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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 the mailing list is open to anyone in the primate field expressing an interest. There is no charge for new issues or the current issue. Back volumes will be furnished free of charge to any library operated by a nonprofit organization with the understanding that they will be kept in the library. Individuals may purchase Volumes 1, 2, 3, and 4 for $4.00 per volume, Volumes 5, 6, and 7 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 reference 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 reference section. Technical names of monkeys should be indicated at least once in each note and article. In general, to avoid inconsistencies within the *Newsletter* (see Editor's Notes, July, 1966, issue), beginning with the April, 1969 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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Managing Editor: Kathryn M. Huntington

EDITOR'S NOTES

Ecology. That is the word that we are hearing increasingly now. We will continue to hear it--undoubtedly more often and more loudly as time passes and man, as is his wont, continues to behave irresponsibly. We tend to think first of pollution, the poisoning of our air and water, when we hear the word, but it clearly means more than that. It means a concern with conservation in all its forms--with the land and all that is on it and with the sea and all that is in it, as well as with the air and water immediately surrounding us. For us, in particular, it means a growing concern with conservation of the populations of nonhuman primates throughout the world. We, as users of primates in the laboratory, are not yet sufficiently sensitive to this trend. But we must change and change soon. Not only because it is right to do so, but because we must do so. Our primary research tool or, if you prefer, the primary object of our research, is threatened with extinction--if not in fact, then in effect. Some governments have already banned the export of primates and others are seriously considering it. We are not just talking about exotic species, such as the golden marmoset, but "common" species, such as the squirrel monkey. Whatever our own convictions are, then, we must be aware that the forces of conservation are gathering strength, that this is bound to affect us personally and that it is coming much sooner than we may think. Furthermore, we must keep in mind that these forces are not always rational. For all of these reasons, we must begin to do our part. This means many things: thoughtful use of our research material in the laboratory, concern about the means by which our research material is obtained, and concern for misuse of our research material outside the laboratory. It means much more than this, and is more complicated than this, but we do not have the space here to discuss it in detail. Some of the issues involved were discussed and suggestions for action made in a recent article by C. H. Southwick, M. R. Siddiqi, and M. F. Siddiqi (Primate populations and biomedical research. Science, 1970, 170, 1051-1054.). The following is an abstract of that article.

> The authors discuss the problem of declining primate populations and stress that these trends represent serious losses for biomedical research. Forces that are combining to threaten decimation of primate populations throughout the world include habitat deterioration, pressure of human populations, changing human attitudes, hunting, and trapping. They point out that conservation means, not merely strict protectionism, but wise use and planned management, based on scientific knowledge. They review the broad patterns of primate utilization and point out that there is in most cases a lack of scientific knowledge about the true status of the population. Some principles of primate population ecology and utilization are illustrated using data on rhesus monkeys that the authors have gathered during the last ten years. They caution that there is danger of undue emotionalism in dealing with the problem of primate conservation. While

extensive harvesting of primate populations may be detrimental, the greatest threat to such populations throughout the world is alteration of the environment. They feel that it is important for the research community to recognize this and to work to attach the blame for the attrition in primate populations where it belongs. They conclude that "...two major types of programs should be initiated as soon as possible: (i) a coordinated and well-planned program of population research to provide more accurate data on the ecologic status and reproductive biology of important species of primates, and (ii) active conservation programs for all endangered species and all species that are directly utilized in biomedical research. The population surveys are necessary to provide the data on which sound conservation practices can be based. The conservation programs are essential to insure that some of the world's important primate species will still be here 10 years from now."

Some time ago, we resolved to devote some of the pages of the *Newsletter* to the cause of primate conservation. To this end, we have been including pertinent articles and notes whenever they have come to our attention.

CONTENTS

SUSCEPTIBILITY OF SQUIRREL MONKEYS TO THE CONVULSANT ACTION OF ISONIAZID[1]

J. H. Peters and G. R. Gordon

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A recent review (Moreland, 1970) on the incidence of tuberculosis in New World primates suggested to us that some observations we made two years ago (Gordon, Shafizadeh, & Peters, 1969) on the sensitivity of squirrel monkeys (*Saimiri sciureus*) to intravenous isoniazid (INH) may be of greater practical importance today.

During studies on the comparative metabolism of INH in mature male squirrel and rhesus monkeys (*Macaca mulatta*), we measured levels of INH and its N-acetyl conjugate (AcINH) in plasma following intravenous doses of 212 μmoles of INH per $kg^{0.75}$ (20 and 29 mg INH/kg to rhesus and squirrel monkeys, respectively). The vehicle was a volume of isotonic saline corresponding to their body weight in $kg^{0.75}$. An immediate difference between the two species was noted. At approximately one hour after injection, all six squirrel monkeys under test exhibited short, but repeated, periods of convulsions and tremors. These reactions continued for two hours in four of the six animals. During this time, profuse salivation also occurred in all six monkeys. At four hours after treatment, handling resulted in only weak resistance, although the earlier toxic signs had disappeared. After 12 hours, these animals reacted normally again.

None of the above symptoms were seen at any time in six rhesus monkeys receiving INH intravenously. Measurements of levels of INH and AcINH in plasma obtained at one, two, and four hours from both species were made using modifications of the fluorometric procedure of Scott and Wright (1967). Table 1 lists the mean values obtained. It is immediately apparent that, in squirrel monkeys, levels of INH were 300% higher at two and four hours and 50% higher at one hour than in rhesus monkeys. The low levels of AcINH found in the squirrel monkeys suggest that a major difference between the two species was in their ability to acetylate INH to the less toxic metabolite, AcINH.

In urine collected during 24 hours after treatment from the squirrel monkeys, we found that, on the average, only 5.0% of the dose was excreted as INH, with 13.7% of the dose excreted as AcINH. In earlier studies (Peters, Gordon, & Brown, 1965) we found that rhesus monkeys excreted, during a 24-hour period, an average of 6.1% of the dose (20 mg INH/kg, I.M. as INH and 59.9% of the dose as AcINH in the urine. There

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[1]This work was supported in part by a grant from the Pharmaceutical Manufacturers Association Foundation.

Table 1

Mean Plasma Levels (± SD) of INH and AcINH in Rhesus and Squirrel Monkeys Receiving INH Intravenously

Time of Sampling	Measured Compound	Rhesus Monkeys (µg/ml)	Squirrel Monkeys (µg/ml)
1 hour	INH	10 ± 3	16 ± 3
	AcINH[a]	8 ± 6	2 ± 2
2 hours	INH	6 ± 3	17 ± 3
	AcINH[a]	2 ± 2	0
4 hours	INH	2 ± 2	7 ± 1
	AcINH[a]	2 ± 1	0

[a]As INH equivalents

seems to be little question that the increased sensitivity of squirrel monkeys to INH results from their limited capability to form and excrete the less toxic metabolite, AcINH.

No previous reports on tests of INH in squirrel monkeys are known to us. In earlier studies, wherein repeated intramuscular doses of 20 mg INH/kg (Peters, Gordon, & Brown, 1965) or single intravenous doses of 20 mg INH/kg (Peters, 1960) were administered to rhesus monkeys, no convulsant effect was observed. The earliest study on the acute toxicity of INH in rhesus monkeys (Schmidt, Hoffmann, & Hughes, 1953) showed that oral doses equal to, or in excess of, 80 mg/kg were required to induce convulsions in this species.

In view of the above, dosage of INH based on levels established for the rhesus monkey could be toxic for the squirrel monkey. We, therefore, recommend caution in using INH for the treatment or prevention of tuberculosis in squirrel monkeys. Until detailed studies are available to define adequate nontoxic doses of INH for these New World monkeys, it would seem prudent to use no more than one-third of the dose employed for rhesus monkeys.

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MEETING ANNOUNCEMENTS: AN INTERNATIONAL WORKSHOP AND SYMPOSIUM ON TRANSPLANTATION GENETICS OF PRIMATES

This symposium and workshop, under the chairmanship of H. Balner and J. J. van Rood, will be held at the Primate Center TNO, Rijswijk, The Netherlands, from September 6 until September 21, 1971. (Workshop Sept. 6-17, Symposium Sept. 20-21).

The purpose is an improved serological definition and genetic analysis of leukocyte and blood group antigens, particularly of rhesus monkeys and chimpanzees. Another issue will be cross-species typing with emphasis on the phylogenetic relationship between antigens of nonhuman primates and the human HL-A system.

Participation in the workshop is restricted to established tissue typers of nonhuman primates. Registration forms and a provisional program plus detailed information for the symposium can be obtained from: H. Balner, Radiobiological Institute TNO, Lange Kleiweg 151, Rijswijk Z. H., The Netherlands.

REPRODUCTIVE PERFORMANCE IN A GROUP OF SQUIRREL MONKEYS DURING TWO CONSECUTIVE SEASONS

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Successful breeding and rearing of laboratory-maintained squirrel monkeys (*Saimiri sciureus*) is not uncommon (Rosenblum, 1968a; Goss, 1968). Lehner *et al.* (1957) and Taylor (1968) have reported a high reproductive efficiency in well-matured, multiparous females.

The present communication describes the reproductive performance of a small, closed group of squirrel monkeys through 2 consecutive years. Eighteen male and 18 female adult animals had been maintained at the laboratory in individual cages for 6 months. In January, 1968, they were transferred to a fenced outdoor enclosure which was partitioned into parallel "runs." The runs were 12 by 4 by 6 ft. and had a shelter at one end. Six monkeys were housed in each run with the male/female ratio varying from 5:1 to 2:4. Purina Monkey Chow 25 supplemented with fresh fruit daily and water *ad libitum* comprised the diet.

Breeding activity was first observed from middle to late October and continued through early December. The percentage of females becoming pregnant within each run was not related to the male/female ratio in the run. The data are too limited to permit more than that simple observation.

The combined reproductive performance for all runs for each of two consecutive years is given in the tabulation below:

Year	No. of Females	Total Births	Number Stillborn[a]	Range of Birthdates
1969	18	13	2	Apr. 20 - Aug. 29
1970	18	14	5	Apr. 22 - June 24

[a]We have used the term "stillborn" for those newborn found dead in the morning. It is possible that some of these were born alive but survived only a short time.

Eleven of the 13 births in 1969 occurred between May 15 and June 15, while 12 of the 14 births in 1970 were between May 8 and June 15. Thus, our experience is in agreement with others (DuMond, 1968; Lehner,

et al., 1967) in that the birth season is restricted.

One set of male twins was born on May 19, 1970. They were normal in appearance but of unequal weight, 60 and 95 gm, and stillborn. The mother showed no post-parturitional difficulties.

