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SHORT COMMUNICATION

Self-aggression in Macaques: Five Case Studies*

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ABSTRACT. Spontaneous self-aggressive behaviors were observed in five adult male rhesus monkeys (*Macaca mulatta*) housed at a university facility. All were individually caged, were free of intercurrent disease, and were being utilized in ongoing research studies. The self-aggressive behaviors observed included self-biting, self-clasping, self-slapping, self-rubbing and threatening of body parts. In several cases, wounds were inflicted and medical treatment was required due to the severity of the lesions. A review of the animals' clinical histories revealed an increased level of self-aggressive behavior in four of five monkeys during such stressful or stimulating conditions as movement of the animal to a new cage, movement of animals out of the room or escape of other monkeys from their cages. The frequency with which these behaviors occurred was quantitated experimentally. The results revealed an increased level of self-aggressive behavior in two of these animals during the videotaped sessions in response to aggressive contacts with the investigator. In contrast, one monkey exhibited self-aggressive behavior both clinically and experimentally in the absence of environmental stimuli or human contact. Clinical management of self-aggressive monkeys included housing monkeys only with physically smaller primates, decreasing the level of environmental stimuli, and drug therapy. Haloperidol was used with success in one animal that exhibited severe self-aggressive behavior.

INTRODUCTION

Self-aggression is an infrequent but dramatic behavioral abnormality occurring in captive nonhuman primates. Both injurious and noninjurious behaviors may be observed in self-aggressive animals. Noninjurious behaviors include self-directed vocal and visual threats, clasping and slapping. More severe expressions of self-aggression such as self-biting, eye-poking, body-throwing and head-banging may result in actual self-mutilation. The wounds inflicted by self-mutilating animals often require medical attention.

Over the last five years, 15 monkeys in our colonies have exhibited self-aggressive behaviors that have resulted in injuries severe enough to require medical treatment. The unusual nature of these cases prompted us to examine the factors associated with the expression of this syndrome. Comparisons of the clinical histories of five animals that exhibited spontaneous self-aggression were made. In addition, the occurrence of self-aggressive behaviors under stimulating and non-stimulating conditions were recorded on videotape. The frequency of self-aggression in these five animals was quantitated by determining the number of 15-sec intervals in which such behaviors occurred. Additionally, observations are presented on the efficacy of treatment of one animal with psychoactive agents.

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MATERIALS AND METHODS

ANIMALS

Five rhesus monkeys (*Macaca mulatta*) with histories of repeated episodes of self-aggression were chosen for study. These five monkeys were being utilized in on-going research activities at the times that self-aggressive episodes occurred, and only occasional blood samples were drawn from each monkey. All were mature adult males at least 10 years old. Four of the five were captured in the wild and obtained as juveniles from commercial importers. They were isolated from physical contact with peers throughout most of their time in captivity. The fifth animal (*Monkey 5*) was born at our facility, separated at birth from its mother, and raised in a nursery without maternal or peer contact. In all five monkeys, self-aggressive behaviors were first observed when the animals were adults.

The animals were individually housed in stainless steel cages that met the cage size recommendations of the Guide for the Care and Use of Laboratory Animals (COMMITTEE ON CARE AND USE OF LABORATORY ANIMALS, 1978). They had visual contact with 10 to 20 other monkeys. They were fed *ad libitum* water and either monkey biscuits (Purina Monkey Chow®, Ralston Purina Co., St. Louis, Missouri) or a liquid diet (Ensure®, Ross Laboratories, Columbus, Ohio). Research and husbandry personnel entered and worked in the housing areas from two to ten times daily.

Monkey 1 first exhibited self-aggressive behavior three months after his arrival from another laboratory where he had been housed for 11 years. He bit his upper left arm five times within a four-month period. On several occasions, the severity of these wounds necessitated surgical repair and extensive post-surgical nursing care. Frequent mouthing of the hands, without breaking the skin, continues to be observed. Self-aggressive episodes have not been associated with any disruptive or stressful environmental stimuli such as cage cleaning or escape of other animals from their cages.

