LABORATORY PRIMATE NEWSLETTER

Volume 5, Number 1

January, 1966

Edited by

Allan M. Schrier

Consulting Editors

Morris L. Povar Fred Stollnitz

Psychology Department
Brown University
Providence, Rhode Island

POLICY STATEMENT
(Revised January, 1966)

The primary purpose of the Laboratory Primate Newsletter is to provide information on maintenance, breeding, and procurement of non-human 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.

It should be kept in mind that the Newsletter is not a formal publication and it is not obtainable in most libraries. Therefore citation of Newsletter notes or articles should be limited to special circumstances. This also means that inclusion of material in the Newsletter does not preclude its publication in a journal. As a rule, authors of longer articles will receive two extra copies of the issue in which the article appears; reprints will not be supplied under any circumstances.

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 and back issues for the current year. 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 and 2 for $4.00 per volume, Volume 3 for $2.00, and Volume 4 for $1.00. (Please make checks payable to Brown University.)

All correspondence concerning the Newsletter should be addressed to:

Allan M. Schrier
Psychology Department
Brown University
Providence, Rhode Island 02912

Acknowledgment

The Newsletter is supported in part by U. S. Public Health Service Grant MH-07136 from the National Institute of Mental Health.

CONTENTS

B VIRUS IN ASSOCIATION WITH A MONKEY COLONY AT A DEPARTMENT OF PSYCHOLOGY

G. Sumner-Smith

Bristol, England

In December, 1964, the author was requested to examine newly arrived Sykes monkeys suffering from pneumonia in the small primate colony at the Department of Psychology of Bristol University. Subsequently the head of the department requested the author, a veterinarian in general practice, to be responsible for the health of the colony. This communication is intended as a statement of the subsequent events that led to the eventual destruction of the colony, with comments on some of the facts that emerge.

During the first six months covered by the report, consultations had taken place with the head of the department concerning the policy to be adopted for quarantine, husbandry, hygiene, security, and human health precautions. The advice was readily accepted and steps were taken to implement both the short- and long-term recommendations.

The colony was housed in various group cages in the department, which is a large converted Victorian residential property. The types of monkeys composing the colony, their sources, dates of arrival, and brief comments about the animals are given in Table I.

On 26th April, 1965, a male vervet (Cercopithecus aethiops) escaped from his cage, broke through a glass window in the department and was found at the top of a large tree on a neighboring hill. He was recaptured on 30th April. During recapture he inflicted a minor bite to the research worker assisting the veterinarian.

The research worker became ill on 24th June and subsequently died on 14th July. An open verdict was recorded at the inquest as it was stated that there was no conclusive evidence of the nature of the virus that caused the illness.

Meanwhile on 5th July the escapee was subjected to a clinical examination and a blood sample and throat swab were taken. No lesions were visible within or around the mouth. The blood, along with samples from the human patient, was subjected in the first case to Herpes simplex neutralizing antibody titration. This was performed because the consulting virologists understood there to be a one-way cross neutralization between H. simplex and H. simiae B.

Subsequently through the good offices of Messrs. Glaxo Laboratories it became possible in early August to subject the serums to virus B antibody neutralization. The results of these tests are summarized in Table II. As indicated in this table, the vervet monkey had a high neutralization titre for both H. simplex and H. simiae B. The human patient

Table I

The Colony

Number	Species	Source	Date of Arrival	Comments
4	Cercopithecus talapoin	Ravensdown Zoo	11-26-64	1 pregnant at time of destruction
4	Erythrocebus patas	Gift from Burroughs Wellcome & Co.	2 on 5-62 2 on 7-62	
2	"	Importer	11-17-63	
1	"	Direct from Entebbe	1962	24 hr. in R.S.P.C.A. Airport Hostel
3	"	Bred in colony	1-64 to 6-65	
8	C. mitis (Sykes)	Importer	11-64 to 4-65	3 deaths (virus pneumonia, per laboratory report); 1-12-64, 1-7-65, and 3-22-65
9	C. aethiops (Vervet)	Direct from Entebbe	9-9-64	All spent 24 hr. in R.S.P.C.A. Airport Hostel. 1 was escapee. 1 died (pneumonia?) 9-11-64

Table II

Results of Neutralization Tests

Date	Subject	H. simplex	H. simiae B
5th July	Vervet monkey	1/256	1/96
26th June	Human patient	<1/2	<1/8
5th July	" "	<1/2	1/8
12th July	" "	<1/2	1/12

showed virtually no neutralization of H. simplex, but showed a markedly higher titre for H. simiae B, and this increased in concentration as the disease progressed.

No virus was isolated from the cerebrum, cerebellum, medulla, mid-brain, cord, C.S.F. or throat swab from the patient. Nor was one isolated from the throat swab from the vervet monkey.

Samples were inoculated into monkey kidney, HeLa cell, and human embryo kidney tissue cultures, as well as into suckling mice.

Whilst it would have been highly desirable to take blood samples from the whole colony, in an effort to ascertain the varying antibody titres of the inmates and to attempt to trace the origin of infection, this would have necessitated the further use of live virus B. The reluctance of virologists to carry out these tests is readily understood and appreciated. The whole colony was destroyed on August 25th.

It is pertinent to note that all the monkeys originated from Africa, and that there had never been any rhesus or cynomolgus monkeys in the colony. A study of their origin (see Table I) will indicate possible sources of contact with H. simiae B infection.

It should also be mentioned that no animals showed any clinical lesions during the time that the author was connected with the colony, but the only animals handled prior to the escape were the Sykes monkeys. They were placed in quarantine on arrival and subjected to routine acceptance tests and examinations. These were the animals that developed virus pneumonia during quarantine, and it is interesting to note that they showed an unusually high lymphocyte count (45-75%). The significance of

these figures is not apparent as it is not understood whether or not they are peculiar to Sykes or if they are the result of a disease process.

The final point to emerge is that whilst primary screening for virus B may be carried out by testing against H. simplex it is not always possible to produce H. simplex neutralization if the virus B titre is very weak, and the poor antigen-producing stimulus of virus B is once again demonstrated.

Acknowledgments

I am indebted to Dr. S. K. R. Clarke of the Public Health Laboratory, Bristol, and to Dr. A. J. Beale of Glaxo Laboratories for performing the titrations and for their ever-willing help and advice. Mr. O. Graham-Jones, Senior Veterinary Officer of the London Zoological Society provided much in the way of consultation and in the practical problem of the destruction of the colony. He is especially deserving of my gratitude.

