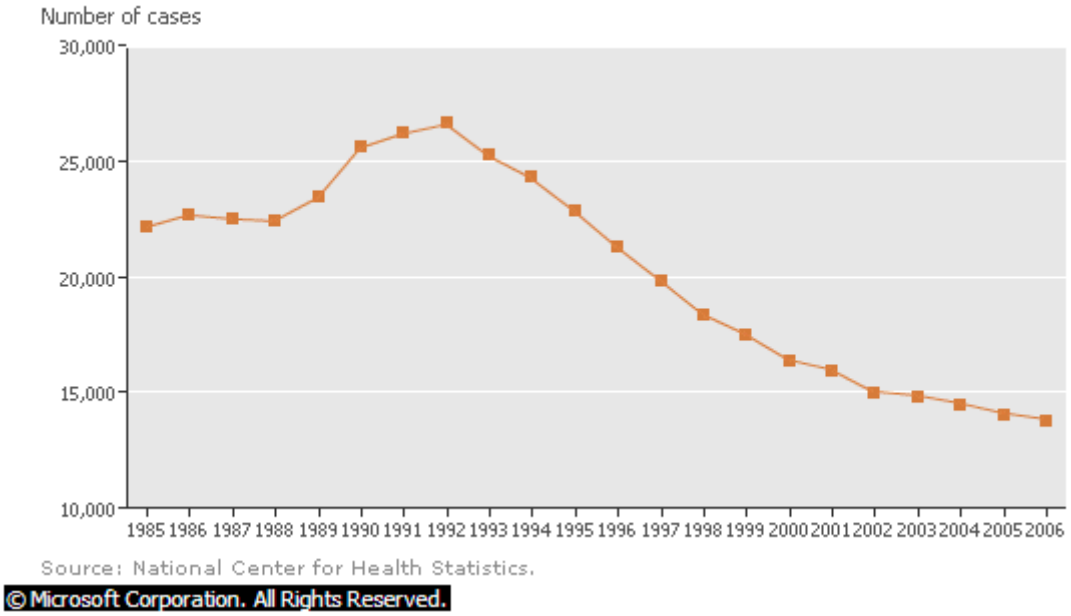
HIV EXAMINER

A Monthly Newsletter of Writers Against Aids and Tobacco Smoking

October Edition

TUBERCULOSIS

I INTRODUCTION



Incidence of Tuberculosis, United States

This graph illustrates the number of new cases of tuberculosis in the United States since 1985. Many researchers attribute the sharp increase in the early 1990s to the spread of acquired immunodeficiency syndrome (AIDS). People with AIDS have weakened immune systems and are particularly susceptible to contagious diseases such as tuberculosis. Poorly supervised treatment of tuberculosis also led to an increase in drug-resistant strains of the bacteria that cause tuberculosis, furthering the spread of the disease. Renewed emphasis on control and prevention has brought the incidence of tuberculosis to record low levels.

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Tuberculosis (TB), chronic or acute bacterial infection that primarily attacks the lungs, but which may also affect the kidneys, bones, lymph nodes, and brain. The disease is caused by *Mycobacterium tuberculosis*, a rod-shaped bacterium. Many people harbor the bacteria but have no symptoms of disease. When symptoms develop, they include coughing, chest pain, shortness of breath, loss of appetite, weight loss, fever, chills, and fatigue. Children and people with weakened immune systems are the most susceptible to TB.

In 1993 the World Health Organization (WHO) declared TB to be a global emergency, the first such designation ever made by that organization. According to WHO, someone becomes infected with the bacteria that cause TB every second. One-third of the world's population is infected with the bacteria, and as many as one in ten of those infected will develop active symptoms of tuberculosis at some point in their lives. People living with HIV are at much greater risk than others.

II TRANSMISSION AND INFECTION

The TB-causing bacteria are transmitted from person to person, usually in infected air droplets. When someone who has symptomatic TB coughs, sneezes, or speaks, small particles that carry two to three bacteria surrounded by a layer of moisture are released in the air. When someone else inhales these particles, the bacteria may lodge in that person's lungs.

A less common route of transmission is through the skin. Pathologists and laboratory technicians who handle TB specimens may contract the disease through skin wounds. TB has also been reported in people who have received tattoos and people who have been circumcised with unsterilized instruments.

A person may become infected with TB bacteria and not develop the disease. His or her immune system may destroy the bacteria completely. In fact, only 5 to 10 percent of those infected with TB actually become sick. The bacteria may remain inactive for years until a weakening of the body's resistance provides the bacteria with an opportunity to multiply and produce symptoms. Someone with an inactive infection cannot transmit the disease. The disease can take two paths: primary and secondary.

A Primary TB

Primary TB does not produce noticeable symptoms in its early stages, when it is not contagious. Macrophages, immune cells that detect and destroy foreign matter, ingest the TB bacteria and transport them to the lymph nodes where they may be inhibited or destroyed. If the immune cells fail to control the infection, the bacteria can multiply.