In 1969, mothers and their infants remained in the runs following parturition. Two of these youngsters survived and are healthy members of the colony. Nine of the 11 animals born alive died at ages ranging between 28 and 81 days. Several of these showed cranial trauma at autopsy. Closer observation of the colony during the day revealed what seemed to be repeated attempts, by other monkeys in the run, to forceably gain possession of an infant from its mother. It is possible that this activity was an expression of the aunt-infant relationship (Rosenblum, 1968b) distorted by the unnatural grouping of animals from different social troups. However, Lehner *et al.* (1967) did not encounter a high mortality of newborn in either of two breeding colonies, one composed of monkeys trapped from the same social troup, the other of mixed-troup origin. Another possibility is that the size and arrangement of the runs prevented the mother and infant from escaping from the other animals. At any rate, it appeared possible that vigorous attentiveness to the infants by other monkeys, under our conditions, may have contributed to the high mortality. For this reason, mothers and infants were removed to individual cages following parturition in 1970 and only two of these infants died in the first 90 days. The seven remaining animals were separated from their mothers at 4 weeks of age and maintained in individual cages. From the time of separation until 20 weeks of age, the youngsters were fed, from a nursing bottle affixed inside the cage, a formulation of soybean milk, sweetened condensed milk, pablum, non-fat dry milk and water. Monkey chow and fruit were introduced into the diet after 20 weeks of age. The nutrient composition of the formula, amount consumed, and growth curves of the youngsters are reported elsewhere[1].

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REQUEST FOR MONKEYS WITH BREAST TUMORS

The Mason Research Institute (MRI), which has contracts with the National Cancer Institute for research in viral oncology and with the Breast Cancer Task Force, is interested in securing any nonhuman primates that have naturally occurring breast tumors. A premium will be paid for any such animal.

This request has a very high priority, since a "C" Type RNA Virus was isolated from a tumor in a rhesus monkey at MRI. The importance of confirming the presence of viruses in solid monkey tumors cannot be overemphasized.

Cables, telegrams or phone calls can be made collect to Dr. Marcus M. Mason, Mason Research Institute, Harvard Street, Worcester, Mass. Telephone: (617) 752-4601.

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PROSIMIANS FOR SALE OR TRADE

Four adult female *Galago crassicaudatus* and one adult female *Nycticebus coucang* are for sale or trade. All are healthy, have been TB tested, and have been maintained in the laboratory for 6 months or longer.--Annette Ehrlich, Dept. Psychology, California State College at Los Angeles, Los Angeles, California 90032. Telephone:(213) 683-3834 or 224-3834.

A REAR PROJECTION VISUAL DISCRIMINATION APPARATUS FOR PROSIMIANS

James L. Fobes[1], Annette Ehrlich and Kendrick N. Williams

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A major factor that affects the speed of visual discrimination learning in nonhuman primates is spatial contiguity of stimulus and response. Learning is most efficient when the response involves actually touching the stimulus, and the degree of learning decrement varies directly with amount of spatial separation, as reviewed by Meyer, Treichler, and Meyer (1965). Separation of cue and response by as little as three-fourths of an inch can produce a performance deficit.

The authors sought to take the above findings into account in designing an automated visual discrimination apparatus to be used with prosimian primates, the thick-tailed galago (*Galago crassicaudatus*) and the slow loris (*Nycticebus coucang*). Stimuli were to be presented automatically by rear projection and cue and response were to be made contiguous by having *S*s press the vertically mounted frosted plexiglas surfaces (4 cm. in diameter) onto which the stimuli were projected. Microswitches mounted behind these viewing surfaces, would, in turn, activate a BRS Foringer control panel. However, this arrangement, which works well with higher primates like the rhesus monkey (*Macaca mulatta*) (Meyer, Polidora, & McConnell, 1961), was found to be unsuitable for our prosimians. The two species are much smaller (the average weight of an adult is 1,000 g) than rhesus monkeys and their prehension patterns differ also. When a galago reaches for an object in the vertical plane, it clenches its fingers into a fist. With this natural response pattern, galagos were readily trained to strike at the panel with sufficient force to activate a microswitch. Lorises, on the other hand, spread their fingers when they reach for objects in the vertical plane. They readily learned to touch the panels but, despite persistent attempts to shape their behavior, they could not be trained to press with sufficient force to activate even the lightest microswitch (3-g pressure). At this point, it should be noted that the problem of how to record a minimal-pressure response is not a new one. Drinkometer circuits, for example, will perform this function. The difficulty here was that no commercially available product was compatible with rear projection; there seemed to be no easy way to make plexiglas screens responsive to a light touch by these subjects (*S*s).

Solution of the problem involved modification of the projection surfaces so that drinkometer circuits could be used. The two projection surfaces on which *S*s viewed the stimuli were covered with 120-mesh stain-

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less steel screens. Each screen was, in turn, connected to the sensing head of a Grason-Stadler (West Concord, Mass.) drinkometer (E4690A); both sensing heads were connected to the mesh flooring of the test chamber. When *S* touched the mesh screen over the plexiglas panel, it completed the drinkometer sensing head circuit from the screen, through *S*'s body, to the mesh floor of the test cage. This activated the drinkometer and a response was recorded. For the human observer, the fine mesh screens have a negligible effect on the projected pattern stimuli which consist of geometric forms and block letters.

Other possible solutions, which involved capacitor-coupled touch circuits, or sensitive relays, were tried and rejected; the solution outlined in the preceding paragraph was judged to be superior for several reasons. First, most capacitor-coupled touch circuits require normal transients (e.g. 60 Hz hum) for operation; the drinkometer, on the other hand, contains its own power supply. Second, the maximum amperage rating of the drinkometer is 1 microampere when shorted, while the most sensitive relays require at least 50 milliwatts for operation (2 milliamperes with a 24 volt d.c. device). Thus, the current sent through the animals's body is considerably lower with the present arrangement. Third, while the drinkometer is readily available commercially, they can be easily and inexpensively made.

Current involved has led to no obvious signs of emotional behavior (urination, defecation, escape attempts) in the past four months in which the apparatus has been in use. Three prosimians in our laboratory that had to make the panel-touching response described here learned a light-dark visual discrimination more quickly than five prosimians that had to make a bar-pressing response (similar to that described by Meyer *et al.*, 1961). The three bar-pressing animals took a mean of 556 trials (range 400-738) to reach a criterion of 27 correct responses in 30 consecutive trials, whereas the five panel-touching animals took a mean of 298 trials (range 208-343). Another advantage of the panel-touching system is that the animals will work for a greater number of trials per session than when bar pressing. This suggests that the findings by Meyer *et al.*, on cue-response contiguity, apply to prosimians also. Seven subjects currently are learning a series of two-choice visual pattern discriminations. All were trained in 15 minutes or less to touch the panels, with food used as the reinforcer.

The seven prosimian subjects now being tested are highly individual in the way in which they make contact with the stimulus panels. Tongue, nose, and hands all are used. Since varying modes of response can be employed, the apparatus would seem to be useful with a wide range of small primates. The only necessary condition would be that it be a moist portion of the animal's body that makes contact.

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NEW PRODUCTS AND SERVICES*

Firm Specializes in Custom Fabrication and Assembly of Plastic Equipment

PLAS-LABS [917 E. Chilson St., Lansing, Michigan 48906; Telephone: (517) 372-7177] is now offering a custom fabrication and assembly service to investigators in the scientific community.

The new organization specializes in plastics (forming, tooling, molding and engraving) and has standard catalog offerings. Any item in the standard line can be modified to fit a particular research requirement. Fabrication of one-of-a-kind and non-catalog type items are welcomed.

Typical projects to date have been animal restraint and isolation devices. Completed assemblies and sub-assemblies have been developed for individual investigators.

New Supplier of Primates for Research

PRIMELABS, INC. [Monmouth County Airport, Farmingdale, New Jersey 07727; Telephone: (201) 938-4222], is a new company specializing in importation and conditioning of primates for research. The staff is composed of people who have come from the research community and is therefore experienced in the specific requirements of its colleagues. The facilities are all new and were designed specifically for primates.

PRIMELABS can supply fully conditioned animals as well as direct shipments. Also, they specialize in animals individually isolated from the trap to laboratory, allowing delivery of animals free of specific viruses. Such animals can be identified as to area of capture. Other services available are: consultation in primate pathology, toxicology and general colony problems.

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*All information in this section has been abstracted from material supplied by the vendor.

MEETING REPORTS: SELECTED ABSTRACTS OF PAPERS PRESENTED AT THE 1970 ANNUAL MEETING OF AALAS*

Modification of the tuberculin response of rhesus monkeys by isoniazid therapy. Gibson, J. P., Rohovsky, M. W., & Newberne, J. W. (The Wm. S. Merrell Company, Division of Richardson-Merrell Inc., Cincinnati, Ohio)

During routine tuberculin testing a group of recently acquired *Macaca mulatta* monkeys were found to be infected with tuberculosis. Isoniazid therapy (20 mg/kg/day) caused 9 positive monkeys to become negative to the tuberculin test within 3 weeks after therapy was initiated. Following 2 months of therapy, the entire colony remained negative for 6 months. At necropsy, many of the animals had gross lesions of tuberculosis and organisms were cultured from the lesions. These findings indicate that isoniazid therapy alters the tuberculin response of monkeys and suggests that such therapy should be used with caution, since the tuberculin test is not reliable in treated animals.

Tuberculosis in baboons before and after isoniazid therapy. Allgood, M., & Price, G. T. (Civil Aeromedical Institute, Federal Aviation Administration, Department of Transportation, Oklahoma City, Oklahoma)

Mycobacterium tuberculosis var. bovis was discovered in a group of baboons purchased for acute experiments. Isoniazid was used in an attempt to control the disease sufficiently to save the animals for the unrelated experiments. Numerous color transparencies of the tissue taken at autopsy were presented. These demonstrated the extensive tuberculosis in one untreated animal, moderate pathology in others, and the tissue changes following therapy. The degree of remission is related to both the term of therapy and the extent of disease prior to beginning therapy.

Radiographic visualization of early pulmonary tuberculosis in the *Macaca mulatta* by contrast pleurography. Kentner, D. C., & Bhargava, A. K. (Schering Corporation, Bloomfield, N. J.)

Contrast pleurography, the interpleural infusion of a radiopaque medium prior to film exposure, has been shown to enhance radiographic visualization of thoracic lesions. A study was undertaken to determine if contrast pleurography could effect visualization of early pulmonary lesions due to the infection of M. tuberculosis in nonhuman primates. Six tuberculin negative rhesus monkeys were inoculated with a virulent strain of M. tuberculosis by intratracheal infusion. The monkeys were radiographed by both contrast pleurographic and by routine radiographic tech-

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*The abstracts are, except for minor changes, from the program for the 21st Annual Session of the American Association for Laboratory Animal Science, November 2-6, 1970, Chicago, Illinois.

niques prior to and at regular intervals following infection. Contrast pleurography allowed radiographic visualization of pulmonic lesions three days post-infection. Visualization of pulmonic lesions by this procedure occurred before either the onset of delayed hypersensitivity or the visualization of lesions by standard radiographic technique. Contrast pleurography also enhanced morphologic and topographic delineation of pulmonic lesions. Visual data were presented.

