

LABORATORY PRIMATE NEWSLETTER

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POLICY STATEMENT
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The primary purpose of the Laboratory Primate Newsletter is to provide information on maintenance, breeding, and procurement of nonhuman primates for laboratory studies. A secondary purpose is to disseminate general information about the world of primate research. Requests for information, for special equipment, or for animal tissues or animals with special characteristics will be included in the Newsletter. As a rule, the only research articles or summaries that will be accepted for the Newsletter are those that have some practical implications or that provide general information likely to be of interest to investigators in a variety of areas of primate research. However, special consideration will be given to articles containing data on primates not conveniently publishable elsewhere. General descriptions of current research projects on primates will also be welcome.

The Newsletter appears quarterly, and the mailing list is open to anyone in the primate field expressing an interest. There is no charge for new issues and back issues for the current year. Back volumes will be furnished free of charge to any library operated by a nonprofit organization with the understanding that they will be kept in the library. Individuals may purchase Volume 1, 2, 3, and 4 for \$4.00 per volume, and Volumes 5 and 6 for \$2.00 per volume. (Please make checks payable to Brown University.)

The publication lag is typically no longer than the 3 months between issues and can be as short as a few weeks. The deadline for inclusion of a note or article in any given issue of the Newsletter has in practice been somewhat flexible, but is technically the fifteenth of December, March, June, or September, depending on which issue is scheduled to appear next. As a rule, authors of longer articles will receive five extra copies of the issue in which the article appears; reprints will not be supplied under any circumstances.

Preparation of articles for the Newsletter.--Articles and notes should be submitted in duplicate and all copy should be double spaced. Articles in the reference section should be referred to in the text by author(s) and date of publication, as for example: Smith (1960) or (Smith & Jones, 1962). Names of journals should be spelled out completely in the reference section. Technical names of monkeys should be indicated at least once in each note and article. In general, to avoid inconsistencies within the Newsletter (see Editor's Notes, July, 1966, issue), the scientific names used will be those of Fiedler [In H. Hofer, A. H. Schultz, & D. Starck (Eds.), *Primatologia*. Vol. 1. Basel, Switzerland: Karger, 1956. Pp. 1-266].

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A BREEDING NOTE ON SAIMIRI SCIUREUS

Jack L. Taylor*

United States Public Health Service, Perrine, Florida

Three births recently occurred in the squirrel monkey colony of the Pesticides Research Laboratory. The babies were born to three of four females which were housed with one male from mid-August, 1966, until mid-February, 1967.

The four females were selected for breeding purposes because they still had young monkeys on their backs when they arrived at the laboratory six months earlier. The first male caged with the females appeared to be frightened, and within 24 hours was killed by them. A second male was placed in the cage. He, too, seemed frightened and was removed. A third male was then placed with the females. This one, at 1000 gm, was heavier than the other two, each of which weighed 850 gm, and he immediately established himself as the head of the group.

The group was housed in an outdoor covered cage which was 66-by-64-by-58-in. A shelter and roost was provided along one side of the cage. The diet was a commercial monkey chow (16% protein) with a daily supplement of oranges, apples, or bananas and water ad libitum.

Coition was frequently observed between the male and each of the females. It was noted that he preferred one female over the others at certain times of each month. This preference of mates was probably associated with the estrous period of each female. The vulva of the preferred female was always red and swollen with a slight mucoid discharge.

Several months after the animals were placed in individual cages, pregnancy became obvious in 3 of the 4 females. The females were allowed to come to term pregnancy and had their babies in a room which housed 33 other monkeys in individual cages. No attempt was made to shelter or isolate the pregnant females from the other animals. There was never any rejection of the infants by their mothers. Each of the babies was born during the night and was found the next morning clinging to its mother's back. On May 3 a male baby was born, another male on June 7, and a female on June 12. All of the newborn were healthy and were nursing within the first 12-24 hours after birth. They have continued to progress nicely and are now healthy, active juvenile monkeys.

The attempt at breeding squirrel monkeys described here seems to have been somewhat more successful than many previous attempts (Hafner

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& Woodburne, 1964), although a very successful breeding program has recently been described (Lehner, Bullock, Feldner, & Clarkson, 1967). At this time, it would be difficult to determine the reasons for our favorable results, especially considering the very small number of animals involved. Perhaps it was the choice of females which showed evidence of fecundity. Also, the male-female ratio was lower than that reported by most breeders. Perhaps this lowered ratio allowed the male to devote all of his attention to a receptive female and thereby service her more often than is possible in a larger group of females. The large pen and the favorable climate are surely important factors.

An attempt to impregnate these females again is planned for the near future.

References

- Hafner, E., & Woodburne, L. S. Breeding Saimiri sciureus. Laboratory Primate Newsletter, 1964, 3 [4], 15-16.
- Lehner, N. D. M., Bullock, B. C., Feldner, M. A., & Clarkson, T. B. Observations on reproduction of laboratory-maintained squirrel monkeys. Laboratory Primate Newsletter, 1967, 6 [1], 1-3.

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NEW TUBERCULOSIS DRUG*

Development of a new drug, Ethambutol, has been reported as a major breakthrough in the fight against tuberculosis. After 5 years of experimental use and research at Battey State Hospital in Rome, Ga., and at several other tuberculosis hospitals around the country, the drug was recently approved for marketing by the U. S. Food and Drug Administration and is now available for prescription use by physicians.

Dr. Raymond F. Corpe, Superintendent of Battey Hospital, said that a reversal of infectiousness in 88 per cent of patients with pulmonary tuberculosis that had resisted other drugs had been achieved with Ethambutol. The new drug is used in combination with older drugs, isoniazid and streptomycin.--Source: Georgia's Health, January, 1968.

*From CDC Veterinary Public Health Notes, January, 1968, prepared by the Veterinary Public Health Section of Epidemiology Program of the National Communicable Disease Center, Atlanta, Georgia.

