Inside broccoli: A weapon against cancer

From presidents to preschoolers, many people who regard broccoli with loathing may soon reconsider. New evidence indicates that the familiar green vegetable contains a powerful weapon against cancer-causing substances.

Researchers at the Johns Hopkins School of Medicine in Baltimore have identified a chemical in broccoli, called sulforaphane, that stimulates animal and human cells to produce cancer-fighting enzymes. "Sulforaphane is possibly the most potent protective agent yet discovered," says Paul Talalay, a molecular pharmacologist. Talalay and his co-workers report their finding in the March 14 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Researchers have suspected since the mid-1970s that some vegetables confer resistance to cancer, especially the cruciferous vegetables, such as broccoli, brussels sprouts and cabbage. Although previous studies uncovered a number of chemicals thought responsible for broccoli's protective effect, none appears more powerful than sulforaphane, Talalay says.

Vegetables contain chemicals that cause human cells to manufacture many different enzymes. Not all of these enzymes behave good-naturedly, however. One group, called phase I enzymes, converts innocuous substances that enter the body into oxidants, reactive molecules that can damage a cell's DNA and thereby increase the risk of cancer. To counteract this threat, cells can also make phase II enzymes, which disarm oxidants before they cause any genetic damage.

Many vegetables stimulate the production of both phase I and phase II enzymes. Others provoke the cells to create only the more beneficial, phase II variety. Talalay's group concentrated on these foods.

The researchers developed a quick and powerful test to identify foods that stimulate only the protective class of enzymes. The test involves adding vegetable extracts to cultured rat and human cells.

Since broccoli has long been suspected to contain a chemoprotectant, they tested it first. "We asked the question: What in broccoli is conferring protection against cancer?" Talalay says. "Now that gave us great anxiety, because we thought we might discover there were 15 things that were doing this."

However, the team found that only one of the compounds isolated from broccoli could stimulate the production of phase II enzymes. They later identified it as sulforaphane.

Using the new test, Talalay's group identified additional protective veggies, including brussels sprouts and kale. Peppers, potatoes and tomatoes, among others, had little or no effect on phase II enzymes. The researchers also found that the sulforaphane in broccoli appears to remain intact when the vegetable is microwaved; they haven't tried other cooking methods yet.

Although some scientists argue that phase I enzymes may prevent certain cancers better than phase II enzymes, most agree that vegetables that stimulate the production of phase II enzymes would protect cells against a wider variety of carcinogens. "Most experts in the field would agree that phase II enzymes should be a little, if not a lot, better than phase I enzymes [against oxidants]. You just don't want to give potentially toxic substances any chance of outsmarting you," explains Jon J. Michnovicz of the Institute for Hormone Research in New York City.

Researchers have not yet shown that sulforaphane directly blocks tumor formation in either laboratory animals or humans, and proving that may take some time, Talalay says. In the meantime, however, the new findings provide a scientific basis for modifying the diet to include more vegetables like broccoli, he says.

Does this recommendation extend to President Bush? "Broccoli should protect both Republicans and Democrats equally well," Talalay replies. — *M. Stroh*

Type A: From the nursery to the boardroom

Moms with certain Type A characteristics are more likely to deliver newborns with intense behavioral styles, according to a new study.

Previous investigations have shown that Type A parents tend to have teenagers who are competitive and hard-driving (SN: 8/31/85, p.133), a pattern that persists into adulthood and may increase the risk of heart disease. While many psychologists say teens learn their Type A tendencies from Mom and Dad, the new study suggests that certain aspects of the Type A drive may surface at birth — long before parenting styles come into play.

Pediatrician Steven J. Parker of Boston City Hospital and David E. Barrett of Clemson (S.C.) University studied 72 healthy, middle-class women who were pregnant with their first child. Four weeks before delivery, the women completed the Jenkins Activity Survey (JAS), which identifies Type A traits such as competitiveness and impatience. Although the test is designed to elicit Type A temperament regardless of employment status, nearly all the pregnant women in the study worked at jobs outside the home.

The team discovered that 53 percent of the volunteers fit the Type A criteria, as measured by the job involvement scale, one component of the JAS. These women tended to get highly involved in tasks both at home and at the office, Parker says. For example, women said they frequently finished other people's sentences in order to speed the conversation and described themselves as people who enjoy competition on the job or in outside activities.

Hard-driving women tended to deliver newborns who responded vigorously to their environment, Parker says. All babies born to women in the study were given a standardized behavioral test within 48 hours of birth. Babies of Type A mothers cried significantly more during the test, the team reports in the March PEDIATRICS. On the other hand, these newborns did not appear crankier or more difficult to handle than infants born to the more laid-back, Type B mothers, Parker says.

Does a baby inherit a certain fervor for life? Parker admits that his study leads to such speculation, but he says there are other possible explanations for the group's finding. For example, Type A mothers may churn out stress hormones that affect the fetus during pregnancy and perhaps influence the newborn's behavior as well, he says.

Once a newborn leaves the hospital and goes home, the story becomes more complicated. Type A parents may teach infants and children their hard-driving ways, Parker admits.

Parker notes that the term Type A was originally used to describe the temperament of certain middle-aged men. Nobody really knows whether Type A traits adequately describe the behavior of women, he adds.

Meyer Friedman, who studies Type A traits at the University of California, San Francisco, says the JAS is an "inadequate" measure of Type A behavior, a problem that may have skewed the study's results. And psychologist Karen Matthews of the University of Pittsburgh notes that the researchers failed to link overall Type A behavior with infant temperament. Only women who were very committed to their work had more intense newborns, she says.

Despite the uncertainties, Parker believes the study does provide parents with some practical tips.

"Babies are born with different temperaments," he says. While Type A moms may be more likely to deliver highly animated babies, some will find that their babies fit the slower-moving, Type B profile. And some Type B moms may find it hard to keep up with a ball-of-fire youngster. For harried parents everywhere, Parker offers some laissez-faire advice: Respect your baby's behavioral style. — *K.A. Fackelmann*