UNIVERSITY OF WASHINGTON SCHOOL OF MEDICINE

Department of Laboratory Medicine

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To: Marsha Landolt, Dean of the Graduate School
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From: James Fine, Associate Professor and Chair, Dept. of Laboratory Medicine
Chair, Comparative Medicine Master of Science degree Review Committee
Marilyn C. Roberts, Professor, Dept. of Pathobiology
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Christian E. Newcomer, Director and Research Associate Professor, Division of Laboratory Animal Medicine, University of North Carolina at Chapel Hill
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Subject: The Report of the Department of Comparative Medicine Review Committee

The Department of Comparative Medicine has offered a Master of Science degree for the past five years under provisional status. The purpose of this review is to determine whether the Department should continue to offer the Master of Science degree and whether the program should be converted from provisional to continuing status. In addition to recommending whether the program should continue, the Committee was asked by the Graduate School to consider some specific issues as part of the review: as a small program, assess the need for the program and its quality; assess the time of the training program; advise regarding the Department's consideration of a Ph.D. program; and assess the Department's strategic goals.

The review process began in 1998 with the Department of Comparative Medicine's Self-Study. This was made available to our committee at the beginning of our review process. Our committee began work during Winter Quarter 1998 at a preliminary meeting with Marsha Landolt, Dean of the Graduate School; John Slattery, Associate Dean of Academic Programs; and Dan Dorsa, Associate Dean, School of Medicine. The committee reviewed the material presented in the self-study and requested additional material, which was furnished by Dr. Melvin Dennis, Jr., Chairman of the

Department, on March 8th. In further preparation for the site visit, the committee requested answers to additional questions; Dr. Gerald Van Hoosier, former chairman of the Department, provided a response on April 2, 1999. We followed this with a committee interview with Dr. Van Hoosier and Dr. Dennis. On April 12th and 13th, we were joined by our outside members, Christian E. Newcomer, V.M.D., Director and Research Associate Professor, Division of Laboratory Animal Medicine, School of Medicine, University of North Carolina; and Ann Kier, D.V.M., Ph.D., DACLAM, Professor and Head, Department of Veterinary Pathobiology, College of Veterinary Medicine, Texas A & M University, for a site visit. During the site visit, individual interviews were held with the following faculty: Melvin Dennis, Gerald Van Hoosier, Warren Ladiges, Robert Rausch, William Morton, Denny Liggitt, Lillian Price, Cynthia Pekow, Margaret Thouless, Ted Birkebak and Ronald DiGiacomo. Master of Science degree students George Sanders and Dana Ness were interviewed and a group interview was held with post-doctoral trainees Andrew Burich, Bernie Buetow, Claire Hankenson, Jennifer Kalishman and Kari Koszdin.

The self-study gave a good overview of the Department from its beginnings as "Experimental Animal Medicine," then "Division of Animal Medicine," finally achieving departmental standing in 1989 as the "Department of Comparative Medicine" in the School of Medicine. Since 1982, it has had a post-doctoral program supported by a training grant from the National Center for Research Resources of the National Institutes of Health (NIH). This program has evolved into its current configuration as a four-year curriculum. The first year of the program is an internship supported by departmental funds, with the subsequent three years supported by the NIH grant. In 1993, the Department was provisionally authorized to award the Master of Science degree in Comparative Medicine pending review in five years. While the committee felt the information about the Department was well done, we thought additional details specific to the Master of Science program were necessary for our evaluation prior to the site visit. Additional information included the following information: detailed placement information on all Master of Science graduates, c.v.'s of all current students, copies of recruitment information, details of the curriculum, benchmarks for student progression, copies of recent theses, information on other programs nationally, the program's national ranking (if one exists), the relationship to Washington State University, the rationale for Ph.D. program, the plans for course offerings and future focus, and its interaction with the Primate Center.

1. Quality

The post-doctoral training program in Laboratory Animal Medicine is recognized nationally and has a reputation equivalent to the programs at the such institutions as the University of Michigan, the University of Missouri, Johns Hopkins, the University of Alabama-Birmingham and the Massachusetts Institute of Technology. These post-doctoral programs were revised under the guidance of the NIH/NCRR during the past decade to enhance the trainees' commitment to research at the bench. Although not required by the NIH/NCRR, the Master of Science degree with a thesis requirement provides appropriate evidence for, and brings closure to, a specific research effort that will be advantageous for the future employment and contribution of the post-doctoral trainees seeking research veterinary positions in the academic environment.

