SCHOOL OF MEDICINE
DEPARTMENT OF COMPARATIVE MEDICINE
SELF-STUDY

DEPARTMENT OF COMPARATIVE MEDICINE
SELF-STUDY, 1998

REVIEW OF MASTER=S PROGRAM IN COMPARATIVE MEDICINE

November 15, 1998

I. CONTEXT

A. Name of Unit: Department of Comparative Medicine
B. School: School of Medicine
C. Title of Degree: MASTER OF SCIENCE IN COMPARATIVE MEDICINE

D. History and Description:

In 1945, when the University of Washington School of Medicine was planned, the founders recognized that medical progress depends on research and that much of the research depends on the use of experimental animals. Accordingly, space was provided for animal housing and experimental surgery in Unit 1 of the new medical school=s facilities. A veterinarian was initially employed in 1949. The evolution of animal medicine at the UW closely parallels the development of the specialty of Laboratory Animal Medicine in the U.S. There was no specialty training available for veterinarians committed to the care and use of laboratory animals in the 1940s, and the emphasis of this laboratory animal science era was on laboratory animal care. During the 1950s, laboratory animal science slowly matured as a specialty. The American College of Laboratory Animal Medicine (ACLAM) was founded in 1957, and the first specialty training program was established in 1960 at the Bowman-Gray Medical School. The emphasis of the emerging specialty shifted in the 1960s to research in laboratory animal diseases or intercurrent infections that were complicating the use of animals in research.

In 1967, John Hogness, Dean of the UW Medical School, chose to establish a balanced program of service, research, and teaching. To expand the academic base of the animal medicine program, the Department of Experimental Animal Medicine was established. By 1975, the national emphasis of the specialty had again shifted. The importance of Laboratory Animal Medicine was increasing. Research into natural and induced diseases remained a high priority. In addition, a primary area of need was for education and training. Experimental Animal Medicine was replaced by the Division of Animal Medicine from 1975 to 1989, when the unit was given departmental standing and became the Department of Comparative of Medicine.

The Division obtained a diagnostic laboratory grant from NIH for research into the area of diseases of laboratory animals. It also began offering postdoctoral training for veterinarians. Since its inception, the program has combined formal course work and research with clinical and anatomic pathology training. Since 1982, the program has been supported by a training grant from the National Center for Research Resources of the National Institutes of Health (NIH). Initially designed as a two-year program, it evolved into a three-year program, and is currently a four-year program. The first of the four years is an internship supported by departmental funds, with the subsequent three years supported by the NIH grant. In 1993, the Department was authorized to award the M.S. degree in comparative medicine. Although pursuing an advanced degree is not a requirement of the program, most trainees choose either the M.S. or Ph.D. options. We have trained 26 postdoctoral fellows who have gone primarily into academic institutions and biotechnology companies. There are currently eight fellows in the program.

In 1995, Melvin B. Dennis, Jr., D.V.M., Professor of Comparative Medicine and Adjunct Professor of Medicine, succeeded Dr. Van Hoosier, who had been chairman since 1975. The eleven regular faculty members in Comparative Medicine have joint appointments in three departments in the Schools of Medicine and Public Health. In addition to the regular faculty, there are three adjunct faculty and several clinical or affiliate faculty with primary responsibilities in other units, e.g., the Primate Center, Veterans Administration, and other departments in the Health Sciences Center, who have significant involvement in the training program.

The definitions of laboratory animal science, laboratory animal medicine, and comparative medicine in Appendix E help to describe the field.

II. UNIT ROLES AND RESPONSIBILITIES

A. Roles and Responsibilities

The mission of the Department is to improve the health and medicine of both humans and animals through excellence in the humane and ethical use of animals in biomedical research. The roles of the Department include service, teaching and research.

1. Service: The chairman of the Department serves as the Attending Veterinarian for the University and has the responsibility and authority to ensure the provision of adequate veterinary care and to oversee the adequacy of other aspects of animal care and use as required by the Animal Welfare Act, which is enforced by the USDA. The chairman is also responsible for compliance with the policies of the U.S. Public Health Service and State laws regarding the use of animals in research, and serves as a member of the Institutional Animal Care and Use Committee.

The facilities, which house approximately 68,900 animals daily on over 700 externally funded projects, are accredited by the Association for Assessment and Accreditation of Laboratory Animal Care, International (AAALAC). The Department acts as an extension of Purchasing to acquire all animals used in teaching and research at the university. Comprehensive animal care, resources, and a full range of services, including veterinary care, laboratory and pathology support, surgery, special procedures facilities, consultation, hybridoma and genetic engineering are provided to faculty. Most of these activities are provided on a self-sustaining basis.

2. Teaching:

a. ***Predoctoral training.*** Most academically oriented laboratory animal medicine programs are located in medical schools, rather than veterinary schools. As a consequence, veterinary students have limited opportunities to investigate careers in comparative medicine during the years when they are deciding on the veterinary specialty they will pursue following graduation. To provide students with exposure to experimentation with animals, the Department sponsors a clerkship program designed for the elective block component of the 4th year curriculum used by many veterinary schools. The length of the clerkship can be adjusted from four to eight weeks to comply with different requirements of block scheduling in the various veterinary schools and student interests. This program was initiated with Washington State University in the late 1970s, and with funding from the American Association of Laboratory Animal Science (AALAS) Foundation, the program was extended to students in other veterinary schools in the U.S. Through direct interaction with faculty and staff, students are encouraged to explore career options in laboratory animal science and to understand that the humane treatment of animals is basic to good science. Since 1990, 55 students have participated in the program. Several of our outstanding clerks were recruited to our postdoctoral program due to this participation in our predoctoral (clerkship) program, e.g., Dr. Sally Thompson, who concurrently completed our laboratory animal program and a Ph.D. in Environmental Health and Toxicology. The goals and objectives for the clerkship are listed in Appendix F.

