70 All-New
Commentaries on the Science
of Everyday Food & Life

DR. JOE SCHWARCZ

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LET THEM EAT FLAX

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ECW PRESS

Published by ECW PRESS
2120 Queen Street East, Suite 200, Toronto, Ontario, Canada M4E 1E2

LIBRARY AND ARCHIVES CANADA CATALOGUING IN PUBLICATION

Schwarcz, Joe
Let them eat flax / Joe Schwarcz.
Includes index.

ISBN 1-55022-698-3

1. Chemistry—Popular works. 2. Chemistry—Miscellanea. I. Title.

Q173.S378 2005 540 C2005-904297-4

Copyedit and Production: Emma McKay
Interior design: Yolande Martel
Interior cartoons: Brian Gable
Cover design: Guylaine Regimbald – SOLO DESIGN
Author photo: Tony Laurinaitis
Printing: Transcontinental
This book is set in Stempel Garamond and Koch Antiqua.

The publication of *Let Them Eat Flax* has been generously supported by the Canada Council, the Ontario Arts Council, and the Government of Canada through the Book Publishing Industry Development Program. Canada

DISTRIBUTION

CANADA: Jaguar Book Group, 100 Armstrong Avenue,
Georgetown, Ontario L7G 5S4

UNITED STATES: Independent Publishers Group, 814 North Franklin Street,
Chicago, Illinois 60610

PRINTED AND BOUND IN CANADA

ECW PRESS
ecwpress.com

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INTRODUCTION

There's never a dull moment in the business of interpreting science for the public. Each day seems to bring an onslaught of fresh scientific studies that pertain to virtually every aspect of our life. I look forward to wading through these, but it is increasingly challenging to avoid drowning in the data. Information overload is a vexing problem! For me, the real difficulty lies in trying to distil some practical sense out of the flood of research findings. I can certainly appreciate the journalistic temptation to come up with seductive headlines for stories, but my concern is that often these oversimplify the results of published research, and, in the end, they either provoke unnecessary fears or raise unrealistic hopes. As Mark Twain quipped, "There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

Take, for example, a paper that appeared in the Journal of Agricultural and Food Chemistry entitle "Which Polyphenolic Compounds Contribute to the Total Antioxidant Activities of an Apple?" Because apples are dear to our hearts, and "anti oxidants" have a positive public image, it wasn't surprising that the press reported widely on the results of the research with headlines such as "Red Delicious Best Disease Fighter." The impact was noted almost immediately with increased sales of Red Delicious apples. Now, I have nothing against these apples; in fact, I like them. But this study di not show that they fight disease better than other apples! To do that, you would have to follow two groups of subjects for many years, with one group regularly eating Red Delicious apples, the other eating some other variety. What the study did show was that Red Delicious apples have a higher leve of antioxidants than some other apples, although varieties such as Jonagold, which is known to be hig in antioxidants, were not included. I think we can safely say that fruits are good for us, and that at least part of the benefit likely comes from their antioxidant content. However, it is unrealistic to imply, based on this apple antioxidant study, that substituting Red Delicious apples for others is goin to have an impact on overall health. This difference in antioxidant content, relative to the total amou of antioxidants we consume, is not likely to be of practical significance. By all means eat apples—of any variety, along with loads of other fruits and vegetables—but don't assume that Red Delicious apples have some special magical quality. No food does.

So what do we say to breast cancer patients who have read about a study carried out at the University of Texas M. D. Anderson Cancer Center that suggests turmeric, the yellow spice widely used in Indian cuisine, may help stop the spread of breast cancer? First, let's take a look at what the researchers actually did. Based on earlier studies that showed a lower rate of cancer in people who ha a diet rich in turmeric, and some previous evidence that one of its ingredients, curcumin, had an anti- tumor effect in the laboratory, the scientists decided to investigate curcumin's anti-cancer potential i a living species. They produced tumors in mice by injecting them with human breast cancer cells, an then surgically removed the cells to mimic a mastectomy. Some of the animals received no further treatment; some were treated with curcumin, some with the cancer drug paclitaxel (Taxol), and other with a combo of curcumin and paclitaxel. The curcumin clearly had an effect: 95 percent of the untreated animals went on to develop lung cancer, but only 50 percent of those treated with curcumin developed tumors. When combined with paclitaxel, the results were even better, with only 22 percent of the mice showing lung tumors. But what does this mean in human terms? Again, it would be unrealistic to suggest that eating curry prevents the spread of cancer. Nobody knows how effectively curcumin is absorbed from the digestive tract, or if it actually has an effect in humans. How much curry would we have to eat? Nobody knows. What we can say is that, based on such studies, it is time to carry out a human trial. Labeling turmeric as an anti-cancer spice is premature and may give false

hope.