Central to the vitality of the program are the current and former chairs. Dr. Melvin Dennis has been the Chairman of the Department of Comparative Medicine since 1995. As the Chair, he carries the major responsibility for the service component of the Department. He is the Attending Veterinarian for the University of Washington 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 animal use on our campus. Dr. Van Hoosier is the former Chairman of the Department. He is currently in charge of the NIH training grant and post-doctoral fellows (including those doing the M.S. in Comparative Medicine, those doing Ph.D.'s and those doing neither) and does a significant amount of teaching in the Department's courses. He is internationally known in the field of small animal medicine (being one of the founders of the field) as well as Editor of its major journal. The Master of Science and NIH training program relies heavily on his expertise. He helps the students to find mentors and, more importantly, is able to help in making arrangements for students to visit other sites to do some of their research. Given Dr. Van Hoosier's central role in the Master of Science program and his senior status, it is important for Comparative Medicine to begin looking for others in the faculty, as well as potential new hires, who can take over his duties when he retires. Because of the significant service commitment that must be supported by the Chair, the committee believes that the separation of the Principal Investigator of the training grant from the Chair should be maintained to insure the integrity of the post-doctoral program.

Other principal faculty involved with the training program include Dr. Warren Ladiges, Dr. William Morton, Dr. Lillian Price, and Emeritus Professor Dr. Robert Rausch. From our interviews it is apparent that these faculty members have a strong and vested interest in the success of this program. Dr. Warren Ladiges holds the major NIH grants in the Department; these grants provide support for the transgenic and knockout mouse facility, a major asset to the Department. It is significant that the mouse facility is run by faculty in Comparative Medicine. It would be advantageous to the students to increase the post-doctoral students' exposure to this resource including doing Master of Science projects in the facility. Dr. William Morton is director of the Washington Regional Primate Research Center (WRPRC) at the University of Washington, with an appointment as Professor in Comparative Medicine. He is the first Primate Center Director in the United States to have a D.V.M. and the committee believes that closer interaction between the Primate Center and Comparative Medicine should be encouraged and would benefit all. Dr. Morton is well-known from his work in non-human primates. Two of the current students want to work with primates and came to this Comparative Medicine program because of the primate center. Dr. Robert Rausch is Professor Emeritus in Comparative Medicine. He is an internationally known parasitologist who still teaches in Comparative Medicine and has an active research career. Dr. Rausch is one of the few people left that is a classically trained parasitologist and small mammal expert and he has a wealth of knowledge. Dr. Lillian Price is Associate Professor in Comparative Medicine. She is the faculty member that coordinates the first year of the program (the service year) for the students. Other departmental faculty have less involvement with the students and are generally early in their careers and have little or no research support.

While the department does has extensive service responsibility to the biomedical research activity on campus, the faculty has its own diverse research interests and good records of independent and collaborative research. The faculty have oversight responsibilities in two areas of animal use that is of urgent and enduring interest to the NIH/NCRR and the national biomedical research community. Specifically, these are the development and characterization of mutant mice in the Transgenic Core Facility within the Department of Comparative Medicine, and the numerous programs using non-human primates at the Washington Regional Primate Research Center. Clinical activities from both of these areas are incorporated into the post-doctoral training activities in Comparative Medicine,

and these resources are a fertile source for research projects for students in the Master of Science program of Comparative Medicine. In addition to advising research projects central to the interests of the Department of Comparative Medicine, the faculty serve as an effective conduit to other senior investigators and established laboratories for students desiring to pursue research interests in disciplines outside the areas of expertise of the Comparative Medicine faculty. Of those primarily in Comparative Medicine, only Dr. Ladiges has NIH funding. It is the review committee's opinion that research funding needs to be increased to allow more opportunity for students to do projects with Comparative Medicine faculty. Lack of funding is a major deterrent in the development of a Ph.D. program in Comparative Medicine.

