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Edited by

Allan M. Schrier

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POLICY STATEMENT

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 is intended primarily for persons doing research with nonhuman primates. There is no charge for new issues or the current issue. Volumes 1-4 may be purchased for $4.00 per volume, Volumes 5-8 for $2.50 per volume, and back issues for the current year for $0.50 each. (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 References section should be referred to in the text by author(s) and date of publications, as for example: Smith (1960) or (Smith & Jones, 1962). Names of journals should be spelled out completely in the References 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 Napier and Napier [*A Handbook of Living Primates*. New York: Academic Press, 1967].

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CONTENTS

ON THE TOXICITY OF PENICILLIN-DIHYDROSTREPTOMYCIN PREPARATIONS FOR MONKEYS

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Difficulties have been reported (Hupp, 1969; Matanic, 1967) in treating squirrel monkeys with a penicillin-dihydrostreptomycin preparation, Combiotic (Pfizer Co. Ltd., Montreal, Quebec, Canada). Preparations of this type have been widely used in the palliative treatment of many conditions in several species. Their continued use in this way appears unjustifiable on the basis of available knowledge of this type of drug.

This view is shared by many authorities. For example: "The advent of the broad spectrum antibiotics has minimized the importance of these combinations yet a number are still in use" (Claus & Tyler, 1968, p. 430). "The mixtures held hazardous as well as ineffective are the 'pen-sulfas' (penicillin and sulfa), the 'pen-streps' (penicillin and streptomycin), and Panalba (tetracycline and novobiocin)" (Gruchow, 1970, p. 1710). Similarly, dihydrostreptomycin is criticized: "Dihydrostreptomycin should not be used in treatment and will not be discussed further" (Busch & Lane, 1967). "Dihydrostreptomycin or combinations of dihydrostreptomycin and streptomycin," as a result of the possibility of permanent deafness, "have no place in clinical practice" (Smith, 1969, p. 54). Streptomycin has an acute toxic effect on the brain stem, depressing first respiration and then blood pressure (Jones, 1965; Smith, 1969).

Referring specifically to monkeys, "Dihydrostreptomycin sulfate and streptomycin sulfate may cause toxic reactions when given at a dosage higher than ten milligrams per pound body weight. Symptoms follow ten to 20 minutes after injection and the animal dies in convulsions" (Gisler, Benson, & Young, 1960). A dose of 150 to 200 mg per kg intramuscularly is the critical point for toxic reactions in human beings (Smith, 1969). The adult intramuscular dosage of streptomycin in the human, for non-tuberculous conditions, is one (maximum two) grams per day divided into two equal doses 12 hours apart (Florey, 1961; Lewis, 1968; Lorian, 1966). For children the rate is 10 mg per kg intramuscularly every 12 hours (Watt, 1970). The dosages for *dihydro*streptomycin are either given to be the same (Gruchow, 1970; Jones, 1965), omitted from the text (Barber & Garrod, 1963; Busch & Lane, 1967; Florey, 1961; Kirk, 1968; Lorian, 1966; Smith, 1969) or given as one half the rate for streptomycin (Claus & Tyler, 1968). The recommended rate of streptomycin in animals is 5 mg per pound intramuscularly every 12 hours (Kirk, 1968; Catcott, 1968).

Procaine benzylpenicillin maintains therapeutic blood levels for 12 to 24 hours with traces left after 48 hours (Barber & Garrod, 1963; Florey, 1952; Smith, 1969). The human dosage is 300,000 to 600,000 I.U. per day intramuscularly divided into two doses 12 hours apart (Barber & Garrod, 1963; Busch & Lane, 1967; Claus & Tyler, 1968; Florey, 1952; Jones, 1965; *Merck Index*, 1952). In animals, the rate is 10,000 I.U. per pound intramuscularly given in one or two injections a day (Kirk, 1968).

If, in spite of these data and opinions, these products are to be used, the daily dosage for high levels in a 500 g monkey would be 0.025 cc of Combiotic (5,000 I.U. procaine penicillin G and 6.25 mg dihydrostreptomycin) given every 12 hours; not 0.5 to 1.0 cc per kilogram given daily or on alternate days. In animals with renal impairment, dihydrostreptomycin should be given with extreme care, as susceptability to the toxic action of the drug is increased (Lewis, 1968; Smith, 1969). At a dosage rate of one cc per kilogram, using Combiotic, one is giving 25 to 50 times the usual dose of dihydrostreptomycin, and this is well into the toxic range (Gisler, Benson, & Young, 1960; Jones, 1965).

One difficulty in evaluating the reports by Hupp (1969) and Matanic (1967) is that the authors do not give complete data on the animals in question. One should have at least some idea of their pretreatment condition. The great majority of squirrel monkeys we receive from commercial supply houses are immature, debilitated, dehydrated and heavily parasitized. The weight of such animals is easily overestimated. Generally ours weigh from 450 to 600 g. Newly arrived and/or sick animals often dehydrate rapidly if not already dehydrated, leading to varying degrees of renal shutdown. Such renal insufficiency strongly predisposes to dihydrostreptomycin toxicity (Jones, 1965; Lewis, 1968; Smith, 1969).

On the basis of our limited number of cultures from respiratory infections of squirrel monkeys, the major pathogens are *Klebsiella* sp. or *Pasteurella* sp., both of which are usually resistant to penicillin and sensitive to streptomycin (Barber & Garrod, 1963). The use of a once a day (or less frequent) treatment regimen of Combiotic will not give sustained therapeutic blood levels of dihydrostreptomycin. As bacterial resistance to streptomycin and dihydrostreptomycin often develops within 48 hours (Smith, 1969), failure to maintain adequate blood levels offers a further hazard.

In 1.0 cc of Combiotic there are approximately 100 mg of procaine, of which 80 mg are bound to the benzylpenicillin; the other 20 mg may be there as an analgesic due to the irritating nature of the product. The amount of discomfort caused by injecting Combiotic at the rate of one cc per kilogram intramuscularly into a monkey can be imagined by making the same calculations for a cow. You would meet with some difficulty in injecting 700 cc of 'pen-strep' into the gluteals of a Holstein,

in spite of the 70 g of procaine in it!

It would seem wise to discontinue both the use of products containing dihydrostreptomycin and fixed-ratio combinations in general.

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REQUEST FOR SLIDES AND FILMS OF PRIMATES

The Simian Society of America is collecting slides and films of apes, monkeys, and prosimians for use in its public education programs. The Simian Society of America is a nonprofit educational and humane organization interested in the welfare of all monkeys in captivity; we attempt to act as an information exchange for laymen who own or handle monkeys. The society does not have the funds to buy a good collection, but we would be willing to pay for copying such materials if necessary.

Also, we would welcome articles and information suitable for laymen written by professionals for our monthly magazine, *The Simian*. Our magazine tries to pass on to its readers as much reliable information about the health, care, and behavior of simians as we can find.--Jan Tompkins, Editor, *The Simian*, 6824 North 38 Dr., Phoenix, Arizona, 85019.

HAND-REARING INFANT SQUIRREL MONKEYS[1]

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There have been only a few reports on hand-rearing infant squirrel monkeys (*Saimiri sciureus*). King and King (1970) successfully hand-reared three *Saimiri* infants from the third day of life, but have presented only a very brief description of their hand-rearing procedures. Hopf (1969) was not very successful in hand-rearing a *Saimiri* infant from the age of 19 days. The infant did not gain weight and became progressively weakened until it died at the age of 61 days.

