LABORATORY PRIMATE NEWSLETTER

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Edited by

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POLICY STATEMENT

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

The *Newsletter* appears quarterly and is intended primarily for persons doing research with nonhuman primates. There is no charge for new issues or the current issue. Volumes 1-4 may be purchased for $4.00 per volume, Volumes 5-8 for $2.50 per volume, and back issues for the current year for $0.50 each. (Please make checks payable to Brown University.)

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

PREPARATION OF ARTICLES FOR THE *NEWSLETTER*.--Articles and notes should be submitted in duplicate and all copy should be double spaced. Articles in the References section should be referred to in the text by author(s) and date of publications, as for example: Smith (1960) or (Smith & Jones, 1962). Names of journals should be spelled out completely in the References section. Technical names of monkeys should be indicated at least once in each note and article. In general, to avoid inconsistencies within the *Newsletter* (see Editor's Notes, July, 1966 issue) the scientific names used will be those of Napier and Napier [*A Handbook of Living Primates*. New York: Academic Press, 1967].

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ACKNOWLEDGMENT

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Managing Editor: Kathryn M. Huntington

CONTENTS

THE CARBOHYDRATES OF SQUIRREL MONKEY MILK*

David H. Buss

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Hopf (1969) recently reported in this *Newsletter* that squirrel monkey milk contains approximately equal quantities of galactose, lactose, and glucose, to a total level of just over 0.1 g/100 ml milk. The only carbohydrate previously detected in nonhuman primate milk is lactose, usually at a level of 4 to 8 g/100 ml milk. But the species examined--chimpanzee (Buss, unpublished results), baboon (Buss, 1968), talapoin monkey (Buss and Cooper, 1970), and *Galago crassicaudatus* (Pilson and Cooper, 1967)--included no New World monkeys.

These findings prompted us to examine the sugars of 15 samples of milk from four squirrel monkeys (*Saimiri sciureus*, from Leticia, Colombia), whose infants were thriving, at lactation stages from 93 to 153 days. Milk from one squirrel monkey whose infant died two days postpartum was also studied. The milk was collected aseptically and immediately frozen to -70°C; it was later analyzed without the use of acid which could hydrolyze any lactose present.

For analysis, the samples were held at room temperature until melted. The lipids were removed with ether and petroleum ether after the addition of a little ammonia. Portions of the remaining aqueous solutions were combined according to animal, and the mixtures were dialyzed at 4°C against several small volumes of water. The dialysates from each sample were combined and lyophilized, and the resulting crystals were dissolved in water (to 20 mg/ml). Aliquotes (5 µl) of the five solutions were chromatographed for 16 hours on Whatman No. 1 filter paper with ethyl acetate/pyridine/water (10:4:3) as the developing solvent; the chromatogram was then sprayed with ammoniacal silver nitrate and heated at 80°C (Jenness, Regehr, and Sloan, 1964). Standards of galactose, lactose, and glucose were chromatographed at the same time.

The only carbohydrate detected in the samples from each of the five squirrel monkeys was lactose.

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*Supported by Grant FR-00451 and Contract PH 43-63-56, both from the U.S. Public Health Service.

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ANNOUNCEMENT FROM YERKES REGIONAL PRIMATE RESEARCH CENTER CONCERNING VISITING SCIENTISTS

The Yerkes Regional Primate Research Center wishes to increase visitations by members of the scientific community for purposes of great ape and other primate research. Accordingly, its administration will view with favor proposals and requests from investigators to spend from a few months up to two years at the Center. For qualified investigators the only restrictions necessarily imposed by the Center will be: (1) that the proposed research be basically compatible with other research programs in progress at the Center, (2) that the investigator provide his own salary, assistant, and support monies, and (3) that the Center be properly acknowledged in all publications or other creative works directly benefited by the researcher's stay at the Yerkes Laboratories. Investigators on sabbatical and research leaves from their home institutions are particularly encouraged to apply.

For further information please write directly to Dr. Geoffrey H. Bourne or to Dr. Duane M. Rumbaugh, Yerkes Regional Primate Research Center, Emory University, Atlanta, Georgia 30322.

SPONTANEOUS MELIOIDOSIS IN A MONKEY: REPORT ON ANOTHER CASE*

Melioidosis was diagnosed in October 1969 in a 9-year-old female pigtail monkey (*Macaca nemestrina*), being used in behavioral research in Seattle. The animal had been semi-isolated for 3 years, but in May was briefly caged near the rest of the colony while floor repairs were made in their observation compound. The monkey had been well except for unexplained lameness in the right leg and mild anemia in August 1969 for which she received iron parenterally. On September 18, she had extensor paralysis of the right leg compatible with a radial nerve injury, mild swelling of the right eyelid and generalized lethargy, and was placed in isolation.