Putting scientific studies into perspective is now more important than ever because we are on the verge of suffering from health and safety advice overload. As study piles upon study— often with apparently contradictory findings—many people are throwing their arms up in frustration. One study shows that Echinacea may help the common cold; another says it's practically useless. Depending on which study you read, vitamin E is good for almost anything that ails you, or is totally ineffective. In fact, it may even be harmful. Coffee may raise your blood pressure according to one report, while another one finds that it is the number one source of antioxidants in the North American diet. The consequence may be that consumers stop listening to any advice. That's why it is important to emphasize that science is based on a continuous evaluation of all studies until a consensus is reached and that making lifestyle decisions based on any individual study is rarely warranted. Especially if you believe Dr. John Ioannidis, an epidemiologist at the University of Ioannina School of Medicine i Greece, whose paper in the Journal of the American Medical Association claims that there is less tha a 50 percent chance that the results of any randomly chosen scientific paper are reliable. His analysis suggests that, due to problems with experimental and statistical methods, small sample sizes, researcher bias, and selective reporting, most research findings cannot be trusted. I suppose this includes his findings as well.

Isaac Asimov, the famed science writer, put it very well when he noted that science now gathers knowledge faster than society gathers wisdom. Let's see what we can do about gathering knowledge and interpreting it with wisdom. And you know what? Eating flax may help us do just that. At least one study claims flax can increase mental prowess. But of course, the study could be wrong.

LET THEM EAT FLAX

Hippocrates' prescription for his patients who suffered abdominal pains was simple: "Let them eat flax!" And it's probably not bad advice—as long as the pain stems from constipation. It turns out tha flaxseeds, which come from the plant used to make linen, are an excellent source of dietary fiber. Th indigestible plant component provides a laxative effect by allowing wastes to absorb water as they journey through the digestive tract. But modern science suggests that eating flax may do more than increase the frequency of bathroom visits. How about decreasing the risk of heart disease and cancer? Could Charlemagne really have been on to something when, in the eighth century, he decreed that his subjects should consume flax regularly? It seems so.

Let's begin our story in an unusual place. The barnyard! Not any old barnyard, mind you, but one where the chickens dine on flaxseeds instead of the usual chicken feed. Why? Because some egg producers are trying to improve the nutritional value and the public image of eggs. Let's face it, whe "eggs" are mentioned, the first word that often comes to mind is "cholesterol," which in turn conjure up thoughts of clogged arteries and premature demise. In truth, blood cholesterol responds much mo to the saturated fats found in meat and full-fat dairy products than it does to cholesterol in egg yolk. Still, eggs suffer from an image problem. Omega-3 fats, on the other hand, positively bask in the limelight these days. Found mostly in fish, these fats have been linked with a reduced risk of heart disease, breast cancer, inflammatory bowel disease, Alzheimer's disease, and arthritis. Slipping these fats into eggs would certainly be a healthy boost to their image! Especially considering that many people worry about pollutants like mercury and PCBs, both of which crop up in fish.

Flaxseed is one of the few plant sources high in omega-3 fats. The term "omega-3" refers to the molecular structure of these fats, indicating the presence of a carbon-carbon double bond on the third carbon from the end of the molecule. Alpha-linolenic acid (ALA), the specific omega-3 found in flaxseed, differs slightly from eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), which a the major fats in fish, but some ALA is converted to EPA and DHA in the human body, as well as in the chicken body.

Most research has focused on the health benefits of EPA and DHA, but ALA itself has also been linked with a reduced risk of heart disease. The Nurses' Health Study, monitored by Harvard University researchers, has followed the health status of over 75,000 nurses who, starting in 1984, filled out food questionnaires every four years. Women who consumed the most alpha-linolenic acid from foods had a 46 percent lower risk of sudden cardiac death than women who consumed the least. The major sources of ALA were green leafy vegetables, walnuts, canola oil, and flax.

Canadian guidelines recommend 1.1 grams of omega-3s for women and 1.5 grams for men on a daily basis. These are really no more than educated guesses based on studies carried out mostly with fish oils. A British trial, for example, showed that heart patients advised to eat two servings of oily fish a week, or to take daily fish oil capsules for two years, had a significantly lower death rate than patients who were told to increase their fiber intake and reduce fat consumption. An Italian study of over 2,800 heart-attack survivors also showed that fish oil capsules providing 850 milligrams each of EPA and DHA dramatically reduced the incidence of death in the first nine months following a heart attack. The protection, however, seems to fade with time, even if fish oil consumption is maintained.

Where do omega-3 eggs fit into this picture? Feeding flax-seeds to chickens makes great use of th "you are what you eat" phenomenon, and results in eggs that have roughly twelve times more omega- fats than regular eggs. Of course, the important question is whether eating such eggs makes a significant contribution of omega-3s to the diet. Perhaps surprisingly, it does. Each egg has roughly 0.35 grams of ALA and 0.13 grams of EPA and DHA, so a couple of eggs provide a significant portion of the recommended intake, about the same as a couple of ounces of a high-oil fish, like salmon. No nutritional authorities suggest that we should be eating two eggs every day, but five to seven a week i reasonable. And even at that rate, switching to omega-3 eggs makes sense. This is roughly equivalent to a weekly serving of fish.

