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POLICY STATEMENT
(Revised October 1962)

The primary purpose of the Newsletter is to provide information on maintenance and procurement of non-human primates for laboratory studies. A secondary purpose is dissemination of general information about the world of primate research. Examples of the kind of practical information that would be useful are as follows: new drugs; novel aspects of cage design; new products; evaluations of various products; references to or short summaries of articles, off-beat or other, of general interest; experiences in connection with the procurement of monkeys. The Newsletter will also publish offers to exchange monkeys (for example, older monkeys for young or infant monkeys) and requests for monkeys with special characteristics (for example, good breeders or pregnant females). If someone has a special problem, he might want to request help through the Newsletter.

As a rule, only research articles or summaries which have some practical implications or which provide general information likely to be of interest to investigators in a variety of areas of primate research will be accepted for inclusion in the Newsletter. Descriptions of current research projects will also be welcome. It should be kept in mind that the Newsletter is not a formal publication and that it is not likely to be obtainable in libraries. Therefore, citation of Newsletter notes or articles in publications is not recommended.

Information for the Newsletter will be welcome from anyone in any research area who is using monkeys. The Newsletter will appear quarterly and will continue so long as people are interested enough to contribute items of information. The mailing list is open to anyone expressing an interest. There is no subscription charge.

Since the Newsletter is sent by third class mail with return postage guaranteed, it will not be forwarded by the Post Office. Names will be removed from the mailing list if an issue is returned because no change of address notice has been received by the Newsletter.

For reasons of economy, beginning with the mailing of the first issue of Volume 2 of the Newsletter, only new issues and back issues for the current year will be mailed to new subscribers free of charge. Volume 1 of the Newsletter may be purchased for $1.00.

All correspondence concerning the Newsletter should be addressed to:

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EDITORS' NOTES

As indicated in the revised Policy Statement, after the next issue is mailed, there will be a charge of $1.00 for Volume 1. We simply do not have the space to store large quantities of back issues, and, of course, the problem increased with each new issue. We plan to run off small quantities of back issues from time to time, but this procedure can be rather expensive. Add to this the cost of mailing, and we have the necessity for the charge. We will continue to send back issues and new issues for any current year free of charge.

The Newsletter is currently being sent to about 320 persons and to 13 libraries. The mailing list is already a good deal larger than we had anticipated and is still growing fairly rapidly. Perhaps we should have tacked to the final sentence in the above paragraph the statement: "at least if the number of requests for the Newsletter does not get out of hand." Incidentally, by way of keeping down the cost of producing the Newsletter, we would suggest that you do not encourage graduate students (notorious collectors of any and all free material), non-professional personnel or pet-monkey owners to request the Newsletter. We will continue the no-charge policy as long as we possibly can. Such a policy, we believe, permits an informality and flexibility which might not be possible otherwise.

You may be interested to learn that Mr. Stanford Gluck of Asiatic Animal Imports, Inc., acting together with Pan American Airlines, has successfully petitioned the Indian government to temporarily remove the ban on shipment of rhesus monkeys by jet aircraft. The ban has been removed for a test period of three months. Shipping time has, as a consequence, been reduced in most instances to under 24 hours.

On a recent visit to Dr. Rosvold at the National Institutes of Health, we learned that orange-flavored Isoniazid tablets are being produced by The Burrough Bros. Mfg. Co., 123 Market Place, Baltimore 2, Maryland. Dr. Rosvold reports that rhesus monkeys readily accept these tablets. The animals are regularly given one 10 mg. tablet in the morning and another in the late afternoon. The Company quoted us a price of $30.00 per thousand tablets with the minimum order 7000 tablets.

CONTENTS

NOTE ON SOME POSSIBILITIES FOR PRIMATE PSYCHOGENETICS

by

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Summary

This note deals with an analysis of the mating patterns existing among the colony of rhesus monkeys at the Wisconsin Regional Primate Center. The prevalence of mating patterns potentially suitable for psychogenetic analysis is reported, but corresponding behavioral data upon which it could be based are not available. Some recommendations are appended.

1. Introduction

The Wisconsin Regional Primate Center is one of seven such centers described in a recent issue of this Newsletter, and is based on the Primate Laboratory of the Department of Psychology. This laboratory has produced notable research work in the past, especially in the areas of the analysis of learning and performance, and the development of infant-mother relationships in the rhesus monkey.

At present the laboratory houses a collection of some 600 monkeys, almost all rhesus (Macaca mulatta mulatta Zimmerman). Of these 313 have to date been born in the laboratory in the course of a special program of rearing rhesus monkeys for research purposes. The program has been highly successful, mortality being extremely low. The methods employed are described in detail by Blomquist and Harlow (1961). It is with this laboratory bred population, where there has been control over, and documentation of, the mating procedures employed, that the present report is principally concerned. The intention is to survey this collection of rhesus monkeys with a view to establishing whether or not behavioral data already exist which would be amenable to analysis by methods currently being used to study the inheritance of behavior in other mammals, especially rodents.

2. Mating Patterns

The analysis of mating patterns in any population is a fundamental

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[1]The work described herein was performed at the Regional Primate Center, University of Wisconsin, where the writer was a visiting professor during the summer of 1962. He gratefully acknowledges the kindness of the Director, Dr. H. F. Harlow, in making his visit possible, and of the faculty, staff and students of the Center for their forebearance and cooperation during it. It was supported by NIH Grant #HE06287.

prerequisite of any attempt at genetical analysis. Accordingly the first task was to obtain as accurate a picture as possible of the familial relationships currently existing in the rhesus colony. This proved to be a more formidable task than might have been expected, since the records kept, though in general very adequate, were not designed to yield this type of information readily. Moreover, there are, especially in the earlier records, some cases of doubt or disagreement over parentage. In such cases the best estimate has been made and used in what follows.