Since his arrival two years ago, *Monkey 2* has been observed to self-clasp and mouth his arm whenever the general level of activity in the room increases. The manifestation of his self-aggressive behavior is unique within this group of monkeys. He allows his right leg to wander across his body, touching his upper arm and opposite leg. When engaged in this activity he does not watch the wandering leg and it thus appears to move "independently." He then suddenly "notices" the leg and grasps and bites it. He has never, however, inflicted wounds which required medical treatment when exhibiting these behaviors.

Monkey 3 is a markedly obese monkey. He first exhibited self-aggressive behavior one month after his arrival. This animal has never attacked his limbs but has bitten the pendulous folds of his abdominal skin, often inflicting puncture wounds. This area was bitten six times in a four-month period in response to increased room activity.

Monkey 4 exhibited self-aggression two years after his arrival. This behavior occurred when he was moved from a primate room in which he had been the largest monkey to another room with larger monkeys. Husbandry personnel noted that over the following three days he huddled in the rear of his cage and avoided eye contact with other monkeys. He then lacerated his right rear leg, left ankle and scrotum. After the wounds were repaired he was returned to the animal room from which he had been moved. Over the four years since this episode, he has only occasionally demonstrated self-aggressive behaviors; these episodes have been non-injurious and have consisted of mouthing of hands and feet. These behaviors occur with the

greatest frequency when other animals in the room receive attention from husbandry or research personnel.

Monkey 5 was born at our facility, separated from his mother at birth and raised in a nursery. He first exhibited self-aggressive behaviors five years ago at age 6. Attacks occurred in response to stressful and disruptive events, such as being transferred to a new cage or when other primates escaped from their cages. The forearms were the sites most frequently attacked. This behavior has been repeated five times in the past five years with each incident severe enough to require surgical debridement and repair. For the last four years he has been housed in a relatively isolated animal room with infrequent visits by research personnel and only twice daily contact with husbandry personnel. He has visual contact with no more than ten other monkeys, all of which are smaller in size. At the present time the animal frequently mouths the forearms without breaking the skin.

Experimental Procedures

The types and frequencies of self-aggressive behaviors in these five monkeys were quantitated from videotapes, according to methods described by Allyn, Deyme and Begue (1976) with minor modifications. On two separate days, animals were videotaped in their home cages for 28 min without the experimenter present in the room (control; 56 min total). On four separate days, 18-min sessions were videotaped with the experimenter present. Each 18-min experimental session consisted of six 3-min periods, during which stimulating and nonstimulating interactions with the experimenter occurred (Table 1). Thus, for each animal, a total of 12 min of videotaping per period was completed during the study. Non-aggressive, nonstimulating contact occurred during periods 1 and 6; in both, the experimenter sat quietly with her back to the animal. In periods 2 through 5, various levels of stimulation were provided. In periods 2 and 3, minimally aggressive threats were made. In period 2, the experimenter stared directly at the animal without speaking while in period 3 the experimenter approached the animal, maintained eye contact, and spoke in a conversational tone. Highly stimulating and aggressive interactions occurred during the remaining two periods. In period 4, the experimenter emitted continual primate threat vocalizations, and in period 5, the experimenter created a generalized commotion in the animal room by emitting threat vocalizations, shaking cages and clapping her hands.

All the videotapes subsequently were reviewed and scored by one individual. The videotaping periods were divided into 15-sec intervals. All behaviors, both normal and self-aggressive, exhibited by an animal in each 15-sec interval were recorded. When a particular behavior occurred, a score of +1 for that behavior in that 15-sec interval was entered on a checklist.

Table 1. Description of experimental periods.

Period No.	Description
1	Experimenter sits quietly with back toward animal.
2	Experimenter stares directly at animal without speaking.
3	Experimenter looks directly at animal and speaks continually in a conversational tone.
4	Experimenter looks directly at animal and emits continual primate threat vocalizations.
5	Experimenter circles the animal room, emitting primate threat vocalizations towards other animals, claps hands, and rattles cages and food bins.
6	Experimenter sits quietly with back toward animal.