By now you're thinking that this must be too good to be true. There must be a "but" coming up, right? Right! Back in 1994, the scientific community was stunned by a study that linked high blood levels of alpha-linolenic acid with an increased risk of prostate cancer. Total fat consumption had been associated with this cancer before. That was no great surprise, since dietary fat is known to increase the production of male sex hormones, which are linked to prostate cancer. Furthermore, man pesticides are fat soluble, and a high-fat diet increases the body's pesticide load, which is certainly undesirable. But all previous indications had been that a diet high in fish oils decreases the risk of prostate cancer. Could ALA be different from other omega-3s? Was it protecting the heart while increasing the risk for prostate cancer? Several studies since have also suggested that ALA may be linked to prostate cancer, but there is considerable controversy surrounding the issue. Plasma levels o ala, for example, show no association with ALA levels in tissue taken from prostate cancer patients. The prudent analysis of the data suggests that it is probably not a good idea for men to consume flax oil on a regular basis.

Ready for another "but"? Consuming flaxseeds themselves has consistently been linked to a reduced risk of both prostate cancer and breast cancer. Perhaps this is because other components of th seed, such as lignans, have proven anti-cancer properties, and may overcome any detrimental effect that may be attributed to ala. A study at Duke University clearly showed that men awaiting surgery fo prostate cancer benefited from a daily consumption of three tablespoons of ground flax. Testosterone levels were lowered, and there was a decrease in cancer cell proliferation.

So we now have the following scenario. The omega-3 fat in flax protects against heart disease, probably by reducing inflammation in the arteries and by smoothing out irregular heartbeats. Flax is also an excellent source of soluble fiber, which binds bile acids in the intestinal tract. This forces the liver to make more bile acids to aid in digestion. Since the raw material for bile acid synthesis is cholesterol, flax consumption ends up lowering cholesterol levels. Soluble fiber also slows the transi

time of food through the stomach and small intestine, which in turn reduces the rate at which glucose is absorbed into the bloodstream. Diabetics have seen blood glucose levels drop with increased flax intake; in one study, blood glucose levels were lowered by almost 30 percent with a daily consumptio of 50 grams of flax-seed. The lignans in the seed might also have a protective effect against cancer. Certainly, the work of Drs. Lillian Thompson and Paul Goss at the University of Toronto is encouraging. These researchers showed that women awaiting surgery for breast cancer had slower-growing tumors if they ate muffins containing 25 grams of milled flaxseed on a daily basis.

Basically, then, consuming ground flaxseed in the ballpark of 25 to 50 grams a day (about 2 tablespoons) seems to be a good idea. Ground seeds can be stored in an airtight container in the refrigerator for roughly a month. Unfortunately, if the seeds are not ground, they tend to exit the body undigested. But consuming flax oil may be a different matter. For men, at least, there is that bothersome potential connection between ALA and prostate cancer.

Omega-3 fats cannot all be lumped into the same category, and it certainly appears that the health benefits of the ones found in fish oil are superior to those of the ALA in flax. Wouldn't it be great if th ratio of ALA to DHA and EPA in flax could be altered to increase the latter? Well, it looks like genetic engineering may just deliver the goods in this instance!

Genetic modification of plants has been criticized for various reasons, including the fact that so fa the consumer has seen no obvious direct benefit of the technology. Now researchers at the University of Hamburg have succeeded in modifying flax plants to produce more DHA and EPA. They managed t isolate the gene from a species of algae that codes for an enzyme that converts ALA into DHA and EPA and have introduced it into flax plants. (Fish derive their omega-3 fats from eating algae.) This will make not only for healthier flax for human consumption, but also for improved animal feed. Chicken that dine on genetically modified flaxseeds will produce eggs with a higher DHA and EPA content, and men will worry less about the alpha-linolenic acid content of flax oil. Where does this leave us? Ground flaxseed is a great addition to the diet, and may be even better when the genetically modified version becomes available.

And in addition to all this, omega-3 fats may even enhance brain function. When we are born, our brain already weighs 70 percent of its adult weight, and most of its growth is completed by about six years of age. Infants whose mothers took extra EPA and DHA during pregnancy show higher mental processing scores and eye-hand coordination at age four. Some studies also have shown a beneficial role for these fats during preschool years in terms of preventing attention deficit hyperactivity disorder and enhancing learning capability. So, like Hippocrates said, "Let them eat flax!" Chickens, and people.

POMEGRANATE AND BLUEBERRY FRENZY

"How much pomegranate juice should I drink?" "How many blueberries do I have to eat to get that cholesterol down?" When I get a flurry of such questions, it usually means that a report of a legitima scientific study has appeared in the lay press, often presenting the results in an overly optimistic ligh

The pomegranate craze was sparked by a couple of studies that suggested the fruit may have a rol in treating breast cancer and in lowering the risk of heart disease. By the time the tabloids got throug with their interpretation of the results, pomegranate juice had become the new wonder kid on the block. And, needless to say, pomegranate capsules are now featured in health-food stores as cancer-preventatives and as treatments for menopause.

