AMERICAN LUNG ASSOCIATION®

Lung Disease Data: 2006

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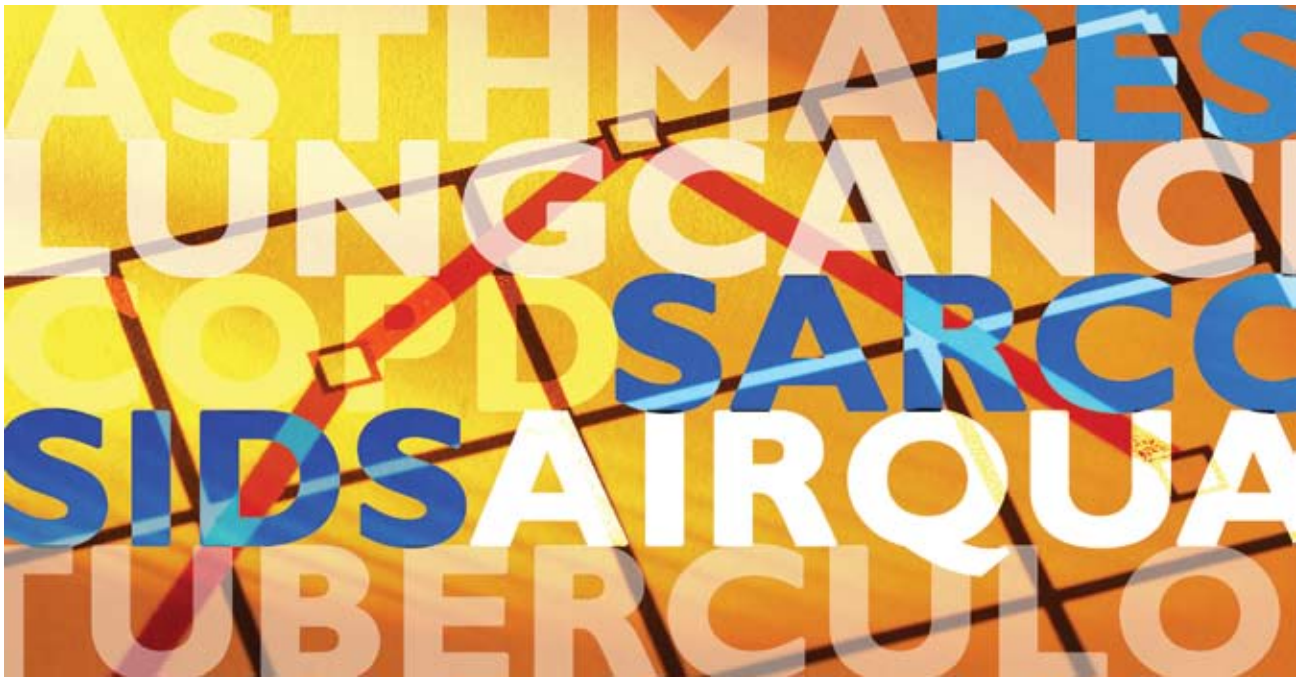

Air Quality • Asthma • Bronchopulmonary Dysplasia • Chronic Obstructive Pulmonary Disease

Cystic Fibrosis • HIV/AIDS • Influenza and Pneumonia • Lung Cancer

Obstructive Sleep Apnea or Sleep Disordered Breathing • Occupational Lung Diseases

Primary Pulmonary Hypertension • Respiratory Distress Syndrome: Adult and Infant

Respiratory Syncytial Virus Disease • Sarcoidosis

Sudden Infant Death Syndrome • Tobacco Use • Tuberculosis

Other Lung Diseases

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Definitions

Prevalence The number of existing cases of a particular condition, disease, or other occurrence (e.g., persons smoking) at a given time.

Incidence The number of new cases (as of a disease) occurring during a particular period of time (as in a year).

Prevalence or incidence rate Cases in a particular population quantity – e.g., per hundred or per thousand.

Age-adjusted figure A figure that is statistically corrected to remove the distorting effect of age when comparing populations of different age structures.