The analysis of the birth records showed a substantial degree of inbreeding which reflects the procedure of using a relatively small number of males of proved fertility and potency for mating. Though this degree of inbreeding could no doubt be expressed more exactly by means of one of the genetical parameters designed for the purpose, perhaps the most suitable way for the present is simply to record the number of fertile matings for each male used. Table 1 shows this information. It is clear

Table 1

Number of fertile matings by males used as a percentage of total births

Male #	Number	Percentage
R 16	51	16.3
R 2	34	10.8
368	24	7.7
R 6	23	7.3
R 64	21	6.7
R 68	15	4.8
R 58	7	2.2
342	7	2.2
257	6	1.9
174	5	1.5
496	5	1.5
494	5	1.5
N 14*	5	1.5
14 others	22	7.0
Unknown**	85	27.1
	313	100.0

*Pig-tail macaque

**Usually males outside the colony, especially at the Cincinnati zoo.

that a few males have played a large part in siring offspring in the colony: indeed, one--R16--is the father of almost a quarter (22%) of all infants of known parentage born since 1954.

When we consider mothers a similar situation is found, though in the nature of things--the rhesus monkey typically bears one infant each year--the maximum contribution to the laboratory colony we can expect from any one female is eight. Of the 59 females producing more than one infant, none is recorded as having produced as many as eight, but there are two cases of seven offspring and six cases of six. The modal number is, however, around two.

The next task was to relate the parentage of the infants born in such a way as to display the family relationships. Logically it was, of course, possible that a particular female had adventitiously been mated each successive year to the same male, with the consequent production of relatively large groups of related siblings in the colony. This has not, however, happened: the largest "families" identified consist of no more than three siblings. There are 5 such families at the moment. The next closest relationship to be expected, and for our purposes perhaps the most useful, as will become clear later, is that of half-sibling, i.e., individuals having one parent the same but not the other. As may be expected from the repeated use of a relatively small number of males there is a complex network of half-sibling relationships among the present colony. These were displayed in a large table which represented the present familial relationships by means of entries for offspring in cells at the appropriate intersection of rows (fathers) and columns (mothers). Having thus obtained a reasonably accurate assessment of family relationships, the next question is the use to which this information can be put.

3. Genetically useful relationships

It was clear that we have in the present population no groups, however bred, which can be considered as representing the outcome of either of the two classical genetical methods of investigation, selection and the crossing of pure lines. Neither has ever been attempted with primates, and the latter would, in addition, need 10 to 20 generations to accomplish homozygosity (genetical purity) by brother x sister matings. In passing, it may be noted in this connection that the first generation of exclusively laboratory-born animals--by which is meant those whose parents were also born in the laboratory--has yet to come. The offspring born to laboratory-raised females have been sired by purchased males who were used from the first in establishing the colony. Thus one laboratory-born female was mated to her own father and produced a viable infant: others were mated to unrelated males for their first, and in two cases, their second, offspring.

In addition, the need for the strictest control of environmental variation in any psychogenetical study should be emphasized here. Obviously this is impossible for purchased animals whose age and background can only be guessed at. And the exigencies of experimental requirements

have hitherto doubtless been responsible for numerous departures from uniformity in the way the laboratory-born population has been raised. Nevertheless, it is clear that the program of infant rearing as at present constituted in the Primate Center is a considerable step towards the solution to this problem and potentially could afford a complete solution, especially in relation to the difficult problem of the control of post-natal maternal effects. (Broadhurst, 1961)

The above two considerations, that is, the absence of planned matings for genetical purposes and the absence of homogeneity of environment, might be thought to preclude any essay at genetical analysis of data from this Laboratory. However, the matter was pursued further in the hope that compensations for the absence of optimum conditions might be made in any subsequent analysis.

The next step, therefore, was to identify patterns of parent and offspring which could be of use. The analysis of parent-offspring correlations and correlations between full- and half-siblings can yield results of great interest, but the prevalence in the colony of half-siblings seemed likely to be especially helpful in the production of what are known as diallel crosses. The diallel cross is a method of investigating hereditary characteristics of any organism by crossing a number of genetically pure varieties, strains or sub-species of it, so that each strain is crossed with every other one in every possible combination. Given n as the number of strains involved, then the resulting diallel table will consist of n^2 measures. Such a diallel table of measures can then be analysed by the methods developed in biometrical genetics for the analysis of continuously variable, quantitative characteristics of the sort exemplified by most behavioral traits. Such analyses result in the apportionment of the variance of the characteristics or traits measured into three broad categories relating to environmental variation, genetic variation due to dominance, and genetic variation due to additive effects. An alternative procedure is to use an incomplete diallel cross which, in its simplest form, reduces to an array of a single strain crossed with several others. A recent application of the complete diallel cross technique to behavioral measures in mammals is provided by Broadhurst (1960), who crossed six strains of rats and measured the emotionality of the offspring.

The use of pure lines in the classic diallel cross seems to rule out any possibility of its application in the present connection. However, it is possible to substitute individuals for pure strains in the diallel analysis, and furthermore, there are indications that it may be possible to employ for this purpose individuals who do not possess genetic homogeneity, and indeed whose genetic background may be unknown. Broadhurst and Jinks (1962) have recently validated this method in part using measures of emotionality in rats. Hence the search among the familial relationships in the rhesus colony was concentrated upon diallel cross and incomplete diallel cross patterns, and arrays which were replicated. In the present context, this meant cases in which a male had sired more than one offspring from more than one female. The use of the large table of familial relationships described earlier led to the identification of a substantial number of crosses and arrays which may be summarized as

follows. There were found:

1 incomplete 4 x 4 diallel cross,
2 complete 3 x 3 diallel crosses,
189 complete 2 x 2 diallel crosses, and
5 replicated arrays which may be designated as follows:
1 male x 13 females, 1 x 7, 1 x 5, 1 x 3 and 1 x 2.