But what did the researchers really find? They discovered that there are compounds in pomegrana juice that have estrogenic activity. In other words, they can alter the way that cells respond to the body's own estrogen. This is certainly of great interest because more than two-thirds of breast cance are estrogen positive, meaning that the body's estrogen stimulates the proliferation of tumor cells. Any substance that reduces such estrogenic stimulation is most welcome. And it seems that some of the polyphenols in pomegranate can do just that. They block the activity of an enzyme known as "aromatase," which is involved in the synthesis of estrogen. (Drugs known as "aroma-tase inhibitors" are now commonly prescribed in the treatment of some breast cancers.) How did the scientists determine the aromatase blocking activity of pomegranates? By studying the effect of the juice on breast cancer cells in the laboratory. They discovered that extracts of the seeds, which is what pomegranate juice really is, reduced the activity of 17-beta-estradiol, the estrogen of concern in brea cancer, by some 50 percent. And breast cancer cells that experienced this reduction in estrogen stimulation died with much greater frequency than normal cells. Of course, this is a laboratory finding, and is still a long way away from showing that pomegranate juice has any effect on actual cancers in the body. There is a big difference between bathing cultured cancer cells in pomegranate juice in a petri dish and drinking the juice. Nobody knows if the active ingredients can be absorbed from the digestive tract and if they have any chance of making it to the site of a tumor. But it seems a pretty good bet that pomegranate juice is not harmful, and may do some good.

Although its benefits for breast cancer may be iffy, pomegranate's role as a heart disease preventative is on firmer footing. Israeli researchers investigated the effect of pomegranate juice on LDL cholesterol or, in everyday language, "bad cholesterol." The juice reduced the conversion of LDL into its most damaging form, known as "oxidized LDL." This finding really may be more than a laboratory curiosity. Why? Because the researchers also found that when mice specially bred to

develop hardened arteries were given pomegranate juice, the size of the lesions in their arteries was reduced by 44 percent. So, basically, while the hype about pomegranate juice may not be completely justified, there is something to it. A daily glass of 8 ounces just may provide surprising benefits. When ten patients with diagnosed atherosclerosis drank a daily glass of pomegranate juice for a couple of years, their blood pressure dropped by 20 percent, and they also experienced a beneficial reduction in the thickness of their carotid artery walls. These effects were not seen in subjects who consumed a placebo drink free of flavonoids, the pigments in pomegranate juice that are believed to be responsible for desirable effects. So, drink the juice, just don't spill any on your clothes. Pomegranate stains are virtually impossible to get out! Ditto for blueberry stains, which you may als have to deal with if you follow the research in that area.

We've heard before about all the good things blueberries may do for us. Anthocyanins, the pigments responsible for the distinct color of the berries, fall into a category of compounds called antioxidants, and a wealth of research suggests that these are good for us. They may discourage bloo clot formation, improve night vision, slow macular degeneration, reduce the risk of cancer, and protect brain cells from aging. So far, it is this anti-aging effect that has captured the imagination of the lay press. While nobody has yet shown that humans who load up on blueberries age more slowly, there have been some intriguing rodent studies. At Tufts University in Boston, a group of elderly rats was put on a blueberry-rich diet, while another group was treated to regular laboratory food. The blueberry-treated rats improved in balance, coordination, and short-term memory.

By the time a rat is nineteen months old (equivalent to about seventy years old for a human), the time it takes them to walk a narrow rod before losing balance drops from thirteen to five seconds. Bu after eating blueberry extract for eight weeks, the old rats managed to keep their balance for eleven seconds! They also negotiated mazes better! This was the study that the press seized upon, and all of sudden, blueberries were elevated to the status of a wonder food. And now, with the announcement that pterostilbene (another compound found in blueberries) may reduce cholesterol, the nutritional status of the berries has risen to even loftier heights. The truth is that the study in question was not done on humans, and not even on live animals. It was done in the laboratory, on rat liver cells. The researchers did show that pterostilbene activates a specific receptor on these cells that is linked with reducing cholesterol and triglycerides. But nobody knows if this compound, when ingested, does the same thing in a human liver, or if it even gets there. Nobody knows how many blueberries would hav to be eaten to lower blood cholesterol, or indeed if they really can do this.

That doesn't mean such research is to be ignored. My guess— hopefully an educated one—is that blueberries should, as often as possible, be a part of the five to ten servings of fruits and vegetables that experts recommend we consume every day. So I'm ready to raise a glass of pomegranate juice to the researchers who have shown that there just may be something special about blueberries.

“ACRYLAWHAAAT?”

When scientists call a press conference, reporters usually expect a dramatic announcement. They’ve cloned a sheep. They think they’ve found a way to produce nuclear fusion in a test tube. They’ve completed sequencing the human genome. They’ve discovered why fewer socks come out of a washing machine than go in. But reporters attending the press conference called by Sweden’s Nationa Food Administration in April of 2002 heard nothing of the sort. Researchers at the University of Stockholm, they were told, had discovered acrylamide in potato chips, French fries, and in a variety o other popular foods. “Acrylawhaaat?” the scribes pondered. Most had never before heard of the chemical they would soon help make into a household word. A dirty word!