Clinical conditions and diseases encountered in a large simian colony. Valerio, D. A., Valerio, M. G., Ulland, B. M., & Innes, J. R. M. (Departments of Laboratory Animal Medicine and Pathology, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington, Maryland 20795)

A colony containing 3,000 consists of more than 12 species with 6 breeding actively. Newborn are primarily used for experimental viral oncogenesis. This presentation covered accumulated observations concerning clinical conditions and diseases encountered in our simians other than the commonly occurring enteritides and pneumonias. Discussions on tuberculosis, giancell pneumonia and the gastric dilatation syndrome were included. Other subjects included diabetes mellitus, herpetic encephalomalacia, yaba-like disease, polycythemia, rheumatoid-like arthritis, congenital anomalies, neoplasms and kaolinite-induced granulomas. Reproductive conditions and pregnancy complications were discussed briefly.

Methodology and management of simian pharmacology/toxicology studies with emphasis on special techniques employed. Thornett, H. D., Martin, D. P., Valerio, D. A., & Hart, E. R. (Departments of Laboratory Animal Medicine and Pharmacology/Toxicology, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington, Maryland 20795)

Recently simians have become widely used in pharmacologic and toxicologic studies as a result of their phylogenetic relationship to humans. This paper reported on the management and special techniques employed in long-term studies as exemplified by a group of 250 adult female rhesus (*Macaca mulatta*) monkeys being observed for chronic drug effects. The techniques emphasized are designed to satisfy a real need for accurate and thorough data collection. Management information included routine preventive medicine practices, records, arrangement of animals, and other parameters necessary for a smooth and efficient operation. Special techniques included experiences obtaining vaginal and cervical smears, oral drug administration, urine collection, and other techniques used to determine drug related results.

Quarantine and conditioning of simians used in biomedical research. Sibinovic, S., Valerio, D. A., & Munster, J. H. (Department of Laboratory Animal Medicine, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington,

Md. 20795)

During the past year our laboratory imported and conditioned 690 simians for various research studies. *Macaca mulatta* represented 89.7%, *Cercopithecus* sp. 7.2%, *Aotus trivirgatus* 1.3%, and *Pan* sp. 1.8%. The length of quarantine is generally 90 days. The mortality rate during quarantine for *M. mulatta* was 5.3%, *Cercopithecus* sp. 10%, *Aotus trivirgatus* 33.3%, and *Pan* sp. 0%. Tuberculin positive reactors, observed only in *M. mulatta* (0.8%), were euthanized. The most common causes of death during the quarantine period were discussed. Ward rooms in the quarantine and conditioning facility are of 3 different sizes to accommodate shipment groups of varying numbers. Processing, care and treatment of newly imported simians were discussed as well as the facility design of the quarantine and conditioning areas, which house approximately 500 monkeys.

Supply and use of primates in the United Kingdom. Present problems and future considerations. Hobbs, K. R. (Laboratory Animals Centre, Medical Research Council, Carshalton, Surrey, U.K.)

A survey is currently being carried out by the Medical Research Council Laboratory Animals Centre into the present use and future provision of simians for biomedical research in the U.K. The need for quarantining and conditioning imported animals was discussed and the associated costs of commercial interests providing certain services were compared with running costs within research establishments. Representation by the importers in the U.K. to the research worker to provide a greater understanding of the latter's needs was discussed. The case for and against various types of specialized primate research facilities was presented and a comparison drawn between the evidence available to date in the U.K. and the approach by some major European enterprises. Mention was made of overseas holding stations and the need for serious consideration of conservation programs. Captive breeding was discussed at some length, and examples given of various research fields which would benefit.

A primate drinking device. Milton, G. C. (Vincent Memorial Hospital Laboratories [Gynecological Division of the Massachusetts General Hospital], Boston, Massachusetts)

A container for preventing monkeys from toying with the water dispenser and thus diluting urine collected in metabolic cages has been developed. The water bottle is enclosed in a stainless steel container which is attached to the front of the cage. The wall of the container adjacent to the cage is double, there being a false back which is separated from the true back by a distance of 3/4 inches and which extends to within one inch of the floor of the container. The water bottle rests upon a shelf welded to the false back and the sipping tube projects into the space between the false and true backs through a small circular opening in the false back. The animal gains access to the sipping

tube via a larger circular opening which has been cut in the front of its cage and which overlies an opening of the same diameter in the true back of the metal container. A drain in the left fore-corner of the metal container carries off any water which may drip from the sipping tube. This drain projects beyond the forward edge of the urine collection pan and allows the water to fall on the floor, or if measurements of fluid intake are desired, into a plastic bag or other collecting device. If the monkey causes leakage of drinking water by toying with the sipping tube or by shaking the cage, the water is thus diverted from the collecting pan. Watering devices were fitted to eight metabolic cages in our laboratory and have given continuous satisfaction.

Methods of anesthesia in subhuman primates. Martin, D. P., Darrow, C. C., II, Valerio, D. A., & Leiseca, S. A. (Department of Laboratory Animal Medicine, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington, Md. 20795)

Techniques utilized in providing anesthesia in over 400 primates per year for various experimental and clinical procedures were described. Species and weights range from infant *Macaca mulatta* (400 gm) and *Galago crassicaudatus* (900 gm) to *Papio* sp. (25 kg) and *Pan* sp. (40 kg). Types of agents discussed included tranquilizers, analgesics, anesthetics and combinations thereof. Emphasis was placed on choice of an agent (based on procedure and species), dosages utilized and techniques of administration.

Selection of liver function tests in nonhuman primates. Kruckenberg, S. M., & Cornelius, C. E. (College of Veterinary Medicine, Kansas State University, Manhattan, Kansas)

Numerous tests have been used to assess liver function in domestic and laboratory animals. A single function test may not give meaningful results and reveal hepatic damage. The use of a battery of liver function tests will aid in detection of both primary and secondary hepatic disorders, differentiation of the type of icterus or anemia, prognostication of the disorder and investigation of the metabolic observations occurring in specific investigations. Tests that measure hepatic uptake, conjugation and excretion of certain organic ions such as BSP and indocyanine green, test dependent upon the measurement of serum enzymes, and miscellaneous tests such as serum protein electrophoresis and prothrombin time may be of help in determining if hepatic damage was present before or during an experiment. Indications for these tests and selection of the best ones were discussed.

Neoplasms in primates. Garner, F. M., & Valerio, Marion G. (Armed Forces Institute of Pathology, Washington, D. C., & Bionetics Research Laboratories, Kensington, Maryland)

Increased numbers of spontaneous neoplasms in simians have been reported in recent years. This is in contrast to the paucity in the early literature when the first tumor was reported by Bland-Sutton in 1885. The most recent reviews were those of Jungherr in 1963 in the *Annals of the New York Academy of Sciences*, "Epizootiology of Cancer in Animals" and Marjorie Luther's "Cancer in Subhuman Primates" in 1962. The present report included a comprehensive up-to-date review of the literature concerning spontaneous neoplasms in simians and those on file in the Registry of Comparative Pathology, AFIP. These were grouped according to organ systems and examples of some of these were illustrated with slides of gross and/or microscopic specimens. Experimentally induced neoplasms were discussed briefly.

Experiences with concurrent shigellosis and measles in recently imported unconditioned *Macaca mulatta*--with spread to a nearby *Macaca fascicularis* enclosure. Palumbo, N. E., & Perri, S. (Division of Comparative Medicine, University of Hawaii, Honolulu, Hawaii)

In a group of fifty juvenile female rhesus monkeys imported directly by air from New Delhi, India, there were 16 deaths over a period of 16 weeks. The unusually high mortality rate was attributed to a concurrent shigella and rubeola outbreak, the enhanced stress from inexperienced handling, and the lack of immediate preventive therapy upon arrival. Both diseases then spread to a nearby open enclosure where 40 conditioned juvenile *M. fascicularis* were housed. There were no deaths in this group, but the morbidity rate was high. Hematologic and clinical chemical parameters were described in both groups during various stages of the diseases.

The use of a shigella vaccine against spontaneous shigellosis in conditioning juvenile rhesus monkeys. Broderson, J. R., Quist, K. D., & Snow, E. J., Jr. (National Communicable Disease Center, Atlanta, Georgia)

A *Shigella flexneri-Eschericia coli* hybrid was given to forty of eighty newly arrived rhesus monkeys to determine the effectiveness of this vaccine against spontaneous shigellosis in a hyperendemic situation. The hybrid used was of the shigella type most frequently isolated, since previous workers have demonstrated a certain degree of seriologically specific protection against challenge. Postmortem examination, bacteriological culture, morbidity and mortality of vaccinates were compared against non-vaccinates. There was some indication that live mutant hybrid vaccines may be effective against spontaneous shigellosis in the *Macaca mulatta*.

A five year survey of enteric pathogens in a mixed colony of subhuman primates. Seibold, H. R., Perrin, E. A., Silvan, A., & Wolf, R. H. (Delta Regional Primate Research Center, Tulane University, Covington, Louisiana)

Incidence of enteric pathogens has been determined over a 5 year period, in a mixed colony of subhuman primates. Approximately 1800 animals were residents for varying times during the period of observation. Both Old World and New World primates were included. Thirteen species were groups ranging from 20 to 278 animals. Enteric pathogens isolated and identified were *Shigella dysenteriae* 1, 2, *Shigella flexneri* 1, 2, 3, 4, 4b, 5, 6, *Shigella sonnei*, *Shigella-Alkalescens dispar* group organisms, *Salmonella* groups B, C_1, C_2, D, E_1, E_4 and 7 types of enteropathogenic *E. coli*. Data on subclinical, clinical and fatal infections was given and significant pathological alterations were described and illustrated.

Endangered Species Conservation Act: Public Law 91-135. Zeehandelaar, F. J. (Wild Animal Importer, New Rochelle, New York)

This law was signed by President Nixon on December 5, 1969. The purposes: "to prevent the importation of endangered species of fish and wildlife into the USA; to prevent the interstate shipment of reptiles, amphibians and other wildlife taken contrary to State law; and for other purposes." The application: 1. The Secretary of the Interior will prohibit importation of endangered species into USA unless with a special permit and under special conditions. 2. The Secretary of the Interior will publish a list of endangered species which must be reviewed every five years and may be reviewed upon request of interested parties. 3. The Secretary of the Interior will prohibit importation of all fish and wildlife, except through ports designated by him. 4. The Secretary of the Interior will prohibit importation of any fish and wildlife, unless lawfully taken at country of natal origin and lawfully exported therefrom. Regulations to implement the law have been published in *Federal Register* on June 2, 1970; the law became effective on June 3, 1970.

