

## 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 (formally the Division of Laboratory Animal Medicine) has evolved into a comprehensive laboratory animal program that provides a full range of veterinary and surgical support. Additionally, for the past 29 years DCM has benefitted from 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 the NIH. DCM's total personnel comprises 170 individuals. The personnel of the division for this past year included 89 animal technicians, 22 veterinary technical staff, five diagnostic laboratory personnel, six research personnel, 12 veterinary professional staff, eight postdoctoral trainees, 19 administrative and supervisory staff, and eight 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 now encompasses approximately 190,000 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 were completed this past year as part of a \$7 million project funded by the Institute and the NIH.

### Facility Management and Animal Care

The seventh edition of the updated *Laboratory Animals Users' Handbook* continues to be available online. The average daily census of laboratory animals decreased 7% during FY2017. 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 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, as well as providing hands-on services for routine mating, weaning, and genotyping. This past year the division started an initiative to reduce work-related injuries to our animal care staff. A consultant, in collaboration with employee teams, has analyzed work methods to determine ways to minimize injuries due to work-related activities.

The division continues to work closely with faculty in the McGovern Center 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. 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, mycoplasma, chlamydia, and

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, Drs. Suresh Muthupalani and Vasu Bakthavatchalu, provide histopathological interpretations.

## Research Activities

In FY2017 DCM faculty and scientific staff received NIH-funded grants (seven in total) supporting a range of studies. One project studied the role of *Helicobacter* as a tumor promoter in gastric cancer and examined the mechanisms by which it contributes to the malignant process. Other areas of study examined the microenvironment associated with Barrett's esophagus; 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 *Helicobacter pylori* infection and concurrent infection from parasites. Faculty and scientific staff examined the role of stress-induced reduction in *Lactobacillus reuteri* on colonic inflammation; 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 finally, studied viral ecology, epizootiology, and the evolution of influenza in animal and environmental reservoirs. Non-NIH funded projects focused on a smart a 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 faecalis* in nonhuman primates. In FY2017 total research expenditures were \$1.3 million.

FY2017 was the 29th 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 59 trainees; 45 have become diplomates of the American College of Laboratory Animal Medicine. An additional 16 DVMs, PhDs, or MDs completed postdoctoral fellowships sponsored by individual or program project grants. Many former trainees hold leadership positions in academia as well as in pharmaceutical and biotechnology companies.

This past year we added two Research/Clinical Veterinarians to our staff. Dr. Monika Burns, who completed her postdoctoral training in DCM, and Dr. Damodaran Annamalai, who completed comparative medicine postdoctoral training at the Oregon Health and Science University. Both are diplomates of the American College of Laboratory Animal Medicine. Dr. Jonathan Runstadler, who had a joint appointment in DCM and the Department of Biological Engineering, moved his laboratory to the Cummings School of Veterinary Medicine at Tufts University this past June where he assumed a faculty position as professor in the Department of Infectious Diseases and Global Health. We are recruiting for a replacement and are also seeking to replace one of our pathologists. In June, Dr. Vasudevan Bakthavatchalu relocated and took a position in industry.

On a national level, previous fellows have been elected to fill the presidency of three national organizations: Dr. Steve Niemi (director of the Office of Animal Resources at

Harvard University) for the American College of Laboratory Animal Medicine; Dr. Scott Perkins (professor and director of the Division of Laboratory Animal Medicine at Tufts Medical Center) for the American Association of Laboratory Animal Science (AALAS); and Dr. Kim Saunders (professor and director of the Department of Comparative Medicine at Oregon Health and Science University) for the AALAS. 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 FY2017, DCM had seven short-term trainees for periods ranging from eight to ten weeks. Many have, upon graduation, entered careers in biomedical research. Sixty-five veterinary students have participated in the summer training program during the past 10 years. Also, the division hosted 11 veterinary students who elected to spend two to four week externships at DCM during the school year.

### Academic Activities

DCM faculty and staff published 42 peer reviewed papers in 2016, three book chapters, and presented numerous research papers at national and international meetings. The third edition of the text *Laboratory Animal Medicine* with Drs. James G. Fox and Mark Whary as co-editors was published last year. DCM staff members wrote 11 of the 39 chapters for this text. Drs. Robert Marini and Fox are also 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 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. Fox is 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. He was also the recipient of the 2014 AALAS Pravin N. Bhatt Scientific Investigator Award. Dr. 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 Assessment and Accreditation of Laboratory Animal Care—an international accrediting body. Dr. Susan Erdman, assistant director of DCM and principal research scientist, serves on an ad hoc review committee for NIH. Dr. Suresh Muthupalani, chief of comparative pathology in DCM, also participates on an NIH ad hoc review committee.

DCM faculty and staff teach In vivo models: Principles and Practices (20.202), a graduate subject in the Department of Biological Engineering. Dr. Runstadler teaches Laboratory Fundamentals in Biological Engineering (20.109) and Molecular and Cellular Pathophysiology (20.450). Dr. 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 material, and information about CAC activities. In conjunction with CAC, DCM staff have developed an online training program plus 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 Institute for Biomedical Research and for Broad Institute investigators who house animals at MIT.

**James G. Fox**  
**Director**  
**Professor, Department of Biological Engineering**