If the TB bacteria multiply, active primary tuberculosis develops. Patients with active primary TB experience such symptoms as coughing, night sweats, weight loss, and fever. A chest X ray may show shadows in the lung or fluid collection between the lung and its lining. If the immune system destroys the bacteria, the patient may experience no more than mild symptoms, such as a cough. If the bacteria are inhibited, rather than destroyed, the body's immune cells and the bacteria form a lump known as a granuloma or tubercle. In effect, the immune cells form a wall around inactive bacteria. As long as the immune system remains strong, the TB bacteria remain walled off and inactive. The tubercles may appear as shadows in a chest X ray. If the immune system later becomes weakened, the tubercle may open, releasing the bacteria, and the infection may develop into secondary TB.

B Secondary TB

In secondary, or post-primary, TB, the formerly dormant bacteria multiply and destroy tissue in the lungs. They also may spread to the rest of the body via the bloodstream. Fluid or air may collect between the lungs and the lining of the lungs, while tubercles continue to develop in the lung, progressively destroying lung tissue. Coughing of blood or phlegm may occur.

III DIAGNOSIS OF INFECTION AND DISEASE

Tuberculosis in the Lungs

Lung tissue calcification, resulting from pulmonary tuberculosis, appears as yellow patches within the chest area of this human X ray. When airborne phlegm contaminated with the bacillus Mycobacterium tuberculosis is inhaled, nodular lesions, called tubercles, may form in the lungs and spread through the nearest lymph node.

CNRI/Photo Researchers, Inc.

Diagnosis of TB requires two separate methods. Tuberculin skin testing is a method of screening for exposure to TB infection. People infected with the TB bacteria develop a hypersensitivity to the bacteria even if they do not develop the disease. In the test a purified protein derived from the bacteria is injected into the skin. The skin area is inspected 48 to 72 hours later for a bump, or positive reaction. A positive reaction implies that TB infection has occurred. Skin tests are not 100 percent accurate, however, and they do not always indicate the presence of active disease.

A diagnosis of TB disease is established by identifying bacteria in *sputum* (material coughed up from the lungs) or other body fluids and tissues, along with an abnormal chest X ray and the presence of TB symptoms. Once TB has been diagnosed, further testing is required to determine which drugs would be most appropriate to treat the particular strain of TB bacteria.

Detecting the presence or the strain of the TB bacterium was once a time-consuming process that would often delay therapy. Today, the use of genetic engineering techniques greatly reduces the time required for diagnosis. A new technique is the polymerase chain reaction (PCR), which can rapidly duplicate a tiny amount of bacterial hereditary material from a small sample of infected sputum.

IV TREATMENT AND PREVENTION

General preventive measures can be taken to reduce the spread of TB in public places. Ventilation systems lessen the chance of infection by dispersing the bacteria. Ultraviolet lighting also reduces, but does not eliminate, the threat of infection by killing TB bacteria in confined spaces. Vaccines, such as the bacillus Calmette-Guerin (BCG) vaccine, prepared from bacteria that have been weakened, are another preventive measure. The BCG vaccine is most effective in preventing childhood cases of TB.

With the advent of effective antibiotics for TB, drug therapy has become the cornerstone of treatment. Single-drug treatment often causes bacterial resistance to drugs. Therefore, all recommended therapies include multiple drugs given for at least 6 months, often for as long as 9 to 12 months. Adjustments to the treatments are made based on susceptibility of the bacterial strain. A combination of antibiotics is usually prescribed. In 1998, scientists successfully decoded the entire gene sequence, or genome, of the tuberculosis bacteria. This advance is likely to lead to the development of new methods for treatment and prevention of TB.

V HISTORY

Robert Koch

A color illustration depicts German scientist Robert Koch at work in his laboratory. Considered the founder of modern medical bacteriology, Koch isolated the bacillus that causes tuberculosis in 1882. He won the Nobel Prize for physiology or medicine in 1905.

THE BETTMANN ARCHIVE/Corbis

TB has existed for thousands of years. Scars on a skull found in Turkey indicate the presence of the disease 500,000 years ago. Scientists also have found tubercles in mummified bodies from ancient Egypt. References to TB can be found in the writings of ancient Babylonia, Egypt, and China. The term *tuberculosis* was first used in 1839; it was derived from the Latin word *tubercula,* meaning small lump, referring to the small scars seen in tissues of infected individuals. TB reappeared in Europe and the United States in epidemic form during the 19th century.

Significant research into the causes and cure of TB began in earnest in the early 19th century. French physician Gaspard Bayle described the damage caused by TB in 900 autopsies. René-Théophile-Hyacinthe Laënnec, also a French physician, described the evolution of the disease from the initial tubercle through its final stages. J. A. Villemin, a French army doctor, showed that TB could be transmitted from humans to animals.

American physician Edward Trudeau was affected by the disease twice, in 1873 and 1876. When he thought he was dying, he traveled to Saranac Lake in the Adirondack Mountains of New York to spend his final days. When he found his symptoms eventually cured, he attributed his healing to the fresh air of the mountains. In 1885 Trudeau built the first American sanatorium. It later became a model for the many sanatoriums that became the mainstay of TB treatment in the late 19th century and early 20th century. By 1930 the United States had 600 sanatoriums with a total of 84,000 beds. Trudeau also established the Trudeau Laboratory, which during the following 50 years, was responsible for training most physicians versed in the treatment of TB.

