CASE REPORT

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Triazolam, Handwriting, and Amnestic States: Two Cases

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ABSTRACT: This paper presents a discussion of handwriting in the amnestic state through two case reports associated with the phenomenon of anterograde amnesia following the use of therapeutic doses of triazolam, a rapid acting oral sleep inducing benzodiazepine. The fact that an individual executing a contract or signing a document may have no recollection of the writing event has significant implications for the questioned document examiner and other forensic science specialists. Since the issue of amnestic states and handwriting has received little apparent discussion in the forensic science literature, this paper outlines a number of issues of concern to the forensic science specialist.

KEYWORDS: questioned documents, benzodiazepines, handwriting, amnesia, triazolam, anterograde amnesia

Many articles have been published about the effects of drugs and alcohol on handwriting. It has been well established that alcohol intoxication produces abnormal changes in the handwriting of many people [*1,2*]. It has also been established that a number of other drugs affect handwriting; examples of these drugs include: thiothixene, psilocybin, methamphetamine, nitrous oxide, meprobamate, phenobarbitone, lysergic acid (LSD) [*3*], and marijuana [*4*]. However, it appears that little has been written about handwriting and "blackouts," or, more formally, drug or alcohol induced amnestic states.

This paper will look at one particular substance, triazolam, and its relationship to handwriting during an amnestic state. It will also discuss the forensic science implications of complex behaviors, such as handwriting executed while in an amnestic state.

Triazolam, marketed commercially as Halcion®, is mainly used as a hypnotic, or in popular parlance, a sleeping pill. What is unique about this drug is that it is rapid acting, and not usually associated with intoxicated states. However, an even more unique quality about this drug is a side effect known as anterograde amnesia, that is, an individual has no recollection of events occurring for a period of time following the ingestion of the drug.

Anterograde amnesia is to be distinguished from retrograde amnesia, which is the lack of recall of events preceding the precipitating insult; head trauma is a good example of a precipitant of retrograde amnesia.

There is a growing body of evidence which suggests that some individuals taking triazolam

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in a therapeutically appropriate manner not only suffer from anterograde amnesia, but also negotiate complex behaviors while in the amnestic state [5]. Discussed in this paper are two cases in which writing was one of the reported activities involved during the amnestic state. In the first case, a comparison will be made of an actual writing sample completed while in an amnestic state; in the second case, a comparison will be made of a writing completed while under the influence of triazolam and alcohol with a writing done 13 days later.

A review of the literature has revealed no apparent research on amnestic states and handwriting. Thus, this paper raises an issue which should receive subsequent attention. It should be pointed out that there has been some research on inducing alcoholic blackouts [6], but this has not involved handwriting.

Characteristics of Triazolam

Triazolam has a mean plasma half-life of 2.3 h, and a range of 1.7 to 3.0 h. It is readily absorbed following oral administration. The mean peak concentration is thought to occur at 1.3 h following a single dose. It has been found to decrease sleep latency, increase the duration of sleep, and to decrease the number of nocturnal awakenings. Triazolam's short half-life is thought to diminish the potential for accumulating either the drug or its metabolites, something that occurs with longer acting drugs. Longer half-life drugs have associated impairment of cognitive and motor performance during waking hours; in addition, there is the increased potential for interaction with alcohol or other psychoactive drugs [7,8].

Case 1

The subject was a 39-year-old male physician with no prior history of alcohol or drug abuse. After a 2-week stay in Europe, he returned to San Francisco for 3 days; then, he went to Boston, Massachusetts, to attend a conference. Because of obvious jet lag, he took triazolam, 0.25 mg, to ensure sound sleep. On the next day, he attended the conference, took notes, and interacted with his colleagues. At the lunch break, he asked when a section of the course would be covered; he was informed that it had been given that morning. On checking his course notebook, he discovered that he had taken copious notes, none of which he remembered writing.

After that day's session, he could not remember the street of the residence at which he was staying; he had to refer to an address that he kept in his wallet to locate his destination and to rely on passersby to direct him to it. Finally, he discovered that he had no recollection of the house at which he was staying, although he felt that he must have looked at it when he left for the course that morning. Thus, this subject reports a period of approximately 4 h for which he had no recall of his behavior.

