LABORATORY PRIMATE NEWSLETTER

Volume 11, Number 1

January, 1972

Edited by

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POLICY STATEMENT

The purpose of the *Laboratory Primate Newsletter* is (1) to provide information on care, breeding, and procurement of nonhuman primates for laboratory research, (2) to disseminate general information about the world of primate research (such as announcements of meetings, research projects, nomenclature changes), (3) to help meet the special research needs of individual investigators by publishing requests for research material or for information related to specific research problems, and (4) to serve the cause of conservation of nonhuman primates by publishing information on that topic. 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. Back issues may be purchased for $1.00 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. 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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ACKNOWLEDGMENT

The *Newsletter* is supported in part by U.S. Public Health Service Grant RR-00419 from the Division of Research Resources, N.I.H.

Managing Editor: Kathryn M. Huntington

CONTENTS

CHIMPANZEE BREEDING AND PREGNANCY DIAGNOSIS IN THE PRIMATE CENTER TNO

C. Goosen, T. M. Speltie[1], and G. A. Boorman[2]

Rijswijk, The Netherlands

The chimpanzee (*Pan troglodytes*) colony of the Primate Center TNO was founded in 1965 with 10 chimpanzees caught in the wild. The first animals were acquired for the study of tissue antigens and the production of antisera to be used for human tissue typing (Balner, 1967). The present colony consists of 62 chimpanzees. Most of the animals are immature, only 5 males and 16 females exceed 30 kilograms in weight.

A limited breeding program was begun in 1970 when a new chimpanzee building became available. This facility includes individual cages, play cages, breeding units and outdoor runs. The animals are housed in individual cages during the night and in groups in play cages or outdoor runs during the day.

In order to follow the menstrual cycles, each female is checked daily for swelling of the sex skin and bloody vaginal discharge. There is marked variation from animal to animal and thus one must be familiar with the characteristics of each individual (Graham, 1970). The degree of sex skin swelling is scored from 1 to 4, and recorded for each animal. In 9 females with regular menstrual cycles the modal length of 25 cycles was 36 days. The menstrual discharge lasted 2 to 4 days in these animals.

During the day, 7 to 8 regularly menstruating females are placed in an outdoor run with one of the 2 males used for breeding. Every 2 to 3 days, the alternate male is introduced to the group of females. Because it is the intention to obtain families of full sibs, a female which has given birth will be mated only with the father of the first infant. (The father can easily be determined by leukocyte typing of the infant; Balner, 1967.) Younger females and males are also housed together during the day in other runs.

An early method of pregnancy diagnosis is required in order to accurately predict the time of parturition and to prevent the pregnant female from being submitted to experimental procedures in which other animals can be utilized equally well. Pregnancy diagnosis by testing for urinary chorionic gonadotropin appears most attractive. It does not involve tranquilization because urine can easily be collected from animals housed individually.

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In March 1971, fresh urine samples were collected from several of the larger females by placing pans beneath each cage in the early morning. A urine sample from one of the chimpanzees (Karin) was positive at a 1: 10 dilution with the Pregnosticon test (Organon, Oss, The Netherlands). This is a commercial human pregnancy test based on the detection of urinary chorionic gonadotropin by inhibition of hemagglutination between antisera against human chorionic gonadotropin (HCG) and red blood cells coated with HCG. In May 1971, the urine from several chimpanzees was again tested, with a similar human pregnancy test (Duphar UCG test, N.V. Philips-Duphar, Amsterdam, The Netherlands). With this test the urine sample from Karin was once again positive. In August, Karin was anesthetized for a routine tuberculin test and pregnancy was confirmed by palpation and X-ray examination.

We then began collecting bimonthly urine samples from the regularly menstruating females and testing these samples with the Pregnosticon test. The urine sample obtained from Karin at the beginning of August was negative and a baby chimpanzee was delivered by cesarean section three weeks later. Cesarean section was performed when no progression of labor was observed 25 hours after rupture of the membranes. The chimp baby is now 8 weeks old and both mother and child appear in excellent health.

Another chimpanzee (Odette) who was negative in March 1971, had a positive reaction in August, with 1: 4 dilution of urine. Two weeks later the urine was positive only at a 1: 1 dilution and subsequent urine samples have all been negative, nevertheless a fetus was revealed by an X-ray photograph.

Recently, our urine sampling was expanded to include females which did not belong to the original breeding group. From this group a chimpanzee (Wanda) was found to be positive at a 1: 60 dilution. Present plans are to continue screening urine from all adult and adolescent females and to quantitate urinary chorionic gonadotropin excretion by the presently used immunoassay as well as by a rat bioassay.

The commercial human pregnancy immunoassay used here (Pregnosticon) appears to be a useful tool for pregnancy detection in the chimpanzee, suggesting antigenic similarity between chimpanzee and human chorionic gonadotropin. The data from 2 animals of our colony (Karin and Odette) suggest that the chimpanzee does not excrete chorionic gonadotropin throughout pregnancy as do humans (Loraine, 1950). This is consistent with other preliminary reports (Tienhoven, 1968; Graham, 1970). However, it must be stressed that a more sensitive assay might reveal a longer duration of urinary chorionic gonadotropin excretion in this species. The positive reaction obtained with two different methods utilizing antisera directed against HCG (Pregnosticon and Duphar UCG test) and urine from a chimpanzee known to be pregnant (Karin), suggest that perhaps other immunoassays for HCG will also prove to be applicable in the management of a breeding colony of chimpanzees. In general, the promising results obtained within a year with our limited breeding program,

which is not unexpected in view of other reports (Guilloud, 1969; Douglas & Butler, 1970; Johnson, Niemann, & Moor-Jankowski, 1971), will hopefully contribute to the survival of an endangered and biomedically invaluable species.

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PIGTAILS AND CHIMPANZEES FOR SALE

Wild-caught Burmese pigtailed macaques (*Macaca nemestrina leonina*): one male, three females imported from Burma in 1968, in residence at San Diego Zoo; approximately 5-1/2 years old; $200 the group. Wild-caught Western chimpanzees (*Pan troglodytes verus*): female, 3-1/2 years old; male, 2 years old; $675 each. Prices FOB San Diego. Crates must be returned prepaid.--Contact: Clyde A. Hill, Associate Curator, San Diego Zoological Garden, P.O. Box 551, San Diego, California 92112 (Telephone: 714-234-5151, ext. 52).

ANIMALS USED IN NUTRITION STUDIES AVAILABLE

In the very near future the animals that have been used in malnutrition studies will be available to investigators who wish to have either tissues or live animals. Interested investigators should send their request to the Director's Office, Wisconsin Regional Primate Research Center, 1223 Capitol Court, Madison, Wisconsin 53706.

All of the animals will be sacrificed unless a specific request for live animals is received by this office. Because the nature of the present situation dictates a policy of filling requests as they come in, we will be unable to guarantee the availability of specific animals after June, 1972. All efforts will be made to supply living subjects prior to this date.

The only cost involved will be for shipping and handling charges, a bill for which will be forwarded to you as soon after shipment as they can be determined. It will be helpful if a statement regarding availability of funds accompanies each request.

The animals available and some of their history are summarized in Tables 1 and 2. The following are some additional facts about the studies: Commercial Similac (Ross Laboratories) was used for the casein control diet. For the soybean control formula, Ross Laboratories substituted soybean protein for the casein protein in Similac, thus keeping all other nutrients of the two formulas equal. Ross Laboratories also produced the 1/2 and 3/4 protein deficient formulas, making them isocaloric with lactose. The 1/2 and 1/4 total nutrient formulas were made by diluting the control formula with water at a 1:1 and 1:3 ratio, respectively.

The experimental formulas were offered at 4-hour intervals from 1 to 7 months of age. The diet, before and after the period of malnutrition, until 1 year of age, was the control diet. Daily vitamin supplements were provided for the entire first year; however, at no time did an animal receive a caloric food other than that described. After 1 year of age the animals received Purina Chow and fruit, offered once each day.

The severity of the malnutrition in regard to physical growth and development may in part be determined by considering the body weight of the animals at significant points of the experiment. The mean body weights (± 1 SD in grams) of 14 control subjects were as follows: at birth, 475 ± 35; Day 30, 619 ± 56; Day 210, 1672 ± 149.

All subjects, with the exception of some of the most severely malnourished animals, have, to date, caught up to the control animals in all physical growth measurements. (If interested, head circumference and body length measurements are also available.)

Table 1

Prenatal Malnutrition Study: Pregnant rhesus females were fed the control formula Similac for the first 30 days of pregnancy. They were then either continued on Similac or were offered Similac deficient in 3/4 of its normal protein content for the remainder of the pregnancy. The offsprings' diet was that of our postnatal control subjects.

Group	Subject & Sex	Date of Birth	Birth Weight in Gm.	Type of Delivery	Gestation Period in Days
Control	Q-3 F	12/7/70	463	Cesarean	166
	Q-26 F	2/15/71	460	Cesarean	166
	Q-78 M	5/5/71	415	Cesarean	163
	Q-83 M	5/10/71	450	Vaginal	160
	Q-92 F	5/16/71	490	Vaginal	160
	R-75 M	8/10/71	555	Cesarean	165
	R-93 F	8/31/71	430	Vaginal	156
	R-99 F	9/7/71	360	Vaginal	154
3/4 Protein Deficient	L-83 M	7/31/69	310	Cesarean	165
	M-18 M	11/19/69	374	Cesarean	166
	M-50 M	2/6/70	435	Cesarean	165
	P-3 F	6/16/70	380	Vaginal	156
	P-45 M	8/10/70	455	Cesarean	164
	Q-94 F	5/17/71	450	Cesarean	165
	R-31 F	6/21/71	422	Cesarean	165
	S-15 M	9/27/71	472	Cesarean	165

Table 2

Rhesus Monkey Postnatal Malnutrition Study (Surviving Subjects and Their Dietary History): All animals were divided into one of two major dietary groups--those receiving a diet containing a high quality protein (casein), and those receiving a diet with a lower quality protein (soybean). Variations of the quality of protein and/or other nutrients in their formula comprise the animal subgroups.