A simple restraining device facilitating caudal venipuncture in squirrel monkeys. Zirzow, G. C., Thacker, R. R., & Woodard, G. (Woodard Research Corporation, 12310 Pinecrest Road, Herndon, Virginia 22070)

The restraining device was designed to allow for optimal flexibility so that a single individual can perform caudal venipuncture. It is basically a 16-inch long clear plastic tube with an inside diameter of 2-3/4 inches. A five-inch long, one-inch wide slit is cut from one end of the tube marking its posterior-dorsal aspect. The tube can be clamped on to a V-shaped tray with a partition to block its anterior end. The monkey with its arms pinioned to its sides and its legs extending backwards is placed headfirst into the tube. This method allows for full freedom of tail manipulation while the monkey and its other appendages are rendered immobile. The injections, weighing, palpebral and dental examinations are easily performed on the restrained monkey. Injection preparation time is reduced, injection

accuracy is enhanced, and only one operator is required.

Erythrocyte 1/2 life determination in rhesus monkeys (*Macaca mulatta*). Mulder, J. B., Brown, R. V., & Corwin, L. A. (Sinclair Comparative Medicine Research Farm and Department of Veterinary Medicine and Surgery, University of Missouri, Columbia, Missouri)

Erythrocyte age can be determined by measuring half-life using ^{51}Cr tagging. Seven ml. blood drawn from the femoral vein, into a syringe with A-C-D solution, were tagged by adding 10-20 microcuries ^{51}Cr. One hour incubation at room termperature was allowed for ^{51}Cr to tag the erythrocytes. Blood with tagged erythrocytes was reinjected into the opposite femoral vein. Four ml. blood were drawn biweekly and placed into tubes containing saponin and E.D.T.A. powder. Tubes were weighed before and after collection for accurate weight of blood. Counts per ml. were recorded using a scintillation well counter. Half-life determination by regression analysis was 16.16 days for males and 16.67 days for females. Ranges for 26 rhesus monkeys, from 6-12 years of age, were 13.60-18.99 days. There was no significant change in erythrocyte half-life in mature rhesus monkeys due to sex. However, a significant change did occur with age. Erythrocyte half-life of monkeys 6-10 years of age ranged from 13.60-16.72 days, with a mean of 15.42 days. Monkeys 10-12 years of age had a half-life range of 16.19-18.99 days with a mean of 17.80 days.

Comparison of hematologic values from peripheral blood of the ear and venous blood of infant baboons (*Papio cynocephalus*). Berchelmann, M. L., Kalter, S. S., & Britton, H. A. (Division of Microbiology and Infectious Diseases, Southwest Foundation for Research and Education, San Antonio, Texas)

The need for frequent blood examination and the difficulty of collecting blood by venipuncture on newborn and infant baboons made an alternate site and method for blood sampling desirable. An adequate free flow of blood could be achieved by properly clipping the outer margin of the ear. Blood specimens obtained by this method from the ear were compared hematologically with venous blood drawn simultaneously from the same animal. Sixty observations were made on 17 infant baboons. The erythrocyte values (hemoglobin, packed cell volume and red cell count) were consistently higher in the ear samples than in the venous samples. The leukocyte counts, however, varied greatly and no uniform difference was noted between peripheral blood or venous blood. Similarly, leukocyte differential counts were indistinguishable, whether from the peripheral sample or the venous sample. These findings parallel those found to exist in humans. It is felt that peripheral blood from the ear may be used for the study of erythrocyte characteristics but is not very reliable for leukocyte counts. (This study was funded in part by grants from the U.S. Public Health Service # RR00451 and RR00278)

Genital herpesvirus hominis infection in monkeys. London, W. T., Catalano, L. W., Nahmias, A. J., Fuccillo, D. A., & Sever, J. L. (Section on Infectious Diseases, Perinatal Research Branch, National Institute of Neurological Diseases and Stroke, Bethesda, Maryland, and the Department of Pediatrics, Emory University, School of Medicine, Atlanta, Georgia)

Three monkey species (*Cebus albifrons*, *Macaca mulatta* and *Saimiri sciureus*) were inoculated intravaginally with *Herpesvirus hominis* (HVH) type 2 virus. Genital infection was established in cebus monkeys in 10 out of 10 attempts. Herpetic vesicles and/or ulcers were demonstrated in the vulva and vagina; herpetic cervicitis was also evident. Infection was proven by virus isolation and serologic study. Attempts to infect 5 rhesus monkeys (*M. mulatta*) and 2 squirrel monkeys (*S. sciureus*) were unsuccessful. Reinoculation with HVH type 2 was performed in all animals and vaginal reinfection was established in only one cebus monkey. The cebus monkey model appears to closely mimic the lesions observed in human genital infections. Future investigation with the model may elucidate the mechanism of transmission and pathogenesis of this disease in the adult, fetus and newborn.

Detection of pregnancy in the rhesus monkey by the measurement of serum progestins. Fritz, G. R., & Knobil, E. (Primate Research Laboratory, University of Pittsburgh School of Medicine, Pittsburgh, Pa.)

We have utilized a rapid method of measuring progestins in peripheral blood serum to determine pregnancy in the rhesus monkey at the expected time of uterine bleeding. Daily blood samples are collected starting on the 23rd day of the menstrual cycle and continued until the day of uterine bleeding. Subsequently, 0.2 ml of each serum sample is assayed for progestin content by the technique of Johansson, Neill and Knobil (*Endocrinology 82*:143, 1968). The entire assay procedure can be completed in about 3 hours. Pregnancy determinations are based on the fact that progestin levels are elevated at the expected time of uterine bleeding in the pregnant animal as contrasted to the nonpregnant animal where the progestin levels are usually less than 1 mg/ml. At this writing, 15 of 18 animals determined pregnant by this technique were confirmed pregnant by digital intrarectal palpation at 40 days from mating. None of the 18 animals diagnosed not pregnant were found to be pregnant at the time of rectal palpation.

Comparative study on the freeze preservation of spermatozoa. I. Primate and bovine. Leverage, W. E., Valerio, D. A., & Schultz, A. P. (Department of Laboratory Animal Medicine, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington, Md.)

Frozen semen technology will enable simian breeders to increase breeding efficiency, more closely monitor genetic control, and add significantly to experimentation in reproductive biology. Techniques developed in simian reproduction may serve as models for research in human reproduction and population control. Freeze

preservation techniques developed in domestic animals, particularly bovine, are being used in many instances as prototypes in primate semen investigation. This presentation concerned freeze preservation technology for both primate and bovine spermatozoa. Three egg yolk-glycerol diluents were studied and the frozen samples were stored for five time intervals at -196°C. Comparisons were made by prefreeze preparations, survival times and freezing effects by species in each diluent. Data on motility and sperm morphology were presented.

Breeding the greater bushbaby, *Galago crassicaudatus*, in a laboratory environment. Valerio, D. A., Johnson, P. T., & Thompson, G. E. (Department of Laboratory Animal Medicine, Bionetics Research Laboratories, Inc., Division of Litton Industries, 5510 Nicholson Lane, Kensington, Md. 20795)

Experiences concerning the laboratory breeding of *Galago crassicaudatus* were described in this report. This breeding colony of prosimians has been established for approximately four years and presently numbers 37. To date there have been 67 live births including five sets of twins. Daily observation for gross vaginal changes as indicative of estrus is necessary, since there are no menstrual signs nor vaginal material available for microscopic evaluation. The females are then placed with the males and remain as monogamous pairs until they are no longer receptive to copulation. Pregnancy is diagnosed by abdominal palpation. Data concerning gestation and conception rates were discussed. In addition, husbandry practices and pathological conditions were reported. The conclusion was that these animals do adapt and reproduce reasonably well in a laboratory environment.

Parakeratosis of the tongue--a unique histopathologic lesion in the zinc-deficient squirrel monkey. Barney, G. H., Macapinlac, M. P., Pearson, W. N., & Darby, W. J. (Division of Animal Care, Vanderbilt University School of Medicine, Nashville, Tennessee)

Zinc deficiency was produced in the squirrel monkeys by feeding a low zinc diet containing casein as the protein source. Casein was rendered low in zinc by a method of isoelectric precipitation and treatment with disodium ethylenediaminetetraacetic acid (Na_2EDTA). Eleven weanling male squirrel monkeys were fed the diet for periods up to 352 days, and were compared with 11 control monkeys fed the same diet supplemented with 15 ug zinc/g. Growth in monkeys fed the low zinc diet was retarded; some showed varying degrees of hair loss. Hair samples showed decreased zinc concentration. At killing, reduced zinc concentrations were found in the heart, spleen, liver, and pancreas. Three monkeys fed the low zinc diet for more than 120 days showed decreased concentrations of serum albumin and zinc. Parakeratosis of the tongues of 9 monkeys fed the zinc-low diet was identified; it was present particularly over the anterior dorsum of this organ.

The past, present, and future of animal welfare legislation. Finch,

C. O. (Animal Health Division, Agricultural Research Service, U. S. Department of Agriculture, Hyattsville, Maryland)

In 1966, Congress passed the first Federal legislation which controlled the procurement, transportation, and holding of animals intended for purposes of research. The Department was required to set *minimum* standards regarding eight requirements named in the Law. The Department consulted with many organizations both in and out of government to set these standards. Dealers (as defined by law) have been licensed. Research facilities (as defined) have been registered with sometimes remarkable results in improvement of animal quarters and care. Emphasis has been on frequent inspections and care of animals rather than infrequent inspections on facilities only. Legal sanctions, behind the scenes persuasion, and direct confrontation have all been used as aids to persuade reluctant organizations or individuals to comply with the standards and regulations. Problems to be studied include euthanasia of large groups of animals, transportation, and possible future legislation. Another problem of significance is to place research use of animals in its proper perspective along with use as pets, exhibition, or entertainment.

* * *

LABORATORY-REARED PRIMATES FOR SALE

Three *Papio papio* baboons are available for sale. These animals were bred and raised in our facilities, and we have complete records on them. These animals are all sisters and we offer them for sale as a group to any interested person. No experimental procedure of any description has been performed on any of these animals. Their birth dates and present weights are: 5/24/65 (36-3/4 lb.), 8/11/66 (30-1/2 lb.), 6/5/68 (19 lb.).

Also available are four *Macaca mulatta* bred and reared in our facilities. We have complete records on them and they also have never been exposed to experimental procedures. Their birth dates, weights, and sex are as follows: 8/25/68: 5 lb., Female; 5/17/70: 3-1/4 lb., Male; 11/4/68: 6 lb., Female; 8/27/69: 4+ lb., Male.--Roger Thacker, Assistant to the Director, Department of Animal Laboratories, The Ohio State University, 400 West 12th Avenue, Columbus, Ohio 43210. Telephone: (614) 422-8541.

POSSIBLE INH-ASSOCIATED HEPATITIS IN HUMANS*

On November 13 and 18, 1970, two Capitol Hill employees died of liver failure clinically consistent with hepatitis. Neither employee was known to have been exposed to blood transfusions, needles, shellfish ingestion or intimate contact with other jaundiced persons in the 6 months prior to onset of hepatitis. No epidemiologic links between these two patients could be established, although both were taking an anti-tuberculosis drug, isoniazid (INH).