Acrylamide was a known animal carcinogen, the spokesperson explained. It had been unexpectedl found in a number of common foods, and possibly could account for thousands of cases of human cancer every year. Now he had the reporters’ full attention. Chips and French fries, as well as some baked goods, had levels of acrylamide hundreds of times higher than the maximum allowed in drinking water, according to standards set by the World Health Organization. Why should there be an acrylamide in drinking water? Because “polyacrylamide” is commonly used in water treatment to coagulate and trap suspended impurities. While polyacrylamide is harmless, it is always contaminate with trace amounts of the material from which it is made, namely, acrylamide. There is no doubt that acrylamide fed in huge doses to rats can cause a variety of tumors, but health authorities agree that th 1 or 2 micrograms of the stuff that might be ingested daily from water with a maximum allowable concentration of 0.5 parts per billion (PPB) is far too little to have any effect. In other words, the benefits of using polyacrylamide to remove water pollutants greatly outweigh any risk it may introduce.

But the Swedish scientists weren’t talking about 0.5 parts per billion, they were talking about French fries that had over 400 PPB, and chips that had as much as 1,200 PPB! Such levels, they suggested, could cause cancer in humans. The acrylamide story made the headlines, causing panic in the supermarket aisles and in the boardrooms of food producers. Was this just another “scare-of-the-day” story, soon to be forgotten, or was it important enough to warrant real changes in our eating habits?

Before coming to grips with that question, let’s take a moment to explore how the information about the presence of acryl-amide in our food supply came to light in the first place. It all started in 1997, with some paralyzed cows in Sweden. Farmers in the Bjare peninsula began to notice that their cows could not stand up properly. When fish breeders found dead fish by the hundreds in their breeding pools, authorities began to suspect an environmental problem. It turned out that they were right. A tunnel was being built nearby, and it had been plagued by water leaks. To solve the problem, over 1,400 tons of a sealant made with polyacrylamide had been pumped into the cracks in the tunnel Since scientists had long known that high concentrations of acrylamide could affect the nervous system, the paralyzed cows and dead fish suggested that the chemical had leached out into the water table. Further investigation revealed that it was not only cows and fish that were affected, but also tunnel workers, who complained of feeling numbness in their extremities! As can be expected, this terrified the locals and caused cattle to be slaughtered, milk products to be dumped, and vegetables to be thrown away for fear of acrylamide contamination.

This is when Margareta Tornquist of the University of Stockholm got into the game. She had been asked to investigate the extent to which tunnel workers had been exposed to acrylamide. Blood

samples were taken and analyzed for the presence of the chemical. For comparison, Tornquist also looked at samples taken from the general Swedish population. The results were stunning! As expecte the tunnel workers had high blood levels of acrylamide, but so did the others. Where was it coming from? Swedish water did not have unusual levels of acryl-amide, so the suspicion turned to the food supply. That's when Tornquist discovered acrylamide in chips, fries, breads, cookies, and crackers. A it turns out, it forms naturally in starchy foods that are fried in fat at a high temperature. When rats were fed such foods, acrylamide was found in their blood at much higher levels than when they were fed boiled foods. A frightening picture began to emerge. A carcinogen, formed in significant amount in common foods, could end up in the blood and be distributed through the body. According to the Swedish National Food Administration, the world needed to be informed of this risk, so it decided to call a press conference.

But wait a minute here. There is no evidence that acrylamide is a human carcinogen. While it is a well-established neurotoxin, a long-term study of over 8,000 workers who manufacture the substance and therefore have huge exposures, found no link to cancer. Furthermore, it should be understood tha our food supply is filled with natural carcinogens. Aflatoxins in peanuts, ethanol in wine, urethane in sherry, styrene in cinnamon, and heterocyclic aromatic amines in beef bouillon are as carcinogenic to rodents as is acrylamide. But we don't eat isolated ingredients; we eat food. And food has numerous anti-carcinogens as well. Broccoli, onions, soybeans, flaxseed, and apples all contain compounds wit decided anti-cancer activity. The bottom line, then, is that there is no scientific justification for the statement that acrylamide in food causes thousands of cases of human cancer. On the other hand, ther is plenty of scientific justification to recommend cutting back on fatty, fried foods such as chips and fries, for a variety of reasons. So if fear of acrylamide causes people to do that, they will indeed be better off.

In any case, the food industry has responded to the acrylamide issue by mounting a variety of studies to explore just how acrylamide forms during baking, and how levels can be reduced. It didn't take long to discover that the backbone of the acrylamide molecule comes from an amino acid called asparagine. When heated in the presence of glucose, asparagine undergoes a series of reactions that eventually liberate acrylamide. Food chemists now went to work and found that baking or frying at lower temperatures (below 175°C, or 347°F) significantly reduced acrylamide levels, which could be even further lowered by adjusting recipes or cooking conditions. For example, when sodium hydroge carbonate (baking soda) is used to replace ammonium hydrogen carbonate as a baking agent in gingerbread, acrylamide concentrations are reduced by more than 60 percent. Blanching potato chips in a dilute acetic acid solution before frying leads to large decreases in acrylamide content. Many suc changes have already been instituted, and an expert panel commissioned by the National Toxicology Program of the National Institute of Environmental Health Sciences now estimates that we ingest roughly 0.43 micrograms of acrylamide per kilogram of body weight a day in our diet, which is well below the amounts that cause cancer in laboratory animals.