Diet	Subject & Sex	Date of Birth	Birth Weight in Kg.	Weight at 30 Days in Kg.	Weight at 210 Days in Kg.
Control: 18.2% Protein 20 calories per fluid ounce (formula fed ad libitum)	G-6 M	4/10/66	.405	.570	1.75
	G-16 M	4/10/66	.495	.595	1.66
	G-92 M	8/7/66	.505	.730	2.08
	J-23 F	4/1/68	.450	.589	1.69
	J-24 M	4/6/68	.490	.677	1.91
	J-40 F	4/29/68	.465	.547	1.62
	J-46 M	5/9/68	.470	.621	1.81
	J-49 M	5/13/68	.530	.565	1.89
	J-79 F	6/14/68	.495	.665	1.65
	K-29 F	9/12/68	.515	.680	1.81
	K-31 M	9/15/68	.450	.579	1.58
	K-32 M	9/17/68	.480	.578	1.64
1/4 Total Nutrition (formula fed ad libitum)	F-99 M	3/31/66	.490	.653	1.07
	G-7 M	4/11/66	.520	.714	.839
	H-1 M	8/29/66	.450	.614	1.04
	H-55 F	12/19/66	.485	.589	.798
	I-58 F	9/22/67	.500	.568	.825
	I-61 F	9/26/67	.485	.596	.813
	I-65 M	10/1/67	.490	.577	.827
	I-72 F	10/16/67	.430	.558	.924
	J-48 M	5/13/68	.515	.618	1.30
1/2 Total Nutrition (formula fed ad libitum)	F-97 M	3/28/66	.450	.627	1.67
	G-84 M	7/23/66	.530	.716	1.79
	H-2 F	8/29/66	.470	.593	1.53
	H-32 F	10/8/66	.415	.554	1.56
	J-74 F	6/10/68	.475	.704	1.65
	J-80 F	6/15/68	.460	.645	1.66
	J-87 M	6/22/68	.525	.646	1.49
	J-89 M	6/25/68	.505	.661	1.59

Diet	Subject & Sex	Date of Birth	Birth Weight in Kg.	Weight at 30 Days in Kg.	Weight at 210 Days in Kg.
75% Reduction of Protein--containing normal amount of calories (formula fed ad libitum)	G-3 M	4/3/66	.465	.628	.905
	G-79 M	7/18/66	.535	.702	.977
	H-33 M	10/15/66	.465	.624	.934
	H-51 M	12/2/66	.505	.554	.710
	I-46 M	8/30/67	.455	.546	.573
	I-48 F	9/2/67	.480	.642	.542
	J-13 M	3/14/68	.425	.589	.526
	J-19 M	3/27/68	.465	.653	.519
50% Reduction of Protein--containing normal amount of calories (formula fed ad libitum)	G-5 F	4/8/66	.430	.601	1.31
	G-24 M	4/29/66	.520	.742	1.65
	G-90 M	8/4/66	.430	.633	1.60
	H-25 M	9/24/66	.480	.638	1.77
	H-27 M	9/28/66	.490	.649	1.54
	J-86 M	6/21/68	.515	.709	1.26
	K-14 M	7/26/68	.510	.813	1.47
	K-16 M	8/3/68	.480	.655	1.15
	K-22 F	8/19/68	.430	.603	1.11
	K-26 M	9/3/68	.475	.650	.968
1/4 Total Nutrition (formula pair-fed to the mean intake per body weight of 14 control subjects)	K-44 M	1/1/69	.435	.615	.543
	K-65 M	3/3/69	.525	.594	.567
	K-70 M	3/13/69	.455	.588	.483
	K-91 M	4/17/69	.535	.675	.559
	K-95 M	4/20/69	.550	.721	.570
	L-2 F	4/23/69	.425	.482	.467
	M-3 M	9/21/69	.490	.605	.499
	M-21 M	11/25/69	.520	.705	.550
	M-36 M	1/8/70	.415	.606	.488
1/2 Total Nutrition (formula pair-fed to the mean intake per body weight of 14 control subjects)	K-63 M	2/18/69	.550	.665	.924
	K-64 M	3/1/69	.550	.722	.850
	K-68 M	3/11/69	.500	.646	.903
	K-72 M	3/19/69	.480	.629	.763
	K-96 M	4/21/69	.520	.701	.810
	L-28 F	5/12/69	.435	.525	.722
	L-85 F	8/4/69	.525	.669	.671
	M-4 M	9/21/69	.400	.504	.640
	M-37 M	1/11/70	.465	.618	.766
	M-44 F	1/19/70	.490	.585	.648

PRIMATE ZOONOSES SURVEILLANCE REPORTS NUMBERS 5 AND 6

These reports, issued by the Center for Disease Control, Atlanta Georgia, summarize information about naturally occurring disease in nonhuman primates and their handlers. The information is received from selected centers that utilize large numbers of primates and from other organizations. The information is intended primarily for the use of the participating institutions and for others with responsibility for the care of nonhuman primates. Much of the information is preliminary in nature.

Following the format of the previous reports, in Numbers 5 and 6 the introductory section (I) is followed by a section (II) on Surveillance Data which includes a subsection (A) on types of diseases and their frequencies for the period covered and one (B) on disease associated with contact with nonhuman primates. In the latter subsection in Report Number 4, an epizootic of tuberculosis was reported to have occurred in a great ape colony. Report Number 5 indicated that 11 people having direct contact with the animals converted from the negative to positive state and that all the conversions were associated with the tuberculosis epizootic.

Both reports conclude with a section (VI) of appendices organized as follows: (1-4) Reported non-fatal disease tabulated by reporting period, by length of time in colony, by age group, and by species group. (5-8) Reported fatal disease tabulated by reporting period, by length of time in colony, by age group, and by species group. (9) Nonhuman primate population at the participating centers.

The remaining contents of *Report Number 5* are as follows, with short summaries included where we deemed the items of special interest:

III. Case Reports

A. *Pneumocystis carinii* pneumonia in chimpanzees (Reported by H. M. McClure and M. E. Keeling, Yerkes Regional Primate Research Center)

Two lab-born infant chimpanzees (*Pan troglodytes*) died at 34 and 45 weeks of age following 6-8 weeks of clinical illness which was characterized by a chronic progressive pneumonia that was refractory to kanamycin and penicillin therapy. Both animals also had a progressive anemia which necessitated blood transfusions. At time of death both animals were found to have extensive interstitial pneumonia due to *Pneumocystis carinii* infection.

B. Cutaneous streptothricosis (*Dermatophilosis*) in a woolly monkey

IV. Special Reports

A. A classification by primary cause of death of 700 consecutive

primate necropsies (Reported by Herman R. Seibold, V.M.D., Head, Division of Pathology, and Robert H. Wolf, D.V.M., Head, Division of Animal Care, Delta Regional Primate Research Center, Tulane University, Covington, Louisiana)

Seven hundred nonhuman primates were necropsied in the period June 1967-May 1971. Infectious disease was considered to be the primary cause of death in 161 animals (23.0 percent), emaciation or emaciation with complications in 203 animals (29.0 percent), perinatal fatalities and miscellaneous non-infectious disease in 91 animals (13.0 percent), shipment fatalities or accidental death in 70 animals (10.0 percent), and death resulting from experimental manipulations in 174 animals (24.9 percent). Contrary to impressions gained from the literature, infectious disease due to virulent contagiums was less of a problem than that due to omnipresent "lesser" or opportunistic pathogens. Infection with the latter organisms was usually associated with debilitation due to other disease processes.

B. Yellow fever serology in nonhuman primates

V. Addendum to Primate Zoonoses Surveillance Report Number 4

A. Rabies in nonhuman primates

B. A fatal case of human shigellosis associated with a pet spider monkey

The remaining contents of *Report Number 6* are as follows:

III. Case Reports

A. Human shigellosis and salmonellosis acquired from a spider monkey

IV. Special Reports

A. Postmortem observations and classification of 946 nonhuman primate deaths at the Yerkes Primate Center Colony (Reported by Harold M. McClure, D.V.M., Dept. of Veterinary Pathology, Yerkes Primate Research Center, Emory University, Atlanta, Ga. 30333)

946 nonhuman primates were necropsied at the Yerkes Primate Center between July 1, 1966, and September 30, 1971. Pulmonary disease and enteric infections or a combination of both were significant causes of death in both newly imported and conditioned animals. A wasting syndrome characterized by diarrhea, dehydration and/or emaciation resulted in the death of 93 animals (primarily New World species). Approximately 37 percent of the animals necropsied had parasite infestations of some type. Most of

these were incidental findings, although some were considered as the primary cause of death. Other causes of death encountered with some frequency included acute gastric dilatation, herpes virus infections, tuberculosis, and tumors.

B. Review of nonhuman primate-associated hepatitis

Previous reports and the project itself have been described in the October, 1970 and April and July, 1971 issues of this *Newsletter*.

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CONFERENCE ON BREEDING OF ENDANGERED SPECIES

This conference, organized jointly by the Jersey Wildlife Preservation Trust and the Fauna Preservation Society, will be held on May 1-3, 1972 at the Conference Room, Hotel de France, St. Helier, Jersey, Channel Islands. The conference will examine the essential requirements and optimum conditions under which endangered species should be kept in captivity to guarantee their perpetuation. The first of two sessions to be held on the afternoon of May 1 will be devoted to anthropoid apes and will be chaired by Dr. E. Lang, Director, Basle Zoological Gardens. The topics and speakers will be: Orang-utans, Dr. Michael Brambell, Curator of Mammals, Regent's Park, The Zoological Society of London; Pigmy chimpanzee, Dr. Jantschke, Frankfurt Zoological Gardens; Gorillas, Geoffrey Greed, Curator, Bristol, Clifton and West of England Zoological Society. The second session will be devoted to the lesser primates and will be chaired by Professor F. Bourlière, Faculté de Médecine de Paris. The topics and speakers will be: Lemurs, Dr. J. J. Petter, Deputy Director, Muséum National d'Histoire Naturelle, Brunoy, France; Lesser primates (general), Dr. R. D. Martin, Department of Anthropology, University College of London; Marmosets, Jeremy J. C. Mallinson, Deputy Director, Jersey Zoological Park.

All Conference correspondence should be addressed to: The Secretary, Jersey Wildlife Preservation Trust (E.S.I.), Les Augrès Manor, Trinity, Jersey, Channel Islands.

MEETING REPORTS: SELECTED ABSTRACTS OF PAPERS PRESENTED AT THE 1971 ANNUAL MEETING OF AALAS*

Primate stabilization and husbandry. Nahon, N. S., & Balin, H. (Div. Reprod. Biol., Dept. Obstet. & Gynecol., Hahnemann Med. Coll. & Hosp., Philadelphia, Pa.)

The role of the conditioned or stabilized primate in the laboratory today as a diagnostic and study aid, is undisputed. Most institutions that once boasted of their large primate colonies are today faced with the necessity to increase their workload with fewer animals. Careful early observation and good husbandry practices enable us to quickly diagnose and treat most primate disorders effectively, keeping cost at a minimum. With the increasing cost for the procurement of suitable laboratory primates together with the increased cost of husbandry, we are forced to strictly adhere to these practices thus producing the healthiest acute and/or chronic animal in the shortest amount of time. Modern medicine affords us many short cuts with the increasing amount of broad spectrum antibiotics and products available to us today. Most will be tolerated and can be successfully given by following the recommended pediatric dosages and prophylactically save many dollar-hours in quarantine treatment and recuperative time.

Stress effects on body weight of *Galago senegalensis*. Howe, F. E., & Dukelow, W. R. (Endocrine Res. Unit, Cen. Lab. Anim. Resources, Michigan State U., East Lansing, Mich. 48823)

Stress effects were observed when a colony of 14 *Galago senegalensis* were moved from one management regime to another. The stress involved: (1) transfer of the animals, in cages, from one building to another; (2) changing the light schedule from midnight to 10 a.m. (light) to 6 a.m. to 6 p.m. (light); (3) changing 1/2 the colony from a commercial canned diet to a banana-meal diet; and (4) reallocation of some animals to new cage partners. Each animal was weighed daily. Changes of the lighting schedule, whether in one step or by changes of 2 hours each 4 days did not effect the weight of any galago. Similarly, a change of the diet was compensated by a return to initial weight within 5 days. The greatest loss occurred in response to physical movement of the animals. A weight loss averaging 15 gm (male) and 19 gm (female) occurred within 4 days with the highest loss occurring on day 2. Return to original weight required 10 days in 2 of the animals, but required nearly 3 weeks in the rest. Interestingly, exchange of partners coupled with moving resulted in a faster return to normal weight than did

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*The abstracts are, except for minor changes, from the program for the 22nd Annual Session of the American Association for Laboratory Animal Science, October 11-15, 1971, New York, New York.

moving with the same partner. One pregnant female, subjected to a change in diet, lighting regime, location, and partner, subsequently delivered a normal, living young a month after stressing.