Note: All statistics in this document apply specifically to the United States and are for the most recent available year. Factors used in expressing these data are as determined by the collecting agencies:

- Mortality (death) rates are per 100,000 population.
- Chronic disease prevalence is per 1,000 population.
- Hospital discharge rates are per 10,000 population.
- Incidence rates are per 100 or per 100,000 population.

Introduction

Why are the lungs so important?

The lungs, with their tiny air sacs called alveoli, have sometimes been simplistically compared to sponges. They are actually far more complex than many other organs. The heart, for example, is a relatively uncomplicated muscular pump designed with one-way mechanical valves for the purpose of keeping the bloodstream flowing in one direction. The lungs must play multiple roles – supplier of oxygen, remover of wastes and toxins, defender against hostile intruders. They contain at least three dozen distinct types of cells, each with its special tasks and abilities. Some scavenge foreign matter. Others, equipped with delicate, hair-like cilia, sweep the mucous membranes lining the smallest air passages. Still others act on substances crucial to blood-pressure control, or serve as sentries to spot invading agents of infection. The roles of many others remain mysteries, posing challenges to researchers.

In mechanical terms, our lungs can be described as the site of gas exchange. Oxygen – the fuel all the cells and organs of our body need to function – is extracted from the air we inhale and infused into the bloodstream, to be distributed to other organs and tissues. With each exhalation, we dispose of the carbon dioxide that is the by-product of our bodily processes. In our lungs, in the course of a single day, an astonishing 8,000 to 9,000 liters of breathed-in air meet 8,000 to 10,000 liters of blood pumped in by the heart through the pulmonary artery. The lungs relieve the blood of its burden of waste and return a refreshed, oxygen-rich stream of blood to the heart through the pulmonary vein.

What are lung diseases?

The lungs are internal organs; yet they are, uniquely, constantly exposed to our external environment – a direct interface with the world outside.

With each breath, a host of alien substances enters our bodies and leaves the lungs a ravaged battlefield. Lung disease is any disease or disorder where lung function is impaired. Lung diseases can be caused by long-term and immediate exposure to smoking (active and passive), air pollution, occupational exposures such as asbestos and silicosis, carcinogens that trigger tumor growth, radon, infectious agents and overreactive defenses.

There are many types of lung diseases including:

- **Obstructive lung disease such as asthma, chronic bronchitis, and emphysema**. These all affect a person's airways and limit or block the flow of air in or out of the lungs.
- **Infections such as pneumonia, influenza, RSV and tuberculosis (TB)**. Bacteria or viruses can cause these diseases that affect the membrane (or pleura) that surrounds the lungs.
- **Lung cancer**. A disease characterized by uncontrolled growth and spread of abnormal cells.
- **Respiratory failure, pulmonary edema, pulmonary embolism, and pulmonary hypertension**. These are caused by problems with the normal gas exchange and blood flow in the lungs.

- **Pulmonary fibrosis and sarcoidosis**. Diseases characterized by stiffening and scarring of lungs.
- **Occupational diseases such as mesothelioma and asbestosis**.

Just as there is no single cause for lung disease, there is no single symptom of lung disease. Some conditions may send disease-specific signals, such as the characteristic wheezing sound made as the asthma sufferer attempts to exhale.

Some lung disorders, such as emphysema, may be evidenced mainly by increasing shortness of breath, eventually upon the slightest physical effort, as flagging muscles fail to receive sufficient oxygen.

Other forms of lung disease may be signaled by persistent cough, chest pain, shortness of breath, abnormal sputum production, bloody sputum, or a combination of these symptoms.

When an infectious agent causes a lung disease, there may also be fever and/or chills. Any suspicion that the lungs might be malfunctioning means that a person should seek medical attention.

What is *Lung Disease Data: 2006*?

In the pages that follow, we have depicted salient facts and figures about some of the most common lung diseases in America today.

The American Lung Association strongly believes that if cigarette smoking, preventable premature childbirth, disregard for workers' safety, and violating clean-air laws were to end today, we could expect a future largely free of the most lethal forms of lung disease.

