to escape, a passerby tried to stop him and was also stabbed by T.P.

T.P. confessed only to the last robbery, because he had no memory of the first two. He did not feel pity for the stabbing victims. Despite evidence to the contrary, he denied abuse of FZ and other drugs.

T.P. was a naive, shy, and immature young man who showed no empathy with his victims. He was very afraid of doing anything wrong during the psychological testing, which contrasted with his behavior during the robberies. It was difficult to imagine that this pallid young man was able to behave in such a cold-blooded manner. He showed signs of paranoia toward the investigating team, particularly the psychiatrist, and toward the nursing team. He also showed some signs of depression.

## Discussion

### *Psychological Aberration or Confusion While Intoxicated With Flunitrazepam*

Abuse of FZ has been involved in several crimes in Sweden. Five forensic patients with documented FZ abuse in connection with their violent crimes have been described herein. All were assessed during 1998. All were under the influence of FZ or of FZ together with alcohol at the time of their crimes. They may well have been under the influence of other drugs (such as amphetamine) that were probably already on the way to clearance from the body, while the level of FZ was increasing rapidly, after recent ingestion. The serious nature of the actions, such as killing a brother or friend, lies at a far remove from the normal

personality of a person described as shy and anxious, a person who does not show aggression and, furthermore, has had positive feelings for the victim. It is true that alcohol intoxication in itself could explain the reduction of judgment and of impulse control, but the subsequent acts, such as biting the victim in the face and sticking a knife into the eye or a screwdriver into the body of the victim, appear completely incomprehensible and bizarre from the point of view of normal psychology. The bizarre nature of the acts is evidence that they were performed when the perpetrator was in a condition of psychological aberration or confusion.

One example of such aberration is an assault on the eyes, which was used by two of the subjects. This type of assault is unusual. One possible reason for the eye gouging in these cases is that the subjects were behaving in a psychotic manner at the time of the eye assault. Many schizophrenics describe that they find it uncomfortable when someone watches them. Recently, Bukhanovsky and colleagues<sup>42</sup> studied 10 cases of perpetrators of eye gouging and reviewed theories of the meaning of this phenomenon. It is interesting that in only four of the cases studied were the persons classified as psychotic at the time of the eye assault, and one of these four became free of psychotic symptoms after a short period of treatment. Three of the four psychotic persons were classified as polysubstance abusers (FZ abuse was not assessed, however). Another possible motive for eye gouging in our cases is that the subjects imagined that they were invisible and the victims' horror-filled eyes called their attention to the reality that they were not. We can only speculate about the meaning of the acts of the perpetrators, because they do not remember their crimes.

### *Amnesic Effect of Flunitrazepam and Legal Issues*

Table 1 includes sentences and diagnoses of all subjects, and gives an intriguing picture of their mental health. Only one in five subjects was sentenced to forensic psychiatric care. Notably, this case reflected the highest score (e.g., 68) on the Global Assessment of Functioning scale (GAF), and the diagnosis of dissociative syndrome as a severe mental disorder. During the FPA of the subject in Case 1, there was, however, an intense debate in the major Swedish daily newspapers concerning both this specific case and Swedish criminal policy in general. G.H. was

first found not to have a severe mental disorder, according to the definition used in Swedish law. The debate involved researchers within psychiatry,<sup>43</sup> forensic psychiatry,<sup>44–46</sup> and philosophy.<sup>47</sup> Then, some months later, after a reassessment, G.H. was found to have had a severe mental disorder at the time of the crime. This second FPA showed that G.H. had a severe antisocial personality disorder with features of narcissism and borderline personality, together with a dissociative syndrome.

It is evident, however, that all FZ abusers had several types of memory disturbances, which are described in dissociative amnesia.<sup>48</sup> When the effects of the drug had worn off, the FZ abusers did not remember their violent actions. In our opinion, the diagnosis in all the cases should have been severe amnesia, not only in the one case that was intensively discussed by the media. It is not clear whether the diagnosis of dissociative syndrome is suitable, because there is no established tradition in Sweden regarding this diagnosis in subjects who abuse FZ. The degree and the duration of amnesic effects of various benzodiazepines are related to the dose. An amnesic effect can be achieved without affecting the level of consciousness<sup>49</sup>—an effect that is desirable in preventing preoperative awareness.<sup>50</sup> Clinical studies have demonstrated that FZ can cause amnesia, particularly anterograde amnesia,<sup>3</sup> which is characterized by loss of episodic memory and the memory of personal experiences—for example, only some circumstances around the crime would be remembered. If a perpetrator does not remember a crime, it cannot be expected that he or she will feel guilty. Thus, FZ may give rise to some difficult legal issues: the question of whether a perpetrator behaved in a psychotic manner or had severe amnesia while intoxicated with FZ.

