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TECHNICAL REPORT

CWLR 2120

THE EFFECT OF EA 1729 ON  
BEHAVIOR OF NUBIAN GOATS (U)

by

Robert D. Appleman  
James Delouche  
Charles G. Wilber

**FC**



6 May 1957

ARMY CHEMICAL CENTER, MARYLAND

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Chemical Corps Research and Development Command  
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Army Chemical Center, Maryland

Chemical Warfare Laboratories Report No. 2120  
Directorate of Medical Research

THE EFFECT OF EA 1729 ON BEHAVIOR OF NUBIAN GOATS (U)

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Physiology Division

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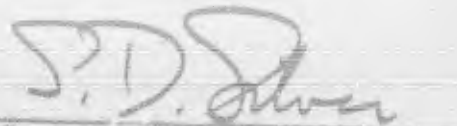
THE EFFECT OF EA 1729 ON BEHAVIOR OF  
NUBIAN GOATS (U)



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ABSTRACT

An exploratory study of the effect of EA 1729 (LSD25) on the behavior of Arabian goats was made. Because the drug has a rapid action of short duration, it was most difficult to measure quantitatively many characteristic behavioral changes. Of the changes recorded after a single dose, the decrease in the time spent eating and the temporary cessation of aggressive action were most obvious. After doses repeated daily for a week the only measurable response is decreased aggressiveness. The authors doubt that further chronic studies with this species will prove fruitful, although further study of the response of goats to single doses of psychochemical agents may be warranted.

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### THE EFFECT OF EA 1729 ON BEHAVIOR OF NUBIAN GOATS (U)

#### I. INTRODUCTION.

It is known that the domestic goat exhibits patterns of dominance which persist unchanged for years (1). Moreover, like all ruminants this species is stereotyped with respect to many behavioral characteristics, e.g., rate of cud chewing, time spent eating, and degree of aggressiveness. Because the goat is used so widely in Chemical Corps research, it is felt that information concerning the effect of EA 1729 (LSD25) on behavior of goats is of interest. Such information might contribute to our understanding of the action of this agent in man. Consequently a preliminary study was made to ascertain the effect of LSD25 on aggressiveness in goats. This paper is a report of the work; it is not intended, and must not be interpreted, as a definitive contribution.

#### II. MATERIAL AND METHODS.

Two approaches were used in this study: the effect on aggressive behavior of a single dose of LSD25 administered intravenously; and the effect of repeated doses on such behavior. In the former approach, four mature female Nubian goats, whose behavioral patterns were established from previous observations, were selected for study. They were put into a climatic chamber at 50°F., and were allowed approximately 4 hr. to become accustomed to the surroundings before observations began. Alfalfa hay and water were supplied ad libitum. After the initial 4-hr. period, the behavior of the animals was observed for 1 hr. which served as a control. Following the control period, two of the four goats, the most dominant (goat D) and the meekest (goat C), were injected intravenously with 1 mg. of LSD25. Goat B (co-dominant) and goat A (almost as meek as goat C) were not treated.

We postulated that LSD25 has an additive effect on goats and that considerable change in behavior would result in goats that had been given repeated doses. The procedure for this part of the study follows:

After 10 days of rest and recovery, the same four Nubian goats used in the first part of the study were subjected to repeated doses of LSD25. They were put into a large pen within the climatic facility at a dry-bulb temperature of 68°F. and a wet-bulb temperature of 61°F. and were allowed 2 days to become accustomed to the surroundings before observations began. Alfalfa hay and water were supplied ad libitum. The animals were observed for 8 hr. over a 2-day period which served as a control. Following the control period, the most dominant and one of the meekest goats were each injected intravenously with 1 mg. of LSD25 daily for six consecutive days. Another 8 hr. of behavior observations were made in the 2-day period following the last injections. Statistical treatment was given to some of the collected data. Standard deviations and significance were determined by Tippett's method (2).

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### III. RESULTS.

