

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. Additionally, DCM has had a National Institutes of Health (NIH) grant for training veterinarians for careers in biomedical research for the past 26 years. The Division also has an active research program funded by numerous grants from NIH. DCM employs 175 individuals. DCM's administrative headquarters, along with its diagnostic and research laboratories, are located on the eighth floor of Buildings 16 and 56. Renovation to the Building 68 animal facility during the past year included floor refinishing and an upgrade of the security system and air handlers. Work is currently underway to replace cage-wash equipment and autoclaves in Building 56. The Division now encompasses approximately 213,000 gross square feet in seven buildings 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. The average daily census of laboratory animals was unchanged for FY2014. Mice remain the primary species used by MIT investigators, representing 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. A full range of cryogenic services are now available, including laser-assisted in vitro fertilization and freezing and retrieval of sperm and embryos. The transgenic core also provides genetically engineered mice to the investigative community at MIT. DCM staff provides colony management of mouse models for investigators using mice in their studies. They advise investigators on breeding paradigms and tracking systems to optimize efficiency of production colonies and provide hands-on services for routine mating, weaning, and genotyping.

DCM also operates two surgery suites: one in Building 46, and another in E25. DCM 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, mycoplasmaology, chlamydiology, virology, serology, hematology, parasitology, clinical chemistry, urinalysis, histology, and pathology. Two board-certified veterinary pathologists, Dr. Suresh Muthupalani and Dr. Vasu Bakthavatchalu, provide histopathological interpretations. The team fully implemented a pathology diagnostic information system to manage diagnostic and pathology data acquisition and dissemination more efficiently.

Research Activities

In FY14 DCM faculty and scientific staff had 12 NIH-funded grants supporting a range of studies:

- *In vivo* studies of nitric oxide biochemistry
- The pathobiology of emerging enterohepatic *Helicobacter spp.* in mice
- The role of *Helicobacter pylori* as a tumor initiator in gastric cancer, helicobacter-associated colitis, and colon cancer
- The role of stress-induced reduction in *Lactobacillus reuteri* on colonic inflammation
- The role of human-derived *Lactobacillus reuteri* to activate innate immunity
- In vivo studies investigating CD4⁺CD25⁺ regulatory cells' ability to treat colon and breast cancer
- How pathogenic GI tract microbes trigger extra-intestinal cancers in tissues such as breast
- 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
- Diagnoses of active fur mite infestations
- The impact of the microbiome on influenza pathogenesis and immune response
- Investigation of the differential environmental stability of influenza virus particles, and
- The study of viral ecology, epizootiology, and evolution of influenza in animal and environmental reservoirs.

Dr. Runstdaler's NIH avian influenza studies received funding through 2021. Total research expenditures were \$2.9 million in FY2014.

FY2014 was the 26th year of the Division's NIH postdoctoral training grant, which is funded through 2018. Our NIH three- to four-year sponsored postdoctoral training program has been completed by 53 trainees; 38 have become diplomates of the American College of Laboratory Animal Medicine. An additional 16 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. On a national level, three previous fellows have been elected to fill the presidency of national organizations: Dr. Steve Niemi, director of Animal Resources at Harvard University, was named president of the American College of Laboratory Animal Medicine. 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, each served a term as president of the American Association of Laboratory Animal Science, in 2009 and 2013 respectively. Dr. Susan Erdman, a former DCM postdoctoral fellow and currently assistant director at DCM, 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 FY2014, DCM had eight short-term trainees for periods ranging from six to 10 weeks. Many have, upon graduation, entered careers in biomedical research. Sixty-seven veterinary students have participated in the summer training program during the past 10 years. The Division also hosted 11 veterinary students who elected to complete two- to four-week externships at DCM during the school year.

Academic Activities

Lynn Wachtman, DVM, MPH, DAACLAM, joined the Division as a senior research/clinical veterinarian in January 2014. She is experienced in primate medicine and is providing expertise for the establishment of a marmoset colony at MIT. Dr. Wachtman was employed by the New England Primate Research Center for eight years prior to joining DCM.

Dr. Vasudevan Bakthavatchalu, BVSc, MVSc, PhD, DACVP, joined the Division in June as a comparative pathologist.

DCM faculty and staff published 24 chapters and 26 peer-reviewed papers in 2013 and presented numerous research papers at national and international meetings. The third edition of *Biology and Diseases of the Ferret* edited by Drs. Fox and Marini was published. Drs. Fox and Whary are editing the third edition of the text *Laboratory Animal Medicine*.

Dr. Fox stepped down as the chair of the board of directors of the National Association of Biomedical Research and continues to serve on the board of directors of national associations and editorial boards of scientific journals. He most recently served on the Physician Scientist Workforce Committee commissioned by the director of NIH. Dr. Mark Whary, associate director of DCM, is a member of the editorial boards of *Comparative Medicine* and the *Journal of the American Association of Laboratory Animal Science*. He was recently elected to serve on the council for the Association for the Assessment and Accreditation of Laboratory Animal Care International. Dr. Susan Erdman, assistant director of DCM and principal research scientist, serves on an ad hoc committee for NIH.

DCM faculty and staff teach in vivo models in 20.202 Principles and Practices, a graduate course in the Department of Biological Engineering. Dr. Runstadler teaches 20.109 Laboratory Fundamentals in Biological Engineering and 20.450 Molecular and Cellular Pathophysiology. Dr. Robert 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 HST090 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 material, and information about CAC activities. In

conjunction with CAC, DCM staff members have developed an online training program and are using the Collaborative Institutional Training Initiative online courses via the MIT Learning Center. These tools are 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 the MIT Medical Department coordinate an occupational health program for animal-related occupational health issues. In addition to the MIT campus, the CAC provides protocol review for investigators at the Whitehead and Broad Institutes.

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