Early in the 19th century TB was considered a refined disease, one that affected artistic, morally superior individuals. But as the epidemic continued and claimed a larger circle of people, often the poor and disadvantaged, the victims themselves were blamed, and in the absence of scientific knowledge, TB was attributed to a person's lifestyle.

Scientific pursuit of the true nature of TB continued. In 1882 German physician Robert Koch discovered the bacteria that caused TB. Using simple but precise observations and experiments, Koch demonstrated the presence of the bacteria and how it was transmitted.

In Paris, French bacteriologists Albert Calmette and Camille Guerin worked with a virulent strain of bovine (cow) tubercle bacillus at the Pasteur Institute. In 1924 they prepared the BCG vaccine in hopes of protecting the world against tuberculosis. It was administered to a newborn child who was at high risk of developing TB. The vaccine was successful, and the child never contracted the disease. In 1944 American microbiologist Selman Waksman isolated streptomycin from a fungus, *Streptomyces lavendula*, heralding the beginning of modern antibiotic therapy for TB.

The success of drug therapy and the declining rates of disease incidence and mortality over the next 30 years instilled a sense of confidence in public health officials that TB could be conquered. As antibiotic therapy became the primary treatment, mortality rates from TB decreased significantly. Deaths from TB in the United States dropped from 188 per 100,000 in 1904 to about 1 per 100,000 in 1980. From 1953 to 1984, the average annual decline in cases was about 5 percent per year. As a result, funding for public health programs in the United

States, including those for the prevention and treatment of TB, was drastically curtailed in the 1980s.

VI RESURGENCE OF TB

As the incidence of TB continued to decline in the early 1980s, most medical experts expected that the disease would be completely eliminated in industrialized nations by the year 2010. But by the mid-1980s, the number of TB cases began to increase—between 1985 and 1991, the number of reported cases in the United States increased 20 percent. Since 1992 the number of TB cases in the United States has declined. Worldwide the incidence has continued to skyrocket.

A HIV and TB

Multiple factors contribute to the global increase in TB. Infection with the human immunodeficiency virus (HIV), which causes acquired immunodeficiency syndrome (AIDS), is the single greatest risk for progression of TB infection to active disease. People with HIV have a weakened immune system that increases their susceptibility to TB, and in these people, TB often progresses rapidly from the primary to the secondary stage. The increase of TB incidence is highest in Africa and Asia, areas with the highest number of people infected with HIV.

B Drug-Resistant TB

A second factor contributing to TB resurgence is the failure of patients to complete the full six to nine months of antibiotic therapy required to cure the disease. Many people stop taking antibiotics when they begin to feel healthier, but successful treatment of TB requires therapy beyond the period of obvious symptoms. When patients fail to follow the prescribed treatment, they may become actively infectious, spreading the disease to others. An infected person may infect as many as 10 to 15 other people in a single year. Failure to complete the full round of treatment also can cause the emergence of TB bacterial strains with acquired drug resistance, further complicating treatment by increasing the length and cost of therapy.

The emergence of strains of bacteria that are resistant to multiple drug therapy is a serious problem, particularly because no drug treatment is available to combat newly emerging strains.

To improve compliance, the World Health Organization (WHO) strongly recommends that all countries, especially those in Africa and Asia, adopt a program called directly observed treatment, short-course (DOTS). DOTS requires health workers to monitor patients to make sure that they follow the complete course of treatment. The success rate and the cost effectiveness of this program have been proven around the world. Epidemics in New York City, Tanzania, Peru, and China in the early 1990s were brought under control using DOTS.

C Other Factors

Migration, international air travel, and tourism also have contributed to the global spread of TB. The extreme difficulty of screening immigrants and travelers for TB allows the disease to cross international borders easily. The substantial increase in homelessness, and the related circumstances of poverty, overcrowding, and malnutrition, also contributed to the increased incidence of TB in the United States and other industrialized countries during the early 1990s.

While industrialized nations with good public health systems have been able to control the recent TB resurgence, curbing the spread of TB on a global scale will require ongoing international efforts. In the future, combating TB throughout the world will require advances in molecular biology, research into the genetics of TB in order to understand drug resistance, and the continuous development of new drugs, as well as the prospect of synthesizing additional vaccines.