KO KLET KAEO, A NEW ISLAND RESEARCH FACILITY FOR PRIMATES

Gershon Berkson

Delta Regional Primate Research Center

The Medical Research Laboratory, SEATO Medical Project, has recently established an island research facility in the Gulf of Siam as a semi-natural habitat for the study of gibbons and other primates of Thailand. The Applied Scientific Research Corporation of Thailand and the Delta Regional Primate Research Center collaborated in this effort. The island project is part of a general program in which 150 gibbons are maintained in laboratories in Bangkok and Phrabuddhabat, Thailand, and its main purpose is to determine those factors which might be important in maintaining and breeding gibbons for conservation and research.

The island, Ko Klet Kaeo, is located near Sattahip in southeast Thailand. It comprises 58 acres and is 400 yards from the mainland. It is thickly covered with bushes and low trees, 15-20 ft. high, and there are also taller trees in some sections. The natural animal population of the island includes a variety of marine and terrestrial invertebrates, birds, reptiles, two species of rat, and a group of approximately 25 crab-eating macaques (Macaca irus).

A network of 10 miles of trails has been cut and is maintained routinely. Small feed and water boxes are distributed widely and these are checked daily by two caretakers. The island is also equipped with a small water reservoir, rain shelters, a weather station, and a 40-by-12-by-6-ft. trap in which groups of monkeys have been caught repeatedly.

Thirteen gibbons have been established on the island, and it is planned to place four more there in the near future. Although many of the gibbons are home reared, there has been normal group formation by some and copulations have been observed.

Studies under way at the present time include a determination of factors affecting gibbon range size and movement, observations of gibbon group contacts with each other and with monkeys, the development of a radiotelemetry system for detecting location of primates, and an experiment concerned with social behavior of infants in the monkey group. The experiments with gibbons are related to the laboratory studies of breeding which are in progress. They will also have a bearing on plans for the development of reserve areas in natural forests.

Inquiries regarding the program should be addressed to Director, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D. C. 20012.

ESTIMATE OF NUMBER OF PRIMATES ACQUIRED FOR RESEARCH IN 1966

In May, 1967, the Institute of Laboratory Animal Resources of the National Research Council-National Academy of Sciences sent a questionnaire to various dealers and institutions in an attempt to determine the number of individuals of different species (both primates and nonprimates) sold by dealers or bred by institutions during 1966. In all, 2380 questionnaires were sent and approximately 60 per cent were returned, which is a very high number as these things go. The following are the results for primate species.

| <u>Prosimians</u> | <u>Sold</u> | <u>Bred</u> | <u>Total</u> |
|--------------------------|-------------|-------------|--------------|
| Bushbabies (Galagos) | 26 | 48 | 74 |
| Lemurs | 6 | | 6 |
| Lorises | 12 | | 12 |
| Tree shrews | 370 | 2 | 372 |
| Total | 414 | 50 | 464 |
| <u>New World Monkeys</u> | | | |
| <u>Callithricidae</u> | | | |
| Marmosets | 260 | 185 | 445 |
| Pygmy marmosets | 50 | | 50 |
| White-lipped marmosets | 150 | | 150 |
| Tamarins | | 24 | 24 |
| Not designated | 951 | | 951 |
| <u>Cebidae</u> | | | |
| Callicebus | 93 | | 93 |
| Capuchins | 91 | 1 | 92 |
| Owl monkeys | 415 | 2 | 417 |
| Spider monkeys | 28 | 2 | 30 |
| Woolly monkeys | 6 | | 6 |
| Squirrel monkeys | 7,745 | 100 | 7,845 |
| Not designated | 545 | | 545 |
| Not designated | 386 | | 386 |
| Total | 10,720 | 314 | 11,034 |
| <u>Old World Monkeys</u> | | | |
| Baboons | 1,154 | 4 | 1,158 |
| Langurs | 10 | | 10 |
| Mangabeys | 133 | 1 | 134 |
| Patas monkeys | 7 | 3 | 10 |
| Bonnet macaques | | 14 | 14 |
| Cynomolgus macaques | 11,994 | 50 | 12,044 |
| Pig-tailed macaques | 242 | 22 | 264 |
| Rhesus macaques | 24,886 | 3,421 | 28,307 |
| Stump-tailed macaques | 404 | 153 | 557 |
| Vervets | 7,507 | 15 | 7,522 |
| Not designated | 968 | 15 | 983 |
| Total | 47,305 | 3,698 | 51,003 |

| <u>Apes</u> | | <u>Sold</u> | <u>Bred</u> | <u>Total</u> |
|-------------|-------|-------------|-------------|--------------|
| Chimpanzees | | 246 | 7 | 253 |
| Gibbons | | 26 | 1 | 27 |
| Orangutans | | <u>2</u> | | <u>2</u> |
| | Total | 274 | 8 | 282 |

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REQUEST FOR MONKEYS WITH SPONTANEOUSLY OCCURRING TREMORS
OR SEVERE SPASTICITY

We are very much interested in obtaining some monkeys who have spontaneously occurring tremors or severe spasticity but are otherwise in good health. We are involved in some experimental research concerned with a potential new therapy for Parkinsonism. We would, of course, be happy to pay for these animals and for their shipping.-- C. Normal Shealy, Neurosurgery, Gundersen Clinic, Ltd., La Crosse, Wisconsin 54601.

REQUEST FOR PRIMATE MATERIAL: TARSIIUS BRAIN

I am interested in obtaining either the complete brain, or the intact brain stem (including cerebellum) of two Tarsius. The specimens should be adequately fixed to allow for detailed topographic observations.--Duane E. Haines, Department of Anatomy, Michigan State University, East Lansing, Michigan 48823.

REQUEST FOR PRIMATE MATERIAL: CHIMPANZEE REPRODUCTIVE ORGANS

Reproductive organs of male and female chimpanzees of all ages are required for a histological study. All gifts of material will be acknowledged, and postage and packing will be refunded if requested. Testes, ovaries, and uterus should be opened longitudinally, and the complete genital tract should be placed in 10% formalin. If possible, the age, weight, and cause of death should be stated.--Charles E. Graham, Yerkes Regional Primate Research Center, Emory University, Atlanta, Georgia 30322.