Both men started taking INH in February 1970, when they were found to have positive tuberculin skin tests. At that time, 13,586 employees were skin tested for tuberculosis after eight cases of tuberculosis (including two deaths) had occurred on Capitol Hill; 2,920 were skin-test positive. For 338 reactors, isoniazid was believed to be medically contraindicated. Isoniazid was recommended for the other 2,582 reactors; 2,321 chose to participate in the preventive treatment program.

In the first 4 months of therapy, INH was distributed monthly by Capitol Hill nurses, and thereafter, at two-month intervals. Medical consultation was available to persons reporting possible side effects. Individuals who failed to come for INH refills were contacted and asked the reason. Approximately 250 persons discontinued therapy because of side effects presumed to be associated with the medication; 350 persons withdrew for other reasons. Early side effects included vague gastrointestinal complaints (94), fever and chills (32), dizziness (26), rash (25), fatigue (23), symptoms or signs of liver dysfunction (6) and other miscellaneous side effects (45). Neither of the two men who died complained to the nurse of any symptoms.

Because of these two deaths, an epidemiologic investigation was started in November to identify other possible cases of liver dysfunction among INH recipients. Hepatitis was diagnosed where there was a history of jaundice and/or dark urine. A total of 17 cases have been uncovered, including the two fatal cases; 11 of these patients had been jaundiced and the others had dark urine, as well as other clinical characteristics suggestive of hepatitis.

Onsets were noted throughout the 9-month period of therapy, with the majority occurring in the first 3 months (Figure 1). The two men who died had onset at 5-1/2 and 7-1/2 months.

The 17 patients included eight males and nine females; their mean age was 47.7 years. Fourteen were white and three were black. Nine patients were hospitalized. Sera from six patients tested for hepatitis

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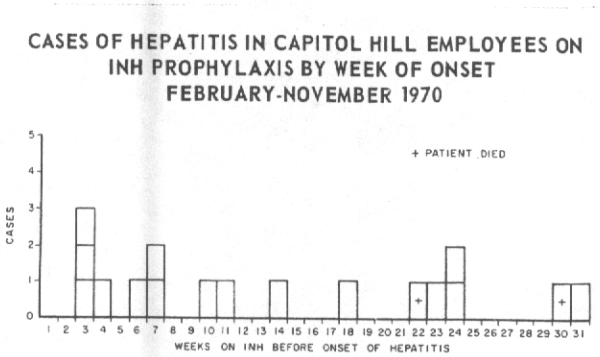
*From *Morbidity and Mortality Weekly Report*, 1970, *19* [48], 462 and 468. The editorial comment is also from the original source.

Figure 1



associated (Australia) antigen during the acute disease were reported negative. One patient had received a blood transfusion 6 months before onset of hepatitis; none of the others had known exposures to needles, blood transfusions, raw clams or oysters, or other jaundiced persons.

In order to assess the background incidence of liver dysfunction and/or hepatitis, a matched comparison group of Capitol Hill employees who have not taken INH is being surveyed. In addition, the Food and Drug Administration is investigating the sources of distribution of the INH lots which were used on Capitol Hill. (Reported by the Tuberculosis Branch, State and Community Services Division, the Viral Diseases Branch, Epidemiology Program, CDC; and the Division of Anti-Infective Drug Products, Food and Drug Administration.)

Editorial Comment.--Isoniazid related jaundice has been observed occasionally in the early months of treatment. Furthermore, in one study, serum transaminase elevations were reported in approximately 10 percent in the first 3 months with subsequent return to normal values after continued medication[1]. Of particular interest in the Capitol Hill investigation is the appearance of a second cluster of cases appearing late in the course of treatment. These late cases are inconsistent with previous observations[1] and suggest the possibility that they may not be related to INH but may represent hepatitis of other etiologies. On November 20, CDC issued a report to state and local public health officials which summarized the available information concerning the Washington cases and recommended no nationwide change in the treatment and preventive treatment programs. The preliminary data of this investigation to date do not suggest the need to change the November 20 recommendations.

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[1]Smith, J. P., & Scharer, L. Adverse effects of isoniazid and their significance for chemoprophylaxis. *American Review of Respiratory Diseases*, 1970, *102*, 821.

MEETING ANNOUNCEMENTS: THIRD CONFERENCE ON EXPERIMENTAL MEDICINE AND SURGERY IN PRIMATES

The First and Second Conferences on Experimental Medicine and Surgery in Primates were held in New York in September 1967 and 1969. The Third Conference will be postponed one year to accommodate a Symposium on breeding of nonhuman primates being organized jointly by the World Health Organization, The University of Berne, and the Swiss Serum and Vaccine Institute, which will take place 28-30 June 1971, in Berne, Switzerland.

In view of the rising European interest in the use of primates for biomedical research, the Third Conference on Experimental Medicine and Surgery in Primates will be held in Lyon, France, on 21-23 June, 1972. The conference will be sponsored by the New York University School of Medicine, New York, the French National Institute of Health and Medical Research (INSERM), the University of Lyon and the Merieux Institute, Lyon, the University Paul Sabatier, Toulouse, and by several other European scientific bodies and institutions.

The Conference Proceedings will be published in English. Topics to be covered are:

Pharmacology and Toxicology
Reproduction, Perinatal Growth and Development
Neurophysiology and Experimental Psychology
Cardiovascular Studies
Transplantation Immunology

Round-table discussions:
Choice of Primate Species for Medical Experimentation
Methods of Housing, Handling and Breeding

Those interested should write to:

for North and South America, Australia, Asia

J. Moor-Jankowski, M. D.
Laboratory for Experimental Medicine and Surgery in Primates (LEMSIP)
New York University School of Medicine
550 First Avenue
New York, New York 10016

for Europe, Africa, Near East

Jacque Ruffie, M. D.
Centre National de la Recherche Scientifique
Centre d'Hemotypologie
Hopital Purpan
Toulouse, France

Conference Co-Chairmen: E. I. Goldsmith, M. D., and J. Moor-Jankowski, M. D.

PRIMATES USED FOR RESEARCH IN 1969[1]

	Sold[a]	Bred[b]	From Wild, Donated, etc.[c]	Total
New World				
Capuchin.....	990	68	1	1,059
Owl.....	3,970	2		3,972
Spider.....	612	7		619
Squirrel.....	8,254	175	35	8,464
Titi, dusky.....			3	3
Marmoset.....	2,204	211		2,415
Not designated.....	265		826	1,091
Total New World Primates	16,295	463	865	17,623
Old World				
African green.....	4,252	60	1,540	5,852
Baboon.....	933	313	8	1,254
Colobus.....	25			25
Langur.....	96	7		103
Macaque:				
Bonnet.....	26	75		101
Crab-eating.....	450	86		536
Formosan Rock.....		7		7
Pig-tailed.....	200	153		353
Rhesus.....	31,569	3,096		34,665
Stumptailed.....	390	96		486
Not designated.....	4,278	264		4,542
Mangabey.....	13	36		49
Patas.....	87	8		95
Talapoin.....		3		3
Not designated.....	195		882	1,077
Total Old World Primates	42,514	4,204	2,430	49,148
Other				
Chimpanzee.....	277	25		302
Galago.....	42	22		64

[1]From the "Summary of Questionnaire to Determine Number of Animals Used for Research in 1969," *ILAR News*, 1970, *14* (1), ii-iii, vi.

	Sold[a]	Bred[b]	From Wild, Donated, etc.[c]	Total
Other (continued)				
Gorilla.....	2			2
Gibbon.....	8	2		10
Lemur, flying.....	2			2
Loris, slow.....	142			142
Siamang.....	14			14
Treeshrew.....	687	8	____	695
Total "other" Primates	1,174	57	____	1,231
TOTAL All Primates	59,983	4,724	3,295	68,002

[a]On 9 June 1970, questionnaires were sent to 950 breeders of laboratory animals, or dealers. 628 replies were received, or 66.1% of those sent out.

[b]On 16 June 1970, questionnaires were sent to 2,290 users of laboratory animals. 1,630 replies were received, or 71.17% of those sent out.

[c]Number of animals collected from nature; captive-bred; donated; or acquired otherwise than from breeders, dealers, or from own breeding.

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MONKEYS NOT SUSCEPTIBLE TO CHOLERA*

Dr. John H. Richardson of the Foreign Quarantine Program, Center for Disease Control, has recently been asked whether monkeys imported from Africa might be infected with cholera. He looked into the matter and found the answer in the chapter on Asiatic Cholera by Eugene J. Gangarosa and Wiley H. Mosley in Tice's *Practice of Medicine:* "*Vibrio cholerae* is highly host-specific for man. In nature, no other species has regularly been found infected, although in the laboratory a variety of animal models have been successfully studied."

The Foreign Quarantine Program anticipates no changes in import requirements for nonhuman primates entering the country from Africa.

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*From *CDC Veterinary Public Health Notes*, October, 1970, prepared by the Veterinary Public Health Section of Epidemiology Program of the National Communicable Disease Center, Atlanta, Georgia.

RECENT PRIMATE LITERATURE IN FIELD OF MAMMALOGY

This is the second list of recent literature in the field of mammalogy that pertains to the order Primates. The first list, which should be consulted for additional information about the list, appeared in the July, 1970 issue of this *Newsletter*. Inquiries and comments should be addressed to Dr. Sydney Anderson, Department of Mammalogy, The American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024.

Search: Primates
Tactics: GR. 40
Numbers Searched: 10140-11449 (November list)
Date: January 12, 1971

10141, 10146-7, 10149-50, 10152, 10167, 10179, 10196, 10218, 10229, 10241, 10243, 10252, 10261, 10269, 10273, 10281-2, 10284-5, 10292, 10299, 10300, 10305, 10315, 10326, 10330, 10336, 10345, 10350, 10354, 10359, 10362, 10377, 10383, 10388, 10391, 10398, 10403, 10410, 10412-3, 10427, 10436, 10451, 10472, 10480, 10488-90, 10495, 10508, 10513-4, 10523-4, 10545, 10547, 10558, 10566, 10571, 10589, 10594, 10604, 10627, 10632, 10638, 10644-5, 10647, 10659-60, 10667, 10672-3, 10692, 10706, 10713, 10717-9, 10721-4, 10736, 10741, 10755, 10760, 10762, 10770, 10774, 10776, 10782, 10796, 10801, 10808, 10811, 10814, 10826, 10829, 10836, 10839, 10847, 10850, 10854-5, 10866, 10892, 10902, 10906-9, 10913-4, 10916-8, 10921, 10923, 10930-2, 10952, 10956, 10973, 10979, 10991-2, 10994, 10999, 11005, 11010, 11012, 11041, 11045-6, 11057, 11071, 11078, 11079, 11080, 11087-8, 11090, 11095, 11097, 11110-2, 11117, 11128, 11145, 11155, 11192, 11216, 11236, 11244, 11247-9, 11262, 11267, 11272, 11275, 11282, 11288, 11298, 11309, 11319, 11330, 11331, 11338, 11347, 11350, 11357, 11362-3, 11365, 11369, 11384, 11387, 11391, 11400, 11406, 11408, 11419, 11422, 11428, 11431, 11433-5, 11441, 11444-6, 11448, 11449.