The faculty's clinical and professional expertise encompass many of the certified veterinary subspecialties including ACLAM, ACVP, ACVPM, and ACVIM affording the post-graduate veterinarians an opportunity to draw upon these resources and different perspectives during their clinical training. We would anticipate that the candidates' clinical service capabilities in a research animal facility setting and their subsequent participation in research projects involving integrative biology or translational research should be well-served by the preparation they receive in the University of Washington Master of Science program offered by Comparative Medicine.

2. Value to the students·

The overall aim of the training program is to produce scientists trained in comparative medicine to meet the expanding needs of animal research in a broad range of biomedical fields. All trainees in the current program have attained a D.V.M. degree prior to admission. This is a very high caliber of Master's student and is a reflection of the post-doctoral nature of the program. In recent history within this group, some individuals had elected the Master of Science as a terminal degree, whereas others had proceeded onto the Ph.D. degree either at the University of Washington or other institutions without completing the requirements of the Master of Science degree. The majority of the candidates and faculty interviewed believed that the completion of the Master of Science degree is an important and sound method of affirming that the candidates had successfully concluded a significant research endeavor.

Two post-doctoral students enter the program each year and begin by rotating through a series of clinical services. This is a highly focused clinical experience and is closely tied to the Department's service responsibility. One suggestion the review committee had was that the student should have management experience during this first year to learn how to deal with personnel issues: make the student "in charge" of people so they begin to understand the complexities of management, a very important skill for all these students.

In the second year, students are accepted into the NIH-funded training program and do a formal rotation in three research laboratories for a minimum of six weeks' duration as they select their potential mentors. During this time, the graduate research project and committee are formalized. The students select which pathway they wish to pursue, the Master of Science degree program in the Department of Comparative Medicine, or a Ph.D. program in another department. Since its inception, the Master of Science program has graduated four students and has three students currently enrolled as Master of Science candidates. The number of students is a concern to the Review Committee in that this seems to be a small yield for the amount of educational resources the department must commit to the training program. It would seem prudent to increase the total number of students who are in the Master's program, a suggestion that we will elucidate in our recommendations section.

The Master of Science in Comparative Medicine degree is attainable in a three-year period. Progress in the program is monitored throughout the program. During the Spring Quarter of the first year, the trainee is evaluated by the Head of the Academic Programs in consultation with the faculty. At this point it is decided whether the trainee should continue with appointment to the NIH training grant for subsequent years. The Committee feels that there need to be regular meetings/evaluations between each student and their degree committee with documentation in the student's file. Written expectations at each year of training would be valuable. At the completion of the laboratory rotations (beginning with Summer Quarter of the second year), a decision is made about the trainee's research project and a research committee is appointed. The final benchmark occurs as early as the third year with the preparation of a thesis or manuscript and a seminar to present and defend the research. The Committee did question the need for a three-year period of

study and research in order to obtain a Master's degree. As can be seen from the above schedule, however, there is not much room in the current structure to condense this training period.

The course requirements clearly defined and are, in part, determined by the research and degree program pursued. There is a significant overlap between the Ph.D. and Master of Science requirements. For the Master of Science in Comparative Medicine, trainees are required to complete *Medical Biometry* (BIOST 511), CMED 520,521 *Biology of Laboratory Animals* (2,2), CMED 530, 531 *Diseases of Laboratory Animals*, CMED MED 540 *Animal Models*, CMED 590 *Selected Topics in Animal Medicine*, CMED 600 *Independent Study or Research*, CMED 700 *Master's Thesis*. There are also weekly one-hour department seminars ("Comparative Pathology Conference", "Current Literature in Laboratory Animal Medicine" and "Clinical Conference Seminar") that involve participation of both faculty and trainees. Other courses are selected by the trainee, in consultation with their committee, as needed or appropriate for the research project. The committee felt that there should be more elective opportunities listed as standard opportunities because there are many university courses available that would be valuable to these students. Potential need for Biostatistics 511was suggested by one faculty member.

Quarterly progress reports are submitted and reviewed at faculty meetings during the first two years as part of the evaluation process. Since the inception of the program, all but two of the Master's candidates have completed the program within the prescribed period. In addition, all post-doctoral students who have completed the training program and taken the ACLAM board exam passed the first time.