Table 2. Definition of self-aggressive behaviors.

Behavior	Definition
Self-bite	Closure of mouth around a body part, i.e., hand, arm, foot, with or without breaking the skin
Self-clasp	Placement of the digits of the hand or foot around a body part
Self-rub	Movement of hand or foot repeatedly against a body part
Self-slap	Forceful placement of hand against a body part
Self-threatening	Direction of an open-mouth grimace towards a body part

The self-aggressive behaviors recorded included self-biting, self-clasping, self-rubbing, self-slapping and self-threatening. Brief descriptions of these behaviors are given in Table 2. The percentage of 15-sec intervals in which any self-aggressive behavior occurred was taken as a measure of the frequency of self-aggression.

DRUG TREATMENT

The effects of psychoactive agents on the frequency of self-aggression in *Monkey 5* were evaluated both clinically and quantitatively. Chlorpromazine (Thorazine®, Smith Kline & French Laboratories, Philadelphia, Pennsylvania) was administered to *Monkey 5* initially at a dosage of 2 mg/kg daily in the drinking water. This was increased gradually to 9 mg/kg/day. Chlorpromazine was subsequently discontinued after three weeks of treatment. Two weeks later, haloperidol (Haldol®, McNeil Laboratories, Fort Washington, Pennsylvania) was administered orally in the drinking water at a dosage of 0.2 mg/kg/day for five weeks.

RESULTS

CASE HISTORIES

The histories collected from interviews with husbandry and research personnel were analyzed to identify common factors associated with self-aggressive behavior. *Monkeys 1, 2, 3* and *4* were trapped as juveniles and it can be assumed that they had normal early maternal contact and socialization. However, these four animals had not experienced physical contact with peers for most of their lives. *Monkey 5*, born in captivity, had neither maternal nor peer contact.

The type and frequency of contact with humans varied among the five monkeys. All five monkeys were fed and watered twice daily but were infrequently handled. In addition, *Monkeys 1, 2* and *3* had supplemental visual contact with humans since personnel frequently entered this animal room to perform a variety of experimental procedures on other monkeys.

The extremities were by far the most common sites of self-aggression. *Monkeys 1, 2, 4* and *5* attacked either arms or legs. *Monkey 3*, who was markedly obese and had pendulous folds of skin, bit his abdominal skin, and *Monkey 4* also traumatized his scrotum. Four of the five animals inflicted wounds serious enough to require medical attention, while the fifth (*Monkey 2*) only exhibited self-clasping and mouthing behaviors. The four that inflicted wounds always used their canine teeth and were never seen to tear or scratch their flesh with their hands.

Self-aggression was generally associated with stressful or otherwise stimulating events in *Monkeys 2, 3, 4* and *5*. For example, *Monkey 3* inflicted serious wounds soon after arrival from another laboratory where he had been housed for approximately 11 years. Self-aggres-

sive episodes also occurred in these four animals following other forms of stimulation such as cage changing, changes in room population, attention given to other animals, and escape of other monkeys from their cages. In contrast, self-aggression in *Monkey 1* could never be associated with stimulating or stressful events and rarely occurred when personnel were in the room.