* * *

THE BABOON IN LITERATURE

Current references to world literature on the baboon are being recorded and annotated by bibliographers of the Biological Sciences Communication Project, the George Washington University, of which Charles W. Shilling is Director. The work is sponsored by the Southwest Foundation for Research and Education, San Antonio, Texas.

Present plans are to accumulate these references for publication as a supplement to The baboon: An annotated bibliography, which was issued in early 1965. This volume is available from the Southwest Foundation for Research and Education, San Antonio, Texas, for the price of $10.00.

Many individuals and institutions shared in the original undertaking, in particular Dr. B. A. Lapin, Academy of Medicine and Science, Institute for Experimental Pathology and Therapy, Sukhumi, Georgia, USSR, who contributed 595 references to the Russian literature, annotated in English. The Regional Primate Research Center, University of Washington, was also a liberal contributor and is continuing to cooperate in the current endeavor.

All who are interested in the baboon as a research animal are encouraged to forward suitable literature references to the Biological Sciences Communication Project, 200 "P" Street, N. W., Suite 700, Washington, D. C. 20036, Attention Miss Mildred Benton, Research Bibliographer.

NOTES ON THE MAINTENANCE OF SQUIRREL MONKEYS OUT-OF-DOORS

Lawrence G. Sharpe and Leon S. Otis

Stanford Research Institute, Menlo Park, California

New and valuable information is being accumulated regarding the maintenance of squirrel monkeys in the laboratory. We would like to add to this knowledge by reporting some of our experiences in maintaining squirrel monkeys in small outside compounds under conditions of wide temperature and humidity variations. All animals, numbering approximately 75, were obtained from a local dealer.

Caging

Caging consisted of three outside compounds, each measuring 8 ft. by 10 ft. by 7 ft. high and made of chicken wire. Two-by-four wooden beams in each compound served as runways or perches. The roof was also made of chicken wire except for a 3-ft.-by-8-ft. portion at the rear of each compound which was covered with corrugated steel to provide shade or protection from inclement weather. The corrugated steel extended for 3 ft. down the back end of the compound as well. The compounds were sheltered from the wind by two adjacent buildings. Small unheated cages with grill floors were placed near the ceiling underneath the sheltered portion of each compound. The ground was covered with wheat straw which was changed every 2 weeks.

Eight adult male squirrel monkeys were placed into one of the compounds on January 5, 1965, with no source of heat other than that provided by each other through huddling. After these animals survived a very wet and cold month, 26 more male monkeys were added on February 2, 1965. Twenty to 30 additional male monkeys were housed in a second compound. In March a small breeding colony consisting of four females and four males was started in the third compound. Animals were added to or removed from the large colonies from time to time depending upon experimental needs.

Weather Conditions

Temperature was recorded by a 24-hour chart-writer. The lowest temperatures recorded for January, February, March, and April were 26°, 30°, 35°, and 34° Fahrenheit, respectively. The highest temperatures for these four months ranged from 65° to 85°. During the first 3 months, at least half the days had temperatures in the 30s. During the late spring and summer months the average high was from 85° to 90°, while the average low was around 50°.

The average high and low relative humidity recorded for the first 8 months were 75% and 57%. Frequently, however, the relative humidity dropped below 30% and climbed above 80%.

Rain occurred for 9 days in January, 4 days in February, 7 days in March, and 8 days in April.

Social Behavior

Huddling was the most frequently observed social behavior during the cold winter months. As many as 15 to 20 animals would sit side by side in a curled position on a runway perch or on the ground. No animal was observed to make ventral contacts with another, as rhesus monkeys normally do when huddling in cold weather. Other kinds of social activity, which appeared when the weather was warmer (from 65° to 90°F.), included fighting, playing, penile displays, and sexual mounting. Fighting occurred frequently in the two larger groups, but no animals had to be removed as a result of injuries suffered from fights. However, serious fighting occurred when six new animals of both sexes were added to the firmly established breeding colony of eight animals. These new animals were continuously under attack by resident members, especially the males. An attack was frequently provoked by such noises as the closing of the cage door or clapping of the hands. After the death of two animals, the other four were removed within 9 days because of health deterioration which probably resulted from injuries sustained from attacks by resident members. The animals that were removed soon regained their health.

Mortality

During the last week in March, five more deaths occurred. Five other animals became ill but were brought back to health by hand feeding. Autopsy revealed that the five deaths were probably due to large collections of parasitic worms (possibly thorny-headed worms) in the intestinal tract. Early in April, we changed from using open water containers, which could be contaminated by the animals, to water bottles; no further deaths or sickness occurred in the 6 months following this change.

Diet

Our squirrel monkeys were fed only commercial monkey chow, and appeared to maintain very good health, as Rumbaugh (1963) also found. Regular weight increases and good fur were typical.

Reproduction

Two pregnancies occurred in our small breeding colony (September 18 and 23, 1965, respectively), but both of the young were found dead. We left the pregnant females in the outside compound, although we removed all but one of the other animals--a female. We felt that successful births would be likelier if the pregnant animals were allowed to remain in the environment to which they had become accustomed. Apparently, this was not the case. We now plan to bring pregnant females indoors during late pregnancy.

Conclusions

We agree with Rumbaugh (1963) that, if received in good health, the squirrel monkey is not as delicate a creature to maintain as some may believe. Squirrel monkeys in groups of from 10 to 30 can easily tolerate temperatures in the 30s (and possibly lower) along with a wide range of relative humidities. It appears that group living in an adequate amount of space enhances the survival value of these animals under a wide range of conditions. Since squirrel monkeys are relatively easy to catch and handle in the outdoor compound, this mode of housing will most likely prove to be one of the best and lowest-cost methods for maintaining large numbers of animals for laboratory use or for naturalistic observations in geographic areas where severe cold and snow are not a problem.

References

Rumbaugh, D. M. Squirrel monkey maintenance at San Diego State College. Laboratory Primate Newsletter, 1963, 2 (3), 2-4.

* * *

NEWSPAPER CLIPPINGS

ANOTHER BUYER FOR APE ART

Albuquerque, N. M.--Two gorillas trying to earn their keep at the Albuquerque Zoo by fingerpainting have sold another abstract.

The zoo announced yesterday that Public Service Co. of New Mexico, an electric utility, had bought for an undisclosed price one of seven paintings the two gorillas have produced.

Earlier, one painting sold for $1,000 and another for an undisclosed amount.