b. ***Postdoctoral training.*** One of the Department=s aims is to promote an environment that will encourage collaboration with other University units and provide the intellectual and technological setting appropriate for state-of-the-art training for the next generation of graduate veterinarians. In the pursuit of this aim, the Department recruits trainees with a degree in veterinary medicine with national representation that includes participation from underrepresented minorities; there is an emphasis in the selection process on factors which indicate an interest in and an aptitude for research. The objective of the postdoctoral training program is to train a new generation of independent, original, comparative medical scientists. The essence of the rationale for the program is as follows: (1) Veterinarians, as a result of their education and experience, have an intrinsic interest and, as a result of their clinical experience, a unique perspective on processes involving animals. (2) There is a continuing need for a rigorous program that provides protected research time for veterinarians to acquire the intellectual and technical skills necessary for contemporary, competitive biomedical

research. (3) Recent advances in molecular biology and genetics provide the tools whereby comparative medical scientists can contribute to the development of animal models and fundamental discoveries relevant to comparative medicine. (4) Laboratory animal veterinarians function most efficiently if they are themselves engaged in research activities and can understand the perspective of investigators.

We feel that it is advantageous to offer the M.S. degree for several reasons. The M.S. in Comparative Medicine represents a distinct accomplishment within a field that does not currently have a Ph.D. program and provides evidence of a successful experience in conducting research and writing a thesis. In addition, it represents advanced expertise within a discipline for all trainees, including individuals who obtain a Ph.D. in one of the basic science departments.

c. ***Continuing education.*** The initial and continuing education of University investigators and technicians on the use of animals is a primary responsibility of the University, as stated in the federal Animal Welfare Act and PHS Policy. This requirement is fulfilled by the Department. Federal regulations and University policy governing the use of animals in research, testing, and teaching require personnel at all levels to document their training and qualifications to perform animal use procedures. To comply with these regulations and to meet the diverse scheduling needs of research personnel, the Department offers Animal Use Training Sessions (AUTS) on a year-round basis. These species-specific hands-on laboratories for the mouse, rat, and rabbit are offered every six weeks. Sessions covering surgical techniques and other species are offered on an as-needed basis throughout the year. These sessions are provided at no charge to University personnel. The Department is viewed as a training resource in animal use by the V.A., and by non-affiliated groups (biotechnical and pharmaceutical companies) who send staff to our AUTS. Postdoctoral fellows are encouraged to gain teaching skills by assisting in the instruction of the AUTS. Department faculty are active on a national level in creating and revising resources for animal use training, including texts, slide programs, videos, and computer programs. Over 1,000 individuals are trained annually.

3. **Research:** One of the Department=s objectives is to conduct research in comparative medicine, which includes the development of animal models of human diseases, investigations of experimentally induced or spontaneously occurring diseases, study of diseases transmissible to humans, and methods of research which refine, reduce, or replace the use of live animals. Due to the heavy service load, many faculty are unable to conduct independent research. Therefore, several faculty perform research in collaboration with faculty in other departments.

An emerging area of research involves phentotyping and studies of pathogenesis of genetically altered animals. Department faculty are currently meeting with interested investigators from other departments in an effort to determine the feasibility of establishing a Center to seek funding in this area.

B. Unit=s Opportunities

The roles described above provided an opportunity to participate in two successful grants involving transgenic technology, the Nathan Shock Center for Excellence in the Biology of Aging and Ecogenetics and Environmental Health. One M.S. degree trainee received her research training as a result of the above programs.

The development of a more focused research program for the Department and the development of more collaborative research with the Primate Center are objectives that are being continuously explored.

Plans for exploring future opportunities include the following :

1. The submission of grant applications involving interdisciplinary research programs, i.e., Mouse Models of Human Cancers Consortium, Aging and Tolerance in TCR Transgenic Mice, and Transgenic Animal Model Development: PKR Protein Kinase.

2. The preparation of a University Initiative Program application involving zebrafish.

3. Applications by junior faculty for mid-career NIH awards (Physician Scientist/K-24).

4. A supplemental request for our training grant to fund the clerkship program after July 1, 1999; with the approval of the request, more proactive advertising is planned.

5. Award of the M.S. degree in Comparative Medicine to trainees pursuing the Ph.D. in other departments at the U.W.

6. Consideration to offering the M.S. in Comparative Medicine to individuals having a background in biology and working in research with laboratory animals.

C. Internal and External Views of Departmental Roles

In the first two decades of the history of the School of Medicine, the unit=s activities were exclusively service, i.e., Alaboratory animal care@ and the unit was viewed as a service organization; this perception may persist with occasional faculty or administrators at the college/university. In association with requirements for compliance with federal laws and policies that have evolved during the past two decades, another possible view of the Department is as the enforcer of regulations (noteworthy is our perception that there is an increasing awareness among investigators that the validity of science is frequently enhanced as a result of compliance issues). While in 1998 there may still be those who question the need for academic roles for the unit, it is our perception that the faculty concur with the Department=s position that the University=s biomedical research programs benefit immensely from academically oriented veterinarians who expand service from Alaboratory animal care@ to analyze complex disease and iatrogenic problems in animals complicating the achievement of their research goals involving animals, and develop more complex resources such as monoclonal antibody production, transgenic and knockout mouse production, and cross fostering to clear lines of intercurrent disease problems. A technical service under consideration for the future is the cryopreservation of valuable genetic strains of mice. In addition, Departmental faculty become collaborators in research activities, grant applications and co-authors in scientific publications. Dr. Ladiges= role as a project Director for the Nathan Shock Center for Excellence in the Biology of Aging (Department of Pathology, School of Medicine) and participation in the Ecogenetics and Environmental Health program (Department of Environmental Health, School of Public Health) illustrates the institutional benefits of an academic comparative medicine program. It is also the Department=s perception that laboratory animal specialists participating in research and teaching can provide high quality clinical care and service, analogous to faculty in the Department of Medicine, and better understand the multiple needs of investigators as a result of their involvement in research. There is no doubt in our mind that the recruitment of talented junior faculty members would be severely handicapped without the opportunity to do research and train fellows in a graduate degree program.