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NEWSPAPER CLIPPINGS: SPECIAL STUDENT AT U. OF CALIF.

A DEGREE IS UNLIKELY

Santa Barbara, Calif.--Seven-year-old Sarah is a special student at the University of California at Santa Barbara. She has studied there for two years and is considered a bright student, but she is not ever expected to get a degree. Sarah's major achievement is learning to read more than 130 words--not much for a college student, but a formidable task for a chimpanzee, which she is.

Dr. David Premack, a psychologist and Sarah's mentor, says her linguistic accomplishments are comparable to that of a two- or three-year-old child. "There may be no limit to what she can do. The only important limit may be the ingenuity of the experimenters," he said in an interview. Sarah reads and "writes" about things of considerable

ape-interest, bananas, oranges and figs. But she also knows the names of her five trainers, other nouns, including soap and garbage can, and such verbs as prefer and smoke. Sarah's "words" are metal-backed bits of plastic. A red square is a banana, a blue triangle an apple, and so on. She writes by placing the pieces on a magnetized language board.

Premack is cautious about the implications of his success in teaching an ape to read. But he says the methods he has developed may be useful in teaching psychotically withdrawn children.

Premack and the four trainers began by teaching Sarah the word for banana. One trainer would put a banana on the table and watch as Sarah ate it. This continued until the trainer introduced the red plastic square. Then the fruit was placed farther back, out of reach. Sarah quickly learned that to get the banana she had to place the red square--the word--on the language board. Other fruits and other words were soon added and aspects of the transaction were changed. The trainers were varied and Sarah had to write "Mary apple" or "Randy apple" to get the fruit. Mary and Randy are names of trainers.

It proved difficult to vary the recipient of the fruit because Sarah was reluctant to relinquish her food. But, as Premack explained, "these problems turned out to be practical matters. We handled them by arranging proper rewards. For example, when Sarah wrote 'Mary give apple Randy,' thereby denying herself the apple, she got a tidbit she likes even more than an apple. Altruism, properly rewarded, soon becomes quite reliable."

Sarah's education advanced a giant step when she began to learn words for things outside her experience such as the concepts of "same" and "different" and their more sophisticated variations of "size of" and "not size of" and "name of" and "not name of." She also learned the concepts "good" and "bad" as expressed by Premack's approval or disapproval. "That isn't any different from a human child whose good and bad are what its parents do or do not approve of," Premack said.

Sometimes the pace of the lessons is too slow for Sarah. Once during a preposition test, Sarah decided instead to quiz trainer, Mary Morgan. The chimp put up a partial statement on the language board, "A is on . . ." and then put the alternate answers on the other side. Mary had to nod when Sarah pointed to the correct response but Mary said, "The little devil would pass by the solution quickly and try to trick me into a mistake."

The Providence Sunday Journal, December 6, 1970

ANNOUNCEMENT OF A LECTURE SERIES ON COMPARATIVE BIOLOGY AND EVOLUTION IN PRIMATES*

A lecture series on "Comparative Biology and Evolution in Primates" will be given by W. C. Osman Hill and A. B. Chiarelli in the Centre of Primatology, Institute of Anthropology, University of Turin, Italy, from 10:00 a.m. to 12:00 noon, February 1 to April 30, 1971.

The topics to be covered are as follows:

COMPARATIVE ANATOMY (Professor W. C. Osman Hill)

1. *What is a primate?*
   1. Definition. 2. Precursors of the primates. 3. Monotremes and marsupials. 4. The status of the tree-shrews: Ptilocercus: Primate or non-primate; relation to elephant shrews. 5. Living primates as an evolutionary series from Tupaioids to man. 6. Arboreal adaptations: diurnal and nocturnal modes of life compared.

2. *Evolution of the primate brain*
   1. Sensory and motor changes involved. 2. Transition from dependence on a "smell brain" to a "visual-auditory" brain. 3. Stereoscopic vision. 4. Colour vision.

3. *Basic olfactory drives of mammals*
   1. Sensory rhinarium, vibrissae, etc. (central representation). 2. Cutaneous glands. 3. Territorial scent marking. 4. Increased tactile sensibility transfer to palms and soles: dermatoglyphics, pentadactyly.

4. *Modes of progression in primates*
   1. Quadrupedal walking and climbing. 2. Bipedal leaping, saltation. Vertical clinging and leaping (Tarsius: Indri). 3. Brachiation: knuckle-walking: bipedal walking. 4. Skeletal adaptations.

5. *Comparative cranial anatomy of primates*
   1. Functional adaptations, especially the masticating apparatus.

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*This series of lectures is being sponsored by the Institute of Anthropology and Centre of Primatology of the University of Turin, the Italian National Council of Research (C.N.R.), the Department of Anthropology, University of Toronto, Canada, and N.A.T.O. Requests for attendance should be addressed to Professor B. Chiarelli, Centro di Primatologia, Instituto di Antropologia, Via Accademia Albertina, 17, (10123) Torino, Italy, or to Professor D. R. Hughes, Department of Anthropology, University of Toronto, Toronto 5, Canada, before January 15, 1971.

6. *Evolution of the teeth*
   1. Basic features in primate dentition. Morphology of the molars.

7. *Alimentary adaptations*
   1. Gastric morphology (simple and complex types). 2. Gut pattern, especially of the large intestine and caecum. 3. Liver changes.

8. *Respiratory organs*
   1. Larynx. 2. Lungs and pleurae (lobation and pleural adhesion, e.g., in *Pongo*).

9. *Criteria from the anatomy and physiology of the reproductive organs*
   1. Mammalian reproduction. 2. Male organs and adaptations. 3. Female organs: uterus, colliculi. 4. Physiology of reproductive cycle. 5. Oestrus, compared with primate menstrual cycle. 6. Phenomena of ovarium, uterine and vaginal cycles. 7. Phenomena of sexual skin. 8. Physiology of conception. 9. Early development of the ovum. 10. Placentation, types. 11. Early embryology.

10. *Palaeocene and Eocene Lemuroids and Tarsioids*
    1. Adaptations. 2. Dental and cranial features. 3. 'Blind-end' evolution. 4. Carpolestids, etc. 5. Main track.

11. *Madagascar, effect of isolation and absence of competition*
    1. Anatomical characters of the Malagasy lemuroids. 2. Speciation and subspeciation. 3. Primitive types, Microcebus, Chirogaleus, Lepilemur and Hapalemur. 4. Lemur. 5. The Indrisoids (specialization parallel to Alouatta and Presbytes). 6. The Aye-Aye.

12. *The Lorises and Galagos*
    1. Specialization and adaptations for nocturnal life by saltation or slow-pacing.

13. *Tarsius, a living fossil*
    1. Generalized and specialized features. 2. Adaptations to vertical clinging and leaping. 3. Caudal specializations. 4. Glandular specializations (Sprenckel). 5. Distribution.

14. *The Platyrrhini*
    1. Evolutionary radiation of primates in the neotropical region. 2. Parallel and convergent evolution. 3. Status of the Callithricidae and of Callimico.

15. *The Cynomorph Catarrhini*
    1. The Fayum fauna. 2. Parapithecus: Propliopithecus and the early differentiation of the Anthropomorpha (Hominoidea). 3. African and Asiatic radiations. 4. Brief review of African and Asiatic genera of Cynomorphs. 5. The Siwalik fauna.

16. *Pongids*

1. Dryopithecines, Proconsul, etc. 2. Miocene, Apes. 3. Geological horizons in the Siwaliks, etc. Gigantopithecus: Meganthropus. 4. Modern apes. 5. Anatomical characters. 6. Gibbons. 7. Orangs. 8. Chimpanzees and gorilla. 9. Distribution. 10. Effect of climatic and environmental changes during the Pliocene. 11. Dryopithecines, dentition, molar teeth patterns. 12. Australopithecines, adaptations. Cranial, dental and pelvic features. 13. Earliest Hominids (Pithecanthropines: Palaeanthropines, Neanderthals, e.g., Monte Circeo). 14. Early sapient man (rise of modern man and differentiation into present day racial types. Australoids, "Capoids", Caucasoids, Mongoloids, Negroids).

COMPARATIVE GENETICS

(Series of lectures organized by Professor B. Chiarelli)

1. *The importance of comparative genetics in primates for the study of human inheritance*

2. *Methods for comparative genetics in primates*

3. *Formal genetics*

1. Inherited blood groups in nonhuman primates and their relationship with the human blood groups. 2. Leucocyte blood groups in nonhuman primates; their relationship with the human leucocyte blood groups and their interest for problems of histocompatibility. 3. The P.T.C. (phenylthiocarbamide) test in primates. 4. Comparison of variations and hereditary traits in the serum proteins of primates and man. 5. Other tests for tissue affinity among various species of primates.

4. *Epigenetic and quantitative traits*

1. Epigenetic polymorphism in the human and nonhuman primate skeleton. 2. Hereditary traits of dentition in primates. 3. The relevance of the dermatoglyphic traits for approaching quantitative heredity in nonhuman primates and man.

5. *Cytogenetics*

1. Importance of a comparison of the karyotypes of various species of living primates in order to reconstruct their phylogeny. 2. Comparison between chromosomes of catarrhine monkeys and man. 3. Origin of the human karyotype. 4. The homology of chromosomes studies by DNA hybridization.

6. *Sex chromosome genetics*

MEETING ANNOUNCEMENTS: SYMPOSIUM ON BREEDING PRIMATES

An international symposium on Breeding Nonhuman Primates for Laboratory Use will be organized jointly by the World Health Organization, the Faculty of Veterinary Medicine, University of Berne, and the Swiss Serum and Vaccine Institute from 28 June to 1 July 1971 in Berne, Switzerland. The main papers will be by invited specialists who will speak on the physiology, husbandry and economics of breeding apes, baboons, macaques, guenons, and New World monkeys under different systems such as indoors, in compounds, and at free range. Short communications will also be accepted and ample time will be allowed for discussion. On 1 July there will be an excursion to Basel with visits to the zoo, animal breeding institutes, and pharmaceutical firms.

The meeting will be conducted in the English language without interpretation. It is intended to publish the proceedings.

The World Health Organization will be primarily responsible for arranging the scientific program and speakers and editing the proceedings; the Faculty of Veterinary Medicine, University of Berne will provide the lecture theatre and ancillary facilities; and the Swiss Serum and Vaccine Institute will arrange registration and accommodation. The registration fee will be 100 Sw.F.

Those interested in attending should write for registration forms to: Dr. J. Ungar, Swiss Serum and Vaccine Institute, Rehhagstrasse 79, Berne, Switzerland.

Attendance will be limited to the first 150 applicants. If you wish to present a short communication (10 minutes) please write to: Professor W. I. B. Beveridge, Veterinary Public Health Unit, World Health Organization, 1211 Geneva, Switzerland.