### Biological Vulnerability

It is known that violent crimes and suicides in which a violent method (such as hanging, shooting, or self-stabbing) has been used are associated with low concentrations of the metabolite of serotonin (5-hydroxyindoleacetic acid (5-HIAA)), in the cerebrospinal fluid (for a review, see Ref. 51). FZ exerts its pharmacologic effects on GABA transmission and may thus lower serotonin activity. This may, in turn, increase the risk of impulsive violent acts, as has been hypothesized by Dåderman and Lidberg.<sup>52</sup> This hypothesis is partly based on results from experimental

studies that show that FZ decreases the synthesis of serotonin in the central nervous system in the rat.<sup>53</sup> There are currently no data about the influence of FZ on serotonin synthesis and release in humans, although other benzodiazepines decrease serotonin output in rats.<sup>54</sup>

FZ may interact with various central neurotransmitters, possibly increasing the risk of detrimental behavioral effects (such as disinhibition and absence of empathy). Examples of these effects have been provided through the analysis of the nature of violent crimes while intoxicated with FZ. In certain vulnerable subjects, FZ intoxication may comprise an increased risk of bizarre and violent behavior.

### Conclusions

FZ-facilitated violent behavior leading to impulsive decision-making has become increasingly common in males. We conclude that psychiatrically or psychologically vulnerable males are at particularly high risk of showing violent and bizarre behavior when under the influence of FZ. Although alcohol is almost always present in FZ-facilitated violent crimes, other drugs, such as amphetamine or cannabis, are also used in combination with FZ. However, drugs such as amphetamine and cannabis, without the presence of FZ, are known not to enhance the propensity for violence. We believe that patients with sleep disorders can be treated just as efficiently with other drugs or with behavioral cognitive treatment programs. Removal of FZ from the Swedish market or the declaration of FZ as an illegal drug may cause drug abusers to seek other drugs that are less likely to be abused and that are less toxic. We suggest that FZ-facilitated violent crimes may be minimized by legal decisions, such as declaring FZ to be illegal. Such legal decisions are needed in countries where FZ is currently legal.

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### References

1. Gambi F, Conti CMV, Grimaldi MR, Giampietro L, De Berardis D, Ferro FM: Flunitrazepam: a benzodiazepine most used among drug abusers. *Int J Immunopathol Pharmacol* 12:157–9, 1999
2. Dåderman AM: Flunitrazepam and violence: psychiatric and legal issues. Unpublished thesis, Karolinska Institute, Huddinge, Sweden, 2000
3. George KA, Dundee JW: Relative amnesic actions of diazepam,



