Safe Pair Formation Technique for Previously Single-Caged Rhesus Macaques

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There is increasing concern that the conventional single-housing arrangement of laboratory macaques (cf. Bayne, 1989) is unsatisfactory both for ethical and scientific reasons (Segal, 1989; USDA, 1991; CCAC, 1993; IPS, 1993). Biomedical professionals, however, may contend that transferring adult macaques from social isolation to a social-housing arrangement is unethical because of the risk of fighting associated with partner intolerance.

A simple technique has recently been described that allows pair formation of previously single-caged adult male rhesus macaques without undue risk. In a pilot study, no fighting occurred when 5 pairs were formed after partners had established dominance-subordination relationships during a short period of non-contact familiarization (Reinhardt, 1988). The present study is an attempt to confirm these preliminary findings.

METHODS

Forty healthy, laboratory-born male rhesus macaques (*Macaca mulatta*) were the subjects of this study. They were 5 to 24 years (mean 8.7 years) old and had been single-caged for several years. None of them were related, nor had any two of them ever lived together.

Potential companions were randomly selected and placed pairwise in two adjacent cages, each having a floor space of 70 X 75 cm and a height of 77 cm. Partners were separated from each other by a grated cage-dividing panel permitting visual, olfactory, and auditory communication. They were familiarized in this way for 24 hours and repeatedly observed (cumulative observation time 5 to 60 minutes) for signs of an established dominance-subordination relationship. Such a relationship was considered established if one of the two males exhibited fear-grinning (when looked at by the neighbor) and/or withdrawing (when approached by the neighbor) and/or threatening-away (directed toward observer). A rank relationship was considered to be equivocal if neither of the two subjects showed any of these subordination-indicative behaviors and/or if both subjects threatened each other across the dividing panel. No attempt was made at this stage to introduce these individuals to each other.

Partners with established rank relationships were transferred into a different double cage (to avoid possible territorial antagonism) without a partition. The new homecage was located in a male-only area (to avoid possible sexual competition). It was provided with two feeder boxes, two drinking spouts, two perches, and two gnawing sticks. A cage divider with a passage hole close to the back wall of the cage offered optional visual seclusion. Room temperature was maintained at 20-22°C with a relative air humidity of approximately 50% and a 12-hour artificial light/dark cycle. Commercial dry food was fed once a day between 07:00 and 09:00, supplemental fruit and bread between 14:00 and 16:00. The animals were offered treats, such as raisins and whole peanuts, during two daily health checks.

New companions were observed by the author during the first 30 minutes after pair formation and repeatedly (at least three times a day) checked thereafter for two months to evaluate their compatibility.

RESULTS

In order to form 20 pairs of the 40 adult rhesus males, a total of 29 dyads had to be tested. Partners of 9 dyads (31%) failed to establish noticeable dominance-subordination relationships during the 24-hour familiarization period and were therefore not paired.

Partners of the remaining 20 dyads (69%) established clear relationships during that time and were paired thereafter. All 20 pairs (100%) were compatible during pair formation and throughout the 2-month follow- up period. No signs of fighting (bruises, bite marks, lacerations) were observed, but partners shared food (both secure their appropriate portion of the food ration), and none of them showed signs of depressions (e.g., no interest in food treats for more than 24 hour).

DISCUSSION

Confirming the preliminary findings (Reinhardt, 1988), the present data are in sharp contrast with "'conventional wisdom that unfamiliar adult macaques are more likely to fight than to coexist peacefully" (Line et al., 1990) and that rhesus macaques are particularly aggressive animals (Fairbanks et al., 1978; Thierry, 1985; Line, 1987). Pair formation of 40 previously unfamiliar single-caged male rhesus macaques was accomplished without any fighting, and paired companions "coexisted peacefully" throughout the two-month study period. The application of the following ethological rule may account for the remarkable success of the pair formation technique:

Dominance-subordination relationships are basic social structures of macaque troops, making aggressive disputes over dominance predictable events when unfamiliar subjects encounter each other. Offering potential companions the opportunity to establish a dominance-subordination relationship without the risk of injury during the non-contact familiarization period and selecting partners only if they showed evidence of an established rank relationship, made aggressive rank disputes rather unnecessary during actual pair formation.

This assumption is indirectly supported by pair formation studies in which partners were also visually familiarized but were subsequently paired regardless of rank relationship establishment. Under these conditions, the occurrence of fighting during partner introduction was 40% (4/10) in adult female rhesus macaques (Reinhardt et al., 1987), 25% (1/4), and 13% (2/15) in adult female longtailed macaques (Line et al., 1990; Crockette et al., 1994) and 67% (10/15) in adult male longtailed macaques (Crockette et al., 1994).

The present findings lead to the conclusion that previously single-caged laboratory nonhuman primates can be readily transferred to more species-adequate, pair-housing conditions without undue risk if potential partners have already established their dominance-subordination relationships during a short non-contact familiarization period preceding the actual pairing.

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