Management of a small, reproducing squirrel monkey colony. Hupp, E. W., Minnis, Brenda, & Dyal, D. R. (Biol. Dept., Texas Woman's U., Denton, Texas 76204)

Numerous investigators who have limited animal care facilities and are now using rodents or other small mammals desire to extend their studies to small primates. This report concerns procedures used during the past 5 years to maintain a colony of approximately 30 adult squirrel monkeys and their offspring. The monkeys were caged in 90 × 60 × 75 cm cages containing one male and 3 or 4 females. They were fed three meals each day at approximately 8 a.m., noon, and 4 p.m. The diet consisted of Purina Monkey Chow and Purina Monkey Chow 25, supplemented with vitamins, orange juice, powdered milk, fruit, peanuts and crackers. The main health problem was bite wounds, which were usually successfully treated with topical and parenteral administration of antibiotics, although a few incidences of dystocia, respiratory inflammation and diarrhea were also encountered. Intestinal parasites were not a problem after animals became acclimatized. Only 5 adults have died: 2 due to obstetrical complications, 3 from other causes. A total of 32 live births was obtained; 25 of these survived to weaning at 4 to 6 months of age. An average of 0.54 live births and 0.42 offspring weaned was obtained per female per year.

Stability of ascorbic acid in animal drinking water. D'Ver, A. S., & Manning, J. E. (Lab. Anim. Serv., Hoffmann-La Roche, Inc., Nutley, N. J.)

The efficacy of utilizing the drinking water to supply ascorbic acid to guinea pigs and monkeys, in lieu of fresh greens or fruit, has often been questioned based on the assumption that ascorbic acid was highly unstable. In this study, several water systems were used, including open water dishes, water bottles and automatic drinking devices, to determine the stability of ascorbic acid in drinking water under actual husbandry conditions. Quantitative analysis indicated an immediate reduction of 10% of ascorbic acid levels in all systems. Thereafter significant differences were observed among the systems used. However, even the worst system tested, the open water dish, retained at least 50% of the original ascorbic acid level after 24 hours.

An evaluation of the gibbon as a laboratory animal. Johnsen, D. O., Tanticharoenyos, P., & Tingpalapong, M. (Dept. Vet. Med., U.S. Army Med. Component, SEATO Med. Res. Lab., Rajvithi Road, Bangkok, Thailand)

The white handed gibbon, *Hylobates lar*, because it is one of the smallest apes and because it seems to be uniquely susceptible to several human diseases, is appealing as a laboratory

animal. The operation of a large laboratory colony of gibbons in Thailand for a number of years has yielded information concerning the biology, husbandry, spontaneous diseases, and research uses of these unusual animals that would be difficult to duplicate elsewhere. The opportunities the gibbon offers for the study of malignant lymphoma, human virus infections such as influenza and *Herpes hominis* infections, and various parasitic infections, are compared to special problems of the care and management of gibbons and their relative susceptibility to diseases, scarcity, and low reproductive capacity. These experiences and observations may be useful in determining if the gibbon should be used as an experimental animal before other more available animals and methods are fully evaluated.

The cellular composition of the bone marrow of normal baboons (*Papio cynocephalus*). Berchelmann, Mary Lou, & Kalter S. S. (Div. Microbiol. Infect. Dis., Southwest Found. Res. Educ., San Antonio, Texas 78228)

Bone marrow studies are being conducted on 25 healthy adult baboons (*Papio cynocephalus*). This group includes both males and females. These animals were captured in Kenya, Africa in 1964 and are part of an established baseline colony at Southwest Foundation for Research and Education. Included in this study are 5 baboons being followed from birth through adolescence to ascertain the marrow changes as the animal matures. The marrow picture of the adult baboons closely resembles that of man. The studies so far completed indicate that in the early months of life the baboon marrow does undergo changes similar to those found in the human infant. There is some decrease in erythroid precursors with an increase in myeloid numbers shortly after birth. At one month these values return to normal. Hempiderin studies are also included in this program.

Age related changes of heamtologic values in infant *Macaca mulatta*. Martin, D. P., McGowan, Martha J., & Loeb, W. F. (Bionetics Res. Labs, Inc., Div. Litton Industries, 5510 Nicholson Lane, Kensington, Md.)

The changes in hematological values occurring in over 100 infant *Macaca mulatta* from birth through 2 years of age were documented. All animals were hand-reared and were free of clinical signs of disease at the time of blood collection. Complete blood counts consisting of packed cell volume, total leukocyte count and differential leukocyte count were performed during the first 3 days of life, at 1, 2, 3, 4, and 8 weeks and monthly thereafter for the first year. During the second year values were analyzed at 6-month intervals. There is an initial high packed cell volume, but this decreases during the first 2 weeks of life. Neutrophils are also high at birth but decline throughout infancy. Lymphocyte levels are low at birth but increase rapidly. An inversion of the lymphocyte-neutrophil ratio occurs

during the first month of life.

Artificial insemination in macaques. Leverage, W. E., Valerio, D. A., & Schultz, A. P. (Bionetics Res. Labs., Inc., 5510 Nicholson Lane, Kensington, Md.)

Artificial insemination in macaques has been studied in our laboratory for 6 years. Initially artificial insemination was performed by depositing the liquid portion of the ejaculate deep into the vagina, occasionally following this with the unliquified coagulum. Using this technique 124 *Macaca mulatta* and 54 *M. fascicularis* were inseminated, which resulted in 4.03 and 9.25 percentage conception rates respectively. Naturally mated *M. mulatta* and *M. fascicularis* controls had 12.97 and 18.18 percent conception rates, respectively. In a later study, 30 *M. mulatta* were bred either naturally or by artificial insemination with whole or trypsin-treated semen. An artificial insemination technique of intrauterine deposition of liquified semen was used in this study. Percentage of conception rates were 20.6, 5.4 and 22.6 for whole, trypsin-treated and naturally mated groups, respectively. The most recent study, still in progress, involved intracervical deposition of liquid semen. Thirty-three *M. mulatta* and 13 *M. fascicularis* have been inseminated to date resulting in 21.2 and 23.0 percent conception rates, respectively.

Breeding the African green monkey, *Cercopithecus aethiops*, in a laboratory environment. Johnson, P. T., Valerio, D. A., & Thompson, G. E. (Bionetics Res. Labs., Inc., 5510 Nicholson Lane, Kensington, Md.)

A breeding colony of African green monkeys, *Cercopithecus aethiops*, was established in 1967 to provide offspring for various carcinogenic studies. The colony is maintained in a laboratory environment and presently consists of 30 females and 6 males. Menstrual cycles are monitored by taking daily vaginal swabs. A method to detect scant menses has been utilized successfully. Breeding is accomplished by introducing the female to the male for a period of 6 days encompassing the estimated day of ovulation. Pregnancy is determined by intrarectal digital examination at 25-30 days post-breeding. To date there have been 48 live births while fetal losses (stillbirths and abortions) have been 28%. Reproductive parameters and pre- and post-partum examination findings were discussed. This simian species reproduces successfully once the adults are acclimated to a laboratory environment.

Breeding and perinatal care for cesarean-delivered rhesus monkeys. Faro, M. D., Barsky, D., Windle, W. F., Barker, June N., Gutierrez, S., & Sechzer, J. (no address given)

The purpose of this report is to describe our experience in providing pregnant monkeys which have the quality and known age required for studies on perinatal brain damage and normal development. A breeding colony was established in 1967, with an initial stock of 42 females and 2 males; now we have 65 females and 5 males. Females were put with males for only 24 hours on day 11

after menstruation began. The annual conception rate was 70%, yielding 172 pregnancies, of which 149 lived to term. Near term, 103 fetuses delivered by cesarean section under 2% procaine HCl were used for physiologic, neurochemical, and behavioral studies of neonatal brain damage. Twenty were born vaginally; the remainder were assigned for oncological studies. Of 35 infants reared in our nursery with 24-hours nursing staff, 18 had brain damage requiring special care. In 1969-71, prophylactic isoniazid appeared to have no adverse effect on conception rate or on 88 fetuses, as indicated by overt signs, birth weight, ECG, EEG, and blood gases.

The use of the rhesus monkey in perinatal research. (Film) Valerio, D. A., & Chez, R. A. (Bionetics Res. Lab., Inc., Kensington, Md. & U. Pittsburgh, Magee-Womens Hosp., Pittsburgh, Pa.)

This 16 mm film depicts the use of the fetal and newborn rhesus monkey (*Macaca mulatta*) in perinatal research. Handling of the newborn and hand-rearing in isolators is briefly described. Surgical procedures and techniques performed on the fetus for a variety of biomedical experiments are shown and discussed. In particular, cannulation of a placental vessel with a T-tube is shown which permits uninterrupted flow through the vessel being sampled. This technique permits the study of placental transfer of labeled and unlabeled substrates as well as study of a fetal plasma response to various stimuli applied to either mother or fetus. Breeding and husbandry techniques are briefly described.

Herpes B virus infections in newly imported *Macaca mulatta*. Sibinovic, S., Valerio, M. G., Fine, D. L., Darrow, C. C., Valerio, D. A., & Ulland, B. M. (Depts. Lab. Anim. Med., Pathol. & Virol., Bionetics Res. Lab., Inc., 5510 Nicholson Lane, Kensington, Md.)

In December, 1970 this laboratory received a shipment of 32 newly imported young-adult (2.5-3.5 kg) *Macaca mulatta*. During the first 21 days of quarantine, 5 animals died and 2 others were euthanized. Three animals that died and the 2 that were euthanized had ulcerative lesions typical of Herpes B virus on the tongue, the hard palate and mucocutaneous border of the lips. The remaining 2 that died had clinical signs of shigellosis. Cytopathic effect typical of Herpes B virus was observed at 72 hours post inoculation of suspect tongue tissue material onto monkey kidney cultures and at 24 hours post inoculation when subcultured on monkey lung tissue cultures. The cytopathic effect of the virus material was neutralized with commercially prepared Herpes B antiserum. Immunofluorescent tests were positive when antiserum against Herpes B was tested in infected tissue culture. Clinical symptoms, gross and histopathological findings were discussed.

Unusual presentation of tuberculosis in subhuman primates. Small, J. D., & Latt, R. H. (Div. Lab. Anim. Med., Johns Hopkins

Med. Sch., Baltimore, Md. 21205)

Tuberculosis is a threat to every primate colony. We recently observed T.B. in 2 aged *Macaca arctoides* which never gave positive tuberculin reactions despite routine testing. They presented with arthritis and osteomyelitis involving the coxofemoral joint, femur, knee joint and thigh muscles. Penicillin sensitive staphylococci were isolated. At necropsy gross visceral lesions of T.B. were seen in only 1 animal (liver, lungs). However, histologic lesions in these organs were present in both animals. Numerous Langhans type giant cells and acid fast bacilli were seen in sections of thigh muscle. The third case, a *M. mulatta* received from an importer on January 8, 1970, was negative to 25 mg. of KOT on January 10, 30, and February 7. On February 13, he was noted to have enlarged cervical lymph nodes communicating by a sinus tract with the left cheek pouch. Pneumococci were demonstrated in the exudate. On February 20, the T.B. test was strongly positive. At necropsy *M. tuberculosis* var. *hominis* was isolated from the cervical lymph nodes. The respiratory tract was free of gross and microsopic lesions of T.B. Tuberculous granulomas were present in the liver. These cases emphasize the necessity of considering T.B. as a possible diagnosis whenever dealing with illness in primates, regardless of their reaction to KOT. Had we included acid fast smears of lesions in our work-up we may have detected the disease sooner. This is now routinely done.