D. Changes in the Field - Past and Present

1. Regulations pertaining to experimental animals have expanded exponentially during the last 10-15 years.

2. Historically, NIH sponsored Diagnostic and Animal Disease Investigative Laboratories (DADIL). The grant to our Department from 1979-1994 provided core support to the Department for faculty and postdoctoral research, especially pilot projects leading to individual grant requests. An example of this sequence of events is illustrated by Dr. DiGiacomo=s R-01 NIH grant entitled APrevention of Pasteurellosis by Vaccination,@ which began as a pilot project on the DADIL. Support for these types of programs was discontinued by NIH in 1994, which resulted in the loss of 1.5 FTE of faculty research effort and 3.0 FTE of technical support within the Department. The types of training for veterinarians that NIH is willing to support has also changed radically since training programs were first established, with an increasing emphasis on research and a decreasing emphasis on clinical training and anatomic pathology.

3. Animal based research has changed considerably over the years, and veterinarians dealing with research issues must be prepared to cope with programs that are strongly rodent based. The emphasis in infectious disease of rodent colonies is also changing, since the use of pathogen-free animals and facilities are more common. However, there is an increasing attention to new emerging diseases, e.g., *Helicobacter sp.* and opportunistic infections, e.g., *Pneumocystis carinii*, since many strains of genetically engineered mice are immunologically compromised.

4. The age of genetic modification and the phenotypic effects of such modification has arrived, and current interest by NIH in the funding of associated projects provides an example of future changes associated with this age. They are currently preparing announcements of programs to support phenotyping efforts by histopathology, clinical pathology, behavior, and a host of other methods for the identification of effects created by genetic modifications. The scope of training must include the rapid advances in molecular biology and other basic sciences which underpin these research efforts.

5. The field of comparative medicine is increasing in complexity. Professionals in the field must be well informed in the appropriate use of many more species, including lower forms, e.g., zebrafish.

6. Comparative Medicine scientists will be faced with the need to subspecialize within the specialty, e.g., the pathology of mice. In addition, it may be necessary to focus on one or two activities (teaching, research, or service).

E. Criteria for Measures of Success

1. Service

Compliance with federal laws and policies, accreditation by AAALAC, and stakeholder interviews reflect a degree of success. In addition, in the genetically engineered animal resources section, success is measured by the generation of transgenic mouse models which express a gene of interest, or which have an exclusive deletion of a gene of interest, with repetitive physiological and/or biochemical characteristics. As a continuing assessment of the quality of the services provided, a formal survey of individual investigator=s needs every two years is under consideration, in addition to the appointment of a ranking faculty rank person to interface with investigators= needs and complaints.

2. Teaching

Support by NIH, classroom evaluations, the number and qualifications of applicants, the drop out rate, and placement after training are criteria that can be used for evaluating the postdoctoral training program.

3. Research

Proficiency in the advancement of knowledge is assessed by publications, high priority scores and funding of grant applications, and invitations received and presentations made at other institutions and scientific meetings. Other measures of success include editorial roles on scientific journals, reviews of manuscripts, appointments to study sections and serving as a reviewer on grant applications.

F. Comparative Medicine as a Leader in the Field

The fundable priority scores for the initial and periodic competitive renewals of the NIH Training Grant reflect the Department=s leadership in training and education. This assessment is evident from the following excerpts from the summary and critique sections of the Apink sheets@ of the most recent competitive renewal:

AThe application has numerous strengths, and only minor weaknesses. The program has an outstanding environment in terms of research depth and breadth, with many well-qualified mentors who have substantial external funding. The institutional commitment to the program, and the additional resources at the UW such as the Regional Primate Research Center are major strengths. The past performance of the program has been outstanding, with an impressive history of most graduates continuing with research efforts.@

AThere is an impressive list of publications by both past and current trainees.@

AThe breadth, depth, and scope of the training available are outstanding.@

Plans for the next 10 years to continue our current leadership in the field and to develop further areas of national and international prominence are listed below.

$ In response to funding opportunities at NIH and the increasing importance of these special research models to faculty at the university, the recruitment of scientists with interest and expertise in the pathobiology of genetically engineered mice will have a high priority. Alternatively, individuals who could bring their own extramural grant to our department will be considered as their grant funding reflects their strong interests and potential in research.

$ One of our long-term goals is the development of a Ph.D. program, either in the Department of Comparative Medicine or jointly with another department, e.g., Pathology. We will also examine the possibility of expanding our training to individuals with a background in biology other than veterinarians.

$ We intend to consider mutually beneficial relationships with biotechnology companies and small businesses for the promotion of research and training support; SBIR grants from NIH may provide one mechanism for the development of common interests with small businesses.

G. Collaboration with other Units at the University and Other Institutions

1. The Washington Regional Primate Research Center (WRPRC)

Since the Department of Comparative Medicine (DCM) collaborates extensively with the Washington Regional Primate Research Center (WRPRC) and a significant number of the Department=s training, service and research activities are conjoint with the Center, background information about the Center, its staff, and its facilities is apropos.

The mission of the WRPRC, one of seven NIH-supported Primate Centers, is to pursue and support basic and clinical biomedical research utilizing nonhuman primates with emphasis within the areas of AIDS-related research, developmental biology, neurobiological and behavioral sciences, cardiovascular physiology, molecular and cell biology, immunology, virology and primate disease models. The overall objective of the WRPRC, is to provide specialized resources for nonhuman primate (NHP) research studies applicable to the solution of human health problems. A summary of the WRPRC core scientist program and accomplishments is appended (Appendix G).