During the 1969 birth season we were forced to hand-raise three infants from our *Saimiri* breeding colony (Peruvian type). The mothers of two infants died when the infants were 15 days old, and the third mother rejected her infant when the infant was 5 days old. The first infant, a male, was born June 27. After its mother died the infant was placed in a small cage with a surrogate mother consisting of a towel-covered heating pad wrapped around a metal bar. The infant was initially fed a commercially prepared baby formula (Similac, Ross Laboratories) from disposable 2.5 cc syringes and then from 6 cc and 12 cc syringes, respectively, as he began to eat more. The powdered formula was mixed with warm water according to the manufacturer's directions, but was not sterilized. At first, the infant was fed every 3-4 hours and was allowed to consume as much as it wanted, which averaged 7.5 cc per feeding. The time between feedings was gradually increased as the amount of formula consumed during each meal increased. After two weeks, when the infant was one month old, he was eating 10 to 15 cc of formula four times daily, every 4 to 6 hours, with the first feeding occurring around 8 a.m. and the last around 10 p.m. Small pieces of apple and banana were added to his diet at 8 weeks of age along with Purina Monkey Chow 25 that had been softened with water. The second infant, a male born July 4, was placed with the first infant on July 20 after its mother died. The amount of formula consumed and the feeding schedule for this infant was similar to that of the first infant.

The surrogate was removed from the infants' cage when they were 6 weeks and 5 weeks of age, respectively, after which they remained together for an additional 15 weeks. During this time they were often

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observed clinging tightly to each other in ventral contact, frequently sucking each other's penis or toes. The sucking was so intense that on one occasion a foot of one of the infants became infected and required continued treatment for a few weeks. These behaviors have been described previously for infant rhesus monkeys (*Macaca mulatta*) raised together from birth (Harlow, 1969).

The two infants were placed in individual cages after they were separated and housed in the same room as other individually caged infants that were born in 1969 and had been raised with their mothers for the first 5 months of life. During the first week of January 1970 both hand-reared infants as well as two mother-reared infants died. Gross autopsies failed to reveal the cause of death for any of the infants.

The third hand-reared infant was a female born November 13, 1969. The mother developed a severe case of diarrhea and stopped lactating 5 days after birth, at which time she rejected her infant. The infant was placed on a towel-covered heating pad in a cage and fed according to the schedule described for the first two infants. Since we had observed some differences in the physical condition of the first two hand-reared infants as compared with our mother-reared infants (see below), we decided to feed the female infant "Similac with Iron" instead of the standard "Similac" formula used previously. When the infant was 24 weeks old, the liquid formula was completely removed from her diet and she was transferred from her individual cage to a cage containing another infant of the same age. On June 11, 1970 she was 30 weeks old and in excellent health. The amount of formula consumed and weight increase for this infant before additional substances were added to her diet at the age of 9 weeks, e.g., fruit, monkey chow, is presented in Table 1.

Table 1

Weight Gain and Formula Consumption for
Infant Female *Saimiri* (Peruvian Type)

Age (weeks)	Weight (g)	Formula Consumption (ml)
1	100	----
2	104.5	183.5
3	109.5	226
4	117.5	259
5	125	286
6	138	327.5
7	149	342
8	160	326
9	177	330.5

We have noticed a number of obvious differences in the physical and behavioral development of our hand-reared and mother-reared infants. The weights of our three hand-reared infants have been consistently below those of our mother-reared infants (Table 2). Although a number

Table 2

Mean Weights (g) of Mother-Reared and
Hand-Reared *Saimiri* (Peruvian Type)

Age (weeks)	Mother-Reared[a] (2 male, 2 female)	Hand-Reared (2 male, 1 female)
4	145	124
8	213	162
12	248	176
16	282	204
20	311	262
24	358	287
28	397	338 (female only)

[a]Weights for mother-reared infants were provided by E. Uyeno.

of factors might contribute to this finding, it seems likely that the quality and/or quantity of their respective diets played an important part. No data have been reported on the quantity of milk an infant squirrel monkey consumes on an *ad libitum* regime, such as when it is with its mother. From our observations, mother-reared infants normally nurse more frequently than the feeding schedule we imposed on our hand-reared infants. The extent to which the frequency of nursing episodes is related to either the amount of consumed material or its utilization needs to be determined. Based on an analysis of squirrel monkey milk (Hopf, 1969), the quality of the formula we used to hand-rear our infants would appear to be sufficient (Table 3). It was noticed, however, that the hair of all three hand-reared infants was somewhat sparse and coarse compared with the hair of mother-reared infants, suggesting a dietary deficiency.

Each of the hand-reared infants developed thumb-sucking behavior, which was most prominent around feeding time or when they became highly excited. This behavior has persisted in the female that is currently housed with a peer. As mentioned above, in addition to sucking their own thumbs at various times, the two males that were raised together often sucked each other's penis and toes when they were in a ventral clinging position. Mother-reared infants from our own or other laboratories (Hopf, 1969) have never been observed sucking any parts of their own body.

Table 3

Carbohydrate and Fat Content in Natural Squirrel
Monkey Milk and in Similac Formula

	Carbohydrate	Fat
Saimiri milk (from Hopf, 1969)	0.1 g/100 ml (includes galactose, lactose, and glucose)[a]	3.3 g/100 ml (approx.)
Similac (standard dilution)	7.0 g/100 ml (lactose only)	3.5 g/100 ml

[a]In contrast to Hopf, Buss and Cooper (1970) found only lactose in a sample of squirrel monkey milk. This difference may represent a species difference (Hopf used the Peruvian type, whereas Buss and Cooper used the Brazilian type) and/or other factors related to the qualitative analyses of the milk.

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A COMPARISON OF STEREOTAXIC ATLASES: COORDINATES FOR HIPPOCAMPUS IN RHESUS AND STUMPTAILED MONKEYS[1]

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For the past few years we have conducted research requiring depth electrodes in various portions of the hippocampus of rhesus and stumptailed monkeys. However, we encountered several problems which interfered with the stereotaxic placement of electrodes in this area: (1) The available rhesus stereotaxic atlases did not include coordinates for all portions of the hippocampus; (2) the atlases did not agree regarding those hippocampal coordinates which were listed; and (3) there is no published stereotaxic atlas for the stumptailed monkey. Our solution to these problems involved a surgical procedure in which the hippocampus was exposed and the location of the hippocampal surface measured by visual guidance. Our results, described below, are in agreement with two atlases which provide limited information about the hippocampus (Atlas & Ingram, 1937; Olszewski, 1952) but disagree with two atlases which provide the most extensive hippocampal information (Russell, 1961; Snider & Lee, 1961).

Method

Subjects

The subjects used for these determinations were three rhesus monkeys (*Macaca mulatta*), weighing 5.2, 4.7, and 3.1 kg, and one stumptailed monkey (*Macaca arctoides*), weighing 3.6 kg. Additional animals have been implanted according to the coordinates derived from these procedures and they have proven to be accurate. All monkeys were obtained from the same supplier.

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Procedure

The animals were administered an overdose of sodium pentobarbital and then positioned in a KOPF stereotaxic instrument. The cranium was removed and then the neocortex was cut away in layers until the hippo-campus was located. The remaining tissue above and lateral to the hippocampus was removed by aspiration and care was taken to avoid damaging the structures which support the hippocampus so that it would not change position. No fixatives or other reagents were used.