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NOTE ON SUBMISSION OF CERTIFICATES OF NEED FOR RHESUS MONKEYS

Beginning January 1, 1971, all Certificates of Need for Rhesus Monkeys should be sent to:

Dr. Charles McPherson
Animal Resources Branch
Division of Research Resources
National Institutes of Health
Bethesda, Maryland 20014

Dr. McPherson will handle the validation of these certificates and will answer any questions concerning the program.

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

BOOKS

Primate behavior: Developments in field and laboratory research. Vol. 1. Rosenblum, L. A. (Ed.) New York: Academic Press, 1970. (Price: $17.50).

This is the first of a planned series of volumes devoted to the field of primate behavior. The series will contain reviews of the literature and extended research programs, conceptual and theoretical papers, and major individual research efforts. The contents of the first volume are as follows: Learning skills of anthropoids by Duane M. Rumbaugh; Primate status hierarchies by Irwin S. Bernstein; Unlearned responses, differential rearing experiences, and the development of social attachments by rhesus monkeys by Gene P. Sackett; Behavior of tree shrews by M. W. Sorenson; Abnormal behavior in primates by G. Mitchell; the Nilgiri langur (*Presbytis johnii*) of South India by Frank E. Poirier.

Macaca mulatta: *Enzyme histochemistry of the nervous system.* Manocha, S. L., & Shantha, T. R. New York: Academic Press, 1970. (Price: $21.50).

An examination of the nervous system of the rhesus monkey. The book describes and discusses the nervous system of this animal from the anatomical, cytoarchitectural, and histochemical viewpoints. It describes the various nuclei and important fiber systems of the brain, spinal cord, olfactory bulb, eye and peripheral nerves with regard to their anatomical location, cellular composition and relationship to surrounding structures. It also examines oxidative and hydrolytic enzymes, and discusses not only the significance of the differences in the localization of these enzymes from one group of neurons to another, but also the significance of these findings for research on other animals.

Macaca mulatta: *Management of a laboratory breeding colony.*

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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.

Valerio, D. A., Miller, R. L., Innes, J. R. M., Courtney, K. Diane, Pallotta, A. J., & Guttmacher, R. M. New York: Academic Press, 1969. (Price: Clothbound, $7.50; Paperbound, $4.50).

This book is concerned with the establishment of simian colonies, especially for laboratory breeding. The contents are: The free-ranging rhesus monkey; Functional organization and staff requirements; Facilities; Simian husbandry; Simian reproduction; Simian medicine; Surgery; Appendix I: Supplementary references; Appendix II: Manufacturers and sources of supplies.

A stereotaxic brain atlas for Macaca nemestrina. Winters, W. D., Kado, R. T., & Adey, W. R. Berkeley and Los Angeles: University of California Press, 1969.

This book measures 22 by 14 inches. The frontal sections are 6.5 times actual size and are represented from anterior 25 to posterior 10. Each anterior to posterior location is represented by a thionine section and a Weil section on facing pages. Twelve thionine-stained sections are presented in the sagittal plane from lateral planes L1 to L16 and eight horizontal sections from the planes H10 to -H6.

Infections and immunosuppression in subhuman primates. Balner, H., & Beveridge, W. I. B. (Eds.) Baltimore: The Williams & Wilkins Company, 1970.

FILMS

Survey of the primates. Rumbaugh, D. M., Riesen, A. H., & Lee, R. Appleton-Century-Crofts Film Library, 267 West 25th St., New York, N. Y. 10001. (Sale price: $400; Rental price: $30).

This is a 38-minute color film designed to introduce students to the area of primatology. The stated aims of the film are: (1) To properly place man as a natural form within the order of *Primates*; (2) to define the basic characteristics of primates which separate them from other mammals; (3) to summarize the geographic distribution of various primate forms; (4) to portray the various adaptations which primates have evolved in relation to environment; and (5) to summarize certain behavioral and social adaptations that are particularly relevant to our understanding of man. Included in the film are representatives of 9 of the 11 families which form the primate order. A total of 49 different primate forms are used as representatives of those families. A 35-page detailed *Study Guide* is provided for use with the film. This guide contains 49 photographs of the species presented, plus a pronunciation guide to nomenclature, a primate order chart, and a discussion of the film. Copies of the *Guide*

may be purchased in packages of 10 for $6.00.

DISEASE

Comparison of the lymphocyte transformation test with the tuberculin test in rhesus monkeys and chimpanzees. Chaparas, Sally D., Hedrick, S. R., Clark, R. G., & Garman, R. (Lab. Bacterial Products, Div. Research Serv., Nat. Inst. Hlth, Bethesda, Md. 20014) *American Journal of Veterinary Research*, 1970, *31*, 1437-1441.

Results of the *in vitro* lymphocyte transformation test were positive for rhesus monkeys (*Macaca mulatta*) which were test positive by the tuberculin intrapalpebral test and which at necropsy had gross and histologic lesions of tuberculosis. Lymphocytes from only 1 of 5 test-positive reactors not having evidence of tuberculosis at necropsy had a positive lymphocyte transformation-test result. Monkeys that were sensitized with BCG in water-in-oil emulsion became tuberculin skin-test reactive and their lymphocytes became transformed by *in vitro* exposure to tuberculin purified protein derivative (PPD). Lymphocytes from 2 seemingly healthy, tuberculin test-reactive chimpanzees (*Pan satyrus*) were also transformed by tuberculin *in vitro*. The *in vitro* test is a useful adjunct for detecting tuberculosis in nonhuman primates.

Nonhuman primates of different species should not be housed together. Hunt, R. D. (New England Reg. Primate Res. Cen., Harvard Med. Sch., Southborough, Mass. 01772) *Laboratory Animal Care*, 1970, *20*, 1007-1008. (Letters section)

Incidence of mycoplasma in nonhuman primates. Hutchison, V. E., Pinkerton, M. E., & Kalter, S. S. (W.H.O. Collaborating Lab. Comp. Med.: Simian Viruses, Div. Microbiol. & Infect. Dis., Southwest Found. Res. & Educ., P.O. Box 28147, San Antonio, Texas 78228) *Laboratory Animal Care*, 1970, *20*, 914-922.

In a 3-year study, 395 nonhuman primates (Kenya baboons, African green monkeys, rhesus monkeys, and chimpanzees) were sampled from the throat, nose, rectum, and vagina to detect the presence of Mycoplasma species. 173 isolations were made. Identification attempts using the growth-inhibition test and selected antisera (*Mycoplasma pneumoniae*, *M. hominis T-1*, *M. orale 1*, *M. salivarium*, *M. fermentens*, and Simian strain #698) were negative. Specific antisera were also prepared to a few predominant prototypes of isolates. Metabolic inhibition tests demonstrated the presence of both carbohydrate-fermenting and non-fermenting types. A serological survey employing the complement-fixation test indicated that a sizable number of these isolates had some common antibodies with *M. pneumoniae*.

Experimental tuberculosis in owl monkeys (*Aotus trivirgatus*). Bone, Jesse F., & Soave, O. A. (Dept. Vet. Med., Oregon State U., Corvallis, Ore. 97331) *Laboratory Animal Care*, 1970, *20*, 946-948.

One of 4 owl monkeys inoculated intratracheally with about 40,000 viable *Mycobacterium tuberculosis* var *hominis* organisms developed a fatal hematogenous infection 42 days after inoculation. The remaining 3 animals developed no gross or microscopic lesions of tuberculosis in 120 days. The species may therefore be presumed to have a high degree of resistance. The intradermal tuberculin test employing a 1:10 dilution of Koch's Old Tuberculin was not effective in diagnosing the disease in the affected monkey.

Candidiasis in simian primates. Wikse, S. E., Fox, J. G., & Kovatch, R. M. (Med. Sciences Lab., U.S. Army Biol. Defense Res. Cen., Fort Detrick, Frederick, Md. 21701) *Laboratory Animal Care*, 1970, *20*, 957-963.

Candidiasis was diagnosed in 6 monkeys over a 10-month period. Most cases had been on antibiotic therapy for enterocolitis. Fungal invasion was seen in epithelium of the tongue, oral cavity, esophagus, and colon, and hard keratin of the nails. Gross lesions of the anterior alimentary tract were either white patches or ulcers of the mucosa. Lesions of the colon consisted of a thick pseudomembrane that contained numerous *Candida* organisms. The nails exhibited typical *Candida* onychomycosis. *C. albicans* was isolated from the 2 cases that were cultured. Tissue invasion by *Candida* blastospores and hyphae was histologically demonstrated in all cases.

Serodiagnosis of simian tuberculosis by soluble antigen fluorescent antibody (SAFA) tests. Fife, E. H., Jr., Kruse, R. H., Toussaint, A. J., & Staab, E. V. (Dept. Serology, Walter Reed Army Inst. Res., Walter Reed Army Med. Cen., Washington, D. C. 20012) *Laboratory Animal Care*, 1970, *20*, 969-978.

Details of a soluble antigen fluorescent antibody (SAFA) test for the serodiagnosis of simian tuberculosis were presented. The efficacy of the SAFA test for early detection of active tuberculosis was evaluated in rhesus monkeys used in a transmission study of simian tuberculosis, and the results were compared with those obtained in tuberculin tests and radiographs. The SAFA test proved to be more sensitive and more specific than the customary intradermal tuberculin tests conducted intrapalpebrally or on the abdomen. Moreover, the SAFA test became reactive 14-74 days before either tuberculin test was positive. The findings indicated that the SAFA test has excellent potential for early detection of active tuberculosis. It was suggested that use of the SAFA test for screening and monitoring the

animals in nonhuman primate colonies could appreciably reduce the risks of tuberculosis outbreaks.

Experimental Yaba and benign epidermal monkey pox in rhesus monkeys. Kupper, J. L., Casey, H. W., & Johnson, D. K. (USAF Sch. Aerospace Med., Brooks AFB, Texas 78235) *Laboratory Animal Care*, 1970, *20*, 979-988.

Two naturally occurring pox virus diseases of rhesus monkeys, Yaba tumor and benign epidermal monkey pox (BEMP), were investigated. The viruses were evaluated for reciprocal cross protection and pathological effects. Five monkeys were inoculated with Yaba virus and all developed lesions. After 66 days they were challenged with BEMP virus and none developed lesions. Five monkeys inoculated with BEMP virus all developed lesions; when challenged 66 days later with Yaba virus, typical Yaba lesions were observed in all 5 monkeys. Histologically the lesions produced by the 2 viruses were remarkably different. Epidermal cells were targets of the BEMP virus while the Yaba virus attacked mesenchymal cells of the subcutis. Cytoplasmic inclusions were produced by both viruses and the BEMP virus produced nuclear vacuoles and inclusions. Electron microscopic studies demonstrated that both viruses multiplied in the cytoplasm and that the ultrastructure of the 2 viruses was essentially identical.