Within several days, a large fluctuant swelling developed over the frontal bone, extending over the orbital crest to involve the right palpebrum. The swelling was excised and 10 cc of a thick, grey-white fluid was drained. The abscess was flushed and packed with a furacin seton, and sodium ampicillin therapy was started. Lincomycin was then used after a preliminary culture of the abscess demonstrated a coagulase positive staphyloccus and a hemolytic streptococcus, sensitive to Lincomycin.

On October 3, three fistulous tracts, discharging a purulent material, were noted on the medial aspect of the upper right forearm. About this time, a gram-negative rod which biochemically suggested *Pseudomonas pseudomallei* was isolated from the original culture; this was subsequently confirmed.

The animal died on October 13. A serum sample taken several hours before death showed a hemagglutination antibody (HA) titer for *P. psuedomallei* of 1:2,560. A necropsy revealed: (1) complete resolution of the abscess over the right frontal bone and eyelid; (2) a marked accumulation of purulent material over fascial planes on the proximal medial aspect of the right arm; (3) a large unilocular abscess beneath the right mammary gland, which extended in a proximal-lateral direction to the axilla. There was no gross anatomic connection between the infections on the right arm and mammary gland; and (4) the right lower lobe of the lung contained two 2 × 2 cm firm nodules which were granulomatous in consistency.

Serologic examination of the remaining 20 animals in the behavioral group demonstrated seven to have HA titers to *P.pseudomallei*, ranging from 1:80 to 1:2,560. A bacteriologic and serologic survey on all animals in the colony is underway.--Reported by Lloyd A. Dillingham, D.V.M., Washington Regional Primate Research Center, and R. Palmer Beasley and William B. Mitchell, Preventive Medicine, University of Washington.

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*From *Morbidity and Mortality Weekly Report*, 1970, *19*, [8], 82, 88. See the July and October, 1969, issues of the *Laboratory Primate Newsletter* for previous case reports.

THE LAST OF THE GOLDEN MARMOSETS[1]

Clyde A. Hill

San Diego Zoological Garden

San Diego, California 92112

"Will you travel near Rio de Janiero?" "Yes, as a matter of fact, it is one of my last stops," replied Dr. Robert Cooper, director of the San Diego Zoo's Primate Research Colony. "As a favor, check into the golden marmoset situation. I am worried about them because they occur in such a small area of coastal forest near the city. If the area is ever developed for agriculture or other commercial uses, it is going to be good-bye goldens."

It was the winter of 1964 and Dr. Cooper was leaving for South America to study sources of New World primates for use in medical research.[2] Although these studies for the National Cancer Institute were successful, he returned from South America with disturbing news about the golden marmosets. During his visit, he had learned that its territories were being developed, the forests were being destroyed, and exportations had fluctuated between two hundred and three hundred a year since 1960. If the situation were allowed to continue, the world's most brilliantly colored primate probably would become extinct in ten years. The available information was not complete; more data was needed to make an ironclad case before legislation could be proposed to rescue *Leontopithecus rosalia*. Documentation arrived; there was no doubt now that something had to be done.

Without fanfare and with deliberation the problem was attacked on three fronts--exportations from Brazil must be slowed, importations into the United States and Europe should be greatly reduced or stopped, and the animal's natural habitat kept intact as much as possible to

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[1]From *Zoonooz*, 1970, *43* [1], 12-17.

[2]The Primate Research Colony was established in 1962 through a contract with the National Cancer Institute of the National Institutes of Health, Department of Health, Education and Welfare. Its purpose was to evaluate the reproductive potential in captivity of a number of small primate species. The Zoo was a good institution to take this contract because of its long successful experience with primates in captivity; and because the equable San Diego climate permitted these studies to be conducted out of doors. As a result of work performed during the ensuing seven years, eleven species have been studied with regard to their husbandry, breeding biology, growth and development, and clinical pathology.

insure its survival. It was done quietly to prevent last minute exploitation. A message was put on the international "zoo grapevine" that the golden marmoset was in trouble and immediately most zoos adopted a "hands off" importation policy. Nevertheless, the word leaked out. Unscrupulous animal dealers issued "get 'em while they last" notices to zoos and other users of primates such as the pet industry. Prices jumped from $35.00 each to $150.00 within a few weeks. Conservationists in Brazil were doing their share. Scientists such as Dr. Fernando D. de Avila Pires, curator of mammals at the National Museum associated with the Federal University of Rio de Janeiro, faced heavy opposition but managed to introduce legislation to ban the export of *Leontopithecus* and to give it government protection. The writer, as chairman of the Subcommittee on Primate Conservation for the American Association of Zoological Parks and Aquariums (AAZPA), introduced a proposal to blacklist the importation of golden marmosets and to expel members who failed to observe the ban. Blacklisting already was in effect for the orangutan and the Galapagos Island giant tortoise. After much deliberation, a compromise was made and the golden marmoset was given a new designation, a species recognized by the AAZPA as "endangered." This was an official warning of status; if the problem became worse, a complete blacklisting would follow.