This outcome was gratifying, but not surprising in view of the mating procedures referred to. The very large number of 2 x 2 crosses conceals a good deal of repetition of a relatively small number of elements in many permutations, for, while each 2 x 2 table is individually unique, and relates to a combination of parents and infants which occurs in no other table, the same parents--especially males--and many of the same offspring recur in many of the tables. Similarly there is some overlap in the two 3 x 3 tables. But the large number of tables seemed to give promise that the important consideration of the replication of them for analytical purposes might be provided for.

4. Behavioral measures

Having discovered the prevalence of potentially useful mating patterns, the next step was to see if behavioral (or other) data existed for the animals concerned which could be used in a biometrical analysis of the tables and/or arrays. Clearly what is ideally required is that there should be scores for some measure or measures of behavioral interest for all offspring and their parents in a given cross, the measures having been obtained at the same age, at the same point in the animals' experience which should be identical for each and every one. Obviously, the structure of the colony--infants born in the laboratory from purchased adults--rules out any strict adherence to this ideal, but it was felt to be worth while to examine the records with this object in view.

In order to study the behavioral experience of each animal as part of a mating pattern of the sort described, it was necessary to consolidate the notations of participation in experiments on a single card for each animal involved. The cards for the various animals were then physically arranged in a representation of the mating pattern in which the said animals participated, either as parents or offspring, and a photograph was taken of the resulting layout in order to provide a permanent record which could be studied at greater leisure than would have been possible otherwise, since each pattern had to be broken up at once in order to provide the cards for subsequent rearrangements.

Some 200 photographs were studied in this way. But in no case was there a complete agreement as between parents and offspring participation in a single experiment, and in only a very few cases was there agreement in this respect as between either parents or offspring. This finding was not unexpected in view of the inevitable age discrepancies which must necessarily occur between and within the generations. It therefore became necessary to study the records of the individual experiments to see if there existed any degree of common procedure which might make it worth

while to seek the data derived from these experiments, with a view to a genetic analysis. A fairly superficial study of this question was adequate to convince the writer that the task was likely to be fruitless. Not only are some of the relevant studies still in progress, but there is so marked a divergence between the various procedures and apparatuses employed that it becomes impossible even to attempt to equate them in any psychologically meaningful way.

5. Other possibilities

There is one single measure which has been consistently recorded for all laboratory-born animals and which is consequently available for genetic analysis. This is birth weight. It is of course the one measure which, by definition, is not available for their non-laboratory-born, purchased parents. It is possible that a measure of adult weight at some standard age might be derived for both groups by adjustment and perhaps extrapolation of the very full weight records available in the laboratory, but weight is a measure which is especially environmentally sensitive and these data would necessarily be contaminated by the markedly different conditions of growth. It seems better therefore to concentrate attention on birth-weight data, and it may be possible to effect a more limited analysis of birth weight in the absence of the parental data. The writer may wish to undertake this in the future.

6. Conclusions

The attempt to obtain data of psychogenetic interest from the records of the Primate Center must be judged to have failed. This is, of course, no reflection upon either the Center, its research program, or upon the records maintained there. It merely emphasizes the dictum that it is rarely possible to adapt psychological experiments to analytic purposes other than those for which they were designed. But in the case of primate genetics the attempt seemed well worth while in view of the time scale inevitably involved in any such research which will undoubtedly be undertaken in the future.

In this connection this perhaps might be an appropriate place for the writer to express his opinion of how data amenable to psychogenetic analysis could be provided in a primate colony such as the present one with little additional expenditure of effort. This takes the form of two simple recommendations. The first relates to records and the second to experimentation. If considerations of family relationship are to be taken into account it becomes important for a central record, preferably in the form of a card file, to be maintained to provide this information. With such a file available it becomes possible to plan matings in such a way as to increase, or to decrease, the degree of genetic homogeneity in the colony as desired, and to provide family groupings of the sort which, as we have seen, allow the application of genetic analysis. It must often be the case that the choice between the use for mating of several otherwise equally qualified males is made with no such considerations in mind whereas a conscious selection could, in time, radically alter the situation.

The second recommendation relates to the multiplicity of test experience given laboratory-born animals. Were it possible to include in each animal's experience a simple test sequence at a standard age from which some measure or measures of psychological interest could be derived, such an attempt at genetical analysis as the present one would inevitably have had some limited success. True, there would be problems relating to allowances which might have had to be made for differences in environment, and to the ubiquitous problems of scaling. But the former might be turned to good account in essaying an analysis of the interaction of genetic background and environmental experience--which is probably the area of crucial interest in psychogenetics--and the latter would no doubt have been overcome by use of appropriate transformations. It is hoped that these observations may lead to consideration being given to these two matters by laboratory primatologists.

References

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HEPATITIS IN HUMANS ASSOCIATED WITH CHIMPANZEES *

Dr. Joe Held, Assistant to the Chief, Epidemiology Branch, has furnished the following regarding chimpanzees as a source of human infection.

During the past several years researchers have become aware of a link between human hepatitis and an association with young chimpanzees and wooly monkeys. Outbreaks were reported in 1960 and 1961 which strongly implicated these animals as the common source of infection.