A comparison of Subject 1's handwriting written while in the amnestic state is made with a sample written while not in the amnestic state. No significant difference could be found between the two samples (see Fig. 1). A look at writing, spatial, size, and accuracy indices reveal little to suggest an amnestic state dependent variation in handwriting. Sample 1 may appear to the casual observer to be more carelessly penned than Sample 2. However, the variation present is most likely due to different speeds of writing. Since the samples available are course notes, written in outline form, the writer's rhythm is probably dictated by the rate of speech of the lecturer. Of course, it cannot be categorically stated that the rhythm variation is not a product of subtle psychomotor influences of triazolam.

Case 2

Subject 2 was a 44-year-old female professional who reported a long-term use of triazolam because of an irregular work schedule. This person also acknowledged periodic abuse of alcohol. However, she reports several incidents probably related to triazolam.

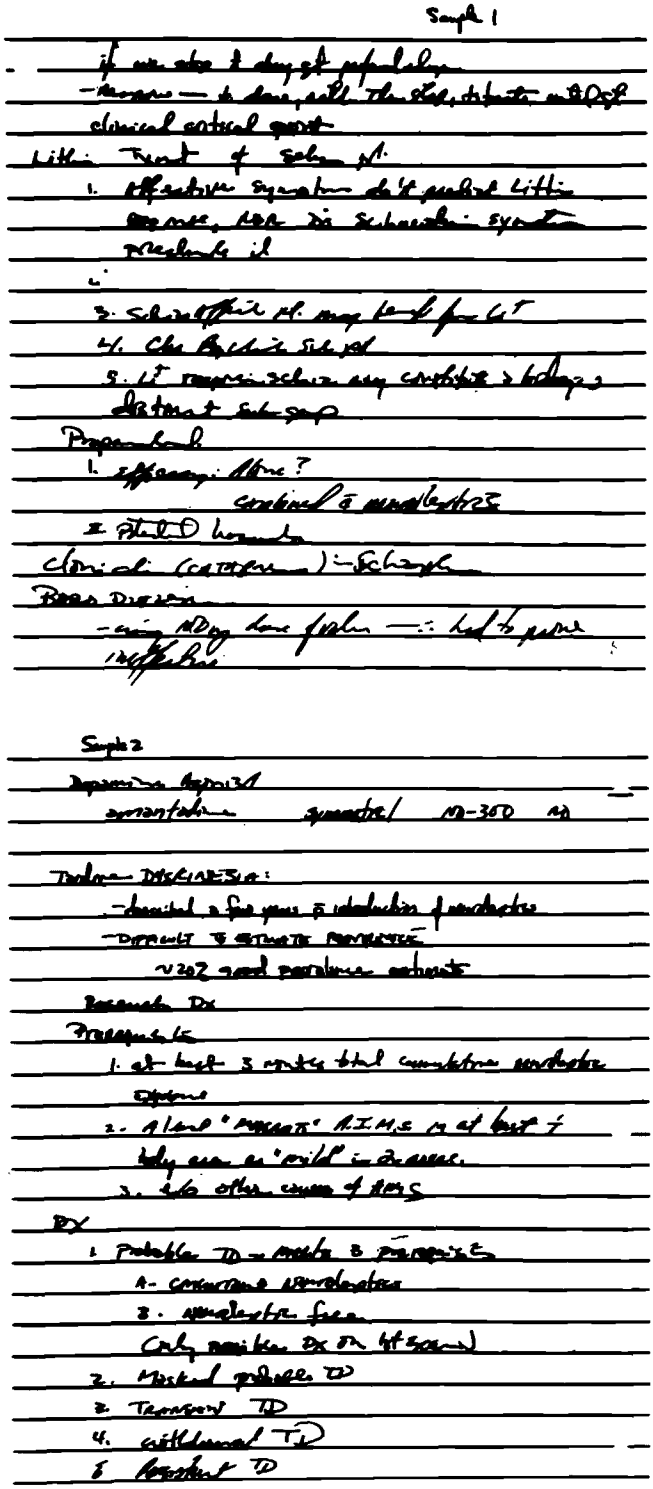

FIG. 1—*Two handwriting samples: Sample 1 was written while the subject was in the triazolam induced amnestic state. Sample 2 was written by the same subject two days later.*

In one event, she had apparently written extremely personal events in her diary and left the diary out for her children to read; in another event, she reports being told by her children of relaying accounts of events which never transpired; in a final event, she reported being found eating video tape.