Below are a few important facts on lung diseases overall:

- Every year over 349,000 Americans die from lung disease – an age-adjusted death rate of 121.4 per 100,000.[1]
- Lung disease is America's number three killer (after heart disease and cancer), responsible for one in seven deaths.[2]
- The lung disease death rate has been continuously increasing while death rates due to heart disease and cancer have been declining.[3]
- Overall, various forms of lung disease and breathing problems constitute the number one killer of babies under the age of one year, accounting for 21 percent of infant deaths in 2002.[4]
- More than 35 million Americans have chronic lung diseases.[5]
- An estimated 440,000 Americans die each year from diseases directly related to cigarette smoking, including heart and lung diseases.[6]
- Millions of children and adults with lung disease in this country are exposed to levels of ozone and particle air pollution that could potentially make them sick.
- Asthma and chronic obstructive pulmonary disease (emphysema and chronic bronchitis), the most common obstructive lung diseases, are associated with substantial health impairment and work disability. Nearly one in five cases of both diminished general health and depression can be attributed to obstructive lung disease.[7]
- Lung disease costs the American economy $81.6 billion in direct healthcare expenditures every year, plus indirect costs of $76.2 billion – a total of more than $157.8 billion.[8]

Air Quality

What is the connection between air quality and lung disease?

Numerous studies have shown that air pollution can cause cardiovascular and respiratory illness, cancer, birth defects, and even death. Sadly, millions of Americans live in areas where the pollution in the outdoor air all too often puts their health and even their lives at risk.

Disasters such as the fog in Donora, Pennsylvania, where almost half of the town's 14,000 residents became ill and 20 died, and the London fog in 1952, where the death toll climbed to over 12,000, have brought the dangers of outdoor air pollution to the forefront.

In addition, indoor air pollution can be just as bad as outdoor air pollution for an individual's health. EPA studies of human exposure to air pollutants indicate that indoor air levels of many pollutants may be two to five times, and occasionally, more than 100 times higher than outdoor levels. These levels of indoor air pollutants are of particular concern because it is estimated that most people spend as much as 90% of their time indoors.

What constitutes outdoor air pollution?

The Clean Air Act provides the principal framework for ambient air quality in the United States, including national air quality standards that safeguard the public against the following six damaging pollutants:[9]

Ozone

Ozone (O_3) is a highly reactive form of oxygen that results from sunlight mixing with hydrocarbons (also called volatile organic compounds) and nitrogen oxides released in fuel combustion.

Recent studies have provided strong evidence that exposure to unhealthful levels of ozone can cause premature death.[10] In addition, ozone exposure can cause shortness of breath and coughing, trigger asthma attacks, and reduce lung function, often leading to hospital admissions and emergency room visits. Repeated exposure may cause permanent damage to the lungs.[11]

Ozone is the main component of smog and levels in the United States tend to be highest during the summer months. Wind can carry ozone hundreds of miles, so people who don't live in areas with lots of industry or automobiles aren't necessarily safe from high ozone levels.

Particulate matter

Particulate matter air pollution (PM) is a complex mixture of substances, including carbon-based particles, dust, and acid aerosols formed in the atmosphere from gaseous combustion by-products such as volatile organic compounds, sulfur dioxide and nitrogen oxides.

Sources are vast and varied, including diesel bus and truck emissions as well as ordinary automobile exhaust, industrial and utility smokestacks, coal-fired power plants, mining, and construction. Particle pollution is especially high in urban industrial and heavily trafficked areas, as well as in some rural locales with unpaved roads and extensive wood burning.

Particles vary in size; the largest particles tend to be more easily trapped in the nose or throat,

while the smaller particles can be drawn into the smaller air passages. Those of special concern have a diameter of 10 microns or less, or less than 1/7 th the diameter of a human hair. Those measuring 2.5 to 10 microns are called coarse particles.

Fine particles, with a diameter of 2.5 microns or less ($PM_{2.5}$) represent the most serious threat. Particles this small easily penetrate the alveoli, the very smallest air sacs of the lung, and because this region of the lung has a slow clearance system, the deposits persist to perpetrate damage for long periods of time. A study conducted in Belgium in 2002 showed that the tiniest particles, termed ultrafine particles – those less than 1 micron in size – may pass through to the blood stream and then to the rest of the body.