It was then the autumn of 1966. The International Union of Directors of Zoological Gardens and Aquariums (IUDZG) also became involved with the conservation of this tiny primate. The International Union for the Conservation of Nature and Natural Resources (IUCN), sped on by the AAZPA and IUDZG decisions, completed its independent study and gave the golden marmoset recognition as "very rare and believed to be decreasing in numbers and giving cause for very grave anxiety." The importation of golden marmosets into the United States became a trickle. The AAZPA again weighed the matter and put *Leontopithecus* on the blacklist.

The exportation-importation squeeze helped immensely. The attrition rate slowed considerably as animal trappers could no longer find a market, and the hunting of this species had turned from legal to clandestine. The export-import ban has provided only temporary relief. As long as man persists in appropriating the habitat of the golden marmoset, *Leontopithecus* will continue down the road to extinction. Hopefully, the Brazilian Government will set aside areas for the preservation of this and other species indigenous to the region.

In the meantime, the AAZPA has made plans for the golden marmosets already in captivity. If all else fails, it may well be that zoos will provide final sanctuary. To be sure, this is second best to what nature could provide, but it is a far better fate than oblivion.

The golden marmosets now held by zoos will be pooled into four major breeding centers. There the marmosets will be placed in a situation which will encourage maximum breeding. If the centers are successful, surplus marmosets will be distributed to other zoos. Thus, in theory,

the wild population should be virtually untouched by zoos. It is hoped that most of the zoos of the AAZPA eventually will have a golden marmoset exhibit, not only because they make such a spectacular display, but because they are an eye-arresting example of the need of conserving wildlife in general.

The San Diego Zoo was chosen as the first center because it had bred and reared more golden marmosets than any other zoo, some two dozen, and because of its mild climate. On the surface it would appear a relatively simple project, but unfortunately it was anything but that. Contrary to popular belief, the species has not done well in captivity; the usual pattern being that a zoo or other institution will acquire a pair or maybe even a half-dozen. Frequently, offspring have been produced, giving rise to a sigh of relief because this has been interpreted as proof that the animals are well and healthy. Soon after, their caretaker's attention was focused on something else that seemed to need more care. Meanwhile, a golden had died--it was a sad loss, but the colony still showed an increase and "nothing lives forever, you know." Later, for every addition there have been two subtractions, and, eventually, there has been the need for "new blood."

The causes of this phenomenon are many. Recent discoveries in the field of nutrition have provided some answers. Researchers (Hunt, Garcia, & Hegstead, 1967) have found that marmosets need tremendous amounts of Vitamin D; in fact, marmosets seem to require almost the amount needed by a full-grown man. Unfortunately, the form of D vitamin supplement given to most primates was the same as that commonly given to man, D^2, which is derived from plant sources. Marmosets cannot utilize D^2, but D^3, derived from animal sources, seems to do the trick. No wonder so many South American primates in captivity suffer from rickets and other vitamin D deficiency problems.

The construction of the breeding center was an awesome responsibility because we were aware of many factors working aginst us and suspected there might be as many or more unknown to us. Curators and keepers, primate psychologists and laboratory technicians, Zoo designer and cage builder met and discussed the problems. Gradually the designer's pen by way of accumulated knowledge sketched a set of working plans, and the plans merged into the reality of concrete, steel, Fiberglas, and a host of other building materials. The unit was finished and on October 13, 1967, it was dedicated by Mrs. Roger M. Netherland. Commander Netherland, a Navy pilot, while attached to Attack Carrier Air Wing Five serving in the Far East, had donated funds which made possible the construction of this conservation center.

The marmosets have been given a southern exposure--scarcely a day passes without sunshine beaming down on them, regardless of season. Fresh air is theirs all the time for they are not housed in a building but out-of-doors. Heat lamps keep them comfortable on cooler days and radiantly heated floors make the bedrooms cozy at night. Part of the

collection is kept on public view; thus the message of conservation can be seen by all. Other golden marmosets are kept away from the public in an effort to determine whether this condition might enhance reproduction. The unit has been in operation for two years and, so far, we have not enjoyed spectacular success. Four infants have been born, plus two stillbirths; two adults have been acquired, and three have died. Obviously, we are not on the right track and further modifications must be made.

Perhaps these creatures need a more natural environment--with this thought in mind, we are expanding the unit to include a jungle cage, literally a bit of natural forest. In addition to the trees and bushes already growing in an area surrounded by wire mesh, large tubs filled with additional plant species will be moved in and out of the cage as necessary. Eugenia, hybiscus, and other food bushes will be replaced as they are eaten, trampled, or picked apart. The jungle cage may not be the answer to all problems, but we hope it will solve a few; at least it will tend to make the marmosets behave in ways enjoyed most by the visitor.

