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LABORATORY ANIMALS

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FOREWORD

The Institute of Laboratory Animal Resources maintains a professional staff and consultants who are available for projects such as the organization of special workshops on laboratory animal technology. Aware of an urgent need for communication and exchange of information on problems of postdoctoral education in laboratory animal medicine, the Committee on Professional Education set up a four-part program as follows:

1) Site surveys were made of eighteen veterinary schools or colleges to determine what role these institutions play in educating both pre- and postdoctoral students in the discipline of laboratory animal medicine.

2) An examination was made of college programs now providing training of laboratory animal colony directors and research workers in laboratory animal medicine.

3) A realistic figure was established representing the projected need for individuals with specialized training in laboratory animal medicine.

4) Following these site visits and questionnaire surveys, a Workshop on Graduate Education in Laboratory Animal Medicine was held, as reported herein.

James R. Pick, D.V.M., Professional Associate of the Institute of Laboratory Animal Resources, made a comprehensive survey of eighteen veterinary schools or colleges through site visits. He organized and conducted the Workshop on Graduate Education in Laboratory Animal Medicine. (Dr. Pick resigned December 31, 1964 to accept the position of Director, Laboratory Animal Facility, University of North Carolina Medical School, Chapel Hill, North Carolina.)

Program Participants

Study Group I	Dr. Bennett J. Cohen (Univ. of Michigan), Chairman
	Dr. Mark Allam (Univ. of Pennsylvania)
	Dr. Clifford Eby (New York Medical College)
	Dr. Roger D. Estep (Howard Univ.)
	Dr. Albert M. Jonas (Yale Univ.)
	Dr. L. Meyer Jones (Amer. Vet. Med. Assn.)
	Dr. W. R. Krill (Ohio State Univ.)
	Dr. John C. LeMay (Duke Univ. School of Med.)
	Dr. Edward Melby (Johns Hopkins Univ. School of Med.)
	Dr. Alvin F. Moreland (Univ. of Florida)
	Dr. M. M. Rabstein (U. S. Army Chemical Corps, Ft. Detrick)
	Dr. C. B. Thayer (State Univ. of Iowa)
Study Group II	Dr. Orland A. Soave (Stanford Medical School), Chairman
	Dr. Bernard A. Brown (Communicable Disease Center, Atlanta)
	Dr. Fred Davison (Amer. Vet. Med. Assn.)
	Dr. Robert J. Flynn (Argonne National Laboratory)
	Dr. Thomas M. Ford (Univ. of Michigan)
	Dr. Gene Gowing (Texas A & M College)
	Dr. Aaron M. Leash (Western Reserve Univ.)
	Dr. Charles C. Middleton (Bowman Gray School of Med.)
	Dr. Sigmund T. Rich (UCLA Center for Health Science)
	Dr. Henry P. Schneider (Hahnemann Med. School)
	Dr. L. J. Serrano (Oak Ridge National Laboratory)
	Captain Jack S. Stanton (Walter Reed Army Inst. of Res.)
	Dr. Mervyn B. Starnes (Univ. of Texas S.W. Med. School)
	Dr. Charles Wallace (Medical College of Georgia)
Study Group III	Dr. Thomas B. Clarkson (Bowman Gray Sch. of Medicine), Chairman
	Dr. Kenneth Burns (Tulane Univ. School of Med.)
	Dr. Jules S. Cass (Veterans Administration)
	Dr. L. R. Christensen (Berg Inst. for Scientific Services)
	Dr. C. E. Cornelius (Univ. of California, Davis)
	Dr. Edward Donovan (Ohio State Univ.)
	Dr. A. G. Edward (Univ. of California, Davis)
	Dr. Willard H. Eyestone (National Institutes of Health)
	Dr. Robert D. Henthorne (Ohio State Univ.)
	Colonel Robert L. Hummer (Vet. Sciences - Brooks AFB)
	Dr. Ronald Hunt (Harvard Medical School)
	Dr. Vernon L. Tharp (Ohio State Univ.)

INTRODUCTION

Dr. Clarkson: I would like to welcome you to this Workshop on Graduate Education in Laboratory Animal Medicine on behalf of the Institute of Laboratory Animal Resources of the National Academy of Sciences - National Research Council. The Institute and its staff, particularly Dr. James Pick, has done a fine job in arranging this session.

Most of you know that yesterday three study groups met to resolve what have been some unanswered questions in the field of education in laboratory animal medicine. Study Group I was given the responsibility of defining in general terms the field of laboratory animal medicine, particularly the scope. Some firm definition is needed in order to build future educational programs. This study group also attempted to delineate the body of knowledge which the specialist should know.

Study Group II dealt with the current and projected needs for personnel in this field. Those of us interested in education have been talking for years about a need which has not yet been quantitated. We think that it may now have been semi-quantitated.

Secondly, they discussed the need for programs in continuing education, not the formal training programs we will be discussing later, but the short courses that we have seen in the medical and veterinary schools.

Study Group III dealt with the formal training programs or programs of graduate education in laboratory animal medicine, their objectives and their content.

Each of the study group leaders synthesized as nearly as he could the thoughts of the study group so that he could present them today.

It is rather interesting to me that it has been only a few years since people were asking whether it might be reasonable to have some period of training in laboratory animal medicine. I remember in 1957, when I first began to talk with people on this subject, many considered this idea as quite strange. They thought the thing to do was to look over someone's shoulder for a few weeks and then start working. There were also a few people who thought there should be some amount of training, six months, or a year or so. Thus, we have seen the concept grow, in a relatively short number of years, to where no one really questions the validity of advanced training in laboratory animal medicine. In fact, we are here to talk about methodology, principles, and objectives, which I consider a real advancement since 1957.

REPORT OF STUDY GROUP I - DEFINITIONS, SCOPE, AND STATUS OF KNOWLEDGE IN LABORATORY ANIMAL MEDICINE

Dr. Bennett J. Cohen

Our group's assignment was to attempt to answer the question, "What should the expert know"? This is another way of asking for a definition of laboratory animal medicine.

It became apparent relatively early in our discussion that we faced a dilemma; we did not know whether the concept of the "expert" should refer to an individual or to the total program required in any institution utilizing animal resources. Both consciously and unconsciously this dilemma colored our deliberations throughout the day. As a matter of fact, each group found it had to define laboratory animal medicine before its subject area could be considered. All of the groups had their problems; and each resolved them in its own way.

You can see from the composition of our group (see program participants listing) that most of us are associated with health science centers, medical schools particularly; and all of us are veterinarians. This inevitably affected our discussion.

I should like to describe the approach our group took to arrive at our definition of laboratory animal medicine. The group members agreed to define the field in terms of what we do. This led to a productive morning session. Each man described his role in the institution he serves. Activities were divided into three major categories: professional services, teaching,and research. This is the traditional division of time for members of the faculty of an academic institution; and in other kinds of institutions, one can find counterpart words which describe similar activities.

Thus, one of the first things we can say about laboratory animal medicine is that it is a professional activity with functions and responsibilities comparable to those of other professional fields. In saying this, we mean to apply the term to the individual and to the program. Bear in mind our group's dilemma to which I referred previously. Each of us listed his activities under the headings of service, research, and teaching. For example, a member of the group concerned with the production of animals for other units in his institution described this activity in the professional service category. Another engaged in studying aspects of the pathologic physiology of the cardiovascular system listed this as a basic research activity. In some cases an individual was concerned with applied research, highly specific to laboratory animal medicine. In other instances the research could just as easily be carried on by a physiologist or pharmacologist; but because the individual considers his principal field to be laboratory animal medicine, the concept of basic or disciplinary research in laboratory animal medicine applied.

The teaching role of various group members also was described. Some are involved in the teaching of medical students in subject areas having little or no connection with laboratory animal medicine; for example, a man who teaches

autopsy pathology to medical students and interns, or a man who teaches gastroenterology to medical students. On the other hand, other areas of instruction are more closely related; for example, the education of graduate students in the utilization of animal resources and in the concepts and methods of animal experimentation; and the more obvious teaching of animal technicians, laboratory technicians, postdoctoral fellows, and colleagues in the health sciences in the use and care of animals.

It was not difficult to identify the three broad areas in which laboratory animal specialists are involved; but what is it that makes us unique? Is there a body of knowledge? I will state at this time the conclusions the group reached.

The group agreed that laboratory animal medicine could be defined in the broadest possible terms as a professional activity concerned with the diseases, biology, and husbandry of laboratory animals, and that the educational background most closely associated with these areas of knowledge is veterinary medicine. The activity includes within its scope the clinical practice of veterinary medicine as applied to the laboratory species.

Presumably, the expert should be knowledgeable, in depth, in areas of diseases, husbandry, and biology; but if we say this, it could be construed to mean that the expert must know everything about everything, because these words are all-inclusive. What is the area of specialized knowledge that makes us unique? This question of who and what is a specialist in laboratory animal medicine will continue to trouble us. Are we talking about the "jack-of-all-trades" who knows a smattering of this and a little of that? Are we talking about a "traffic policeman" in an institution who can only refer individuals to the disciplinarians when problems come his way? Are we talking about the veterinary clinician whose skills are limited to treating any animal that is sick, and to making recommendations for keeping animals clinically normal? Are we talking about the research-oriented veterinarian with an advanced degree in a discipline who regards himself as a physiologist or as a pathologist, but because he also carries responsibilities for directing animal facilities he also calls himself a specialist in laboratory animal medicine? As I raise these questions, I hope you are getting the feeling I believe our group sensed unconsciously: that we are not talking about a simple activity.

The direction in which our group moved was unexpected. I sensed a desire to define laboratory animal medicine in somewhat narrower terms than I personally preferred. I think this was an effort to be constructive because a definition that is too broad may have no meaning. On the other hand, I felt uneasy about too narrow a definition of the field; because if it is overly restrictive, it may result in keeping people out of the field who should be in it. So I present this problem of definition as one of the challenges you must face in the discussion to follow.