Atypical mycobacteria as a cause of tuberculosis in a rhesus monkey. Latt, R. H. (Div. Lab. Anim. Med., Johns Hopkins Med. Sch., Baltimore, Md.)

A 4.5 kg female *M. mulatta* was received from a commercial supplier on 1/8/70. After a quarantine period of 6 weeks, which included 4 negative tuberculin tests, the animal was placed in a breeding colony, and started on prophylactic isoniazid incorporated in the diet. The animal remained clinically normal and received 2 further tuberculin tests with negative results during the next 2 months. On 4/27/70 bilateral draining fistulas were noted in the region of the angle of the mandible. The fistulas appeared to communicate with the cheek pouches on both sides. The skin adjacent to the openings was thickened and irregular. The animal was euthanized and submitted for necropsy. The gross findings included enlarged submandibular and anterior cervical lymph nodes, congestion and ulceration of the mucous membranes of the cheek pouches, and congestion of all lobes of the lungs. Cultures of the cheek pouch mucous membrane and regional lymph nodes yielded Runyon Group III Mycobacteria. The histopathological findings in this case and the significance of Group III, isoniazid resistant mycobacteria in a primate colony were discussed.

Tuberculosis in anthropoid apes. Keeling, M. E., McClure, H. M., & Bonner, W. B. (Yerkes Reg. Primate Res. Cen., Atlanta, Ga. 30322)

An epizootic of tuberculosis occurred in a colony of 125

great apes after the introduction of a 9-year-old female chimpanzee which had been maintained in a laboratory environment for 8 years. This animal was tuberculin skin test negative on four occasions during a 10-week period. Radiographs taken during this period were also negative. The animal died of disseminated tuberculosis 5 months after being released from quarantine and introduced into the colony. Subsequently 3 chimpanzees and one orangutan were euthanized and tuberculosis was confirmed at necropsy and by culture. An additional 9 chimpanzees, 9 orangutans and 4 gorillas converted to positive tuberculin skin tests. Other diagnostic procedures were employed to confirm tuberculosis in the tuberculin positive animals. These procedures included comparative skin testing procedures, radiography, cultural and microscopic evaluations of tracheobronchial and gastric washings, exploratory laparotomy and histopathology of skin test sites. The results of continued diagnostic procedures after placing the entire colony on isoniazid therapy were presented as were experimental attempts to establish the infectivity of known tuberculous chimpanzees while on isoniazid therapy. At least 10 human tuberculin skin test conversions associated with this epizootic were also discussed.

Filariasis in New World nonhuman primates: histochemical differentiation of circulating microfilariae. Chalifoux, Laura V., Hunt, R. D., Garcia, F. G., & Sehgal, P. K. (New England Reg. Primate Res. Cen., Harvard Med. Sch., Southboro, Mass.)

Filariasis is one of the most common parasitic infestations in New World primates. The significance of these parasites with respect to animal health, their influence on experimental manipulations, or potential public health hazard, is poorly defined. In part, these parameters have not been fully explored owing to difficulties in accurately identifying the numerous types of circulating microfilariae or failure to locate adult parasites at necropsy. Five groups (*Saimiri sciureus*, *Saguinus oedipus*, *Aotus trivirgatus*, *Ateles geoffroyi*, *Cebus albifrons*) of New World monkeys were screened for the presence of circulating microfilariae. Parasites were encountered in each species. Each positive sample was stained for the demonstration of acid phosphatase using naphthol ASTR phosphate as substrate, and hexazonium pararosanaline to produce a red azo dye with the released naphthol. Eight distinct microfilariae were differentiated on the basis of morphologic characteristics and distribution and localization of histochemically demonstrable acid phosphatase. Methods of identification, incidence, and significance were discussed.

Clinical evaluation of CI 744 for I.M. anesthesia in dogs and primates. Bree, M. M., & Rowe, S. E. (Unit for Lab. Anim. Med., U. Michigan, Ann Arbor, Mich.)

A series of phenyl-cyclohexylamines and their derivatives are under clinical investigation as cataleptoid anesthetics for i.m. use. CI 744 is a combination of 2 compounds: Tiletamine HCl (CI 634) and the unnamed investigational tranquilizing agent

(CI 716). These 2 compounds appear to act synergistically to produce effective surgical anesthesia in several species of laboratory animals. We evaluated CI 744 in 40 dogs and 61 primates (4 species). The 2 compounds were mixed in a ratio of 2:1, 1.5:1, or 1:1 of CI 634 and CI 716, respectively. CI 744 was then administered at 10 or 15 mg of CI 634/kg of body weight in dogs and 2-9 mg of CI 634/kg in primates. Thus, the amount of CI 716 administered varied with the ratio used. In our hands, the 2:1 ratio appeared to have the most promising clinical applicability although adequate anesthesia was demonstrated with all of the ratios tested. Induction was smooth (1-2 minutes); excellent muscular relaxation was observed, palpebral and swallowing reflexes were not abolished, and recovery was uneventful. Surgical anesthesia was maintained for 60-90 minutes following a single i.m. injection, the duration depending upon the dose. We believe CI 744 is an extremely promising anesthetic agent for i.m. use in dogs and primates.

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MACAQUES FOR SALE

The following well-conditioned surplus monkeys are for sale. Stumptailed macaques: one male (20 lbs.); five females (two proven breeders, 23, 22.5, 20, 19, and 25.5 lbs., respectively). Rhesus macaques: one male juvenile (6 lbs.), one female (12 lbs.). Make offer. Contact: Dr. Phillip C. Green, Department of Psychology, Bowling Green State University, Bowling Green, Ohio 43402. (Telephone: 419-372-2303)

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PRIMATE MATERIAL WANTED: PREGNANT ANIMALS OR EMBRYONIC TISSUE

Embryonic tissue of each of the following three species is needed: rhesus (*Macaca mulatta*), cynomolgus (*M. fascicularis*), and African green (*Cercopithecus aethiops*) monkeys. If you can provide either the tissue itself or one pregnant animal of any of the three species please contact: S. M. Purcell, D.V.M., Manager, Laboratory Animal Science and Medicine, Smith Kline & French Laboratories, Philadelphia, Pa. 19101).

INSTITUTE ON COMPARATIVE BIOLOGY OF PRIMATES PLANNED

A NATO Advanced Study Institute on Comparative Biology of Primates will be held in Montaldo (Turin), Italy, June 7-19, 1972. According to the organizers, the aim of the Institute is the development of a general philosophy for the science of primatology. Lecturers are selected from those scientists deeply involved and interested in this field. The course intends to serve students and researchers using primates in medical and biological research, but especially those interested in the natural history of the group and in human biology.

In the past the study of primates was largely limited to determining the origin of the human species. Today, however, interest in them extends far beyond this narrow focus. In terms of both practical human purposes and theoretical interests, the study of primate biology and behavior is of ever increasing importance. Their close comparative relationships with man has proved of such great value to human biology and medicine that their numbers and kinds are quickly dwindling. For this reason, one of the focuses of this course will be on their reproductive biology. The central topics of the course will, however, have broader interdisciplinary purposes.

Some of the specific topics to be included in the program are: comparative anatomy, comparative physiology, comparative neuroanatomy and neurophysiology, comparative endocrinology, comparative reproductive physiology, comparative genetics and molecular biology, comparative cytogenetics, comparative behavior, use of nonhuman primates in biological and medical research, conservation; a workshop on methods for comparative cytogenetics of primates is also planned during the meeting.

The tentative list of lecturers is: N. A. Barnicot (London, U.K.), I. S. Bernstein (Lawrenceville, USA), C. R. Carpenter (Athens, USA), B. Chiarelli (Turin, Italy), J. Egozcue (Barcelona, Spain), D. Ferenbach (Paris, France), M. Goodman (Detroit, USA), B. Harrisson (Ithaca, USA), W. C. O. Hill (Folkestone, U.K.), H.J. Kuhn (Frankfurt, Germany), R. D. Martin (London, U.K.), J. R. Napier (London, U.K.), B. Rensch (Munster, Germany), D. Rumbaugh (Atlanta, USA), R. E. Tashian (Ann Arbor, USA), P. V. Tobias (Johannesburg, South Africa), R. H. Tuttle (Chicago, USA), C. Vogel (Kiel, Germany), M. L. Weiss (Detroit, USA).

Applications should be sent directly to the Chairman of the Institute by 31 March 1972: Dr. B. Chiarelli, Istituto di Antropologia, Via Accademia Albertina, 17, 10123 Torino (Italy). All applicants will be notified of the Committee's decision on their application by 30 April 1972. Requests for application forms or for further information must be addressed to the organizing assistants of the Advanced Study Institute: Miss C. Bullo, c/o Istituto di Antropologia, Via Accadmia Albertina, 17, 10123 Torino (Italy), or Mr. D. A. Shafer, c/o Dept. of Anthropology, University of Toronto, Toronto, Ont. (Canada).

ILAR ANIMAL MODELS AND GENETIC STOCKS PROGRAM

The Animal Models and Genetic Stocks Program is an information exchange service conducted by the Institute of Laboratory Animal Resources (ILAR) at the National Academy of Sciences. This program was started in July 1969 and was initiated as a result of resolutions adopted by the Genetics Society of America and the National Institutes of Health. These resolutions cited the urgent need to establish a central agency to collect, maintain, and disseminate information on all vertebrate models and genetic stocks useful for biomedical research.

The objectives of the program are to locate sources of animal models and genetic stocks, to accurately describe these models, and to develop and maintain a locator file so that this information is available to scientists seeking a particular strain of animal or model. These ends are met by the collection, storage, and dissemination of such data as key references and major characteristics pertaining to animal models or genetic stocks, names and addresses of sources of supply and location of animal colonies, and the names and addresses of scientific consultants to animal model topics. The data are made available without charge to interested individuals by response to specific inquiries and through periodic publication in the *ILAR News*, the Institute's quarterly newsletter. Since the program's inception, ILAR has responded to over 450 inquiries from scientists throughout the United States and abroad. Data on approximately 350 different kinds of genetic stocks or strains are on file, and over 1200 reference citations have been published in the *ILAR News* and placed on file in the storage and retrieval system. Another featured section in the *ILAR News* is "The Genetic Stock Market Report," which gives a brief description of selected animal colonies throughout the country.

The Committee on Animal Models and Genetic Stocks meets periodically with the ILAR staff to review information collection and dissemination techniques and to discuss possible symposia or workshops in the animal model field. The group recognizes the critical importance of preserving certain strains and cell lines for future investigations. At a recent workshop the development of symposia on the creation of a cell culture and sperm bank was discussed, as was a national repository for laboratory animals and mutant stocks. The staff and Committee members also attend and participate in meetings and symposia of other groups investigating topics related to the Animal Models and Genetics Stocks Program.

During the past five years, ILAR has sponsored five symposia on "Animal Models for Biomedical Research" to emphasize the fact that unique animal models exist for diverse biomedical needs. The proceedings for these symposia have been published by the National Academy of Sciences. The papers stress the specific genetic, physiologic, and pathologic traits or conditions in particular species or strains of animals that make them appropriate and unique research tools with which to gain insight into parallel human conditions or basic biomedical phenomena. In 1971, ILAR published a compilation of abstracts or summaries of papers on animal models

that have appeared in diverse biomedical journals during the past two years.

In view of the rapidly expanding reference file and genetic stock registry, plans are being formulated to develop a machine storage and retrieval system that will enable ILAR to expand beyond the manual storage system capabilities and to respond to specific inquiries more rapidly and comprehensively. In addition, invertebrate animal models and genetic stocks are currently included in the program.