Five floors of the Health Sciences I Wing and I-Court space are dedicated to administration, research laboratories and animal housing space in the Main Facility. Recently, the WRPRC has leased facilities in downtown Seattle totaling nearly 40,000 square feet of laboratory and administrative space to house AIDS-related vaccine development programs, a SPF *Macaca nemestrina* breeding colony, and anticipated programs in virology/immunology. Additional facilities include the Infant Primate Research Laboratory located in RR wing of the Health Sciences Building. International affiliations include the Indonesian Natural Habitat Breeding Facility and the Institute of Medical Primatology in Sochi-Adler, Russia. The Center maintains three national information systems: the Primate Information Center, which provides bibliographic

data and references for primate researchers; the Primate Supply Information Clearinghouse, which maintains records of available or needed primates; and a Tissue Distribution Program. The WRPRC continues to expand access to the resources of the Center on a local, regional and national level and to disseminate research findings and information on primate use to scientists throughout the world.

Six WRPRC veterinarians are currently regular or clinical faculty with the Department and contribute to the accomplishment of the programs goals and objectives. Center veterinarians give both the postdoctoral training and the university animal care and use nonhuman primate lectures. Center staff with appointments in the Department faculty participate in clinical conferences and seminars, and provide hands-on training of postdoctoral fellows in the WRPRC clinical rotation. Additionally, joint Center staff-Department faculty provided training for a clerk (veterinary student) in the Department in the summer of 1998. Besides offering potential laboratory research opportunities in the WRPRC Core Scientist laboratories, basic and clinical research opportunities are encouraged by collaboration with the Center veterinary staff. For example, an ongoing postdoctoral project investigating production of baboon embryonic stem cells has been supported by both the Department and the Center since 1997. A similar cooperative postdoctoral project was developed to enhance laparoscopic resources in 1997.

WRPRC veterinary faculty provide expertise in a variety of areas, strengthening both units resources in general, and the training program in particular. Bill Morton offers extensive experience in the areas of infectious disease, especially AIDS research and management of NHP colonies. Ben Weigler is a veterinary epidemiologist, with experience in research colony management and a strong interest in zoonotic disease. Two experienced comparative medical pathologists, Ted Birkebak and Dave Anderson, specialize in NHP pathology. Cathy Johnson-Delaney has over ten years of experience working with NHP, and has published extensively in the field of exotic animal medicine. Anne Lichtenwalner is a veterinarian and physiologist with 3 years of experience in reproductive management of NHP, and is active in research on sexually transmitted diseases and reproduction biology. JoEllen Grabber has 7 years of experience in clinical support of several NHP colonies, including great apes. (See Appendix G Figure: Organization of the Animal Resource).

The DCM/WRPRC pathology program provides shared space and personnel for tissue preparation/histology, and shared salary support of a veterinary pathologist. This collaboration offers excellent training opportunities to postdoctoral fellows, and enhances the NHP component of the DCM pathology Conferences. WRPRC/DCM pathologists have collaborated with clinical veterinary staff in producing clinical case reports, and in providing research support for collaborative projects. For instance, collaborative efforts led to five presentations at the 1998 AALAS meeting.

In summary, collaboration of the Department of Comparative Medicine with the WRPRC offers enhanced opportunities for service to investigators; for teaching of postdoctoral fellows, general university NHP users, and veterinary student clerks; and for research in model development and in experimental, spontaneous or zoonotic disease investigations.

2. The International Council for Laboratory Animal Science (ICLAS)

In association with Dr. Van Hoosier=s tenure with the Governing Board of the International Council for Laboratory Animal Science (ICLAS), DCM faculty have participated in training activities sponsored by ICLAS at biomedical institutions in Mexico, Central America and South America, and have been invited to participate in a forthcoming Congress in Europe.

3. Other Units and Institutions

Collaborations with other units at the University and other institutions are listed in Appendix H.

4. Improving Ties and Enhancing Collaboration

We propose to strengthen ties with other institutions by sponsoring a Visiting Professor annually from another institution with relevant research interests as a strategy for responding to new developments in the field. The participation by faculty in the Department in collaborative research programs will be a primary and continuing method for improving collaboration with other units at the University.

III. DEGREE PROGRAM (MASTER=S)

A. Relationship to Other Instructional Program

The predoctoral or clerkship program for students in the 4th year of veterinary school assists the faculty of Comparative Medicine in identifying candidates for the postdoctoral training program.

B. Curriculum Description

See Appendix I.

C. Goals and Objectives

As described in Appendix I, the training program is divided into two phases, with an emphasis on clinical training in Phase I and research training in Phase II. The overall goal of Phase II of the training program is to provide instruction in the content knowledge, methodological skills, and scholarly work habits which will enable trainees to conduct research to advance knowledge in the field of comparative medicine. This is accomplished through the mentor relationship with an established scientist and full participation in a research project. Such individuals are envisioned as becoming intellectual leaders in the specialty while engaged in active research, service, and teaching. Specific objectives include the instruction of trainees in the principles of experimental design, statistics, data collection, grant writing, the preparation of manuscripts, and the ethical principles of research, including animal experimentation and the humane care and use of laboratory animals.

D. Comparisons with Other Programs

Most training programs are flexible and evolving in association with the pressures of NIH and other funding sources. At some postdoctoral training programs for veterinarians, the Master=s or Ph.D. degree in an affiliated department is an integral part of the program. At other programs, trainees do not pursue a graduate degree although, if supported by NIH, fellows are actively involved in research; at other institutions, the training is a residency program without a major research project. A synopsis of the program at universities identified for comparative purposes previously is presented below.

$ **Johns Hopkins University.** The first year of a four-year program, supported by institutional funds, is essentially a residency with service responsibilities. During the subsequent three years, supported by NIH, some trainees pursue non-degree research while others enroll in M.P.H. or Ph.D. programs. Comparative Medicine or Pathology cannot offer these degrees, so admission to a graduate school (there are 3) must be sought.

