Behavior

The evolution of family homicide

Evolutionary theories of social behavior — sometimes lumped under the heading of sociobiology — maintain that the appetites, aversions, motives, emotions and thinking patterns of humans, as well as other species, are shaped over the millennia to produce "nepotistic" social action. In other words, individual members of a species engage in typical actions to promote the survival and reproductive success of genetic relatives. Genetic relatedness is said to be linked to enhanced cooperation and reduced conflict between individuals.

How, then, do evolutionary theorists explain the tragic occurrence of murders within families? Recent statistical analyses of family homicides in the United States, Canada and elsewhere do, in fact, support evolutionary models of human behavior, say psychologists Martin Daly and Margo Wilson of McMaster University in Hamilton, Ontario.

Most family homicides involve one spouse killing the other, usually fueled by male attempts to control female sexual and reproductive behavior, the researchers report in the Oct. 28 SCIENCE. In the savanna and tropical environments that fostered the nonindustrial societies typical of most of human evolution, male competition for fertile women and the guarding of mates served useful purposes, particularly to ensure accurate paternity, Daly and Wilson contend.

That behavioral tendency can go awry in modern society, however. Most North American spouse-killers say the husband's concern with his wife's fidelity or her intention to end the marriage led him to initiate the violence, the researchers note. "Men strive to control women by various means and with variable success, while women strive to resist coercion and maintain their choices," they say. "There is brinkmanship in any such contest, and homicides by spouses of either sex may be considered the slips in this dangerous game."

Evolutionary influences also contribute to parent-child murders, Daly and Wilson add. The great majority of infanticide cases in nonindustrial societies reflect three instances in which parents withdraw affection from newborns: doubt that the child is the parent's own, conviction that the child is weak and unlikely to produce offspring as an adult, and external pressures (such as food scarcity and overburdening demands of older siblings) limiting a child's survival chances.

People apparently come to cherish their children increasingly over the years as the child's reproductive chances increase, the researchers say. Thus, parents in modern societies should be less likely to kill offspring nearer to maturity (and reproductive success) and more likely to kill offspring in the first year after birth. Furthermore, because children impose more restrictions on mothers, infanticide should be more frequent among women. Canadian data on 845 child homicide victims between 1974 and 1983 bear out these predictions, Daly and Wilson assert.

An emphasis on genetic relatedness also aligns with the sad fact that children in stepparent families are disproportionately abused and killed in industrial nations, the investigators say. Data from the United States and Canada show the risks of homicide are greatest for youngsters 2 years old and younger. Abusive stepparents usually spare their own children in the same household, Daly and Wilson add.

Most stepparents are supportive, they acknowledge. "The fact remains that step-relationships lack the deep commonality of interest of the natural parent-offspring relationship, and feelings of affection and commitment are correspondingly shallower. Differential rates of violence are one result."

The psychologists conclude that homicide — in or out of the family — is a rare, extreme outcome of social motives and self-interests that have been selected through evolution to produce adaptive behavior on average, not in all situations.

Biology

Sowing gene-altered antifungal bacteria

Wheat take-all disease is aptly named. The take-all fungus invades the roots of wheat plants, causing a crop-devastating dry rot that costs U.S. farmers millions of dollars each year. With no chemical fungicides approved against take-all and no resistant varieties of wheat available, farmers in take-all areas must rotate their wheat crops with other plants that don't support the fungus — or hope that a natural species of fungus-killing bacteria makes its home in their fields.

Scientists experimenting with genetically engineered bacteria hope to change that scenario. Researchers at Monsanto Co. in St. Louis have taken a naturally occurring, soil-dwelling species of the bacterium *Pseudomonas* that produces a chemical related to the antifungal phenazine, and added to its genetic material two genes that make the microbes easy to track in the soil. They plan to coat wheat seeds with the bacteria and plant them in test plots at Clemson (S.C.) University.

The Environmental Protection Agency recently granted approval for the bacterial release, based in part on data from ongoing experiments with similar gene-altered bacteria at Clemson. Scientists designed those experiments to see how far engineered bacteria might move from the test site, how long they would survive and whether they would transfer their genetic material to other bacteria. The bacteria, which had no fungicidal activity, were labeled with "marker genes" that made them easy to find in soil.

According to Monsanto's David Drahos, results from those first experiments show that gene transfer with other bacteria "does not take place at all." And with the exception of "one guy that got between 7 and 14 inches," all the bacteria stayed within 7 inches of where they were planted.

In the new experiments, scientists will see whether wheat plants that grow from seeds coated with the fungicide-producing *Pseudomonas* prove resistant to take-all disease. Since the fungicidal bacteria have had marker genes inserted, it should be easy to correlate plant survival with the presence or absence of the fungus-killing bacteria. If the technique proves successful, researchers hope to engineer the bacteria to produce even more of the fungus-killing chemical and to apply the technique to other soil-borne pests.

Scientists produce poison-proof plants

Genetic engineering is not for bacteria alone. Plants, too, can be genetically altered to resist chemical herbicides that fail to discriminate well between weeds and crops. In a handful of cases so far, scientists have managed to gene-alter plants to make them resistant to specific herbicides (SN: 5/28/88, p.348). In almost all of these cases, researchers made plants resistant by altering the production of "target" molecules to which herbicides normally bind in plants.

Now agricultural gene jockeys report engineering tobacco plants resistant to bromoxynil — an herbicide that normally kills broad-leaved plants. But rather than altering the plants' target molecules, the scientists inserted into the tobacco plants a "detoxifying" gene — taken from a soil bacterium — that codes for an enzyme, nitrilase, that breaks down bromoxynil. The transgenic plants produced measurable quantities of the enzyme and survived being doused with the herbicide, the researchers report in the Oct. 21 SCIENCE. Progeny of the plants showed resistance as well.

"These [progeny] plants expressing nitrilase grow, flower and set seed normally, even when sprayed with concentrations of bromoxynil eight-fold higher than the highest field rate normally used," report David M. Stalker, Kevin E. McBride and Lorraine D. Malyj of Calgene, Inc., a Davis, Calif.-based biotechnology company, where similar work is underway with cotton and tomatoes.