We experienced difficulty initially in differentiating the terms "specialty" and "discipline." Dr. Thayer and I inadvertently used the word "discipline" in talking about laboratory animal medicine, whereupon Dr. Jones and Dr. Allam properly put us in our places by pointing out that it is not a discipline in the sense that physiology or pathology is a discipline. Rather it is a veterinary specialty. What makes it a specialty? We have a specialty board called the American College of Laboratory Animal Medicine, recognized by the American Veterinary Medical Association. This indicates that laboratory

animal medicine is a specialty. In addition, the Civil Service Commission has acknowledged specialty training in this area by establishing professional positions in the field. This too makes it a specialty. Therefore, we should not refer to laboratory animal medicine as a discipline. I recognize that there are scientists here today who are not veterinarians, yet who are very close to laboratory animal medicine. To allay possible concern about veterinary appropriation of the field, let me say that the group yesterday agreed that the word "medicine" in the term laboratory animal medicine is crucial; that is what makes it possible to consider laboratory animal medicine primarily in veterinary terms. However there is no question that the broad area of laboratory animal utilization and care involves many disciplines and specialties.

If I interpret correctly the thinking of people who are not trained in veterinary medicine as such, but who are close to the animal care field, there is a legitimate reluctance to assign to veterinary medicine the total expertise in this area. On the other hand, I do not believe that the orientation of veterinary medicine is one of possessiveness; that we have the only key to this particular kingdom. There is room for all with a contribution to make.

At present, nearly all members of Group I are involved in professional service activities for a very significant portion of their time. This is part of the evolutionary development of laboratory animal medicine. Other fields have experienced similar development, starting with major service connotations and gradually becoming more research-oriented. In his introductory statement, Dr. Clarkson alluded to the fact that as recently as 1957, the idea of advanced training in this specialty was seriously questioned. Well, as recently as 1948 or 1949, the idea that this was a field at all was rather novel. I know that Dr. Brewer and others in this audience recall the days very well.

The words "general administration" come to mind as a description of the duties of some laboratory animal specialists. This may include cultivating the art of pouring oil on troubled waters within one's institution; presenting the dean with the annual budget; fighting the battle of space; trying to find the money for work clothing for animal technicians; training a supervisor to train the animal technician staff; asking a physiologist, who insists on coming to you personally to order two dozen mice for next Thursday, to go to the office which has been set up for this activity; or meeting with the animal care committee to resolve problems of animal care and utilization which transcend the artificial lines of departmental autonomy. All of these activities may be categorized as professional services; and I am not excluding here the veterinary medical and diagnostic services any modern research institution needs today to provide adequately for the care of animals.

The idea that medical research institutions should have an animal disease diagnostic laboratory to serve investigators, in the same way that the clinical laboratory of a hospital serves the medical school and hospital staff, is novel even yet. The idea is novel, not because institutions do not want this, but because they have not yet tooled up for the task ahead. In a large institution with a heavy service load one man may not be able to meet his professional service responsibilities properly and well. Our group discussed this problem at length and concluded we had come back full circle to the area of program. How can we program for the animal resource needs of our institution? This is part of the problem of determining what the expert should know.

If we simply list the duties we expect experts in laboratory animal medicine to fulfill, are we describing the job of one individual, or are we describing the total institutional requirements for professional services? It seems obvious that a variety of skills may be required and more than one person may be involved.

We did not resolve this dilemma of differentiating between the individual and the program with complete satisfaction. Nevertheless, the group found the discussion stimulating and worthwhile. Those who have worked with study groups know that one often approaches a discussion with very definite ideas about the way things should work out; it is always a shock when it doesn't. We discussed whether the laboratory animal "expert" should engage in teaching and research. My personal opinion is an unequivocal yes. But are teaching and research really feasible for the laboratory animal clinician who has a heavy professional service load? Should research be part of the professional obligation of a veterinarian engaged in the practice of laboratory animal medicine? Again we come back to this unresolved dilemma of the individual and the program. I do not believe anyone in our study group opposed the idea that research and teaching are essential parts of a complete program in laboratory animal medicine; but there was some feeling that a service position alone could be a rewarding full-time activity in itself in a research institution.

I find it difficult to separate teaching and research from service, and the individual from these aspects of a complete program; others may have less difficulty in doing this.

The group accepted Dr. Mark Allam's approach to this matter: "While service is the essential function of the laboratory animal specialist, individuals involved in directing or participating in the operation of institutional animal facilities should be encouraged to acquire additional experience in disciplines associated with laboratory animal medicine. This should be accomplished through formal or informal instruction and research."

We debated whether this concept was pertinent to the definition of laboratory animal medicine and the role of a practitioner of this specialty. Is the man directing an animal facility analogous to the general practitioner of medicine who refers "problems" to specialists, when the "problems" in this case are teaching and research? Other members of our group had less trouble than I in defining laboratory animal medicine as a full-time professional activity without adding to it a research-teaching role for individuals in the field.

To return to the concept of program, the group recognized the possibility of teaching and research in areas of particular significance to our field; for example, the instruction of graduate students in the medical sciences in utilizing animal resources. The student with a bachelor of science degree in biology or liberal arts, taking a Ph.D. degree in pharmacology, biochemistry or physiology, needs orientation towards the use of animals that laboratory animal specialists are particularly qualified to offer. In the course of his graduate training he learns instrumentation methods and mathematical statistics. Surely animal care is equally important. There is a strong feeling within the group that this is so. However, if only one individual is available for the massive and sometimes burdensome service activities,where will he find the time to present this kind of instruction? One might ask,"Where is the time for this individual to do the research necessary to advance laboratory animal medicine?" One may also turn these questions around. If a person is involved and committed so much to research

and teaching, where will he find the time to do a proper job of professional service? Again we return to the concept that a program requiring several individuals with different skills may be required.

I have expressed the consensus of our group that the expert should have detailed knowledge of the husbandry, biology, and diseases of laboratory animals; but we recognize that almost any discipline may fall within the scope of these areas. I have suggested that our people should know how to conduct independent research, should teach, and should have the administrative skills to direct the operation of an animal facility. This is leaving you with the dilemma I raised earlier, that the expert must know everything about everything; yet his services are required in many areas. But this is the challenge of differentiating between an individual and a program. Somehow within the body of knowledge of laboratory animal medicine we must provide for both.

Dr. Krill: In a land grant institution, where there are many students majoring in animal science, should courses be offered in areas related to laboratory animal medicine such as the production of laboratory animals? Do you feel there is a need for this type of instruction for students in animal husbandry?

Dr. Cohen: There is such a course program at one of the agricultural institutes at Delhi in New York where training for laboratory animal technicians is offered. I see no conflict between the training of professional workers and technicians in this area; for example, many 'honprofessionals" in the "degree holding" sense do a fine job of animal production at a commercial level. Those of us who work with animal technicians in the research institutions know how difficult it is to upgrade their positions; yet they are among the most valuable members of research teams. The concept that animal technicians are untrained and uneducated still prevails in many institutions. The concept of a supervisor of animal care with a college degree is still somewhat novel. Some institutions still think in terms of the farmer with little formal education who is "qualified" in all areas of animal care. I do not believe these people are going to compete with directors of animal facilities, but some with better educational background might become supervisors in our institutions.

Dr. Krill: I just wanted to say that there is a definite role for these people. With their training in animal production, genetics, and nutrition they would be very helpful to the professional director of animal care and might relieve him for professional activities.

Dr. Cohen: What are some of the professional activities you have in mind?

Dr. Krill: Many activities, such as providing the proper environment, hygiene, and sanitation in the animal facilities; working with the researchers and advising them about proper animal usage and the conditions under which they are to be kept. The professional director should have liaison with research people and be available for consultation in every way possible. This is where he can render his greatest service and even be part of a research team. He should know enough about research and research methods to function in this way. If he is tied down with routine activities he will not have time for this. Many technical duties could be relegated to supervisory level personnel.

Dr. Soave: Most of us are hired to run the animal facility in medical centers. If we can make time for teaching and research, fine; but we were hired primarily

for service.

Dr. Clarkson: I will take issue with that. The need for professional services precipitates an activity in laboratory animal medicine in a medical center; but from having discussed the matter with many deans, I think they would feel they were getting only part of the job done if they received professional services only. Most deans want a unit in laboratory animal medicine in which teaching and research will be regarded as essential activities.

Dr. Krill: The need for professional services is primarily on the minds of those who wish to employ a veterinarian. However, we must look to the future and set our sights high. This includes training people for teaching and research. We must have something to offer beyond just the "know-how" of animal care. This may be our primary goal and function initially, and it should not be neglected. But the more we can offer in these other areas, the more we are going to advance our profession. In the long run a man's stature and the things he is permitted to participate in depend upon what he has to offer.

Mr. I. Jerome Abramson (Phila. Laboratories): Are courses in laboratory animal medicine offered in veterinary colleges at the undergraduate and graduate levels?

Dr. Cohen: One result of this meeting may be more interest on the part of the veterinary colleges in examining their own roles in undergraduate education in this area. The problem of how to incorporate more information about laboratory animal resources in the veterinary curriculum is occupying many hours of many deans' time these days. From the perspective of a training program director in a medical institution responsible for training veterinarians in laboratory animal medicine, I believe they should enter my program with grounding in the problems of the laboratory species similar to that which they command in the problems of the domestic species. This is a responsibility of veterinary colleges. There seems little doubt that veterinary colleges will need to review the curricula in all departments to determine how best to incorporate more information about the laboratory species.

The other component of this is how to educate the student scientists who are going to use animals in their professional careers in the proper utilization of these resources. The specialist can play an important role in his institution by adding this perspective to the total educational program.

Dr. Flynn: Dr. Soave has said that the majority of people who want to hire veterinarians have as their primary desire someone to run the animal facility. I agree with him. Of the hundreds of letters I have received in my former position as secretary-treasurer of ACLAM most of the people who wanted to hire veterinarians - and most of these were deans, assistant deans or directors of their respective institutions - wanted a man to run their animal facility; that is exactly how they stated it.

In your defense, though, Dr. Clarkson, many of them did say they wanted a man who could also do research. They would say the reason is they did not feel they could make the investment to hire a full-time veterinarian to do nothing but run their animal facility. They are incompletely aware of the magnitude of professional services an expert in laboratory animal medicine can render. When they mention research, they are thinking in terms of anatomy or physiology, not research in laboratory animal medicine.

Dr. Clarkson: The controversy concerning the relative importance of research and professional services has been with us for a long time and is not likely to be resolved in our morning session. I hope this discussion will bring to you an awareness that the relative importance of these two activities is unresolved and will require some fresh, original thinking.

