

Mustard's Mini-Me

A WAY TO SWITCH PLANTS' REPRODUCTIVE PROGRAMS COULD HELP FARMERS.

The shipments of seeds that farms rely on at the beginning of each growing season could soon be a relic of the past. Scientists have discovered how to coax plants to clone themselves by altering their reproductive methods.

Most plants—including major food crops like corn—create seeds by mixing genetic material from male and female cells. Offspring are unique, an unfortunate fact for farmers who want every generation of plants to have the same optimized characteristics. To ensure that sameness, farmers buy quality-controlled seeds rather than rely on the plants' hit-or-miss approach. But many wild plants reproduce in a different way, called apomixis. They produce seeds that, instead of having a random mix of genes, contain an exact copy of their own genome.

HHMI international research scholar Jean-Philippe Vielle-Calzada wanted to know which genes and molecules distinguished apomictic plants from their sexually-reproducing relatives, and whether one type of plant could be coaxed to behave like the other. He focused his research on *Arabidopsis thaliana*, a flowering mustard plant that reproduces sexually.

Vielle-Calzada's lab group, at the Center for Research and Advanced Studies of the National Polytechnic Institute in Mexico, screened *Arabidopsis* for genes with high activity in the reproductive

structures, or ovules, of the plant. One gene jumped out: *Argonaute 9*, one of ten *Argonaute* genes in the mustard plant. While *Argonaute* proteins control gene expression across the whole plant, *Argonaute 9* is only found in the ovules, the researchers found.

When they turned off the gene, the researchers were in for a surprise. The *Arabidopsis* ovules started producing cells that are precursors

to seeds and usually contain a mix of genes. But these instead had clones of their own genetic material—just as apomictic plants do.

"For the first time, we have a hint of where to look to induce this phenomenon in sexual plants," says Vielle-Calzada.

The scientists hypothesize that turning off *Argonaute 9* in other plants will have the same effect. They continue to study why this gene so drastically changes the reproduction program of *Arabidopsis* and they want to know what other molecules are involved—for example, what genes *Argonaute 9* helps to repress. ■ —SARAH C.P. WILLIAMS



Arabidopsis ovules show multiple reproductive precursor cells when one gene is blocked.

IN BRIEF

diabetes. The results appear in the May 20, 2010, issue of *PLoS One*.

BROKEN-HEARTED FISH

Zebrafish have the unusual ability to repair their own hearts, something doctors treating humans would love to harness. New research brings that goal one step closer to reality, with cellular details revealing just how zebrafish manage to regenerate heart muscle.

HHMI early career scientist Kenneth Poss of Duke University Medical Center stimulated zebrafish heart regeneration by cutting off part of the animal's ventricle—one chamber of the heart. Then Poss and his collaborators tracked the activity of cells over time.

They discovered that some heart muscle cells near the injury began expressing a gene called *gata4*. When this gene is turned on, heart cells begin to divide, building a new wall of heart muscle. Within two to four weeks, the researchers observed that new wall was functioning in sync with the rest of the heart.

The results, published March 25, 2010, in *Nature*, were similar even after they blocked regeneration to allow scar tissue

to form in the injured heart, as would happen in a damaged human heart. After the regenerative block was released, new heart muscle built up around the scar. The results could help scientists studying human heart damage develop new treatments.

NEANDERTAL NUCLEOTIDES

The heavily built hominids that roamed the planet until 30,000 years ago are more human—when it comes to their genomes—than scientists once thought. To come to this conclusion, HHMI investigator Gregory J. Hannon of Cold Spring Harbor Laboratory used a new genetic sequencing technology to analyze DNA from a 49,000-year-old Neandertal bone flake found in a Spanish cave.

Since the ancient bone material was crawling with bacterial and fungal contaminants from the cave, Hannon and his collaborators relied on a novel technology called "DNA capture and resequencing," which allowed them to isolate only DNA that encodes proteins. They focused on 14,000 genes and compared their sequences with the same genes in humans. Only 88 genes produced proteins that differed between Neandertals and humans,

the team reported May 7, 2010, in *Science*. Of those varying proteins, it's not yet known whether any of the sequence differences leads to changes in function.

In the same issue of *Science*, a large international team including HHMI investigator Evan Eichler, at the University of Washington, published the complete 3-billion-base-pair genome of a different Neandertal individual from bones found in Croatia. That study also found that relatively few changes have been incorporated into the human genome since humans diverged from the Neandertals.

TARGETING BRAIN TUMORS

Researchers have revealed a weak spot in one of the deadliest forms of brain cancer. Turning off a pathway that's active in many glioblastoma tumor cells triggers the cells to die.

In 2002, the University of Massachusetts lab group, led by HHMI investigator Michael R. Green, discovered a cellular survival factor called ATF5 that's overly activated in many cancerous cells. The protein is an attractive drug target for glioblastomas, because it is often abundant in brain tumors but is not produced in healthy