Biology

Punching up the activity of genes

One of the most powerful ways to investigate the role of a new gene is to create an organism that lacks the gene's activity. With the help of X rays, toxic chemicals, and other substances that mutate genes, scientists have created fruit flies, mice, fish, and many other creatures that are missing the use of specific genes—so-called knockout animals. Yet knocking out a gene doesn't always reveal its duties, especially if the animal has redundant genes that can compensate.

Instead of eliminating a gene, investigators have now found a way to systematically increase the activity of random genes in fruit flies. Much like the knockout animals, these mutant flies are providing insight into the roles of both well-known and recently discovered genes. "You're suddenly seeing things from a different angle," says Pernille Rørth of the Carnegie Institution of Washington in Baltimore, Md.

Rørth and her colleagues create the mutant flies using a P element, a small piece of DNA that can jump at random to a new chromosomal location. The P element is linked to a promoter, a DNA sequence that can drive the activity of a nearby gene. "It activates whatever is next door to the element," says Rørth.

By mating flies that have such a P element at a random place in their genome with flies engineered to make the protein that turns on the promoter, the scientists create mutant offspring whose alterations can be attributed to the increased activity of a specific gene. This approach has already highlighted genes known to be involved in wing and eye development and pointed to novel genes that play a role in those tasks. These initial results appear in the March 6 DEVELOPMENT. —*J.T.*

Brain and blood vessels share cues

Researchers have unexpectedly found that as blood vessel cells grow, they sport a surface protein also displayed by developing brain cells. The finding suggests that this protein, known to guide embryonic brain cells as they form connections, may also influence the route taken by new blood vessels. Curiously, cancer cells also exhibit the protein, called neuropilin-1.

Michael Klagsbrun of Children's Hospital in Boston and his colleagues made these discoveries while searching for cell surface proteins that respond to vascular endothelial growth factor (VEGF), a protein that aids the formation of blood vessels. Many tumors, for example, make VEGF, which helps them establish a blood supply to fuel their continued growth.

The investigators found a new VEGF-binding surface protein on blood vessel cells, the third isolated so far. Surprisingly, it turned out to be neuropilin-1, which had been thought to operate primarily in the developing brain. Axons—the long extensions formed by growing brain cells—display neuropilin-1, which reacts to proteins called semaphorins or collapsins, which serve as axonal stop signs. When an axon reaches a brain region containing semaphorins, its tip collapses and the axon moves off in a different direction.

Finding neuropilin-1 on blood vessel cells raises many intriguing questions, such as whether VEGF uses it to guide the direction of vessel growth. Klagsbrun's group has found that blood vessel cells with neuropilin-1 and another VEGF receptor move more readily toward the growth factor than do cells with just the second receptor. They report their findings in the March 20 CELL.

Might the stop signs of the embryonic brain also work on blood vessels? "We're wondering if there are negative cues [for blood vessel growth] and if collapsin-semaphorin could be one of them," says Klagsbrun. He and his colleagues are also trying to understand why tumors both secrete VEGF and display its binding partner, neuropilin-1. Compounds that interfere with their joining may help fight cancer, speculates Klagsbrun. —*J.T*

Manatees win some and lose some

New estimates of long-term survival suggest that some populations of the endangered Florida manatee are growing. However, manatees on the state's populous southeastern coast are not increasing, and their survival appears precarious (SN: 3/29/97, p. 191).

Differing patterns of boat traffic and development may explain the variation between regions, report scientists in the April ECOLOGY. Florida's Crystal River and Blue Spring, areas with low speed limits for boats and little development, have growing manatee populations. Regions with weaker conservation measures have seen essentially no growth in manatee populations. "There's a lot of hope for these animals," says coauthor Thomas J. O'Shea, now of the U.S. Geological Survey in Fort Collins, Colo. Manatee-conscious management efforts like those in Crystal River and Blue Spring have paid off, he says, "but these numbers show that it's very easy to tip the balance in a negative way."

The researchers gleaned data from an ongoing project that uses photographs to identify individual manatees. Initially, scientists had used the photos only to learn how often manatee females had calves and how far the adults roamed.

By the mid-1990s, scientists had 20 years' of data documenting manatee births and individuals' survival or demise. Those data, analyzed with recently developed statistical techniques, allowed researchers at the USGS in Gainesville, Fla., and the National Center for Scientific Research in Montepellier, France, to calculate with greater accuracy the probability that an adult manatee would live from one year to the next.

Estimating adult survival rates is essential to calculating population growth rates for large, long-lived mammals, says O'Shea. "We haven't been able to do that very well for manatees up to this point." —*M.N.J.*

Where have all the flowers gone?

After 20 years of data collection and analysis, the World Conservation Union of Gland, Switzerland, has issued its first worldwide IUCN Red List of Threatened Plants. About 34,000 species—roughly one of every eight known species of ferns, flowering plants, and conifers and related plants—merit this dubious honor. The list contains 14 percent of the rose family, 32 percent of irises, and 32 percent of lilies.

"I think this is a very conservative estimate," says Bruce A. Stein of the Nature Conservancy, one of the U.S. partners in the effort. He worries that the list misses a significant number of imperiled plants because botanists have not yet studied the most remote corners of the world. For example, only 2.4 percent of Brazil's 56,215 species appear on the Red List, but Stein suspects that the percentage in trouble is much higher.

The plants that did make the list include such high-profile victims of ecological mishaps as the Florida torreya, a tree from the same family as the yew that produces the cancer drug taxol. Development slashed the torreya's habitat to one area along the Apalachicola River, where a fungus is now attacking the last stand. Wild goats have eaten most of another rarity, the San Clemente Island bush mallow, which literally clings to survival on cliff edges that the goats can't reach. Of the United States' approximately 16,000 plant species, 29 percent appear on the list. —*S.M.*

Henry Mills/Nature Conservancy

Schweinitz's sunflower, on the Red List, remains in fewer than 50 patches in North and South Carolina, mostly along roadsides, where protection is difficult.