In September, 1961, the Florida State Board of Health and Yerkes Laboratory cosponsored a meeting in Jacksonville, Florida, for persons interested in the problems of sub-human primates as a source of human hepatitis. Representatives of public health agencies, universities and military installations were invited. The group recognized that this was not a problem of great magnitude insofar as the number of human cases known to have occurred, but that it is certainly an important area to consider for further investigation. There are several unanswered questions in this area, and the resolution of these questions may well give added insight into the overall epidemiology and etiology of infectious hepatitis. Also a great deal needs to be learned regarding the effect of these infections on chimpanzees, and studies are needed to determine whether these animals may be suitable for some aspects of laboratory studies of infectious hepatitis. The group agreed that the Communicable Disease Center should be the focal point for the collection and dissemination of hepatitis surveillance information. Any persons receiving information on human cases of hepatitis resulting from contact with sub-human primates are asked to notify Dr. Joe R. Held, Assistant to the Chief, Epidemiology Branch, Communicable Disease Center, Atlanta 22, Georgia.

Dr. John Hughes, Division of Foreign Quarantine, Public Health Service, has made arrangements for the various U. S. Quarantine Stations to notify CDC whenever new shipments of chimpanzees arrive in the United States. A system of follow-up on these importations is now being initiated and it is anticipated that officials of state health departments in states to which these animals are shipped will be asked to participate in this surveillance program. It is hoped that much can be learned about the population at risk and the degree of risk. Any additional information obtained on the subject will appear in VPH Notes.

Previously we have reported on the various outbreaks of hepatitis associated with contact with chimpanzees and wooly monkeys. (See VPH Newsletters for November, 1960, April, 1961, June, 1961, September, 1961, and October, 1961) Below is a summary of cases reported to the Center (See

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* From the May, 1962, issue of the CDC Veterinary Public Health Notes prepared by the Veterinary Public Health Section of the Epidemiology Branch, Communicable Disease Center, Atlanta, Georgia.

Table I)

Late in 1960 Dr. Donald Coohon, Public Health Veterinarian, Michigan State Health Department, reported to the Communicable Disease Center an outbreak of hepatitis in 8 individuals who had had intimate contact with the same Colombian Wooly Monkey--two cases in one household and six in another. (VPH Newsletter, November, 1960)

About this time a report was received from Dr. William Hillis, of the Air Force, regarding an outbreak of hepatitis among chimpanzee handlers at Holloman Air Force Base. (VPH Newsletter, April, 1961: Hepatitis Surveillance Report No. 4, March 21, 1961; and Hillis, et al., Amer. J. Hyg., Vol. 73, No. 3) Dr. Hillis reported that the incidence was 52 percent among intimate handlers of newly arrived chimpanzees during a two-and-one-half year period (Table II). During the same period the incidence among other personnel on the base was only 0.4 percent. Newly arrived chimpanzees are held in an isolation colony for 45 days, and after this period are added to the established colony. Among 75 handlers of chimpanzees in the established colony, there were no cases of hepatitis during the same two-and-one-half-year period. Thus it would appear that the chimpanzees were shedding the virus for less than 45 days after their arrival at the base.

We began to learn of additional cases of human hepatitis which were believed to have resulted from contact with sub-human primates. To date the Center has received information on 54 such cases (Table I). The first of these cases occurred in 1953 among chimpanzee handlers at an Air Force Base in Austin, Texas.

Dr. Arthur Riopelle, Director, Yerkes Laboratories of Primate Biology, and Dr. J. F. Molloy, EIS officer assigned to the Florida State Board of Health (1959-1961) furnished information on an outbreak of human hepatitis which occurred at the Yerkes Laboratory in 1961 (Table III). Six of nine persons having intimate contact with a group of newly imported baby chimpanzees became ill. The baby chimps were added to the laboratory colony for a study in which it was necessary to handle, care for and play with them much as one would with a child. This included frequent changing of diapers. Two of 12 persons having casual contact with these animals also developed hepatitis. These were the investigator in charge of the study and his assistant.

Drs. L. B. Clayton and W. R. Stinger of the Dade County, Florida, Health Department investigated an outbreak of hepatitis among employees at a zoo in Miami during the summer of 1961. Six cases were recorded among 37 employees (Table IV). All six individuals had close contact with a chimp newly imported a month before onset of the first case.

In each of the above multiple-case outbreaks intensive epidemiological investigation revealed no other probable source of infection. Of the 54 human cases reported to date, 46 have occurred since 1958. Chimpanzees are believed to have been the source of infection in 45 cases and Wooly Monkeys in 9.

The reservoir of infection for the chimpanzees is unknown. Dr. Hillis reported that one of the importers followed a practice of administering pooled human blood by intraperitoneal injection to the chimps after their capture. This was done to protect the animals from human diseases with which they might come in contact. Conversations with several other importers indicate that this is not a common practice and that as far as could be determined only this one individual practiced this procedure. Reportedly many of the imported chimpanzees are captured by natives in Africa as babies when the parents are killed for food. The orphan babies are then brought into native villages where they are kept until they are purchased by an importer. In these villages the chimps have intimate contact with their human captors and if there is active hepatitis virus in this human population it seems likely that the animals have ready access to the virus.

The human cases have been clinically indistinguishable from infectious hepatitis and have occurred in individuals having intimate contact with chimps three-to-six weeks prior to onset of illness. The associated animals have demonstrated a variety of clinical illnesses, but the general pattern has not been compatible with infectious hepatitis in man. Most of the animal illnesses have been respiratory and parasitic in nature and are believed to have a variety of etiologies. However, the illnesses were similar to those commonly seen among sub-human primates newly imported into this country. In some of the more recent outbreaks the associated animals were found to have altered liver-function tests, but the significance of these tests in chimpanzees needs further definition.