We can also take some comfort in a recent joint study conducted by the Harvard School of Public Health and the Karolinska Institute in Sweden, which found no link between the consumption of acrylamide and the occurrence of colon, bladder, or kidney cancers. The study's researchers, who reported their results in the British Journal of Cancer in 2003, performed what is known as a case-control study. They examined the dietary intake of acrylamide among 987 cancer patients and compared it to that of 538 healthy people to see if they could find a link between the disease and the chemical. No such link was apparent: the cancer patients had consumed no more acrylamide than had the healthy subjects. In fact, they associated higher levels of acrylamide in the diet with a lower, not higher, risk of colon cancer. Still, we are not yet ready to declare acrylamide an anticarcinogen. In al

likelihood, foods that contain acrylamide also contain other ingredients, such as fiber, which may offer protection against cancer. An Italian study came up with similar results. An examination of ove 7,000 cancer victims showed no evidence of a link to consuming fried or baked potatoes.

The question of a link between breast cancer and acrylamide has also been examined in light of th fact that high doses increase the risk of mammary tumors in rats. A Swedish study, published in the Journal of the American Medical Association in 2005, found no evidence of a connection after havin followed over 43,000 women with an average age of thirty-nine for eleven years. Based on food frequency questionnaires at the beginning of the study, the women were divided into five categories that reflected their intake of acrylamide. Almost 700 women were eventually diagnosed with breast cancer, but there was no significant difference in the risk of the disease relative to the amount of acrylamide consumed.

Finally, let me call your attention to a paper published in the American Journal of Clinical Nutrition, which didn't get nearly as much attention as the acrylamide story. Researchers at Tulane University studied over 9,000 people for roughly twenty-five years and found that those who consumed more than three servings of fruits and vegetables a day had an almost 30 percent lower risl of strokes and heart disease than those who ate less. They didn't call a press conference . . . but shoul have.

TRANS FATS

Really, it all started back in the 1980s. Researchers were surprised to find that Scandinavians, while consuming more saturated fat than Americans, had a lower incidence of coronary heart disease. Consumption of such fats, found in meat, dairy products, palm and coconut oil, is known to drive up blood cholesterol, which in turn is linked to an increased risk of heart disease. So why were America at greater risk than the Scandinavians? Well, maybe it had to do with the "partially hydrogenated" fa that American producers were pumping into the food supply.

Saturated fats are composed of chains of carbon atoms that are bonded to as many hydrogen atom as possible. They are "saturated" with hydrogen. Vegetable oils are mostly "unsaturated," meaning that some of the carbon atoms in their molecules are joined to each other with an extra bond instead being linked to hydrogen. These carbon-carbon double bonds (described as having a "cis" configuration) impart a bend to the molecule. Treating such unsaturated fats with hydrogen gas in the presence of a nickel catalyst adds hydrogen atoms to some of the carbon-carbon double bonds, resulting in "partially hydrogenated" fats. Since unsaturated fats have not been linked with heart disease, such partially saturated fats were expected to have a better safety profile than the saturated variety. And from a practical viewpoint, hydrogenation reconfigures some of the "cis" bonds to a "trans" form, resulting in molecules with straightened carbon chains, which can then pack together more closely. As a result, liquid oils are converted to solid fats suitable for making margarine or shortening for baked goods. Partially hydrogenated fats are also less likely to go rancid on reaction with oxygen than oils. In other words, partially hydrogenated fats seemed to be the answer to cutting down on saturated fats in the diet. As it turns out, though, things that seem too good to be true usuall are.

Martijn Katan at the Agricultural University in Wageningen, the Netherlands, suspected that the higher rate of coronary disease in the us as compared with Scandinavia might have something to do with trans fat consumption. So he enlisted fifty-nine volunteers who, for three consecutive three-wee periods, ate diets that varied only in their major fat content. Through one cycle the main fat was olei acid, a monounsaturated fatty acid found in olive and canola oil, another cycle featured saturated fats and the third cycle incorporated solid "trans" oleic acid. The results were surprising. Compared with saturated fat, trans fat consumption resulted in higher LDL cholesterol ("bad cholesterol") and lower HDL cholesterol ("good cholesterol"). In fact, the ratio of total cholesterol to HDL cholesterol, a measure of heart disease risk, rose 23 percent on the trans fat diet and only 13 percent on the saturate fat diet. Of course, this was a much higher trans fat intake than the typical North American diet, in which roughly 5 percent of the total calories come from such fats, but the message was clear. There may be a problem with trans fats!

Other studies also cast these fats in an unfavorable light. The famous Nurses' Health Study, administered by Harvard University, has been following over 75,000 nurses for years and has linked foods such as cakes, cookies, white bread, and certain margarines—all major sources of trans fats—with a higher risk of coronary disease. Recently, researchers have also associated trans fats with type II diabetes, breast cancer, sudden cardiac death, asthma, and an increased risk of inflammation. Yes, each of these studies can be, and has been, criticized, and I suspect my analysis will also ruffle some feathers. But the fact is that one can scour the scientific literature and not come up with any benefits for consuming partially hydrogenated fats. So, even if the risks are somewhat exaggerated, there is n harm in avoiding these substances.

