SCIENCE NEWS of the week

High Cholesterol = High Cancer Risk?

Some epidemiologic studies have shown an association between a high-fat diet and subsequent development of cancer, and this along with the heart disease link is why many doctors recommend that people lower their fat and cholesterol intake. But other studies have failed to show the cancer connection, and several have even found a link between *low* blood cholesterol levels and cancer.

Now, three new studies, two in Europe and one in the United States, have addressed the issue. They will no doubt add to the data base, but they won't necessarily answer the question of what to eat. The European studies strengthen the low-fat diet suggestion: They report an association between high blood cholesterol levels and an increased risk of colorectal cancer. The U.S. work shows no strong relationship between dietary fat and breast cancer.

While the European findings are in agreement with some previous studies, they run counter to others, including the Framingham (Mass.) heart study (SN: 1/24/81, p.55), that link low blood cholesterol levels to a higher incidence of colorectal cancer. In one of the newly reported studies, Sven A. Törnberg and his colleagues at the Karolinska Hospital in Stockholm, Sweden, analyzed data from more than 92,000 people over a 15-year period. Blood levels of cholesterol and cholesterol-laden lipoproteins were measured in the mid-1960s, and subsequent cancer was monitored.

The researchers found a statistically significant correlation between high cholesterol and the development of rectal cancer in men: The cancer risk was 65 percent higher among the group with the top 20 percent of cholesterol levels compared with men in the bottom 20 percent. The data also pointed, although not as strongly, to a direct cancer-cholesterol relationship in men with colon cancer and in women with colon or rectal cancer.

Gerd Alexander Mannes and his colleagues at the University of Munich in West Germany looked at people with colorectal adenomas, growths that are thought to be precancerous. When they compared blood cholesterol levels in these patients with the results obtained in the examinations of 842 people whose colons were checked for adenomas, they found "a small positive association." After adjusting for age and relative obesity, both of which increase cholesterol levels, the researchers determined that people who had the top 20 percent of cholesterol levels were twice as likely to have adenomas as those in the bottom 20 percent.

The association between high cholesterol and cancer could be an indirect one, both groups suggest in the Dec. 25 NEW ENGLAND JOURNAL OF MEDICINE. High blood cholesterol levels reflect a diet high in saturated fats, they say, and the higher cancer rate may be due to the production of carcinogens by fat metabolism.

The U.S. National Cancer Institute (NCI) recommends that Americans reduce their intake of saturated fat and cholesterol. Peter Greenwald, director of the division of cancer prevention at NCI, says the current reports "are very consistent with what we're saying." Cutting down on saturated fat and cholesterol "is good for both heart disease and cancer."

Greenwald says studies that showed a link between low cholesterol levels and colorectal cancer were not convincing in this respect. Many of them were designed to study heart disease incidence rather than cancer, he says, and the inverse relationship disappeared when data from people who developed cancer within two years were excluded. The disappearance could mean that the precancerous state had lowered their cholesterol levels and created a misleading connection, Greenwald observes.

But Paul Sorlie of the National Heart, Lung, and Blood Institute, one of the researchers who analyzed the Framingham data, said after a preliminary look at the reports that the Swedish study may have missed the low-cholesterol-cancer connection because the lowest cholesterol levels in the study group were higher than those in Framingham and elsewhere. "It's at the lower cholesterol levels that you see a higher risk," he says.

The inconsistency at the other end of the scale — why the Framingham data and other studies revealed no increased risk with increased cholesterol levels — is at the moment unexplainable, he says. "I think it's still moot. It could be methodology, or it could be some difference between the populations, like lifestyle, genetics or nutrition."

The breast cancer study ends up in the middle ground, with dietary fat intake showing no effect on the development of breast cancer. Harvard University researchers, led by Walter C. Willett, report in the Jan. 1 NEW ENGLAND JOURNAL OF MEDICINE on their study of nearly 90,000 female registered nurses who were questioned about their eating habits.

During a four-year prospective study, 601 of them were diagnosed with breast cancer; an evaluation of the incidence among women in the top 20 percent of fat intake compared with the lowest 20 percent showed "no evidence of a positive relation." The finding could be due to a true lack of effect, or an effect could take longer than four years to show up, the authors suggest. — *J. Silberner*

True ZITs: Can such things be?