Experimental Procedures

The behaviors exhibited by each of the five monkeys under stimulating and nonstimulating conditions were recorded on videotape and quantitated. The percent of 15-sec intervals in which self-aggressive behaviors occurred was determined for each of the six experimental periods, for all six experimental periods (overall frequency), and for the control period (Table 3). Individual variations in the frequency of self-aggression were observed. *Monkey 5* exhibited self-aggression during the stimulating conditions of periods 2 through 5, with an overall frequency of 28% for the six experimental periods. This was the highest frequency of self-aggression observed in the five monkeys. The frequency of self-aggression in the control period was only 4%. *Monkey 2* also exhibited a relatively high overall frequency of self-aggression (12%), primarily in periods 3, 4 and 6. In contrast, *Monkey 1* bit or threatened his hand principally during the nonstimulating control period (10%) while exhibiting an overall frequency of only 1% in the experimental periods. No specific patterns of self-aggression were observed in *Monkeys 3* and *4*; self-aggression occurred infrequently or not at all in both experimental and control periods. *Monkey 3* exhibited self-aggression only in period 3, in which the experimenter spoke to the animal in a conversational tone. *Monkey 4* exhibited self-aggression only when the level of stimulation was extremely high, in periods 4 and 5. In all cases, the specific behaviors exhibited by the monkeys were the same as those described in the clinical histories.

Drug Therapy

Previous clinical experiences with two self-aggressive monkeys who were treated with phenothiazine derivative tranquilizers indicated that these psychoactive agents could be used to reduce the frequency of self-mutilation in monkeys (Pond & Rush, 1980). Consequently,

Table 3. Frequency of self-aggressive behaviors*.

Monkey No.	Experimental period[1]						Overall frequency[2]	Control period[3]
	1	2	3	4	5	6		
1	2	4	0	0	0	0	1	10
2	2	0	17	17	4	31	12	3
3	0	0	6	0	0	0	1	1
4	0	0	0	2	2	0	1	0
5	0	27	38	80	23	0	28	4

*The percentage of 15-sec intervals in which any self-aggressive behavior occurred was taken as a measure of the frequency of self-aggression. 1) A description of each experimental period is given in Table 1. Each period was videotaped for 3 min on four separate occasions for a total of 12 min (48 15-sec intervals). The values given represent the percentage of 15-sec intervals in which a self-aggressive behavior occurred; 2) The values given represent the overall frequency of self-aggression observed during all six periods (72 min total; 288 15-sec intervals); 3) Two control periods (56 min total; 224 15-sec intervals) were videotaped for each animal without the experimenter present. The values given represent the percentage of 15-sec intervals in which a self-aggressive behavior occurred.

Monkey 5 was treated with each of two psychoactive drugs, chlorpromazine and haloperidol, and each time its behaviors were quantitated. Initially, chlorpromazine was given orally at a dosage of 2 mg/kg/day. No change in the frequency of self-aggression was seen (data not shown). Similarly, when the dosage was increased to 9 mg/kg/day, self-aggression persisted and chlorpromazine therapy was discontinued after three weeks of treatment. Two weeks later, treatment with haloperidol (0.2 mg/kg/day in the drinking water) was initiated. Subsequent videotape analysis revealed a reduction in self-aggressive behaviors under stimulating conditions. Self-biting occurred in only 8% of the 15-sec experimental intervals (data not shown) compared to 28% of the experimental intervals recorded prior to treatment with haloperidol.

DISCUSSION

Spontaneous self-aggression occurs in only small numbers of wild-caught nonhuman primates, although it may be induced in laboratory-born animals by manipulation of the rearing conditions (CROSS & HARLOW, 1965; JONES & BARRACLOUGH, 1978). Over the last five years, only 15 macaques exhibiting self-aggressive behaviors have been identified in a primate colony with an average yearly population of 400 monkeys (POND & RUSH, 1980). Through review of individual histories and subsequent videotape studies on five of these monkeys, two factors were identified that appeared to be associated with self-aggression. From these studies, specific methods for management and control of these behaviors have been developed.

The clinical histories indicated that a reduced level of social contact was associated with the development of self-aggression in these animals. Prolonged isolation from peers was a common factor among the five monkeys studied; all five were housed individually for eight or more years. Experimentally, animals experiencing social deprivation or isolation often exhibit a variety of self-aggressive behaviors (JONES & BARRACLOUGH, 1978; SACKETT, 1968; BERKSON, 1968; CROSS & HARLOW, 1965). Animals with early maternal contact but lacking socialization with peers, and animals with both early maternal and peer contact may exhibit self-aggressive behaviors, but generally at a reduced frequency compared to animals raised in total isolation (BERKSON, 1968; ERWIN, MITCHELL & MAPLE, 1973; CROSS & HARLOW, 1965). Our results are in agreement with these studies in that the four wild-caught monkeys (*Monkeys 1–4*) that presumably experienced early maternal and peer socialization, exhibited self-aggression at a level lower than that observed with the most severely affected animal, *Monkey 5*. *Monkey 5* was born in captivity and lacked both maternal contact and peer socialization.