REPORT OF STUDY GROUP II - PRESENT AND PROJECTED MANPOWER NEEDS IN LABORATORY ANIMAL MEDICINE - NEED AND METHODS FOR CONTINUING EDUCATION IN LABORATORY ANIMAL MEDICINE

Dr. Orland A. Soave

Our group (see program participants listing) was to look into manpower needs and the need for programs of continuing education in laboratory animal medicine. We agreed on some specific points and felt these could form a basis for discussion.

Our primary premise was that every major institution using laboratory animals needs professional services in laboratory animal medicine to some extent, whether it is five per cent of a man or several men.

Secondly, professional services are defined as those which are provided by veterinarians trained in laboratory animal medicine.

Thirdly, training in laboratory animal medicine is interpreted as producing the ability to provide a number of services. These include administrative responsibilities, planning and consultation on animal problems and architectural construction, professional or clinical service responsibilities including laboratory diagnosis, and teaching and training responsibilities. In addition to these specifics, training in laboratory animal medicine should provide sufficient background to answer questions in the areas of nutrition, genetics, experimental design, animal diseases analogous to those in man, and maintenance of germfree colonies. Public relations is certainly not the least of these responsibilities, and conducting independent research is another important area. This represents the total program within the animal facility. I do not think this means one person, especially in a large facility which may require half a dozen trained individuals.

The manpower necessary to meet these requirements was analyzed by the study group from the standpoint of numbers and types of institutions that require or will require such services. In these categories were medical schools, veterinary schools, dental schools, pharmaceutical companies, hospitals of at least 500 beds, feed manufacturers, research institutions, private laboratories, universities that do not have an affiliated medical school or veterinary college, government agencies, and commercial breeders.

From this analysis, it was concluded that approximately eleven hundred institutions will need professional services. On the assumption that some institutions with a few animals may have someone for consultation only two or three hours a week, and that others will have several people, it can be estimated that the number of additional trained specialists will average about one per institution.

Current figures indicate that there are approximately 250 persons providing professional services in laboratory animal medicine; this indicates a need for 850 additional professionally trained people. This figure is in substantial agreement with the results of two other independent surveys; one made by the Institute of Laboratory Animal Resources on animal facilities in 1961, and the

other made by the ILAR Committee on Professional Education in 1964. This figure represents a current need. As education and participation in voluntary accreditation programs increase, and as the effect of possible legislation is felt, demands for trained, competent people will increase tremendously.

In the field of continuing education, to our knowledge, only the Armed Forces Institute of Pathology offers any kind of regular short course. This points to the need for expanding this field.

The recommendations of the study group were that continuing education could be accomplished in a number of ways: Meetings, such as those held by the Communicable Disease Center for public health personnel and which last one or two weeks on an annual or semiannual basis and are presented at one central location, would be one approach. National or regional meetings might be sponsored by the Communicable Disease Center. Universities could sponsor meetings. Portions of association meetings could be taken, say, for one day of intensified short-course training in laboratory animal medicine.

Secondly, training publications; as, for example, the Public Health (CDC) training manuals, might be of help. Films or video tapes could be shown locally and would save traveling time and costs.

Traveling lectures are a possibility if someone qualified in a specific area would spend some time with a particular group for training purposes.

Continuing education could be realized through several methods and sponsoring institutions could be approached on this matter. The Institute of Laboratory Animal Resources, for instance, has sponsored several meetings. Whether they would be able to do this again is not known, but is a possibility. Other agencies and institutions include the Communicable Disease Center, the Animal Care Panel, the Armed Forces Institute of Pathology, the American College of Laboratory Animal Medicine, the various universities, the Atomic Energy Commission, and possibly the National Aeronautics and Space Administration (NASA). The primate centers, in fact, might be a good place for regional short courses.

Such short courses might be financed by the National Institutes of Health, by private foundations, by the Atomic Energy Commission, by private industry, (such as pharmaceutical companies), by universities, or by NASA. The bulk of the costs of short courses given in medical schools, which last three to five days, are often covered by individual registration fees. Possibly local veterinary associations or ACP chapters could sponsor such meetings. NATO supported one such meeting last year, but whether they will continue to do this is not known. The World Health Organization might be interested in training.

Lastly, it was recommended that the Institute of Laboratory Animal Resources, which already has a Committee on Professional Education, should ask this committee to develop a program for continuing education and to locate possible sponsoring or funding agencies.

Dr. Schneider: I wonder whether anyone could help us change this figure of eleven hundred places. In this figure we did not include a number of commercial breeders who could use veterinary services on a consulting basis. Is there someone who could give us a figure for the number of breeders who would elect to, or through regulatory edict, use veterinary services?

Dr. Clarkson: If I am correct, you are asking the question not so much as to numbers of total breeders, but numbers of breeders of a size and nature that are likely to need professional services.

Dr. Schneider: I think all breeders need professional services. They are in the same category as hospitals of five hundred beds or more, which may use laboratory animals and may have need of professional services.

Dr. Clarkson: That is certainly one of the more difficult areas in which to define the manpower need.

Dr. Cornelius: Probably the estimates Dr. Soave is giving are quite accurate in terms of professional services. However, I go back to Dr. Cohen's problem, which was to define what we are speaking of in terms of laboratory animal medicine. From the educators' standpoint in the school of veterinary medicine we are thinking about increasing the number of species in undergraduate and postgraduate courses.

It is obvious that veterinary medicine has not accepted the challenge of developing educational programs in this field, and all at once we will wake up and find that we have a real obligation. We had 25 per cent of our graduates this year attempting to go into this field which we have defined as laboratory animal biology and medicine in the broadest sense. Veterinary medicine's greatest contribution in the next fifty or one hundred years is going to be in the flow of information from the health sciences to mankind. Many people in veterinary schools were thinking about increasing their staffs in terms of people who have disciplinary training and an interest in laboratory animal biology and medicine in a professional sense. If we consider the large number of people contributing information to this field, the numbers would change quite dramatically.

Dr. Clarkson: Your comments are very much along my own line of thinking, Dr. Cornelius. It is surprising that we are talking about figures above Dr. Soave's thousand. We are talking about a yeoman's job already at a thousand, so we really have a challenge which is far greater than we had anticipated.

Dr. Soave: Let us say you need eight hundred trained people in the next ten or twenty years; that is forty per year. I don't think you are meeting that in the existing training program.

Dr. Clarkson: No, we are finishing more nearly four per year than the needed forty per year.

Dr. Soave: This is one of those things where the supply and demand increase as you get more people in the field.

Dr. Lisbeth M. Kraft (Public Health Research Institute): I just wanted to ask if the study group mentioned anything about high school biology teachers? The science fair projects and the number of youngsters using laboratory animals in high schools is a trend that is going to increase. I see here an opportunity for educating these youngsters and their biology teachers by professionals and I wonder if it is not being overlooked by veterinary schools and us? These students might become interested in our discipline or our area.

Dr. Soave: We did not consider this. Sometimes these students have worked out rather sophisticated projects. On the other hand, very often my feeling is that many of these things should be discouraged, because the students really don't know what they are doing.

Dr. Kraft: Have you ever tried to discourage them?

Dr. Soave: Yes, I have tried.

Dr. Kraft: It is something we have to face as a reality and not try to bury our heads in the ground.

Dr. Soave: I speak to the high school students once or twice a year ostensibly on veterinary medicine as a profession, but I slant and bring in laboratory animal medicine and the proper use of animals.

Dr. Rich: In cases where the youngsters tackle problems which are beyond their area of competence, I send them back to the library to study the experimental design they have proposed. I try to make them realize they are attempting to do something that can't be done at their level, and that they need to do a lot more learning.

Dr. Kraft: I am trying to make the point that this is an area where we are taking some of our time, whether we like it or not, and it is something that should be developed along with our other professional services in research and teaching.

Dr. Soave: Part of this is public relations and one approach to the problem would be liaison with local groups of science and biology teachers. Offering to assist such groups and discussing problems might help.

Dr. Cohen: My question relates to the qualities of some of these eight hundred and fifty individuals who are expected to come into this field in the next few years. Suppose you have a microbiologist whose job is to run a diagnostic laboratory associated with animal facilities. Is he a specialist in laboratory animal medicine or is he a microbiologist? In the considerations of your section, is he one of this eight hundred and fifty, or is he somebody you pull out from the microbiology department to put into your unit?

Dr. Soave: I think we limited the professional service to a veterinarian who has some training in laboratory animal medicine. We realized that there will be many institutions, e.g. small hospitals, which will continue to have a microbiologist, or a pathologist who will be responsible for the animal facility. This is certainly true in the State of California. Under the animal control law, there are many places where they would say the pathologist is in charge; he is designated as the person responsible for the animals. He probably had not been up there in five or six weeks, but he was the responsible person. - - No, he is not part of the eight hundred and fifty.

Dr. Jonas: Rephrasing this as a possible answer to the question raised: in the discussion we had there was difference of opinion. One of the definitions at which we arrived was that laboratory animal medicine is a clinical specialty of veterinary medicine requiring the normal ancillary laboratory backups: bacteriology, histopathology, and so forth. But in my opinion, laboratory animal medicine is in this narrower sense a clinical study, and it requires these other

services. Then you can go on into the administrative part which requires a knowledge in laboratory animal care, the researcher, the program director. Sometimes the dean wants to embody all of these people into one, and he may or may not be able to do this.

Dr. Melby: I want to speak on Dr. Kraft's discussion of the problem that everybody has encountered with high school students who want to do research. In the State of Maryland a society called the Maryland Society for Medical Research exists. A group of scientists recognized this situation years ago, and some of their functions may be of interest to you. When children apply to someone, such as myself or scientists in the general community for this type of advice, they are referred to the Maryland Society for Medical Research. The student is advised to work through his biology instructor or teacher in the local high school. Secondly, they outline a research program which can conceivably be carried out under the direction of the biology teacher within the high school. Then they will go ahead, and the Society will supply the animals free. They will even supply transportation, feed, bedding, and instruction in normal animal care, if they are assured that, under the supervision of the biology teacher, or whoever is the responsible person, the animal will be treated in a humane fashion, and destroyed or returned at the conclusion of the experiment.

This has worked exceedingly well because of several factors. It covered the scientific community against complaints from people about abuse of animals by high school students. Secondly, it has given us an entreé into working directly with students who have particular interests or are gifted along certain lines, allowing us to bring these people along very nicely, and at least demonstrate what is possible in research.