An educational exhibit describing the Animal Models and Genetic Stocks Program is being constructed for use at national scientific, medical, and veterinary meetings to gain a wider exposure to biomedical personnel. Investigators are invited to visit the exhibit and discuss possible applications and inquiries with the ILAR staff representative.

ILAR considers this to be an important program with great potential for improving communication within the research community. However, the support of every investigator is essential if a comprehensive listing of the animal models and genetic stocks being used throughout the country is to be maintained. ILAR is asking researchers to assist in the development of its data bank by providing information relative to animal models or genetic stocks maintained within their institutions. Interested persons are urged to make suggestions regarding the program and to furnish all information they may have concerning potential models or genetic stocks. Pertinent reprints, colony information, and other correspondence should be addressed to:

Animal Models and Genetic Stocks Program
Institute of Laboratory Animal Resources
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D. C. 20418

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CANADIAN ASSOCIATION FOR LABORATORY ANIMAL SCIENCE: CALL FOR PAPERS

Persons wishing to present papers of 15 minutes in length on any area of laboratory animal science at the 11th annual convention of the Canadian Association for Laboratory Animal Science should send the title and an abstract of no more than 200 words to: F. M. Loew, D.V.M., Ph.D., Director, Animal Resources Centre, University of Saskatchewan, Saskatoon, Canada. The convention will be held at the University of Alberta, in Edmonton, on August 23-25, 1972. No submissions will be considered after April 30, 1972, and those whose submissions are accepted will be notified by May 30, 1972.

NEW ASSOCIATE DIRECTOR OF THE NATIONAL CENTER FOR PRIMATE BIOLOGY

Dr. Richard A. Griesemer was recently appointed Adjunct Professor of Pathology and an Associate Director of the National Center for Primate Biology at the University of California, Davis. In addition to serving as head of the pathology laboratories at the Primate Center, he has an appointment as Adjunct Professor of Pathology at the School of Veterinary Medicine on the Davis campus.

Dr. Griesemer was awarded his D.V.M. degree from the Ohio State University in 1953, and was employed there as an Instructor from 1953 to 1955. In the years 1955-1957, Dr. Griesemer served as a Captain in the United States Air Force and worked as Junior Pathologist and Assistant to the Chief of the Virology Branch of the Armed Forces Institute of Pathology in Washington, D. C. He then returned to the Ohio State University where he received his Ph.D. degree in Veterinary Pathology in 1959. He remained there, was promoted to the position of Professor in 1964, and from 1967 to 1971, he served as Chairman of the Department of Veterinary Pathology.

Dr. Griesemer's major research interests lie in the fields of comparative and experimental pathology, with special concentration in viral oncology, gnotobiology, and immunopathology. His research has played an important role in the detection of viral diseases in domestic animals. While at the Ohio State University, he was the first to raise germfree dogs, cats, and monkeys, and developed new methods for using them in research. As a result of his work, Dr. Griesemer was presented the American Veterinary Medical Association Gaines Medal and Award in 1968.

In addition to his receiving national recognition for his achievements in these areas, Dr. Griesemer participated in the U.S.-Japan Exchange Program, sponsored by the National Academy of Sciences, when he was awarded the position of International Visiting Scientist in 1967. Dr. Griesemer is presently a member of the Animal Resources Advisory Committee, National Institutes of Health, and the Research Council of the American Veterinary Medical Association; he is a Consultant to the National Cancer Institute on biohazards; he also acted as program chairman of the Tenth Annual Symposium on Gnotobiotic Research this year. Dr. Griesemer has authored or co-authored over fifty published scientific papers.

RELATIONSHIP OF HERPES VIRUS AND CERVICAL CANCER STUDIED IN THE CEBUS MONKEY*

A study done by scientists at the National Institute of Neurological Diseases and Stroke, in collaboration with others (London, Catalano, Nahmias, Fuccillo, & Sever, 1971), has established the cebus monkey as an effective model for the study of genital herpes virus as a possible cause of cancer.

The increased frequency of antibodies to herpes virus hominis (HVH) Type II in women with invasive carcinoma of the cervix and in women with carcinoma *in situ* has led researchers to believe there is an association between genital herpes and cervical cancer. To test this assumption, scientists have produced an experimental model of genital HVH infection in subhuman primates.

The NIH scientists found that the cebus monkey is readily susceptible to genital infection with HVH Type II, and the infection is reproducible. Genital infection was readily established in all of 10 female cebus monkeys, whereas attempts to infect five rhesus monkeys and two squirrel monkeys were unsuccessful.

Infection was induced by placing virus-soaked cotton swabs in the vaginal vault and was proven by virus isolation, serologic studies, and demonstration of herpetic vesicles and/or ulcers on the vulva and vagina; there was also moderate inflammation of the cervix. Lesions developed on the fingers, face, and lips of five of the 10 monkeys. All animals were reinoculated with HVH Type II, and vaginal reinfection was established in three cebus monkeys despite the presence of serum neutralizing antibodies.

The investigators reported that the lesions produced in monkeys closely resemble the disease seen in human genital infections. The incubation period and clinical course were markedly similar to those observed in humans.

With the animal model now available, scientists will be able to investigate the pattern of venereal transmission of genital HVH, the role of the virus in producing spontaneous abortion, congenital malformations, and neonatal morbidity and mortality, the role of the virus in causing carcinoma of the cervix, and the efficacy of certain experimental drugs for the treatment of neonatal HVH infections.

REFERENCES

London, W. T., Catalano, L. W., Jr., Nahmias, A. J., Fuccillo, D. A., & Sever, J. L. Genital *Herpesvirus hominis* Type 2 infection of monkeys. *Obstetrics and Gynecology*, 1971, *37*, 501-509.

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*From *CDC Veterinary Public Health Notes*, September, 1971, p. 2.

MONKEYS FOR EXCHANGE

We have approximately twelve female rhesus monkeys (*Macaca mulatta*), half of these adult and half of these under one year of age, with known birthdates and histories, which we are eager to trade for fully adult intact males. Other animals surplus to our present research needs include the following fully adult animals: Patas monkeys (*Erythrocebus patas*), one male, two female; West African green monkeys (*Cercopithecus aethiops sabaeus*), three male; pigtail macaques (*Macaca nemestrina*), two male, three female; and olive baboon (*Papio anubis*), one female.--Contact: Dr. Irwin S. Bernstein, Yerkes Field Station, Route 1, Lawrenceville, Georgia 30245.

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INFORMATION WANTED: BRAIN WEIGHTS DURING DEVELOPMENT

The Galesburg State Research Hospital is anxious to collect weights of monkey brains during development (both pre- and postnatal) to use for analyses of age equivalence in comparative brain development. Any biochemical data on the developing brain in monkeys would also be appreciated.--Contact: Dr. Williamina A. Himwich, Galesburg State Research Hospital, Galesburg, Illinois 61401.

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PRIMATE CARCASSES WANTED

I would like to obtain carcasses of primates which have been sacrificed in the course of research. These will be used for preparation of skeletons to be used as a reference collection for teaching and research. I will be glad to pay shipping costs on those specimens which I can use. Please send a list of available animals to:--Dr. Robert B. Eckhardt, Department of Anthropology, 409 Social Science Building, Penn State University, University Park, Pennsylvania 16802.

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MONKEY WITH CEREBELLAR HYPOPLASIA AVAILABLE

Our zoo has a young patas monkey (*Erythrocebus patas*) showing signs of cerebellar hypoplasia. If anyone is interested and doing work in this area, we will make this animal available.--Contact: Wesley A. Johnson, D.V.M., Oklahoma City Zoo, Oklahoma City, Oklahoma 73102.

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

BOOKS

Primate behavior: Developments in field and laboratory research. Vol. 2. Rosenblum, L. A. (Ed.) New York/London: Academic Press, 1971. [Price: $13.50]

This volume includes the following chapters: The rhesus monkey in North India: an ecological and behavioral study, by D. G. Lindburg; Field and laboratory studies of social organization in *Saimiri* and *Callicebus*, by W. A. Mason; Experimental studies of communication in the monkey, by R. E. Miller; Parturition in primates: behavior related to birth, by E. M. Brandt & G. Mitchell; The social behavior of gibbons in relation to a conservation program, by G. Berkson, B. A. Ross, & S. Jatinandana.

Behavior of nonhuman primates. Vol. 4. Schrier, A. M., & Stollnitz, F. (Eds.) New York/London: Academic Press, 1971. [Price: $10.00]

The latest volume in this series includes: Retention of discriminations and an analysis of learning set, by D. W. Bessemer & F. Stollnitz; Higher mental functions of a home-raised chimpanzee, by K. J. Hayes & Catherine H. Nissen; Two-way communication with an infant chimpanzee, by Beatrice T. Gardner & R. A. Gardner; The assessment of language competence in the chimpanzee, by D. Premack.

Reproduction and breeding techniques for laboratory animals. E. S. E. Hafez (Ed.) Philadelphia: Lea & Febiger, 1970.

Chapter titles and authors are as follows: Copulatory behavior, by D. A. Dewsbury; Sexual cycles, by R. R. Fox & C. W. Laird; Female reproductive organs, by E. S. E. Hafez; Primates, by A. G. Hendrickx & D. C. Kraemer.

Bibliotheca primatologica. No. 14: Functional myology of the hip and thigh of cebid monkeys and its implications for the evolution of erect posture. Stern, J. T., Jr. Basel/New York: Karger, 1971.

This study discusses aspects of primate evolution in

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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 light of certain facts from the realm of functional comparative anatomy. Observations on the musculature of the hip and thigh of cebid monkeys serve as the basis for deductions concerning the relationship between the morphology and locomotor behavior of these animals. Information about muscles and their functions are utilized to gain insight into the evolution of erect bipedal locomotion in hominids.

REPORTS

Seventh annual report, 1970. Trinity, Jersey, Channel Islands: The Jersey Wildlife Preservation Trust, 1970.

This report includes articles with the following titles: Celebesian black ape *Cynopithecus niger niger* Desmarest, 1822; A breeding analysis of a group of captive black and white colobus, *Colobus polykomos polykomos*, Zimmermann 1780, at The Jersey Wildlife Preservation Trust; and Observations on the reproduction and development of vervet monkey with special reference to intersubspecific hybridization *Cercopithecus pygerythrus* F. Cuvier, 1821. The Breeding Results--1970 section includes a variety of primates. There is also a list of the species in the Trust's collection.

DISEASE

Induction of neoplasms by viruses in marmoset monkeys. Deinhardt, F., Wolfe, L., Northrop, R., Marczynska, Barbara, Ogden, J., McDonald, Ruth, Falk, L., Shramek, Grace, Smith, R., & Deinhardt, Jean (Dept. Microbiol., Rush-Presbyterian-St. Luke's Med. Cen., 1753 West Congress Parkway, Chicago, Ill. 60612) *Journal of Medical Primatology*, 1972, *1*, 29-50.

C-type RNA viruses of avian, feline and simian origin induce sarcomas in marmosets and a simian herpesvirus induces lymphomas and/or lymphocytic leukemias. Virus genome expression is usually repressed to various degrees *in vivo* but becomes derepressed if the tumor cells are grown *in vitro*. The high susceptibility of marmosets to oncogenic viruses and the hematopoietic chimerism between offspring make them ideal animals for studying not only the oncogenic activity of animal tumor viruses and of potentially oncogenic materials but also the immune response to the viral-induced neoplastic diseases.

Isoniazid therapy of tuberculosis in baboons. Allgood, M. A., & Price, G. T. (AC-119, Civil Aeromed. Inst., FAA Aeronautical Cen., P. O. Box 25082, Oklahoma City, Okla. 73125) *Primates*, 1971, *12*, 81-90.