As time marches on, more improvements in quarters and feeding techniques may be deemed advisable in our search for a better way to successfully keep *Leontopithecus* in captivity. Unfortunately, time is not on our side!

[The following information appeared among the photographs in the original article--Ed.] The silky, shimmering hair of the golden marmoset is especially luxuriant on the sides of the head and nape giving it a leonine appearance; hence, its other names, lion marmoset and maned tamarin. There is evidence that the golden marmoset was known to Europeans as early as 1551; and by Shakespeare's time, marmosets of many species were kept as pets. They even became popular with ladies of fashion who carried them about on their person. Madame Pompadour had a golden marmoset, probably because it is the most brightly colored of them all.

The golden marmoset was at one time practically confined to the forests of the Serra do Mar in the state of Rio de Janeiro at elevations from 1,500 to 3,000 feet. Now it is restricted to the strip of montane rain forest, about 60 miles wide on the coast, of the states of Rio de Janeiro and Guanabara in southeastern Brazil. It lives in small scattered troops from sea level to about 1,500 feet, avoiding contact with man. Dr. Fernando D. de A. Pires wrote, "When Prince Maximilian zu Wied traveled through the region in 1816-1817, he found the species common. In recent years the area has become heavily populated and to some extent industrialized. Much of the indigenous forest has been felled and replaced with exotic trees. Today, only a small percentage of the region is suitable habitat for the marmoset. The demand for living specimens has brought about a steady decline."

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REQUEST FOR PRIMATE MATERIAL: UTERINE CERVIX

An extensive comparative study on the microanatomy, histology, and cytology of the cervix of nonhuman primates is being undertaken. We request any samples you might have available of pregnant or non-pregnant uterine cervices. Please send in 10% formalin or any other fixative with known information such as age and reproductive stage to the following address:--E.S.E. Hafez, Department of Gynecology-Obstetrics, Wayne State University School of Medicine, Medical Research Building, 550 East Canfield, Detroit, Michigan 48201.

* * *

OFFER OF A TRADE FOR BREEDING *MACACA NEMESTRINA*

I would like to trade one adult male *Macaca nemestrina* and one adult male *Macaca arctoides*, both proven sires, for two female *Macaca nemestrina*, preferably of breeding age. Both of these males were handled to maturity, their canines have been cut, and while they cannot be called tame, they are used to being handled. Both are in excellent health.--W. B. Lemmon, P.O. Box LL, Norman, Oklahoma 73069.

* * *

OLD WORLD MONKEYS FOR SALE

The following monkeys are available for purchase: 4 *Cercopithecus aethiops*, female, 3.4-3.6 kg, $40 each; 1 *Cercocebus galeritus*, female, 8.6 kg, $150; 1 *Cercocebus albigena*, 5.7 kg, $125; 1 *Papio anubis*, female, 10.3 kg, $150, 1 *Papio hamadryas*, female, 4.3 kg, $225. If interested, please contact Dr. Charles W. Hill, Delta Regional Primate Research Center, Covington, La., 70433 (Tel. 504-892-2040).

U.S. NATIONAL INSTITUTES OF HEALTH AND UNIVERSITY OF PUERTO RICO SIGN PACT TO CONTINUE PRIMATE ECOLOGY STUDIES*

Dr. Robert Q. Marston, National Institutes of Health Director, recently visited Puerto Rico to sign an agreement with Dr. Jaime Benitez, President of the University of Puerto Rico, to continue a research program in ecology. The research is a cooperative venture between the University and the National Institute of Neurological Diseases and Stroke (NINDS). It is supported by NIH.

The pact was signed "to confirm a new accord between us--an agreement which is a continuation of a long-time and extremely productive association."

One phase of a 14-year cooperative venture between the University and NINDS has been culminated. Research will continue on four offshore "monkey islands" on the biological, behavioral, social, and medical aspects of primatology. Studies will include population dynamics, social behavior, dominance, maternal-infant relationships, physiology and pathology and breeding.

The rhesus monkey colony, established on Cayo Santiago in 1939, was the first primate research facility of its kind. Most of the 1,000 monkeys now on the island range freely while only a small number are kept in enclosures for close observation.

The NINDS Puerto-Rican-based Laboratory of Perinatal Physiology, which has completed obstetrical studies on its caged colony of monkeys, will move its facilities to the NIH reservation in the near future. Since 1956, the program of this laboratory had focused on the neurological consequences of perinatal injury. The gestational physiology of these rhesus monkeys closely resembles that of man. The studies in the program served as a counterpart to NINDS's Collaborative Perinatal Research Project--a study of pregnancy, birth, and early development conducted with 55,000 mothers and their children at 14 medical centers.

Helps Doctors.--Studies with these monkeys have helped to clarify the mechanisms responsible for brain damage during the perinatal period, and especially significant studies were conducted on neonatal asphyxia and resuscitation.

The perinatal program in Puerto Rico has become known as a small center of international research and exchange.

