

Division of Comparative Medicine

The [Division of Comparative Medicine](#) (DCM) provides animal husbandry and clinical care for all research animals on the MIT campus. Since its inception in 1974, DCM has evolved into a comprehensive laboratory animal program that provides a full range of veterinary and surgical support. DCM has a National Institutes of Health (NIH) grant for training veterinarians for careers in biomedical research. The division also has an active research program funded by numerous grants from NIH. DCM now has 175 personnel. The division's administrative headquarters and its diagnostic and research laboratories are located on the eighth floor of Buildings 16 and 56. The renovation of the E25 animal vivarium was completed this past March, and animals were moved back into the facility. This project was the result of a \$15 million NIH infrastructure C06 grant awarded to professor James Fox in FY2010. The division now encompasses approximately 213,000 gross square feet devoted to animal research activities on the MIT campus.

Facility Management and Animal Care

DCM has updated the *Laboratory Animals Users' Handbook*, and the sixth edition is now available online. There were no changes in the average daily census of laboratory animals in FY2013. Mice remain the primary species used by MIT investigators and represent more than 98% of DCM's animal population. The division has two core facilities to support transgenic and gene "knockout" in vivo experiments, and performs a range of transgenic services, including in vivo embryo transfer for rederivation of mice with endemic disease that have been imported to MIT from laboratories worldwide, in vitro fertilization, and genotyping of mice. During the past year services were expanded to incorporate a full range of cryogenic services, including laser-assisted in vitro fertilization. Efforts are currently under way to perfect a technique of vitrification freezing that will allow us to freeze all stages of preimplantation embryos as well as a technique to freeze and successfully retrieve sperm. The transgenic core also provides genetically engineered mice to the investigative community at MIT. DCM staff provide colony management of mouse models for investigators using mice in their studies. They advise investigators on breeding paradigms and tracking systems to optimize the efficiency of production colonies, as well as providing hands-on services for routine mating, weaning, and genotyping.

DCM also provides diagnostic laboratory services in support of the veterinary care, surveillance, and quarantine programs. The diagnostic laboratory is equipped and staffed to provide technical services in microbiology, mycology, mycoplasma, chlamydia, virology, serology, hematology, parasitology, clinical chemistry, urinalysis, histology, and pathology. Two board-certified veterinary pathologists, Dr. Nicola Parry and Dr. Suresh Muthupalani, provide histopathological interpretations. A pathology diagnostic information system that will enable DCM to manage diagnostic and pathology data acquisition and dissemination more efficiently has been implemented in the past few months.

Research Activities

Currently DCM faculty and scientific staff have 11 NIH-funded grants supporting in vivo studies of nitrite carcinogenesis and the pathobiology of emerging enterohepatic *Helicobacter* spp. in mice. Division faculty and staff are also conducting studies on the role of *Helicobacter pylori* as a tumor promoter in gastric cancer, helicobacter-associated colitis, and colon cancer; *Helicobacter* species-induced hepatocellular carcinoma; the role of stress-induced reduction in *Lactobacillus reuteri* in colonic inflammation; and the role of human-derived *L. reuteri* in activating innate immunity. In addition, they are conducting in vivo studies investigating CD4⁺ and CD25⁺ regulatory cells' abilities to treat colon and breast cancer, the means by which pathogenic gastrointestinal tract microbes trigger extra-intestinal cancers in tissues such as those of the breast, and the development of novel techniques for generating gene-deficient animals that can be used across species in a cost-effective manner while decreasing animal usage. They are studying the viral ecology, epizootiology, and evolution of influenza in animal and environmental reservoirs as well. Total research expenditures were \$3.2 million in FY2013.

