Biomedicine

Kathy A. Fackelmann reports from Clearwater Beach, Fla., at the American Heart Association's annual science writers' seminar

Mutant gene causes heart malformations

In the very early days of development, some cells in the human embryo migrate to the right and others travel to the left. Those that end up on the right are destined to become organs such as the liver. Those that move to the left will specialize to become the heart, stomach, and other left-sided organs.

For cells that will become the heart, reaching the proper position in the body is critical. If cells take a wrong turn, the heart will develop abnormally. Babies born with such cardiac misplacements often die or require extensive surgery.

But what gives primitive cells a road map to their proper destination? Researchers at Yale University School of Medicine believe that a gene and its protein product may act as traffic cops, directing cells that will become heart cells to swing to the left.

Donna Rounds, Martina Brueckner, and their co-workers have been studying a mutant gene that causes a misplacement of the heart in mice. Their research suggests this gene lies along a particular region of mouse chromosome 12. The Yale team is currently trying to isolate and analyze that mutant mouse gene.

At the same time, the Yale group is trying to unravel the human side of the heart-defect story. They suspect the human version of this gene lies on chromosome 14. The researchers are now in the process of studying families that have a history of this heart condition, Rounds says.

Once the researchers home in on the human gene, they can begin the process of analyzing its protein, she says. This protein may somehow signal embryonic cells to turn left instead of right, she speculates.

Studies such as this could help answer questions about the first few weeks of embryonic life and perhaps give scientists clues to uncovering the secrets of other genes associated with congenital heart disease, the researchers add.

Heartbeat syndrome often overlooked

A heart-rhythm abnormality once thought quite rare may actually be a leading cause of unexpected death in children and young adults, according to one researcher.

The Long QT Syndrome gets its name from the prolonged QT interval that shows up on an electrocardiogram, a test that records the heart's electrical impulses. Many doctors, including cardiologists, miss or never see that clue to the lethal condition, says G. Michael Vincent of the University of Utah School of Medicine in Salt Lake City.

Typically, the only symptom of the abnormality is a very fast and irregular heartbeat that surfaces during times of excitement or physical exertion. Often, children or adults with this rapid heartbeat will lose consciousness. Sometimes, the heart regains a normal rhythm on its own. In other cases, the erratic heartbeat persists, causing death.

The condition is inherited — often people with the syndrome have a family history of unexplained, sudden cardiac death. Recently, researchers identified a genetic marker for the condition, Vincent notes.

When people have a very obviously prolonged QT segment on an electrocardiogram and a family history of sudden cardiac death, the diagnosis proves relatively straightforward, Vincent says. However, many with this syndrome have heart function that appears completely normal during an electrocardiogram taken at rest. Often, abnormal electrocardiogram readings surface only during physical exertion, he explains.

The disorder need not be fatal, Vincent stresses. He points out that a variety of medications and treatments now exist for people with Long QT Syndrome. For example, beta-blocker drugs often can prevent the onset of a dangerously irregular heart rhythm, he says.

Environment

Reassessing pesticides' value

Farmers worldwide invest some $2.4 billion annually in pesticides to protect rice — more than growers spend on pest-control chemicals for any other crop. Moreover, rice pesticides "are among the most toxic agrochemicals," according to the Philippines-based International Rice Research Institute (IRRI). And that's important, a new IRRI study argues, because rice farmers waste much of their pesticide investments. Moreover, after factoring the health costs of pesticides into the economic analyses of rice production, "the net benefits of pesticide use in the areas studied were negative," the study concludes.

The new 100-page analysis reviews and synthesizes the findings of a host of published studies and field trials on rice production and associated pesticide-related health effects. IRRI's report indicates that both farmers and the rice-research community exaggerate the threat that rice pests pose — while largely ignoring the costs, both to health and the pocketbook, of pesticide application.

For instance, IRRI cites one recent Philippine survey that found 31 percent of rice farmers thought all insects are pests, and that 80 percent of surveyed growers spray pesticides when they see what they deem to be pests. Moreover, though these farmers have largely switched in recent years to new pest-resistant cultivars, they "spray as much as they did with nonresistant varieties."

Indeed, some 26 percent of surveyed growers said they sprayed more. Ironically, though Philippine rice growers expected to lose more than 35 percent of untreated crops to insects and other pests — levels typical of 20 or more years ago — IRRI cites experiments and trials that demonstrate losses associated with unsprayed, resistant cultivars typically average only 5 to 10 percent annually.

When it balanced the value of crops against the costs of applying pesticides and of treating chemical handlers for pesticide-related health effects, IRRI found that "natural pest control" — which it described as conserving natural predators of rice pests, usually by avoiding the use of pesticides — "consistently has the highest net benefits." In most years, IRRI calculates, the practice can return almost three times the benefit of spraying fields with the aim of achieving complete pest control.

These findings tend to run counter to those in a major study of pesticides' value to U.S. fruit and vegetable growers. Published last September by the Park Ridge, Ill.-based American Farm Bureau Research Federation, this study found that even a 50 percent cut in pesticide use on nine "minor" crops — potatoes, oranges, tomatoes, grapes, lettuce, apples, onions, sweet corn, and peaches — would cut yields dramatically and raise costs to growers and consumers.

Halving pesticide use would cut yields roughly 20 percent for processed vegetables and some 42 percent for fresh vegetables, the Farm Bureau said. Estimates of fruit losses tended to be even higher — from a 28 percent reduction in oranges to a 59 percent fall in peach yields. Additional drawbacks of reducing pesticide use would include higher labor costs, higher food-processing costs, seasonal gaps in the supply of some fruits and vegetables, and the need to plant more acres, according to Ronald D. Knutson, director of the Agricultural and Food Policy Center at Texas A&M University in College Station, who led this analysis.

The U.S. study did not account for health effects in its analyses. But some have cited concerns over cancer (SN: 7/3/93, p.4&10) and other human-health risks (SN: 1/22/94, p.56). The Farm Bureau asserted such health considerations are driving calls to cut U.S. pesticide use. "Chemical manufacturers, faced with expensive tests to label products for individual commodity use, have generally responded by dropping labels for many low-use commodities" such as produce, the bureau also reports.