TABLE I

HUMAN HEPATITIS WITH SUSPECTED SUB-HUMAN PRIMATE SOURCE
(Reports Obtained by the Communicable Disease Center)

Year	State	Place	No. of Cases	Suspected Animals	Comments	Source
1953	Texas	Air Force Base Chimpanzee Colony	5	Chimpanzee(s)	Intimate contact with chimpanzees and monkeys.	(1)
1955	Maryland	NIH Animal Colony	1	Chimpanzee(s)	Veterinarian in charge of Animal Colony.	(2)
1955	New York	City Zoo	2	Chimpanzee(s)	Veterinarian and nurse treating sick zoo animals.	(3)
1958	Florida	Monkey Jungle (Exhibition)	1	Wooly Monkey	Wife of owner--nursed sick baby monkey for 2 weeks, 3-to-4 weeks prior to onset.	(4)

TABLE I (Cont'd.)

HUMAN HEPATITIS WITH SUSPECTED SUB-HUMAN PRIMATE SOURCE

Year	State	Place	No. of Cases	Suspected Animals	Comments	Sourc
1958-1960	Florida	Wild Game Farm and Importation Facility	4	Chimpanzee(s)	Animal caretakers - contact with newly imported animals.	(1)
1958-1961	New Mexico	Air Force Base Chimpanzee Colony	15	Chimpanzee(s)	Veterinarians and animal caretakers - contact with newly imported animals.	(1) (5
1960	Michigan	Private Homes	8	Wooly Monkey	Had been in 2 different homes approximately 6 weeks prior to onset of first cases.	(6)
1960	Michigan	Pet Shop	1	Chimpanzee	Onset 6 weeks after caring for newly imported chimpanzee.	(6)
1961	Florida	Center for Primate Research	8	Chimpanzee(s)	Cases among persons working with newly imported young chimpanzees.	(4) (7
1961	New York	Animal Importation Facility	1	Chimpanzee(s)	Animal caretaker - contact with newly imported animals.	(8)
1961	Florida	Municipal Zoo	6	Chimpanzee	All cases had contact with newly imported baby chimpanzee.	(4) (
1961	Connecticut	Home of Zoo Director	2	Chimpanzee	Wife and son of Zoo Director cared for newly imported chimpanzee 5 weeks before onset.	(10)
1953 to 1961 TOTALS			54			

(1) Dr. Wm. D. Hillis, et al., Amer. J. Hyg. Vol. 73, No. 3.
(2) Dr. Wm. Gay, National Institutes of Health, Bethesda, Maryland.
(3) Dr. Leonard Goss, New York Zoological Park - Now at Cleveland Zoo.
(4) Dr. James Scatterday, Dr. James O. Bond, and Dr. J. F. Molloy, Florida State Board of Health, Jacksonville.
(5) Dr. James Cook and Dr. Robert Edwards, Veterinary Services Branch, Holloman Air Force Base, New Mexico.
(6) Dr. Donald Coohon, Michigan Department of Health, Lansing.
(7) Dr. Arthur Riopelle, Yerkes Laboratories of Primate Biology, Jacksonville, Fla.
(8) Dr. Vincent Guinee, EIS Officer, CDC (Patient was under his care while he was a resident physician, St. Vincent's Hospital, New York City).
(9) Dr. L. B. Clayton and Dr. W. R. Stinger, Dade County (Florida) Health Department, Miami.
(10) Dr. Robert McCullum, Yale University, New Haven, Connecticut, and Dr. Mila Rindge, Connecticut State Health Department, Hartford.

TABLE II

INFECTIOUS HEPATITIS AMONG VARIOUS GROUPS
AT HOLLOMAN AIR FORCE BASE, NEW MEXICO, AND SURROUNDING OTERO COUNTY
MAY, 1958, THROUGH DECEMBER, 1960

(From Hillis, Am. J. of Hygiene, Vol. 73, No. 3)

Group	Population	Cases of Hepatitis	Incidence (Percent)
Otero County, New Mexico	36,870	71	0.2
Base Personnel Exclusive of Veterinary Services Branch	6,500	24	0.4
Handlers of Chimpanzees in Established Colony only	75	0	0
Veterinary Services Branch	35	11	31
Intimate Handlers of Newly Arrived Chimpanzees (Veterinary Services Branch)	21	11	52

TABLE III

INFECTIOUS HEPATITIS AT YERKES LABORATORIES OF PRIMATE BIOLOGY
(Unpublished Data from Riopelle and Molloy)
8 CASES

Date Newly Imported Group of Infant Chimpanzees Arrived at Laboratory - March 2, 1961

Date of Onset of First Case - March 28, 1961

Date of Onset of Last Case - April 9, 1961

Group	Number	Cases of Hepatitis
Persons Having Intimate Contact with Newly Arrived Chimps	9	6
Persons Having Casual Contact with Newly Arrived Chimps	12	2
Other Employees Having No Contact with Newly Arrived Chimps	29	0
TOTALS	50	8

TABLE IV

INFECTIOUS HEPATITIS AT A ZOO
(Unpublished Data from Clayton and Stinger)
6 CASES AMONG 37 ZOO EMPLOYEES

Date Newly Imported Infant Chimpanzee
Arrived in United States from Liberia - June 15, 1961

Date Arrived at Crandon Park Zoo - July 6, 1961

Human Cases:

Date of Onset	Age	Sex	Race
8/7/61	19	F	W
8/7/61	18	F	W
8/7/61	16	F	W
8/17/61	17	F	W
8/17/61	28	M	W
8/23/61	23	M	W

All six of the cases had close contact with the chimpanzee. The four girls were summer employees responsible for its daily care, feeding, and for laundering of soiled diapers. The two men were regular employees responsible for the cleaning of its quarters.