When observers discovered the cosmic background of microwave radio radiation 20 years ago, they were happy with its apparent smooth isotropy. In any direction they looked, they saw radiation of the same temperature, and that was good because they believed that the universe was homogeneous and isotropic, and so the microwave background, which comes down to us undisturbed from early times, should have been smooth.

Now, observers would like to find minute fluctuations in the temperature of the background radiation. If they don't eventually find them, a good deal of present cosmological theory will go overboard.

The good news is that scientists have reported three measurements that could be one sort of the desired anisotropies. More work is necessary to find out if they are the real things, but one of the experts in the field, David Wilkinson of Princeton (N.J.) University, comments: "It smells as though we're getting close to anisotropy, close to a real detection."

In general, observers distinguish three size scales of temperature fluctuation in the background radiation. One refers to the present time, and two refer to distant epochs in the past. The large scale covers an area in the sky 90° across or greater, with the background slightly warmer over one area of that size and slightly cooler over another. This scale refers to the present time, and an anisotropy on this scale, the "dipole anisotropy," has been known for several years. Astronomers take it as the result of a motion of our galaxy toward the galaxies in the Virgo cluster.

The smallest scale, fluctuations around a minute of arc in extent, would result from fluctuations in the density of matter in the universe that occurred at the very beginning and might have been the seed around which galaxies and clusters of galaxies formed. No hint of these has been seen.

The present tentative results concern the middle range, areas a few degrees across. At the recent 13th Texas Symposium on Relativistic Astrophysics held in Chicago, three groups reported apparent fluctuations of temperature in areas 5° or 8° across. They are Edward

Fomalont and Kenneth I. Kellermann of the National Radio Astronomy Observatory in Charlottesville, Va., who worked with the Very Large Array (VLA) of radiotelescopes near Socorro, N.M.; Bruce Partridge of Haverford (Pa.) College, who also worked with the VLA; and Rod Davies of the Nuffield Radio Astronomy Laboratories in Jodrell Bank, England, and Anthony Lasonby of Cambridge University, both working with an antenna in the Canary Islands.

Typical of what these groups find is a temperature variation of 5 parts in 100,000 over an area of 8° in the sky. Mapped with false colors to indicate temperature differences, such a pattern looks like acne, and so some of the scientists involved call this the ZIT model.

The ZITs refer to an interesting time, as cosmologists describe it, back at a redshift of 1,000. (For comparison, the most distant and oldest quasars we can see have redshifts around 4.) Wilkinson translates a redshift of 1,000 as when the universe was 100,000 years old (compared with a present age between 10 billion and 20 billion years). The ZITs thus refer to fluctuations in the famous cold, dark matter that seems to pervade the universe and may be enough to close it. They also refer to regions that in earlier times had developed out of contact with each other and were then beginning to overlap each other.

In the earliest days of the universe, two different expansions were concurrently going on. These were the expansion of space – that is, of the universe itself – and the expansion of our (or any observer's) horizon. Astrophysicist David Schramm of the University of Chicago says that people may deceive themselves if they imagine the Big Bang as a kind of explosion. He prefers to use the analogy of raisin-bread dough. As the dough rises, it expands everywhere fairly evenly. As a result, the raisins are carried farther and farther from each other, even though they do not move with respect to the dough right around them. Galaxies, like the raisins, are carried farther and farther from each other as the space between them (like the dough) expands, but they do not necessarily move with respect to the space right around them.

Meanwhile our horizon is expanding, too. At any time we can see only the objects from which light has had time to get to us since the beginning of the universe. If we could have been around when the cosmos was 1 second old, we would have seen only objects less than 1 light-second away, not as far as the moon now is. As time goes on, each observer sees objects farther and farther away. Horizons expand at the speed of light; space expands presumably at a different speed. Expanding horizons may gradually gain on the expansion of space, or they may not.