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*Based on an article in *The NIH Record*, 1970, *22* [6], 1.

REQUEST FOR PRIMATE MATERIAL: SMALL INTESTINES FOR STUDY OF LACTASE LEVELS

A colleague and I are engaged in a research project in which we are attempting to determine whether or not nonhuman primates can tolerate lactose in milk. We plan to make such a determination by measuring the levels of intestinal lactase in primates who have been sacrificed. In order to maintain proper controls we also plan to determine levels of maltase and sucrase as well as do histology on the small intestine. We need the small intestines of adult nonhuman primates. We are interested in all species of primates.

In order for our research to be meaningful, the following specifications must be adhered to:

The specimen (1) must be from an adult primate free of any known serious gastrointestinal disease, who has fasted for 12 hours prior to sacrifice; (2) should include all of the small intestine, and both the pyloric sphincter and ileocecal sphincter should be included in the case of smaller species, while that portion of the small intestine from the pyloric sphincter to well into the ileum should be included in the case of larger species; (3) must be removed from the animal and frozen within thirty minutes (at the very outside) following death, for lactase begins deteriorating almost immediately following expiration; (4) should be neatly packed (not just dropped in a plastic bag) in plastic film and *immediately* frozen on dry ice.

A very small piece of the jejunum (about half the size of a dime) should be excised upon removal from the animal prior to freezing, and placed in formalin and shipped with the remainder of specimen. This will be used for histology.

A brief statement which includes species, diet, estimate of age, reason for sacrifice or cause of death, evaluation of health prior to death, where animal was obtained, and what drugs, if any, the animal was given prior to death would be helpful.

Orders should be shipped air freight packed in dry ice, to my colleague, Dr. Michael Charney (Dept. of Anthropology, Idaho State University, Pocatello, Idaho 83201).--Robert D. McCracken, School of Public Health, University of California, Los Angeles, California 90024 (phone: Area Code 213 825-5236).

INTERNATIONAL STUDBOOK FOR THE GOELDI'S MONKEY

In order to complete a studbook for Goeldi's monkeys (*Callimico goeldii* Thomas, 1904) we are asking all owners and caretakers to contact the studbooker. The animals of the following owners are already known to us:

(1) Chicago, Brookfield Zoo
(2) Chicago, Dept. of Anatomy, University of Chicago
(3) Goulds, Florida, Monkey Jungle
(4) Frankfurt, Zoologischer Garten
(5) Houston, Dental Science Institute
(6) Ingelheim, Mrs. Heinemann
(7) Paris, Mr. LeNestour
(8) Pittsburgh, Zoological Garden
(9) San Antonio, Zoological Garden
(10) San Diego, Zoological Garden

Goeldi's monkeys are easy to recognize. They are the only entirely black, marmoset-sized primates from South America. Sometimes the tips of the hairs show a browny shine; no color pattern. The upright hair on top of the head forms a crown.--Rainer Lorenz, Studbooker, Dept. of Behav. Sci., Tulane Univ., Delta Regional Primate Research Center, Covington, La. 70433, U.S.A.

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REQUEST FOR MALE LEMUR

We are seeking an adult male grey lemur (*Lemur macaco fulvus*) to set up a breeding pair with a female in our lab. Anyone who has an available male is requested to contact Dr. Claud A. Bramblett, Department of Anthropology, The University of Texas, Austin, Texas 78712.

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REQUEST FOR CHIMPANZEE CAGES

I would like to obtain the loan of two cages suitable for temporary housing of adult chimpanzees. The cages are needed for a period of two months. I would pay shipping costs.--Charles E. Graham, Yerkes Regional Primate Research Center, Emory University, Atlanta, Georgia 30322.

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

BOOKS

The chimpanzee. Vol. 1. *Anatomy, behavior, and diseases of chimpanzees.* G. H. Bourne (Ed.) Published in simultaneous European (Basel: Karger, 1969) and American (Baltimore: University Park Press, 1969) editions. (American edition: 478 pages, $28.50, if ordered singly, and $25.00 if subscribing to series.)

This is the first of a series of volumes on the chimpanzee to be edited by Dr. Bourne who is the Director of the Yerkes Regional Primate Research Center. This volume includes the following sections and articles: DISCOVERY: The discovery of the chimpanzee, by W. C. Osman Hill. TAXONOMY: The nomenclature, taxonomy, and distribution of chimpanzees, by W. C. Osman Hill. ANATOMY: The skeleton of the chimpanzee, by Adolph H. Schultz; Growth changes in skull, face, jaws, and teeth of the chimpanzee, by W. M. Krogman; Anatomy of the larynx and the anatomical basis of vocal performance, by G. Kelemen; The brain of the chimpanzee, by Totada R. Shantha and Sohan L. Manocha. BEHAVIOR: Research on the home-raised chimpanzee, by Winthrop N. Kellogg; A comparison of nesting patterns among the three great apes, by Irwin S. Bernstein. RADIATION: Whole body radiation in the chimpanzee, by Harvey Rothberg. INFECTIONS: Malaria in chimpanzees, by R. S. Bray; Intestinal infections, by R. E. Rewell.