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HEPATITIS - OREGON

Dr. Grant Skinner, Director, Epidemiology and V. D. Sections, Oregon State Board of Health, and Dr. Donald Pickering, Director, Oregon Regional Primate Center, recently reported an epidemic of hepatitis among animal handlers at the newly opened Center for Primate Research in Portland.

This outbreak is particularly significant because it is the first in which Celebes apes are a suspected source of human hepatitis. Dr. Joe R. Held, who is investigating cases of human hepatitis associated with

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*From the July, 1962, issue of the CDC Veterinary Public Health Notes.

sub-human primates (May, 1962, Veterinary Public Health Notes), has received reports of 54 cases of human hepatitis in which sub-human primates were implicated as the source of infection. Chimpanzees were the source in 45 cases and wooly monkeys in nine.

In the Oregon outbreak, within a 10-day period in April, 1962, four workers at the Primate Center became icteric with illnesses characteristic of infectious hepatitis. The dates of onset of illness of the four cases were April 12, 16, 17, and 22. Two illnesses which may have been cases of anicteric hepatitis also occurred at the Center at about the same time. No hepatitis cases were reported in the families or neighbors of these cases.

The Primate Center houses a variety of monkeys and apes for investigational purposes. The two most recent animal shipments to the Center included chimpanzees and Celebes apes (Cynopithecus niger). Two chimpanzees arrived on February 23, one on March 7, and one on March 12. Seventy Celebes apes arrived in December and five in February.

The Center is divided into two wings with a central area housing the laboratory, the X-ray and clerical group. Six persons work in the south end of the building and six in the north end. Individuals who work in the central portion of the building include: two laboratory workers, one X-ray technician, three clerical workers and the supervisor of personnel who work in the two wings.

At the time the chimpanzees and Celebes apes arrived they were housed in the north end of the building and both groups of workers were in contact with the chimps. However, the contact of the north group with the chimpanzees was related to weekend work and occasional holding and cleaning of the animals. On the other hand the south group had little or no contact with the Celebes apes.

Neither group of workers received gamma globulin.

All of the men who became ill worked in the north end of the building. Of the two persons who may have had anicteric hepatitis, one worked in the north end of the building and the other was a worker from the central portion who had contact with both chimpanzees and Celebes apes.

Thus, there were no cases of hepatitis among the persons having the closest contact with chimpanzees and all of the cases occurred among persons having contact with Celebes apes.

On epidemiological grounds it would appear that the Celebes apes were responsible for the cases of hepatitis in these workers.

PUBLIC HEALTH SERVICE

PRIMATE RESEARCH CENTER PROGRAM

The primate research center program of the Public Health Service is directed toward meeting the widely recognized need for suitable facilities for conducting research on subhuman primates.

A primate research center as conceived under this program is an organizational entity providing an optimal environment wherein resident and visiting scientists, representing a breadth of disciplines, may actively pursue research in order to advance all possible areas of knowledge relating to the biological characteristics of the primate throughout its entire lifespan. Such a center, in spirit and in fact, must be a major research resource facility to meet regional and national needs. Grants have been made for establishment of centers meeting these specifications in Oregon, Washington, Wisconsin, Georgia, Louisiana, and Massachusetts.

Oregon Regional Primate Research Center - Dr. Donald E. Pickering, Director

The PHS primate center program was inaugurated in 1960 with the awarding of grants to the Medical Research Foundation of Oregon for construction and operation of a regional primate center at Portland. The University of Oregon will provide the academic environment within which the center will operate.

The new facility, including unique out-door colony buildings, is located in Beaverton, on a large tract of land about 10 miles west of downtown Portland.

Investigators utilizing the center will work toward the definition of such vital processes as are involved in heredity and in the origin, specialization, and functional mechanisms of living cells and organ systems in the healthy and diseased primate. Some of the areas of investigation include physiology and biochemistry of the fetus and newborn, fetal skeletal biochemistry and growth, congenital anomalies, and cardiovascular physiology and pathology.

Regional Primate Research Center, University of Washington -
Dr. Theodore C. Ruch, Director

Grants have been awarded to the University of Washington for the construction and operation of a regional primate research center to be located on the university campus at Seattle.

The center will serve as a facility for university faculty members using primates in medical, biological, and psychological research. The center will also emphasize the training of visiting scientists in primate research techniques and primate care. Further, it will also serve as a center for development and dissemination of new information about primate

research.

Among key investigations to be carried on at the center will be studies in neurophysiology and electrophysiology, gastrointestinal physiology, skeletal and dental development, physiological psychiatry, and obesity and dietary factors in cardiovascular diseases.

Wisconsin Regional Primate Research Center - Dr. Harry Harlow, Director

Grants have been awarded to the University of Wisconsin for construction and operation of a primate research center to be located adjacent to the present primate laboratory, on a site in the campus extension area.

Long-term holding facilities will be built to permit study of the more than 25-year lifespan of the rhesus monkey. Furthermore, an extensive breeding program will be undertaken to provide a constant supply of young animals.

Among investigations that will receive emphasis at the new center are studies on postnatal development of the primate brain, hormonal factors in reproductive processes, biochemical factors associated with mental retardation, and variables influencing the development of normal and abnormal affectional systems.

Yerkes Regional Primate Research Center, Emory University -
Dr. Geoffrey H. Bourne, Director

Grants have been awarded to Emory University for construction and operation of a primate research center designed primarily for multidisciplinary study of the chimpanzee, to be located on the university campus. Establishment of this center would assure continuation and further development of the psychobiological research of the Yerkes Laboratories of Primate Biology, Inc., owned by Emory University and presently located at Orange Park, Florida.