A local epizootic of tuberculosis in a laboratory colony of baboons was controlled by 40-80 mg/kg daily dose

of isoniazid. There was definite regression of disease in all animals examined at autopsy, after three weeks and three months of therapy, following their use for unrelated acute experiments. One animal survived in apparent health with a healthy infant that was born after 102 days of therapy.

Hydatid disease in a macaque. Houser, W. D., & Paik, S. K. (Reg. Primate Res. Cen., U. Wisconsin, 1223 Capitol Ct., Madison, Wis. 53706) *Journal of the American Veterinary Medical Association*, 1971, *159*, 1574-1577.

Echinococcus granulosus infection was diagnosed in a mature macaque (*Macaca mulatta*). Necropsy findings included hydatid cysts in the lungs, liver, and peritoneal cavity, and liver cirrhosis. The cause of the liver cirrhosis could not be determined definitely, but it was believed that the toxic effect of hydatid fluid might have been involved.

Lethal toxoplasmosis in a woolly monkey. Hessler, J. R., Woodard, J. C., & Tucek, P. C. (Div. Comp. Med., Coll. Med., U. Florida, Gainesville, Fla. 32601) *Journal of the American Veterinary Medical Association*, 1971, *159*, 1588-1594.

A pet woolly monkey had a history of lethargy and anorexia for one week. The monkey was in good condition and its pelage was excellent. Rectal temperature was 103°F (39.4°C), and the feces were loose, yellow, and contained numerous *Strongyloides* eggs. Treatment was initiated, but the monkey died the same night. Histologic examination of tissues revealed toxoplasma organisms in the brain, lungs, liver, kidneys, thyroid gland, spleen, heart, lymph nodes, and adrenal glands.

Pneumococcic meningoencephalitis in a rhesus monkey. Fox, J. G., & Soave, O. A. (Animal Care Facility & Dept. Med. Microbiol., Stanford Med. Sch., Stanford, Calif. 94305) *Journal of the American Veterinary Medical Association*, 1971, *159*, 1595-1597.

Seven days after receipt, and while in quarantine, a 5-kg male rhesus monkey was observed to have its head tilted toward the left side of its body. Meningitis and inner or middle ear infection was diagnosed tentatively. Central nervous system signs persisted for 12 days in spite of intensive treatment with antibiotics. After 2 weeks of illness, the monkey was killed and necropsied. Pure cultures of *Diplococcus pneumoniae* were isolated from both brain and pulmonary tissue.

Dermatophytosis due to *Microsporum canis* in a rhesus monkey. Baker, H. J., Bradford, L. G., & Montes, L. F. (Dept. Comp. Med., U. Alabama, Birmingham, Ala. 35233) *Journal of the American Veterinary Medical Association*, 1971, *159*, 1607-1611.

Microspprum canis was cultured from hair and purulent exudate taken from a rhesus monkey with extensive alopecia and focal, suppurative skin lesions. Light and electron

microscopic studies of affected tissues revealed ectothrix invasion of hairshafts and fungal cells in demal abscesses. The infection is believed to have originated from infected but clinically normal cats or dogs housed in adjacent rooms. Griseofulvin therapy resulted in prompt and complete remission of all lesions. The intense inflammatory response observed in this case resembled a common clinical form of *M. canis* infection (kerion) in man.

Melioidosis in imported nonhuman primates. Kaufmann, A. F., Alexander, A. D., Allen, A. M., Cronin, R. D., Dillingham, L. A., Douglas, J. D., & Moore, T. D. (Nat. Communicable Dis. Cen., PHS, Atlanta, Ga. 30333) *Journal of Wildlife Diseases*, 1970, *6*, 211-219.

In 1969, five cases of melioidosis in three separate outbreaks were diagnosed in nonhuman primates in the United States. In the first outbreak, two stump-tailed macaque monkeys (*Macaca arctoides*) developed signs of the disease approximately 6 months after purchase. A third animal, a chimpanzee (*Pan troglodytes*), probably acquired its infection from one of these monkeys. Two other unrelated cases involving a pig-tailed monkey (*Macaca nemestrina*) and a rhesus monkey (*Macaca mulatta*) were diagnosed. These monkeys had been imported 3 years and 6 months, respectively, prior to the recognized onset of their disease. These cases represent the first known occurrences of spontaneous melioidosis in nonhuman primates in the United States.

Studies of the Delta herpesvirus isolated from the patas monkey (*Erythrocebus patas*). Ayres, J. P. (Delta Reg. Primate Res. Cen., Tulane U., Covington, La. 70433) *Laboratory Animal Science*, 1971, *21*, 685-695.

The Delta herpesvirus grew well in primary human fetal kidney cells (HFK) and in all cell cultures derived from simian primates. Human embryonic lung (WI-38) and primary rabbit kidney cells (RK) were poor substrates, and no infectivity was detected in human amnion (FL), human epidermoid carcinoma (HEp-2), or chick embryo fibroblasts (CEF). No infectivity was demonstrated in chick embryos, mice, rats, or rabbits when inoculated with viable virus-infected cell suspensions. The disease (with characteristic clinical signs) was experimentally transmitted to the patas monkey and reisolated. Experimentally induced serum conversion was detected in owl and patas monkeys and vervets by constant serum-varying virus neutralization tests. There was no evidence of a serological relationship to Herpesvirus simplex or varicella-zoster virus; however, the Delta virus and both the Liverpool vervet virus and the patas herpesvirus showed common serological reactivity. The Delta agent was ether and heat sensitive (inactivated at 56°C in 2 min), was

not filterable, and did not hemagglutinate human O or patas red cells. Electron micrographs supported its cell-bound characteristics when compared with other viruses which possess this feature. These data strongly suggested that the Delta herpesvirus in the monkey may be the simian counterpart of chickenpox in man.

Tumor production in squirrel monkeys (*Saimiri sciureus*) by Rous sarcoma virus. Rabin, H., & Cooper, R. W. (Inst. Comp. Biol., Zool. Soc. San Diego, San Diego, Calif. 92112) *Laboratory Animal Science*, 1971, *21*, 705-711.

Rous sarcoma virus of the Schmidt-Ruppin strain produced solid fibrosarcomas at the site of inoculation in all squirrel monkeys tested up to the age of 303 days at the time of inoculation. The average latent period of these tumors was 37.2 days. This time span did not change with increasing age of the host. The tumors grew slowly and attained large size, but there was no indication of metastasis. Spontaneous regression occurred in over one-half the cases and was of a very protracted nature in all but 1 instance. The lowest tumor producing doses found corresponded to 3×10^3 and 8×10^3 infectious units of virus for tissue cultures of chick embryo fibroblasts. A group of animals, all adults older than 4 years of age, comprised of non-pregnant females, pregnant females, and females treated with single large doses of cyclophosphamide was refractory. One male squirrel monkey more than 5 years of age was treated with caprine anti-squirrel monkey thymocyte globulin. This individual developed a tumor 35 days after inoculation with RSV. Another male monkey also older than 5 years was treated with normal caprine globulin and was refractory to challenge with RSV.

The *in vitro* assay of tuberculin hypersensitivity in *Macaca mulatta* sensitized with bacille Calmette Guèrin cell wall vaccine and/or infected with virulent *Mycobacterium tuberculosis*. Baram, P., Soltysik, Louise, & Condoulis, W. (Div. Immunology, Amer. Dental Assn., Res. Inst., 211 East Chicago Ave., Chicago, Ill. 60611) *Laboratory Animal Science*, 1971, *21*, 727-733.

The development of tuberculin hypersensitivity in *Macaca mulatta* was assayed *in vitro* using peripheral blood lymphocytes from nonsensitive, bacille Calmette Guèrin cell wall vaccinated, and *Mycobacterium tuberculosis* infected animals. The incorporation of isotopically labeled (tritium) thymidine by the lymphocytes, incubated with and without PPD was used as an index of cell stimulation. Following bacille Calmette Guèrin cell wall vaccination, lymphocytes from 24 of 26 animals gave values greater than the baseline mean plus 2 standard deviations. Following infection of 22 bacille Calmette Guèrin sensitized and 6 nonsensitive

animals with viable *Mycobacterium tuberculosis* H37RV by insufflation, 26 of 28 animals responded with lymphocyte delayed hypersensitivity assay values greater than $\bar{x} + 2S\bar{x}$. Five of the animals gave questionable skin tests at this time. The remainder were positive by intrapalpebral skin test.

Herpesvirus T as the cause of encephalitis in an owl monkey (*Aotus trivirgatus*). Tate, C. L., Lewis, J. C., Huxsoll, D. L., & Hildebrandt, P. K. (Div. Vet. Med., Walter Reed Army Inst. Res., Walter Reed Army Med. Cen., Washington, D. C. 20012) *Laboratory Animal Science*, 1971, *21*, 743-745.

An immature male owl monkey (*Aotus trivirgatus*) submitted for histopathology with a history of respiratory distress had lesions consistent with those found in *Herpesvirus* infections, including encephalitic lesions. *Herpesvirus T* was isolated from tissues collected at necropsy.

Abdominal hernias in the rhesus monkey (*Macaca mulatta*). Fox, J. G. (Aerobiol. Evaluation Labs., U.S. Army Biol. Def. Res. Cen., Fort Detrick, Md. 21701) *Laboratory Animal Science*, 1971, *21*, 746-747.

Five abdominal hernias have been diagnosed clinically in rhesus monkeys and were surgically repaired. Four hernias were diagnosed as indirect inguinal hernias and 1 as a paramedian abdominal hernia.

Shigellosis in nonhuman primates: a review. Mulder, J. B. (Sinclair Comp. Med. Res. Farm & Dept. Vet. Med. & Surg., U. Missouri, Columbia, Mo. 65201) *Laboratory Animal Science*, 1971, *21*, 734-738.

Shigellosis is widespread in primates and is a public health problem in man; several species of *Shigella* are transmissible between man and monkeys. Clinical signs described in nonhuman primates were general depression, weakness, prostration, emaciation, and, in terminal stages, diarrhea with profuse passage of blood and mucus. Death occurred within a few days to 2 weeks following the onset of clinical signs. The cellular inflammatory reaction resulting from *Shigella* infection was primarily limited to the mucosa. Lesions progressed from catarrhal enteritis to severe ulcerative colitis and hemorrhage. The most common organisms causing natural infection in primates were the *Shigella flexneri* group and *Shigella sonnei*. Several investigators produced experimental shigellosis in monkeys by oral administration or intestinal injection of *Shigella* organisms. Healthy carriers also transmitted viable pathogenic bacilli. Investigators failed to produce adequate immunity with oral administration of live organisms, parenteral injection with killed organisms, or oral administration with hybrid strains.

Chimpanzee-associated infectious hepatitis among personnel at an animal hospital. Friedmann, C. T. H., Dinnes, M. R., Bernstein, J. F., & Heidbreder, G. A. (313 N. Figueroa, Room 619, Los Angeles, Calif. 90012) *Journal of the American Veterinary Medical Association*, 1971, *159*, 541-545.

Infectious hepatitis occurred during a 3-week period among 8 persons affiliated with a California veterinary hospital. The source of the virus was thought to be a newly imported chimpanzee. A probable secondary case occurred 3 weeks later.

Pathologic conditions in the patas monkey. Migaki, G., Seibold, H. R., Wolf, R. H., & Garner, F. M. (Comp. Pathol. Branch, Vet. Pathol. Div., Armed Forces Inst. Pathol., Washington, D. C. 20305) *Journal of the American Veterinary Medical Association*, 1971, *159*, 549-556.