Zoo officials hope the paintings will raise $15,000, the price the zoo agreed to pay on a buy-now, pay-later basis for the two young gorillas and a third which has not yet been delivered.

Providence Evening Bulletin, January 7, 1966

PROTEIN IN THE DIET OF NONHUMAN PRIMATES

Morris L. Povar

Psychology Department, Brown University, Providence, Rhode Island

Although the specific nutritional requirements of poultry and some other domestic animals have been studied extensively, the feeding of nonhuman primates is still highly speculative. The requirements given for Macaca mulatta (Committee on Animal Nutrition, 1962), which are better known than those of any of the other simians, are based on simple experiments using few animals and on information about domestic animals and man. Much of the confusion and contradictory advice about protein requirements results from this lack of hard facts. One of the certainties is that protein is one of the critical items in an animal's diet and can be supplied from many sources. Since protein in primate diets has been the subject of several inquiries made of the Laboratory Primate Newsletter (see Editor's Notes, October, 1965), it appears that there would be some value in reviewing the import of protein quality and its relationship to feed.

"High" and "low" protein diets are frequently mentioned in the literature, referring strictly to the quantity of protein in the ration. This gives no indication of the quality of the protein and its availability to the animal consuming it. According to the National Research Council (NRC) Committee on Protein Malnutrition (1963), "The nutritive value of a dietary protein depends upon the pattern and quantity of essential amino acids it presents to the body after absorption from the intestines" (p. 137). The report includes analytical methods for the determination of nitrogen and amino acids, evaluation of protein quality of foods from their amino-acid content, biological-assay methods of protein evaluation, clinical methods of protein evaluation, and an especially interesting section on the relationship of stress and physiological state to biological evaluation of protein quality. This report summarizes current thought on protein quality, so it should be read by all concerned.

Many factors such as processing can reduce or increase the nutritional value depending on the nature of the protein involved. The age of the individual consuming the protein has a tremendous effect on protein requirement. According to a report of the NRC Food and Nutrition Board (1959), the infant human requires approximately five to six times as much protein as the adult. This elevated requirement of the young, growing animal is true of all species studied. Protein requirements are also elevated by pregnancy, lactation, and disease, among other things.

Evaluating the protein quality in a ration, therefore, is not simple. Food products for animals are labeled to show minimum crude

protein,* minimum crude carbohydrates, minimum crude fat, and maximum fiber and ash. By federal law, ingredients are listed in order of their weight in the formula, largest quantities being listed first. However, there is absolutely no assurance that a product containing 20% crude protein is more desirable than one containing 10%. The latter could, for example, consist primarily of such high-quality protein sources as powdered skim milk or liver or soybean meal, whereas the former could consist of such low-quality protein sources as gelatin, tankage, or cornmeal. Unless the specific protein needs of an animal are known, and unless the nutritive value is known, the purchaser is totally dependent upon the reputation and integrity of the manufacturer for assurance that the formulation has quality, and not mere quantity.

The preparation of a diet by the laboratory for large-scale feeding does not in itself obviate the quality problem. Protein ingredients used in a ration, unless analyzed carefully, vary considerably, depending on their source. The testing procedure for quality control is extremely expensive and is economically practical only when applied to very large-scale purchases. The lack of knowledge about nutritional requirements of primates undoubtedly helps to explain why so many laboratories give natural foods to animals that also get commercial rations. These supplemental feedings probably contribute to the variable results obtained in different laboratories with similar animals.

References

Committee on Animal Nutrition. Nutrient requirements of laboratory animals. Publication 990. Washington, D. C.: National Academy of Sciences--National Research Council, 1962.

Committee on Protein Malnutrition. Evaluation of protein quality. Publication 1100. Washington, D. C.: National Academy of Sciences --National Research Council, 1963.

Food and Nutrition Board. Evaluation of protein nutrition. Publication 711. Washington, D. C.: National Academy of Sciences--National Research Council, 1959.

Morrison, F. B. Feeds and feeding. (20th ed.) Ithaca, N. Y.: Morrison, 1946.

---

*Crude protein is defined by Morrison (1946) as follows: "...all the nitrogenous substances in feeding stuffs. The simpler nitrogenous compounds have been called amids or non-protein nitrogenous compounds." The latter compounds, though containing nitrogen, are not proteins and do not satisfy the protein requirements of animals.

PROGRESSIVE PRIMATE PROCUREMENT*

T. W. Roth

3413 Turner Lane, Chevy Chase, Maryland

The research scientist of today buys his equipment from the most reputable source which spends large amounts on developing improved designs. At the same time he acquires his research primates from sometimes very dubitable sources over which he has little or no control.

A few of today's commercial primate suppliers are getting more sophisticated than the old time "monkey dealer" was, but their development is hampered by higher costs resulting from this sophistication. The inclination of many scientifically untrained purchasing agents to buy the cheapest available primate stands in sharp contrast to their quality-conscious acquisition of equipment.

Purchasing agents frequently do not stop to realize that a given monkey, once it becomes involved in research programs, increases in value N times its original cost by the addition of the time-value of X scientists and technicians. If this animal turns out during research to be unsuitable for its intended purpose and is discarded, initial cost plus N times X will be lost.

A primate caught and kept under the best known husbandry conditions until its utilization by research is easily worth the only slight increase in initial purchase costs, by substantially reducing the losses and the number of time and money-wasting discards.

It is an unescapable fact that ultimate primate resources--tropical countries--almost universally have lower standards of sanitation and hygiene than we take for granted in our western technological civilization. Even domestic livestock in these areas is commonly maintained at standards and yields far below those established in our areas. Endemic diseases are more prevalent among both population and livestock. This plus the obvious fact that tropical conditions encourage growth of all life including pathogenic agents make primates obtained through generally poor (and thus even less hygienic) trappers a prime receptacle for human pathogenic elements.

Primates from areas of dense human population in all likelihood have developed antibodies against frequent human infections while others obtained in more remote and less populated areas will die when brought in contact with human diseases, thus cutting deeply into the trapper's revenues and encouraging him to concentrate on the "stronger" monkeys near his home. When this area becomes depleted he still does not move

---

*From Laboratory Animal Care, 1964, 14, 524.

towards "cleaner" more remote areas, but extends his capture activities to the vicinity of other villages.

