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Comparative Effects of the Administration of Taraxein, d-LSD, Mescaline, and Psilocybin to Human Volunteers

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Taraxein is a protein fraction obtained from the serum of schizophrenic patients, but not from the serum of nonpsychotic control subjects. When the amount obtained from 400 ml. of serum from schizophrenic patients is injected intravenously into nonpsychotic subjects, it induces symptoms identical with those seen in patients with the disease, schizophrenia.[1,2,3,4] Since our first report[5] of the effects of taraxein in May, 1956, a number of studies have been undertaken with this substance, not only in our own laboratories at Tulane University School of Medicine, but in a number of other centers. Several confirmatory studies have now been published.[6,7,8] We currently are exploring the mode of action of this fraction. Its instability, however, has complicated and limited this area of investigation.

This report concerns the similarities and differences in symptoms induced by the administration of taraxein and of three other known psychotomimetic compounds—d-LSD, Mescaline, and Psilocybin. A similar comparative study of the effects of taraxein, d-LSD, and Mescaline has been conducted in Sweden[9] on three subjects, all of whom received the three compounds.

Material and Methods

Four volunteer subjects were included in the study: one psychiatrist; and three prisoners at the Louisiana State Penitentiary at Angola. Three of the subjects received taraxein, d-LSD, Mescaline, and Psilocybin. One subject received taraxein, Mescaline, and Psilocybin.

Taraxein was administered intravenously in the quantity fractionated from 400 ml. of pooled serum of chronic schizophrenic patients. The patient donors are housed in a special Tulane University Research Unit at the East Louisana State Hospital, Jackson. All patients from whom blood was drawn had physical examinations and laboratory tests, including liver function studies. None were on medication. The blood was drawn during a fasting state. All patient donors had been receiving a well balanced diet supplemented with vitamins. The serum from which the taraxein was fractionated was handled in the manner which has been described previously.[1] The quantity of material actually injected into the volunteer subjects varied from 3 ml. to 10 ml. An amount of d-LSD, 150 micrograms, was given intravenously to one subject (W. L.) and orally to two. Mescaline was administered intravenously to one subject (O. D. W.) and orally to the other three subjects in the amount of 750 milligrams. Psilocybin was administered orally in the amount of 10 milligrams.

Criteria for selection of volunteer subjects included excellent physical health and an absence of nervous or mental disease in the subject and in his immediate family.

Prior to the experiments, the subjects were advised of the nature of the study and were required to sign special release forms relieving the physicians and institutions involved of any responsibilty. The subjects were told that the experiments were to be conducted on a

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double-blind basis, and this terminology was explained. With all four subjects, taraxein was administered as a double-blind procedure. On two occasions, other compounds were administered as part of a double-blind study. All other studies conducted were single blind procedures. Moving picture films (16mm sound) were obtained of each of the prisoner volunteer subjects when they received taraxein. One of the prisoner subjects (W. L.) was filmed before and after the administration of each of the four compounds.

Results

The symptoms developed by each of the four volunteer subjects following the administration of the various compounds are shown in table 1. Symptoms are graded according to intensity, from 1 to 4.

Following the administration of taraxein, the symptoms consistently were those which are described with the disease, schizophrenia. Most outstanding was the prevalence of symptoms which seemed to resemble those characterized as fundamental by Bleuler.[10] In contrast, symptoms usually associated with intoxication predominated with the psychotomimetics. Some symptoms characteristic of psychotic behavior were present with the administration of all compounds. In table 2, the intensity (graded from 1 to 4) of response of each of the four volunteers to the various compounds is shown.

Our results confirm those of Martens et al.[9] that a subject who responds intensely to one compound also responds with marked reactions to the other compounds. Those subjects displaying a mild response to one compound similarly show little response to the other agents. We were unable to correlate the intensity of response with our clinical appraisals of the baseline personality of the volunteer. The most intense reactions and the least intense reactions were elicited in the two subjects who on baseline psychiatric examination were appraised as the most unstable of the volunteer group. The comparative effects of the administration of the compounds in each of the subjects are described below.*

VOLUNTEER I (F. S.)