REQUEST FOR INFORMATION ON PREVENTION
OF SELF-MUTILATION

In a fairly stable colony of rhesus (Macaca mulatta) and cynomolgus (M. irus) monkeys, two apparently healthy rhesus monkeys have repeatedly self-mutilated their legs. All of the animals are separately caged but share the use of several carrying cages and of the testing apparatus.

The two affected animals have been subjected to shock training and ablation of the auditory portion of the cortex. They have been in the colony for nearly two years. Others in the colony have undergone the same training and some have undergone surgery as well. Husbandry is the same for all.

Bacteriological cultures have revealed the usual accepted skin organisms. Fungus cultures have resulted in growth of only the common, supposedly non-pathogenic organisms. Skin scrapings have been negative for external parasites. Each animal has been anesthetized and examined physically. They seem to be quite normal except for the abrasions and lacerations. The available literature mentions self-mutilation as present with several systemic diseases. This does not seem to be the case in this situation. However, the colony did go through an outbreak of Shigella dysentery, just previous to the beginning of the self-mutilation by the two individuals.

One animal was given a long-acting cortical steroid product (depomedrol). For three weeks this unrestrained primate left the affected area alone. Exactly three weeks following the injection he tore open the wound and has had to be restrained since to prevent further damage. Three weeks is the usual clinical period of time that the effect of this product seems to last in most animals.

If anyone has any information on the matter, it would be greatly appreciated.* The animals are valuable and the restraint has taken them off their schedule for two months.--W. N. Konde, D.V.M., Henry Ford Hospital, 2799 West Grand Boulevard, Detroit, Michigan 48202.

*Self-mutilation of rhesus and cynomolgus monkeys has been an occasional problem in the editor's laboratory. A related problem is infliction of severe bite wounds upon female cage mates by mature males when paired for mating. The canine teeth were removed from all breeding males and this stopped the damage to the females and incidentally stopped any self-inflicted damage by the "defanged" males. One male who repeatedly injured himself remained in the laboratory 4 years post extraction and caused no further damage to himself.

GIBBON'S DECLINE AND FALL*

The following is a review of The Apes by Vernon Reynolds (New York: Dutton, 1967) which appeared in the December 29, 1967, issue of Time magazine.

The primatologist's a man
Who searches where mankind began:
The Congo's matted jungle trees
Are thick with eager Ph.D.s.
And here is one more sober study
Designed to prove the ape man's buddy--
A hairy version of your brother
Your sister and your uncle's mother.
This Dr. Vernon Reynolds, he
Can prove the noble chimpanzee
Is very like to you and me;
He's sorry when he's done some wrong,
Attempts to make some kind of song,
Rarely does what he is told,
Becomes arthritic when he's old.
Like man's, his sex life is a mess;
He may aspire to faithfulness
But rarely is he known to snub
A lady member of the club.
The trouble is, this information
Is all from jungle observation.
When Reynolds wants a closer view
He's forced to study in a zoo,
And there like men, the apes in cages
Are prone to sulks and lethal rages,
Turn homo and refuse to play
With any girl who comes their way,
Lose all desire to drink or dance,
Fall in a catatonic trance.
So Dr. Reynolds urges that
Man should provide a habitat
For his poor hairy dumb relations,
A sort of ape's United Nations.
The state of Florida might serve
As one great simian preserve,
Where the whole tribe would perhaps thrive,
Or just contrive to stay alive.
And in this tax-free paradise
Who knows, the ape might learn to rise
Higher on Darwin's family tree
And join in man's society.
Then some gifted gibbon may
Be able in his apish way
To peer at Cape Canaveral
And write a new Decline and Fall.

*Reprinted by permission from Time; Copyright Time Inc. 1967.

NEWS RELEASE: CHILD ON PICNIC IN SOUTH AFRICA SEIZED BY BABOONS

Johannesburg, South Africa--After the recent discovery of the body of 2-year-old Trixie Gibbs of Johannesburg in the baboon-infested Heidelberg Kloof (ravine) near here, police again have issued the warning: beware of baboons. It is believed that the little girl was carried off from a picnic spot in the Heidelberg Kloof by a troop of chacma baboons. She was found 48 hours later three miles away, dead from exposure. Scratches and bruises on her body indicated the work of baboons.

Baboons in the Transvaal were declared dangerous game only three years ago, soon after a year-old boy was snatched from his carriage by a large male in a Brakpan shopping center. Brakpan is 30 miles from Heidelberg Kloof. The baboon carried the child a few feet and then bit it in the head, killing it instantly before the horrified gaze of the mother. Only a year before, at Cullinan near Pretoria, police shot a large male which was blamed for the deaths of two African girls, aged 5 and 13. It is said to have chased them over a precipice. The male attacked several people, mainly by throwing stones at them.

The chacma baboon, a 3.5-foot-tall monkey with the head of a dog and the fangs of a leopard, is probably the world's most dangerous primate; it is more feared in Africa than the gorilla. It has been accused of man-eating. On the Ruvuma River in Tanzania a solitary male baboon caused an entire village to be evacuated when it took to killing lone travelers. It rushed out at them, killing them with a single ripping bite.

The baboons of the Heidelberg area are thought to be a unique and large race of baboons which have been cut off from their cousins for generations. They are confined to an 18-mile range of mountains and occasionally, when their favorite food such as scorpions and wild fruit runs low, they invade the nearby town of Heidelberg. Two years ago three were shot in the town after they attacked schoolchildren. I have often run into the baboons in the Heidelberg Kloof. Although they bark warnings and rush around in excitement when one approaches, they are inclined to run when one gets to within 50 or 60 yards. But like most baboons they are less afraid of women and not at all scared of children.

A theory has been put forward that the baboons which accosted Trixie did not intend doing her harm. Trixie might have been just another victim of the female baboons' strong maternal instinct toward anything young and helpless. These monkeys have from time to time snatched babies from cradles and carried them into trees and attempted to nurse them. Frequently they abduct baby rabbits and goats. The adopted baby animals usually die of starvation in a day or two, leaving the female baboon to howl and moan her loss for hours on a hilltop.-- James Clarke, Copley News Service.