Exposure to particle pollution increases the risk of premature deaths and can trigger asthma attacks, wheezing, coughing, and lung irritation in people with sensitive airways. Persons with chronic cardiovascular disease and diabetes are also at high risk.[12]

Recent research has estimated that fine particle pollution from U.S. power plants cuts short the lives of more than 23,000 people each year. Hundreds of thousands of Americans suffer from asthma attacks, cardiac problems and upper and lower respiratory problems associated with fine particles from power plants, according to the report.[13]

One study linked lung cancer to levels of particulate pollution currently in the United States, and confirmed the increased risk of cardiopulmonary mortality.[14]

Nitrogen dioxide

Nitrogen dioxide (NO_2) forms when fossil fuels are burned at high temperatures and is principally derived from motor vehicle exhaust, coal-fired electric utilities and industrial boilers. Nitrogen oxides are also a key ingredient in the formation of ozone and some particle pollution.

Nitrogen dioxide can irritate the lungs and lower resistance to respiratory infections such as influenza. Frequent or continued exposure to much higher concentrations than those normally found in the ambient air may cause increased incidence of acute respiratory illness in children.

Sulfur dioxide

Sulfur dioxide (SO_2) is formed when fuel containing sulfur (mainly coal and oil) is burned, and during metal smelting and other industrial processes.

Major health concerns associated with exposure to high concentrations of SO_2 include difficulty breathing, lung illness including asthma attacks, changes in pulmonary defenses, and aggravation of existing heart disease. Sulfur dioxide is a key ingredient in the formation of some particle pollution as well.

Exposure to SO_2 often occurs along with exposure to particulates, as they are formed from the same sources.

Carbon monoxide

Carbon monoxide (CO) is colorless and odorless, and at high levels can be poisonous. CO is formed when carbon in fuel is not burned completely. It can cause harmful health effects by reducing oxygen delivery to the body's organs and tissues. At low levels of exposure, CO mainly affects those with heart conditions. At higher levels, which are typically found indoors, CO can be poisonous and life-threatening. CO exposure may also cause injury to the eyes, reduced work capacity, difficulty doing manual and complex tasks, and poor learning ability.

Lead

Lead is a metal found naturally in the environment and in manufactured products. Due to the phase out of leaded gasoline between 1975 and 1986, outdoor lead levels have decreased by more than 90 percent. While the primary impact is not on the lungs, the respiratory system is the major route of entry into the body for lead particles. Lead harms the brain and nervous system and damages the kidneys, liver and other organs. High levels of exposure to lead can cause seizures and mental retardation, and can harm learning ability and IQ in children and fetuses.[15]

Fossil fuels

Most outdoor air pollution stems from **burning fossil fuels**, whether from generating electricity, operating industrial processes, or driving the family car. Over the past 20 years, the national air quality and emission levels for all six principal pollutants have improved. Despite this progress, however, about 160 million tons of air pollution were released into the air in the United States in 2002, and approximately 146 million people lived in counties that did not meet EPA standards for at least one of the pollutants.[16]

Air quaity monitoring

The **American Lung Association State of the Air: 2006** report estimates that 152 million people live in counties with unhealthy levels of ozone or PM, the two most prevalent of the principal air pollutants.

In addition to these six major pollutants, there are other hazardous or toxic air pollutants that may not be as widespread but can be found in high concentrations, especially in industrial areas or near roadways and coal-fired power plants. These include pollutants that are known to cause cancer, such as benzene, and others that damage the nervous system or brain, such as mercury.

Every day, air quality data is collected by state and/or local air pollution control agencies from a network of monitors set up across the nation. Air quality information may be included as part of the weather forecast on TV and radio, or printed in the newspaper. Many states post ozone forecasts on the Internet at www.epa.gov/airnow/index.html.

Visit **lungusa.org** or call **1-800-LUNG-USA** for more air quality information.

What constitutes indoor air pollution?

Elements in the air within the home, school and/or workplace have been increasingly recognized as threats to respiratory health. Poor indoor air quality can cause or contribute to the development of chronic respiratory diseases such as asthma and hypersensitivity pneumonitis.