The chimpanzee. Vol. 2. *Physiology, behavior, serology, and diseases of chimpanzees.* G. H. Bourne (Ed.) Published in simultaneous European (Basel: Karger, 1970) and American (Baltimore: University Park Press, 1970) editions. (American edition: 427 pages, $28.50, if ordered singly, and $25.00 if subscribing to series.)

This is the second of the series on the chimpanzee edited by Dr. Bourne. This volume includes the following sections and articles: PHYSIOLOGY, ANATOMY: Chimpanzee

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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.

visual perception, by A. H. Riesen; Chimpanzee color vision, acuity, and ocular components, by D. N. Farrer and F. A. Young; Morphology of the chimpanzee kidney: a comparison with man, by C. Craig Tisher; Renal function in the chimpanzee, by J. A. Gagnon; Energy metabolism of the chimpanzee by H. E. Dale, M. D. Shanklin, H. D. Joynson, and W. H. Brown; Temperature studies on the chimpanzee, by W. E. Ward and E. R. Archibald; The sense of taste of chimpanzees and other primates, by H. Kalmus; The spinal cord (spinal medulla) of the chimpanzee, by C. R. Noback and Sonya K. Simenauer; Postural, propulsive, and prehensile capabilities in the cheiridia of chimpanzees and other great apes, by Russell H. Tuttle. CHROMOSOMES: The chromosomes of the chimpanzee, by B. Chiarelli. BEHAVIOR: Chimpanzee social behavior, by W. A. Mason; Operant conditioning research with the chimpanzee, by F. H. Rohles, Jr. SEROLOGY: The evidence from genetically informative macro-molecules on the phylogenetic relationships of the chimpanzees, by M. Goodman, G. W. Moore, W. Farris, and Emily Poulik. INFECTIONS: Chimpanzee viruses, by S. S. Kalter and N. B. Guilloud; The isolation of mycoplasmas from chimpanzees, by B. C. Cole, C. E. Graham, J. R. Ward.

Laboratory animal handbooks. No. 4: *Hazards of handling simians*. F. T. Perkins and P. N. O'Donoghue (Eds.) London: Laboratory Animals Ltd., 1969.

See the previous issue of the *Newsletter* for a short description of the book. We list it again in order to provide the following specific information about purchasing the book. The book can be purchased for $6.00 (less 10% if remittance accompanies the order and no invoice is required) from Laboratory Animals Ltd., 7 Warwick Court, London, W.C.1, England. Make checks payable to: Laboratory Animals Ltd. A/C No. 3481115.

BIBLIOGRAPHIES

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This is the third of a series of supplements to the original bibliography, published in 1964.

DISEASE

Ketosis in subhuman primates. Seibold, H. R. (Delta Reg. Primate Res. Center, Tulane U., Covington, La. 70433) *Laboratory Animal Care*, 1969, *19*, 826-830.

A metabolic disorder resembling ketosis in cattle was observed in 9 *Callicebus moloch* and 1 *Pan troglodytes*.

Clinical signs, when observed, were depression and terminal coma. Ketone bodies were found in the urine. Anatomical lesions were fatty changes of the liver, kidneys, and myocardium. The *C. moloch* also had an increase of lipid in the adrenal cortices. There was no associated pathological condition in 4 of the animals. A possible connection between the ketosis and the negative feeding disposition of *C. moloch* in captivity is discussed.

Epizootic diarrhoea in a group of pig-tailed macaques (*Macaca nemestrina*). Groves, M. G., Anandan, J., & Davis, C. E. (Div. Vet. Med., Walter Reed Army Inst. Res., Walter Reed Army Med. Cen., Washington, D. C. 20012) *Kajian Veterinaire, Malaysia-Singapore*, 1969, *2* [1], 23-28.

An outbreak of diarrhoea in 24 pig-tailed macaques (*Macaca nemestrina*) recently transported to new holding facilities is described. This epizootic was unique in the variety of bacterial enteropathogens isolated and in the number of monkeys from which mixed cultures of enteropathogens were isolated. The role of shigella in the aetiology of simian diarrhoea is emphasized by the isolation of 13 strains of *Shigellae* spp. from 10 macaques. Four enteropathogenic *Escherichia coli* and 2 *Salmonella lexington* were also isolated. After treatment with ampicillin and furazolidone, all animals became asymptomatic. In follow-up cultures 2 isolates were obtained from monkeys which had previously been negative for enteropathogens.