RECENT BOOKS AND ARTICLES*
(Addresses are those of first authors)

Books

Primates in medicine. Moor-Jankowski, J., & Goldsmith, E. I. (Eds.). Vol. 1. First Holloman Symposium on Primate Immunology and Molecular Genetics. Kratochvil, C. H. (Ed.) Basel and New York: Karger, 1968.

This volume is the first in a series of publications which will be oriented towards the application of information to problems in human medicine. The similarities and differences existing between man and his closest relatives will be emphasized.

A handbook of living primates. Napier, J. R., & Napier, P. H. New York: Academic Press, Inc., 1967.

This book is designed to provide a catalogue of facts about primate biology. Part I contains an account of the morphology of primates and provides an overall survey of the principal features and characteristics which distinguish primates from other mammals and from each other. Part II presents data for each genus under various main headings: Geographical Range, Ecology, Morphology, Genetics, Behavior, Development and Reproduction, Captivity, etc. Part III consists of supplementary and comparative data using explanatory notes to amplify, discuss, and define terms and concepts used in the genus profiles in Part II. It also gives "statistics" of the Order, with comparative tables of limb proportions, weights and dimensions, gestation periods, etc.

The baboon in medical research. Vol. II. Vagtborg, H. (Ed.). Austin: Univer. Texas Press, 1967.

The Second International Symposium on the Baboon and Its Use as an Experimental Animal was held in San Antonio, Texas, in the fall of 1965 under the sponsorship of the Southwest Foundation for Research and Education. This book, the second volume in a continuing series, constitutes the proceedings of that Symposium. A variety of scientific areas is represented including taxonomy, colony management,

*In many cases, the original source of references in the following section has been the Current Primate References prepared by The Primate Information Center, Regional Primate Research Center, University of Washington. Because of this excellent source of references, the emphasis here has been shifted to presentation of abstracts of articles of practical or of general interest, rather than simply listing them.

anatomy, embryology, pathology, physiology, biochemistry, microbiology, and experimental medicine.

A stereotaxic brain atlas for *Macaca nemestrina*. Winters, W. D., Kado, R. T., & Adey, W. R. Berkeley: Univ. California Press, 1967.

This atlas consists of an introduction, which includes five photographs of the head and brain of the animal, followed by 35 Weil-stained transverse sections, two sagittal photomicrographs and two horizontal. A three-part appendix gives specific information about the monkey used, figures for measurements, and verifications, and recommended practice for using the atlas. There is also an index.

Zoonoses of primates. Fiennes, R. N. London: Weidenfeld & Nicolson, 1967, or Ithaca, N. Y.: Cornell Univ. Press, 1967.

A survey of all the known diseases of primates that can be transmitted to man. The possible dangers of zoonoses, which often produce more severe symptoms in man than in their nonhuman hosts, are described in general terms. Charts and diagrams of the distribution of the various primates throughout the world are included. There are three main sections: The first deals with parasitic diseases and provides a critical evaluation of the ectoparasites, arthropod vectors, endoparasites, protozoa, and fungi. The second section is concerned with bacteria and covers most of the organisms producing diseases in primates and assesses the role in causing human disease of the *Salmonella*, *Shigella*, and other groups that infect simians. The third and largest section deals with viruses. The viruses are divided into four groups: those of the arboreal disease cycle, including yellow fever; viruses that are minor in primates but often serious in man; human diseases that can be transmitted to animals and then spread to other humans; and nonpathogenic viruses that can cause disease in humans by being transmitted in immunizing agents manufactured from simian tissues.

Bibliotheca Primatologia. No. 6: Social organization of hamadryas baboons. Kummer, H. Basel and New York: Karger, 1968.

Bibliotheca Primatologia. No. 7: Biology of the howler monkey (*Alouatta caraya*). Malinow, M. R. (Ed.). Basel and New York: Karger, 1968.

Includes articles on: Functional anatomy of the upper limb; The periodontium and periodontal pathology; The skin; Radiographic study of the postnatal skeletal development; Laboratory observations on living howlers; Arterial pathology; General pathology; Anti-globulins resembling human rheumatoid factor in howler monkeys; Population characteristics; Chronological age determination as estimated from strontium-90

content of teeth and bone; Fetal growth and development; and Characteristics of the masticatory system.

Disease

Influence of isoniazid therapy on the course of tuberculosis in a rhesus monkey. Burkholder, C. R., Hirsh, D. C., Hickman, R. L., & Soave, O. A. (Animal Care Facility, Stanford Med. Sch., Palo Alto, Calif. 94304) Journal of the American Veterinary Medical Association, 1967, 151, 918-919.

The case reported suggested that the tuberculin test is reliable in early infection, there is a possible influence of isoniazid on the mild tuberculin reaction, and reversion of the monkey to a tuberculin negative status at the 1:10 dilution with Koch's Old Tuberculin occurs after 10 weeks of treatment and with undiluted tuberculin at 19 weeks. Viable tubercle bacilli could be isolated from the feces after 10 weeks of therapy. Isoniazid therapy seemed to arrest the disease.

Tuberculosis in the stumptailed macaque (Macaca speciosa). Wolf, R. H., Bullock, B. C., & Clarkson, T. B. (Dept. Lab. Animal Med., Bowman Gray Sch. Med., Wake Forest U., Winston-Salem, N. C. 27103) Journal of the American Veterinary Medical Association, 1967, 151, 914-917.

Tuberculosis was diagnosed in 2 stumptailed macaque monkeys (Macaca speciosa). Gross lesions in one involved the hilar lymph nodes, lungs, liver, and spleen. Histologically, there was disseminated tuberculosis, with caseous necrosis, calcification, numerous Langhan's giant cells, and fibrosis. In the other, lesions were confined to the thoracic cavity and involved the lungs and hilar lymph nodes. Caseous necrosis was found with no calcification, fibrosis, or Langhan's giant cells. Acid-fast bacteria were demonstrated in tissue sections. Mycobacterium tuberculosis var. hominis was cultured.