Secondhand smoke

Environmental Tobacco Smoke (ETS) or **secondhand smoke** is estimated to cause 3,000 deaths from lung cancer and some 35,000 deaths from cardiovascular diseases in nonsmokers annually. In addition, secondhand smoke triggers asthma attacks and causes lower respiratory tract infections, pneumonia and many other harmful conditions. Studies have estimated that ETS may significantly aggravate symptoms of asthma for 200,000 to 1,000,000 children each year.[17]

Radon

Radon is a naturally occurring gas that results from the radioactive decay of uranium. Radon breaks down into odorless and colorless particles that are often present in the home. Smokers exposed to radon substantially increase their risk of lung cancer compared to exposed non-smokers. The chief sources of radon pollution are rocks and soil that lie beneath buildings. Radon enters structures through openings such as foundation cracks. Studies estimate that 15,400 to 21,800 people die annually of lung cancer caused by radon exposure. Any home in any community can have high levels of radon.[18]

Combustion products

Combustion products (aside from tobacco smoke) include carbon monoxide, nitrogen dioxide, and sulfur dioxide. Sources of combustion products include stoves, furnaces, dryers, fireplaces and heaters. Carbon monoxide, which is colorless and odorless, can be particularly dangerous. Fatal and near-fatal carbon monoxide poisonings occur most often during the winter months as a result of misuse or malfunction of heating devices. An average of 480 persons die from unmentioned, non-fire-related CO exposure annually.[19]

Biologicals

Biologicals include substances such as waste matter and dander from living organisms (both pets and pests), pollen, molds, mildew, dust mites, bacteria and viruses. Biologicals cause many allergic reactions and worsen asthma in those allergic to mold. They may be a source of serious, potentially life-threatening diseases, such as legionnella. In office buildings, heating, cooling, and ventilation systems are frequent sources.

VOCs

Volatile Organic Compounds are emitted as gases from solids or liquids. Sources include formaldehyde-containing building materials, as well as an array of home and office products ranging from cosmetics, paints, and cleaners to pesticides, copiers and printers, glues and adhesives, and craft supplies.

Lead dust

Lead dust is a particular danger to children and unborn babies. It can get in the way of physical and mental development, and cause acute illness in both children and adults. In older buildings (often found in poor, urban areas), lead dust comes from old, lead-based paint that is still on the walls. It is estimated that 83 percent of privately owned housing units and 86 percent of public units still contain some lead-based paint. While small children nibbling on chips of lead paint has been the most widely publicized image of lead poisoning, those children inhaling lead dust is the most devastating reality. Ninety-five percent of lead in children is inhaled.[20]

Asbestos

Asbestos can be found in older homes and buildings, but it is most dangerous in industrial settings. It was once widely used in shingles, fireproofing, heating systems, and floor and ceiling tiles in older buildings. When asbestos-containing material is damaged or disintegrates, microscopic fibers are dispersed into the air. The risk occurs when the fibers become airborne. As such, removal of asbestos-containing materials is not always wise. The EPA requires removal only in order to prevent significant exposure. A management program for intact asbestos-containing materials is often recommended instead.

Other

The National Academy of Sciences/Institute of Medicine issued a report on asthma and indoor air quality, confirming that dust mites and other allergens, microorganisms, and some chemicals found indoors are triggers for asthma. In addition, the report stated that there was sufficient evidence to suggest links between secondhand smoke, house dust mites and the development of asthma in preschool aged children.[21]

In a 2004 report, the National Academy of Sciences/Institute of Medicine also reviewed the research on the health effects associated with damp spaces and mold. They found sufficient evidence to associate cough, wheeze, upper respiratory tract symptoms and, in sensitized persons, asthma symptoms with damp indoor spaces and mold.[22]

Who is at risk?

Exposure to indoor or outdoor air pollution can pose a wide range of health risks for many populations. Those that are most vulnerable include children, the elderly, culturally diverse populations and people with chronic lung disease.

Children

Children. Physically, children are more vulnerable to air pollution than adults because their respiratory defenses are not fully formed. Their airways are smaller and more likely to become blocked when irritated. They breathe more rapidly, taking in more pollution per pound of body weight.

According to the Department of Education, one-half of the 115,000 schools in the U.S. have problems linked to indoor air quality. Of these, 28,000 have inadequate heating, ventilating and air conditioning systems and 21,000 have faulty roofs.[23]

Also, the use of secondary heating sources contributes to breathing problems in infants. Use of wood stoves, gas space heaters, and kerosene heaters is associated with wheezing and coughing in babies.[24]

Children also spend a lot of time outdoors, playing hard and breathing hard, especially in the summer when ozone levels are the highest. Also, for reasons not fully understood, children do not acknowledge the symptoms of ozone exposure, even when they are experiencing significantly reduced breathing ability. So they are less likely than adults to protect themselves from further harm by reducing activity level or going inside.