Dr. Henry J. Baker (Johns Hopkins University): Dr. Soave, in your discussion of manpower needs, you mentioned individuals who were working full-time exclusively in the area of laboratory animal medicine. You also commented upon the needs of smaller universities and hospitals for part-time consultations. Did you consider in your discussions individuals engaged principally in veterinary clinical medicine, and how they would fit into this picture?

Dr. Soave: Yes, we discussed this problem. Our figure of eight hundred fifty plus represents a total count and does consider the individual who acts as a consultant for several institutions as one full-time specialist rather than four or five part-time people.

We did discuss the practicing veterinarian under the problems of continuing education. The practitioner is one person we should try to reach with these programs, since he will be called upon for consultative services. This is especially true of those who are in a city which has no large medical center, but does have a hospital doing some research. We felt that trying to add up quarter time, half time, full time was virtually impossible. Several of our group consult in two or three places, as I do occasionally too. Our group felt that quite a few veterinarians in practice were called upon occasionally in certain areas.

Dr. Flynn: We discussed Dr. Cohen's question about microbiologists and others, and how they would fit into the scheme of these eight hundred and fifty people who are needed. One of the comments was that all of the things you have defined, Dr. Soave, as the professional services to be rendered by one person or group of persons or part of one person include such fields as administration, disease diagnosis, laboratory diagnosis, nutrition, germfree technology, etc. If one

person has to be chosen to advise in all of these areas, then that one person would best be a veterinarian. Though we agree that many institutions would only need a man part time, some would need as many as ten, and in these instances all ten would not be veterinarians. It is conceivable that the director of this group would be a veterinarian, but the members of the team could be members of many disciplines, so that the figure of eight hundred and fifty does not necessarily include only veterinarians.

The other point raised was that the present rate of graduating four students per year might have to be accelerated to something like forty, so that we would have about eight hundred in twenty years. I agree that we need about eight hundred and fifty now and that not all medical research institutions are aware that they need this many. If we take the present growth rate of people entering into this field with a doubling rate in about five years, that is, now there are two hundred and fifty, five years before there were one hundred and twenty five, and five years before there were about sixty, we will reach this figure of eight hundred and fifty in something like ten or fifteen years. You would only have to train forty to eighty a year. There is another factor. This awareness in the past has been by word of mouth - one dean has a good facility and another dean comes visiting, sees it and says, "I want a veterinary director, too." One other factor that is coming up in the next few years will accelerate this much faster than word of mouth. This is the possibility of legislation or at best, perhaps, voluntary accreditation. This will increase the number of people entering this field, and the number of institution deans and directors becoming aware of the need. These needs will be pointed out very forcefully, and it is very possible that you may find that these eight hundred and fifty may have to be on the job in something like three or four years.

Dr. Soave: We discussed this problem and, as I recall, we felt that we might go along slowly for the next five years, but then get a great demand for trained people.

Dr. N. R. Brewer: There is activity on the part of practitioners to work in this field. The American Animal Hospital Association has a committee on laboratory animals, and much interest has developed among practitioners, particularly in small towns. I don't know how you would get a total figure of how many veterinarians are included, because I know in Chicago there are a number of veterinarians doing part-time work. They are not even members of the American Animal Hospital Association. You could get some idea if you were interested by writing the American Animal Hospital Association asking them to make a survey of the number of veterinarians doing part-time work in this area. It might be interesting. My guess is you will come up with a figure of about two thousand.

Dr. Jean K. Nielsen (Food and Drug Administration): I would like to come back to Dr. Kraft's comment. I had the feeling that perhaps her comments were slanted toward considering high school students as a source of potential trainees in this field. We deviated from that thought but high school students who are interested in science fairs could be encouraged to look into this field of training.

Dr. Clarkson: The next part of our program will involve a discussion of the current policy of the National Institutes of Health toward postgraduate education in laboratory animal medicine. I am sure all of you appreciate the importance of the National Institutes of Health support of these training activities. Without exception, all of the formal programs for civilians, now in existence,

are supported to some extent by NIH. I really cannot see how it can go on without NIH support. I don't know what other agency might support this kind of activity.

It is with a great deal of interest that we all hear the thoughts of NIH extramural programmers about our activity. We are very fortunate today in having with us Dr. James Dow, who is the Program Administrator of the Physiology Training Committee. The Physiology Training Committee has most of the existing programs which are NIH-supported.

NATIONAL INSTITUTES OF HEALTH POLICY ON TRAINING GRANTS IN LABORATORY ANIMAL MEDICINE

James W. Dow, M.D.

Dr. Dow: Laboratory animal medicine is fairly new to us. It is even newer to me than it is to others at N.I.H. and on the Physiology Training Committee, because I came there a year ago and only later visited the first two programs which were already in operation.

Exactly how the Physiology Training Committee got this responsibility, I am not quite certain. It is very questionable that the Physiology Training Committee ought to have it.

Laboratory animal medicine is not perhaps all things to all people, but it is two things to two different sets of people. To the people engaged in laboratory animal medicine, education, and research, it is an area of intense interest for its own sake, an area that is as broad and in some ways as vital to human health as clinical medicine.

To other life scientists, including physicians and surgeons engaged in research or clinical investigation in the medical schools, it is primarily a service. It is something they want to have in order to provide well-tended animal farms, sources of experimental animals with known health records, known genetic makeup, plus some assistance with the postoperative care of animals, etc.

So there are two major aspects of this program: research and service.

I don't know why service makes everyone bridle so. One thinks of a professor as being a great research man. He doesn't like to think of himself as a teacher, but that is the service he offers, and that is why he is at the university. The academic M.D. does not usually like to base his reputation on his excellent care of patients, though some do. He prefers to be known for the papers he has published in some exciting field. But he is there really to take care of people. That is, at least in part, why he is paid. The training function, the service function that laboratory animal medicine offers, is of this nature. It is a highly dignified operation.

The research function is certainly exciting. It covers a broad area, encompassing microbiology, genetics, immunology, pathology, physiology, etc.,

which makes it preposterous that any one basic science training committee should be singled out to handle so broad a program.

The training that can be given under such an arrangement would depend upon the skills, the interests, the capabilities of the people who conduct the programs. It depends upon time available, upon the situation in which the training is conducted, and a great deal upon the caliber of students one can recruit. At its best, training for research in this area is as demanding as any program could be.

To give the student a broad look at all of the disciplines involved is not hard. This can be done with the existing course structure in a veterinary school, or in a medical school, in a couple of years. It can be combined with the residency kind of appointment that we see commonly. But it is impossible to see how this kind of training can create a very considerable competence in a narrow area, when it is also necessary for researchers to work effectively on the frontier of these basic sciences.

We are, therefore, faced with a problem which is just one of many. Biomedical engineering is an example. This new interdiscipline started with engineers spending much time trying to help surgeons with artificial heart-lung problems, or to record a physiological signal, or sort out signal from noise, or in any of a variety of other engineering problems. Departments of engineering at universities were then sufficiently interested to offer their help to life science groups, largely medical and largely concerned with helping humanity. The engineers were offering a service. But what happens next? When the engineers want to enter the medical or life sciences field, they do not want to offer a service. They want to function as research people. Therefore, training programs become complex, difficult, and more prolonged than a normal Ph.D. in electrical engineering or physiology would be.

Both of those things must be supported, yet we do not support service. We have turned down a number of perfectly good training programs, even some that confer a doctorate, because they are concerned with the development of instrumentation and not with the application of engineering approaches to scientific investigation of living material.

Support personnel are needed in other fields: clinical pathology, biochemistry, medical microbiology, natural products chemistry, cyto genetics, electron microscopy, and there are more. Training programs have been considered by committees in all these areas and turned down on the basis that these were not research training. Yet in each case the committee recommended that the service function be carried out. The NIH carefully delimits what it tries to do. Our language says that we are authorized to conduct training for research. There is nothing whatsoever said about our being authorized to train support personnel.

The National Advisory General Medical Sciences Council at its last meeting a couple of weeks ago essentially directed the branch to find a way to implement the intent of these programs in both areas, in service and in research. To my mind this means that the two functions should be identified and supported for what they are.

A number of mechanisms are possible. The present mechanism suffices when a laboratory animal medicine program permits adequate training in physiology at a level consistent with other programs in physiology. Most of these are doctorate programs requiring four or five years of training. Our present mechanism would appear to be able to handle only a very small proportion of these.

Since laboratory animal medicine does cover a very wide spectrum of disciplines and since in some cases the functions of education for the students will be divided between basic science departments, it seems that having a Center of Laboratory Animal Medicine, including the function of training, might be most appropriate. Training might then lead to a degree for each candidate in a different basic science, depending upon the candidate's interests.

We might set up a committee on veterinary science within the National Institute of General Medical Sciences, staff it with veterinarians with demonstrated competence in each of the basic sciences, and handle all of the proposed programs through that one committee.

In any case, we do have the directive to identify and set up a mechanism to assist you in forming and developing these programs. Perhaps that is a good place to stop, because I do want you to know that the difficulties you have been encountering are not due to any desire on the part of the advisory committees or the administration at NIH to discourage this activity. It is quite the reverse.

Dr. Cohen: Dr. Dow, you indicated at the beginning of your talk that you do not have authority at the present time to support service training, and yet at the conclusion of your talk you indicated that you want to support service training. Are you asking the group here to suggest the mechanism, or do you have the guidelines by which those of us who are interested in the area can develop proposals?

Dr. Dow: I don't believe we need a voice from the outside other than the one we already have. The distinction between research training and training in support of research activities can be a very fine line. I did indicate that this line may have been drawn in order to prevent an enormous drain on funds which the administration in the beginning wished to concentrate on the preparation of investigators at the independent research level. Funds are not quite as limited now, and independent investigators we train may require multimillion dollar computers, linear accelerators and other expensive equipment in order to function effectively. Such men need support personnel to help them. Should we train people to offer these various services? Is that part of our authorization? I suspect that this is really something for which we need no more than a strong go-ahead by a national advisory council. I don't believe we need new legislation.

Dr. Joseph Stuart (Georgetown University): You said the stress here is on physiology, but what if the doors open to programs in pathology and microbiology?

Dr. Dow: I consider the Physiology Training Committee inappropriate because the program encompasses an entire range of activities in such basic sciences as physiology and in the clinical-pathological sciences of the diseases of animals. I think that programs submitted right now to the Physiology Training Committee will have to be held up if they are not literally good physiology training programs. One in pathology, for example, might be held up until we can set up a mechanism to handle all areas.