A contagious pox disease in monkeys. Hall, A. S., & McNulty, W. P., Jr. (Oregon Reg. Primate Res. Center, 505 N.W. 185th Ave., Beaverton, Oregon 97005) Journal of the American Veterinary Medical Association, 1967, 151, 833-838.

A spontaneously occurring, contagious, epidermal disease in macaques was transmitted to animal handlers. The clinical course and morbid anatomy was characteristic of a pox infection; however, the isolated agent, while morphologically a pox virus, was not a type that is presently known to infect monkeys or man. Although the method of transmission from monkey to monkey is unknown, handlers usually contracted the disease through small scratch wounds on the arms. The disease has a benign and relatively short course.

Clinical examinations of the Japanese monkey (Macaca fuscata).
Tanaka, T., & Nigi, H. (Dept. Lab. Primate Med., Japan
Monkey Centre, Inuyama, Aichi) Primates, 1967, 8, 91-106.

Since 1962 clinical examinations have been performed on 466 Japanese monkeys from the troops of the western part of Japan. During the external inspection we found a few cases of malformation of the hand and foot in some troops, but except for these they were in good physical condition, negative on tuberculin test and for Shigella and Salmonella infection. In all troops a high rate of helminthic infection was detected and there was a difference in the rate of occurrence of certain helminths between Macaca fuscata fuscata and M. fuscata yakui. No single case with the antibody to B Virus was encountered, and it seems that no infection of B Virus is present among the Japanese monkeys. The free-ranging condition under which the Japanese monkey lives in troops seems to be satisfactory and they seem to have no serious problem of any kind at present.

Overt Herpes-T infection in squirrel monkeys (Saimiri sciureus).
King, N. W., Hunt, R. D., Daniel, M. D., & Melendez, L. V.
(New England Reg. Primate Res. Center, Southboro, Mass.)
Laboratory Animal Care, 1967, 17, 413-423.

Herpes-T virus was isolated from 2 of 4 clinically ill squirrel monkeys. The disease was characterized by labial and oral ulcerations in all 4 animals. In one of 2 animals killed and examined histopathologically, characteristic herpes virus inclusion bodies and giant cells were observed. Although Herpes-T virus has been isolated from a latent infection in this species, this is the first report of a clinical entity produced by this virus in the squirrel monkey. These data further support the conclusion that the squirrel monkey is a natural host for this virus and that the disease in this species is analogous to Herpes simplex in man.

Seroreactivity of non-human primates in treponemal and non-treponemal antigen tests for syphilis. Kuhn, U. S. G., Brown, W. J., & Falcone, V. H. (Res. & Development Labs, Venereal Dis. Res. Lab., Communicable Dis. Cen., Atlanta, Ga. 30333) World Health Organization Technical Document (WHO/VDT/RES/68.137), 1968.

Two serologic tests considered to be specific for treponemal infections and one anti-cardiolipin (reagin) test were performed on samples of blood serum or plasma from 250 chimpanzees and from a smaller number of 10 other species of primates. Anti-treponemal antibodies were demonstrated in 19 per cent of the chimpanzee samples. Reagin was detectable in 10 per cent. The antibodies were

found in 1 black ape, 3 mangabeys, and 2 green monkeys. The antigen responsible for the positive serology is not known, but its identification may contribute to a better understanding of the origin and control of syphilis.

Natural treponematosi s of monkeys in Africa: isolation and adaptation of a strain of pathogenic treponema in the hamster. Fribourg-Blanc, A., & Mollaret, H. H. World Health Organization Technical Document (WHO/VDT/RES/68.135), 1968. (In French)

More than two thousand serum samples from monkeys and apes of various species from different parts of the world have been examined since 1962 by the immunofluorescent technique for Treponema. Animals coming from certain regions of Central Africa have treponemal antibodies identical to those observed in man during the course of syphilis. These titers are variable and may be very high. Guinea, Senegal, and the Congo (Brazzaville) seem to be the most important centers of this endemic disease. In smears of the popliteal lymph nodes of sixty seropositive animals, 15 were positive for Treponema which could not be differentiated morphologically or immunologically from the pathogenic Treponema of humans. An inoculum derived from the popliteal lymph nodes of about twenty animals was injected four different times into six hamsters. There was a very positive serological reaction to the inoculation after 6 months. Two of them developed cutaneous lesions rich in Treponema which was transmissible to other hamsters. The transmissions have been successful through four passages. It appears possible to transmit it to the rabbit in the same manner. A study is now in progress in collaboration with the World Health Organization in an attempt to locate the precise geographical distribution of this infection and the characteristics of this strain. Simian treponematosi s and the endemic human disease of the same type which produced the cutaneous lesions in the hamsters were observed to occur in similar geographic areas. The similarity of the simian strain to Treponema pallidum of man stimulated the consideration of the monkey as a natural reservoir of yaws. A series of experiments are in progress under the auspices of WHO using the strain isolated for inoculation into humans and various nonhuman primates.

Physiology and Behavior

Normal blood values of the adult female monkey (Macaca mulatta). King, T. O., & Gargus, J. L. (Bio/dynamics, Inc., East Millstone, N. J.) Laboratory Animal Care, 1967, 17, 391-396.