This person was examined by a psychiatrist who found no evidence of psychosis or major psychiatric disease. In fact, her normal cognitive skill and level of function tended to be quite high. Unfortunately, no sample of this subject's handwriting was available that covered one of the periods discussed above. However, a writing sample was taken while she was under the influence of both alcohol and triazolam, but not demonstrably intoxicated; a urine sample was positive for both alcohol and benzodiazepine. A second handwriting sample was taken some 13 days after the patient's last use of alcohol or triazolam.

A comparison of Subject 2's handwriting samples reveal in Sample 1 subtle differences which are consistent with alcohol influences (see Fig. 2). Margin variability, increased space in between words and lines, slightly larger writing, increased ratio of capital to small letters, and gross errors were observed; these criteria were similar to those used by Rabin and Blair as an indication for alcohol related handwriting changes [9]. One notable difference between Subject 2's samples is the preference for morphologically different letter "I"s; she uses a cursive "I" in Sample 1 for her personal pronoun, but a handprint "I" in Sample 2.

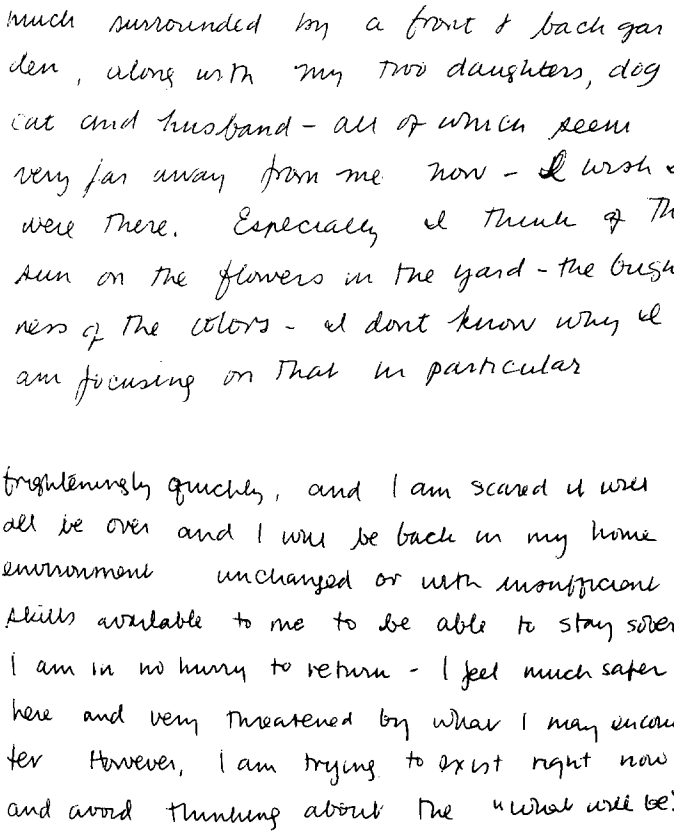

FIG. 2—*Two handwriting samples: the sample on the top was written while the subject was under the influence of both alcohol and triazolam, as verified by a positive urinanalysis. The sample on the bottom was written thirteen days later, after the subject had been hospitalized in a drug program and while completely drug free.*

Discussion

The issue of anterograde amnesia and triazolam is of significance to forensic scientists. There are many people in the United States who are taking benzodiazepines, the class of drugs to which triazolam belongs. A recent paper published in the *Journal of the American Medical Association* revealed that approximately one third of the people in the United States report some degree of insomnia; fully one half of this group consider their insomnia serious; 10% of those affected with serious insomnia receive prescription sleep promoting medication [*10*]. Thus, approximately four million people receive some form of medication for sleep at any given point in time. These numbers alone suggest that any complication associated with such medications would be a significant problem.