$ **University of Alabama**. The first year of a five-year program is an intense laboratory Animal Medicine training and the trainees pursue a Ph.D. in Cellular and Molecular Biology which is a program jointly sponsored by the Department of Comparative Medicine and the Department of Pathology.

$ **University of California**. Since the U.C. at San Francisco does not have a training program, the two programs at the U. C. at Davis are briefly described for comparative purposes. A twoBthree year clinically oriented, non-degree, residency program is offered. Residents participate in the instruction of veterinary students, and are encouraged to publish a paper based on clinical research. The other program is funded by NIH and is strictly research for three years. Participants in the latter program are individuals who have received prior clinical experience or training in the U.C. at Davis program or elsewhere.

$ **University of Michigan**. The program consists of one year of Laboratory Animal Medicine residency supported by local funds and three years of research training supported by NIH. Trainees are not required to obtain a degree. They are encouraged to obtain a Master=s or Ph.D. in an affiliated basic

science department in conjunction with their research training in the laboratory of the affiliated department. Requiring a Master=s is currently under consideration.

$ **University of Minnesota**. Trainees complete a residency program and a Master=s degree in the Clinical Laboratory Science program in the Department of Laboratory Medicine and Pathology.

E. Measures of Success

Publications in refereed journals by fellows in the training program are one generally accepted measure of success. A list of publications is presented in Appendix J with the name of the trainee double underlined.

Other notable accomplishments include the following:

1. Two former trainees have been successful in getting SERCA awards from the NCRR, and 11 have completed specialty certification in either the American College of Laboratory Animal Medicine or the American College of Veterinary Pathology.

2. Of the 26 trainees to finish the program, 13 are employed in academic institutions, three in research institutes, five in biotechnology or pharmaceutical companies, and three are employed in Aother@ position categories (e.g., U.S. military). Eleven trainees obtained an advanced degree (M.S. or Ph.D.), and two are currently enrolled in Ph.D. programs.

3. Dr. Guy Mulder received the Young Investigator Travel Award for his poster presentation at the Annual Teratology meeting in Keystone, CO, June 22-27, 1996.

F. Impediments, Improvements

Historically, a principal impediment for meeting the objectives of the program has been the quantity and quality of laboratory and office space for trainees. A recently completed renovation program has corrected this programmatic deficiency. The program can be further improved by encouraging joint appointments of new faculty with other departments and increasing research funds for Comparative Medicine faculty, which would facilitate opportunities for fellows to do their research within the Department and strengthen relationships with other departments in the Health Sciences Center.

IV. RESPONSES TO CHANGE

A. Past and Anticipated Changes in Training

In the recent past, the program underwent a major restructuring with the following two major changes: (1) removal of clinical training in laboratory animal medicine or anatomic pathology from the three-year NIH-supported program in order to place increased emphasis on research, and (2) expansion of the program to include established investigators from other departments as research mentors for the trainees.

Problem-based learning, a teaching strategy that places emphasis on the development of the ability to recognize and define problems, analyze data, and evaluate solutions rather than the simple transfer of knowledge, has been used, and is in the process of continuing development for several of the core courses.

B. Influence of New Developments

Over the past ten years, there has been a dramatic change in the character and direction of academic comparative medicine. This is manifested in the exponential growth of transgenic, Aknock-out,@ and somatic-cell gene therapy animal model systems accompanied by generation of the knowledge and skills necessary to develop, maintain, and characterize these systems. Much of this change has been driven by an explosion of interest and understanding in biotechnology, genetics, and integrative biology. If veterinarians are to be full members of the modern, multidisciplinary research team, they must be educated, not only in the clinical care of research animals and the regulations regarding humane use of animals in research, but also in the methodology of research. They must also learn the values and work habits of successful researchers. Substantive training in cutting-edge biotechnology, transgenic sciences and gene therapy, as well as several other basic, human health-oriented disciplines, are available at a limited number of medical schools. In contrast, training of this breadth, depth, and intensity is not available within a veterinary school environment where focus and financial constraints direct attention toward the clinical care of food and companion animals. Consequently, we find that our new postdoctoral students fresh out of veterinary school, while having very good applied clinical skills, typically lack exposure to these more basic topics. To keep pace with these and other rapidly evolving changes, we must train comparative medical scientists not just in how to deal with the end result (i.e., the individual animal) but in the basic science leading to the development and characterization of these models as useful research tools. As molecular biology has developed, there are a cadre of scientists studying the genome in increasingly minute detail. Many of these molecular biologists lack training in whole systems biology, which is a strength in the training and background of veterinarians. The postdoctoral students bring a substantial understanding of whole-animal systems to the program. This enables them to develop a unique perspective on the critical importance of animal health and well-being to the validity of animal-based research. We consider this perspective an important research resource, and its enhancement an additional goal of our training program. This broad-based approach is accomplished by partnering the historically strong basic research enterprise at the University of Washington with our well-established and respected laboratory animal training program.

C. Changes Associated with the Need to Provide Service

The University of Washington is a licensed research institution with the USDA in accordance with the Animal Welfare Act and keeps an acceptable Assurance Statement on file with the National Institutes of Health in order to receive grant funds for research involving experimental animals. In addition, the University is accredited by the Association for Assessment and Accreditation of Laboratory Animal Care, International (AAALAC). During the past five years, the faculty and staff effort required to comply with the federal and state laws, guidelines and policies associated with the use of laboratory animals has significantly increased and a continuing increase in the time required can be anticipated.

One measure employed to assess the Department=s success in the services provided was interviews with stakeholders. Approximately 47 faculty, staff and administrators were interviewed during the

Summer Quarter, 1998 as a part of the unit=s strategic planning process. The questionnaire used in conjunction with the interviews is in Appendix K. Although there is always room for improvement, and communications is a continuing challenge in large institutions, the results indicated that the Department is performing commendably in providing service to the university community.