During the course of a long-term toxicity test utilizing adult female monkeys (Macaca mulatta) repeated hematologic

and blood biochemical determinations were made in both control and treated animals. This report presents the results of such determinations made on 15 control animals at the initiation of the study, at 45 and 90 days and at 90-day intervals thereafter until sacrifice or death. Some biochemical studies were made at other times. Observation periods varied for individual monkeys from 3 to 33 months. The values obtained are as follows: packed cell volume, $41.1 \pm 3.2\%$; hemoglobin, 13.4 ± 1.4 gm/100 ml; red blood cells, $5.19 \pm 0.57 \times 10^6$ cmm.; white blood cells, $12,800 \pm 4,800$ /ccm. Differential: myelocytes and metamyelocytes, 0; juvenile and band cells, 0; segmented nuclear cells, $43.4 \pm 17\%$; lymphocytes, $52 \pm 17\%$; monocytes, 1 ± 1 ; eosinophils, 4 ± 4 ; basophils, 0. Sedimentation rate, 1.3 ± 1.9 mm/hr. Biochemical values: bromsulphalein retention, $0.7 \pm 1.8\%$; serum glutamic pyruvic transaminase, 20.2 ± 11.8 Reitman-Frankel units; alkaline phosphatase, 2.5 ± 1.3 Sigma units; protein-bound iodine, 5.0 ± 1.5 μ g/100 ml.; serum calcium, 10.9 ± 0.7 mg/100 ml.; inorganic phosphorus, 4.7 ± 1.3 mg/100 ml.; total phosphorus, 16.0 ± 2.7 mg/100 ml.

Values for blood constituents of the African green monkey (Cercopithecus aethiops). Pridgen, W. A. (Lederle Labs., American Cyanamid Co., Pearl River, N. Y.) Laboratory Animal Care, 1967, 17, 463-468.

Physiological measurements were made on a group of African green monkeys (Cercopithecus aethiops). Determinations included blood glucose, blood urea nitrogen, plasma glutamic oxalacetic transaminase, plasma glutamic pyruvic transaminase, plasma sodium, plasma chloride, plasma alkaline phosphatase, plasma uric acid, and sulfobromophthalein sodium retention.

Systemic arterial blood pressure and pulse rate in chronically restrained rhesus monkeys. Forsyth, R. P., & Baireuther, R. (Cardiovascular Res. Inst., U. California, San Francisco Med. Cen., San Francisco, Calif.) The American Journal of Physiology, 1967, 212, 1461-1463.

Systemic arterial blood pressure and pulse rate were measured once each hour in 13 restrained, unanesthetized rhesus monkeys with implanted intra-arterial catheters. Pressures and pulse rates (average of 24 measurements/day) were generally higher during the week after surgery and introduction to the restraining chair than during subsequent weeks (2-34 weeks). Mean systemic arterial pressures exclusive of the first week, varied from 117 to 136 mm Hg systolic, 71 to 84 mm Hg diastolic; pulse rate varied from 118 to 160 beats/min. Mean plasma levels of epinephrine were 0.3 μ g/liter (SD = 0.4) and of norepinephrine, 0.9 μ g/liter (SD = 0.4).

Drugs

Intravenous administration of a new volatile anesthetic, 2,2-dichloro-1,1-difluorethyl methyl sulfide, in dogs and monkeys. Salman, K. N., Rozman, R. S., Cascorbi, H. F., & Krantz, J. C., Jr. (U. Bagda, Coll. Pharmacy, Bagdad, Iraq) American Journal of Veterinary Research, 1968, 29, 165-172.

A new volatile anesthetic--2,2-dichloro-1,1-difluorethyl methyl sulfide (methioflurane)--was potent in dogs and monkeys when administered intravenously in emulsion form. Induction of anesthesia was rapid. The anesthetic syndrome, including ease of control of the level of anesthesia, lack of excess salivary and mucus production, good muscle relaxation and analgesia, and maintenance of arterial blood pressure, was very good. The anesthetic emulsion proved safe for anesthesia, as indicated by results of histopathologic studies and organ-function tests, and by its compatibility with certain pre-anesthetic drugs (thiopental sodium, secobarbital sodium, morphine sulfate, and atropine sulfate) and epinephrine. Resuscitation of animals was made easy because of the ability of the lungs to excrete the anesthetic.

Clinical use of the short acting anesthetic 2-(0-chlorophenyl-2-methyl amino cyclo hexanone hydrochloride (CI 581) in Macaca mulatta, Macaca irus, and Macaca nemestrina monkeys. Bree, M. M. (Animal Care Unit, U. Mich., Ann Arbor, Mich.) Laboratory Animal Care, 1967, 17, 547-550.

CI 581, a phenylcyclidine derivative, is a short-acting anesthetic devoid of convulsive properties when administered to nonhuman primates. This report concerns its use in 80 Macaca mulatta, 5 Macaca irus, and 4 Macaca nemestrina monkeys. The monkeys weighed 2.5-10.0 kg; all were acclimated to the animal facilities and were in good physical condition. The anesthetic was injected intramuscularly in the thigh in single doses of 10 to 25 mg/kg with the monkeys restrained in a scissors net. Induction was smooth and without excitement. Induction time averaged 4.1 minutes and did not vary with the dose or species. Effective anesthesia was maintained in Macaca mulatta monkeys for an average of 21.9, 38, 44, and 70 minutes, with corresponding doses of 10 mg/kg in 37 monkeys, 15 mg/kg in 29 monkeys, 20 mg/kg in 8 monkeys, and 25 mg/kg in 6 monkeys respectively. In 5 Macaca irus receiving 10 mg/kg, effective anesthesia was maintained for an average of 33.4 minutes. In the Macaca nemestrina monkeys, successive intravenous doses were used for lengthy procedures following an initial intramuscular dose. Recovery from anesthesia was smooth in all instances. Procedures carried out on anesthetized animals included ulnar nerve resection and repair, extraction of teeth, facial nerve

decompression, electromyography, and tattooing. CI 581 is a promising anesthetic for nonhuman primates.

Facilities, Care and Breeding

Protein requirement of the young, growing chimpanzee. Hodson, H. H., Jr., Mesa, V. L., & Van Riper, D. C. (6571st Aeromedical Res. Lab., Holloman Air Force Base, New Mexico) Laboratory Animal Care, 1967, 17, 551-562.