After the hippocampus was exposed (Figure 1), the following three
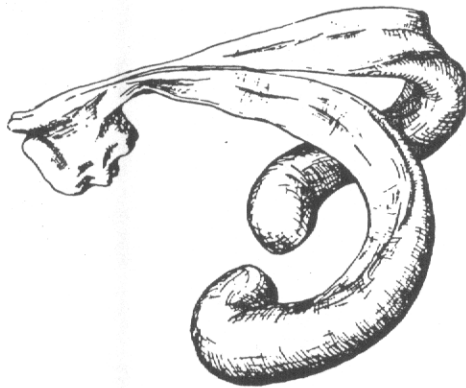
Figure 1. An illustration of the dissected monkey hippocampus, fornix, and septum.

measurements were taken at 1 mm increments along the anterior-posterior extent of the hippocampus by observing the position of a 22-gauge rod which was mounted upon a stereotaxic carrier: (1) The distance from stereotaxic midline of the medial edge of the hippocampus excluding the fimbria; (2) the distance from stereotaxic midline of the lateral edge; and (3) the height of the rostral edge of the hippo-campus at the hippocampal midline measured from the inter-aural line. The first two measurements were obtained by visually lining up the edge

of the pointer with the edge of the hippocampus. The third measurement
was taken after the pointer had been lowered sufficiently to create
a slight depression in the hippocampal surface. The height coordinates
were corrected so that zero was 10.0 mm above the inter-aural line.

Results and Discussion

The results are presented in Table 1. The coordinates have been
verified by observation of histological sections from the brains of
approximately 20 additional monkeys. Subsequent experience has indicated

Table 1

The Stereotaxic Coordinates for Hippocampus
in Rhesus and Stumptailed Monkeys

Mm anterior to inter- aural line	Mm from midline to the medial edge	Mm from midline to the lateral edge	Mm from inter- aural line to rostral edge
0	12.5-15.3	16.1-16.3	+0.3 - +3.0
1	12.4-14.2	16.3-16.4	-1.3 - +2.3
2	13.0-14.0	16.3-16.8	-1.1 - +1.6
3	13.2-14.1	16.3-17.1	-2.1 - +0.5
4	13.1-14.1	16.5-17.0	-2.2 - -1.2
5	13.5-13.9	16.6-17.3	-2.3 - -1.7
6	13.4-13.6	16.7-17.6	-2.3 - -2.2
7	12.7-13.6	16.7-17.6	-2.8 - -2.4
8	12.8-13.5	17.0-17.7	-3.5 - -2.8
9	11.8-13.5	16.9-17.4	-4.3 - -3.3
10	11.1-12.5	16.5-17.5	-4.5 - -3.7
11	9.0-11.0	16.0-17.1	-5.3 - -3.9
12	7.0-7.2	15.6-16.5	-5.3 - -4.4
13	6.2-6.3	15.1-15.9	-5.0 - -4.0
14	6.3-6.9	14.3-15.3	-5.5 - -4.7
15	6.5-8.2	14.6-15.4	-5.8 - -4.7
16	7.4-9.8	13.8-14.8	-6.4 - -5.0

that for smaller rhesus monkeys of about 2.2 to 3.6 kg, the hippocampal
midline is about 13.0 mm from stereotaxic midline. This is opposed
to a distance of about 14.0 mm in larger rhesus monkeys. The hippocampal
midline in stumptailed monkeys was slightly further lateral than in
rhesus--about 14.0 to 15.0 mm from the stereotaxic midline. The most
variable dimension has been height, with the rostral edge of the hippo-
campus often at the deeper of the coordinates shown by Table 1. It
would be wise to aim the tips of electrodes towards the deeper co-
ordinates to insure reliably accurate placement.

The coordinates of the caudal edge of the hippocampus were not
measured in 1 mm increments, but generally they were found to be about
5 mm below the rostral edge in the anterior third of the hippocampus
and about 4 mm below the surface in the medial third. The posterior
third becomes progressively less deep until it is only about 1.5 to
2.0 mm below the rostral edge at the most posterior extent.

Although there is no stereotaxic atlas for the stumptailed monkey,
Kling and Orbach (1963) stated that the Snider and Lee atlas could be
used for these animals. Although our results agree in that the stump-
tail hippocampus is in the same general location as the rhesus hippo-
campus, our findings do not support the use of the Snider and Lee atlas
for either species.

Our results do agree with the findings of Olszewski (1952) and
Atlas and Ingram (1937), but both of these atlases present only a few
sections which include hippocampus. It is not known whether the other
structures illustrated by Atlas and Ingram and Olszewski might also be
accurate for our monkeys. We do not know why our results do not agree
with those of Snider and Lee and Russell. Whether procedural differences
or subject differences could account for this discrepancy is unknown.
It is possible that those previous atlases used rhesus monkeys which
were younger, yet as heavy as the animals used for the present measure-
ments. Such younger animals could have slightly smaller brains than
older animals, even though their overall body weight is as great.

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ECTOPIC THYROID IN A RHESUS MONKEY (*MACACA MULATTA*)

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Accessory thyroids found in the muscle of the tongue are documented in man (Gudernatsch, 1953). They are considered to be remnants of the thyroglossal duct. Arey (1957, p. 238) states that accessory thyroids may also be derived from detached portions of main primordium that fail to descend properly. Accessory thyroids have also been reported in the tongue of the cat, the hyoid bone of pigs, and the pericardium of dogs (Cohrs, 1967; Jubb & Kennedy, 1963). In a review of the literature and report on the thyroids of the rhesus monkey, Hromoda and Hromoda (1968) did not list any accessory thyroids.

During the examination of tissue taken from an adult female rhesus at the writer's laboratory, thyroid tissue was found beneath the epithelium of the tongue. No gross lesion had been noted and there had apparently been no problem associated with the glandular tissue. However, accessory glands may be involved in neoplastic or goitrous changes that affect the main glands (Cohrs, 1967).

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SQUIRREL MONKEY SUSPECTED SOURCE OF TUBERCULOSIS IN A HUMAN[*]

In January 1969, a 35-year-old Negro animal handler, who worked for a veterinarian in Knoxville, Tennessee, was found to have a positive tuberculin skin test of 13 mm. He had had a negative skin test in September 1968. Chest X-rays in January and again in July 1969 were also negative. The man was started on 300 mg of isoniazid daily for one year. In January 1970 after the patient's year of treatment, he was retested and remained positive. All members of his family were also skin tested and were negative.

The patient's only known exposure to tuberculosis had been to a squirrel monkey, treated as an outpatient for pulmonary disease at the veterinary hospital in late August 1968. The monkey coughed frequently and directly on the patient during some of the procedures in the pet hospital. The monkey died after one week of treatment, and a necropsy demonstrated lesions compatible with miliary tuberculosis. Culture material yielded *Mycobacterium tuberculosis*.

The monkey had been purchased in August 1968 from a pet shop in Maryville, Tennessee. The monkey had been in the pet shop two weeks prior to sale and then in the home of the new owner for two weeks before it showed signs of the respiratory illness.

When necropsy suggested tuberculosis, the veterinarian, the animal handler, the receptionist at the veterinary hospital, the monkey's owner, and the owner of the pet shop were tuberculin tested. All were negative. In a retest in January, 1969, only the animal handler had become positive. (Reported by Mary Duffy, M. D., Director, Knox County Health Department; Luther E. Frederickson, D.V.M., Public Health Veterinarian, Tennessee State Department of Health; R. D. Linnabary, D.V.M., Chapman Highway Animal Clinic, Knoxville; and the Microbacteriology Unit, Diagnostic Services, Animal Health Division, U.S. Department of Agriculture, National Animal Disease Laboratory, Ames, Iowa.)

Editorial Comment.--Tuberculosis is well recognized as a public health hazard encountered in Old World monkey species, but its occurrence is rarely reported in New World species frequently kept as pets (Chrisp, Cohen, Ringler, & Abrams, 1968; Fiennes, 1965; Hessler & Moreland, 1968). This species has been thought to be refractory to tuberculosis and is not routinely tuberculin tested for this reason.