D. Strategies to Address the Following Anticipated Changes

1. **Faculty retirements:** Since several faculty members joined the Department during an interval of only a few years, their retirement will occur within a relatively short period of time. Although the Department does not ask faculty who can contribute fully to the program of service, teaching, and research to consider retirement at any specific age, several faculty will reach the customary retirement age between 1999 and 2008. Faculty replacements will probably be recruited at the level of Assistant Professor. The Department is currently recruiting for an Associate Attending Veterinarian and a comparative medical pathologist. In accordance with departmental and University policies, recruitment for all positions involves a national search that includes advertisements in suitable journals. Since past and potential productivity in appropriate research areas is an important factor in the identification of qualified candidates, start-up funds are essential!

2. **Emerging technologies for research and teaching:** Familiarity with modern technologies is essential for successful research and interaction with investigators involved in biomedical research involving animals that depends on such methods. One example of curriculum changes relevant to new technology is the rotation of trainees during their first year to the K-wing facility and genetically engineered mouse resource. In association with this three month rotation under the supervision of Drs. Ladiges and Ware, fellows observe and participate in the injection of nucleic acid constructs into embryonated eggs, the propagation of stem cells and knock-out procedures and the transfer of eggs and blastocysts to surrogate dams. The postdoctoral fellows are also encouraged to attend the regularly scheduled gene therapy seminars, since most of this rapidly evolving technology is initially investigated in animals. It is anticipated that similar strategies will be used as new technology develops. In addition, the need for continuing education is emphasized for an understanding of new technological advances and their application.

3. **Pressures on space**: Additional laboratory and office space will be required for the Department as new programs are funded, e.g., the program project on the pathobiology of genetically engineered mice. Additional laboratory and office space contiguous with current facilities is highly desirable. Accordingly, a request to the Health Sciences Administration for the assignment of additional laboratories and offices will be made when the grant application is submitted.

Innovative ideas are being developed for the housing of experimental animals to maximize current space restrictions in a continuing effort to meet the immediate needs of the University. For example, individually ventilated cage racks are being purchased for the housing of laboratory mice. The new racks permit the number of mouse cages in a typical room (280) to be doubled and provides protection from the transmission of infectious diseases. To meet the future needs for housing the experimental animals of several departments on campus, departmental personnel are participating in the predesign stages of three new buildings, Life Sciences I, II, and III; additional animal housing and procedure space is anticipated.

4. **Pressures on budget:** A prerequisite for budgetary stability is the recovery of all costs associated with animal resources and institutional support for all activities related to compliance with federal, state and local laws and guidelines on the use of experimental animals. The increasing cost of the regulatory burden by the Animal Care Committee has been, and continues to be, a specific problem. Continual review of departmental staffing requirements and proper utilization of personnel have proven effective in reducing some pressure on budgetary items. All departmental personnel are challenged to be cognizant of ways to reduce cost without sacrificing service. Applications for external funding by NIH are essential for special facilities requirements and the continuing development of the research program. In addition, funding for projects of mutual interest by biotechnology companies is another strategy to be continuously explored.

5. **Ways the college, HSC, and university can facilitate progress:** The permanent assignment of Dr. Van Hoosier=s loaned position to the Department, with permission to fill it when he retires, and the permanent assignment of additional space are essential to accomplish the Department=s goals. In addition, increases in staff for the support of service, compliance and administrative activities are important for the faculty to maintain a balance between service and academic activities.

E. Demographic Changes

The impact of I-200 is currently under review, but since the funding is national, federal requirements must be met. The Department=s strategy to recruit individuals to the training program from minority groups currently underrepresented in comparative medicine, prior to I-200, is outlined below.

1. Program Announcements

a. Formal educational opportunities advertisements are placed in the *Journal of the American Veterinary Medical Association* (JAVMA); notices indicate that the postdoctoral training program is actively recruiting minority applicants.

b. Training opportunities announcements are placed in Intervet (Journal of the Student AVMA); notices indicate that the clerkship and postdoctoral training programs are actively recruiting minority applicants.

c. Announcements, flyers, and informational brochures describing the clerkship and postdoctoral training opportunities and encouraging minority applicants are sent to the Dean, laboratory animal medicine specialist, President of the Student Chapter of the AVMA, and minority recruitment officer of each U.S. veterinary school.

2. Identification of Potential Candidates

a. One of the difficulties encountered in efforts to recruit minority students to the training program is the small pool size of minority applicants. An effort will be made to increase the number of minority applicants by sending information to all veterinarians from underrepresented minorities, not just those who have expressed an interest in laboratory animal medicine. Few veterinary schools have strong programs in laboratory animal medicine, and it is feared that many of the students may not realize that laboratory animal medicine is a career option. Therefore, to increase the number of minority applicants, a letter will be sent to the minority recruitment officer of each U.S. veterinary school asking for the names and addresses of students from underrepresented minorities. We will send information and application material to each of the students identified. We hope to identify students who may have an interest in research (i.e., in basic sciences) but have not considered comparative medicine as a training option.

b. The Department participates in the UW Health Sciences Minority Students Program, (e.g., summer research programs such as the NIH-funded Minority High School Student Research Apprentice Program).

c. Faculty and instructional staff traveling in the vicinity of veterinary medical schools are encouraged to visit with students, administrators, and minority recruitment officers to discuss training opportunities and encourage applications from minority students.

3. Interaction with Applicants

a. Potential applicants are sent brochures describing each of the predoctoral and postdoctoral training programs and encouraging application.

b. Prospective applicants are encouraged to visit the campus and meet with faculty, staff, and students.

c. During the recruitment process for postdoctoral candidates, it is our policy to pay airfare for up to three candidates, who have not previously been to the Department and met with faculty members, to visit the campus for a personal interview, tour of facilities, and preview of our training program. If the three highest candidates by pre-interview evaluation do not already include a minority candidate, then a competitive minority applicant with the highest pre-interview score is offered airfare for a campus visit and interview.