Twelve immature chimpanzees were randomly assigned to 3 diets with two 10 to 12 kg and two 20 to 25 kg animals receiving each diet. The diets contained approximately 4 Kcal/gm and either 12%, 15%, or 18% protein. These were fed at the rate of 105 to 115 Kcal/kg of body weight. There were no significant differences among the animals in weight gains, serum protein and creatinine, hemoglobin, or nitrogen retention over a 7-month period that could be related to the dietary protein level. A low blood urea nitrogen level and urinary nitrogen excretion rate (resulting in a low urinary nitrogen to creatinine ratio) for the animals on the 12% protein diet indicated that the 12% protein diet (3.3 gm protein intake per kg body weight) may have been approaching the minimal dietary requirement. Therefore, it appears that the 15% protein diet (i.e., 3.5 to 4.5 gm protein intake per kg body weight) was optimal for the young, growing chimpanzee.

Biological activities of vitamins D₂ and D₃ for growing squirrel monkeys. Lehner, N. D. M., Bullock, B. C., Clarkson, T. B., & Lofland, H. B. (Dept. Lab. Animal Med., Bowman Gray Sch. Med., Wake Forest U., Winston-Salem, N. C.) Laboratory Animal Care, 1967, 17, 483-493.

A comparison of the biological activities of vitamins D₂ and D₃ for growing squirrel monkeys (Saimiri sciureus) is described. Physical, chemical, radiological, and histological data are presented. Juvenile squirrel monkeys fed diets containing up to 10.00 I.U. of vitamin D₂ per gram developed rickets, and were not different on the basis of studies made from monkeys fed a diet devoid of vitamin D. Squirrel monkeys fed diets containing vitamin D₃ did not develop rickets, and no differences were found among those animals receiving from 1.25 I.U. to 10.00 I.U. of vitamin D₃ per gram of diet. The data presented suggest that squirrel monkeys cannot, or can only poorly, utilize vitamin D₂. Squirrel monkeys maintained in the absence of ultra-violet light should be given vitamin D₃ to supply their vitamin D requirement.

Relationship of sexual receptivity to menstrual cycles in adult rhesus monkeys. Erikson, L. B. (Dept. Anatomy, U. Alberta,

Canada) Nature, 1967, 216, 299-301.

Data are presented which indicate that sexual excitability, as judged by vaginal contraction and/or vasocongestion, receptivity, and completion-delay timings, typically increases at the probable period of ovulation, and, as is consistent with what is already known, also occurs at other times during the menstrual cycle.

The estrous cycle of the squirrel monkey (Saimiri sciureus).

Lang, C. M. Animal Resource Facility, Pennsylvania State U., Hershey Med. Cen., Hershey, Pa. 17033) Laboratory Animal Care, 1967, 17, 442-451.

Studies of vaginal smears made from 25 Brazilian squirrel monkeys indicate that the estrous cycle of this species is 12.54 ± 2.01 days. Cytologic evidence of estrus is not consistently accompanied by vulvar hyperemia and swelling. Histologic examination of the ovaries at necropsy indicate that the majority of the estrous cycles are anovulatory.

Use of the rectal probe method for electrical ejaculation of apes, monkeys and a prosimian. Fussell, E. N., Roussel, J. D., & Austin, C. R. (Delta Reg. Primate Res. Center, Tulane U., Covington, Louisiana) Laboratory Animal Care, 1967, 17, 528-530.

Descriptions are given of four rectal probes which have been found suitable for the electrical ejaculation of a wide range of primates, and a simplified circuit for providing the stimulation. A brief outline is presented of the recommended procedures to be followed in the use of this equipment.

Squirrel monkey reproduction: The "fatted" male phenomenon and seasonal spermatogenesis. DuMond, F. V., & Hutchinson, T. C. (Monkey Jungle, Inc., Miami, Florida 33170) Science, 1967, 158, 1467-1470.

Records of reproduction in a Miami colony of squirrel monkeys living in a seminatural state and of monkeys in the field indicate that the male undergoes an annual testis cycle. The spermatogenic phase is associated with the seasonal acquisition of a secondary sexual characteristic which we have termed the "fatted" condition. Body weights, measurements of subcutaneous fat, and testicular histology studied over a 12-month period further establish this cycle. Climatological analyses suggest that this cycle is associated with the precipitation cycles of the respective environments.

Changing parturition time in monkeys (Macaca nemestrina) from night to day. Jensen, G. D., & Bobbitt, Ruth A. (Reg. Primate Res. Center, U. Washington, Seattle, Wash.)

Laboratory Animal Care, 1967, 17, 379-381.

Parturition in monkeys occurs predominantly at night. During 16 pregnancies in a laboratory colony, the diurnal cycle was reversed at least 3 days before parturition. Lighting, environmental noise level, and caretaking routines were altered. In a group experiencing 10 hours of artificial night during the natural day and 14 hours of artificial day extending through the natural night, 11 of 12 deliveries occurred during the artificial night. When the artificial night was reduced to 7 hours, only 2 of 4 births occurred during this period.

Development of a primate source. Van Riper, D. C., Fineg, J., & Day, P. W. (Vivarium Div., 6571st ARL, Holloman Air Force Base, New Mexico) Laboratory Animal Care, 1967, 17, 472-478.

Although the idea of restraining large primates via the utilization of a water moat is not new, the concept of encompassing a large area of semi-arid desert to accommodate large numbers of chimpanzees and attempt to carry on a variety of research efforts is new. The consortium, as the name implies, allows the chimpanzees free range over an area of 29.8 acres. The design is circular, having a diameter of 1200 ft. The water moat measures 16 ft. across and has a maximum depth of 4 ft. Within the island formed by the moat are four smaller circles which have been planted with a large variety of vegetation to simulate the chimpanzee's natural habitat as closely as possible in our semi-arid desert. To be assured of continued growth of the transplanted vegetation, an underground irrigation system has been incorporated. One building transverses the moat for the purpose of providing food and water, as well as protection from extremes in climate associated with "high" desert regions. The consortium provides a milieu in which a variety of environmental factors which influence individual behavior and social structure can be manipulated and studied in ways not possible in the natural habitat. As a result of recent progress in microminiaturization and radiotelemetry, an effort to extend the range of physiological and behavioral analysis to the freely moving chimpanzee will also be integrated into this study.

Colonization of the tree shrew (Tupaia glis). Morris, J. H., Negus, N. C., & Spertzel, R. O. (Dept. Lab. Animals, Div. Vet. Med., Walter Reed Army Inst. Res., Washington, D. C.) Laboratory Animal Care, 1967, 17, 514-520.