While the Review Committee was satisfied with the overall curriculum, we did feel there was certain aspects that could use more structure and attention. We were concerned the department had not provided the trainees with well-stated written goals and objectives for each phase of the program and for each of the required courses. How the students are graded and what is required of students needs to be established and provided each time the course is given. The department did outline the goals and objectives for each course when requested to by the Committee. This material is a good start and could be incorporated into the course material for the students. Also of concern is that the departmental courses had syllabi of inconsistent quality. A departmental standard should

be set for comprehensive course syllabi and this material should be reviewed and revised on a regular basis. A standard schedule of classes needs to be determined and committed to so students know when courses will be taken. The committee also felt there was too much course customization for individual students and suggest that this practice be discontinued. Lastly, student evaluations for every course, each time it is taught, need to be collected and available for review.

All of the students we interviewed (whether they were in the Master of Science program, the Ph.D. program, or still undecided) expressed their strong endorsement of the program. The students seemed mature, poised, with well-thought-out plans and career goals. The Master's degree trainees stated that one of the reasons they chose to apply for the Department of Comparative Medicine training grant at the University of Washington was that the program offered the Master of Science degree and did not require graduate work for a Ph.D. The students were satisfied with the program, and they enjoyed the flexibility and research opportunities offered. They also valued the opportunity to work within other departments.

Informational recruitment material was outdated. The Committee suggests an annual review of this material and inclusion of current faculty c.v.'s. The Committee also suggests that former students be surveyed on a regular basis. The findings could then be made available for review, improving information for students and potential students as well as serving as a quality assessment tool for the program performance.

3. Role within the University

The program is designed to prepare individuals for careers in laboratory animal research. To date, the program has focused only on those with a veterinary medical degree (D.V.M.) or equivalent. In contrast to the general D.V.M. experience that emphasizes domestic animals, this training centers around animals used in laboratory research, *i.e.,* mice, rats, rabbits, primates, *etc.* As a result of the advance training opportunities for graduate veterinarians, the University's own research community derives benefits from an outstanding program of veterinary care far exceeding the University's investment in core salary support for veterinarians in the Department of Comparative Medicine.

Is the University of Washington the correct place to house such a program, or would it be more appropriate at Washington State University, home to the state's only School of Veterinary Medicine? This question is answered in a letter dated March 30, 1999 from the Dean of the College of Veterinary Medicine, Dr. Terry McElwasin, in which he reaffirms WSU's continuing and unequivocal support for the type of training provided to veterinary graduates. He specifically felt that such a program's place is within a medical school setting. Because the veterinary graduates have limited exposure to laboratory animals, this program satisfies the need for training that can only be provided where veterinarians work in support of medical research. Dr. McElwasin cites the "revolutionary advances" in the use of laboratory animals (particularly transgenic animals) in biomedical research. From his perspective, this graduate program is becoming an even more viable career track for veterinary graduates than when the program was first proposed.

4. Resources

Students receive a reasonable yearly stipend while in the program. The first year's support is derived from service revenue generated by the Department. The subsequent three years' support comes from the NIH training grant and is available to two new students each year. This federal funding seems relatively stable given its seventeen-year history in the Department. It might be useful to explore both financial support as well as possible rotations with local industries involved with laboratory animal research, such as Zymogenetics.

Three full-time faculty positions are supported on state funding. This level of funding has remained constant for twenty-three years. The Department has expanded its faculty by making appointments to veterinarians in the WRPRC and the VAMC and through NIH on non-federal grants and contracts. The Department was also "loaned" one position when the current Chair was appointed, and another in response to the Association for Assessment and Accreditation of Laboratory Animal Care during their site visit in 1997. Given the important service provided by this faculty, we felt that the issue of level of core support for veterinary salaries should be re-evaluated by the University.

