Biomedicine

Get the infection, not the disease

Federal scientists are taking a new tack in the battle against a parasitic worm common in the developing world: Rather than preventing infection, a new vaccine protects against damage caused by the worm. In an animal study, it dramatically reduced the scar tissue caused by schistosomiasis, an infection afflicting more than 200 million people worldwide.

"The pathology we see with this disease comes from the type of immune response that is mounted," says Thomas A. Wynn of the National Institute of Allergy and Infectious Diseases (NIAID) in Bethesda, Md., one of the study's authors. "We can tell the body to mount a different type of immune response that is more protective."

People become infected with schistosomiasis-causing worms by wading or swimming in infested waters. The worms bore through skin, enter the bloodstream and make their way to the blood vessels connecting the liver and the intestines. Five weeks after infection, the worms mate and lay eggs. Most of the eggs cross into the intestine and are excreted; returned to the water supply, the eggs infect snails which serve as a reservoir for reinfection.

Schistosomiasis results from the portion of these eggs that aren't excreted and lodge in the liver. There, the immune system recognizes them as a foreign invader, forming scar tissue that contains the eggs in a capsule called a granuloma. Chronic infection by the worms provokes continual formation of scar tissue, leading to high blood pressure. The body responds by creating new, fragile and leaky blood vessels that "cause people to bleed to death," says Wynn.

Vaccines designed to prevent the infection fail to protect against repeated infections. But last year, the NIAID researchers reported that they could treat mice with a vaccine that trained the immune system to attack the parasite's eggs without forming large granulomas. This vaccine of worm eggs and an inflammation-fighting molecule known as IL-12 worked with mice infected intravenously (SN: 8/20/94, p.120). Now the researchers have vaccinated mice and then infected them with the worm through the natural route of skin exposure. Such animals again developed smaller granulomas than untreated mice, Wynn's team reports in the Aug. 17 NATURE.

"The animals are still getting infected," says Wynn. "They still have the same number of worms. But what we have done has affected how much damage the eggs will cause."

The researchers also found that IL-12 boosts the potency of anti-infection vaccines.

The elderly still get inappropriate drugs

The good news is that the number of elderly people getting inappropriate prescription medicines has dropped since 1987. The bad news is that too many older Americans still take medications that may do more harm than good.

A July 1995 report by the General Accounting Office—the investigatory arm of Congress—now indicates that the proportion of noninstitutionalized elderly Americans receiving at least one of 20 drugs considered inappropriate for their age group dropped from 25 percent in 1987 to 17.5 percent in 1992.

Older people in general take more medications, leaving them particularly vulnerable to potentially lethal effects of inappropriate medication. And, with age, livers and kidneys begin to lose the ability to process and eliminate drugs.

The report suggests that managed care may help prevent the problem by centralizing care through a primary care physician. While it recommends better pharmacology training for physicians, the report also concludes that to prevent drug interactions, patients must inform their doctors of all medications they are taking.

Nutrition

Got them low-fat, polyunsaturated blues

Some people joke that the best therapy in the world can be found in their refrigerator. Nothing seems to raise their spirits better than high-fat, high-carbohydrate foods.

No one really knows if the immediate solace provided by a pint of chocolate chip ice cream has any biochemical basis. But some scientists propose that a deficiency of a particular kind of polyunsaturated fat may contribute to depression.

Previous studies have linked low-cholesterol diets with increased rates of depression and suicide (SN: 03/11/95, p.157). Cholesterol is an important component in brain-cell membranes, and altering the composition of these membranes may in turn affect receptors for serotonin, a chemical messenger that is deficient in many people suffering from depression.

A study conducted in Finland, however, reached the opposite conclusion, and still another found no association at all between cholesterol and depression.

Another contradiction arose when connecting these findings to heart disease. If low cholesterol contributes to both depression and a lower risk of heart disease, then it follows that depression should go hand in hand with lower rates of heart disease. In fact, the opposite is usually true.

The key to explaining this conundrum may lie not in the cholesterol but in docosahexaenoic acid (DHA)—a long-chain, omega-3 polyunsaturated fat (SN: 04/15/89, p.237), says Joseph R. Hibbeln of the National Institute of Alcohol Abuse and Alcoholism in Rockville, Md. Hibbeln and colleague Norman Salem Jr. review previous work in the field and present their theory in the July AMERICAN JOURNAL OF CLINICAL NUTRITION.

In some of the earlier studies, subjects were encouraged to lower the cholesterol content of their diet by lowering their overall fat intake. This also may have lowered levels of DHA, which, like cholesterol, is an important component of brain-cell membranes.

Because about 50 percent of the fatty acids in these membranes cannot be made by the body, Hibbeln explains, membrane composition strongly depends on the diet.

DHA and its fatty acid precursors come mainly from seafood. In the Finnish cholesterol study, participants lowered their fat intake by consuming more fish, while in other studies, people tended to replace saturated fats with polyunsaturated plant fats—corn oil, for example—which the body cannot make into DHA. This difference, the researchers suggest, may account for the conflicting results.

Jay Kaplan of the Bowman Gray School of Medicine at Wake Forest University in Winston-Salem, N.C., studies the effect of low cholesterol on aggression in monkeys as an analogue to its effects on human behavior. He expresses some skepticism about Hibbeln and Salem's theory, arguing that it doesn't explain results from studies in which cholesterol was reduced with drugs, not by changes in diet. Kaplan's own work still points to cholesterol as the culprit.

But Hibbeln proposes an explanation for those cases too. "Cholesterol-lowering drugs bind fats and interfere with fat absorption in the gut," he says. "They may be interfering with the absorption of essential fatty acids as well as absorption of cholesterol." Other drugs have a secondary effect of inhibiting the synthesis of DHA from its precursor fatty acids, which in turn could reduce DHA levels, he says.

The theory does not rule out the contribution of other factors to depression, such as stress, personality, and psychological disorders, the researchers say, but at least it "opens up the question" of the role of polyunsaturated fats. The theory also doesn't offer any dietary recommendations, Hibbeln says—and still needs to be backed up with experimental evidence.

It may be some time before anyone recommends eating a piece of fish instead of ice cream as a cure for the blues.