Environmental stimuli, i.e., stimuli arising from events occurring extrinsic to the animal, were found to contribute to the expression of self-aggressive behaviors in affected monkeys. Through evaluation of individual histories and videotapes, the monkeys appeared to fall into two categories—those that exhibited self-aggression in response to stressful or stimulating events (*Monkeys 2–5*), and those that exhibited self-aggression in the absence of environmental stimuli (*Monkey 1*). *Monkeys 2* through *5* exhibited self-aggressive behaviors in response to such events as escape of monkeys from their cages, movement to a new cage, or the presence of people in the room. Two of these animals, *Monkeys 2* and *5*, were sufficiently stimulated by events in the experimental studies to exhibit self-aggression on videotape. As seen in Table 3, the frequency of self-aggression in these two monkeys was much greater in the experimental periods than during the control periods. The reasons for the reduced frequency

of self-aggression exhibited by *Monkey 2* during period 5 are unclear. Inappropriate stimulation may have been responsible for the low frequency of self-aggressive behaviors seen in the remaining monkeys, *3* and *4*, during the videotape studies. A variety of frustrating or stressful events and aggressive interactions have been reported to elicit self-aggressive behavior in affected monkeys (LEVISON, 1970; JONES & BARRACLOUGH, 1978; ERWIN, MITCHELL & MAPLE, 1973). For example, self-aggressive behaviors occurred in a captive born *Macaca arctoides* in response to visual and vocal threatening by the investigator, while nonaggressive interactions infrequently elicited such behaviors (ALLYN, DEYME & BEGUE, 1976).

In contrast to these four monkeys, *Monkey 1* engaged in self-aggression only in the absence of any apparent stimuli, as indicated by the clinical history and the relatively high frequency of self-aggression observed during the control session. It may be that self-aggression developed in this animal as a substitute for the stimulation derived from contact with peers (BERKSON, 1968) and that this behavior persisted into adulthood in the absence of normal socialization.

Administration of phenothiazine derivative tranquilizers has been utilized with success in macaques. Fluphenazine (12.5 mg/week intramuscularly) was used in a male *Macaca fascicularis* that severely self-mutilated after neurosurgery, and self-biting was effectively controlled in a rhesus monkey with oral chlorpromazine (3.0 mg/kg/day) (POND & RUSH, 1980). Similarly, MCKINNEY et al. (1973) reported that chlorpromazine reduced the frequency of self-aggressive behaviors in three of four severely affected rhesus monkeys. In the present study, chlorpromazine was ineffective in controlling self-aggression in one animal, *Monkey 5*, while treatment of the same animal with haloperidol resulted in a marked reduction in self-aggression. The reasons for the ineffectiveness of chlorpromazine in this animal are unclear.

Other approaches to the management of self-aggression have been utilized in lieu of therapy with psychoactive agents. Prior selection of members of the room population was useful in controlling self-aggression in *Monkey 4*; housing this animal only with smaller animals resulted in infrequent episodes of noninjurious self-aggression. Avoidance of excessive environmental stimuli reduced the frequency of self-aggression in *Monkey 5*. This monkey was housed with relatively few animals and was visited by personnel only twice daily. Finally, since self-biting of the extremities was the most common manifestation of self-aggression, removal of the canine teeth can be utilized to limit the severity of self-injury in affected monkeys. Several surgical procedures have been described for removing or modifying canine teeth (SMITH, 1971; TOMSON, SCHULTE & BERTSCH, 1979). This approach may be utilized to supplement other methods of management.

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