It is at this point that we need a scientifically trained worker qualified to assess such factors as: the usage of human excreta for fertilizing fields which are raided by primates; drainage direction of natural bodies of water or possible human concentration further upriver resulting in drinking water pollution; venereal and other infectious disease levels in the village providing trappers; suitability of transport routes and methods to the exporters' compound; compound conditions; handling for transport to point of export; design of shipping containers, location of consignment in aircraft in relation to ventilating facilities; arrangement for care enroute in case of delay; air (or boat) transport scheduling. He further has to be aware of port of entry requirements and assure himself that shipping conditions comply with import regulations; arrange for fast clearance at port of entry and plan onward carriage to final destination.

All these and related considerations demand a revision of the approach to primate procurement. Just like meat, the cheapest "cuts" (read primates) are usually the poorest in quality and a swing toward quality-conscious acquisition therefore becomes mandatory.

Based on experiences gathered and techniques developed during many years of wild animal (as opposed to domestic) procurement, including a wide range of primate species, the author contends that as research continues and increases its occupation with nonhuman primates to help human primates, researchers become more and more aware of shortcomings resulting from inadequate husbandry concepts. The laboratory researcher needs a qualified team of field researchers to back him up and improve the quality of his research specimen.

Potential field researchers need sound analytical reasoning powers, tact, diplomacy, linguistic abilities and a wide range of adaptability and flexibility (as long as the final aims remain inflexible) more than they need specific scientific training. However, a sound basis of formal training in biology, zoology, zoo-geography, animal husbandry or veterinary science is necessary as a foundation on which to build this specialized field knowledge.

Translating scientific demands down the line to frequently illiterate indigenous trappers takes highly trained individual skills if it is to be successful. The cost of developing these skills can be more easily borne by research than by commerce under our present social structure. Regardless of the cost factor increasing demands for better laboratory primates urgently require development of adequate numbers of this type of procurement experts.

This is an area where ultimate expertise is the product of well absorbed and digested experience superposed on the basis of good profes-

sional training and thoroughly practical minds. Such experts could also provide the desirable side benefit to make source area populations generally more conscious of, and better acquainted with, modern husbandry methods. Besides helping domestic laboratory research needs they would thus automatically become good-will ambassadors at grass-root levels with considerable influence in the concept of the "family of nations."

Introduction of such novel concepts into primate procurement will no doubt tend to increase initial costs but the increased returns and productivity of primates obtained by scientific techniques will easily outweigh the higher acquisition expenditures. Commercial, as well as non-profit research, benefits indirectly from the services of any one field representative striving to make base-line supply personnel aware of better husbandry methods. When Trapper A can buy more bread because he keeps alive and sells more animals than Trapper B, it follows that B will strive to imitate A's successful techniques. Therefore, while the organization supporting a field expert derives the immediate benefit, the mere existence of this individual tends to upgrade standards for the entire field of primate research.

Another advantage automatically following is the conservation of natural resources rather than the continuation of their present destructive exploitation. An average of only 50% of primates reach the researcher from their point of origin which means that a given primate population figure is decimated at more than twice the rate it is being utilized. If research losses due to poor management are added to the fact that most researchers want young adult specimens of around 5 kg, the resultant elimination of future breeders in a given primate population becomes staggering. It can be said without exaggeration that each primate used averages a population density loss of ten animals under our present procurement methods.

It speaks well for primate fecundity that such wasteful exploitation still produces sufficient quantities, but as little as early strip miners cared about erosion damages for future generations, as little seem present day suppliers to be inclined to worry about primate availability to future generations of researchers. After all, the explosive increase in the demand for laboratory primates only goes back some 20 years.

Thus the qualified field experts, by reducing loss and increasing yield, would ultimately benefit preservation and conservation of a valuable primate research animal for future generations.

PRIMATES FROM TRAP TO TEST TUBE*

T. W. Roth

3413 Turner Lane, Chevy Chase, Maryland

Researchers today can avail themselves of control-bred rats with genetically determined backgrounds. If they prefer mice, hamsters or beagles they have similar choices.

But specimens of the highest mammalian order short of man, the primates, are unavailable with even a modicum of these advantages. On the contrary, this group is subjected to a multitude of uncontrolled, extraneous influences.

The most realistic way to improve matters--even if only limited improvements will result--is to revise our procurement standards all the way from trap to test tube.

The main reason for primate suitability is its similarity to Homo sapiens. It follows that many factors which influence Homo sapiens will also affect a primate. Unless we want to concern ourselves as researchers with a host of factors carried and introduced to our experimental specimen by man before and during capture, in hygienically substandard areas with the rich variety of parasites and pathogens prevalent in tropical and subtropical latitudes--we must improve husbandry concepts all the way to the source and implement feasible control measures.

The author has been engaged in some ten years of field collecting and observation of procurement methods all over the world, of primates and other mammalian life forms, and feels compelled to sound a warning comment on the potential dangers of existing methods. To illustrate, follow the average fate of a single monkey from the field to the research laboratory. For simplicity's sake, let us identify the hypothetical animal as X.

X is a member of a group of rhesus (M. mulatta) living somewhere in the basin of the Ganges River--severely polluted--in densely populated Uthar Pradesh province of India. A young animal (5-7 lbs.), he is relegated to the fringe of the group which means that he feeds on leftovers or discards from the core of his tribe. With his tribe he invades durrah (millet) fields some of which are fertilized by human excreta, a concentrated source for infestation with human parasites. He and his companions' water supply comes from the polluted river or nearby water holes dug for domestic stock. Thus even before the trapping occurs we have determined three different sources for potential acquisition of pathogens:

---

*From Laboratory Animal Care, 1965, 15, 243.

1. human parasites
2. human waste products
3. bovine, canine, avian and caprine pathogens

Animal X's group has inhabited this area for generations and the existence of hereditary or individually acquired resistance and/or antibodies against many of these extraneous pathogens which will influence serological test results can be assumed.

During the interval between sowing and harvest the villagers within the troops' range engage in trapping this troupe. The traps have been used for many seasons and have been stored without any form of sanitation, in or around huts, stables or dumps, among village pye-dogs, cattle, goats and chickens. TB, Kala Azar (Leishmaniasis), venereal disease and a host of other endemic diseases are prevalent among the population. Mumps, whooping cough, measles, diphtheria, suppurating lesions are common among the children.

Thus animal X is trapped and brought to the village with numerous counts against him. The experienced trapper will "sort out" the animals according to size to avoid losses by crowding large aggressive animals together with small specimens. Thereby animals from different areas are introducing a new set of pathogens to each other.