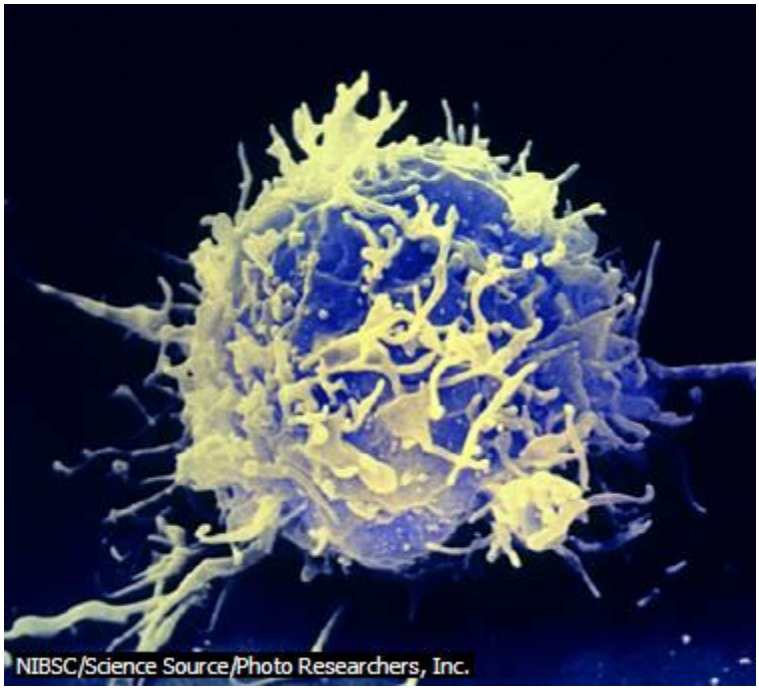
LYMPHOMA

I Introduction

Lymphoma, group of cancers that arise in the lymphatic system, body tissues that fight infection and perform several other vital functions in the body. Lymphoma is often called non-Hodgkin’s lymphoma to distinguish it from Hodgkin’s disease, a specific type of cancer that also affects the lymphatic system. However, the term non-Hodgkin’s lymphoma is somewhat misleading because, unlike Hodgkin’s disease, lymphoma encompasses many cancers. These various types

of lymphoma differ from each other in symptoms, treatment, and prognosis, depending on the type of cell that becomes cancerous and other characteristics. According to the American Cancer Society, in 2005 more than 56,000 people in the United States developed lymphoma and 19,200 died of the disease. For reasons scientists do not completely understand, the number of people diagnosed with lymphoma has increased more than 80 percent since the early 1970s. The incidence of lymphoma increases with age, and it is slightly more prevalent among men than among women. In the United States, non-Hispanic whites have the highest incidence of lymphoma.

II CAUSE



Lymphocyte

This scanning electron micrograph shows one of the primary cells of the lymphatic system, a T lymphocyte. T lymphocytes are specialized white blood cells that identify and destroy invading organisms such as bacteria and viruses. Cancers of the T lymphocytes, which comprise 15 percent of all lymphomas, spread through the lymphatic system to other parts of the body.

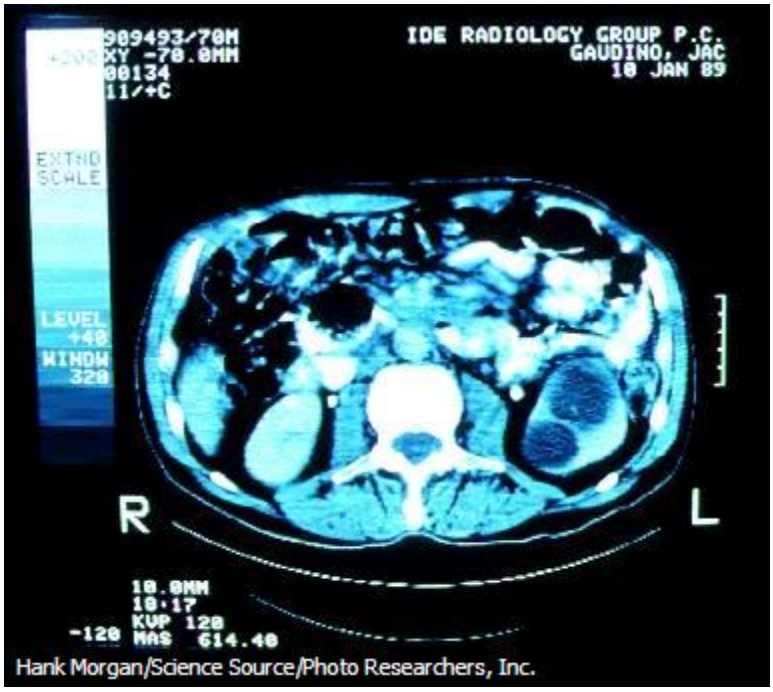
NIBSC/Science Source/Photo Researchers, Inc.

The lymphatic system consists of white blood cells known as T and B lymphocytes; lymphatic vessels, thin tubes that form a network in the body alongside blood vessels; and hundreds of

lymph nodes, bean-sized collections of tissue found in the chest, abdomen, neck, groin, and under the arms. Lymphoma occurs when, for mostly unknown reasons, a single B lymphocyte or T lymphocyte becomes cancerous and begins to grow in an unchecked fashion, its descendants eventually spreading throughout the body and crowding out normal tissues. One type of B cell lymphoma is Burkitt's lymphoma, which typically spreads to areas outside the lymphatic system such as the bone marrow, blood, and central nervous system. Examples of T cell lymphomas include lymphoblastic lymphoma, which usually develops in the thymus and forms a tumor mass in the area behind the chest bone, and mycosis fungoides, a rare skin disorder that spreads to the lymph nodes and internal organs.