Application of preventive health measures to curtail chimpanzee-associated infectious hepatitis in handlers. Krushak, D. H. (Phoenix Labs., Ecological Investigations Program, Nat. Communicable Disease Cen., 4402 North Seventh St., Phoenix, Arizona 85014) *Laboratory Animal Care*, 1970, *20*, 52-56.

At this facility and within a 3-year period, hepatitis was confirmed from 0-33 days after arrival in 9 of 14 chimpanzee cohorts. In the first 18 months of this period, infectious hepatitis was diagnosed in 5 of 6 handlers 12-29 days after exposure to the infected chimpanzees. Following the fifth human case, preventive health measures were initiated, including (1) routine administration of immune serum globulin to handlers; (2) use of protective devices and the proper management of chimpanzee personnel and facility hygiene. In the subsequent 18 months, no other handlers (5 involved) developed infectious hepatitis despite continued occurrence of hepatitis in newly arrived chimpanzee cohorts. These results suggest that rigorous application of the above preventive measures can reduce and perhaps eliminate the occurrence of chimpanzee-associated hepatitis in handlers.

Identification of intestinal helminth eggs in Old World primates. Jessee, Marianne T., Schilling, P. W., & Stunkard, J. A. (Vet. Services Div., Nav. Med. Res. Inst., Nat. Nav. Med. Cen., Bethesda, Md. 20014) *Laboratory Animal Care*, 1970, *20*, 83-87.

The illustrations, measurements, and descriptions of the intestinal helminth eggs presented in this article can be helpful to other laboratories working with Old World primates in the identification of the following parasites: *Strongyloides, Oesophagostomum, Trichuris, Physaloptera, Streptopharagus, Trichostrongylus, Ternidens diminuta, Physocephalus, Bertiella, Capillaria* and a trematode sp. The eggs were collected in fecal samples from chimpanzees, baboons, and 4 different *Macaca* species (*M. mulatta, M. cyclopis, M. arctoides, M. nemestrina*). Identification of the eggs was carried out to their genera with the exception of the trematode sp. Specific species identification of the helminths could not be accomplished with a high reliability by examining only the eggs found in the fecal sample; the exact identification of the helminths was accomplished from adult specimens collected during necropsy. Most of the above named parasites have been found frequently in Old World primates except for *Physocephalus*.

PHYSIOLOGY AND BEHAVIOR

Selected hematologic, serum chemical, and arterial blood gas characteristics of squirrel monkeys (*Saimiri sciureus*). Manning, P. J., Lehner, N. D. M., Feldner, M. A., & Bullock, B. C. (Dept. Lab. Animal Med., The Bowman Gray Sch. Med., Wake Forest U., Winston-Salem, N. C. 27103) *Laboratory Animal Care*, 1969, *19*, 831-837.

Selected hematologic, serum chemical, and arterial blood gas characteristics of a group of 112 Brazilian-type squirrel monkeys were reported. Most of the hematologic and serum chemical measurements were determined once yearly for 3 consecutive years. Serum enzyme activity of glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, and alkaline phosphatase was considerably higher than values reported for Old World nonhuman primates. Arterial blood gas characteristics (pH, $pCO_2 pO_2$) were measured on samples from sedated and nonsedated squirrel monkeys. The mean values for arterial pH and pCO_2 were compatible with metabolic acidosis which was more severe in the nonsedated group of monkeys. It was postulated that the low values for arterial pH and pCO_2 were due to struggling and hyperventilation which occurred when blood samples were obtained.

Studies on menstrual cycles and other related phenomena in the langur (*Presbytis entellus entellus*). David, G. F. X., & Ramaswami, L. S. (Reproduction Physiol. Sec., Dept. Zoology, U. Rajasthan, Jaipur) *Folia Primatologica*, 1969, *11*, 300-316.

Seventy-six menstrual cycles of 16 *Presbytis e. entellus* in captivity ranged from 19 to 68 days in duration. The mean of the cycle was 26.8 ± 1.0 days. The most common range was observed to be 21 to 26 days with a mode at 22 days. Common duration of menstruation was 2 to 4 days. Vaginal lavage study exhibited cyclical change and the cornified cells which are present throughout the menstrual cycle predominate during the midcycle. A drop in the vaginal temperature when the vaginal cornification is maximal is indicative of ovulation. "Ferning" in the vaginal lavage was conspicuous only during certain phases of the menstrual cycle. Cyclical response of the cervix to estrogen is obvious from the presence of "ferning" only during certain phases of the menstrual cycle and was found to be maximum on days 6 or 7. Three menstrual cycles of 2 langurs exhibited midcycle bleeding which occurred during the summer months. As there was no correlation between vaginal temperature drop and the vaginal cornification during these menstrual cycles, it is suggested that these could have been anovulatory. Prolonged duration of the menstrual cycles due to the change of conditions was invariably seen.

Some aspects of the physiology of the anesthetised marmoset. Davies, J. A. (Pharmacology Group, Bath Univ. Technology, Sch. Pharmacy, Bath, BA2 7AY, England) *Laboratory Animals*, 1969, *3*, 151-156.