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[*]From *Morbidity and Mortality Weekly Report*, 1970, *19* [21], 207 and 212. The editorial comment is also from the original source. See p. 21 of this *Newsletter* for an abstract of a related article, entitled "Tuberculosis in New World monkeys."

REFERENCES

Chrisp, L. E., Cohen, B. J., Ringler, D. H., & Abrams, G. D. Tuberculosis in a squirrel monkey (*Saimiri sciureus*). *The Journal of the American Veterinary Medical Association*, 1968, *153*, 918-922.

Fiennes, R. N. Incidence of TB in squirrel monkeys and marmosets. *Laboratory Primate Newsletter*, 1965, *4* [1], 10.

Hessler, J. R., & Moreland, A. F. Pulmonary tuberculosis in a squirrel monkey (*Saimiri sciureus*). *The Journal of the American Veterinary Medical Association*, 1968, *153*, 923-927.

*   *   *

REQUEST FOR INFORMATION: CORRECTION OF STEREOTAXIC COORDINATES FOR LARGE *SAIMIRI SCIUREUS*

Data are requested that relate to the correction of stereotaxic coordinates (particularly of structures in and near the hypothalamus) for *Saimiri sciureus* weighing 900 gm and over. The brains of five large *Saimiri sciureus*, stereotaxically marked with reference needles, are now being histologically examined in our laboratory. Anyone interested in this material, which can form the basis of a stereotaxic atlas, or anyone with relevant information is asked to contact Dr. Eleanor R. Adair, John B. Pierce Foundation Laboratory, 290 Congress Ave., New Haven, Connecticut 06519. Telephone: (203) 562-9901.

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REQUEST FOR MONKEYS: MALE GREEN AND FEMALE SQUIRREL MONKEY

We are seeking a young male adult African green monkey and female squirrel monkey for breeding purposes in our laboratory. We could also use unneeded primate cages. We will pay shipping charges.--Dr. Frederick Ben Wishner, Henry Higley Memorial Bio-Structural Laboratory, Columbia Institute of Chiropractic, 261 West 71st Street, New York, N. Y. 10023.

ENDANGERED SPECIES LAW EFFECTIVE JUNE 3, 1970[*]

Regulations implementing the Endangered Species Act (Public Law 91-135) were published in the Federal Register June 2, 1970, and became effective immediately except for a 60-day delay in the requirement which restricts importation of all fish and wildlife to five designated ports of entry.

A significant provision in the law is the limiting of importation of any wildlife to either New York, N. Y.; Miami, Fla.; Chicago, Ill.; San Francisco or Los Angeles, Calif. The port of New Orleans, La. may be added to the list at a later date.

Exceptions have been made for fish and wildlife originating in Canada and Mexico by permitting entry at certain border stations. An exception is also provided for issuance of special permits to bring fish or wildlife in at non-designated ports provided notice is given and that justifiable reasons are given for requesting entry at other than a designated port.

A Form 3-177 (Customs Declaration) must be filed for all primates imported showing common and scientific names, number, country of origin, whether or not on the Endangered Species List, together with an export permit from the country of origin showing that the animals were lawfully taken, transported or sold.

The regulations also contain a list of species and subspecies considered to be threatened with extinction in other countries. The animals on this list of greatest interest to biomedical scientists are the primates and the list contains a greater number of these than was originally anticipated.

As was expected, all members of the Lemuridae, Indriidae, and Daubentoniidae familes of prosimians are considered endangered.

Of the great apes, the gorilla and orangutans are listed as are two species of lesser apes, Kloss' gibbon and the pileated gibbon.

Old World monkeys included on the endangered species list include the lion-tailed macaque, Tana River mangabey, duoc langur, Pagi Island langur, red colobus, and Zanzibar red colobus.

New World monkeys considered endangered are the woolly spider monkey, white-nosed saki, uakaris (all species), Goeldi's marmoset, golden lion tamarins, four subspecies of spider monkeys found in Guatemala

and Costa Rica and the red-backed squirrel monkey of Costa Rica.

The inclusion of the spider and squirrel monkeys will result in some confusion unless clarifying instructions are issued to insure that only those subspecies found in Guatemala and Costa Rica are considered as being threatened with extinction. Since neither Guatemala nor Costa Rica are important sources of research primates, their inclusion on the Department of the Interior's list is not serious except from the stand-point of confusing inspectors, importers, and exporters.

Primates included on endangered species list (Federal Register, June 2, 1970):

Common name	Scientific name	Where found
Lemurs, all species	*Lemuridae*, all members of the genera *Lemur*, *Hapalemur*, *Lepilemur*, *Cheirogaleus*, *Microcebus*, *Phaner*	Madagascar and Comoro Islands
Indri, Sifakas, Avahi, all species	*Indriidae*, all members of the genera *Indri*, *Avahi*, *Propithecus*	Madagascar and Comoro Islands
Aye-Aye	*Daubentonia madagascariensis*	Madagascar
Spider monkey	*Ateles geoffroyi frontatus*	Guatemala
Spider monkey	*Ateles geoffroyi geoffroyi*	Guatemala
Spider monkey	*Ateles geoffroyi ornatus*	Costa Rica
Spider monkey	*Ateles geoffroyi panamensis*	Costa Rica
Red-backed squirrel monkey	*Saimiri oerstedii* (*Saimiri sciureus oerstedii*)	Costa Rica
Woolly spider monkey	*Brachyteles arachnoides*	Brazil
White-nosed saki	*Chiropotes albinasus*	Brazil
Uakiris, all species	*Cacajao*	Peru, Colombia, Venezuala, Brazil, and Ecuador

Goeldi's marmoset	*Callimico goeldii*	Brazil
Golden-rumped, golden-headed tamarin, golden lion marmoset	*Leontideus* spp.	Brazil
Lion-tailed macaque	*Macaca silenus*	India
Tana River mangabey	*Cerocebus g. galeritus*	Kenya
Duoc langur	*Pygathrix nemaeus*	Indochina
Pagi Island langur	*Simias concolor*	Indochina
Red colobus	*Colobus kirkii*	Kenya
Zanzibar red colobus	*Colobus badii rufomitratus*	Zanzibar (Tanzania)
Kloss' gibbon	*Hylobates klosii*	Indonesia
Pileated gibbon	*Hylobates pileatus*	Malaysia
Orangutan	*Pongo pygmaeus*	Indonesia, Malaysia, Brunii
Gorilla	*Gorilla gorilla*	Central and western Africa

*   *   *

REQUEST FOR ANTIBODY TO THE COMPLEMENT OF MONKEYS WITH SEVERE MITE INFESTATION

Our studies with monkeys that are severely infested with lung mites indicate that the components of the complement are altered. We are interested in knowing which component is affected, and therefore wish to obtain antibody to the complement. Anyone having information as to whether this antibody material is commercially, or otherwise, available, or who knows if there is any method for the separation of these components from monkey serum is asked to contact Dr. Bhavani Belavady, National Institute of Nutrition, Indian Council of Medical Research, Jamai Osmania, Hyderabad-7 A.P., India.

RECENT PRIMATE LITERATURE IN FIELD OF MAMMALOGY

The Bibliography Committee of the American Society of Mammalogists has been preparing on a regular basis a list of the recent literature pertaining to the field of mammalogy. Starting in 1970, this list has been published, under the heading "Recent Literature of Mammalogy," as a supplement to each quarterly issue of the *Journal of Mammalogy*. Each citation in the list is numbered, indexed, and incorporated in a retrieval system. The numbers below are those in the list of August, 1970, that pertain to the order Primates. A similar list could be published regularly in the *Laboratory Primate Newsletter* should it prove useful. Inquiries and comments on this system or the value of this list of numbers should be addressed to Sydney Anderson, Department of Mammalogy, The American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024.