People have an increased risk of developing lymphoma if their immune system is weakened due to, for example, a genetic condition, infection with the human immunodeficiency virus (HIV), or as a result of taking immune-suppressing drugs to prevent rejection of a transplanted organ. The connection between immune deficiency and lymphoma leads some scientists to believe that an abnormal immune response to common infections may play a key role in the development of the disease. In Africa, people who are infected with both the malaria parasite and Epstein-Barr virus have an increased risk of developing Burkitt's lymphoma. However, most people who develop lymphoma have no known risk factors.

III SYMPTOMS AND DIAGNOSIS



Computed Tomography Scan

A computed tomography (CT) scan produces a cross-sectional image of a portion of the body. A precisely directed, narrow X-ray beam passing through the body provides a highly accurate, painless, diagnostic tool that allows examination of the interior of the body without invasive procedures. This technique helps physicians determine how far lymphoma has spread through the body.

Hank Morgan/Science Source/Photo Researchers, Inc.

The symptoms of lymphoma vary greatly from person to person, but most frequently the first symptom is a painless swelling of a lymph node in the neck, under an arm, or in the groin. Other symptoms of lymphoma can include shortness of breath; a dry, persistent cough; and pain from masses of tumor cells in various parts of the body, such as the chest or abdomen. Organs, such as the kidneys or liver, may stop functioning properly if lymphoma cells grow into tumors there. Some patients also develop fever, night sweats, or weight loss.

Many of the symptoms of lymphoma may be confused with other common illnesses. For instance, an enlarged lymph node is also a symptom of flu or other common infections, particularly in infants and children. To make a certain diagnosis, doctors perform a biopsy, in which part or all of an enlarged lymph node is removed and examined under a microscope. If

cancerous cells are present, doctors also try to establish what type of lymphoma is present and how rapidly it grows. Doctors stage the cancer, or determine how far it has spread, by performing tests, such as computed tomography (CT) scans of the chest and abdomen, blood tests, and biopsies of the bone marrow. This information can help doctors recommend appropriate treatment and predict the patient's likelihood of recovery.

IV TREATMENT

Treatment for lymphoma is tailored to each individual patient, depending on the type of lymphoma present, how fast it grows, and how far it has spread. In general, lymphomas that derive from T cells are more difficult to treat than B cell lymphomas, and patients over age 60 are less likely to be cured than younger patients. Lymphoma can easily spread throughout the body, so patients whose disease appears to be confined to one or a few lymph nodes may have collections of cancerous cells elsewhere in the body that are not big enough to be detected by the tests used in staging the disease. For this reason, the treatment of choice for lymphoma is usually chemotherapy—drugs given by mouth or through the veins to kill rapidly dividing cancer cells throughout the body. Radiation therapy, in which high-energy rays are directed at a specific part of the body, is sometimes given after a course of chemotherapy to help prevent a relapse.

Chemotherapy medicines and radiation are toxic to both lymphoma and normal cells, and they can cause a variety of side effects, including nausea and vomiting, hair loss, mouth sores, and skin irritation. More serious side effects can include infections, bleeding, and organ damage. Physicians have made great progress in controlling these complications, and most patients recover from all side effects after their treatment for lymphoma.

In patients whose lymphoma returns after treatment, doctors may use higher doses of chemotherapy or radiation in a second attempt to kill the cancerous cells. These intensive treatments also destroy the blood-forming cells in the patient's bone marrow. After the high-dose chemotherapy or radiation treatment, stem cells, which are responsible for long-term formation of blood, must be infused into the patient in a procedure known as stem cell transplantation. The stem cells may be collected from the bone marrow or circulating blood of the patient before the

chemotherapy or radiation treatment, or the cells may come from an immunologically matched donor, usually a parent or sibling.

Several recent innovations have improved treatment for lymphoma. These include antibody therapy, in which highly specific molecules known as monoclonal antibodies are used to destroy lymphoma cells with minimal effect on normal cells, and vaccine therapy, which helps stimulate the patient’s immune system to fight the lymphoma. Some of these treatments are still experimental and are very expensive. In recent years these and other new treatments, as well as better management of the side effects of chemotherapy, have improved the five-year survival rate for lymphoma from 31 percent in 1960 to approximately 60 percent today.

Contributed By:
Fredrick B. Hagemeister

1983: Medicine

Archives consist of articles that originally appeared in Collier's Year Book (for events of 1997 and earlier) or as monthly updates in Encarta Yearbook (for events of 1998 and later). Because they were published shortly after events occurred, they reflect the information available at that time. Cross references refer to Archive articles of the same year.

1983: Medicine

Artificial heart.

The first recipient of a permanently implanted artificial heart, Dr. Barney Clark, died on March 23, after surviving a remarkable 112 days by means of it. The plastic-and-aluminum device, designed by Dr. Robert K. Jarvik of the University of Utah, had been implanted on December 2, 1982, just in time to save Clark's life. A retired dentist from the Seattle area, he had been suffering from cardiomyopathy, a progressive weakening of the heart muscle, which would no longer respond to drug treatment. At 61 years of age, he was more than ten years too old to be considered for a human heart transplant. But his stable personality and supportive family—as

well as the gravity of his condition — made him a good candidate for the highly risky artificial heart implant.