The bamboo crates in which they are kept are exposed to insects, clouds of dust, dogs, chickens and children. Dead animals in a group are removed infrequently and disposed of on the nearest dump. The sharp split bamboo from which holding crates are often made result in severe lacerations thus opening new doors for infection. Needless to say, these containers are used season after season until they become irreparable. Feed, provided by a trapper who has barely enough to feed himself and his family, is of poorest quality. Water in many instances has to be carried from some distant source and only small amounts are used to replenish water containers contaminated with fecal matter and rotting remnants of old feed.

Medication and disinfectants are not available and with the virtually complete lack of hygienic concepts among the villagers, property--such as domestic live stock, rates even less sanitation. Wild caught animals have hardly any value (...we can always catch more...) and thus receive the lowest grade of substandard husbandry methods.

The exporter's agent picks up the collected animals, X among them. They are stacked on a truck, on top of open bamboo crates from another village and carried for miles through swirling clouds of dust and many other villages to the nearest railroad station.

Often the agent again redistributes the collected animals according to weight, size, or sex, and X may wind up in a crate with others collected 100 miles distant from its own habitat.

After debilitating box car rail shipment the animals arrive at the exporter's compound where they are released into gang cages, again on the basis of size, weight or sex. Any concern for separation as to exact location of origin has by now become senseless.

The possibility of infestation with pathogens has multiplied beyond all calculations by this time. The exporter then begins packing to fill his orders. X and four other animals from his cage are packed with six animals from another and ten animals from still another cage to make up the shipment.

The aircarrier loads the shipment according to weight and distribution requirements. The first stop-over is in a port where the ground temperature can be a soaring 105 F. Safety regulations prohibit activation of ventilation and other air conditioning equipment, while the craft is on the ground. Next stop may be a transfer in a port with a ground temperature of 20 F, into an unheated craft, or into an overheated shelter where different food and water with a totally different pH is offered.

After two or three days transit, X arrives at the port of destination, again undergoes dramatic changes in pressure and temperature during clearance and pickup. Finally X winds up at the importer's compound. Suddenly, instead of casual infrequent "care" he gets intensive attention --by now he is worth considerable money invested in purchase and transportation. X faces digestive upset by another total change of feed and water, adjustment difficulties from wooden to metal cages, emotional upset from frequent handling, and numerous other new factors. After all, his proto-hominid reactions make X desirable for behavioral research.

This pattern is repeated when the importer dispatches X to the researcher. By now the animal has been subjected to so many changes, physical, nutritional, and sensory that it can hardly be considered a "standard" primate in any sense of the word. If X survived in reasonably good health he was a strong specimen with a wide range of resistant faculties (antibodies) to start with.

The picture changes only in minor aspects as far as origin is concerned. The South American Indio trapper follows basically the same pursuits as the Indian villager and the African trapper is primarily concerned with his own survival rather than that of a primate "pest."

According to statistics on African green monkeys (C. aethiops) from a major research organization, even expensive efforts to apply some control over source, transportation and holding facilities overseas--eliminating a middle man or importer--still produced an average mortality of 14.4% during the first 24 hours (including specimens DOA) in 1963, and 7.4% during the first half of 1964, with a total mortality from multiple causes (including initial mortality) only slightly higher. If you add to these figures the number of animals useless for research due to disease or severely disturbed behavior patterns, the waste becomes rather

appalling.

Importation of primates into this country according to Public Health Service figures totalled 162,541 in 1962; 150,442 in 1963; 115,438 for 1964 and it is safe to assume that other research-oriented nations obtain large numbers from all tropical and subtropical zones yielding primates. Conservatively estimating an average mortality and loss rate of 35% of the total importation for these three years (which does include pet trade and zoo import fitures) a total of 150,000 primates have been lost, constituting an expenditure of more than eight million dollars.

There is no doubt in the author's mind that the commercial importer will have a most important function in a change of importation methods because he, more than the "consumer," is familiar with conditions which require improvements. He cannot improve conditions, however, without assuming higher operating costs which he must pass on to the researcher if he is to survive.

It is up to us who can afford to concern ourselves with mankind's survival through research to utilize our test material--primates--to the best possible advantage and employ the highest known standards in procurement.

* * *

BABOON STEREOTAXIC ATLAS SOUGHT

Any information on the existence of stereotaxic atlases and coordinates applicable to any species of baboon would be appreciated. --Richard P. Michael, Institute of Psychiatry, The Maudsley Hospital, Denmark Hill, London, S.E.5, England.

REPORT ON SIMIAN TUBERCULOSIS SEMINAR

The Simian Tuberculosis Seminar at the 16th Annual Meeting of the Animal Care Panel at Philadelphia explored the problems of tuberculosis control and the role of isoniazid in this field. Dr. M. M. Rabstein was the group leader and Dr. L. H. Schmidt was the first speaker. Dr. Schmidt reviewed his vast experience, dating back to 1938, with tuberculosis in Macaca mulatta. Over 20,000 M. mulatta and 3,000 other non-human primates were subjects in his research for periods of 6 months to 20 years.

A few of the key points made by Dr. Schmidt, referring primarily to M. mulatta, follow:

1. The daily dosage of isoniazid used in general colony prophylaxis is 5 mg/kg body weight, which is placed in the food just prior to feeding. Isoniazid is inactivated in stored food with even a modest moisture content. Therefore, if a prepared diet containing isoniazid is kept for any length of time, it would be well to monitor its isoniazid content.

2. In studies that were directed toward delineating the toxicity of isoniazid for the rhesus monkey, when the compound was administered in two equal doses of 120 mg/kg daily for 6 months there were no ill effects. On the other hand, doses of 240 mg/kg twice daily produced convulsions and peripheral neuropathies. Doses of 20 mg/kg were fed twice daily for two years without evidence of untoward reactions.

3. Shipments of isoniazid have been received that have contained up to 15% impurities. At least one of these impurities is considerably more toxic than isoniazid.

4. When animals in which TB was induced experimentally were treated with isoniazid, the following observations were made:

a) 3 months treatment--inadequate
b) 6 months treatment--95% effective
c) 9 months treatment--uniformly effective

5. If one subjects an animal with established disease to 9 months of treatment with effective doses of isoniazid, there is about a fifty-fifty chance that the tuberculin-positive reaction would be converted to a tuberculin-negative test within one year of termination of treatment.

6. With regard to the emergence of isoniazid-resistant organisms during the treatment of established tuberculous disease, if treatment with isoniazid was not totally eradicative within a 6-month period, the residual tubercle bacilli were isoniazid-resistant in about two-thirds of the total observations.