A number of recent studies have added to the evidence that children are especially vulnerable to the harmful effects of ozone and particulate matter.

One study followed 1,600 southern California children enrolled as fourth graders in 1996 for four years. The researchers found that the children's exposure to ozone and PM was correlated with reduced growth in peak flow rate – the ability to push air out of the lungs, which is an indicator of growth in lung function. Larger deficits in lung function growth rate were observed in children who spent more time playing outdoors, confirming findings from an earlier study of another similar group of children.[25]

Researchers have found that when air pollution worsens, more children stay home sick from school due to respiratory illnesses. One study of school children in Nevada found that increases in ozone levels were associated with an increase in school absentee rates.[26]

Children with asthma can benefit greatly from a reduction in ozone concentrations, as a study of the 1996 Summer Olympics in Atlanta demonstrates. The city made a concerted effort to reduce traffic congestion to enable spectators to get to the games. Public transit was enhanced, the downtown was closed to private cars, and businesses were encouraged to promote telecommuting and alternative work hours. The result: large and significant decreases in ozone concentrations. During this period, researchers found significant reductions in the numbers of urgent care visits, emergency care visits, and hospitalizations for asthma among children ages 1-16.[27]

Playing team sports in high-ozone areas may also increase the risk of developing asthma. Researchers at the University of Southern California in Los Angeles found that children living in communities with high ozone levels who played team sports were three times more likely to develop asthma. The risk of asthma increased with each additional sport played by a child in a high-ozone community.[28]

Other studies have shown that as particulate levels increase, so do pediatric asthma hospitalizations and emergency room visits.

Elderly

Elderly. For most people, breathing ability diminishes over time as a part of the normal process of aging; so even the healthy elderly are at increased risk from exposure to air pollutants like ozone, which further reduces their lung function. Air pollutants also increase an individual's susceptibility to infections such as influenza and pneumonia, of which the elderly are the primary victims.

Racial disparity

Racial disparity. Culturally diverse population subgroups experience greater exposure to unhealthful outdoor/indoor air quality. In particular, research indicates that minorities live in greater concentrations in areas that fail to meet the national air quality standards as well as areas with above average numbers of air-polluting facilities than in areas that have better air quality and fewer sources of pollution.

An EPA report found that 52.5 percent of all whites live in counties with high ozone concentrations. For African Americans the figure is 62.2 percent, and for Hispanics, 71.2 percent. Similar proportions were found for carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter, with higher percentages of African Americans and Hispanics residing in counties with excessive levels of these pollutants.

In addition, because of low-quality housing, overcrowding, and lack of air conditioning, children in low-income communities may also spend more time outdoors on smoggy summer days.

A report found that three of the five largest hazardous waste landfills in the United States are in African American or Hispanic neighborhoods. An update to this report found that the average percentage of people of color in areas with toxic waste sites is three times higher than in areas without toxic waste sites.[29]

More recent studies have been concerned with power plants and the release of nitrogen oxides and sulfur dioxide, which form particle pollution that has been linked to more than 550,000 asthma attacks and 23,600 premature deaths nationwide. Pollution from power plants affects all Americans, but 68 percent of African Americans live within 30 miles of a coal-fired power plant, compared to only 56 percent of whites.[30]

Workers

Workers. There are also a large number of people who fall into sensitive groups because their activities cause them to be exposed to ozone for prolonged periods of time. Much of the laboratory research on ozone health effects has been on healthy people exposed for six to eight hours. In healthy individuals, the physical response to ozone is negligible at first and then gradually worsens.

Outdoor workers such as construction workers, police officers, farmers, and mail carriers are exposed to ozone all day, every day, throughout the ozone season. They exert themselves and breathe hard, which exacerbates the effect upon their respiratory system. Besides suffering the acute effects of day-to-day exposure, these individuals are also at increased risk for long-term effects of air pollutants. For example, chronic exposure to ozone has been associated with permanent scarring of the lungs and reduced breathing ability.

