Have Danes solved the French paradox?

Danish scientists have published a study that they argue goes a long way toward explaining why the French, despite generally high concentrations of cholesterol in their blood, don't experience the high rates of heart disease seen in other groups with similarly elevated cholesterol.

Hans Ole Hein of State University Hospital in Copenhagen listened to discussions of this so-called French paradox at a meeting in Bordeaux, France, 3 years ago. It set him mulling over how he might investigate one putative explanation—that the French drink a lot of wine, a beverage studies have indicated could significantly cut the risk of heart disease.

Hein figured that the French, who tend to dine on cholesterol-elevating high-fat entrees, probably have high concentrations of low-density lipoprotein (LDL) cholesterol, a major risk factor for heart disease. So, using a group of 2,800 Danish men that his team had been following since 1985, he examined the relationship between LDL cholesterol in the blood and drinking's impact on the frequency of first heart attacks.

Among the 20 percent of men with the highest LDL cholesterol (at least 203 milligrams per deciliter of blood), 16.4 percent of teetotalers developed heart attacks in 6 years, the researchers report in the March 23 BRITISH MEDICAL JOURNAL. The frequency was just 8.7 percent in those who regularly consumed up to three servings of alcoholic beverages a day and a mere 4.4 percent in men who consumed more. Alcoholic drinks provided no reduction in heart attack risk among the 20 percent of men having the lowest LDL readings (140 mg/dl or less) and only weak benefits for those in between.

These data indicate that people at highest risk of heart disease benefit most from alcohol's protection, observes Eric B. Rimm of the Harvard School of Public Health in Boston. In the same issue of the journal, Rimm and his coworkers review 12 earlier studies on alcohol and heart risk to find out whether there is anything especially protective about wine. Like the Danish study, says Rimm, his review indicates that "it doesn't matter what beverage you get the alcohol from."

While R. Curtis Ellison, a cardiovascular epidemiologist at Boston University School of Medicine, agrees that all alcoholic drinks offer heart benefits, he contends that only by randomly assigning similar individuals to different drinks and following them for years—which probably can't be done—could one conclude that people who choose one form of alcohol over another don't also differ in social, physiological, or other factors that might affect risk. Like Hein, however, he believes the data are now strong enough for physicians to begin recommending a drink with dinner for most patients at high risk of heart disease.

On that point, Marion Nestle of New York University disagrees heartily. Citing "the enormous social impacts of alcohol on society"—including drunk driving, violence against women and children, and gun-related accidents—she says that "under no circumstances should people who aren't drinking be encouraged to do so." She would advocate instead exercise, a better diet, and not smoking. *—J. Raloff*

Laser reaction control in hot sodium vapor

Whether in the kitchen, laboratory, or industrial plant, chemistry typically involves mixing together the right proportions of the necessary ingredients, then heating the mixture to get the desired products. The trouble with heating, however, is that the energy needed to break old bonds and form new ones goes into the molecules as random motion. The chemist has little control over where the energy goes, and much of it ends up being wasted.

Lasers offer a means of delivering energy directly to individual molecules. Now, a team of chemists has shown that it's possible to increase the yield of one product while decreasing that of another simply by adjusting the wavelength of the laser light bathing the molecules in a high-temperature vapor.

Paul Brumer of the University of Toronto, Moshe Shapiro of the Weizmann Institute of Science in Rehovot, Israel, and their coworkers describe the results in a manuscript accepted for publication in PHYSICAL REVIEW LETTERS.

"It's a significant step forward, especially because they can [control the reaction] in a harsh environment," says Robert J. Gordon of the University of Illinois at Chicago.

To direct the course of chemical reactions and influence the distribution of reaction products, the chemists exploit subtle quantum effects resulting from the interaction of light and matter (SN: 4/20/91, p. 245).

The researchers use two lasers that boost electrons in a molecule to higher energy states, resulting in two different matter waves in the molecules. Like overlapping water waves, these excitations interfere, either reinforcing or canceling each other. Changing the wavelength of one of the lasers can then modify the interference pattern to favor reinforcement or cancellation. Such adjustments can alter the course of the chemical reaction.

"This is a new procedure for achieving quantum interference," Brumer says.

Previously, researchers had focused on adjusting the phase relationship (the relative position of the crests and troughs) of two laser beams so that they create quantum interference. With the new technique, this interference effect is generated by the molecule.

"The lasers one needs don't have to be high-quality," Brumer says. "They can jitter or jump about in phase, and one still maintains this quantum interference effect."

Brumer, Shapiro, and their coworkers tested their scheme by illuminating sodium vapor at 370°C to 410°C with ordinary, pulsed dye lasers. They induced the dissociation of molecules made up of two sodium atoms. By changing the wavelength of one of the lasers appropriately, they could control the proportion of atoms that ended up in a particular excited atomic state.

"Except for one experimental result, no one else has managed to simultaneously enhance the production of one product and deplete the production of another," Brumer says.

The one exception was reported last year by Gordon and his collaborators (SN: 5/27/95, p. 328). That group relied on maintaining certain phase relationships between two laser beams to control whether a molecule of hydrogen iodide broke up or merely ejected an electron.

More recently, they did the same experiment with the iodide of deuterium, a heavy version of hydrogen. Deuterium iodide behaves chemically like hydrogen iodide.

"We get different results for deuterium iodide," Gordon says. "Even something as simple as changing a hydrogen atom to a deuterium atom can make a big difference in controllability."

Although chemists are still far from controlling reactions involving large molecules or pinpointing specific bonds within a molecule, these results represent encouraging steps toward those goals.

"People said at the beginning that this would never work," Brumer comments. "What we have now are some beautiful demonstrations that one can in fact use quantum interference phenomena to control chemical reactions."*—I. Peterson*