Dr. Krill: As I look upon laboratory animal medicine, it is much the same as clinical medicine, the service part of it. You may find that the people who go into laboratory animal medicine are coming from many different areas in which they may have a special interest. Maybe one or two want to follow physiology as their major. Others may want to follow pathology, some may want to go into the field of preventive medicine, and some may want to go into any one of the other disciplines in basic science.

To handle a trainee grant by a college, should the people within the college decide, when the application is made, whether it should be turned over to physiology or parasitology, bacteriology or what area, or should one department request it? We have the department of medicine where we are giving the graduate training program, and there the student may pursue for his major work the area in which he is most interested, in consultation with the chairman and members of that department. That is the way we solved it, because we did not know into which one department it should go.

Dr. Dow: For requests that fall within one discipline the request can come from any department in a college or in a school of veterinary science. A request which covers a number of disciplines might have to come from an inter-departmental committee, from a laboratory animal medicine department, or from a center for laboratory animal medicine.

Suppose these programs were made degree programs. Each man might have then a spectrum of courses and experience which would be appropriate for anyone concerned with the operation of such a facility, but have just as concentrated, narrowed-down and focused a scientific education in a single area as any other Ph.D. I think it is the best way to do it. The college concept which you are suggesting is the one I intended to suggest by saying I would like to see these programs handled in a central resource with participation by each of the basic science departments, and with the men who are enrolled as candidates in laboratory animal medicine also enrolled as Ph.D. candidates in any of several departments. I know of an example of this in one of our major universities, and I consider this to be one of the ways the matter can be handled. The situation of a D.V.M. interested in laboratory animal medicine differs from that of the M.D. interested in biomedical engineering. It is fairly easy to get an M.D. to go for a couple of years of very rigorous study. He does not usually want to go for the four or five years that would be necessary for him to get a Ph.D. in engineering or biomedical engineering. I don't believe I find the same difficulty in veterinary medicine. I think there is a large pool of doctors of veterinary medicine who would be very happy to participate in a program of this sort, which would cause them at the end to know they were thoroughly qualified in some basic science, skilled in a function as well, and virtually assured of an academic career of research and teaching thereafter. I don't believe that the degree requirement would be a considerable barrier.

Dr. Schneider: Possibly what we need - and this points out one of the weaknesses of laboratory animal medicine - is being more definitive about what we represent within the institution and among ourselves. By using the name of the specialty that we represent rather than such terminology as vivarium, animal care units, biological laboratory, you know what the man is in the institution, what he represents, and what his function is. From there let this man go out into the various disciplines, from his specialty, to get his graduate work. He still would be definitely a part of the specialty group. I would assume that there are from six to a dozen terminologies used to explain this department within

institutions in the country. The terminology of Dr. Clarkson's Department of Laboratory Animal Medicine might be the correct one.

Dr. Dow: Of course, I do think that you do not want to lose identity for laboratory animal medicine by virtue of making it an appendage to pathology training or physiology training, etc., any more than you really want to distribute these requests among pathology, or microbiology, etc. You could not possibly get any kind of uniform handling of laboratory animal medicine if proposals were submitted to 13 different basic science training committees at the National Institute of General Medical Sciences. We do need to identify the discipline on which the program will be concentrated, but not to the extent of obscuring the fact that this is training as well in laboratory animal care.

Dr. Cohen: It is my great pleasure to introduce Dr. Thomas Clarkson who has chaired the meeting. The genesis of this meeting is primarily Dr. Clarkson's inspiration, and I think all of us owe him a debt of thanks for the foresight in recognizing the timeliness of this discussion.

REPORT OF STUDY GROUP III

CONSIDERATION OF COMPOSITION AND EDUCATIONAL PHILOSOPHY OF GRADUATE TRAINING ACTIVITIES IN LABORATORY ANIMAL MEDICINE

Dr. Thomas B. Clarkson

My responsibility today is to bring to you the thoughts of Study Group III (see program participants listing) which dealt with the philosophy of graduate education in laboratory animal medicine, with the content of these programs, and with some of the promising future patterns for research. We also found it necessary to usurp a part of the responsibility of Study Group I and define laboratory animal medicine in our terms before we could begin, in order to focus on the objectives of post-DVM or graduate training in laboratory animal medicine.

Our study group had a slightly different flow of thought than Study Group I, because there was unanimity of thought that professional services, research, and teaching were all of equal importance, recognizing that some people are going to be stronger than others in any one of these particular activities. We felt certain that the composite of professional services, research, and teaching was the core of this activity called laboratory animal medicine. Therefore we felt that the objectives of specialized training, post-DVM training, or graduate education was to provide the person with advanced knowledge and understanding as it concerns teaching, research, and professional services.

Our study group dealt specifically with some of the questions Dr. Cohen brought up, i.e., is service a goal itself? We quite understandably had to deal with this. If we accept the philosophy that service is a goal in itself, then this would suggest that training should be entirely oriented to professional services. Our study group, however, tended to be of the opinion that service itself was not the ultimate goal. If we look at some analogous areas of medicine and try to observe the effect that service as an ultimate goal had upon these areas, we can see that it has been a gradual process of atrophy. Those who think deeply about this will appreciate that in order for any activity, area, discipline, or subject to continue to grow and to attract new and imaginative people, it must be progressive. It is completely unsound to continue some activity that is not improving itself and advancing knowledge. We had to deal with the phenomenon that Dr. Cohen referred to, the "jack-of-all-trades," or a man who knows a little bit of everything. It was our thought that the objective of graduate education should not be to provide this sort of very general and superficial knowledge.

There are two components to graduate education. One is that the postgraduate student should have whatever body of knowledge that exists in laboratory animal medicine. If we agree that laboratory animal medicine is a specialty, this certainly implies that it can be one only if it holds some special body of knowledge. We felt that if it is a specialty, then it is necessary to impart this particular body of knowledge.

Along with this it was felt that we should be able to advance the field of laboratory animal medicine by disciplinary understanding or by depth in a discipline. I do not think that our group was enthusiastic about the idea that graduate training is being devoted entirely to laboratory animal medicine, meaning this core of knowledge alone to which I will refer later, but that it should involve some disciplinary depth. Because I am a proponent of the idea of education specifically in laboratory animal medicine, it was pointed out to me during the session that even though this is what I say, this is not what we do in our institution. I had to admit that what we do, and which is what we must believe, is to give these people depth in pathology, although we call it laboratory animal medicine in our own program. Certainly, this might be in any of the disciplines. Pathology was mentioned frequently yesterday, as was physiology, but the need for people with discipline depth and understanding in nutrition, biochemistry, genetics, and many other areas was noted.

There were three principal problems that the group was able to define which are pertinent to the objectives of training in laboratory animal medicine. We were concerned with the current tendency to train people to meet the immediate need. We felt that an educational process should be defined in philosophic terms and not molded so specifically as we have in the past to train a man to fit a specific job. Obviously we are not even sure how we see it, as you can tell from this morning's conversation. I do submit that these different viewpoints may be resolved in the next five or ten years, and a good educational program should provide people with such a foundation that they would be prepared to contribute in a meaningful way to their field, not for the next three to five years, but for the next 10 to 40 years. These people must then be in a position to have a broader base than perhaps necessary to meet the challenge as some would see it in 1964.

We also dealt with a second area of objectives in training, and I must confess that I might have felt more strongly about it than the study group. Maybe I should call this a personal concern, although I did find some support in the group. This is the concern with "diseases of laboratory animals," meaning not really diseases of laboratory animals, but only those infectious diseases that are of colony health importance. We must be concerned with those infectious diseases that kill large numbers of animals. But if we are to be learned individuals who understand the animals we work with, we must have an increased focus on those metabolic or degenerative diseases that are of interest as comparative medicine problems, but which rarely make an animal sick. I think we have only been talking about the "clinically important" diseases when we talked about diseases of laboratory animals.

The third area of concern about objectives was one in which we were not able to come to any unanimity of opinion and that is the importance of training in the managerial phases of animal care. Some program directors in our group felt that, since many of these animal care budgets are operations of half a million dollars or more, the man should have significant managerial training. Others felt that this type of training was not necessary. This is an unresolved problem.

Now, to the program itself. We have set in context the objectives as we have seen them, that is 1) to impart the body of knowledge accumulated about laboratory animal medicine, and 2) to prepare the individual to advance his specialty by means of the competence gained by disciplinary understanding.

The first problem that we dealt with as far as program organization is concerned was whether programs are more effective in the graduate school environment or out of the graduate school environment. As Dr. Cohen has said, he came prepared for some long sessions on some things, and I was prepared for a great controversy on this. I was surprised to find that our group was unanimous in feeling that training can be more effectively done in the graduate school atmosphere. This represents some change in the pattern of our thought over the past three or four years. We found that most of the program directors had their people enrolled in the graduate school. Most of the students were candidates for degrees. Other programs planned to redirect their efforts into degree programs. Had we held this meeting a few years ago, there would have been more thought among educators that this was a clinical specialty and that we should provide a residency which is not a part of the graduate school.

It is interesting to comment on what seems to be a divergency between Study Group I and Study Group III; Study Group I having leaned much more strongly towards the need for people with training for professional services, Study Group III saying we should be training people in the graduate school. I suppose we are here today to raise questions, and this would seem to be one. The graduate school is probably not an effective place to provide these people with the professional competencies that are referred to under professional services in Study Group I. The feeling of our group that training more appropriately belonged in the graduate school was due to the fact that it would ensure better student selection, that we could be assured of assistance in evaluating student performance, and that their grasp of research and the ability to communicate their findings would be enhanced by the experience of the thesis preparation and thesis defense.

Having agreed that the graduate school seemed to be the more appropriate atmosphere for graduate education in laboratory animal medicine, we began to turn to specifics. We saw three patterns of training within the graduate school that could be productive.

I would like to point out that we recognized that these patterns would vary from institution to institution, depending upon the characteristics of the schools of our respective institutions, some permitting degree designations of one sort or another, and others none. We recognize that such variations must exist.