Areas of research emphasis of the new center will include studies on the relation of infant growth and experience to behavior in later life, physical, physiological, and psychological attributes of aged primates, perceptual and cognitive functions, brain functions, comparative studies with monkeys and with other anthropoids, and effects of unusual environments and intense stimulation.

Delta Regional Primate Research Center, Tulane University -
Dr. Arthur Riopelle, Director

Grants have recently been awarded to Tulane University for construction and operation of a primate research center in New Orleans.

When established, research emphasis at the center will be on cardiovascular diseases, infectious diseases, and behavioral sciences.

New England Regional Primate Research Center - Dr. Bernard Trum, Director

Grants have been awarded to the Harvard Medical School, acting in behalf of several Greater Boston and New England universities and medical institutions, for construction and operation of a regional primate research center to be located on a 140-acre tract of land in Marlboro and Southboro, Massachusetts

The objectives of the center are: (1) to provide facilities and support for (a) an investigative program designed to study many aspects of primatology, such as bacteriology, physiology, nutrition, endocrinology, pathology, psychology, and social behavior, (b) programs to be conducted by visiting scientists, (c) the acquisition, breeding, and maintenance of a variety of primate species; (2) to train professional and technical personnel in primatology and primate husbandry; (3) to provide primates for the research programs of the cooperating institutions.

July 17, 1962

The above information was supplied by Katherine A. Parent, Executive Secretary, Primate Research Study Section, Division of Research Grants, National Institutes of Health.

* * *

ADDITION TO LIST OF EASTERN SUPPLIERS OF MONKEY CAGES

We received a justifiably hurt letter from a cage manufacturer who learned that he had been omitted from our list of Eastern monkey cage suppliers (LPN, Jan., 1962). We have remedied the situation below. The list is certainly far from complete. If you know of additional cage manufacturers in the East or in other parts of the country, please send us their names.

Harford Metal Products, Inc., Aberdeen, Maryland

AGED MONKEYS NEEDED

If you know of a source of aged monkeys, especially rhesus monkeys, whose birth date can be established within a few months, please contact Dr. William I. Gay, Chief, Animal Hospital Section, Laboratory Aids Branch, Division of Research Services, National Institutes of Health, Bethesda 14, Maryland.

* * *

BLOOD PRESSURE OF MONKEYS (SAIMIRI SCIUREA)*

Heart rate and blood pressure were measured on two squirrel monkeys (Saimiri sciurea).

The animals were placed in a Carmichael-MacLean restraining chair during recording. The apparatus used is a Decker Model 320-1 Caudal Plethysmograph, and a Sanborn Model 296 Two-channel Recorder.

The occluding cuff was positioned approximately 10 cm. from the base of the tail. Pulse rate information was also obtained.

The average heart rate was 324 beats per minute (range, 273-350), and the average systolic blood pressure was 160 mm Hg (range, 153-171).

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*The authors would be interested in knowing what blood pressures other people have obtained using the above or any other technique in order to check on the accuracy of the measurements.

* * *

RECENT ARTICLES

Research bibliography

The chimpanzee: a topical bibliography. Rohles, F. H. (Copies may be obtained by writing to Lt. Col. (Dr.) F. H. Rohles, Chief, Comparative Psychology Branch, 6571st Aeromedical Research Lab-

oratory, Holloman Air Force Base, New Mexico) Aeromedical Research Laboratory Technical Documentary Report 62-9, June, 1962.

This comprehensive bibliography on the chimpanzee contains over 2300 references in almost all areas of research. English translations are made on all foreign entries. The entries are divided into the major areas of anatomy, physiology, pathology and experimental medicine, and psychobiology with finer breakdowns within each of these categories.

Disease symptoms and treatment

Lung mites: Pulmonary acariasis in the primate. Grinker, J. A., Karlin, D. A., & Estrella, P. Manelo (Dept. of Pathology, Evanston Hospital, Evanston, Ill., and Dept. of Pathology, Northwestern U. Med. School, Chicago, Ill.) Aerospace Med., 1962, 33, 841-845.

The article presents a brief review of studies on pulmonary acaris in the hope that investigators will become cognizant of possibilities that their experiments, especially those on Old World monkeys, may be affected by the presence of lung mites.

Lead intoxication in primates. Hausman, R., Sturtevant, R. A., & Wilson, W. J., Jr. Forensic Sciences, 1961, 6, 180-196.

General on care and treatment

All of the articles listed in this section are from the June issue of the Proceedings of the Animal Care Panel (1962, Vol. 12).

Maintenance of monkeys experimentally infected with organisms pathogenic to man. Jemski, J. V. (U.S. Army Chemical Corps Biological Laboratories, Fort Detrick, Maryland) pp. 89-98.

The article describes some of the methods and equipment developed to safely handle experimental animals, especially monkeys, infected with highly communicable diseases.

Management practices in a normal monkey colony. Stone, W. G. (Lederle Laboratories Division, American Cyanamid Co., Pearl River, New York) pp. 99-106.

Importing monkeys under isolated conditions. Vickers, J. H. (Lederle Laboratories Division, American Cyanamid Co., Pearl River, New York) pp. 107-112.

The article discusses a program to individually isolate rhesus monkeys from the time of trapping until use in the laboratory. Problems encountered in establishing such a program and in maintaining segregation are mentioned.

A restraint unit for large monkeys. Rich, S. T., & Cohen, B. J. (University of California Med. Center, Los Angeles, Calif.) pp. 113-116.

The article describes a combination trap cage and restraining mechanism for handling large monkeys. A pair of framed nets on pipe slideways can be closed, locked, and removed with the monkey secured between the nets.