7. The capacity of isoniazid to protect tuberculin-negative monkeys against infection when these non-immune animals were housed in the same cages with subjects bearing fulminating cavitary disease was studied. The non-infected animals were treated with isoniazid for about one year beginning with the last day of exposure to the infected subjects. Under this condition, approximately 50% of the exposed individuals developed tuberculous disease after withdrawal of isoniazid. In every instance the organisms responsible for the evolution of the disease were susceptible to isoniazid.

8. With even the smallest measurable increases in resistance of tubercle bacilli to isoniazid in vitro, it was necessary to increase the amount of isoniazid administered by four to six times in order to achieve an adequate therapeutic response.

9. Tubercle bacilli that are resistant in vitro to one microgram of isoniazid or more and are catalase negative have markedly reduced pathogenicity for the rhesus monkey, guinea pig, and man.

Another speaker on the seminar panel, Dr. R. L. Miller, reported a severe tuberculosis outbreak while animals were receiving isoniazid at the 5 mg/kg level prophylactically.

In the question-and-answer period that followed:

1. Of special interest to those doing behavioral work with primates was a report by Dr. A. M. Jonas of Yale that the performance of macaques in a psychological experiment changed markedly when the monkeys were placed on isoniazid at the 5 mg/kg level, and the drug had to be discontinued.

2. Dr. Schmidt reported receiving Koch's old tuberculin that was ineffective as a diagnostic agent. He recommended that all lots be checked prior to use at a laboratory such as his.

3. Dr. Schmidt stated that in a colony free from tuberculosis it would be desirable to have attendants who are tuberculin negative. This would provide protection to the animal groups and would also make it possible to detect incipient disease in the animal handlers if a regular tuberculin testing program is followed.

4. It was generally agreed that Koch's old tuberculin was preferred over P.P.D. (purified protein derivative) for tuberculin testing of macaques.

TUBERCULOSIS SURVEILLANCE

One of the more serious diseases of primates communicable to man is tuberculosis. Although reports of this disease in monkeys or apes are published occasionally, most of our information about the incidence of the disease is obtained by word of mouth. The purpose of this note is to suggest that any cases of tuberculosis and the general circumstances surrounding the cases in either new shipments of animals or in established colonies be reported to the Laboratory Primate Newsletter. In this way readers will get some idea of the incidence of simian tuberculosis.

To start what we hope will be a continuing series in the Newsletter under the above title, two cases of tuberculosis in recent shipments of rhesus monkeys to the Brown University Primate Behavior Laboratory are reported below.

The first case occurred in a shipment of 9 rhesus monkeys that arrived during March, 1965. The animals were shipped by air in two crates divided into single compartments, and were placed in our isolation quarters immediately upon arrival. The animals were supposed to have been "conditioned" for one month, during which time they were to have received two tuberculin tests, the first upon arrival at the importers, and the second shortly before they were to be shipped to us. The day after they arrived at our laboratory they were all given the intradermal palpebral tuberculin test. By the following day, one of the animals showed a very strong positive reaction; its eyelid was swollen and red and practically closed. The positive reactor was sacrificed and the remainder of the shipment was returned to the importer. Autopsy revealed lesions consistent with early tuberculosis, but the organism was not isolated. The importer reported that the positive reactor was probably a newly imported animal that had been included in the shipment by mistake.

A shipment of 12 rhesus monkeys arrived from the same importer during December, 1965. The same general conditions prevailed. One of the animals, though negative on the initial test upon arrival, showed a strong positive reaction one week later. A retest 3 days later gave a very strong reaction in the other eye. It was sacrificed and the autopsy and culture confirmed the presence of early tuberculosis. In this instance, we were reluctant to return the 11 remaining animals because they were of an age difficult to obtain and there was a good possibility that the disease had not had a chance to spread. We have been continuing weekly tuberculosis tests and plan to keep the group in the isolation quarters not less than 3 months. Should another positive reaction occur, the entire group will be destroyed immediately.

NEW PRODUCTS AND SERVICES

Banana-flavored Nutrient Pellets are now being packaged for sale at the following prices per 5000 pellets: 75 mg--$15.00, 190 mg--$30.00, 300 mg--$50.00, and 1 gm--$60.00. The following is the nutritional analysis of the Nutrient Pellets: Protein--26.60%, Fat--8.80%, Ash--8.10%, NFE--47.50%, Fiber--1.20%, Moisture--5.50%, Calcium--1.01%, Phosphorous--0.81%. No attempt has been made to assay for other trace minerals such as iron and copper. The energy yield is 4.34 kilocalories/gram. Determination of the precise vitamin content, which is both complicated and expensive, has not been done yet. The quality of the amino acids, their availability, and the natural vitamins in the ingredients used in the pellets probably make the addition of most vitamins redundant. Nonetheless, the following vitamins (in powdered form) per gram of diet mixture are added:

0.60 mg Vitamin A with Vitamin D (Type 500A/50D)
0.06 mg Vitamin B_1
0.06 mg Vitamin B_2
0.06 mg Vitamin B_6
0.50 mg Vitamin C
0.60 mg Pantothenic acid
0.60 mg Niacin
0.018 mg Vitamin E
0.003 mg Biotin

The stability of Vitamin C continues to be a controversial issue. Our vitamin supplier's analytical chemists assure us that Vitamin C in powdered form is relatively stable. Recently, they agreed to do a serial analysis of pellets up to two years of age for Vitamin C content, the results of which will be made available. A complete nutritional and vitamin analysis by an independent laboratory is also planned, and the information will be available to investigators.

The ingredients used in making the pellets are lactose, banana flakes, soya flour, whole milk, whole egg, wheat germ, Promine D, egg white, calcium, carbonate, defluorinated calcium phosphate, sodium sucaryl, iodized salt, vitamin mixture, and banana flavor. It should be noted that the quality of these ingredients is a cut above those usually found in animal feed. This plus the expensive pelleting process accounts for the difference in price.

Banana-flavored Reward Pellets, which are similar to the Nutrient Pellets but not suitable as a whole diet, are now available at a lower cost.--Animal Health Marketing Division, CIBA Pharmaceutical Co., Summit, New Jersey.