#### 1. Single Injection.

The effects of LSD25 were first noticed about 3 to 4 min. after injection. The treated animals bellowed and shook their heads vigorously. The two treated goats did not resume eating; on the other hand, the nontreated goats continued to eat for most of the hour (table 1). Another obvious effect of LSD25 was a decrease in aggressive activity, particularly on the part of goat D, who was shown previously to be the dominant goat of the group (table 2). In the control hour, goat D took part in and was successful in 11 aggressive actions. For the initial 20 min. after being dosed with LSD25, goat D showed no aggressive tendencies toward the other goats. However, in a matter of minutes, this situation was alleviated and goat D became just as aggressive or possibly even more so than she had been previously during 66 hr. of observation. Notice in table 2 that twice as many skirmishes occurred in an hour after treatment as occurred before treatment.

Table 1

Effect of 1 mg. of LSD25 Upon Time Spent Eating Hay per Hour

Condition	Time spent eating hay			
	Control goats		Dosed goats	
	A	B	C	D
	min./hr.			
Previous study	25	27	18	32
Control hour	60	60	60	60
After dosage of LSD25	46	60	0	0

Table 2

Amount of Aggressiveness Occurring Before and After Injection of 1 mg. of LSD25 (Expressed as Times per Hour)

Condition	Control goats				Dosed goats				Total no. of skirmishes
	A		B		C		D		
	Won	Lost	Won	Lost	Won	Lost	Won	Lost	
Control hour	0	13	4	0	0	2	11	0	15
First 20 min. after treatment	0	0	0	0	0	0	0	0	0
20 to 60 min. after treatment	0	10.5	4.5	0	0	19.5	25.5	0	30

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The activity, or amount of movement within the room, of the treated goats was increased. Both treated animals wandered around the room aimlessly and often walked in circles. Their sense of balance may have been affected; if so, the effect was most pronounced for only a few minutes after drug was given. A stifling or stiffening of the rear legs for several minutes after treatment may have been the cause of the apparent loss of balance. A peculiar lip action was evident in the treated goats the entire hour after injection. The lip movement was vertical in direction rather than the normal horizontal jaw movement. It is entirely possible that the affected animals could not have eaten hay even if they had desired to do so.

Other characteristics observed which were in contrast to the normal behavior pattern and apparently an effect of LSD25 were: exophthalmia, twisting of the head sideways, piloerection along the dorsum, and constant wagging of the tail.

### Repeated Doses.

Although no recorded behavioral changes were found to be clearly significant, based on the statistical manipulation used by us, it is evident that a definite trend toward decreased aggressiveness occurred. The LSD25-injected goats were involved in 50% fewer skirmishes after treatment than before, while the control goats were involved in a comparable number of fights. Data relative to these changes are summarized in table 3. The treated animals were victorious in about the same percentage of skirmishes after the chronic dose was administered as before treatment (62.9% compared with 68.3%).

Table 3

Effect of Repeated Doses of LSD25 on the Occurrence of Aggressiveness Between Different Goats

Animal	Number of fights*	Wins*	Losses*	Percentage wins
Before treatment				
Goats A and B	68.5	14.8	53.7	21.6
Goats C and D	106.1	72.5	33.6	68.3
After treatment				
Goats A and B (control)	66.1	26.1	40.0	39.5
Goats C and D (treated)	53.7	33.8	19.9	62.9

\* Values refer to the number of times aggressive action occurred per 10 hr. of observation.

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No appreciable change occurred in the activity, time spent eating hay, or time spent standing. Mean values and standard deviations of the treated individuals for these characteristics are found in table 4, which shows that a considerable decrease in activity occurred after treatment. This may be attributed to the pronounced decrease in the amount of aggressiveness occurring. Previous unpublished results show that activity and aggressiveness are positively correlated. Such responses as exophthalmia, stifling of the rear legs, and the peculiar lip action which were all observed after a single dose did not obtain after repeated doses. Neither was piloerection along the dorsum, constant tail wagging, or violent shaking of the head or body observable to any appreciable extent after repeated doses.

