

Storm shows need for mouse backup, but costs present challenges

In June 2001, pathologist David Roth was set to leave for a sabbatical in England, when Hurricane Allison swept into town. The massive storm interrupted not only his trip but also his career. As rainwater flooded into Roth's lab at the Baylor College of Medicine in Houston, his collection of genetically modified mice became a casualty of the storm. Valuable reagents were destroyed, too.

After assessing the research lost, Roth decided his best option was simply to start anew elsewhere. "If you lose everything, you're at least a couple of years behind," he says. The next year, he found a fresh start at the New York University (NYU) Langone Medical Center where he climbed the ranks to become director of the medical scientist training program.

Although they say that lightning doesn't strike twice, Roth now believes that hurricanes do. When Hurricane Sandy rolled in to the greater New York region on 29 October, the Langone Medical Center was one of the hardest hit among the 60 research institutions in areas declared disaster zones by the government. Even though Roth had moved on to work at the University of Pennsylvania in Philadelphia a year earlier, his former graduate student Marc Coussens was still working on some of Roth's mice at NYU.

As had happened a decade earlier, those mice were lost to the storm. But this time Roth was better prepared. He had previously provided mouse strains from all ongoing experiments to the Jackson Laboratory in Bar Harbor, Maine, making the mice more easily recoverable. Other scientists affected by Sandy, however, haven't been so fortunate. According to Jessica Guenzel, an NYU spokesperson, the university's Langone Medical Center, on the east side of Manhattan, lost an estimated 7,660 mouse cages as a result of Sandy.

Now, given the increased frequency with which extreme weather events seem to be hitting research facilities, the biomedical community has started to call for more awareness and funding to encourage and enable backup of genetically modified organisms, particularly when the organisms aren't shared among labs at different institutions.

Mouse trap

Unlike coverage for buildings, labs or equipment, insurance coverage for biological specimens is elusive. Insurance companies usually don't cover natural disasters; those damage costs shift to the US Federal Emergency Management Agency, and neither private insurance nor the government's disaster response body can replace the mice, enzymes or DNA that represent years of work and thousands of funding dollars. "If you're unable to tag a market value to those, insurance will exclude those as what they call a 'research product,'" explains Bruce Flynn, director of risk management and insurance services at the University of California–San Francisco.

Although they have no price tag, carefully engineered mice are often the most crucial part of a scientist's research. For example, the mice lost by Bruce Cronstein, codirector of NYU's Clinical and Translational Science Institute, had been genetically altered to lack the A_{2A}R adenosine receptor. His lab was using the mice to investigate whether adenosine affects the breakdown of bones that keep prostheses in place after hip and knee replacements.

Fortunately, Cronstein had shared his mice with researchers at other institutions. As such, he should fare better when rebuilding his colony, according to David Spector, director of research at the Cold Spring Harbor Laboratory (CSHL) in Long Island, New York. "When we provide strains for our colleagues we're thinking about science and doing experiments," he says. "But given this tragedy now, it's certainly a good idea to share."

Because facilities at CSHL were not severely damaged by Sandy, scientists there who had previously collaborated with NYU researchers are now looking into which mice they can return to Manhattan. However, the mice Cronstein and his NYU colleagues may receive from other researchers must be quarantined to ensure they don't have pathogens that could enter the lab, and any mice recovered from the few frozen embryo stocks NYU still has will require years of rebreeding to achieve proper genetic purity. Either way, it'll be a while before

it's back to research as usual for most mouse-based investigations.

Going forward, many researchers say they will become more proactive about freezing the embryos and sperm of genetically modified rodents as they develop new models. Such was the case after Hurricane Katrina, when there was an uptick in cryopreservation requests from across the country, notes Judy Hallet, director of the Transgenic Mouse Core Facility at the Purdue University Cancer Center in Lafayette, Indiana. "Every time something like this happens, researchers say, 'This could happen here,' and we'll get a little surge in new orders," she says. But it doesn't take long, Hallet notes, for people to forget.

Work in progress

Journals often ask scientists to preserve their mice, but usually only after the work is published. This benefits researchers who worry about being scooped, but it makes them susceptible to devastation in a natural disaster.

Following the loss of genetically altered animals in the aftermath of Hurricane Katrina, Tulane University has encouraged its scientists to use cryopreservation sooner and more frequently. According to Laura Levy, vice president for research at the New Orleans-based institution, faculty there now store many of their specimens on site and have improved support for their freezers, including an added carbon dioxide backup system that can maintain cold temperatures for several days without power.

Since losing his mice at Baylor, Roth has gone all out with backup measures. He keeps some embryos frozen on campus in addition to his reserves at the Jackson Labs. It presents a high cost, to be sure, and one that not everyone is certain is worth it. Cronstein, who regrets not freezing his mouse embryos, worries that dipping into his grant funding to pay for the Jackson Labs' services—which range from \$1,000 to \$4,000 for freezing and recovery per mouse line, along with a \$190 annual storage fee—might limit the opportunities to pursue other projects.

That's why Levy thinks the costs of backing up such important data should be its own budget line when researchers apply to grants. "It depends on the cost restrictions on your grant," she says, "but I think it's a legitimate cost and could be justified on many project budgets."

Susan Matthews

Corrected after print 22 March 2013.



Taken by storm: Better mouse backups needed.

Correction

In the December 2012 issue, the article entitled "Storm shows need for mouse backup, but costs present challenges" (*Nat. Med.* **18**, 1724, 2012) incorrectly referred to the price of freezing per embryo as \$1,000 to \$4,000, when in fact this cost refers to the price of freezing per mouse line. The error has been corrected in the HTML and PDF versions of the article.