FY2013 was the 25th year of the division's NIH postdoctoral training grant. The grant was funded for another five-year cycle through 2018. Our NIH three- to four-year sponsored postdoctoral training program has been completed by 50 trainees; 35 have become diplomates of the American College of Laboratory Animal Medicine. An additional 16 participants with DVMs, PhDs, or MDs completed postdoctoral fellowships sponsored by individual R01 or program project grants. Many former trainees hold leadership positions in academia as well as pharmaceutical and biotechnology companies. Previous fellows have been elected to fill the presidencies of three national organizations: Dr. Steve Niemi (director of animal resources at Harvard University) at the American College of Laboratory Animal Medicine and both Dr. Scott Perkins (director of the Division of Laboratory Animal Medicine at Tufts-New England Medical Center) and Dr. Kim Saunders (professor and director of the Department of Comparative Medicine at Oregon Health and Science University) at the American Association for Laboratory Animal Science. Dr. Susan Erdman, a former DCM postdoctoral fellow and currently DCM's assistant director, is past president of the American Committee on Laboratory Animal Diseases.

The NIH training grant also provides short-term training opportunities for veterinary students interested in careers in comparative medicine. During FY2013, DCM had six short-term trainees for periods ranging from six to 10 weeks. Many have, upon graduation, entered careers in biomedical research. Sixty-nine veterinary students have participated in the summer training program during the past 10 years. Also, the division hosted eight veterinary students who elected to participate in two- to four-week externships at DCM during the school year.

Academic Activities

Hilda Holcombe, DVM, PhD, DACLAM, joined the division as a senior research/clinical veterinarian in November and has primary responsibility for rodents in the Koch Institute for Integrative Cancer Research and non-primate species in E17/18. She

received her PhD in immunology after graduating from veterinary school and has a primary interest in mucosal immunology.

Jennifer Haupt, DVM, is the division's new research/surgery veterinarian. She joined us after completing a three-year residency in animal surgery at Tufts College of Veterinary Medicine.

DCM faculty and staff published eight chapters and 41 papers during the past year and presented numerous research papers at national and international meetings. Dr. Fox and Dr. Robert Marini are finalizing the third edition of *Biology and Diseases of the Ferret*, and Dr. Fox and Dr. Mark Whary are editing the third edition of *Laboratory Animal Medicine*.

Dr. Fox assumed the chairmanship of the board of directors of the National Association for Biomedical Research and continues to serve on the boards of directors of national associations and the editorial boards of scientific journals. Dr. Fox was elected to the National Academy of Practices in 2012. Dr. Whary, associate director of DCM, serves on the editorial boards of *Comparative Medicine* and the *Journal of the American Association for Laboratory Animal Science*. Dr. Erdman, assistant director of DCM and principal research scientist, serves on an ad hoc committee for NIH/NCI (National Cancer Institute), and Dr. Parry, chief of comparative pathology, is a member of the exam committee of the American College of Veterinary Pathology. DCM faculty and staff teach 20.202 In vivo Models: Principles and Practices, a graduate course in the Department of Biological Engineering. Dr. Jonathan Runstadler teaches 20.109 Laboratory Fundamentals in Biological Engineering, and 20.450 Molecular and Cellular Pathophysiology. Dr. Marini, assistant director and chief of surgical resources, serves as a lecturer in the Harvard-MIT Division of Health Sciences and Technology, where he is involved in the teaching of two courses (HST.542J Quantitative Systems Physiology and HST.090 Cardiovascular Pathophysiology).

Committee on Animal Care Activities

All students, staff, visiting scientists, and principal investigators who use animals in teaching or research must be certified by the Committee on Animal Care (CAC). To enable protocol submission and personnel training, CAC's website provides required forms, continuing education materials, and information about CAC activities. In conjunction with CAC, DCM staff have developed an online training program that is combined with individual orientation and training in animal use by the veterinary staff at the Institute. Individual and group didactic training sessions for Institute personnel on topics pertaining to the care and use of laboratory animals are also offered on a regular basis. CAC, DCM, and MIT Medical coordinate an occupational health program for animal-related occupational health issues. In addition to its work on the MIT campus, CAC provides protocol reviews for the Whitehead Institute for Biomedical Research and the Broad Institute.

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