And now another facet of trans fats has come to light. Dr. Anne-Charlotte Granholm at the Medica University of South Carolina found that trans fats might impair learning and memory! She fed one group of rats a diet that contained 10 percent hydrogenated coconut oil, a common trans fat, while another group dined on soybean oil. Then the animals had to sink or swim—literally. They had previously been trained to find the location of hidden platforms in a water-filled maze, and now they were asked to recall their training. Well, basically, the soybean rats had no problem, but the trans fat rats floundered. This was not totally unexpected, since previous studies had shown some memory impairment with increased consumption of fats, but now the finger seemed to be directly pointed at trans fats. And the scary thing was that the quantity of trans fats the rats consumed was proportional what North Americans eat routinely. How trans fats damage the brain isn't clear, but one theory is th they cause inflammation that damages specific proteins that nerve cells use to send and receive signals. Dr. Granholm was so impressed by the results of her research that she went home and rid her kitchen of all foods that harbored trans fats. She also swore off French fries, which are usually loaded with the nasty stuff.

Manufacturers are heeding the advice coming from researchers and are trying to reduce the trans fat content of their products. Trans fat–free Oreos are already on the market, alongside trans fat–free Doritos. A move in the right direction, I suppose. And maybe McDonald's will make good on its promise to eliminate trans fats. But you know what? Foods that contain trans fats are generally poor on the nutrition scale anyway, so there is no harm in cutting down. As far as snacks go, well, apples don't have trans fats. Nor do oranges. Or bananas. Or broccoli. Munch on those instead of doughnuts and you'll be healthier. And, apparently, smarter.

NEWFANGLED CHOCOLATES

When I was growing up in Hungary, my big treat was a cup of hot cocoa every night. Cocoa powder was a luxury item, and I was only able to partake of the pleasure because my aunt, who lived in Canada, used to send us “care” packages. And you know what? I may just go back to that old habit. Especially if the research about “high-flavonol” cocoa turns out to be as promising as it now seems. Dr. Norman Hollenberg of Harvard Medical School certainly thinks it will. And he should know. Hollenberg is involved in serious research about the possible health benefits of cocoa, all because a while ago he came across a scientific paper written back in the 1940s about the unusual blood pressu of the Kuna Indians living in the San Blas Islands of Panama. What was so unusual about the blood pressure of these natives? It was extremely low, and did not rise with age. Did they possess some marvelous gene, Hollenberg wondered? As it turned out, no. Kuna Indians who had moved to the mainland of Panama did not have unusually low blood pressure. So what were they doing on the islar that could have had such an amazing effect? It seems they were drinking a lot of cocoa made with locally grown, minimally processed cocoa beans. This, Hollenberg thought, was worthy of investigation.

So where do you go to seek research funds for such a study? You don’t go to a lightbulb manufacturer or an automobile producer. You go to the chocolate industry. And the Mars Company, a you can imagine, was quick to jump on this bandwagon. The giant private corporation, which floods the world with the likes of Dove bars and m&ms to the tune of some $17 billion in annual sales, coul well afford to support some promising chocolate research. In fact, the company itself had long been tinkering with the chemistry of chocolate, hoping to come up with a version that could be promoted a having some sort of health benefit.

Mars’ work had been stimulated by the fact that chocolate contains flavonols, compounds also present in tea and red wine that have been linked with protection against heart disease. The company had been trying to come up with a high-flavonol cocoa, but had run into difficulty because flavonols impart a bitter taste. Finally, though, after years of work, Mars scientists managed to find the right kind of cocoa beans, which through a patented mild process could be transformed into a high-flavonc cocoa powder acceptable to the palate. Mars was happy to provide Dr. Hollenberg with a supply for his studies. And what did the studies show? That the high-flavonol cocoa relaxed blood vessels in people and led to better circulation. Amazingly, it resulted in a 33 percent improvement of blood flo to the brain, which could be very meaningful for people suffering from dementia caused by poor circulation.

There was other good news about chocolate coming from research supported by Mars at the University of California in Davis. Here, Dr. Carl Keen, chair of the Department of Nutrition, had found that a flavonol-rich cocoa drink had an effect on blood platelets that was similar to taking a daily dose of a baby aspirin. Such “blood thinning” has been shown to reduce the risk of heart attacks caused by blood clots. Mars scientists now toted up the results of their own research, and of work carried out by university investigators, and decided that the time had come to tackle the challenge of making chocolate into a “functional food.” Most everyone loves chocolate because of its flavor, but just imagine the market potential if there were significant health benefits to munching on the delicac Health instead of guilt? Sounds great!