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Search:  Primates
Tactics:  GR.4
Numbers Searched:  8706-9999, 10000-10139 (August list)
Date:  22 June 1970
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8716, 8717, 8730, 8760, 8761, 8766, 8780, 8781, 8794, 8802, 8808, 8809, 8816, 8824-27, 8830, 8831, 8834-36, 8838, 8846, 8856, 8857, 8861, 8868, 8871, 8874, 8879, 8884, 8885, 8898, 8902, 8903, 8926, 8934, 8947, 8969, 8975, 8979, 8981, 9002, 9004, 9014, 9020, 9030, 9048-50, 9053, 9056, 9069, 9074, 9078-81, 9087, 9092, 9094, 9099, 9108, 9115, 9127, 9131, 9149, 9152, 9164, 9166, 9167, 9170, 9181, 9186, 9196, 9197, 9199, 9208, 9218, 9221, 9237, 9239, 9243-45, 9248, 9250, 9251, 9257, 9260, 9271, 9273, 9278, 9283, 9285-87, 9289, 9295, 9298, 9299, 9303, 9318, 9320, 9328, 9330, 9331, 9340, 9356, 9359, 9363, 9365, 9368, 9369, 9373, 9376, 9379, 9387, 9390, 9400, 9401, 9407, 9408, 9414, 9416, 9429, 9440, 9460, 9463, 9469, 9476, 9478, 9479, 9500, 9515, 9518, 9520, 9521, 9527, 9531, 9554, 9557, 9567, 9573, 9576, 9583, 9594, 9610, 9611, 9618, 9623, 9641, 9643, 9644, 9648, 9654-58, 9664, 9666, 9669, 9694, 9695, 9720, 9721, 9743, 9748, 9749, 9773, 9777, 9787, 9793, 9803, 9807, 9808, 9811, 9818, 9844, 9849, 9865, 9869, 9881, 9885, 9904, 9914, 9915, 9917, 9925, 9931, 9933, 9954, 9958-60, 9967-69, 9971, 9980, 9992, 10010, 10013, 10015, 10016, 10017, 10040, 10043, 10044, 10047, 10048, 10063, 10066, 10077, 10083, 10084, 10091, 10101, 10102, 10122, 10128, 10137.

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

BOOKS

Stereotaxic atlas of the brain of Macaca fuscata. Kusama, T., &
Mabuchi, M. Baltimore, Maryland: University Park Press,
1970.

This is a large-format (12-1/2 in. by 17 in.) atlas
containing 60 photomicrographic studies of the frontal
brain sections in stereotaxic coordinates, plus 20 text
pages describing methods and materials, and details of
measurements, nuclear classifications, and configurations.
(Price: $24.50)

BIBLIOGRAPHIES

Bibliography of the studies on non-human primates in Japan 1968.
Ecology and sociology. *Primates*, 1969, *10*, 303.

Bibliography of the studies on non-human primates in Japan 1968.
Psychology. *Primates*, 1969, *10*, 303-304.

Bibliography of the studies on non-human primates in Japan 1968.
Morphology. *Primates*, 1969, *10*, 304-305.

Bibliography of the studies on non-human primates in Japan 1968.
Laboratory primate medicine. *Primates*, 1969, *10*, 305-307.

DISEASE

Isolation, identification, and experimental transmission of
Herpesvirus T from an owl monkey (*Aotus trivirgatus*).
Burkholder, C. R., & Soave, O. A. (Anim. Care Facility
& Dept. Microbiol., Stanford Med. Sch., Stanford, Calif.
94305) *Laboratory Animal Care*, 1970, *20* [2], Part I,
186-191.

A disease syndrome characterized clinically by
facial edema and periorbital swelling was observed in 3
owl monkeys. One animal also had a parotitis. Two of the
3 sick animals died, and *Herpesvirus T* was isolated from

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[*]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 present
section is devoted primarily to presentation of abstracts of articles
of practical or of general interest. In most cases, abstracts are those
of the authors.

the parotid gland tissue of 1 monkey. The virus was
identified using a serum neutralization test wherein
controls failed to neutralize the virus at all dilutions.
Experimental inoculation of the agent into 9 owl monkeys
produced clinical signs, consistent with the natural
disease in 2 animals, both dying from the infection.
Microscopic pathology resembled that described for *Herpes-
virus T* infection in owl monkeys, as did the intranuclear
inclusion bodies seen in several tissues.

Agglutinating antibodies for *Bordetella bronchiseptica* in sera
before, during, and after an epizootic of pneumonia in
caged monkeys. Graves, I. L. (Dept. Epidemiol. & Virus
Lab., Sch. Pub. Hlth, U. Michigan, Ann Arbor, Mich. 48104)
Laboratory Animal Care, 1970, *20* [2], Part I, 246-250.
During an epizootic of pneumonia, *Bordetella bronchi-
septica* was isolated from an African green monkey with
histopathology characteristic of bronchopneumonia. A
sensitive antigen, prepared from the organism, detected
agglutinating antibodies in the sera from 50% of a group
of healthy monkeys tested prior to and 6 months after
the date of isolation. Nineteen months after the epizootic,
46.2% of the monkeys in residence, representing 4 different
species, had agglutinating antibodies for *B. bronchiseptica*.
The organism was not isolated from nasal or pharyngeal
mucous membranes, nor was additional respiratory disease
detected in the colony.

Tuberculosis in New World primates. Moreland, A. F. (Div.
Comp. Med., Coll. Med., J. Hillis Miller Hlth Cen., U.
Florida, Gainesville, Fla. 32601) *Laboratory Animal Care*,
1970, *20* [2], Part I, 262-264.
An extensive literature survey has revealed a con-
siderable number of cited cases of tuberculosis in New
World monkeys, including 12 cases in squirrel monkeys.
Due to a prevalent opinion among veterinary laboratory
animal clinicians that New World primates are relatively
resistant to tuberculosis, this report assumes great
importance. Evidence is presented that tuberculosis in
New World monkeys can lead to death of the animals, may
include calcified lesions, and may produce an unusual
hypersensitivity response to tuberculin. It was concluded
that tuberculosis is unusual in wild New World monkeys but
may be contracted in captivity by exposure to tuberculous
Old World monkeys or humans.

The incidence of poliovirus in chimpanzees (*Pan troglodytes*).
Douglas, J. D., Soike, K. F., & Raynor, Judith. (6571st
Aeromed. Res. Lab., Holloman Air Force Base, New Mexico
88330) *Laboratory Animal Care*, 1970, *20* [2], Part I, 265-
268.

Poliovirus Type 3 was recovered from stool specimens of 3 chimpanzees recently imported into the United States from western Africa. As a consequence, a screening program was initiated to determine exposure rates in imported chimpanzees. Serum specimens collected from 117 chimpanzees over a 2-year period were tested for serum neutralizing antibodies against poliovirus Types 1, 2, and 3. Ten chimpanzees had antibodies against poliovirus Type 1, 18 had antibodies against poliovirus Type 2, and 28 had antibodies against poliovirus Type 3. Multiple type poliovirus antibodies were found in sera from 9 of these chimpanzees.

Natural infection of *Echinococcus granulosus* (Batsch, 1786) Rudolphi, 1805 in the Kenya baboon (*Papio* sp.). Myers, Betty June, Kuntz, R. E., Vice, T. E., & Kim, C. S. (Div. Microbiol. & Infect. Dis., Southwest Found. Res. & Educ., San Antonio, Texas 78228) *Laboratory Animal Care*, 1970, *20* [2], Part I, 283-286.