Taraxein: Immediately after the injection, the subject experienced tachycardia and the sensation that his face was swollen and flushed. These symptoms disappeared in a few minutes. Within 10 minutes following the intravenous injection of taraxein, he felt that his thought processes had "slowed down". Considerable anxiety and tension were aroused because the subject, a psychiatrist, thought that he had been given a placebo injection. Since he was experiencing symptoms which he, as a psychiatrist, associated with the disease, schizophrenia, he thought he was, in actuality, schizophrenic. He was suspicious of the interviewers and felt the need to "cover up" his feelings. Affect was flat and he seemed withdrawn. He displayed blocking and impoverishment of thought. After the symptoms disappeared, the subject complained of headache and fatigue.[11]

d-LSD: Thirty minutes following the administration of d-LSD, the subject commented that he was hungry and cold. His pupils were dilated. He described

*At the time of presentation of this paper, a 16mm sound movie film depicting brief excerpts of the reactions of one of the subjects to each of the four compounds was shown.

Table 1.—*Symptoms of Volunteer Subjects Graded According to Intensity*

	Association Defects	Ambivalence	Hallucinations	Illusions (Sensory Distortions)	Delusions	Vegetative Symptoms
Taraxein	4	4	0	0	4	0
LSD	3	2	0	3	0	3
Mescaline	2	2	2	4	1	3
Psilocybin	2	2	1	4	0	4

	Anxiety	Euphoria	Dysphoria	Depersonalization	Hypomania	Intoxication
Taraxein	4	0	4	3	0	0
LSD	2	3	2	1	2	3
Mescaline	2	4	2	1	3	4
Psilocybin	0	3	0	1	2	3

Table 2.—*Difference in Intensity of Reaction of Volunteer Subjects*

	Taraxein	LSD	Mescaline	Psilocybin
Volunteer I (F. S.)	1	2	2	1
Volunteer II (W. L.)	3	1	2	1
Volunteer III (B. S.)	4	–	4	4
Volunteer IV (O. D. W.)	1	2	1	1

the situation as humorous and giggled in a silly manner. He reported visual distortion: e.g., people seemed taller than their actual height; doors appeared oval instead of rectangular. Later, he experienced some time distortion and exaggerated sensitivity to noises. After one hour, nausea began and recurred in waves persisting throughout the reaction. After two hours, the silliness and other symptoms associated with intoxication disappeared and the subject appeared tense and nervous for several hours. There were no delusions or hallucinations.

Mescaline: Two hours after administration of Mescaline, the subject complained of being cold. His pupils were moderately dilated. When he closed his eyes, he saw a variety of vivid colors. Some visual distortion was present: e.g., objects were enlarged; people appeared older. Listening to music was enjoyable and he was annoyed by distracting noises. Affect was appropriate except for a moderate euphoria.

Psilocybin: Thirty-five minutes after administration, the subject complained of hunger which became more intense, recurring in waves. The room appeared to be sloping. The subject was chilled and pupils were dilated. Visual distortions were described: e.g., some objects in the room appeared larger, others smaller, and some closer. The subject described this experience as a pleasant one and he did not appear particularly nervous or tense. There was some difficulty in attempting to concentrate during reading. Lights in the room faded or became brighter at times. Noises in the room, at times, seemed exaggerated. The experience was described as quite similar to "the feeling one has with a great amount of alcohol". All in all, the sensation was pleasant with lightheadedness and a tendency to giggle. The effect began to diminish about two hours after administration.

VOLUNTEER II (W. L.)

Taraxein: One minute after injection, the subject noted a "funny" feeling running through his arm, and his head felt "peculiar". Ten minutes after injection, he complained of dizziness, of his mind wandering, and of difficulty in thinking. He later stated that he couldn't "grasp the point" when the examiners asked questions. He complained of his mind being "blank". On one occasion he arose from his chair and, with a dazed look, headed for the movie camera, stating blandly that he wanted to destroy it. He described his state as "daydreaming". A few minutes later he became catatonic, and stared inappropriately at the camera. He could be postured. His affect was bland and inappropriate. Most symptoms had disappeared at the end of 50 minutes.

d-LSD: Three minutes after administration, he complained of numbness and an upset stomach. His pupils were dilated. He had difficulty in determining the exact date. He stated that when he lay down, he could see "outer space" and "jewels". He felt happy. Periodically, the subject complained of chills and drowsiness. There was no blocking. The reaction persisted four to five hours.

Mescaline: The first symptoms were rage and a flushed appearance of the face with dilated pupils. He did not show evidence of blocking. Later, he seemed to have minimal impoverishment of thought. This was difficult to determine since his anger handicapped conversation with him. He had difficulty in walking a line. At times, he appeared to hallucinate, but denied this on direct questioning. Toward the end of the experiment (four hours after administration), the subject acted euphoric. He was ingratiating and extremely friendly, and, at times, would smile rather inappropriately.

