# Muscle-bound cattle reveal meaty mutation


C. Pennington & D. Garrels/PNAS

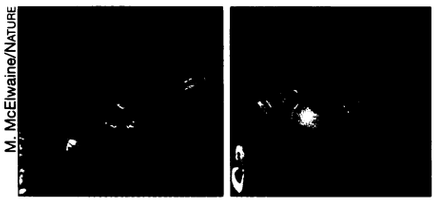
*A Belgian Blue.*

In their quests to beef up, Popeye ate spinach and Arnold Schwarzenegger pumped iron. Scientists have now found that some muscle-bound cattle, such as a hulking strain prized for its tender meat, acquire their brawn more easily: They have mutations in a gene that normally curtails muscle growth.

The story of this newfound gene started with some unexpectedly muscular mice and may end, researchers speculate, with the creation of meatier cattle, chickens, and pigs—and even with treatments for muscular dystrophies.

The gene prompting such hopes encodes myostatin, one of a large family of growth-regulating proteins. While looking for new members of that family, Se-Jin Lee of the Johns Hopkins Medical Institutions in Baltimore and his colleagues unearthed myostatin and found that it is made in mouse skeletal muscle.

The scientists then created a mouse strain with a deactivated myostatin gene. The mice develop into lumbering rodents, with two to three times more skeletal muscle mass than normal. "Picture a big grizzly bear walking on all fours," says Alexandra C. McPherron, a colleague of Lee.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*Shoulder muscle of normal (left) and mutant (right) mouse.*

Lee and McPherron, as well as two other research groups, have now identified mutations in the myostatin gene of the Belgian Blue, a celebrated strain of cattle bred in Belgium over the last few decades. Fed normally, Belgian Blues develop 20 to 30 percent more muscle than average cattle, and their meat is lower in fat and unusually tender.

In the September NATURE GENETICS, a European team led by Michel Georges of the University of Liège in Belgium reports that the animals are missing a small portion of their myostatin gene; the group had sought a mutation in Belgian Blues for more than a decade. In the September GENOME RESEARCH, Timothy P.L. Smith of the U.S. Department of Agriculture Meat Animal Research Center in Clay Center, Neb., and his colleagues in New Zealand report finding the same deletion in Belgian Blues. They also found a more subtle mutation of the gene in Piedmontese cattle, another unusually muscular strain.

Lee and McPherron's report, which includes the DNA sequence of the myostatin gene in 18 breeds of cattle, appears in the Nov. 11 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

While excessive musculature often has a downside—reduced fertility, for example—agricultural scientists still hope to beef up chickens and pigs by deactivating the myostatin gene or limiting its activity, says Lee. Moreover, since the gene remains active in adult muscles, researchers plan to explore whether inhibiting myostatin might benefit people with muscular dystrophies or the muscle-wasting often caused by cancer and AIDS.

The discovery of myostatin may even revive an old mystery. "How does an organ know its correct size?" asks Steven L. McKnight of the University of Texas Southwestern Medical Center at Dallas. In the 1960s, scientists proposed that organ-specific molecules dubbed chalones regulate growth, notes McKnight. Myostatin "matches the expectations of these chalones," he says. —*J. Travis*

# Unusual fish threat afloat in the Atlantic

Heavily stocked with cod, haddock, and other cold-water fish, Georges Bank in the Northwest Atlantic Ocean was for centuries a magnet for fishermen. Now closed because of overfishing, the steep underwater mountain pulls in researchers studying this important ecosystem's recovery and its vulnerability to climate change.

In 1994, an unusual phenomenon resurfaced from that work. Clear, gelatinous creatures that normally live as tiny, tentacled stalks on the ocean floor were filling up the nets used to sample the waters. "We noticed nets were coming up slimy," recalls Barbara K. Sullivan of the University of Rhode Island Graduate School of Oceanography in Narragansett.

An obscure report from 1915 also described large numbers of the organisms, which turned out to be hydroids, cousins of jellyfish and anemones.

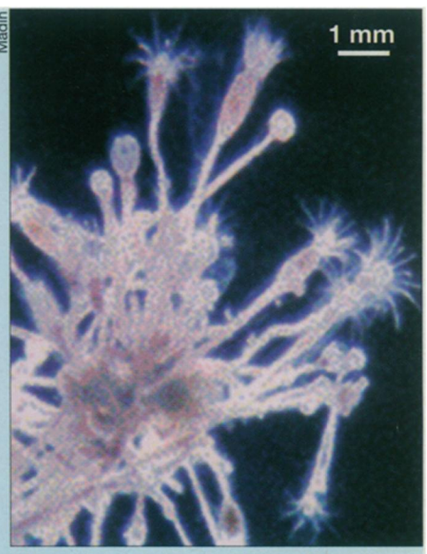
From their studies of the hydroids at Georges Bank and in the lab, reported at several forums this fall, Sullivan and her colleagues are amassing evidence that the floating creatures (*Clytia gracilis*) are unrecognized, yet major players in the Georges Bank food web. Hydroids may be competing with cod and haddock larvae by consuming significant amounts of minute crustaceans known as copepods, which the fish also eat.

The hydroids, with their stinging tentacles, prey directly on fish larvae, too. Sullivan reports that in large tanks, hydroids at the densities found in Georges Bank can reduce the survival of fish larvae by 50 percent.

The floating forms of hydroids may account for 90 percent of the planktonic biomass pulled up in sampling nets, says Laurence P. Madin of the Woods Hole (Mass.) Oceanographic Institution, one of Sullivan's collaborators. "Normally these things wouldn't be found floating in the water at all," he adds.

"Biologically, it's interesting because it's something you don't suspect is going on," says Peter Auster, a fish ecologist at the University of Connecticut in Groton. Researchers point to evidence that the ocean turbulence around Georges Bank is a big factor in keeping the hydroids afloat.

They've also floated another possibility: Commercial trawling for fish, which scours the seafloor habitat (SN: 10/26/96, p. 268), may have stirred up the hydroids. "Most of Georges Bank prior to the recent closing was trawled extensively," says Madin. "It seems like a reasonable hypothesis, although it may only be part of what's happening." —*C. Mlot*



Madin

*The tentacled, floating form of the hydroid is about the size of an eraser head. These gelatinous sea creatures typically live in a colony anchored to rocks or sea grasses. The waters of Georges Bank are thick with the unusual floating forms, which may be competing with and even preying on fish larvae.*