The first pattern was that of a man enrolled in the graduate school, not necessarily as a degree candidate. The study group felt there should be such a category. It was pointed out that we will be called upon to provide education for people who, perhaps, in addition to the Doctor of Veterinary Medicine, also have the Master's and the Ph.D. Obviously you would not enroll these people for a degree. We felt there would be an increase in the number of these individuals, and that the pattern should be to enroll this man in the graduate school as a non-degree candidate. He would be already prepared to advance the field by virtue of some disciplinary competence, and he would be coming for the "core of knowledge" in laboratory animal medicine.

The second pattern of training, and one which broadly fits most of the training activities of today, was the Master of Science type program. The Master of Science degree would be conferred in either of the two areas, in a discipline, say physiology, during which the man would learn the methodology of his discipline and be able to advance the understanding of laboratory animal

biology and medicine by his competence and understanding of the discipline. He would also be given the body of knowledge as nearly as the institution could define it in laboratory animal medicine, so that here we would have a man who would be brought to the "frontier of knowledge" in laboratory animal medicine. He would also have gained some degree of disciplinary understanding to advance this frontier.

There are a number of programs leading to the Master of Science in laboratory animal medicine to which I alluded earlier. The study group felt that this was an acceptable pattern of training if it accomplished the same thing that we discussed in the disciplinary program. It would not only give him the "core of knowledge" by presenting him what we know in laboratory animal medicine, but would also provide him with a disciplinary depth to advance the specialty. We felt that whether we categorize these programs as M.S. degrees in laboratory animal medicine or not, they must have the component of providing students with some disciplinary depth so they have a methodology to advance the specialty.

The third pattern of training is one which represents a second growth phase in our thinking. It is a very challenging thought and apparently is being considered by at least two veterinary schools. The concept is one that is similar to the concept of the M.S. degree candidate in a discipline and involves the Ph.D. candidate in a discipline. This pattern is one in which a man with the Doctor of Veterinary Medicine degree does not enroll in a master's program, but goes straight for the Ph.D. in a categorical discipline. The one difference in this from standard Ph.D. programs is that the overriding intent in all of his graduate education would be to develop him into a laboratory animal specialist. Consequently, his Ph.D. training would have three major components. The first of these would be gaining insight into the practical problems of laboratory animal care by having this individual visit a variety of animal facilities. Both of the institutions that spoke of this felt this worked well in a big center having many types of animal facilities; you might also send this man to four or six kinds of very different animal facilities. This exposure over an as yet undefined period to the practical problems of the laboratory animal at the site is one component.

The second component would be his discipline depth. This would come about by his being assigned to a major professor in a categorical discipline. The man would take the usual course work and would do a thesis problem under this professor.

The third phase would relate to his being given the "core of laboratory animal knowledge" to which we have referred. We visualize this kind of training as being divided into half a dozen courses which would bring him up to the "frontier of knowledge." We have talked a great deal about this "core of knowledge" which is a packet that each one of these people gets in addition to his understanding of a discipline. We tried to define this as specifically as we can, because I think we have referred to it too generally for too long a time. We did this by thinking first that the man should have a very broad survey course exposure, and in this survey exposure he would become acquainted with an introduction to strains and strain sources, anatomic peculiarities of laboratory animals, physiologic parameters of laboratory animals, some of the advanced animal production technologies, etc., and as well be introduced to the rudiments of animal experimentation.

Surprisingly enough, we find that young veterinarians don't know how to give medication to a rodent; they don't know about the manual handling of laboratory animals. We have to start at a very rudimentary level, so that the basic elements of using animals in research would be a part of this survey course.

The second area of subject matter in this package is the diseases of laboratory animals. We are talking not only about the infectious diseases of clinical importance, but also about latent infections, metabolic diseases, degenerative diseases, genetic anomalies, and the whole range of abnormal biology that is of biomedical interest. Not only are we thinking that the man should understand the variety of types of diseases, but he should have some understanding of the biological phenomena that one can learn by the similarities and contrasts in the disease expression among the laboratory animals.

The problem of surgical training was also discussed. Everybody felt some elements of laboratory animal surgery should be in this packet. I don't think we ever arrived at any definite conclusion; however, the consensus was that it should be somewhat less on the techniques, and somewhat more on what knowledge can be gained through the surgical preparation. Dr. Christensen raised a very interesting point. He called this the "modified model," and we shall refer to this later. Some broad understanding of the area of surgery as it is related to the laboratory animal and what has been learned biologically from this, represents a third part of the packet.

A fourth part of the packet we might call "animal experimentation." Dr. Christensen proposed that we call it an extension or modification of the animal model, and this is a good thought. This would be the broad area of the induced diseases. Few of us go through a day without being asked about a method for making a particular animal hypertensive, diabetic or something else. We feel that a rather sophisticated approach to this is in order, and the man should be well schooled in these methods, what has been learned by their use, and particularly their limitations.

Along with the continuing concept of the modified animal model, he should be given special insight into the use of naturally occurring diseases as research tools. Some use has been made of these in laboratory animal medicine, and we will see an increased emphasis and an increased research use being made of naturally occurring diseases.

The fifth part of this packet was laboratory animal genetics. We were not quite sure where the man should acquire this knowledge, but we felt he should have some understanding of the genetics of inbred strains, methods for maintenance of inbred strains, and their meaning in population genetics. It was pointed out to us in our section that this has been a neglected area in current training. I expect it is neglected by the other program directors as it has been by me for lack of someone to teach it. However, if we recognize that this is an important part of the packet of knowledge, I think we will have to meet the challenge in finding teaching resources.

This leaves us two other things that should be included in this packet. The feeling that these people should have competence in biostatistics was well recognized. If competence in biostatistics was not a part of their discipline competence, it certainly should be in the laboratory animal medicine packet. We wanted to be sure it was not omitted.

We all recognize there was some real, genuine need for the category of business affairs and facilities design. We tried to resolve the question of how this should be presented in a program of graduate education. We really did not find a solution. Ohio State University came up with a possible solution: They are going to have an expert on this subject on their campus, a veterinarian who has been trained in hospital administration and cost accounting. Our group felt if instruction is to be given in this area, it should be done well, and estimated cost and maintenance figures should be replaced by those accurately derived. Facility design must be dealt with, but we do not yet know the best way to do it.

Dr. Flynn: Dr. Clarkson mentioned that I was opposed to the training of individuals in research in depth. You are referring to my statement when I said most medical institutions who want to hire a veterinarian think first of someone to run their animal facilities. They also want this person to double in research and teaching. I said that I oppose the method of placing a man in another department, say, bacteriology, virology, histology, or physiology, and giving him teaching responsibilities for some undergraduate medical students. This would be poor teaching or research, and for a trainee to learn something of teaching methods, I feel he should be grounded in depth in a discipline. I am absolutely for these things.

What I am opposed to is that laboratory animal medicine may not appear to many institutions as being a legitimate area of research. This core of knowledge that you mentioned is a legitimate area for research. We must convince deans and directors of institutions that this man has plenty to do in providing these professional services, doing research and teaching in this area, and not frittering away his time in some other area.

Dr. Clarkson: Yours is a statement and not a question, but I might just elaborate on it for a minute. We must be very careful not to modify our thoughts on teaching programs by some of the practical problems that exist in the medical schools. I am not sure that this can be taken into consideration.

Secondly, I should like to restate that I certainly agree that this packet of knowledge is so broad that it needs a great deal of research. To receive this research we nave to have young men who understand the unanswered questions, that is, they have had the packet, and they have also some competence by which they are able to attack these unanswered questions that they have recognized in the packet.

Dr. Cohen: When you speak of research in laboratory animal medicine, I find this hard to pin down. I can think of research in a clinical area, problems related to laboratory animals where one can define an obstetrical area, or one can talk of physiological or pathological or microbiological aspects. You are getting right back to the discipline; one would not ordinarily think of saying "I am doing research in laboratory animal medicine."

Dr. Peter J. Matthews (National Animal Disease Laboratory): There are some inherent difficulties in what I suggest now, but I would like to see that the kind of knowledge we talked about is put into the undergraduate curriculum. This would allow a student to go on to graduate school and extend his knowledge beyond what he has learned.

Dr. Clarkson: We were certainly aware that a lot of what made up this packet of knowledge to be presented to the student in graduate training was or might well be in the undergraduate curriculum in some other field. There are two practical problems. As trainers we have to deal with the material as we get it; also there is the veterinary school problem which was adequately discussed yesterday by the representatives of Ohio State University and of the University of California. This latter problem is twofold. One part is that every specialty group thinks their people should be better prepared in their own area of interest, and the other part is that veterinary schools are increasingly aware of the importance of training in laboratory animal medicine. Some of the schools are beginning to talk not only about the horse, the cow and the dog in anatomy, but also about the rat and the rabbit. When they get to physiology they consider not only the domestic animals but also some of the laboratory animals. What we say in five years may be quite different from what we say today.

Dr. Soave: If you want competent people who will keep up with the literature in this field, you have to have the stimulus of research and training. If you perform only professional services, you have the danger of simply being a supervisor of animal care. I feel strongly that you need the above mentioned stimulus, and I think that I was misinterpreted.

Dr. Brown: I would like to answer the question asked by Dr. Matthews. Most deans agree that the present veterinary curricula are chock-full now and that there is not too much room for additional material. The Communicable Disease Center recently made a survey regarding the DVM curriculum and its relationship to public health teaching. It was found that there was not a great deal of teaching in this area. If you surveyed the curricula as far as laboratory animal teaching is concerned you would find that this is an area that is not very well covered. In Study Group II we did make one further recommendation, and that was that we have an educational job to do. We must teach veterinary faculties that this is an area of considerable importance. In view of the fact that sixty per cent of the veterinarians are engaged in practice and the remaining forty per cent in other fields, these other fields should be specifically mentioned, and it should be revealed to the graduating student that he has many areas in which he can participate. Laboratory animal medicine is one. Public health is another. Industry is another, etc. I do not mean to include training for teaching in this specific field in the DVM program.

Dr. Krill: With regard to the DVM curriculum, we cannot give special emphasis to any one particular field. I am hoping that we can get a program under way that will allow our students in their clinical assignments to have experience in the laboratory animal facility, so that they acquire an appreciation of the program. It could be mentioned in the small animal medicine course rather than making a special field of this. We could fragment our attention, and we could increase the amount of material we get to where we would have to increase the time requirement. You can get the time requirement and the cost of an education to the point where you discourage the boy of average means.

I would like to raise one question in regard to the Master of Science degree. There is some aversion and resistance toward calling it a Master of Science degree in laboratory animal diseases. Why is this any different from a Master of Science degree in public health? Is there any difference between them? I can see many areas of resemblance.