A cooperative study between the Delta Regional Primate Research Center and the Armed Forces Institute of Pathology was undertaken to determine the nature of spontaneous lesions found in the patas monkey (*Erythrocebus patas*). This report is based on 72 necropsies at the Delta Regional Primate Research Center. The necropsies were supplemented by histologic and microbiologic examinations. The pathologic conditions consisted of spontaneous diseases and sequelae to surgical experiments. Spontaneous diseases were listed in decreasing order of apparent transmissibility. Most of the deaths resulted from noninfectious diseases and infections that depend on predisposing factors.

Diplococcal leptomeningitis in a rhesus monkey. Manning, P. J. (Sinclair Comp. Med. Res. Farm, U. Missouri, Columbia, Mo.) *Laboratory Animal Digest*, 1971, *7* [3], 52-53.

Leptomeningitis in a rhesus monkey is described. *Diplococcus pneumoniae* was cultured from numerous organs as well as cerebral spinal fluid.

Observations on shigellosis and development of multiply resistant shigellas in *Macaca mulatta*. Lindsey, J. R., Hardy, P. H., Jr., Baker, H. J., & Melby, E. C., Jr. (Dept. Comp. Med., U. Alabama, Birmingham, Alabama 35233) *Laboratory Animal Science*, 1971, *21* [Part I], 832-844.

A 3 year study was conducted of disease problems occurring in simian primates during conditioning and long term maintenance for research purposes. A total of 555 cases of diarrhea was observed in 1,178 *Macaca mulatta* housed an average of 126 days each. Most cases occurred in recently acquired animals, with the highest frequency occurring in the third week from time of arrival. Only rare cases were seen in animals housed 2 months or longer. Epizootiologic, microbiologic, and pathologic evidence incriminated *Shigella flexneri* as the etiologic agent, although

this organism was isolated from only 23% of clinical diarrheas. Increased transmission of shigellae during transportation, various "stresses" related to shipment, and intercurrent infections such as giant cell pneumonia appeared to contribute importantly to the peak levels of morbidity and mortality from shigellosis. Shigellosis was considered the primary cause of 117 deaths compared to only 74 deaths from all other causes. Multiply drug resistant shigellae and other enterobacteria became common in animals of this facility during the 3 years of the study, probably as a result of generous use of antibacterial drugs by animal vendors and the facility's own staff. Sound isolation and quarantine procedures rather than therapeutic measures were emphasized for control of infectious diseases in simian primates.

Some clinical and microbiological findings in vervet monkeys (*Cercopithecus aethiops pygerythrus*). Yamashiroya, H. M., Reed, Josephine M., Blair, W. H., & Schneider, M. D. (IIT Res. Inst., Life Sci. Res. Div., Chicago, Ill. 60616) *Laboratory Animal Science*, 1971, *21* [Part I], 873-883.

Baseline clinical hematologic, parasitologic, bacteriologic, and histopathologic examinations were made on 29 vervet monkeys (*Cercopithecus aethiops pygerythrus*) serving as donors of kidney tissue for latent virus-cell culture studies. Analysis of fecal samples showed presence of the following helminth ova: *Trichuris*, 48%; *Oesophagostomum*, 34%; *Physaloptera*, 14%; and *Strongyloides*, 10%. Multiple parasitism with 2 or more helminths was commonly observed. *Salmonella* or *Shigella* were not detected; an enteropathogenic Escherichia coli 086:B7 was isolated from 1 monkey. Hemosporidia were detected in 45% and *Hepatocystis* infection confirmed histologically in 41% of the monkeys. Cultivation of 22 lots of primary vervet monkey kidney cultures resulted in the recovery of cytomegalovirus and foamy virus in 36% and 32% of the culture lots, respectively.

Klebsiella-Enterobacter infections in chimpanzees. Schmidt, R. E., & Butler, T. M. (6571st Aeromed. Res. Lab., Holloman Air Force Base, New Mexico 88330) *Laboratory Animal Science*, 1971, *21* [Part I], 946-949.

The clinical and pathological features of fatal infections due to organisms of the *Klebsiella-Enterobacter* (K-E) group of bacteria in 3 chimpanzees (*Pan troglodytes*) were reported. Several organs were affected, with the lungs most consistantly involved. The lesions were morphologically similar to those occurring in man and nonhuman primates with K-E group infections. Antibiotic therapy for non-related conditions was considered a predisposing factor.

Nonhuman primate virology. A workshop at Southwest Foundation for

Research and Education, San Antonio, Texas, April 26-27, 1971. *Laboratory Animal Science*, 1971, *21* [Part II].

The entire contents of Part II of Volume 21 of the above journal are devoted to the proceedings of this workshop. Articles and authors are as follows: Concepts of a nonhuman primate virology workshop, by W. J. Goodwin; Problems associated with the use of nonhuman primates, by S. S. Kalter; Viral diseases noted in the Yerkes Primate Center Colony, by H. M. McClure & M. E. Keeling; Colony management as applied to disease control with mention of some viral diseases, by D. A. Valerio; Collection and handling of specimens for detection of infection or disease, by S. S. Kalter; Viral diseases of nonhuman primates in the wild, by R. L. Heberling; Review of some outbreaks of viral disease in captive nonhuman primates, by C. España; Assay and pathogenesis of oncogenic viruses in nonhuman primates, by H. Rabin; New herpesviruses from South American monkeys: preliminary report, by L. V. Melendez, M. D. Daniel, H. H. Barahona, C. E. O. Fraser, R. D. Hunt, & F. G. Garcia; The research reagents program of the National Institute of Allergy and Infectious Diseases, by R. J. Byrne; A program for surveillance of nonhuman primate disease, by A. F. Kaufmann; B. virus vaccine, by R. N. Null; Use of nonhuman primates for vaccine manufacture and control, by N. M. Tauraso; The identification of primates used in viral research, by R. W. Thorington, Jr.; Viral biology and ecology, by R. Cooper; Reduction of nonhuman primate viral infection, by W. D. Houser; Epizootic vesicular disease in macaque monkeys, by B. Lourie, W. G. Morton, G. A. Blakely, & A. Kaufmann; Possible cytomegalovirus infection in man following chimpanzee bite, by Elizabeth Muchmore; Rabies in imported nonhuman primates, by J. H. Richardson & G. L. Humphrey; Delta Primate Center viral infection losses, by H. R. Seibold; Collaborative studies on nonhuman primate virology, by K. F. Soike.

PHYSIOLOGY AND BEHAVIOR

The influence of introductory techniques on the formation of captive mangabey groups. Bernstein, I. S. (Yerkes Reg. Primate Res. Cen., Emory U., Atlanta, Ga. 30322) *Primates*, 1971, *12*, 33-44.

Twenty-seven sooty mangabeys (*Cercocebus atys*) were used in a series of experiments concerned with the effects of introductory technique upon group formation. The number of animals introduced, the number of animals resident and the age and sex characteristics of the newcomers and residents all influenced the nature of initial interactions. When preformed groups were introduced to each other another level of complexity was introduced inasmuch as the physical limitations of the test situation precluded permanent main-

tenance of two group structures. The reception of newcomers was similar to that described in macaque experiments but group integrative mechanisms were clearly still in progress at the conclusion of the experimental period. A well organized successful breeding group has emerged from these experiments.

Four years of annual studies of chimpanzee vision. Young, F. A., Leary, G. A., & Farrer, D. N. (Primate Res. Cen., Washington State U., Pullman, Wash.) *American Journal of Optometry and Archives of American Academy of Optometry*, 1971, *48*, 407-416.

Four annual studies of the visual ocular components of approximately 40 male and 40 female chimpanzees are summarized and discussed. In general, ocular changes over the five-year span are similar to those found in human subjects under similar conditions except for changes in the corneas, which show changes not usually found in humans. Approximately a third of the subjects show increased axial lengths and myopia. Females show higher levels of myopia than males.

Amino acid patterns in the plasma of Old and New World primates. Peters, J. H., Berridge, B. J., Jr., Chao, W. R., Cummings, J. G., & Lin, S. C. (Life Sci. Div., Stanford Res. Inst., Menlo Park, Calif. 94025) *Comparative Biochemistry and Physiology*, 1971, *39B*, 639-647.

1. Fasting plasma amino acid levels were determined in one New World (squirrel monkey) and four Old World (rhesus and talapoin monkeys, chimpanzees, and stump-tailed macaques) subhuman primate species. The values were compared with those for normal human subjects. 2. Few qualitative differences were observed between man and the simian species and among the latter species in the 29 plasma constituents measured. 3. Numerous quantitative differences between man and the simian species and among the latter species were observed.

51-chromium-labeled erhthrocyte half-time in rhesus monkeys (*Macaca mulatta*). Mulder, J. B., Brown, R. V., & Corwin, L. A. (Sinclair Comp. Med. Res. Farm, U. Missouri, Columbia, Missouri 65201) *Laboratory Animal Science*, 1971, *21* [Part I], 870-872.

Half-time disappearance of ^{51}Cr-labeled erythrocytes is useful diagnostic information. In this study the half-time disappearance of labeled erythrocytes from rhesus monkeys (*Macaca mulatta*) and the effect of age or sex on erythrocyte half-time was determined. Radioactive sodium chromate was used for erythrocyte labeling in 42 animals, ranging from 2-12 years of age. The half-time disappearance was calculated for each animal by linear regression. Mean erythrocyte half-time was: 2-4 years of age, 14.93

(±1.00) days; 5-7 years of age, 17.02 (±0.98) days; and 8-12 years of age, 17.01 (±0.36 days). The difference in erythrocyte half-time between the younger age group and the 2 older age groups was significant ($p < 0.01$). No significant differences ($p < 0.05$) existed between each of the 2 older groups or between sexes.

Normal serum biochemical values of *Macaca arctoides*, *Macaca fascicularis*, and *Macaca radiata*. Altshuler, H. L., Stowell, R. E., & Lowe, R. T. (Nat. Cen. Primate Biol., U. California, Davis, Calif. 95616) *Laboratory Animal Science*, 1971, *21* [Part I], 916-926.

Sera from *Macaca arctoides*, *Macaca fascicularis*, and *Macaca radiata* were studied to establish normative baseline values for 23 chemical constituents. The animal populations studied were carefully selected to include only mature, healthy animals. Highly significant differences in the normal ranges were found when the different species and when males and females of the same species were compared. The frequency distribution curves of the animal populations studied were found to be non-Gaussian. Certain differences between the normal ranges of the species studied and normal ranges of non-simian populations were observed and briefly discussed.

Comparative blood values in several species of nonhuman primates. Vogin, E. E., & Oser, F. (Food & Drug Res. Labs., Inc., Maspeth, N. Y. 11378) *Laboratory Animal Science*, 1971, *21* [Part I], 937-941.

Hematological and blood chemical data have been compared for 4 species of monkeys. The results indicated that the rhesus, galago, and cynomolgus monkeys have values essentially similar for all of the parameters examined. Squirrel monkeys often showed marked deviations from the means of the other species.

DRUGS

Sedation for transportation of a lowland gorilla. Bush, M., Moore, J. A., & Neeley, Lena M. (Div. Lab. Anim. Med., Johns Hopkins U. Sch. Med., Baltimore, Md. 21205) *Journal of the American Veterinary Medical Association*, 1971, *159*, 546-548.

Phencyclidine and promazine is a satisfactory combination for sedating the lowland gorilla for a long flight.