Psilocybin: Thirty minutes after administration, the subject's pupils were dilated. He complained of nausea and pain in his stomach. His face was flushed. Then be began to smile almost continuously, stating that he felt wonderful. He kept his eyes closed and stated that this made him "feel good". He was interested in the colors and forms he could see with his eyes closed. Later, for about four minutes, he was tense and irritable and complained of loud noises. He stated that he felt like "hurting someone". At the conclusion of the experiment, he complained of drowsiness.

VOLUNTEER III (B. S.)

Taraxein: One minute after injection, the subject complained of a drumming noise in his ears. Later, he stated that he felt isolated—as if he were in a soundproof room. Within 10 minutes, his affect flattened and he became evasive and suspicious. He felt that his face was deformed ". . . my eye is out of my head and there is a hole in my face." One hour following the injection he had a headache and vomited. He had persecutory delusions and threatened to kill the examiner. It was necessary to terminate the reaction approximately three hours later with an intravenous injection of Thorazine. Later, the subject stated that he felt the examiner was going to attack him with a blackjack.

d-LSD: The subject did not receive this compound.

Mescaline: Two hours after administration, pupils were dilated and the

subject became increasingly suspicious. He began using foul and abusive language, and threatened the interviewers. He had colored, moving visual hallucinations, and displayed some time distortion.

Psilocybin: Thirty minutes after injection, the subject's pupils were dilated and he complained of chills. Later, he had visual (colored-motion) hallucinations, and, in four instances, auditory hallucinations. Affect was inappropriate. At times he giggled in a silly manner, and, at other times, he displayed rage. He also showed blocking and flight of ideas.

VOLUNTEER IV (O. D. W.)

Taraxein: One minute after injection, the subject complained of dizziness and light-headedness. Within 10 minutes, he displayed blocking, smiled inappropriately, and was unable to concentrate for long periods. He tried to disguise his thoughts. There was loss of animation in his face, and he appeared autistic. Later, he described his feeling as "being high on whiskey". Thirty minutes after injection, subject displayed hostility and continued blocking. Impoverishment of the thought processes was more evident. This reaction subsided in about one hour.

d-LSD: Forty minutes after administration, the subject complained of light-headedness, as if he were "drunk". He stated that he was sick and nauseated and wanted to lie down. Pupils were dilated. There was no impoverishment of thought. He displayed a certain amount of confusion in thinking that he had been given whiskey instead of d-LSD. He repeated that he felt "drunk". He had difficulty in concentrating. At the beginning of the experiment, his affect was silly and there was a certain amount of grinning, but later he became very flat. He was extremely tense and restless. Throughout the experiment he was slightly sick to his stomach. Visual and auditory hallucinations were denied.

Mescaline: The subject did not develop many symptoms. Pupils were dilated and he smiled throughout the interviewing. On several occasions, he stated that he felt "high" or "drunk". The examiners felt that he was covering up some of his feelings and thoughts. There were no obvious defects of thought processes or difficulty with concentration. In a subsequent interview, the subject stated that he had felt very warm toward the examiners, but that they, and fellow prisoners, seemed to have "hard faces". Later in the day, he showed an unusual amount of aggressive behavior. He entered the office of the prison physician, put his feet on a table, and asked for his chart. He recalled that he had been suspicious of the examiners and had felt the need to hold back some information. He also stated that on a couple of occasions he had thought that a friend was at the door of his room because he seemed to hear his voice, but when he checked at the door, no one was there.

Psilocybin: One hour after administration, the subject described feelings of being "high". He smiled with a silly manner and stated that he felt drowsy. "I am loaded on whiskey." Pupils were dilated. Thought processes were slowed and concentration was difficult. Minimal blocking was evident and the sub-

ject complained of a tendency for his mind to become blank. The examiners wondered whether the subject was covering up more pathology. During an interview one week later, the subject stated that the hands and faces of the interviewers had appeared distorted. He had not mentioned this while under the influence of the compound.

Summary

This study is a comparison of the effects induced in four nonpsychotic volunteer subjects with the administration of various psychotomimetic agents. Taraxein induced symptoms which the examiners considered to closely approximate those seen with endogenous schizophrenia. Following administration of taraxein, there was more dysphoria, blocking and thought deprivation displayed than with the other psychotomimetic compounds. Clear-cut secondary symptoms evolved with the administration of taraxein which were more typical of those seen in schizophrenic patients than the secondary symptoms induced by the other compounds. The changes induced with the administration of the other compounds were more typically toxic. Outstanding features were disturbances in sensory perception, particularly visual distortions, giddiness, and euphoria.

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