Echinococcosis was reported in 2 Kenya baboons. One host, in addition to typical hydatid cysts, possessed a large atypical "cabbage-like" cyst of *Echinococcus granulosus* in the liver. Although a large number of baboons have been sampled in the laboratory as well as the field, these cases represent the first evidence of natural infection.

The remaining papers in this section were presented at a workshop, entitled "Nonhuman primate parasites," held at the Southwest Foundation for Research and Education, San Antonio, Texas, May 26-27, 1969. The workshop was organized by R. E. Kuntz, T. C. Orihel, and Betty J. Myers. All the papers appeared in *Laboratory Animal Care*, 1970, *20* [2], Part II, 319-409.

Current use of nonhuman primates in biomedical research. Goodwin, W. J. (Animal Resources Br., Div. Research Resources, NIH, Bethesda, Md. 20014), pp. 329-332.

The establishment of the 7 Regional Primate Research Centers provided a major impetus for the increased use of nonhuman primates in biomedical research. The research programs currently underway in each Center were summarized. In 1966, a total of 666 research projects using nonhuman primates were listed by the Science Information Exchange of the Smithsonian Institution. An analysis made in 1968 revealed that the number of projects had increased to 951, an increase of 31% in 2 years. The source of funding, areas of research, species used, and dollar value of these projects was presented. The demand for nonhuman primates for use in biomedical research is expanding rapidly; therefore, it is essential that an adequate supply of the appropriate species, the proper facilities, and properly trained personnel be made available.

Trends in microbiological investigations on the nonhuman primate
(possible association with parasitological programs).
Kalter, S. S. (Div. Microbiol. & Infectious Dis., Southwest
Found. Res. & Educ., San Antonio, Texas 78228), pp. 333-336.

Use of nonhuman primates in the laboratory as experi-
mental animals or as models for understanding human disease
has prompted studies on what may be considered as the
"normal" microbiology and parasitology of the various species
of simians employed. In addition, sufficient evidence has
now been collected demonstrating the importance of infectious
agents (primarily viruses) in the transmission of disease
from animal-to-man as well as from man-to-animal and the
influence of these infections on the outcome of the experi-
ment. Of primary importance to parasitologists is the fact
that their involvement with various animal products makes
them one of the more important groups that should be cog-
nizant of the potential problems and dangers. Various prob-
lems and dangers are described and recommendations are sug-
gested for minimizing their effects.

Procedure in laboratory examination of primates with special
reference to necropsy technics. Wong, M. M. (Nat. Cen.
Primate Biology, U. California, Davis, Calif. 95616),
pp. 337-341.

In general, the degree of success in searching for
parasites in a host depends on the efficiency of the method
used in the search. Although the most commonly used
technics (such as blood and fecal examination) for sur-
veying of parasites give indication of possible parasitisms
by certain endoparasites, some tissue-dwelling, immature
stages or single sex infections would not be discovered if
procedures which expose the parasite itself were not carried
out. Based on some basic principles of parasitological
examinations as well as consultations with the more experi-
enced investigators in this field, a model procedure for
necropsy examination for parasites was developed. Major
problems encountered in such a procedure include the length
of time required for each examination and the necessity for
a complete carcass. Cooperation between a pathologist and
a parasitologist is a distinct advantage.

Technics for recognition of parasites. Myers, Betty J. (Div.
Microbiol. & Infectious Dis., Southwest Found. Res. & Educ.,
San Antonio, Texas 78228), pp. 342-344.

With the growing use of nonhuman primates for biomedical
research, there has been an increased demand for a standardized
research animal. This had led to the establishment of routine
screening and baseline programs to detect parasites which may
interfere with the designed research or the health of the
animal, or become a threat to man. These demands have made

it necessary to re-evaluate the various technics used for routine parasite screening as opposed to those of a research parasitologist. The programs, as well as the technics involved, were discussed.

The pathology of pentastomid infection in primates. Cosgrove, G. E., Nelson, B. M., & Self, J. T. (Biol. Div., Oak Ridge Nat. Lab., Oak Ridge, Tennessee 37830), pp. 354-360.

Primates serve as intermediate hosts in the life cycle of pentastomids. Cysts with nymphs of the pentastomid parasite *Porocephalus clavatus* were frequently noted at necropsy (20%) in marmosets of the genus *Saguinus* from South America. The viable encysted nymphs elicited practically no pathologic response other than pressure effects in the host tissues. However, death of the nymphs was followed by intense chronic inflammatory response with ultimate nodular scar formation. Our material did not show the larval invasive stage (visceral larval migrans) that was expected in the early days after infection. Comparison of the occurrence and pathologic response was made with previous reports of pentastomid species in other primates.

Simian and anthropoid malarias--their role in human disease. Warren, McW. (Central American Malaria Research Station, USAID, APO New York, N. Y. 09889), pp. 368-376.

A better understanding of the relationships between human and simian malaria can be acquired by investigating the evolutionary trends of both the hosts and the parasites. It was postulated that the origin of primate malarias was in Southeast Asia and that their distribution to Africa came with the migration of an infected hominid ancestor to Africa possibly one million years ago. In this way malaria parasites were introduced into the apes and monkeys of West Africa with the development of *P. schwetzi*, *P. gonderi*, and *P. ovale* from primitive *P. vivax* stock. It was proposed that *P. falciparum* and *P. reichenowi* are of African origin. Further human migrations brought the parasites to the New World in the 16th century, giving rise to *P. brasilianum* from *P. malariae* and *P. simium* from *P. vivax*. The general evolutionary trend has been for man to become separated from other primates ecologically and therefore lessen the potential for an interchange of malaria parasites. A common vector for human and simian malaria in these areas is significant. Vectors of nonhuman primate malaria have not been identified from Africa and South America. Generally, it is believed that man's activities are lessening his chances of acquiring simian malaria infections. However, it is expected that an occasional case will be detected in jungle areas of Africa, Asia, and South America when malaria eradication programs

have progressed to a point where individual cases can be recognized. Evolution is a dynamic concept and still in progress, and the possibility of "new" species of *Plasmodium* in monkeys and apes currently evolving should not be ruled out.

Protozoan parasites of nonhuman primates as zoonotic agents. Levine, N. D. (Coll. Vet. Med., Agricultural Experiment Station, & Dept. Zoology, U. Illinois, Urbana, Ill. 61801), pp. 377-382.

Protozoan parasites (aside from those associated with malaria) common to man and nonhuman parasites were discussed. *Trypanosoma cruzi* causes Chagas' disease in man and occurs in a number of lower primates in South America, but the latter are not an important reservoir for man. The role of wild primates in leishmanial infections remains to be determined. *Toxoplasma gondii* occurs both in man and lower primates, but its mode of transmission and its prevalence in the latter are unknown. *Trichomonas tenax* occurs in the mouth of man and various lower primates, and *Pentatrichomonas hominis*, *Retortamonas intestinalis*, *Chilomastix mesnili*, and *Enteromonas hominis* in the large intestine; none is pathogenic. *Giardia lamblia* has been found in the small intestine of both and may cause diarrhea. *Entamoeba histolytica* is a pathogenic intestinal parasite of man and lower primates, but *E. hartmanni*, which looks like it but is smaller, is not. *E. moshkovskii* also looks like it but occurs in sewage. Nonpathogenic amoebae occurring in man and other primates include *E. chattoni*, *E. gingivalis*, *Endolimax nana*, and *Iodamoeba buetschlii*. All but *E. gingivalis* occur in the intestine; it occurs in the mouth. *Balantidium coli* is a large ciliate which may cause diarrhea both in man and other primates.

