Biomedicine

Double-duty proteins

Consider the lens — a sort of biological monocle perfectly suspended inside the eye. It has no blood vessels, no nerves, not even any genetic material—yet it lives and grows for as long as we do, and in order to bend light as efficiently as possible, it has the most concentrated protein content of any tissue in the body. According to a recent report, there may be more to that protein than meets the eye.

Graeme Wistow and Joram Piatigorsky, of the National Eye Institute in Bethesda, Md., report in the June 19 SCIENCE that certain proteins called crystallins, which are common in the lens and were heretofore regarded as simply structural, are actually enzymes or are closely related to enzymes. They confirmed this role, which had been suggested by previous, preliminary research, by comparing the amino acid sequences of the crystallins with the sequences found in several enzymes. The high degree of similarity leads them to suggest that there is an evolutionary advantage to materials that can do "double duty," at least in highly specialized parts of the body such as the lens.

The cells that make up a lens are indeed specialized. In order to be transparent, they lose all their internal structures early in embryo development, leaving them unable to replicate or to produce their own energy. Crystallins, however, which make up as much as 60 percent of the vertebrate lens, are sturdy enough to last a lifetime without replication, while as enzymes they are capable of converting sugars into energy for the lens. Piatigorsky told SCIENCE NEWS that such a perfect overlap of chores may be one of the best examples of "evolutionary pragmatism," in which a single gene may code for proteins that perform a number of functions.

"In the evolution of the lens, nature took a very practical route," he says. "It took the genes and proteins that were already around," and used them to fill both structural and functional needs.

Safe supinity

Need an excuse for not getting up in the morning? Why not tell your boss you've got a bad case of circadian platelet aggregability?

In recent years scientists have confirmed that heart attacks are more likely to strike in the morning than at any other time of day, but nobody's been able to explain the phenomenon. Now there is evidence that increased platelet activity — apparently associated with getting up in the morning—may be the cause of these early-morning attacks.

Geoffrey H. Tofler and his colleagues at Harvard Medical School in Boston report in the June 11 NEW ENGLAND JOURNAL OF MEDICINE that platelets — normally part of the body's blood-clotting machinery—show an increased tendency to aggregate, or stick to each other, in the hours just after a person gets out of bed in the morning. The increase is not seen in people who stay in bed. While a definitive causal relationship has yet to be shown, the scientists hypothesize that activation of the sympathetic nervous system, associated with arising and with morning activities, may in turn stimulate platelet aggregability. If a clump of platelets then becomes lodged in an artery that normally supplies oxygen to the heart, they say, the blockage could precipitate a heart attack.

What's more, the authors note, the risk of getting out of bed may be even greater for people with a history of coronary artery disease and for people who smoke, since both factors have been shown to cause a general increase in platelet aggregability. While the discovery may not serve as a medical excuse for people too lazy to get out of bed, the researchers suggest it may lead to some early-morning dosage adjustments for patients taking anticoagulant drugs.

Food Science

Why carrots may reduce cholesterol

Bile acids, which help digest fats in the diet, are made from cholesterol. Normally, the body reuses bile acids over and over. But a small percentage does end up being lost, and when it is, the body must draw upon its cholesterol to synthesize more. For several years scientists have known that certain vegetable fibers not only bind bile acids, but also appear capable of reducing body cholesterol levels. After studying interactions between human bile acids and carrot fiber (mostly cell-wall fragments rich in pectin), Peter D. Hoagland and Philip E. Pfeffer of the Agriculture Department's Eastern Regional Research Center in Philadelphia now know why. Their findings indicate that calcium pectate appears responsible for most, if not all, of the fiber's binding of bile acids—and therefore for the vegetable's cholesterol-lowering ability.

Moreover, Hoagland says, "We've looked at onion and cabbage. Since they both have calcium pectate and bind bile acids, I think this [calcium-pectate binding] may be a fairly general effect." He says this suggests that for people with high blood levels of cholesterol, "it may be possible to lower it 10 or 20 percent just by increasing your dietary intake of carrots or similar vegetables." Alternatively, he believes substances like carrot fiber (or just its calcium pectate) could be developed as a healthy noncaloric filler for meats and baked goods, such as cakes and breads.

Their report appeared in the May/June JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY.

Wines and sulfites: A necessary marriage

For years, winemakers have relied on sulfur dioxide to prevent oxidation and the growth of microorganisms in their valuable grape nectars. Today the treatment is used on just about all wines, worldwide, according to University of California at Davis enologist Cornelius S. Ough. But concern in recent years over life-threatening reactions to these preservatives by some asthmatics has led many people to question whether sulfiting agents like sulfur dioxide are absolutely necessary (SN: 12/13/86, p.374). Now, in the March/April JOURNAL OF FOOD SCIENCE, Ough and Edward A. Crowell conclude that there's no way a decent wine can avoid them.

The Davis researchers made 60 batches of wine from eight types of university-grown grapes — everything from white riesling to cabernet sauvignon. One-third of the prefermented juice from these grapes was treated with sulfur dioxide, another third with nitrogen to prevent oxidation and a final third with aeration — to deliberately promote oxidation. Half the wine made from each of these juices was then treated with sulfur dioxide before bottling.

A year later, samples of the wine made from each were served to a panel of skilled tasters and evaluated. According to the researchers, the judges found "wines with no sulfur dioxide treatments were definitely inferior in quality." Ough says they tended to be an unattractive brown in color, carried an oxidized "acrylic-like" aroma and had an "off" taste. The best wines resulted from sulfur dioxide treatment of both the prefermented juice and wine, though treatment of just the wine was often enough to salvage an otherwise objectionable batch of oxidized juice. Even use of sulfur dioxide in the juice only — prior to winemaking — was better than none, though Ough notes that such early treatment "tends to be fairly ineffective as an antioxidant and preservative."

Though vintners today tend to use as little sulfur dioxide as they can get away with, Ough says, the role of their antioxidant will be assuming increased visibility. A new federal rule requires that all alcoholic beverages bottled after July 9, including wines, must be labeled as having sulfites if they contain more than 10 parts per million of the preservative.