The 7½-hour operation, performed by Dr. William C. DeVries at the University of Utah Medical Center, involved removing most of Clark's natural heart and replacing it with a device called the Jarvik-7, designed to mimic the action of the natural organ. The artificial heart was permanently connected by 6-foot-long hoses to a compressed-air pump that caused it to 'beat'; the pump was housed in a wheeled cart. After the operation Clark suffered numerous complications, but he made more progress in recovering than many had anticipated. Two months after the procedure, he was able to take ten steps with the aid of a walker and pedal a stationary bicycle. His condition worsened a month later, however, and death eventually resulted. Clark's doctors stated that his death was caused not by any failure of the device, but by an overall failure of his own organ systems. The operation raised ethical questions, including those of cost and recipient selection, but it nevertheless was widely seen as an important step in the treatment of heart disease and the replacement of organs with artificial devices.

AIDS epidemic.

With neither a cause nor a means of prevention in sight, the epidemic of acquired immune deficiency syndrome (AIDS) continued this year. Most of its victims fell into one of four well-defined high-risk groups: homosexual or bisexual men with many sexual partners (by far the largest risk group), hemophiliacs, intravenous drug users, and Haitian immigrants. By late in the year, according to U.S. and Canadian government health organizations, over 2,700 cases had been reported in those two countries, with a total of over 1,100 deaths.

AIDS is characterized by the near total loss of the body's ability to fight off disease. With no natural defenses left, and no means of restoring them artificially, AIDS victims are especially vulnerable to a host of infections, such as pneumonia caused by the organism *Pneumocystis carinii*. It and a cancer called Kaposi's sarcoma are the most common causes of death in AIDS patients.

New hope for the infertile.

Now that in vitro fertilization has become a relatively well-established technique, and 'test-tube' babies are no longer as unusual as they once were, researchers in California have reported success with a new, still experimental method of fertilization that offers additional hope to couples with fertility problems. The technique, known as ovum (egg) transfer, involves taking sperm from the prospective father and then placing it in the uterus of a woman who has agreed to provide an egg. (With in vitro fertilization, on the other hand, the egg is obtained surgically from the mother and is then fertilized with the father's sperm, in the laboratory.) If fertilization occurs, the embryo, during the first week of pregnancy, is carefully flushed from the donor's womb through a narrow plastic tube. It is then transferred through a catheter to the uterus of the woman who will carry the fetus to term. Dr. John E. Buster, a professor of obstetrics and gynecology at the University of California at Los Angeles Medical Center, reported in July that he and his colleagues had successfully transferred fertilized eggs into two women out of 14 who had agreed to undergo the new procedure.

Ovum transfer offers at least one advantage over in vitro fertilization: no surgery is required for the recipient. However, the procedure, like artificial insemination, necessitates the participation of a third person in the process of conception, something that not everyone will find acceptable. Researchers suggest that ovum transfer will be most useful either in place of in vitro fertilization, when a woman has blocked fallopian tubes that cannot be opened surgically, or instead of that method, either when the eggs cannot be removed surgically or where there is concern that the prospective mother might transmit a genetic disorder to her offspring.

Brain tissue grafts.

The grafting of new tissue to replace parts of the brain that have been damaged or diseased is a long way off for humans, but a study reported this summer suggests that such 'transplants' may eventually provide a method of treating some brain disorders.

In the first step of the new study, conducted by four Massachusetts researchers, a portion of the frontal cortex of 21 adult male rats was deliberately damaged. (That part of the brain governs the ability—in both humans and rats—to plan and execute actions in the proper sequence.) Next, frontal cortex tissue taken from rat fetuses was implanted in eight of the rats. Six of the other damaged rats received implants of fetal tissue from another part of the brain, the cerebellum, and seven received no implants at all. In addition, eight rats with no brain injuries served as controls.

All of the rats were then presented with a task that a normal laboratory rat can master in a few days. Placing drinking water first in one arm, then another, of a T-shaped maze, the scientists tested the rats' ability to learn to alternate the direction they needed to go in order to get to the water.

The results suggest that the grafts of frontal cortex tissue did enhance the rats' learning ability. The damaged rats that received these grafts learned the pattern far more rapidly—in 8½ days—than did those injured rats that received the cerebellar graft or received no graft. It took the rats in both of the latter groups an average of 18 days to master the maze. (The undamaged control group learned to do the task in under three days.)

Researchers suggested that the rats with frontal cortex grafts did as well as they did partly because the transplanted tissue 'connected' to their brains and partly because it sparked the release of chemicals that enhance the growth of neurons. If those chemicals could be isolated, the researchers speculate, similar positive results might be achieved by chemical means alone.

Coffee and cholesterol.

The debate over coffee's effects on health continued this year, as Norwegian researchers reported findings that could link coffee drinking to increased risk of heart disease. According to Dr. Dag S. Thelle and colleagues at the University of Tromsí, drinking large amounts of coffee may result in increased cholesterol in the blood, which has been linked in turn with the development of heart disease.