The Review Committee felt that the department has adequate space for administrative functions, laboratories, and animal housing to support this training program. The physical resources offer a broad view of the roles of animals in basic and applied research and are in a variety of settings throughout the metropolitan area. On the University campus, the T-wing of the Health Sciences houses 3200 square feet of office space for administrative and secretarial support of the Department and its programs. Contiguous with the administrative space is 4300 square feet of laboratory space (including a fully equipped necropsy lab). This laboratory provides for both clinical service and research. There is a BL-2 laboratory for microbiology, four recently completed laboratories of 205 square feet each in the K-wing/I-Court, and one 195 square foot procedure room for genetically engineered rodent procedures and BSL-3 laboratories with contiguous animal housing. There is 27720 square feet allotted for animal housing and service divided into four well-equipped spaces: three within the Health Sciences and a fourth at Harborview Medical Center. In addition, the new 14000 square foot K-Wing/I-Court facility became operational in January 1996. A large portion of this space is dedicated to transgenic animal production and use. The Seattle Veterans Administration has a 12000 square foot animal facility, and the Fred Hutchinson Cancer Research Center maintains 40000 square feet of animal housing and procedure areas.

The Department of Comparative Medicine collaborates extensively with the NIH-supported Washington Regional Primate Research Center, and much of the Department's training, service, and research are conjoint with the Primate Center. The mission of the WRPRC is to support basic and clinical biomedical research utilizing non-human primates. Within the Health Sciences complex, the WRPRC occupies five floors of the I-Wing and I-Court dedicated to administration, research laboratories, and animal housing space; there is an Infant Primate Research Laboratory in the RR wing. The Center recently leased 40000 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. Located with the director and five WRPRC veterinarians are the regular or clinical faculty of the Department. This proximity is a major resource for the program.

Objectives

During the past year, the Department of Comparative Medicine underwent a strategic planning process involving an outside consultant and active participation by their faculty. As a result, they have produced summary documentation that was included in the self-study materials. In this documentation they defined the departmental mission and formulated service, education, and research goals. It is the Review Committee's opinion that this is a well-formulated succinct statement that fits the Department's current role serving it well into the future.

Recommendations:

1. The Committee unanimously recommends that the Department of Comparative Medicine's Master of Science degree program should be converted from provisional to continuing status with review in five years. We were very pleased to have had the opportunity to participate in this exercise and believe that the Master of Science program should be afforded continuing strong support. It does an excellent job of serving the students, the University's scientific community, and the national (NIH/NCRR) goal of preparing the next generation of laboratory animal veterinarians for robust careers as scientific colleagues, collaborators, and contributors. However, it is a small program with few graduates and a curriculum that is still evolving. It is for this reason that we recommend a review in five years.

2. All students entering the Department of Comparative Medicine post-doctoral training programs should be expected to complete the Master of Science degree during their training unless they already possess the Master of Science degree in another scientific discipline relevant to future careers in biomedical research. One modification deserving study for veterinarians enrolled in the program *en route* to the pursuit of a Ph.D. would be to abolish the requirement for a separate thesis for a Master's degree or to allow the publication of research findings in a referred journal to substitute for the Master of Science thesis. The "core" course content of the Master of Science degree also should be carefully reviewed to allow candidates aspiring to the Ph.D. degree to optimize the number of credits eligible for subsequent application to this pursuit. With these

changes in curriculum it may be possible to increase the class size for the Master of Science degree in Comparative Medicine, mitigating the concerns of some of the faculty about the amount of time required to prepare a lecture for only a few students.

3. The committee recommends the expansion of the program to offer three-year Master of Science degrees to non-D.V.M.'s. The committee suggests that the Master of Science degree program in Comparative Medicine need not remain the exclusive domain of graduate veterinarians. There may be non-veterinarians committed to careers in biomedical research involving extensive, highly technical animal use, who would derive professional benefit from a Master's degree in Comparative Medicine, although this may entail some modification in the structure and content of the current program. These non-D.V.M. Master of Science students could not be supported by the current NIH training grant.

4. The Committee is in agreement that the Department should focus on the Matser's program and not pursue a Ph.D. program at this time. The Master of Science program is still young and needs more fine-tuning and experience. The limited NIH research funding in the Department is an impediment to a Ph.D. program and needs to be broadened to allow more opportunity for students to do funded projects with Comparative Medicine faculty if they are to consider a Ph.D. within the Department.

Attachment