A device for weighing monkeys. Westcott, R. B. (U.S. Army Chemical Corps Biological Laboratories, Fort Detrick, Maryland) pp. 117-120.

The article describes construction and use of a relatively simple scale attachment for use in weighing monkeys. The advantages of a systematic weighing program during the conditioning period are discussed.

A device to facilitate the restraint of laboratory animals. Landolt, R. E., Peters, D. C., & Davenport, P. (Hazleton Laboratories, Inc., and Bionetics, Inc., Falls Church, Virginia) pp. 121-124.

The article describes an inexpensive, simple method for immobilizing certain experimental animals without anesthesia. The "stovepipe" device described worked with rabbits, cats and rhesus monkeys.

Physiology: Techniques and results

An intracardiac technic for obtaining blood samples from monkeys. Conroy, J. D., Tashjian, R. J., & O'Connor, Patricia (The Animal Medical Center, New York, New York) Cornell Vet., 1962, 52, 151-155.

Renal function studies in monkeys (Macaca mulatta). Pickering, D. E., & Sussman, H. H. (Oregon Regional Primate Research Center, Beaverton, Ore., and Pediatric Endocrine-Metabolic Laboratories, Univ. Ore. Med. School, Portland, Ore.) Amer. J. vet. Res., 1962, 23, 667-672.

Renal clearance values for insulin, endogenous creatinine, and sodium para-aminohippurate (PAH) were determined in healthy immature and mature rhesus monkeys.

Urinary amino-acids of non-human primates. Fooden, J. (Limited supply of reprints available from the Chicago Zoological Park, Brookfield, Ill., Attention: Dr. George B. Rabb) Zoologica, 1961, 46, 167-180.

The blood pictures in monkeys. Williams, R. A. Southeastern Vet., 1962, 13, 88-89.

Virus B

Occupational infection with virus B of monkeys. Love, F. M., & Jungherr, E. (Dept. of Medical Services and Dept. of Virus Biological Research, Lederle Laboratories Division, American Cyanamid Co., Pearl River, New York) J. Amer. med. Assoc., 1962, 179, 804-806.

The article describes a fatal case of human infection with B virus of monkeys in a pharmaceutical worker. Of interest in the case was, among other things, the fact that the disease was contracted without any definite history of injury. The authors strongly recommend distribution of a manual on protective measures and training programs for employees working with monkeys.

* * *

NOTE ON A HUMAN CASE OF SHIGELLA SONNEI

CONTRACTED FROM GIBBONS

On February 22, 1962, two gibbons (Hylobates-Brachytantes, Symphalangus) and 400 monkeys arrived in the United States via Pan American from Bangkok. The two gibbons were brought in for a woman in accordance with arrangements made by her four months before while she was in Bangkok. The gibbons became sick on the day after arrival and, seven days later, the owner became ill. The animals, one male and one female, were 2-1/2 years old.

A veterinarian who had no experience with monkey infections was called in to diagnose the illness. The presence of acute diarrhea led him to diagnose the infection as cholera, and to call in another veterinarian who had had experience with monkey infections. The latter diagnosed the infection simply as dysentary. Cultures made at the Alameda County Department of Health indicated that both gibbons were infected with Shigella sonnei.

On the morning of the seventh day after the arrival of the gibbons, the owner became ill with acute vomiting, nausea and diarrhea. The following morning she was taken to the hospital, where she expired 48 hours after onset of the illness. Cultures were made from the patient on entering the hospital (rectal swab) and Shigella sonnei was recovered. Autopsy also revealed S. sonnei in the intestine.

Of interest and perchance a contributing factor was the fact that this patient was on steroids and had been for years.

Dr. K. F. Meyer
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NEWSPAPER CLIPPING

SCIENTISTS DRAFT BOOK ON PRIMATES

Palo Alto, Calif., Sept. 15. - A group of American and foreign students of monkey behavior planned a winter of collaboration this week at Stanford University.

Seven of the scientists, who have been observing the family life of subhuman primates for a number of years, are spending the next nine months at the Center for Advanced Study in the Behavioral Sciences. Their objective is to produce a comprehensive book on primates.

Dr. Ralph W. Tyler, director of the eight-year-old center, said that these scientists would debate questions like these: What does the study of apes and other subhuman primates tell us about human behavior? What more can one learn about primates by studying them in the wild rather than in cages? How is body structure related to evolutionary development? The primate project has been underwritten by the National Institute of Mental Health with a grant of $ 99,791.

The scientists involved directly in the project are Dr. Irven DeVore Jr. of the University of California; Dr. Jane Goodall of the Coryndon Museum at Nairobi, Kenya; Dr. K. R. L. Hall of the University of Bristol, England; Dr. Phyllis Jay of the University of California; Dr. Hiroki Mizuhara of the Japan Monkey Center at Aichi-ken, Japan; Dr. George B. Schaller of the University of Wisconsin, and Dr. Sherwood L. Washburn of the University of California. All of them except Dr. Goodall, whose arrival has been delayed, sat down this week at the center with eight other scientists concerned with experimental and field studies of primate behavior.

With movies and discussion, they determined pretty clearly what was known now about monkey behavior that could be included in the projected volume, and what new research was needed. In the coming months the project members will debate and write in the cloistered center. The whole group, including participants in this week's preliminary conference, is to be brought together again next summer for final editing of the volume.

The scientists have studied wild gorillas, chimpanzees, baboons, langurs, macaques, howlers and gibbons. Their research has carried them into Africa, India and elsewhere.

The New York Times, 16 September 1962

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CORRECTION

Dr. Robert E. Edwards is at the Psychopharmacology Service Center, rather than the Psychophysiology Service Center.