I would like to go on to the Ph.D. degree. I cannot see any place for a Ph.D. degree in laboratory animal medicine at this time. A Ph. D. degree should be in a discipline. If a man is interested, in the course of his Ph.D. training, let him go ahead and take as much of this work as he may want to, but why should we concern ourselves with a Ph.D. in laboratory animal medicine?

Dr. Clarkson: The comments that I made were directed toward a Ph.D. program in a categorical discipline, with the man perhaps taking somewhat longer for his degree to get some exposure to practical situations, and to get this "packet of knowledge," in addition. It is just as you say, that he took some laboratory animal training along the way. The question of the master's degree in laboratory animal diseases or laboratory animal medicine is a very complicated one. It revolves around the fact that to have productive research, you have to have some methodology. All of our methodology is built around disciplinary understanding. If you are going to advance the understanding of laboratory animal diseases, you must use microbiology or pathology. Laboratory Animal medicine has no peculiar disciplinary methods.

Dr. Krill: Is there any difference between this and public health?

Dr. Clarkson: It is not different from public health. I personally feel this is a limitation of the M.P.H. degree.

Dr. Oscar Sussman (N.J. State Department of Health): Might it not be better to return to the terminology we are avoiding. I am referring to a department of veterinary medicine in these research establishments.

Dr. Clarkson: This is a very difficult question that we are unable to resolve here. Most medical schools are aware of the problem that the term,"veterinary medicine," does not fully describe this specialty because veterinary medicine is primarily focused on domestic animals rather than on laboratory animals. Most feel that "laboratory animal medicine" is a more descriptive designation. I do think that Dr. Schneider's point is well taken that we need to designate more definitively the activity of given units, and not disguise them behind odd terms like medical research laboratory, animal support laboratory, and so forth.

Dr. Edwards: In the discussion of Study Group III you pointed out that there was unanimity of opinion regarding the enrollment in graduate schools whether they were degree-oriented or not. I think an impression was left that we did not discuss board certification.

Dr. Clarkson: That board certification may be an effective measure of the accomplishments of the individual rather than reliance on the graduate school was presented to the study group.

Dr. Serrano: You mentioned three patterns that had developed in the field of education of laboratory animal medicine, the non-degree program, and the degree programs leading to the M.S. and Ph.D. degrees. We now see developing the staff concept, where more than one veterinarian is associated with a particular institution, that we could have junior appointments. Such veterinarians would not be specifically in a training program, but would be employed by the institution to perform a service and would be under the direction of another veterinarian with greater experience.

This seems to be a possibility for a fourth pattern of training, and I was wondering if your group had looked at this also.

Dr. Clarkson: We viewed our task as that of defining patterns of graduate education. We recognized that there were going to be people who dropped out of these programs who would fill in at all levels requiring less competence. We should not aim at some pattern which provided people with some lesser amount of training than we considered appropriate.

Dr. Edwards: Do you think that the measure of standards and the definition of objectives by the American College of Laboratory Animal Medicine would fit as a measure of standards as they exist today?

Dr. Cohen: The American College of Laboratory Animal Medicine has the same problems that have been raised before the group today. We are a recognized specialty, but have to work a little bit to define what it is for which we are recognized. This is a job that you and we have together. The American College of Laboratory Animal Medicine is nothing more than a mirror of ourselves, so the problems that you see in the organization are the problems that we have. If we don't make a success of a specialty board, the fault is not that of some unseen figure. It is our fault and responsibility. We have to make the College something very meaningful. If we do not have the College we will have to invent a substitute for it. This is a task that the College has set for itself. It is going to need the help of everyone who wants to make it successful.

Dr. Melby: It would seem that the professional groups and the people here in the audience have decided that adequate training in laboratory animal medicine in the future is going to involve a very broad approach to learning the various clinical aspects of laboratory animal medicine as it applies to veterinary medicine and as a continuation of it. In addition, to perform adequately in a given position the individual must delve in depth into a discipline, and a discipline as I define it is in a basic science field.

What happens in institutions, such as mine, which relegate degree programs only to the basic science discipline? Unless there is a change in the administration of these institutions, we would not get very far in establishing a degree program in laboratory animal medicine. Such a proposal would not be considered favorably whether we had it funded by NIH, had excellently qualified research people or not. A man receiving training in various other clinically oriented areas does not receive a degree in these areas.

I am a bit concerned also from the standpoint of a situation which I know will develop very shortly. A very fine veterinarian, with good training, has received a Ph.D. degree. He is neither in a medical school nor a veterinary school, but in an excellent basic science department of an arts and science school. He is coming into an institution as its representative with professional responsibility because he is basically a veterinarian. He will be carrying on their animal care program. This is a situation in which the entire research potential of this institute is dependent upon its animal resources. The individual with a Ph.D. in a basic science has this type of information, but he does not have laboratory animal medicine, nor does he have the capacity that is built into this institution as of the moment to enable him to do the job and determine what should be done in this area. Should this man finishing his Ph.D. after five rigorous years in mastering this discipline take two or three years off to learn

laboratory animal medicine, so that he can really perform the way they want him to in this area? In two or three years, he will have lost many of the techniques important to his basic discipline. I wonder if the veterinarians' main criticism is that we are so broad that we have not been able to narrow ourselves down to perform in any area which we attempt.

Dr. Clarkson: You have raised the point of a particular institution not accepting the Master of Science degree in laboratory animal medicine. If you remember from our presentation this morning, I said there would be wide variation among the institutions. Some hardly give master's degrees, others grant them freely; some call them one thing and some call them another. This is rather immaterial. The quality of the training that goes into a man's master's degree is the important thing, and our study group felt, irrespective of what you call it, if he got this packet of knowledge that we talked about in laboratory animal medicine, and he had the confidence through a discipline to advance this, then he had the appropriate training.

You raised the question about the veterinarian with a Ph.D. in a basic science from an arts and science college who would be going to a medical school without any training in laboratory animal medicine. This is happening, and it is what the institution chose to do and what the man chose to do. It is really not pertinent to our discussion. One of the proposals from Study Group III, which I tried to make today by talking about the role of the man who has come into training but is not a degree candidate, would be some concentrated effort at a university, veterinary school or medical school to which this man could go to get this packet of knowledge, presumably in less time than you suggested. I think the University of California particularly sees some future function with this group of people coming to them for the "packet of knowledge." If the aforementioned individual chooses not to acquire this "packet of knowledge," and the university chooses to take him as he is, then I am not sure that this is pertinent here.

If I may comment upon your feeling that we are becoming more diffuse, I think this is not right. This is the first meeting I have ever attended at which we have faced squarely the proposition that we have too long tried to be the "jack-of-all-trades," or as Dr. Cohen said, the "policeman who merely points directions to specialists." We must give these people not only the general knowledge but also some specific knowledge, so that we do not have a man who is a generalist but one who has something specific. I feel that a very large step has been made away from the overgeneralization with which we have suffered in the past.

Dr. Cohen: I interpreted Dr. Melby's first question a little differently than Dr. Clarkson did, and, in my interpretation, he has raised a very cogent one and a very difficult one. What Dr. Melby is saying, as I interpret it, is that if a man is to get a degree in physiology or a degree in pathology, the requirements are so rigorous that he will spend four years of very hard, intensive work, where he really cannot do justice to the professional component of what we call laboratory animal medicine. How can we, therefore, train him in two ways or for two areas within this four-year period?

It is a problem which bothers us to a considerable degree. I do not know that we have a full answer. All that I can suggest is that within many of the disciplines there are sub-disciplines. Within physiology one has environmental physiology, gastrointestinal physiology, respiration physiology, etc. Within

each department today we are finding area training, where the man who is going into respiration physiology is not required to take all of the courses which the man who is taking gastrointestinal physiology has to take. They try to synthesize the rudiments and then they let the man move into the special area.

As representatives of laboratory animal medicine, our objective should be to go back to our basic science departments and say, "Here we have a man who wants disciplinary training. Can we synthesize the essence of disciplinary training in pathology or physiology in such a way that the veterinarian, whose interest is laboratory animal medicine, can, at the end of his training in one of these departments, call himself a physiologist or a pathologist, but also have acquired that substantive professional training in laboratory animal medicine"? This is an unresolved problem, but this is the kind of approach I hope we will develop in our institution. I do not know how successful we will be, because this requires a selling job within the basic science departments, and I do not know that physiologists, pathologists, or microbiologists are willing to look at the problem from this kind of perspective. They could just say, "Well, we are getting something less than a physiologist. We cannot set the standards lower for these people than we do for the Bachelor of Science candidate who wants to come in and take a Ph.D."

Dr. Cornelius: Most of the Ph.D. programs in physiology are about three-year programs, and not four, at least in our institution. We had the same type of meeting some time ago for clinical pathology and faced the same problem we are talking about here today. I direct a program at our school which is one of clinical pathology sponsored by the pathology section, where they look at it as experimental pathology in the broadest sense. It is inter-departmental. We offer Ph.D.s in biochemistry, physiology, and in comparative pathology. These are all important disciplines to what we think of as clinical pathology,which is again a service area and looks like we are talking about laboratory animal medicine. I think the clinical pathologist has the same problem, as well as the pathologist who learned his diagnostic pathology or diagnostic biochemistry while he was getting his Ph.D. degree. Our boys come out in about three and a half years with the doctor's degree in physiology or biochemistry, and at that time they have also picked up lots of information from diagnoses which they are going to be using as their service responsibility.

The two clinical pathology programs at Yale and our school could be models for what we are going to be developing in laboratory animal medicine.

PANEL DISCUSSION

Dr. Clarkson: We hoped you would want to pose a number of questions to the people currently active in programs of postgraduate education in laboratory animal medicine.

We have received the following question: Suppose one of these 871 institutions wishes to employ a man in laboratory animal medicine now. How can it fill this position, and how can the man hired obtain the core of knowledge in time to qualify for the standards that have been proposed?

Dr. Cohen: This is a question without a very obvious answer. The essence of it is that there are more potential positions available today than there are people qualified to fill them according to the standards about which we are talking today. All I can say is that we want to do the very best job in our training programs so that we can provide the best possible training opportunity. We may have to push the "off campus" programs of continuing education, such as Dr. Brown at the CDC may be developing. We have to use every possible communication medium such as journals, scientific and professional meetings, etc. to get across the message of the field, so that people will recognize areas in which they need further development, further training. There is no question but that institutions are going to have to weigh the potential advantages of putting a man to work tomorrow against the disadvantages of not having that man as well trained as if they waited a year or two for someone to come out of a training program.