In the questioned document practice, the implications of anterograde amnesia may involve a question of authenticity, or, if there is no dispute about the authenticity of the document, whether the person was sober, intoxicated, or displaying any abnormal behavior at the time that the document was signed. Hilton implies an amnestic state in his paper on the influence of alcohol on handwriting with a vignette about a business transaction occurring over cocktails or highballs; he states that there might be a disputed signature which arose from the social event which could not be clarified because none of the parties to the dispute could remember the normal details of the business conference to relate them to an expert [*1*]. Hilton's study, unfortunately, did not involve the specific question of whether the subject recalled, after recovering from the influence of alcohol, preparing writing specimens while under the influence of alcohol.

With drugs that cause anterograde amnesia, Hilton's illuminating scenario changes. Thus, one party may in fact recall all the details of the business transaction, while another party may recall none of them. This would be especially true if the business transaction occurred not at a business lunch over cocktails, but at a morning meeting over coffee and doughnuts.

The two cases discussed in this paper as evidence of the phenomenon of anterograde amnesia associated with triazolam are by no means the only anecdotal accounts. Shader and Greenblatt reported that a traveler ingested 0.25 mg of triazolam to ensure sleep during an overnight flight to Europe; the next night this traveler had amnesia for how he had gotten from the airport to his destination; he could only refer to train and taxi receipts that he had accumulated during his travel; they also reported that a lecturer who had taken 0.25 mg of this benzodiazepine to ensure a sound sleep before a presentation the next day apparently presented his lecture and later negotiated with a contractor about a project; the lecturer had no memory of the meeting with the contractor [*11*].

Regestein reports that a 25-year-old business woman awoke to find that she had changed her nightclothes without any recollection of this after having taken 0.5 mg of triazolam for sleep; he also reported that a 40-year-old mathematician discontinued 0.5 mg of triazolam nightly because of amnesia for events the previous evening on frequent occasions [*12*].

Even the popular literature has come to acknowledge the relationship between benzodiazepines like triazolam, amnestic states, and complex functions like decision making and handwriting. For instance, an article appeared in the July 1986 issue of *Psychology Today* on this very subject; the article was called "Stolen Moments"; it explained in laymen's terms the effects of triazolam [*13*]. Such articles serve to inform the public about the side effects of drugs like triazolam, but they also serve to offer readymade excuses to those who would exploit the amnestic phenomenon.

From a forensic science point of view, the fact of anterograde amnesia is important; a document examiner might be engaged to review and validate the signatures on important contracts that are in dispute because one of the signatories claims no memory of the signing. Any party to such a contract might approach the document examiner in order to protect an interest. Unless there are nonvested interest witnesses to the signing, the effort of the docu-

ment examiner may play an important role in resolving the matter. With benzodiazepines like triazolam, once the signatures or writing samples have been compared and a conclusion reached, it would be instructive to inquire of the contesting party about the use of sleeping pills. Such a person should remember taking the medication. An affirmative response should aid in the conclusion that no fraud or forgery has taken place if the signatures in question are determined to be genuine.

From another point of view, a person who combines drugs, such as triazolam and alcohol, may in fact behave in a strange fashion. Such a person could write anonymous threatening notes or nonanonymous threatening notes and subsequently deny authorship. Since the deviant behavior will have occurred while under the influence of drugs, this person would not have recall subsequently. Thus, even a polygraph test would be of little use, because no physiologic response would attend the testing. Conversely, an innocent person who experienced anterograde amnesia might conceivably "fail" a polygraph test as a result of anxiety associated with the amnesia secondary to the triazolam.

The notion that deviant behavior could occur while under the influence of triazolam or triazolam and alcohol is suggested by Case 2. Clearly, a single case is insufficient evidence upon which to base a wide-ranging conclusion. However, this possibility must be contemplated given the widespread use of sleeping pills in society today.

Conclusion

The two cases presented in this paper highlight a growing phenomenon, anterograde amnesia secondary to sleeping pill ingestion, which may pose an interesting dilemma for document examiners and other forensic science workers. These cases presented with the other anecdotal evidence suggest that an individual under the influence of benzodiazepines such as triazolam is quite capable of negotiating complex transactions without retaining a memory of those transactions. These transactions can involve writings which subsequently could become the subject of controversy. Triazolam appears to cause no apparent change in handwriting as suggested by the two cases discussed, but of course, more research needs to be conducted on the amnestic state which specifically involves handwriting to validate this impression.

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