

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, for the past 28 years, DCM has had 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's total personnel comprises 175 individuals, including 92 animal technicians, 29 veterinary technical staff, 6 research personnel, 12 veterinary professional staff, 9 postdoctoral trainees, 19 administrative and supervisory staff, and 8 support staff. DCM's administrative headquarters, along with its diagnostic and research laboratories, are located on the eighth floor of Buildings 16 and 56. The division encompasses approximately 193,000 gross square feet in seven buildings devoted to animal research activities on the MIT campus. Replacement of all cage washers and autoclaves in the Building 68 animal facility, along with improvements to the air handling system, is ongoing as part of a project funded by the Institute and NIH.

Facility Management and Animal Care

DCM has updated the *Laboratory Animals Users' Handbook* to the seventh edition, which is available online. The average daily census of laboratory animals remained the same for FY2016. 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. Services include a full range of cryogenic services, including laser-assisted in vitro fertilization and freezing and retrieval of sperm and embryos. The transgenic core facility 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. Staff members advise investigators on breeding paradigms and tracking systems to optimize efficiency of production colonies, as well as providing hands-on services for routine mating, weaning, and genotyping.

The division has worked closely with faculty in the McGovern Institute for Brain Research to establish a successful marmoset colony and to construct transgenic marmoset models.

DCM also operates two surgery suites, one in Building 46, the other in Building E25. The division 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, and pathology. A fully equipped and staffed histology laboratory also supports DCM research and diagnostic efforts as well as technical support for the MIT investigative community. Two board-certified veterinary pathologists, Dr. Suresh Muthupalani and Dr. Vasu Bakthavatchalu, provide histopathological interpretations.

Research Activities

In FY2016 DCM faculty and scientific staff had nine NIH-funded grants supporting a range of studies, including:

- 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
- modulation of systemic immune responses and the Th1/Th2 gastric cytokine profile due to *H. pylori* infection and concurrent infection from parasites
- the role of stress-induced reduction in *Lactobacillus reuteri* in colonic inflammation
- examining if gut microbes possessing phosphorothioate modifications of their genomes have a selective advantage during the inflammation and oxidative stress of colitis
- how toxic environmental agents perturb biological systems and how such perturbations may affect human health
- how pathogenic GI tract microbes trigger extra-intestinal cancers in tissues such as breast, and
- the study of viral ecology, epizootiology, and evolution of influenza in animal and environmental reservoirs

Additional projects focused on a smart sewage study for Kuwait and an investigation of the impact of human-gull interactions in shaping viral evolution in the avian host. Funding has also been secured to study nosocomial *Enterococcus fecalis* in non-human primates. Total research expenditures were \$2.1 million in FY2016.

FY2016 was the 28th year of the division's NIH postdoctoral training grant, which is funded through 2018. The division's NIH three- to- four-year sponsored postdoctoral training program has been completed by 57 trainees; 39 of whom have become diplomates of the American College of Laboratory Animal Medicine. An additional 16 DVMs (doctor of veterinary medicine), 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.

The NIH training grant also provides short-term training opportunities for veterinary students interested in careers in comparative medicine. During FY2016, DCM had six short-term trainees for periods ranging from eight to 10 weeks. Many have, upon graduation, entered careers in biomedical research. Also, the division hosted 12 veterinary students who elected to spend two- to four-week externships at DCM during the school year.

Academic Activities

DCM faculty and staff published 30 peer-reviewed papers during the past year and presented numerous research papers at national and international meetings. The third edition of the text *Laboratory Animal Medicine* with Drs. Fox and Whary as editors was published last year. DCM staff members wrote 11 chapters for this text. Drs. Robert Marini and James Fox are editing a text on the biology and use of marmosets.

Dr. Fox stepped down as the chair of the board of directors of the National Association of Biomedical Research. He 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. Fox is also a member of the National Academy of Sciences Global Forum on Innovations in Health Professional Education, and serves on ad hoc review committees for 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 elected last year to serve on the Council for AAALAC (Association for Assessment and Accreditation of Laboratory Animal Care), the international accrediting body.

Dr. Susan Erdman, DCM assistant director and principal research scientist, serves on an ad hoc review committee for NIH. Dr. Suresh Muthupalani, DCM chief of comparative pathology, also serves on an NIH ad hoc review committee.

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. Robert Marini, assistant director and chief of surgical resources, serves as a lecturer for teaching labs in the Institute for Medical Engineering and Science.

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 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 Institute's veterinary staff. 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 review for investigators at the Whitehead Institute for Biomedical Research and for Broad Institute investigators who house animals at MIT.

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