Natural infection in primates: helminths and problems in primate phylogeny, ecology, and behavior. Dunn, F. L. (Dept. International Hlth & The George Williams Hooper Foundation, U. California, San Francisco Med. Cen., San Francisco, Calif. 94122), pp. 383-388.

Present knowledge of natural parasitic infection in nonhuman primates is far from satisfactory. Measures were recommended that could generate more primary data. Such data are needed in several fields of applied and basic research. Natural infection records for some Malayan primates were presented to exemplify the potential interest and value of such information. Examples of the application of natural infection data to problems in primate phylogeny and behavior were presented; most of these were drawn from the literature on parasitic helminths of New World primates.

Comparative relationships of some parasites of man and Old and
New World subhuman primates. Chitwood, Maybelle (Beltsville
Parasitological Lab., Animal Disease & Parasite Research
Div., Agricultural Res. Serv., U. S. Dept. Agriculture,
Beltsville, Md. 20705), pp. 389-394.

The transmissibility and relationship of some parasites
of man and of Old and New World nonhuman primates were
discussed. From the available information, it was concluded
that New World primates are of limited value in medical and
veterinary research because their natural parasites are
closely related to those of dogs, rodents, and insecti-
vores. Certain Old World primates, however, especially
members of the Pongidae and Cercopithecidae, appear to
offer meaningful information because of closer relationships
of their parasites to those of man. The value of experi-
mental results depends on existing parasitism of the host
animal.

The helminth parasites of nonhuman primates and man. Orihel, T. C.
(Tulane U., Delta Reg. Primate Res. Cen., Covington, La.
70433), pp. 395-401.

Nearly 250 species of helminths have been reported
from nonhuman primates to date. More than 30 of these are
peculiar to monkeys and apes and have not been reported from
other hosts. Among the remaining parasites, there is a
large goup of species which infect man as well. Some of
these, such as *Oesophagostomum*, are primarily parasites of
apes and monkeys but are potentially zoonotic, i.e., they
also occasionally infect man. Others, such as *Ascaris
lumbricoides*, *Necator americanus*, *Ancylostoma duodenale*,
Schistosoma spp., etc. are common parasites of man which,
under circumstances yet to be elucidated, apparently can
infect nonhuman primates as well. The similarity of the
eggs of related groups of strongyli creates serious diag-
nostic problems in man and primate. The susceptibility of
certain nonhuman primates to strains of human parasites and
the suitability of these host-parasite systems as laboratory
models for study were discussed in the light of recent ob-
servations in the laboratory.

Respiratory mite parasites in nonhuman primates. Hull, W. B.
(U.S. Nav. Med. Res. Inst., Nat. Nav. Med. Cen., Bethesda,
Md. 20014), pp. 402-406.

The classification and biology of mites parasitic in
the respiratory system of primates were briefly outlined.
Species of the genera *Pneumonyssus*, *Rhinophaga*, and *Pneumonys-
soides* were listed in tabular form with their known hosts
and microhabitats. The methods for diagnosis and recovery
of lung mites, including living mites from anesthetized mon-
keys, and preparation for study were given. The incidence

of lung mites in primates, with special reference to the relative severity of infestations in Old World hosts commonly employed as laboratory animals in medical research, was discussed.

Pertinent literature sources and the desirability for establishment of a center for nonhuman primate parasites. Myers, Betty J. (Div. Microbiol. & Infectious Dis., Southwest Found. Res. & Educ., San Antonio, Texas 78228), pp. 407-409.
　　　　Systematic literature on nonhuman primate parasites is scattered through many journals, records often being incorporated as incidental findings with other research. Preparation of host-parasite checklists and use of current literature citations have served as guidelines for present and future studies. With the growing use of nonhuman primates in biomedical research, more parasitological material is available for study, with few systematists to study it. There is a need for a repository and reference center for proper study and maintenance of these materials. This center would receive, categorize, catalogue, and make available to research parasitologists a reference type collection of parasites for study.

PHYSIOLOGY AND BEHAVIOR

The hepatic function test in the Japanese monkey using bromsulphalein. Nigi, H., & Noguchi, Y. (Dept. Lab. Primate Med., Japan Monkey Centre, Inuyama Aichi, Japan) *Primates*, 1969, *10*, 295-301.
　　　　Although reports of many clinical hepatic tests have been published, modifications of methods will be needed in applying them to the monkey because of differences in metabolism, technical difficulties in obtaining blood serum, and the limited volume of fluids which can be administered. The BSP test, one of the most sensitive methods used in clinical medicine, was examined in order to determine its applicability to the Japanese monkey. It was determined that BSP plasma concentration in the normal healthy Japanese monkey is less than 1.5 mg per 100 ml 30 minutes after dye injection at the rate of 10 mg per kg body weight. Over-retention of BSP was detected in the monkeys affected with experimentally induced liver damage.

Data on selected clinical blood chemistry tests of adult female rhesus monkeys (*Macaca mulatta*). Rao, G. N., & Shipley, E. G. (Endocrine Labs. of Madison, Inc., Madison, Wisc. 53701) *Laboratory Animal Care*, 1970, *20* [2], Part I, 226-231.
　　　　Means and standard deviations for selected clinical blood chemistry tests were calculated from the data derived from 50 to 141 sexually mature female rhesus monkeys. The

following values were obtained: serum glutamic oxaloacetic
transaminase, 26.6 ± 9.9 Sigma-Frankel units/ml; serum
glutamic pyruvic transaminase 18.5 ± 12 Sigma-Frankel units/
ml; serum alkaline phosphatase, 7.5 ± 3.3 Sigma units/ml;
blood urea nitrogen, 23 ± 4.1 mg/100 ml; fasting blood
glucose, 61.8 ± 10.6 mg/100 ml; serum total cholesterol,
219 ± 52.4 mg/100 ml; serum triglycerides, 66.6 ± 51.3 mg/
100 ml; and plasma cortisol, 30.8 ± 8.1 µg/100 ml. Marked
differences in alkaline phosphatase values were observed
between different age groups, being high in young and small
monkeys and low in old and large monkeys. A highly sig-
nificant positive correlation coefficient of 0.71 was ob-
served between age and body weight. Highly significant
negative correlation coefficients of 0.57 between age and
alkaline phosphatase and 0.56 between body weights and
alkaline phosphatase were obtained.

Normal values for blood constituents of the baboon (*Papio* species).
De la Pena, A., Matthijssen, C., & Goldzieher, J. W.
(Div. Clinical Sci., Southwest Found. Res. & Educ., P. O.
Box 28147, San Antonio, Texas 78228) *Laboratory Animal
Care*, 1970, *20* [2], Part I, 251-261.

The levels of various constituents in the plasma or
blood of baboons have been studied cross-sectionally and
also longitudinally over a period of 2 years in order to
establish normal ranges for this species. Locally-bred
animals as well as animals that were fresh from their natural
habitat or that had undergone some months of acclimatization
were sampled. Group and sex-related differences were observed
in a number of parameters. In the longitudinally-studied
animals, between-animal variation and within-animal variation
were indistinguishable. Definite trends were observed in
the mean value of some parameters. The constituents analyzed
in this study included glucose, urea nitrogen, uric acid,
total lipids, total cholesterol, bilirubin, transaminases,
lactic dehydrogenase, acid and alkaline phosphatase, calcium,
inorganic phosphate, chloride, potassium, sodium, osmolality,
pH, total protein, albumin, albumin-globulin ratio, amino
nitrogen, fibrinogen, individual amino acids, and protein-
bound iodine. The normal values for uric acid, cholesterol
and certain of the enzyme activities were quite different
from those found in man.