F. Personal Productivity

1. Faculty

a. The allocation of faculty time in service, teaching and research is tailored to the individuals faculty member=s talents with maximum flexibility, given the Universities guidelines for advancement. Service and teaching are credited equally with research as measures of productivity. Satisfactory performance in assigned service responsibilities is a prerequisite for the continuing appointment of core faculty in the Department, because of the *raison d'être* of the unit.

b. In association with annual reports and reviews, junior faculty meet with the chairperson to discuss progress, assignments and future plans. Measures of academic productivity include publications, project funding, presentations, with added weight to invited presentations, classroom evaluations and mentoring of trainees, Department and university committees, and professional activities, e.g., study sections, scientific journal appointments and activities and participation in scientific associations.

c. Consideration to the timing and amount of service is one method employed to encourage and preserve research productivity. Although it will be a challenge given the small number of faculty and the service load, a continuing effort will be made to protect research time (against teaching and service) and provide laboratory set-up costs and research funds to allow beginning faculty to become self-reliant. After faculty become established and obtain funding, technicians and post-doctoral fellows, they should be successful in coping with service, teaching and research responsibilities. Another method employed is to permit individuals who replace a proportion of their salary from departmental funds with grant funds to use the accruals from their departmental salary to arrange for others to perform their service responsibilities. A program for short excused away time (one-half or a full quarter) to advance career talents is also under consideration.

d. Service responsibilities exceeding 50% of faculty time is a primary impediment to overcome and the availability of research fund is a secondary obstacle. Steps to overcome these hurdles include more reliance on collaborative research and grants with other departments, and an increased involvement of staff for service activities.

2. Staff

The measures of staff productivity are illustrated by the Animal Sciences Section of the Department. In addition to daily interaction between staff personnel and supervisors, career progress notes in narrative form are prepared as a part of the Performance Evaluation. Such factors as overall performance, specific accomplishments, and goals are addressed. In areas where strengths are identified, they are reinforced and highlighted. Professional development is explored for areas not considered strengths. On site training classes leading to the certification of animal technicians by AALAS are encouraged. The results of semi-annual site visits by the Animal Care Committee also provide a measure of staff productivity. A Department Technician of the Year is recognized, based on an individual having a positive impact on the overall service

mission of the Department. The technician is awarded a personalized plaque, their name plate is attached to a master plaque, and funds permitting attendance at a regional or national meeting of AALAS are provided.

V. Goals

A. Departmental Goal Setting

Activities initiated during the past year illustrate the process for setting departmental goals. The faculty met on May 21, 1998 with a consultant, reviewed what strategic planning can do for us individually, the strategic planning model (Appendix L) and identified the following categories of stakeholders for the Department: investigators, faculty, staff, students, other departments, the School of Medicine, NIH, the public/ taxpayers, and USDA regulators. In accordance with the consultant=s recommendation, departmental members identified individuals within the various categories and developed a interview format (Appendix K) in June and conducted 47 stakeholders interviews in July and August. A retreat was held on September 24 and 25 and a follow-up meeting on November 16 to consider the results of the interviews and to revise the mission and goals for the Department. One or more additional meetings are anticipated for subsequent phases of the continuing strategic planning process.

B. Future Goals

The current draft of the mission and goals being developed by the process described above follows.

1. Mission

The mission of the Department of Comparative Medicine at the University of Washington is to improve the health and medicine of both humans and animals through excellence in the humane and ethical use of animals in biomedical research.

2. Goals

a. *Service*

$ To provide a fiscally responsible, responsive high quality animal care resource for investigators in order to facilitate biomedical research.

$ To provide technologically advanced special services for investigators.

$ To provide high quality veterinary care and eliminate intercurrent infections in laboratory animals as a complication of research.

b. *Education*

$ To provide training and education for all individuals involved in research or teaching programs involving animals, to ensure that use and care of animals is performed in a responsible and ethical manner.

$ To educate students in comparative medicine and biomedical research.

$ To provide an exemplary postdoctoral program which prepares veterinarians for productive careers in comparative medicine.

$ To support public education on the importance of animals in biomedical research.

c. *Research*

$ Conduct competitive, independent biomedical research and animal model development programs.

$ Establish an environment that fosters research collaboration between departmental members and encourages interdisciplinary collaboration outside the department.

$ Devise compassionate, alternative methods of investigation which reduce, refine, or replace the use of live animals in research, teaching, and testing.

$ Pursue grant applications, including pilot funding, in areas such as mouse genomics, infectious diseases, and reproductive biology.

C. Rewards and Assistance in Achieving Goals

In 1997-1998, the University of Washington received $557 million in grants and contracts and a substantial part of those research dollars have involved the use of animals. It may not be widely realized by faculty and staff at the University of Washington that the Department of Comparative Medicine has wide-reaching responsibilities to maintain a commensurate degree of animal support, which goes beyond the procurement and care of animals. It includes clinical care, exclusion of intercurrent diseases, and compliance with regulations governing the use of animals in research. The continuation of Comparative Medicine as a fully functioning academic unit for teaching, research, and service is essential to maintain the quality of this support. The University of Washington could recognize and reward the Department of Comparative Medicine in the following ways:

1. **Increasing responsibilities and numbers of faculty**. At the inception of the Division of Animal Medicine in 1975, three full-time faculty positions were allocated with state funding. The Unit was given academic status as the Department of Comparative Medicine in 1989 without the allocation of any additional faculty positions. In 1975, the total dollars in grant and contract funding received by the UW was $96 million. At the present time, the Department has only the same three faculty positions funded by University dollars; i.e., although grant and contract funds have increased approximately sixfold, allocated faculty positions have remained the same for 23 years. Over the years, the Department has been able to expand its faculty by making appointments to veterinarians in the WRPRC and the V.A. in addition to obtaining both NIH and non- federal grants and contracts. This dependence upon Asoft@ money is a tenuous situation that is difficult to sustain for the long run. Recently, the Department was Aloaned@ one position when the present Chair was appointed, and another in response to concerns raised by the Association for Assessment and Accreditation of Laboratory Animal Care, International (AAALAC), during their last site visit in 1997.