Improving building environments may result in health benefits for more than 15 million of the 89 million U.S. indoor workers, with estimated economic benefits of $5 to $7 billion annually, according to a study.[31] The report notes the estimated potential annual reductions in adverse health effects include 5 to 7 million communicable respiratory infections, a 6 percent to 15 percent reduction in asthma flare-ups among the 4.7 million indoor workers with asthma, and a 20 percent to 50 percent reduction in nonspecific building-related symptoms.

Exercising adults

Exercising adults. Cyclists, joggers and others who engage in intensive, regular outdoor exercise in and around polluted urban areas are one of the largest sensitive groups, and perhaps the least likely group to be recognized as such. Unfortunately, the exercise regimens that they have chosen for health-promoting benefits also put them at increased risk of harm from air pollution. The health impact of exposure increases as the level of exertion goes up. Physical exertion raises respiration rates and forces an increased volume of air deeper into the delicate lower reaches of the lungs. Studies of athletes have found reduced breathing ability and symptoms such as coughing and tightness of the chest after a normal workout at ozone levels that would be categorized as 'Unhealthy for Sensitive Groups.' Athletes who exercise in the afternoon and early evening, when daily ozone levels are highest, compound their risk.

Other responders

Other responders. A number of laboratory studies have shown that among healthy adults there is a wide variation in individual response to ozone. Some people are more likely to have a marked reaction than others. If lung capacity is measured, for example, in a group exposed to the same ozone concentration, the breathing of some will be more impaired than that of others. These sensitive individuals are known as 'responders,' and make up an estimated 5 to 20 percent of the total population. Scientists do not know what makes them respond so strongly to ozone; it may involve ethnic background, genetics, demographic characteristics, or even diet.

How can you protect your health outdoors?

Keep track of air pollution forecasts, often reported in the weather reports on television or in newspapers. If the air quality is predicted to be unhealthy, limit the amount of time you or your child spends outdoors in vigorous activity. Keep all outdoor activities as far as possible from busy roadways and other sources of pollution.

Those most at risk from air pollution are children, adults over 65, people with asthma or other chronic lung diseases, people with cardiovascular diseases and diabetes. These individuals need to be particularly aware of air pollution forecasts outdoors.

If someone in your family has asthma, air pollution can be a serious trigger of an attack. One of the problems with ozone air pollution (smog) is that it makes people with asthma more sensitive, so that on bad air days they react more strongly to other triggers than usual.

For more information on asthma management, see the Asthma section.

Make sure your child's teachers, coaches, and camp directors are aware of the health risks of air pollution and have policies in place to protect the kids when air quality is unhealthy. If your child has asthma, it is important that these caregivers know that he or she may be especially prone to an asthma attack on high ozone days.

How can you protect your health indoors?

Declare your home a smokefree zone. Secondhand smoke can cause serious health problems, especially for children. Ask smokers to take it outside and encourage them in their efforts to quit.

Good ventilation reduces indoor air pollution. Leave doors between rooms open for better air circulation. Open windows when possible to allow for a good supply of outdoor air. Note that people with asthma, allergies and COPD may benefit from keeping windows closed and using air conditioners when outdoor pollens and pollutants are high. Install and run exhaust fans in bathrooms and kitchens to remove moisture and pollutants from the house.

Keep humidity levels low. Use a dehumidifier or air conditioner. Clean both regularly so they do not become a source of pollutants themselves. Fix all leaks and drips in the home, as standing water and high humidity helps mold and other biological pollutants grow.

Prevent carbon monoxide poisoning. Have all fuel burning appliances inspected by a qualified technician once a year. Install a carbon monoxide detector near your sleeping rooms.

Keep dust mites and other allergens to a minimum. Wash bedding materials in hot water (at least 130˚F). Replace your carpet with area rugs that can be washed more easily and more often.

Fit your gas range with a hood fan that exhausts the air outside. Use the fan or open a window when cooking to **remove gas fumes**.

Check cleaning products and pesticides for toxic ingredients, and use them according to the manufacturer's directions. Keep your home well ventilated while using these products. Consider switching to less toxic alternatives.