The tree shrew (Tupaia glis) has been colonized, and will reproduce in controlled environments. This species adapts well to the laboratory environment and may contribute significantly to research in areas requiring primates or

higher rodents. The kibbled canine diet, supplemented with multivitamin preparation, has been fed to all animals in the colony for extended periods, and all have remained in excellent physical condition. Optimum cage requirements and design have been described. Use of these should facilitate efficient production of the species. The puberty age and short gestation period provides access to an economical laboratory primate.

Small chimpanzee colony management. Arce, A., & Dobie, R. (Melpar, Inc., Falls Church, Virginia) Journal of the Institute of Animal Technicians, 1967, 18, 139-143.

Chimpanzees pose special problems in handling and husbandry. This paper discusses some of these problems and describes the methods employed in dealing with eight juvenile chimps.

A simplified incubator-isolator for infant monkeys. Kerber, W. T., Reese, W. H., Reeves, C. J., & Paynter, O. E. (Sinclair Comparative Med. Res. Farm, Route 3, Columbia, Mo. 65201) Laboratory Animal Care, 1967, 17, 406-407.

An incubator-isolator has been designed to house infant monkeys during the critical first 2 to 3 weeks following birth. Two clear plastic rodent cages are used to construct the isolator. A heating pad provides warmth. The incubator is relatively inexpensive, provides protection for the monkey and allows observation of the animal through the clear plastic.

Extraction of canine teeth from the rhesus monkey. Hilloowala, R. A., & Miller, R. L. (Bionetics Res. Labs., Inc., Falls Church, Va. 22046) Journal of the American Veterinary Medical Association, 1967, 151, 830-832.

In a breeding colony of rhesus monkeys, wounding of females by males in breeding cages was minimized by extraction of the canine teeth from the males. A modification of a procedure used in human oral surgery was successfully applied to more than 80 monkeys. The management of the animals was markedly simplified, and there was no diminution in potency or fertility.

Development and evaluation of a pelleted and tableted diet for chimpanzees. Robaidek, E. S., Derse, P. H., Regel, L., & Nees, P. O. (Wisconsin Alumni Research Foundation, P. O. Box 2217, Madison, Wisconsin 53701) Technical Report No. ARL-TR-67-21, 6571st Aeromedical Research Laboratory, Holloman Air Force Base, New Mexico, 1967.

Eleven modifications of the Wisconsin Alumni Research Foundation (WARF) chimpanzee diet were evaluated for nutritional adequacy during a 9-month feeding period. Six

18-36 months old chimpanzees of both sexes were used. Daily food intake and bi-weekly body weights were obtained. Hematological studies, and biochemical determinations of serum, urinary and fecal constituents were made at regular intervals during the course of the study. Fecal bacteria measurements at selected intervals were also made. Feed palatability and fecal consistency were evaluated. All modifications of the diet were found to be adequate in providing the basic nutritional requirements of the animals, with the exception of vitamin C, which was partially lost in pelleting of the diets. A formulation was made which could be satisfactorily tableted for use in dispensing machines. The same formulation was the most palatable and produced a very satisfactory fecal consistency. Suggestions for improving vitamin C stability in the pelleted diets are made.

Basics of the radiography of small primates. Ferron, R. R. (Oregon Reg. Primate Res. Center, Beaverton, Oregon) Laboratory Animal Care, 1967, 17, 594-599.

Radiography is an important procedure in research conducted on small primates and in the maintenance of their health. The radiographic skills are described, including correct handling, sedation, restraining methods, good positioning, and the use of modern equipment. The similarity to pediatric radiography is discussed. A description of chest and other radiography, the types of film employed, and a starting technique are also presented.

Effects of dietary protein levels on the Saimiri sciureus. De La Iglesia, F. A., Porta, E. A., & Hartroft, W. S. (Res. Inst. Hosp. Sick Children, Toronto, Canada) Experimental and Molecular Pathology, 1967, 7, 182-195.

Despite the increasing use of the squirrel monkey in nutritional studies, little is known of the dietary requirements of this species. Twelve young (700 gm initial weight) male squirrel monkeys were allotted to 4 groups of 3 animals each and were offered ad libitum, during 24 weeks, isocaloric diets in which the amounts of protein were 25%, 12.5%, 9%, or 6%. The dietary protein employed was a purified soya protein and was supplemented with 2.1 gm% of methionine to obtain the same content of this amino acid as present in casein. The diets contained amounts of vitamins and essential food factors in excess of the estimated normal requirements. The results indicate that the diets with 25% protein permit the growth and the normal maintenance of several functional and morphologic parameters studied. An almost similar effect was observed with 12.5% protein diets. The protein intake in monkeys fed this diet was 8 gm/day/kg of body weight, and it appears to be the minimal normal

protein requirement for this species in captivity under the experimental conditions employed in this work. The effect of 9% and 6% protein diets was manifested by poor ponderal growth, decrease in albumin/globulin ratio, decrease in hemoglobin concentration, decrease in BUN, and increase in serum alkaline-phosphatase activity. In addition, the livers of animals on the low-protein diets had moderate to severe ultrastructural alterations. The authors concluded that the amount of protein currently assumed to be necessary in commercial diets for squirrel monkeys (20% or more) may be excessive. However, such protein levels may still be necessary because the quality of protein in commercial diets is normally not as high as that used in the experiment.

Instruments and Techniques

A jacket for stimulating and recording from monkeys. Schwartz, A. A., Eidelberg, E., & Cheshire, F. (Dept. Neurobiology, Barrow Neurological Inst. of St. Joseph's Hosp., Phoenix, Ariz. 85013) Electroencephalography and Clinical Neurophysiology, 1967, 22, 563-564.

A jacket is described which permits attachment of surface electrodes to the hands of relatively unrestrained monkeys. It may also be used for chronic electrical recording and injection delivery systems in monkeys where restraining chairs are objectionable and more freedom and movement is desired.

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