Some normal values of blood pressure, heart rate, and respiration rate, obtained from 37 anaesthetised marmosets, are reported together with results of the electrocardiograms of 6 marmosets. The effects of a variety of pharmacological agents are also reported. The suitability of the anaesthetised marmoset as a representative of the primate order for the pharmacological evaluation of drugs that affect the cardiovascular and respiratory systems is discussed.

Certain hematologic and blood chemical values in adult stumptailed macaques (*Macaca arctoides*). Vondruska, J. F. (Industrial Bio-Test Laboratories, Inc., Northbrook, Illinois 60062) *Laboratory Animal Care*, 1970, *20*, 97-100.

Certain hematologic and clinical chemistry values of 36 adult stumptailed macaques (*Macaca arctoides*) were determined. Mean values, standard deviations, and minimal-maximal values were determined for hemoglobin concentration, and packed cell volume; total erythrocyte, total leukocyte,

total reticulocyte, total platelet (estimation), and differential leukocyte count; cellular indexes, serum concentration of urea nitrogen, creatinine, glucose, total protein, bilirubin, sodium, potassium, calcium, chloride values; erythrocyte and plasma cholinesterase, serum alkaline phosphatase, serum glutamic-pyruvic transaminase, and serum glutamic-oxolacetic transanimase activities. Calculations were made separately for males and females and then for the entire group, and the latter data were compared to known values for rhesus monkeys.

Baseline values of cerebrospinal fluid from the chimpanzee (*Pan troglodytes*). Derwelis, S. K., Butler, T. M., & Fineg, J. (Order reprints from T. M. Butler, Vet. Div., 6571st Aeromedical Res. Lab., Holloman Air Force Base, New Mexico 88330) *Laboratory Animal Care*, 1970, *20*, 107-108.

A lumbar puncture technique was used to collect cerebrospinal fluid from 27 chimpanzees at the 6571st Aeromedical Research Laboratory. Laboratory analyses and their respective mean results were as follows: total protein, 131.5 mg%; specific gravity, 1.006; glucose, 56.8 mg %; chloride, 125.3 mEq/1; potassium, 2.95 mEq/1; sodium, 144.5 mEq/1; and white blood cells, 1.8.

FACILITIES, CARE, AND BREEDING

Breeding gibbons (*Hylobates lar entelloides*) in the laboratory. Berkson, G., & Chaicumpa, V. (Illinois State Pediatric Inst., 1640 West Roosevelt Rd., Chicago, Ill. 60608) *Laboratory Animal Care*, 1969, *19*, 808-811.

Laboratory breeding of gibbons is feasible. Success depends on fertility and compatibility of pairs. Copulation is more frequent in the laboratory than has been reported in the field but is not strictly cyclical nor associated with fertilization. Abdominal swelling may be seen 4 months prior to parturition, but a more sensitive indicant of pregnancy is a regression of the eversion of the labia majora of the vulva.

A comparison of outdoor and indoor housing of rhesus monkeys (*Macaca mulatta*). Banerjee, B. N., & Woodard, G. (Woodard Research Corp., 12310 Pinecrest Road, Herndon, Virginia 22070) *Laboratory Animal Care*, 1970, *20*, 80-82.

A comparison was conducted of survival, physical condition, reproduction, and cost of housing of rhesus monkeys in outdoor and indoor facilities. Survival in the outdoor pens averaged 80-90%, which was the same as for the indoor monkeys. Body weight in the outdoor monkeys showed an average increase of 62%, in comparison to a 43% increase in the indoor monkeys over the same time period. The outdoor monkeys showed significantly better reproductive

performance than did those indoors. The cost for maintaining the outdoor monkeys was considerably less than for maintaining monkeys indoors.

INSTRUMENTS AND TECHNIQUES

An abdominal collar device for use on monkeys. Engstrom, G. C. (Dept. of the Army, Fort Detrick, Frederick, Maryland 21701) *Laboratory Animal Care*, 1970, *20*, 112-113.

A simple, inexpensive abdominal collar for postsurgical protection of abdominal incisions in monkeys is described. The device provides comfortable and painless protection without restraining the animal. The advantages over other methods for the protection of abdominal incisions, wounds, and catheters are discussed.

A monkey vest to carry lightweight equipment. Cressman, R. J., & Cadell, T. E. (Dept. of Psychology, U. Waterloo, Waterloo, Ontario, Canada) *Laboratory Animal Care*, 1970, *20*, 120-122.

A leather monkey vest was designed for carrying telemetry and other radio frequency oscillator equipment. The design permitted unrestrained rhesus monkeys (*Macaca mulatta*) weighing 3 and 9 kg to carry loads of up to 300 g. It was found that the animals could carry such loads for periods of at least 2 months without skin irritation and without limitation of locomotion.

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