The study examined the coffee-drinking habits of 14,581 Norwegian men and women to see whether consumption of coffee was related to cholesterol levels in the blood. The results, described by the researchers as surprising, showed that people who drank between one and four cups of coffee daily had cholesterol levels about 5 percent higher than those who drank no coffee. The effect was magnified with increased consumption; those who drank between five and eight cups daily had cholesterol levels that were 9 percent higher, and those who drank nine or more cups of coffee each day had levels about 12 percent higher than those of abstainers. The relationship between coffee and cholesterol remained 'strong and statistically significant' even after the researchers took into account age, body size, level of physical activity, smoking habits, and alcohol consumption.

The researchers acknowledged that their findings by themselves did not settle the issue and that they left many questions unanswered, chief among them the question of why such an apparently strong relationship had not been well established by other research. The researchers suggested several distinctive characteristics of their study population that might have made the relationship more evident. One was the amount of coffee consumed by the subjects, 60 percent of whom reported drinking five or more cups of coffee daily; only about 20 percent of the subjects in similar American studies consumed that amount. Another factor might have been the strength of the coffee generally consumed in Norway.

Lyme disease.

Eight years after the first cases of Lyme disease were reported in Connecticut, researchers have published their findings on the identification of the organism responsible for this inflammatory disease, which has since spread to other states and countries. A previously unrecognized bacterium carried by the *Ixodes dammini* tick is the culprit, according to March reports by two groups of investigators. The organism, now called *I. dammini* after the tick, was first isolated in 1982 in the ticks, which are common in the region where Lyme disease is endemic. The same organism was then isolated in the tissues of Lyme disease patients by teams at the Yale University School of Medicine and the State University of New York at Stony Brook.

In its early stages, Lyme disease is characterized by skin rashes, fever, chills, and other symptoms. The disappearance of symptoms may or may not mark the end of the disease; some victims later experience periodic episodes of arthritis, and others suffer neurological and cardiac problems as well. Identifying the organism responsible for the ailment is important because victims diagnosed and treated with antibiotics during the early stages of illness are less likely to experience its debilitating long-term effects.

Test for Huntington's disease.

Huntington's disease, or Huntington's chorea, is a fatal hereditary disorder whose symptoms include jerky movements and mental deterioration. The child of an affected parent has a 50 percent chance of also contracting it. Since symptoms do not usually appear until early middle

age, victims may unknowingly pass the disease on to their children before a diagnosis can be made.

This situation may change as a result of the development of the first genetic test to detect the disease, announced in November by scientists at Massachusetts General Hospital in Boston. Using sophisticated gene-splicing techniques, the researchers discovered a 'marker,' or indicator, of the disease in human genetic material. Another year or two of study is required before the test can be widely applied, but it shows promise of making possible a diagnosis of the disease early in the life of those yet without symptoms, as well as prenatally.

High blood pressure.

Despite years of advising people with hypertension (persistently high blood pressure) to eat less salt, physicians have lacked hard evidence that a low-salt diet does in fact result in lower blood pressure. This July, a study conducted by Dutch researchers offered the first evidence that lower salt intake may have a favorable effect on blood pressure. The study, conducted at Erasmus University Medical School in Rotterdam, compared 245 babies whose parents fed them a diet containing normal amounts of salt for the first six months of life with another group of infants who were fed diets containing two to three times less salt. It was found that, after six months, the infants on the low-salt diets had blood pressure levels that were on average slightly lower than those who had taken in normal amounts of salt. The researchers contended that, though the difference was slight, the lower level, if maintained over a period of years, could 'contribute considerably to the prevention of cardiovascular disease.'

The issue, however, is far from settled. Another study, also described in July, found no link between high salt consumption, as reported by subjects, and high blood pressure, even among overweight people. A team of researchers in Connecticut questioned 1,655 men and 1,911 women as to the amount of salt they ate. Substantial differences in salt consumption were reported, but these did not correlate significantly with differences in blood pressure.

Another study unveiled this year offered insight into a different risk factor for hypertension. Stress, which physicians think may contribute to the development of high blood pressure, may play this role by causing the kidneys to retain salt, which in turn leads to a disruption in the body's regulation of blood pressure. Previous investigations of rats indicated that stress causes their kidneys to excrete less salt and that rats that develop high blood pressure are more likely to

retain salt than those that do not. To see whether the same pattern prevailed in humans, a team led by Dr. Kathleen C. Light of the University of North Carolina School of Medicine chose two groups of male college students; one was at high risk of hypertension, either because the students had family histories of high blood pressure or because they had borderline levels of hypertension themselves; the other was at low risk.

To place them under stress, the students were assigned competitive tasks. The researchers found that those in the high-risk group had increased heart rates and tended to excrete significantly less urinary sodium and fluid. The study concluded that 'psychological stress appears to induce changes in [the kidney's] excretory functions that may play a critical role in long-term blood pressure regulation.'

Stress and immune response.

Blood pressure is not the only regulatory function that may be affected by stress; researchers this year offered evidence for the theory that the body's ability to fight disease with antibodies varies with the amount of stress an individual experiences.

In a one-year study, researchers from Harvard and Tufts universities and Beth Israel Hospital in Boston found that the levels of an antibody known as secretory immunoglobin A (s-IgA) dropped significantly when the subjects, 64 dental students, were in stressful situations, such as during examination periods. The researchers also discovered that the student's individual emotional reaction to a stressful situation affected the level of the antibody. Subjects found to be more competitive on the basis of standardized personality tests showed lower levels of s-IgA than less competitive peers subjected to the same type of pressure.