FACILITIES, CARE AND BREEDING

Establishment of a colony of titi monkeys (*Callicebus moloch*). Lorenz, R., & Mason, W. A. (Delta Reg. Primate Res. Cen., Tulane U., Covington, La. 70433) *International Zoo Year-*

book, 1971, *11*, 168-175.

The history and conditions of care of a colony of over 45 titi (*Callicebus*) monkeys are described.

Estrous behavior of free-ranging rhesus monkeys (*Macaca mulatta*). Loy, J. (2454 Kennington Rd., Knoxville, Tenn. 37917) *Primates*, 1971, *12*, 1-31.

The sexual behavior of a group of free-ranging rhesus monkeys (*Macaca mulatta*) was studied for 13 consecutive months in an attempt to determine whether or not sexual activity occurred year-round, and the importance of sexual attraction to rhesus monkey social organization. Estrous behavior was seen both inter-menstrually and peri-menstrually, producing a shorter mean estrous cycle length than reported by other workers. New data was gathered on the inter-relationships among age, dominance rank, and sexual activity; son-mother and brother-sister matings; and sexual favoritism among free-ranging rhesus monkeys. A few females who failed to conceive during the fall breeding season showed cyclic estrous behavior throughout the entire annual cycle. Hypotheses are given as to possible physiological bases for birth season sexual cycles. Several forms of inter-animal bonding, including sexual bonding, are enumerated, and their importance to rhesus monkey social organization discussed.

Vital statistics from a breeding colony. Reproduction and pregnancy outcome in *Macaca mulatta*. Wagenen, G. van (Dept. Obstet. & Gyn., Yale U. Sch. Med., New Haven, Conn.) *Journal of Medical Primatology*, 1972, *1*, 3-28.

Vital statistics are presented for a colony of *Macaca mulatta* established in 1935 in the Department of Obstetrics and Gynecology, Yale University School of Medicine. Resident monkeys always number around 75 including infants, juveniles and adults aged to 30 years. To avoid inbreeding, purchased animals of equal number were introduced to make growth and developmental data of greater use.

Reproductive history of the Holloman chimpanzee colony. Butler, T. M. (AMD OL (RDA), Holloman Air Force Base, New Mexico) *Journal of Medical Primatology*, 1972, *1*, 51-57.

The Aeromedical Research Laboratory at Holloman Air Force Base, New Mexico, has pioneered in maintaining and breeding chimpanzees for medical experimentation. Using improved husbandry techniques, a most successful chimpanzee breeding colony has been developed. A relatively small breeding group produced 50 pregnancies during 1966-1971. It is expected that the colony will continue to produce 8 to 10 offspring per year.

Observations on mating behavior of wild siamang gibbons at

Fraser's Hill, Malaysia. Koyama, N. (Dept. Primate Ecology, Primate Res. Inst., Kyoto U., Inuyama, Aichi, Japan) *Primates*, 1971, *12*, 183-189.

Copulatory and associated behaviors were observed during a 15 months' stay at Malaysia. Photographs revealed that the mating posture was ventro-ventral, followed by the male's approach from above and behind.

Reproductive patterns of three species of macaques. MacDonald, G. J. (Lab. Human Reprod. & Reprod. Biol., Dept. Anatomy & N. E. Reg. Primate Res. Cen., Harvard Med. Sch., Boston, Mass.) *Fertility and Sterility*, 1971, *22*, 373-377.

Reproductive cycles of three species of macaques, *M. arctoides*, *M. fascicularis*, and *M. mulatta* were observed in a controlled environment. Recorded were: duration of menstrual flow, periodicity of menses, occurrence and duration of physiologic amenorrhea, days of exposure required for conception, inception, duration, and incidence of implantation bleeding, duration of gestation, and reproductive efficiency of each species. The effectiveness of the breeding program is indicated by the summated reproductive efficiency for each of the three species. These data allowed comparisons between species.

An annual rhythm in the sexual activity of the male rhesus monkey, *Macaca mulatta*, in the laboratory. Michael, R. P., & Keverne, E. B. (Primate Behav. Res. Labs., Inst. Psychiatry, Bethlem Royal Hosp., Monks Orchard Road, Beckenham, Kent, England) *Journal of Reproduction and Fertility*, 1971, *25*, 95-98.

The report describes annual changes in the ejaculatory performance of 15 male rhesus monkeys when paired with intact females whose Fallopian tubes had been ligated to prevent pregnancy. Although exteroceptive factors were not rigorously controlled, the seasonal changes in temperature and illumination were quite small. Data were obtained from 1156 tests conducted during a 5-year period from January 1965 to December 1969. There was a well-marked maximum in ejaculatory activity during December which contrasted with low levels in the period, February to May. The mean for November to January, the peak mating period in India, was significantly greater than that for March to May, the peak birth period in the wild.

Canine, feline, and laboratory primate dry feeds: guidelines to evaluation. Feldmann, B. M., Dudman, L. M., & Redfearn, M. S. (Div. Anim. Resources, U. California, Berkeley, Calif. 94710) *Laboratory Animal Science*, 1971, *21* [Part I], 862-864.

Laboratory animal dry feed manufacturers were asked

to supply nutritional data on their canine, feline, and laboratory primate feeds. More nutritional information than currently available is needed to adequately compare these feeds. Comparative feeding trials under specified conditions are the *sine qua non* of animal feed evaluation.

ECOLOGY AND FIELD STUDIES

The orang-utan in Sabah today. MacKinnon, J. *Oryx*, 1971, *11*, 141-191.

A study of a wild population in the Ulu Segama Reserve. Contents include Part I, Background: Introduction; Anatomy, morphology and biochemistry; Prehistory, history and mythology; Orang-utans in captivity; Attempts at rehabilitation; The study of wild orang-utans. Part II, The Study: Methods of study; Ecology of habitat; Nests: distribution and structure; Locomotion and posture; Daily routine: feeding, drinking, resting; Orang-utan group composition; Display, vocalisation and communication; Social bonds: grooming and aggression; Sexual behaviour; Infant development and maternal care; Play; Group interaction and encounters with other animals; Population density. Part III, Conclusions and Discussion: Summary of study; Discussion; What hope? Bibliography.

TAXONOMY

Color and sex in gibbons. Fooden, J. (Field Museum Nat. History, Roosevelt Rd., Lake Shore Drive, Chicago, Ill. 60605) *Bulletin of The Field Museum of Natural History*, 1971, *42* [6], 2-7.

Gibbons vary in hair color, much as do human beings; an evolutionary theory of variation is now being worked out which involves some interesting relationships between sex and color.

INSTRUMENTS AND TECHNIQUES

Nuclear family apparatus. Harlow, Margaret K. (U. Wisconsin, Madison, Wis. 53706) *Behavior Research Methods and Instrumentation*, 1971, *3*, 301-304.

The nuclear family apparatus was designed to provide a living arrangement that included fathers as well as other family members. Accordingly, it required generous dimensions so as not to cramp the males and durable materials that could withstand their strength. The apparatus described in this paper is relatively large, strong, easy to keep clean, and safe in its construction. It provides quarters for four rhesus monkey families--the parents and their offspring. Parents are confined to living cages at the rear and ends, but their young may divide their time between living cages

and large play areas equipped with motor apparatus.

A method for studying visually guided perception and learning in newborn macaques. Sackett, G. P., Tripp, R., Milbrath, Constance, Gluck, J., & Pick, H. (Reg. Primate Res. Cen., U. Wisconsin, Madison, Wis. 53706) *Behavior Research Methods and Instrumentation*, 1971, *3*, 233-236.

A maintenance technique was developed in which neonatal monkeys obtain all liquid food by placing their heads in a face mask mounted on their cage wall. Complete self-feeding required only 3-6 days for animals started at birth. Once under a self-feeding schedule, operant responses were shaped to study visual perception, visually guided motor performance, and discrimination learning at ages much younger than those allowed by most alternative methods. Dark rearing, with the only source of visual input being through the face mask eyeholes, allowed the *E* to control completely the neonate's visual experiences and its opportunities for visual-motor responding. The method has proven useful in rhesus monkey newborns for studying adaptation to prismatic displacement at 30 days of age, and to performance on various reinforcement schedules.

Tracking vervet monkeys by radio. Moor, P. P. de (Dept. Microbiol., Inst. Pathol., Pretoria, South Africa) *African Wild Life*, 1970, *24*, 269-276.

Ten vervet monkeys (*Cercopithecus aethiops*) are being tracked remotely by means of a radio system in Ndumu Game Reserve in South Africa. The transmitter is housed in a brass cylinder about 1-1/4 inches in length and 3/4 inches in diameter. It is attached to the monkey by means of a copper band, which forms the aerial and is enclosed in a plastic tube fastened around the animal's neck to form a collar. The net weight is 150 grams, or between 3% and 5% of the weight of an adult monkey. The batteries in the transmitters are expected to last longer than two years, this phenomenal life span being achieved by using an extremely weak signal and pulsing it so that current is actually only drawn for 1/5 of the total time. In addition, a photoelectric cell has been incorporated which switches the batteries off at night, when the monkeys are sleeping in trees. A direction-finding antenna and a portable receiving set are mounted on a Landrover to pick up the signals. Every day the movements of the animals are plotted and we are rapidly filling in details of the frequency and manner in which they make use of different parts of their territories according to the time of day and the season of the year.

Anesthetic management for fetal operation in the subhuman

primate. Morishima, H. O., Hyman, A. I., Adamson, K. *et al.* (Dept. Anesthesiology, Columbia U. Coll. Phys. & Surg., New York, N. Y. 10032) *American Journal of Obstetrics and Gynecology*, 1971, *110*, 926-933.

A stereotaxic atlas of the brain of the tree shrew (*Tupaia glis*). Marrocco, R. T., De Valois, R. L., & Boles, J. I. (Dept. Psychology, U. Calif., Berkeley, Calif. 94720) *Journal für Hirnforschung*, 1970, *12*, 307-312.

Thirteen adult *Tupaia glis*, weighing from 94-180 gms, were used to construct a stereotaxic coordinate system of the mes- and diencephalon. Ten animals were anesthetized, perfused, decapitated, and the heads stored in formalin solution. Steel sewing pins were later inserted into the brains under stereotaxic control at known horizontal and vertical positions as reference points. Three animals were used in electrophysiological investigations of the visual system. Electrode tracks verified the accuracy of the coordinate system obtained from the majority of the brains. After all brains had been fixed in formalin for at least 7 days, 50 μ sections were cut on a freezing microtome and stained alternately with cresylechtviolett and Luxol fast blue. Photographic enlargements were made of all brain sections and tracings made of selected sections. The tracings of 10 mm of brain from the level of the nucleus of the IVth nerve to the anterior commissure are presented.

A long term restraint device for primates. Henry, K. R., & Bowman, R. E. (Dept. Psych., U. Calif., Davis, Calif. 95616) *Physiology and Behavior*, 1971, *7*, 271-272.

A restraining device for large rhesus monkeys is described. This equipment allowed the animal to self-feed, yet it could not touch its intracranial cannulae. It also reduced tissue necrosis and allowed the animal to stand or sit as it willed, thereby maintaining good leg muscle tonus.

A self-feeding device for infant baboon liquid diets. Voss, W. R., Buss, D. H., & Carroll, L. W. (Dept. Virol. & Epidemiol., Baylor Coll. Med., Houston, Texas 77025) *Laboratory Animal Science*, 1971, *21* [Part I], 901-903.

A simple stainless steel device which holds a baby bottle in position for *ad libitum* feeding of infant baboons in holding boxes and cages was described. The advantages and disadvantages of using self-feeding devices were discussed.

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