A new monkey chair for experimentation on the unanesthetized, awake small monkey weighing between 100 and 1800 gm is now available. It is called the "Rochester Chair" and is made with rust-proof metals and 1/2-

in. plexiglass, and set on a stable base. This chair has the following features: 1. Versatility and mechanical adaptability. 2. Allows free access to the animal while protecting catheters, electrodes, etc. which may be in the head or legs of the animal. 3. Space-saving design allows the "Rochester Chair" to fit into a small testing chamber. The price for the basic, complete monkey chair is $125. Additional useful attachments are also available.--Monkey Chair Inc., 9 Stanford Rd. West, Rochester, N. Y. 14620.

New address for Rider Animal Co., Inc.: 5409 Stratemeyer Dr., Orlando, Florida, 32809.

* * *

ANIMALS SOUGHT FOR RHEUMATISM RESEARCH

The Nuffield Foundation, as part of its program of research into possible underlying causes of rheumatic disease, is anxious to intensify the search for naturally-occurring forms of rheumatoid, or rheumatoid-like, lesions in animals suitable for laboratory study. A naturally-occurring rheumatoid arthritis in monkeys, for example, would have important implications for the controlled study of the disease. The fact that no evidence--or very little--has so far been obtained that this affliction of man is shared by other primates may simply be due to the almost total preponderance of young animals among those which have been available for study. The Foundation would now like to extend the search to cover a reasonably large sample of older monkeys, and to submit to expert examination the hands and feet (to include wrist and ankle joints) of elderly monkeys, preferably of known age.

I would be very grateful to anyone who could put me in touch with possible sources of such material. Centers already concerned in primate studies, in the laboratory or in the field, and where colonies of monkeys are maintained over their natural life span, would evidently be in the best position to help. Would anyone able and willing to help please be kind enough to get in touch with me stating what numbers, species, and age-groups of monkeys could be made available for examination? In some cases it might be possible to arrange for on-the-spot x-radiography. In other cases, e.g. following death, it might be possible to send specimens, suitably preserved, to the rheumatologist who would be examining the joints for the Foundation. Suitable instructions about this, and any other help required; which may include defrayment of expenses, can then be given according to circumstances.--Brian Young, The Nuffield Foundation, Nuffield Lodge, Regent's Park, London, N.W.1, England.

YERKES REGIONAL PRIMATE RESEARCH CENTER DEDICATED

The Yerkes Regional Primate Research Center of Emory University, Atlanta, Georgia, was dedicated October 27, 1965. Following the dedication ceremony, a talk was given by Professor Adolph Schultz, Director of the Anthropological Institute, University of Zurich, Switzerland.

The new Center succeeds the Yerkes Laboratories of Primate Biology which were located in Orange Park, Florida. The Director of the Center is Geoffrey H. Bourne. Most of the animals were moved from Orange Park during July, 1965. Most of them were placed in the Center's new quarters on the Emory campus, with the remainder going to the Center's 117-acre field station at Lawrenceville, Georgia, which is 24 miles northeast of Atlanta. The animals at the Center include 27 orangutans, 15 gorillas, 66 chimpanzees and some 200 monkeys of a variety of species. Among the animals is Wendy, one of the four chimpanzees in the original collection of the late Dr. Robert M. Yerkes, the Yale University scientist who founded the Orange Park laboratories in 1930. Wendy is now about 42 years of age. Another chimpanzee in the colony, Alpha, now 35 years of age, was the first chimpanzee born in the Orange Park laboratories.

Investigations of heart and blood vessel disease, muscular dystrophy, and other disorders are being conducted at the Yerkes Center. Neurophysiology, immunology, biochemistry, psychiatry, psychology, and anthropology are among the disciplines represented.

The Yerkes Center is the fifth primate center to be dedicated, the others being the Centers in Oregon, Wisconsin, Washington, and Louisiana. Only the Centers in Massachusetts and California remain to be completed (see the January, 1964, issue of this Newsletter for a review of the regional primate research center program). Construction of all seven primate centers was financed by grants from the National Heart Institute of the U. S. Public Health Service, and are operating on funds from the Animal Resources Branch of the National Institutes of Health and from individual research grants.

* * *

FOOD FOR THOUGHT

Apes and monkeys are among the most intelligent animals. Countless species live in the jungle trees of the warmer regions and feed on fruits of various kinds. In captivity, most of them learn tricks easily.--From a box of FF-brand seedless raisins.

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

Disease

Hepatic lesions in pyridoxine-deficient monkeys. Wizgird, J. P. et al. (U. of Calif. Med. Center, San Francisco) Archives of Pathology, 1965, 79, 317-323.

Nutritional Laennec's cirrhosis in the Macaca mulatta monkey. Gaisford, W. D., & Zuidema, G. D. Journal of Surgical Research, 1965, 5, 220-235.

On the susceptibility of Macaca mulatta to infection with Schistosoma incognitum. Dutt, S. C. (Div. Parasit., Indian Vet. Res. Inst., Izatnagar, India) Current Science, 1965, 34, 49-50.

Vitamin A study in monkeys. White, E. A., & Wornick, R. C. (Vigo Plant, Chas. Pfizer & Co., Inc., Terre Haute, Indiana) Veterinary Medicine, 1965, 60, 823-825.

Shigella isolees de excrements des animaux. Szturm-Rubinsten, S., & Piechaud, D. (C. N. R. S. et Institute Pasteur, Laboratoire de Microbie Gen., Paris, France) Annales de l'Institute Pasteur, 1965, 108, 257-259.

Physiology and Behavior

Ecology and behavior of the vervet monkey, Cercopithecus aethiops, Lolui Island, Lake Victoria. Hall, K. R. L., & Gartlan, J. S. (Dept. Psychol., U. Bristol, England) Proceedings of the Zoological Society of London, 1965, 145, 37-56.

Collection of primate semen by electroejaculation. Weisbroth, S., & Young, F. A. (Berg Inst., N. Y. U. Medical Center, New York, N. Y.) Fertility and Sterility, 1965, 16, 229-235.

Weighing wild Japanese monkeys in Arashiyama. Hazama, N. (Lab. Physical Anthropol., Kyoto U., Kyoto) Primates, 1964, 5, 81-104.

Fifty years of research on mammalian reproduction: A bibliography of the scientific publications of Carl G. Hartman. Public Health Service Publication No. 1281. Washington, D. C.: U. S. Dept. Health, Education, and Welfare, 1965.

This bibliography was compiled by Rudolf F. Vollman and copies may be obtained through his office: Section on Obstetrics, Perinatal Research Branch, National Institute of Neurological Diseases and Blindness, Bethesda, Md. 20014.