Serum and cerebral spinal fluid chemistry values for the monkey
(*Macaca mulatta*). Turbyfill, C. L., Cramer, M. B., Dewes,
W. A., & Huguley, J. R., III. (Armed Forces Radiobiol.
Res. Inst., Defense Atomic Support Agency, Bethesda, Md.
20014) *Laboratory Animal Care*, 1970, *20* [2], Part I, 269-273.

Normal values for 24 serum and 8 cerebral spinal fluid
chemical components were determined for the monkey (*Macaca*

mulatta). Analyses were performed on serum from 10 males
and 10 females, and sex-related differences in the levels
of some of the constituents were evaluated. The serum
levels of urea nitrogen, creatinine, allantoin, total pro-
tein, glutamic-pyruvic transaminase, lactic dehydrogenase,
creatine phosphokinase, and amylase were significantly dif-
ferent for the sexes ($p < .05$). Chemical analyses were
performed on cerebral spinal fluid from 18 males and 12
females. Significant sex-related differences in concentra-
tion were found for calcium, chloride, and total protein in
cerebral spinal fluid.

DRUGS

Electrocardiographic studies in the Japanese monkey (*Macaca
fuscata*) with special reference to the effect of anesthesia
with barbituates. Noguchi, Y., Tawara, I., Kondo, K.,
Nigi, H., & Tanaka, T. (Dept. Pharmacology, Faculty of
Medicine, U. Tokyo, Tokyo, Japan) *Primates*, 1969, *10*, 273-283.
    The electrocardiograms of 157 healthy Japanese monkeys
(*Macaca fuscata*) covering a wide range of ages in both sexes,
were recorded under light pentobarbital (Nembutal) anesthesia.
Although results were generally similar to those reported
for other macaque species, some quantitative differences
were observed. The heart rate was about 160 per minute in
all monkeys examined; the P-Q interval was 0.11 ± 0.06
sec; the duration of QRS was 0.04 ± 0.01 sec; the Q-T in-
terval was 0.24 ± 0.06 sec. The mean axis of QRS was +59°
and the pattern of the QRS complex was qR type in most
cases. The comparison with the human electrocardiogram
shows that the heart rate of *M. fuscata* is about twice that
of man, while the P-Q, QRS, and Q-T intervals were about
one-half of those found in human subjects. In the monkey,
however, the P wave was sharp and the T wave flat. In order
to estimate the effect of anesthesia on the electrocardiogram,
the records of several monkeys before, during, and after
intravenous administration of barbiturates were compared.
Although some animals showed extrasystoles after barbiturate
was administered, generally no essential changes were noted
in the records, except for the retardation of the rate and
proportional prolongation of intervals.

FACILITIES AND CARE

A temporary drinking water system for chimpanzees. Krushak, D. H.,
& Taylor, A. J. (Animal Experimentation Unit, Phoenix
Labs., Ecological Investigations Program, Nat. Communicable
Dis. Cen., Phoenix, Arizona 85014) *Laboratory Animal Digest*,
1970, *6* [1], 10-11.
    A system has been devised to provide drinking water

for individually caged chimpanzees temporarily housed in a multipurpose room. A heavy duty licking nozzle attached to standard plumbing parts furnishes a sanitary water supply that requires little maintenance.

BREEDING

Vaginal cytology and reproduction in the squirrel monkey (*Saimiri sciureus*). Hutchinson, T. C. (Dept. Anthropology, U. Missouri, Columbia, Mo. 65201) *Folia Primatologica*, 1970, *12*, 212-223.

      Birth weight data from a reproductive colony of squirrel monkeys show that the minimum viable birth weight is around 84 g. Reproductive success occured in this colony after the animals were moved from individual cages to a gang cage situation. Mean cycle lengths from two colonies of squirrel monkeys showed only slight differences, one averaging 13.4 and the other 11.3 days. However, when half of the latter group were placed in comparatively small cages their mean cycle length dropped to 8.2 days. It is the opinion of this investigator that the various cycle lengths reported by other investigators are probably correct for their particular environments. The length of the estrous cycle in the squirrel monkey is apparently responsive to environmental stimuli.

Photic influences on primate (*Macaca mulatta*) reproduction. Birkner, F. E. (Inst. Rehabilitation Med., NYU Med. Cen., New York, N. Y. 10016) *Laboratory Animal Care*, 1970, *20* [2], Part I, 181-185.

      This study aimed to determine photic influences on the incidence of conception on a stable colony of caged monkeys in New York City. Conventional methods were employed to ascertain the onset of menses. Depending on the regular menstrual cycle of individuals, the females were mated on days 9-13, counted from the first indication of menstrual flow. Conceptions were confirmed through rectal palpation of the uterus. Records were maintained over a period of 3 years of the daily length of exposure to daylight, as well as of the foot-candle intensity (at cage level) of supplemental artificial illumination. The number of conceptions recorded during corresponding calendar months was correlated with the then prevailing photic conditions. The month of July, when optimum lighting conditions prevailed, showed 13 conceptions, as compared with 14 conceptions during December which ranks lowest in number of daylight hours. The indications are that M. *mulatta* breeds throughout the year and, although seasonal peaks seem to occur, a relationship between conceptions and exposure to light is not discernable.

INSTRUMENTS AND TECHNIQUES

A stomach tube for the administration of gelatin capsules to
   nonhuman primates. Conzelman, G. M., Jr. (Dept. Physiol.
   Sci., Sch., Vet. Med., U. California, Davis, Calif. 95616)
   Laboratory Animal Care, 1970, *20* [2], Part I, 280-282.
       A stomach tube, which in some respects resembles a
   balling gun, was designed for the purpose of giving capsules
   packed with 2-naphthylamine to rhesus monkeys. Capsules
   of sizes 4, 3, and 2 have been administered with this de-
   vice.

Cast immobilization of the legs of rhesus monkeys. Rohner, R. G.,
   Jr., & Eyring, E. J. (Dept. Orthopaedics, The Children's
   Hosp., 17th at Livingston Park, Columbus, Ohio 43205)
   Laboratory Animal Care, 1970, *20* [2], Part I, 287-288.
       A method of cast application was devised and tested
   favorably for immobilizing the knees of monkeys for
   indefinite periods. The casts have been in place for as
   long as 8 weeks without an attempt by the monkeys to remove
   them. Pressure areas were not noted under the casts.

A suit for protecting chronically implanted devices in monkeys.
   Davis, E. E., & Jones, T. L. (Stanford Res. Inst., Menlo
   Park, Calif. 94025) *Behavior Research Methods and In-
   strumentation*, 1970, *2*, 96-97.

The semiautomatic Wisconsin general test apparatus. Davenport,
   J. W., Chamove, A. S., & Harlow, H. F. (Reg. Primate Res.
   Cen., U. Wisconsin, Madison, Wisc. 53706) *Behavior Research
   Methods and Instrumentation*, 1970, *2*, 135-138.
       A semiautomatic version of the Wisconsin General Test
   Apparatus is described along with circuitry. Comparison
   data are provided for the semiautomatic and manual WGTA
   obtained under comparable procedures and conditions.
   Response latencies are given for go/no-go object dis-
   crimination problems and subsequent retention tests.

An automated multiple choice test of short-term spatial memory
   for monkeys. Glick, S. D., Jarvik, M. E., Levin, B., &
   Carley, J. L. (Albert Einstein Coll. Med., New York, N. Y.
   10461) *Journal of the Experimental Analysis of Behavior*,
   1970, *13*, 317-318.

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