Enter the “CocoaVia” bar, which Mars is test-marketing on the Internet. Each bar contains a standardized amount of 100 milligrams of flavonols, meaning that the daily consumption of two such

bars provides a flavonol content that can have an appreciable effect on blood pressure and platelet aggregation. But the researchers have taken an extra step. They have incorporated a gram and a half o phytosterols into each bar. These plant-derived compounds have been shown to lower blood cholesterol levels. What about the fat content of these bars? Doesn't that outweigh any benefit? Actually, it seems not. Each bar has only about 3 grams of fat and 90 calories. Of course, fruits and vegetables are still a far better source of flavonols and phytosterols, and nobody, including Mars, is suggesting that CocoaVia is a "medicine." But, hey, if scientific research can produce a healthier chocolate, then why not? And if the mechanism of the action of flavonols is unraveled, such research may eventually even lead to flavonol-based medications.

Dr. Hollenberg at Harvard is very interested in determining just how flavonols affect blood pressure. His research has shown that these compounds somehow increase the release of nitric oxide, substance that causes blood vessels to dilate, in the body. Dilated blood vessels in turn lead to decreased blood pressure. In fact, Viagra works via the same mechanism. It opens up blood vessels, allowing more blood flow to some important anatomical parts. So now you see that there may be several reasons for going back to that childhood regimen of drinking a cup of hot chocolate every night. Dr. Denise O'Shaugnessy, a researcher in England, would likely agree. In 2005, her research team found that just one cup of cocoa can inhibit the functioning of platelets, cells that are involved i blood clot formation. Since blood clots can cause heart disease and strokes, a nice cup of hot cocoa may be just what the doctor orders. And with huge profits at stake, we probably won't have to wait to long until Mars' patented high-flavonol cocoa becomes commercially available. And can healthier m&ms and Dove bars be far behind? Sweet dreams, but just don't forget about the real proven "functional foods": your fruits and veggies.

THE SOUR SIDE OF HIGH-FRUCTOSE SWEETENERS

Sugar producers are hopping mad. So are the companies that flood soft drinks, cereals, yogurts, bake goods, and various desserts with high fructose corn syrup (HFCS). There is no sweet talk at all when it comes to their reaction to a recommendation by the World Health Organization that the intake of added sugars in food and drink should be no more than 10 percent of daily calories. Sweeteners are being unfairly singled out as being responsible for poor diets, the industry claims, since the cause of obesity is too many calories, no matter where they come from. "Taxpayers' dollars should not be use to support misguided, non-science based reports, which do not add to the health and well-being of Americans, much less to the rest of the world," says the Sugar Association. Humbug, I say. We consume way too much sugar and other caloric sweeteners, and there is plenty of scientific information to suggest a link with obesity and other health problems. Of course the industry objects t such allegations—after all, billions of dollars are at stake.

No, sugar is not "white poison," as some would have us believe. In moderate amounts, it can be part of a healthy diet. But North Americans are not consuming sweeteners in moderate amounts. We are guzzling them at a rate of about 50 teaspoons of added sugar per day! That is an astounding amount. It's readily believable, though, given that a can of pop has roughly 10 spoonfuls, and many people drink several cans a day. In this context, "sugar" refers to both sucrose, which is extracted fro sugar cane or sugar beets, and "high fructose corn syrup," which is manufactured from cornstarch. Sucrose consumption has actually declined in the last twenty years, but that's only because it has bee replaced by HFCS as the prime sweetener. The increased use of HFCS mirrors the increase in obesity in North America. Of course, such an association cannot prove cause and effect, as I'm sure industry spokespeople would be quick to point out. Overconsumption of high-calorie foods and lack of exercis is the problem, they say. Technically, they are right. But the fact is that far too many of those extra calories come from added sugar. So why not reduce this? There is no downside to curbing our intake of sweeteners. There is absolutely no risk in drinking water instead of soft drinks!

Replacing sucrose with high fructose corn syrup may not be just a benign switch of one caloric sweetener for another. There may be metabolic consequences. So why was this switch made in the first place? Because HFCS costs a few pennies per kilo less than sugar does to produce. But because of the volumes used, that can translate into hundreds of millions of dollars in the long run.

The technology to produce HFCS emerged in the 1950s with the isolation of enzymes from bacteria capable of breaking cornstarch down into glucose. Since the us government subsidizes corn production, a cheap way of producing glucose now became available. There was a problem, though. Glucose is only about 70 percent as sweet as sucrose. Once more, some newly isolated enzymes entered the picture. Glucose isomerase, from a special strain of Streptomyces murinus, readily converted some of the glucose into fructose, which is 30 percent sweeter than sucrose. It is also more water soluble than glucose. This made it possible to produce a stable syrup with roughly 55 percent fructose content and high sweetening power. This "high fructose corn syrup" was easier to blend into soft drinks and foods than sucrose, and was welcomed by everyone—except, of course, the sucrose producers.

When HFCS was first introduced, nobody thought it would have a different effect on the body than sucrose. After all, sucrose is broken down in the body to equal amounts of glucose and fructose, and can therefore be thought of as a 50 percent fructose product. Can an extra 5 percent of fructose in HFC make a metabolic difference? Yes, some researchers argue. Our consumption of fructose has increase