Marmosets (Hapiladae): Breeding seasons, twinning, and sex of offspring. Hampton, J. K., Jr., & Hampton, S. H. (Dept. Physiol., Sch. of Med., Tulane University, New Orleans, La.) Science, 1965, 150, 915-917.

Fetal weight: Gestational age relationship in several species. Spencer, R. P., & Coulombe, M. J. (Yale Univ. Sch. Med., New Haven, Conn.) Growth, 1965, 29, 165-171.

Observations on the social behavior of tree shrews in captivity. Sorenson, M. W., & Conaway, C. H. (Dept. Zoology, U. Missouri, Columbia, Mo.) Folia primatologica, 1966, 4, 124-145.

Maternal behavior in primiparous and multiparous rhesus monkeys. Seay, B. (Wisconsin Reg. Primate Res. Cen., U. Wisconsin, Madison, Wis.) Folia primatologica, 1966, 4, 146-168.

Drugs

Thiabendazole as an anthelmintic in research monkeys. Cullum, L. E., and Hamilton, B. R. (Animal Resource Center, Arizona State U., Tempe, Arizona) American Journal of Veterinary Research, 1965, 26, 779-780.

A study of the efficacy of thiabendazole and dithiazanine iodide piperazine citrate suspension against intestinal parasites in the Macaca mulatta. Guilloud, N. B., King, A. A., & Locke, A. (Yerkes Reg. Primate Res. Cen., Emory Univ., Atlanta, Ga.) Laboratory Animal Care, 1965, 15, 354-358.

Phencyclidine for analgesia and anesthesia in simian primates. Melby, E. C., Jr., & Baker, H. J. (Sch. of Med., Johns Hopkins Univ. Hosp., Baltimore, Md.) Journal of the American Veterinary Medical Association, 1965, 147, 1068-1072.

Phencyclidine anesthesia in baboons. Vondruska, J. F. (U. S. Army, Edgewood Arsenal, Md.) Journal of the American Veterinary Medical Association, 1965, 147, 1049-1052.

Facilities, Care and Breeding

Principles of public health importance in the management of a subhuman primate colony. Hummer, R. L. (Southwest Foundation for Research and Education, San Antonio, Texas) Journal of the American Veterinary Medical Association, 1965, 147, 1063-1067.

Monkey colony management. Young, R. J. (Hickman Air Force Base, Air Force Vet. Corps, Honolulu, Hawaii) Journal of the American Veterinary Medical Association, 1965, 147, 1053-1062.

Instruments and Techniques

A new multipurpose brain depth probe: long-term implantation and electroencephalographic recording in man, monkey, and cat. Fischer-Williams, M., & Bickford, R. G. (Mayo Graduate School of Medicine, Rochester, Minn.) Mayo Clinic Proceedings, 1965, 40, 791-804.

* * *

AN ACCREDITATION PROGRAM FOR LABORATORY ANIMAL CARE FACILITIES

The American Association for Accreditation of Laboratory Animal Care (AAALAC) announces the commencement of a voluntary accreditation program for laboratory animal care. The AAALAC consists of national education, health, and research organizations professionally concerned with the care, study, and use of laboratory animals in scientific research, and has been organized to promote a program for the accreditation of laboratory animal care facilities that will encourage, promote, and facilitate scientific research using experimental animals.

The AAALAC is governed by the Board of Trustees with a Board member from each of the 15 member organizations. The Chairman of the Board of Trustees is L. Meyer Jones, Director of Scientific Activities, American Veterinary Medical Association. Henry T. Ricketts of the Department of Medicine, University of Chicago School of Medicine, is the Vice Chairman. Secretary-Treasurer of the Board is Leslie H. Burrows, Assistant Secretary of the Council on Dental Research, American Dental Association.

The Board has appointed a 12-member Council on Accreditation to organize and operate the program, which will include site visits to institutions seeking accreditation. The Chairman of the Council is Bennett J. Cohen, Associate Professor of Physiology and Director of the Animal Care Unit, University of Michigan Medical School. The Council reviews all applications and evaluates the site visitors' reports. The U. S. Public Health Service Guide for Laboratory Animal Facilities and Care (1965; can be purchased from Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402) serves as the basic guide used in evaluating institutional animal care facilities.

Further information about the program may be obtained from: American Association for Accreditation of Laboratory Animal Care, 4 E. Clinton Street, Suite 605, P. O. Box 1300, Joliet, Illinois 60434.

ADDRESS CHANGES

Charles F. Chesney
Research Animal Hosp.
U. of Minn., Coll. Med. Sci.
P. O. Box 69
Minneapolis, Minn. 55455

J. Derrell Clark
1600 Allo Ave. #76
Marrero, La. 70072

G. A. Deneau
Southern Research Inst.
2000 Ninth Ave., South
Birmingham, Ala. 35205

Irven DeVore
Dept. Social Relations
402 William James Hall
Harvard University
Cambridge, Mass. 02138

Otho D. Easterday
P. O. Box 3
Oakton, Va. 22124

Donald E. Furry
Naval Med. Res. Inst.
Nat. Naval Med. Cen.
Bethesda, Md. 20014

Rafael N. Garcia
Orchard Park Apt. P2
Univer. of California
Davis, Calif. 95616

Norman B. Guilloud
Yerkes Regional Primate
Research Center of
Emory University
Atlanta, Ga. 30322

Bessie D. May
947 Cypress Lane
Davis, California 95616

James H. Moser
Parke Davis Co.
Jos. Campau at the River
Detroit, Mich. 48232

V. D. Rider Jr.
Rider Animal Co., Inc.
5409 Stratemeyer Dr.
Orlando, Fla. 32809

Suzanne Ripley
Eastern Pennsylvania
Psychiatric Institute
Henry Ave. & Abbottsford Rd.
Philadelphia, Pa. 19129

R. A. Sauter
Eli Lilly & Co.
740 So. Alabama St.
Indianapolis, Ind. 46206

Louis Skiera
50 East Cedar
Chicago, Ill. 60611

Richard W. Sroges
Dept. of Psychology
Eastern Michigan Univer.
Ypsilanti, Mich. 48197

Robert W. Sussman
1023-1/2 So. Shenadoah St.
Los Angeles, Calif. 90035

Alton J. Wilson
Dept. of Vet. Med.
Lovelace Foundation
5200 Gibson Blvd., S.E.
Albuquerque, N. M. 87108

Joseph J. Vitale
Dept. Foods & Nutrit.
Genetics Bldg.
Univer. of Wisconsin
Madison, Wis. 53706