With the dramatic increase in the numbers of active protocols and animals used, with compliance and regulatory requirements, and novel challenges presented by large numbers of genetically engineered rodents, there has been a dramatic increase in the service requirements of the faculty. In order to meet the additional demands for service, core faculty members have had to sacrifice time initially allocated for research and teaching activities. A step toward alleviating the strain would be achieved by allocation of another new faculty position and permanent assignment of the position loaned to the Department when the Chair was appointed. New positions will involve a national search as well as the commitment of start-up funds to allow a new faculty member to actively participate in the research mission of the Department, in addition to filling important service and teaching roles.

2. **Assignment of Additional Laboratory Space**. An area identified by NIH as of crucial importance to the human and mouse genome projects is studies of the pathobiology of genetically engineered animals, including phenotyping and whole animal integrative biology. This is an area of expertise in the

Department and one with potential research funding that would provide tremendous support for many investigators throughout the UW. The Department is currently meeting with groups and preparing to respond to requests for proposals in these areas. One significant constraint is laboratory space. The Department is assigned 4,300 ft^2 laboratory space in the T-wing contiguous with administrative offices. Much of the bench space is devoted tasks such as histology and serology functions necessary to the to service missions of the Department. Additional laboratory space is needed in order to develop a research initiative. Additional space would be of tremendous value in meeting this need and in attracting faculty who could contribute to both research and service programs of the Department.

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HECB Data:

1. **Degree Program Title:** Master of Science in Comparative Medicine

2. **Year of last review:** 1992

3. **Documentation of continuing need:**

There is a continuing need for comparative medical scientists with a background that includes cell and molecular research. Advertisements for positions and the number of positions offered our trainees by state-of-the-art laboratories in academic, government, and industrial organizations, including expanding new fields in biotechnology, exceeds the supply. Veterinarians completing the program are a resource to the institution and the research groups. Although the proposed training program emphasizes research skills, it is built on a base of clinical training with experimental animals. The skillful investigation of problems initially presenting as clinical cases may reveal factors complicating the research protocol, e.g., intercurrent infections, and unless properly resolved may have a major impact on the project. While the immediate needs of many research institutions can be met by individuals with only clinical training, these individuals, their institutions, and biomedical research in general are better served if they can advance knowledge in comparative medicine. Since our goal is to train individuals to be equal partners in an academic medical center, there is an emphasis in the selection process on factors which indicate an interest in and aptitude for research. Following the completion of postdoctoral training in comparative medicine and the basic sciences, veterinarians have a unique background to conduct independent and collaborative research.

4. **Assessment information relating to student learning outcomes and program effectiveness:**

Criteria for Measures of Success

1. Service

Compliance with federal laws and policies, accreditation by AAALAC, and stakeholder interviews reflect a degree of success. In addition, in the genetically engineered animal resources section, success is measured by the generation of transgenic mouse models which express a gene of interest, or which have an exclusive deletion of a gene of interest, with repetitive physiological and/or biochemical characteristics. As a continuing assessment of the quality of the services provided, a formal survey of individual investigator=s needs every two years is under consideration, in addition to the appointment of a ranking faculty rank person to interface with investigators= needs and complaints.

2. Teaching

Support by NIH, classroom evaluations, the number and qualifications of applicants, the drop out rate, and placement after training are criteria that can be used for evaluating the postdoctoral training program.

3. Research

Proficiency in the advancement of knowledge is assessed by publications, high priority scores and funding of grant applications, and invitations received and presentations made at other institutions and scientific meetings. Other measures of success include editorial roles on scientific journals, reviews of manuscripts, appointments to study sections and serving as a reviewer on grant applications.

5. Plans to improve the quality and productivity of the program:

In the recent past, the program underwent a major restructuring with the following two major changes: (1) removal of clinical training in laboratory animal medicine or anatomic pathology from the three- year NIH-supported program in order to place increased emphasis on research, and (2) expansion of the program to include established investigators from other departments as research mentors for the trainees.

Problem-based learning, a teaching strategy that places emphasis on the development of the ability to recognize and define problems, analyze data, and evaluate solutions rather than the simple transfer of knowledge, has been used, and is in the process of continuing development for several of the core courses.

6. Data on number of majors and degrees granted in the last three academic years

One major, Master=s degree in Comparative Medicine

1995-1996	1	Robert R. Peterson
1996-1997	1	Guy B. Mulder
1997-1998	1	Saijai Cheunsuk

7. Number of FTE faculty and graduate assistants that teach in department

The research mentors for the trainees are the individuals who have a major commitment to the training of the postdoc, and, as an interdepartmental program, participating faculty are in a number of different departments. The appropriate allocation of time for a research mentor is difficult to determine, but would approximate .25 FTE per trainee for six trainees doing research. The primary time commitments for research mentors are either working with trainees rotating through their laboratory, or research supervision of trainees doing research with them.

In addition, the approximate allocation of time for faculty members in the Department of Comparative Medicine teaching numbered courses is as follows:

G. Van Hoosier	25%
M. Dennis	10%
R. DiGiacomo	5%
L. Price	10%
T. Birkebak	10%
R. Rausch	5%
C. Frevert	5%
B. Iritani	5%
W. Ladiges	10%
A. Lichtenwalner	5%

W. Morton	5%
C. Pekow	10%
M. Thouless	5%
C. Ware	5%
B. Weigler	10%

There are no Graduate Assistants in the Department of Comparative Medicine.