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- flunitrazepam and lorazepam in man. *Br J Clin Pharmacol* 4:45–50, 1977
- Buchsbaum MS, Coursey RD, Murphy DL: The biochemical high-risk paradigm: behavioural and familiar correlates of low platelet monoamine oxidase activity. *Science* 194:339–41, 1976
  - Schalling D, Åsberg M, Edman G, Oreland L: Markers for vulnerability to psychopathology: temperament traits associated with platelet MAO activity. *Acta Psychiatr Scand* 76:172–82, 1987
  - Coursey RD, Buschbaum MS, Murphy DL: 2-year follow-up of subjects and their families defined as at risk for psychopathology on the basis of platelet MAO activities: 2-year follow-up of low platelet MAO. *Neuropsychobiology* 8:51–6, 1982
  - Virkkunen M, Kallio E, Rawlings R, *et al*: Personality profiles and state aggressiveness in Finnish alcoholic, violent offenders, fire setters, and healthy volunteers. *Arch Gen Psychiatry* 51:28–33, 1994
  - Stålenheim EG, von Knorring L, Oreland L: Platelet monoamine oxidase activity as a biological marker in a Swedish forensic psychiatric population. *Psychiatry Res* 69:79–87, 1997
  - Stålenheim EG, von Knorring L: Personality traits and psychopathy in a forensic psychiatric population. *Eur J Psychiatry* 12:83–94, 1998
  - Dåderman AM, Edman G: Flunitrazepam abuse and personality characteristics in male forensic psychiatric patients. *Psychiatry Res* 103:27–42, 2001
  - Barett JE Jr: Use of the M-N-T Inventory (Sjöbring's personality dimensions) on an American population. *Acta Psychiatr Scand* 7:501–9, 1972
  - Eysenck SBG, Eysenck HJ: Impulsiveness and venturesomeness: their position in a dimensional system of personality description. *Psychol Rep* 43:1247–55, 1978
  - Zuckerman M: Behavioral Expressions and Biosocial Bases of Sensation-Seeking. New York: Cambridge University Press, 1994
  - Teo SH, Chee KT, Tan CT: Psychiatric complications of Rohypnol abuse. *Singapore Med J* 20:270–3, 1979
  - Barattini M, Fantozzi R, Masini E, Mannaioni PF: Abuse of licit drugs in heroin addicts [in Italian]. *Clinica Terapeutica* 120:183–98, 1987
  - van der Laan JW: Benzodiazepinebruik door drugsverslaafden: heeft flunitrazepam een bijzondere plaats? [Benzodiazepines used by drug addicts: does flunitrazepam have a special place?] *Tijdschr Alcohol Drugs* 14:65–74, 1988
  - Maddaleno M, Florenzano R, Cruz XS, Vidal R: Consumo flunitrazepam via nasal en adolescents marginales de Santiago de Chile [Abuse of flunitrazepam by the nasal route among slum adolescents of Santiago]. *Rev Med Chile* 116:691–4, 1988
  - Dobson J: Sedative/hypnotics for abuse [letter]. *N Zealand Med J* 102:651, 1989
  - Navaratnam V, Foong K: Opiate dependence and the role of benzodiazepines. *Curr Med Res Opin* 11:620–30, 1990
  - San L, Tato J, Torrens M, Castillo C, Farre M, Cami J: Flunitrazepam consumption among addicts admitted for inpatient detoxification. *Drug Alcohol Depend* 32:281–6, 1993
  - Keup W: Abuse Sampling of Alcohol, Medicinal and Drug Dependence: SAWS Data for Germany 1976–1990. Lamberts Verlag Publishing, 1993, pp 398–403 (Cited in World Health Organization Expert Committee on Drug Dependence: Critical Review of Psychoactive Substances: Flunitrazepam. Geneva: World Health Organization, 1994, p 22)
  - Ross J, Darke S, Hall W: Benzodiazepine use among heroin users in Sydney: patterns, availability and preferences. Sydney, Australia: National Drug and Alcohol Research Center Technical Report No. 27, 1995
  - Saum CA, Inciardi JA: Rohypnol misuse in the United States. *Subst Use Misuse* 6:723–31, 1997
  - Dobbin M: Flunitrazepam (Rohypnol, Hypnodorm): report from the Victorian Department of Human Services. Melbourne, Australia: Department of Human Services, 1997
  - Dåderman AM, Lidberg L: Flunitrazepam (Rohypnol) abuse in combination with alcohol causes premeditated, grievous violence in male juvenile offenders. *J Am Acad Psychiatry Law* 27:83–99, 1999
  - Druid H, Holmgren P: A compilation of fatal and control concentrations of drugs in postmortem femoral blood. *J Forensic Sci* 1:79–87, 1997
  - Kriminalvårdsstyrelsen [The National Prison and Probation Administration]. Läkemedelsstatistik [Statistics for the Use of Medicine]. Norrköping, Sweden: Kommittén för kriminalvårdsmedicin [the Committee for Prison Medicine], 1998
  - Ståhl PÅ: Protokoll från sammanträde med Kommittén för kriminalvårdsmedicin, kriminalvården, Klientenheten 1998–05-27 [Minutes from a Meeting with the Committee for Prison Medicine, The Swedish Prison Administration, Client Unit, May, 27, 1998]. Norrköping, Sweden: Kriminalvårdsstyrelsen [The National Prison and Probation Administration], 1998
  - Dåderman AM, Lidberg L: Rohypnol bör klassas som tung narkotika [Flunitrazepam should be classified as a controlled drug]. *Läkartidningen [J Swedish Med Assoc]* 96:1005–7, 1999
  - Anglin D, Spears KI, Hutson HR: Flunitrazepam and its involvement in date or acquaintance rape. *Acad Emerg Med* 4:323–6, 1997
  - Rickert V, Wiemann CM: Date rape among adolescents and young adults. *J Pediatr Adolesc Gynecol* 4:167–75, 1998
  - Schwartz RH, Milteer R: Drug-facilitated sexual assault (“Date Rape”). *South Med J* 93:558–561, 2000
  - Inciardi JA, Surratt HL: Children in the street of Brazil: drug use, crime, violence, and HIV risks. *Subst Use Misuse* 33:1461–80, 1998
  - Calhoun SR, Wesson DR, Galloway GP, Smith DE: Abuse of flunitrazepam (Rohypnol) and other benzodiazepines in Austin and South Texas. *J Psychoact Drugs* 28:183–9, 1996
  - Hermansson G: Rohypnol: ett våldspiller [Rohypnol: a violence tablet]. *Svenska Narkotikapolisföreningens Tidning [The Magazine of the Swedish Narcotics Officers Association]* 3:28–34, 1998
  - Elmgren K: Överprövningsärenden i Socialstyrelsens Rättsliga Råd 1993 [The Cases of Reexamination at The Legal Aid Council at the National Board of Health and Welfare in 1993]. Stockholm, Sweden: The Legal Aid Council, 1997
  - Simmons MM, Cupp MJ: Use and abuse of flunitrazepam. *Ann Pharmacother* 32:117–9, 1998
  - Holmberg G, Dåderman AM, Jonasson B, *et al*: Lugnande läkemedel som oroar [Sedative Substances That Make Us Anxious]. Stockholm, Sweden: Fritzes, 2002
  - Scrip World Pharmaceutical News, January 17, 2001, p 22
  - Wretman C: Rohypnol och öl förvandlar ungdomar till mördarmaskiner [Together with one beer, rohypnol converts adolescents into a murder-machine], <http://www.expressen.se/article/10APRIL01>; Sohlander A: Ministern vill förbjuda Rohypnol [The minister will prohibit rohypnol], <http://www.aftonbladet.se/vss/nyheter/story/10APRIL01>
  - Rättsmedicinalverket [The Swedish National Board of Forensic Medicine]: Statistisk årsbok [Annual review of statistics]. Stockholm: ABA Kopiering, 1999
  - Bukhanovsky AO, Hempel A, Ahmed W, *et al*: Assaultive eye injury and enucleation. *J Am Acad Psychiatry Law* 27:590–602, 1999
  - Eriksson T: Vettlost fångsla seriemördare [It is senseless to sentence a serial murderer to prison]. *Dagens Nyheter*. August 15, 1998, p 2
  - Kullgren G: Filosofi på villovägar [Philosophy on the wrong track]. *Svenska Dagbladet*. October 29, 1998, p 20