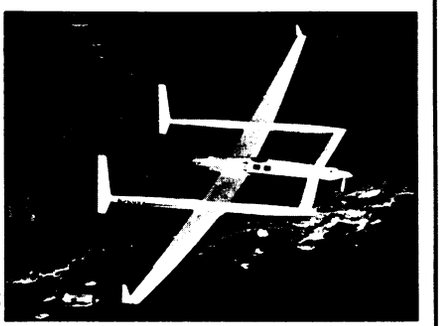
It is not clear how big the universe was at time zero, though it seems to have been extremely smaller than it is now. However, in the earliest moments, a number of regions could have developed independently of one another, because their horizons did not overlap and they could not communicate and so could not affect events in each other. Eventually horizons began to overlap. Each observer began to see regions that had developed independently of his or her own immediate surroundings. The differences between them should show up as minute variations in the equilibrium temperature of the cosmic microwave background, on the order of 1 part in 1,000 or less. Such phenomena should produce the ZITs.

Are the reported observations really ZITs? Wilkinson cautions that they could be galactic bremsstrahlung, radiation produced by galaxies moving through the intergalactic gas. Spectra will tell the difference: True ZITs will have the blackbody spectrum characteristic of the cosmic microwave background. The present observations are all at single frequencies, because radiotelescopes observe one frequency at a time. Astronomers are now planning to look at other frequencies to see whether they can fill in the proper spectra. *– D. E. Thomsen*

Around the world on a tank of gas

Early on the morning of Dec. 14, a spindly, ungainly, plastic-and-paper aircraft, dragging its fuel-laden wings, took off from Edwards Air Force Base, Calif. Nine days later, the airplane, *Voyager*, landed on the same field after completing the first nonstop flight around the world without refueling.

"It was a good, solid engineering feat," says Joseph W. Stickle, chief of the low-speed aeronautics division at NASA's Langley Research Center in Hampton, Va. Although the flight represents no single, major technological breakthrough, he says, it's the culmination of recent advances in composite materials, in airfoil design and in weather observation and navigation.



Mobil

The experimental aircraft Voyager *as it appeared during a test flight earlier last year.*

The experimental plane's designers put together several state-of-the-art technologies to create a unique, featherweight aircraft specifically designed to accomplish its one mission. The plane's self-supporting skin consists of a honeycombed paper core sandwiched between layers of carbon-fiber tape impregnated with an epoxy resin. Firewalls of special lightweight ceramics able to withstand temperatures greater than 2,000°F separate the aircraft's two engines from the fuel tanks. The only metal components are the two engines and a few nuts and bolts. Although its 111-foot wingspan is longer than that of a Boeing 727, the empty, no-frills aircraft weighs only 1,858 pounds.

Its smooth skin and novel airfoil shape also help reduce drag. The absence of joints and protruding rivets typically found in wings fabricated from metal allows air to flow smoothly in even layers over the two wings. This couldn't have been done without the use of composite materials, says Stickle. However, this flight was too short to address concerns about the long-term durability of composite materials – their resistance to fatigue, ultraviolet light and lightning.

When *Voyager* took off, it carried about 1,200 gallons of fuel. After its nine-day westward circuit covering more than 25,000 miles, fewer than 10 gallons of usable fuel were left. At an average speed close to 115 miles per hour (including tail winds), the aircraft's miles-per-gallon performance rated higher than that of many automobiles.

Satellite-based weather observations and navigational aids enabled the pilots to avoid thunderstorms and dodge tropical typhoons in a flight that occurred mainly over water. Five or 10 years ago, when such aids were unavailable, the flight would have been much more hazardous, says Stickle.

In terms of human endurance, the *Voyager* flight was probably more demanding than any previous airplane flight. The pilots, Dick Rutan and Jeana Yeager (no relation to test pilot Chuck Yeager), had to cope with being cooped up in a cabin that's barely the size of a phone booth. Turbulence repeatedly knocked the pilots around. In Rutan's words, the aircraft was a "beast" to fly, often rolling, heaving and lurching through the air. The flapping of its wings, which could flex as much as 30 feet, didn't help. Because there was no soundproofing, Rutan and Yeager also had to put up with a constant, deafening roar from the plane's engines.

As he approached Edwards Air Force Base at the end of the flight, Rutan radioed, "I must admit there [were] times during the flight when I didn't think it was possible." *– I. Peterson*