Dr. Tharp: Laboratory animal medicine is not peculiar in this respect. I have four positions open in the department of veterinary medicine right now, and I may have to hire boys straight out of school for some of those. Trained individuals are not available in any of these fields of veterinary medicine.

Colonel Hummer: We had a request several months ago for a man trained in laboratory animal medicine with a specialty in baboon medicine. There was no place where we could provide this training on an off-the-cuff basis. The best thing we could do was to send him to one of our primate colonies. He received about four weeks of concentrated, on-the-job training in "primatology," and this seemed to suffice. Following four weeks of training, he assumed a role in this baboon colony and has done a terrific job. If a vacancy in a specific area and a similar program can be found to which an individual can be directed for short-term intensive training we may have another approach to a basic orientation.

Dr. Serrano: There are an estimated two hundred and fifty veterinarians spending some time in laboratory animal medicine, of which not more than ten per cent have had formal training. Another estimate was that we need to train forty people per year, and the present formal programs are producing two or three people a year. There will undoubtedly be a lag phase of three to five years before there is any real increase in the training effort. This suggests that there will have to be other mechanisms, since formal training programs are going to play a minor role in meeting the manpower needs in the next five years. What are the mechanisms outside of the formal training programs?

Dr. Cohen: It seems obvious and evident that an institution that wants to fill a position will do so in the best way it can. In some cases the decision will be, "We will wait ;" in other cases, "We will try to get a consultant"; and in other cases, "Let us put this man in; he will learn on the job, and we will do everything we can to support him.." The mechanism Dr. Clarkson has mentioned is that of the preceptorship, the "approved residency," when an institution may want to expand its program in laboratory animal medicine by the Parkinson Law concept of bringing in two men to do one man's work, and so forth. The fact is they may bring a veterinarian into an institution to work under someone acknowledged as an expert in the field. This is one way of getting the clinical training and orientation that has been presented today.

Dr. Clarkson: I would like to ask Dr. Burns if he would comment on the question of how we can get manpower outside of the training programs.

Dr. Burns: We have had three different veterinarians come to us for a period of two weeks to three months for orientation in laboratory animal medicine and colony management. They spent their time very avidly with us, and felt they learned something. They returned to their institutions and incorporated in their programs some changes which they felt, in viewing our program, were worthwhile. This is just a straight preceptor-type of approach, and outside of this, I really do not know what you can do, other than the formal training program.

Dr. Serrano: Dr. Burns, you say that you have a formal program where veterinarians who are now engaged in laboratory animal medicine, but who have never had formal training, can have an opportunity to come to your facility and pick up this core of knowledge that veterinarians should have to be called specialists?

Dr. Burns: If I said that, I did not mean it. We do have trainees in laboratory animal medicine in a formal program; besides this we have had three other veterinarians come to our institution for the periods I indicated and on the basis of a personal arrangement. I repeat, this is just an informal, personal arrangement.

Dr. Robert Fuerst (Texas Women's University): Are other countries, for example, Canada or England, experiencing the same sort of manpower shortage as we are, and how are they approaching it?

Dr. Cohen: The organization of the veterinary profession itself in England is a little different than it is in this country. We are not comparing equivalent situations. In England within the past six months, we have seen the establishment of an organization known as the Laboratory Animal Science Association, which is essentially the veterinary group now beginning to organize itself. On the whole the British research institutions do not view the directorship of laboratory animal care in quite the way we do here. There are not very many veterinary directors of medical research institute animal programs. On the other hand, to qualify that, I should say there are some wonderful people working in medical institutions and veterinary science institutions who are tremendously well qualified in the field. I think of Dr. Patterson, at Porton Down, and Dr. Gledhill at the National Institute of Medical Research. There is a growing interest in England in the kind of approach we are taking here. There is as much interest in this direction as there was some years ago when we became interested in the British approach to the training of animal technicians.

Dr. Burns: I was told this morning that at the Ontario Veterinary College in Guelf they now are adding two or three courses in laboratory animal medicine.

Dr. Moreland: Is there not a great likelihood that a man trained in a basic science discipline will refuse to accept the clinical responsibilities of the laboratory animal unit, and instead choose to pursue his basic science discipline full time? If this should happen, it seems that his training in laboratory animal medicine would be completely lost.

Dr. Tharp: I look at it in the manner I think the question pointed, that very likely he would be so grounded in that discipline that he might never assume a service responsibility as described previously as one of those three objectives. He would do research in his basic area, and I believe that he and the other people who were doing this research would be trying to hire someone else to fulfill their service needs. In clinical veterinary medicine, as applied to the other animal species, most of our good clinicians who can be depended upon as directors of clinics, for service in the clinical areas, and for teaching clinical veterinary medicine have not gone on to the Ph.D. degree. This is not so in all colleges, since more members of clinical departments have been obtaining Ph.D. degrees in basic science areas.

Our program as we offer it at Ohio State University, where we are giving a Master's and allowing a man to pursue activities in these ancillary services, will be about as far as we want to go in the degree work. If he wants to go on for a Ph.D. degree, we will have him sign up in physiology, pathology, anatomy, or whatever he may choose, but we will have him leave the department of veterinary medicine.

Dr. Clarkson: I would like to move next to Dr. Cohen, as an individual trained in a basic science discipline. Have you been tempted to retreat to physiology?

Dr. Cohen: Yes, and I think the question is a good one. I would like to return to the concept of a program and an individual that I raised this morning. Those people trained to a Ph.D. level and with that kind of interest are likely to direct themselves to institutions where the concept of a program is more feasible. They will seek the larger biological science institutes and institutions, where there will be more than one veterinarian, and in this kind of situation, I see no conflict at all in so dividing the service load. One individual may take the service and his interest and accept this as his responsibility, or the clinical services may be divided in such a way that they are manageable and not an onerous burden on anyone. This is a reasonable approach. The advantage of having people in laboratory animal medicine trained to the equivalent of the research degree is that we will get people doing research from the perspective of laboratory animal medicine but trained in depth in all of the disciplines that we are going to need to bring to bear on the problems of the field.

Dr. Burns: I would like to think that program directors are educators. I would also like to believe that all those people we are training would stay within this particular specialty, but I am not naive enough to believe that this is going to happen. If we set up our programs around this basic core of knowledge, which makes a trainee a specialist, they have this information, and then they can also develop a categorical discipline. I do not think you will lose these people, because even if they do leave you from the standpoint of management of operations, they are still there to advance the amount of knowledge available by their contributions in a discipline. By advancing the knowledge of latent disease problems, they have contributed to the progress of education.

Colonel Hummer: I fear that if we do move to the Ph.D. route, we are going to lose a lot of men active in colony management in this one-man situation. On the other hand, we are bringing a wealth of talent into the laboratory animal medicine field, and I think we need all of this talent we can get. If we consider the dollar reward I wonder if we might be pricing ourselves out of the pure laboratory animal medicine field by going the Ph.D. route. I am afraid that the dollar sign will loom bigger than their loyalty to the active management of the colony, and they may move to other areas. But this is a gamble we must take, and the value of those who stay with us either actively or in a passive role will still do the program a terrific amount of good.

Dr. Clarkson: We must think in terms of creating a type of scientist who may not fit into our existing job descriptions, but when we get such people, opportunities will be available for them. Science seems to work that way. When you create a kind of scientist, then opportunities will appear into which he will fit.

Miss Rita Malek (University of Illinois): Do you feel there is a need for a medically oriented individual to aid and relieve the veterinarian in the animal facility, that is utilization of registered nurses, for example, who could perform certain procedures above the level of competence of animal technicians? Most of the veterinarians appear to be extremely busy, and many of the procedures that have to be done to animals are very time-consuming and could be done by persons with a medical orientation and further trained by the veterinarians.

Colonel Hummer: In our laboratory in Alaska we have a registered nurse who relieves our man of a lot of the routine medications, temperature taking, and records of all types. This is a program that is in its infancy. Employing nurses might prove very beneficial, and if there is a way that we can encourage them to join our ranks, I would be the first to support this effort.

Dr. Cohen: Other than to support what Colonel Hummer has said, I think you will find no disagreement, Miss Malek, among anyone in this group about the importance and desirability of adding to the capacity of animal units to do a better job.

Dr. Peter J. Matthews (National Animal Disease Laboratory - Iowa): Would it be feasible to have a central college of laboratory animal medicine where veterinary graduates could take courses and obtain certification?

Dr. Clarkson: I believe the question concerns the effectiveness of smaller programs over the country versus a central college of laboratory animal medicine. Advanced training varies a great deal with the "personality" of the individual educational institution. This means that people with different viewpoints would be produced, and I think we need a heterogeneous mass of viewpoints to advance our field. I would be very disturbed by seeing one place that gave one viewpoint and one stereotyped kind of person. I would rather continue to see the heterogeneity which comes from academic institutions each with a distinct personality.

Dr. H. C. Morgan (School of Veterinary Medicine - Athens, Georgia): With due consideration to a crowded curriculum in the veterinary school, how much laboratory animal medicine should be taught to undergraduate veterinary students? Should we aim toward a separate course or place more emphasis within existing courses, keeping in mind the lack of coordination that would occur in existing

courses?

Dr. Tharp: We are in the process of reviewing our curriculum right now, and we need more hours. I do not know whether we need another year or if we need to revamp some of our course work. I suspect that we can put some laboratory animal medicine into each of our courses to get the students acquainted with it. But I am not sure in how many courses we could find room in our undergraduate curriculum right now. In fact, we know there are many areas like this with which we cannot possibly cope and maintain the training in four professional years. So we must either readjust our thinking by going back to specialty training earlier in our curriculum, (and some of us question whether we can always afford the luxury of giving every candidate for the DVM degree the overall training across the field), or go back to about the third year and let a man select a specialty. Thus, we are all in the position of restudying the curriculum. The heartening thing is that we have been able to listen to these demands and have this in our minds when people with possibly a limited knowledge in laboratory animal medicine are discussing these curricula changes. It is really good from our standpoint that we were invited here today to listen to this discussion.

LABORATORY ANIMALS

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