45. Lidberg L: Seriemördare måste ses som psykiskt störda [Serial murderers have to be looked upon as mentally disturbed]. Dagens Nyheter Stockholm. August 22, 1998, p 2
46. Levander S: Angrip kriminalpolitiken: inte rättspsykiatri [Attack criminal policy: not forensic psychiatry]. Svenska Dagbladet Stockholm. October 29, 1998, p 20
47. Fjellström R: Inga kriterier finns som utesluter vård [There are no criteria that exclude forensic psychiatric care]. Svenska Dagbladet Stockholm. November 4, 1998, p 14
48. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders (ed 4). Washington, DC: American Psychiatric Association, 1994
49. Kortilla K, Linnoila M: Amnesic action and skills related to driving after intravenous flunitrazepam. Acta Anaesthesiol Scand 20: 160–8, 1976
50. Mattila MAK, Säila K, Kokko T, Kärkkäinen T: Comparison of diazepam and flunitrazepam as adjuncts to general anaesthesia in preventing arousal following surgical stimuli. Br J Anaesthesiol 51:329–37, 1979
51. Åsberg M: Monoamine neurotransmitters in human aggressiveness and violence: a selective review. Crim Behav Ment Health 4:303–27, 1994
52. Dåderman AM, Lidberg L: Flunitrazepam may lower the serotonin level in the brain and is associated with severe violence in men. Poster presented at the Annual Meeting of the Swedish Serotonin Society, August 26–27, 1999, Stockholm, Sweden; at the 30th Congress of the European Association for Behavioral and Cognitive Therapies, September 26–28, 2000, Granada, Spain; and at the 2nd European Congress on Violence in Clinical Psychiatry, June 28–30, 2001, Stockholm, Sweden.
53. Nishikawa T, Scatton B: Neuroanatomical site of the inhibitory influence of anxiolytic drugs on central serotonergic transmission. Brain Res 371:123–32, 1986
54. Pei Q, Zetterstrom T, Fillenz M: Both systemic and local administration of benzodiazepine agonists inhibit the in vivo release of 5-HT from ventral hippocampus. Neuropharmacology 28: 1061–6, 1989