Table 4

Means and Standard Deviations of Various Behavior Characteristics Before and After Repeated Doses of LSD25

Condition	Before treatment		After treatment	
	Mean	S.D.	Mean	S.D.
Activity*	13.2	± 6.9	7.6	± 2.9
Eating hay**	25.1	11.4	31.2	12.9
Standing**	43.7	13.4	45.3	15.1

\* Number of times animals moved 10 ft. or more per hour.

\*\* Number of minutes per hour.

#### IV. DISCUSSION.

It appears that it may be extremely difficult to measure quantitatively many of the behavioral characteristics that are affected by LSD25. It seems of little value to measure those phenomena which occur only a few times during an hour when, as with LSD25, the effect of the drug is evident for only an hour. To overcome this difficulty, the drug could perhaps be administered intramuscularly rather than intravenously to prolong its action. It is, however, doubtful that the drug administered intramuscularly would have sufficient effect to permit meaningful quantitative behavioral observations on many caprine behavioral responses.

In general there is a dearth of background information on higher levels of integrated response in nonprimate mammals. A recent report on behavior in sheep and goats merely emphasizes this deficiency (3).

It is the authors' opinion that the following traits may be measured quantitatively in a study on the effects of single doses of LSD25 or related compounds:

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1. Time spent standing.
2. Time spent eating.
3. Making of peculiar noises.
4. Activity or movement within the pen.
5. Displays of aggressive activity.

Other changes in behavior apparently do occur. However, the type and nature of these changes which do not lend themselves well to quantitative measure might well be shown by an increased use of motion pictures. The manner in which such records could be tabulated escapes us at the moment.

A clear difference between the effect of a single dose of LSD25 and repeated doses in goats was revealed. After a single injection, the dominant goat became more aggressive and remained so for 20 to 60 min. after treatment (table 2). After repeated doses the aggressiveness of this same goat was decreased by over 50% (table 3), and this was the only measurable change seen in goats so treated.

We have an indication, then, that LSD25 does influence aggressive behavior in goats. Whether the decreased time spent eating, after a single dose of LSD25, is the result of loss of appetite or is merely the outcome of more time spent in fighting cannot be decided. It should be emphasized that the responses of goats to LSD25 are transitory at best and require that the observations be made laboriously by persons well acquainted with caprine behavior. In view of the vague results following repeated doses, further behavioral studies of goats so treated with LSD25 are not warranted.

No attempt should be made to interpret these data in terms of human behavior. Such a course could lead only to error. We know that the brain controls behavior; and we know how different in morphology are the brains of goat and man. We also are aware that species with similar brains morphologically may behave differently. A good idea of the primitive state of our knowledge concerning animal behavior can be obtained by reading Hurton's recent book (4), especially chapter 20.

### V. SUMMARY.

1. An exploratory study of the effects of single and of repeated doses of LSD25 on the behavior of female Nubian goats was made.
2. Following a single dose of 1 mg. of LSD25, there was a decrease in time spent eating and a temporary cessation of aggression after which aggressive activity increased.

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3. After repeated doses, aggressive activity was decreased by 50%.

4. After a 1-mg. dose of LSD25, the goats showed exophthalmia, stifling of the rear legs, and a peculiar lip movement. These responses were not present after repeated doses.

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THE EFFECT OF EA 1729 ON BEHAVIOR OF NUBIAN GOATS  
(U) - R. D. Appleman, J. Delouche, C. G. Wilber  
CWLR 2120, 6 May 1967  
Project 4-08-02-019-04 (CONFIDENTIAL)

An exploratory study of the effect of EA 1729 (LSD25) on the behavior of Nubian goats was made. Because the drug has a rapid action of short duration, it was most difficult to measure quantitatively many characteristic behavioral changes. Of the changes recorded after a single dose, the decrease in the time spent eating and the temporary cessation of aggressive action were most obvious. After doses repeated daily for a week the only measurable response is decreased aggressiveness. The authors doubt that further chronic studies with this species will prove fruitful, although further study of the response of goats to single doses of psychochemical agents may be warranted.

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