Urinary bladder involvement in the talapoin (*Cercopithecus talapoin* Schreber) due to infection with *Schistosoma haematobium* (Bilharz, 1852) Weinland, 1858. Myers, Betty J., Kuntz, R. E., Huang, T. C., & Moore, J. A. (Div. Microbiol. & Infect. Dis., Southwest Found. Res. & Educ., San Antonio, Texas 78228) *Laboratory Animal Care*, 1970, *20*, 1004-1006.

Preliminary observations on the talapoin (*Cercopithecus talapoin*) infected with moderate numbers of *Schistosoma haematobium* (Iran) have revealed marked involvement of the urinary bladder, as indicated by cauliflower-like formations and edematous tissue proliferations covering the entire inner surface. Numerous eggs occurred in tissues of the bladder (9500 eggs/g) as well as in other viscera.

Naturally occurring lesions seen at necropsy in eight woolly monkeys (*Lagothrix* sp.). Henderson, J. D., Jr., Webster, W. S., Bullock, B. C., Lehner, N. D. M., & Clarkson, T. B. (Dept. Lab. Anim. Med., Bowman Gray Sch. Med., Wake Forest Univ., Winston-Salem, N. C. 27103) *Laboratory Animal Care*, 1970, *20*, 1087-1097.

A good physical and laboratory examination is necessary to assess the health status of newly imported woolly monkeys. In our experience these animals are frequently anemic, hypoproteinemic, dehydrated, and emaciated on arrival. During a period of acclimation, 8 of 17 woolly monkeys died. The

9 surviving monkeys have adapted to a diet of commercial monkey food and tap water. Major lesions seen in the 8 monkeys at necropsy were pneumonia (6 cases), meningitis (2 cases), and hepatic necrosis (6 cases). Vena caval thrombosis of unknown cause occurred in 2 cases. Arteriosclerotic lesions were seen in the aorta and renal and coronary arteries of 1 monkey. Findings consistent with delayed involution were seen in the uterus of 1 monkey. While it is recognized that this report is based on a small number of monkeys, it is hoped the information may be useful to other investigators using woolly monkeys in biomedical research.

Dichlorvos: an anthelmintic for primate trichuriasis. Pryor, W. H., Jr., Chang , C., & Raulston, G. L. (U.S. Nav. Med. Res. Unit No. 2 [Taipei, Taiwan], Box 14, APO San Francisco 96263) *Laboratory Animal Care*, 1970, *20*, 1118-1122.

Two hundred Taiwan monkeys (*Macaca cyclopis*) were examined for the presence of *Trichuris* sp.; 144 (72%) were positive. Thiabendazole (100 mg/kg twice at a 10-day interval) was evaluated for efficacy against that parasite with 30% of the subjects successfully treated. An additional group of monkeys, all positive for *Trichuris* eggs, received dichlorvos (canine formulation) at a single dose of 40 mg/kg (100% cleared); 20 mg/kg on each of 2 successive days (100% cleared); 10 mg/kg on each of two successive days (85% cleared); and 10 mg/kg as a single dose (70% cleared). Untreated control subjects retained *Trichuris* throughout the initial 30-day study period. Spontaneous clearing of 25% of the controls occurred within the subsequent 5- month period. Adverse reactions such as vomiting, diarrhea, anorexia, and 3 deaths occurred following the dose of 40 mg/kg. No deaths occurred at the lower dose levels, but some monkeys exhibited transient signs of cholinesterase inhibition. Ten unparasitized rhesus monkeys (*M. mulatta*) given 40 mg/kg for comparison had no clinical signs of toxicity. This variation might be a difference in species susceptibility or due to the Taiwan monkeys having had recent exposure to cholinesterase-inhibiting insecticides.

Nasal leech infestation in the rhesus monkey. Fox, J. G., & Ediger, R. D. (Animal Farm Div., Fort Detrick, Frederick, Md. 21701) *Laboratory Animal Care*, 1970, *20*, 1137-1138.

Dinobdella ferox, a leech that infects the nasal passages of various domestic animals and man, was recovered from 5 rhesus monkeys (*Macaca mulatta*) during a 4-year period at the primate conditioning colony, Fort Detrick, Maryland.

Tularemia in a pet squirrel monkey (*Saimiri sciureus*). Emmons, R. W., Woodie, J. D., Taylor, Mary S., & Nygaard, Genevieve S.

(Viral & Rickettsial Dis. Lab., California State Dept. Public Health, Berkeley, Calif. 94704) *Laboratory Animal Care*, 1970, *20*, 1149-1153.

Franciscella tularensis was isolated from the brain of a pet squirrel monkey (*Saimiri sciureus*) which died after several days of illness. Identity of the isolate was established by cultural characteristics, agglutination tests, fluorescent antibody staining, and mouse pathogenicity studies. Epidemiological investigation suggested that transmission of infection may have occurred in the pet shop from which the monkey was purchased.

PHYSIOLOGY AND BEHAVIOR

Hematologic values for nonhuman primates tabulated from the literature. II. *Total leucocytes and differential counts.* Morrow, A. C., & Terry, M. W. Seattle: Primate Information Center, 1970.

FACILITIES, CARE, AND BREEDING

Effects of infant loss on the interbirth interval of Japanese monkeys. Tanaka, T., Tokuda, K., & Kotera, S. (Japan Monkey Centre, Inuyama, Aichi, Japan) *Primates*, 1970, *11*, 113-117.

This report analyzes the intervals between births which might be affected by interrupted lactation due to the loss of young in a group of semi-wild Japanese monkeys. Of a total of 168 births involving determinable interbirth intervals, there were 53 (31.5%) with an approximate interval of 1 year and 107 (63.7%) with an approximate interval of 2 years. Among the 168 births, those resulting in "loss of infant" within 185 days (a figure obtained by subtracting the 180 days of the gestation period from 365 days, the mean interbirth interval), numbered 40. Of these, 38 (95%) subsequently gave birth in the following year. On the other hand, only 11 (8.6%) out of the remaining 128 females, that is, those who did not lose their infants, gave birth during the following year. These data indicate that parturition in successive years is much more prevalent among females who suffer "loss of infant" than among those who do not. From the results, it is suggested that separation of infants from their mothers increases the reproductive ability of the mothers and that, for the purpose of increasing reproduction, this separation should be made at the latest before or during the following mating season.

Reproductive behavior of captive male rhesus monkeys (*Macaca mulatta*). Missakian, E. A., Del Rio, L. R., & Myers, R. E. (Lab. of Perinatal Physiology, P. O. Box 5095, Puerta Tierra

Station, San Juan, Puerto Rico 00906) *Communications in Behavioral Biology*, 1969, *4*, 231-235.

Patterns of reproductive behavior among male rhesus monkeys (*Macaca mulatta*) in captivity were investigated. Twelve males housed at the Laboratory of Perinatal Physiology, San Juan, Puerto Rico, were subjects in this study. Each male was periodically exposed to a sexually receptive female for 48 hr. The initial 2 hr. of each exposure was observed via closed-circuit television and one-way vision windows. The following behavioral measures were recorded: grooming (male and female), mount, mount attempt, ejaculation time, intermount interval, refractory period, mount duration, and thrusts per mount. Data from the initial three-mount series were analyzed and compared in order to reveal possible differences on the above measures across successive mount series. The following characteristics were found: (1) increased ejaculation time, (2) increased mount frequency, (3) increased intermount interval, (4) decreased thrusts per mount, and (5) no change in total thrusts. These results were essentially in agreement with data reported by Michael and Saayman (1967).

Nursery care and growth of Old and New World infant monkeys. Ausman, L. M., Hayes, K. C., Lage, A., & Hegsted, D. M. (Dept. Nutrition, Harvard Sch. Pub. Health, Boston, Mass. 02115) *Laboratory Animal Care*, 1970, *20*, 907-913.

In order to use infant simians for studies in experimental nutrition, an infant monkey nursery was established. Old World (*Macaca fasicularis*) and New World monkeys (*Cebus albifrons*, *Cebus apella*, and *Saimiri sciureus*) comprised the experimental animals. The infants were removed from the dams at birth, kept in incubators for the first 2-3 weeks of life, and then housed in individual steel cages. The monkeys were fed a commercial liquid baby formula and provided water *ad libitum* after 3 weeks of age. This report includes mean values for growth, food consumption, and body temperatures, as well as information on clinical care and observations during the first 8 weeks of life.

Hematologic changes associated with pregnancy and parturition in *Macaca mulatta*. Switzer, J. W., Valerio, D. A., Martin, D. P., Valerio, Marion G., & Rininger, Bonny F. (Dept. Lab. Animal Med. & Pathol., Bionetics Res. Labs, Inc., Kensington, Maryland) *Laboratory Animal Care*, 1970, *20*, 930-939.

Hematological examinations were performed on the blood of 20 *Macaca mulatta* at monthly intervals during gestation and for a period of 8 weeks after delivery. An additional group of 200 animals was followed on a trimester basis during pregnancy and for the same postpartum period. The postpartum

hemograms and prenatal hemograms were compared with values from normal, non-pregnant, female rhesus monkeys. After parturition, the hematocrit falls rapidly, reaching minimal values by 72 hr. and returning to normal levels within 21 days. The sedimentation rate continues to increase following parturition, is maximal by 72 hr. and returns to normal in 14 days. Reticulocytes increase to maximal values in 7 days and return slowly to normal levels in 8 weeks. Leukocytes are slightly elevated in the postpartum period with an increase in neutrophils and a decrease in lymphocytes and eosinophils. The lymphocyte/neutrophil rate returns to normal in 2 weeks. Eosinophils increase to above normal by 3 weeks and remain at elevated levels beyond the 8-week period studied. Failure of the hemogram to return to essentially normal levels within 3 weeks after delivery is indicative of postpartum complications or the presence of disease.

INSTRUMENTS AND TECHNIQUES

A method for chronic intravenous drug administration in squirrel monkeys. Stretch, R., & Gerber, G. J. (Dept. Psychol., Univ. Western Ontario, London 72, Ontario, Canada) *Canadian Journal of Physiology and Pharmacology*, 1970, *48*, 575-581.

A system for the infusion of drug solutions into the blood stream of relatively unrestrained and unanesthetized squirrel monkeys, via a chronic intravenous catheter, is described. Results pertaining to the maintenance of schedule-controlled behavior by response-contingent infusions of *d*-amphetamine sulfate are included to illustrate a specific application of the technique.

Primate liver and spleen biopsy procedures. Voss, W. R. (Dept. Virol. & Epidemiol., Baylor Coll. Med., Houston, Texas 77025) *Laboratory Animal Care*, 1970, *20*, 995-997.

A simple and rapid, closed biopsy technic for the collection of liver tissue from marmosets (*Saguinus oedipus* and *Callithrix jacchus*) and tamarins (*Saguinus nigricollis*) for histopathological examination is described. A 16-gauge Klatskin needle and a subcostal approach are used. An open liver and splenic biopsy procedure which involves a mid-line abdominal approach and packing of the incised tissue site with absorbable gelatin sponge is also described. The sedation and operative care that are necessary with these procedures are presented.

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