Treating Alzheimer's disease.

Alzheimer's disease, a devastating neurological disorder that results in a progressive massive deterioration of mental functioning, is the underlying cause of perhaps 120,000 deaths in the United States each year. Although no way has yet been found to prevent the disease or halt its progress, several preliminary studies reported this year suggest that certain drugs might alleviate the symptoms.

One of the drugs, naloxone (sold as Narcan), is already used to treat narcotics overdoses. Because naturally-occurring substances similar to naloxone may play a role in memory losses associated with Alzheimer's disease, Dr. Barry Reisberg of New York University Medical Center and colleagues tested the drug's effects on seven Alzheimer's patients. Tests of memory, perception, and other functions showed that all the patients improved somewhat after receiving the drug, with three improving so markedly that family members noted the change. Two of the patients experienced increased anxiety, but there were no other side effects.

Physostigmine (sold as Antilirium) is also being studied for use in treating Alzheimer's disease. In one preliminary study, Dr. Leon J. Thal and Paula Altman Fuld of New York's Albert Einstein College of Medicine found that eight of 12 patients tested with the drug improved their ability to carry out a recall task. When given higher doses, the patients did suffer significant side effects—nausea, vomiting, sweatiness, or queasiness. In another study, Dr. Kenneth L. Davis and colleagues at the Bronx Veterans Administration Medical Center found that, in a small group of patients who received the drug, two showed 'clinically meaningful' effects. They were found to be less disoriented and better able to relate to their environment, and they generally behaved in a more appropriate fashion, though they remained, 'quite demented.'

Smoking.

No 'safe' cigarettes.

Smoking 'light' cigarettes (those low in nicotine and other substances) apparently does not reduce the risk of cigarette-related heart attacks, researchers reported this year. Further confirming the notion that it's better to quit than switch, another study found that light cigarettes, in fact, have as much nicotine as regular cigarettes.

The first study, conducted by researchers from Boston and Harvard universities, compared the smoking habits of 502 men between the ages of 30 and 54 who were hospitalized after suffering first heart attacks with the habits of 835 men hospitalized for other reasons. It was found that the men who smoked faced almost three times the risk of heart attacks as those who did not smoke. Researchers also found that the level of risk did not change with the amount of nicotine and carbon monoxide in the cigarettes smoked. The effect of these two substances was studied

because nicotine is known to increase blood pressure and carbon monoxide to reduce the amount of oxygen that reaches the heart.

The reason for the lack of difference may lie in part in the findings of the second study, conducted by Dr. Neal L. Benowitz of San Francisco General Hospital and Medical Center and colleagues. They found that despite the claims of cigarette manufacturers and contrary to the results of previous tests made by the Federal Trade Commission, the tobacco in low-yield cigarettes did not contain less nicotine than does that in most regular-strength cigarettes. The investigators reached this conclusion after extracting and measuring the nicotine content in different cigarettes. To determine how much nicotine was consumed by smokers of low-yield cigarettes, the blood concentration of a nicotine by-product was measured after 272 subjects smoked various brands. The researchers suggested that their methods provided more accurate information than did the smoking machines used in the FTC tests.

Smoking and longevity.

Smoking has also been named as the factor that bridges the 'longevity gap' between men and women. A study conducted by Drs. Dean R. Gerstein of the U.S. National Research Council and Gus H. Miller of Pennsylvania's Indiana University suggested that the 'overwhelming' reason why American women are statistically likely to live longer than men is that they have tended to smoke less. But because women are now beginning to smoke almost as much as men, the 7½-year difference in their lifespans may gradually vanish.

The researchers studied a population of 8,300 people in western Pennsylvania. When they removed two factors in their analysis—smoking and death from violent causes—they found that longevity for men and women was about equal. The analysis suggests that the difference in longevity is not, as other studies have suggested, the result of either innate differences or the greater on-the-job stress to which men are presumably subject. Stress, however, may play a role; those who are forced to cope with more stress may seek to alleviate its effects by smoking. Young women are currently taking up smoking at higher rates than are young men; the study concludes that when the adverse health effects catch up with them, the women will probably develop cancer and other cigarette-related diseases at rates as great as those of men.

Cancer and chromosomes.

A study reported in July offered a new theory about why, when a large group of people are exposed to a cancer-causing agent, only some develop cancer. Dr. Jorge J. Yunis of the University of Minnesota suggests that chromosomal 'fragile sites' caused by genetic weaknesses may make some people more susceptible to cancer than others.

Reporting his findings in *Science*, Yunis first explained how 'characteristic defects,' consisting of missing or rearranged genes, are now known to exist in most human tumor cells. In comparing tumor cell chromosomes to white blood cell chromosomes of cancer patients, he found that the latter had fragile sites, prone to breakage, in the same regions where the cancer cell chromosomes showed defects. Yunis was able to associate breakage points with fragile sites in types of lung cancer, lymphoma, and leukemia. If the finding holds up for other kinds of cancer, the sites could be used as a guide in identifying people who are most vulnerable to cancer.

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