Test your home for radon. Use radon test kits that bear the label 'Meets EPA requirements.' If high levels of radon are in your home, consult a trained professional.

Never leave a car or lawn mower running in a garage or shed. Do not use unventilated heaters or charcoal grills indoors.

What is the American Lung Association's role in air quality?

Enforcement of the Clean Air Act

The American Lung Association has been fighting for cleaner outdoor air since the 1960s. To get cleaner air, we have led the fight for the enforcement of the nation's most effective environmental law, the Clean Air Act. Thanks to this Act, harmful emissions have dropped by over half since 1970. The Lung Association has taken legal action repeatedly to be sure that the law is enforced and the air gets cleaner. We work regularly with the US Environmental Protection Agency and with state and local air pollution control agencies to urge steps to get pollution out of the air.

State of the Air report

One of the Lung Association's tools is the annual **State of the Air** report that grades counties across the nation on their levels of air pollution. This report puts in terms that are easy to understand the amount of air pollution in these counties. In addition, the report ranks cities and counties, showing those with the most serious pollution problems, but those with the cleanest air, as well.

Advocacy

The Lung Association is building capacity among advocacy staff and volunteers to be more engaged in state and local air quality planning efforts and the review of the fine particle health-based standard.

Education

For indoor air, the Lung Association helps educate the public about effective ways to improve indoor air quality. Through national public information campaigns and outreach to the media,

the Lung Association provides research-based advice in a marketplace that often is filled with misleading information.

Media outreach

For the devastating hurricanes that hit the Gulf Coast in 2005, the Lung Association produced a special brochure and enhanced media outreach to guide those who needed help cleaning up the damage in their flood and rain ravaged homes.

The Lung Association has also been engaged on Environmental Tobacco Smoke (ETS) issues, ensuring that the U.S. Environmental Protection Agency has the resources to conduct public outreach programs on the impacts of ETS on children and providing comments to the State of California to list ETS as a toxic air contaminant. In addition, the Lung Association is developing a national radon agenda with government and NGO stakeholders.

Asthma

What is asthma?

Asthma is an inflammatory condition of the bronchial airways. This inflammation causes the normal function of the airways to become excessive and overreactive, thus producing increased mucus, mucosal swelling and muscle contraction. These changes produce airway obstruction, chest tightness, coughing and wheezing that lead to asthma attacks. If severe, this can cause shortness of breath and low blood oxygen.

Asthma symptoms include: coughing, wheezing, and shortness of breath.

Asthma ranks among the top 10 most prevalent conditions causing limitation of activity. A recent survey indicated that in the year 2000, persons with asthma had 3.7 days with activity limitations compared to 1.6 days in those who have never had asthma.[32]

Another survey found that 48 percent of people with asthma say that the disease limits their ability to take part in sports and recreation, 36 percent say it limits their normal physical exertion and 25 percent say it interferes with their social activities.[33]

Asthma can be life-threatening if not properly managed.

Who gets asthma?

An estimated 29.8 million Americans have ever been diagnosed with asthma by a health professional. Close to 20 million Americans currently have asthma, of which 11 million had an asthma attack in 2003.[34]

After a long period of steady increase, evidence suggests that asthma morbidity rates have plateaued and/or decreased. However, certain subgroups are still disproportionately affected by asthma.

Children

Children. Asthma is the leading serious chronic illness of children in the U.S. In 2003, an estimated 6.2 million children under age 18 (1.2 million under age 5) had asthma, of which 4 million had an asthma attack.[35]

Asthma is the third leading cause of hospitalization among children under the age of 15. Close to 39 percent of hospitalizations due to asthma in 2002 were in those under age 15; however, only 2 percent of the U.S. population was younger than 15 years of age.[36]

It is also the number one cause of school absences attributed to chronic conditions, leading to an estimated 12.8 million school days lost annually.[37]

Recent studies have suggested that children of smokers are twice as likely to develop asthma as the children of nonsmokers, and that even apparently healthy babies born to women who smoked during pregnancy have abnormally narrowed airways, which may predispose them to asthma and other respiratory disorders. The U.S. Environmental Protection Agency (EPA) has concluded that exposure to environmental tobacco smoke increases the number of episodes and the severity of asthma in children.[38]

One recent study found that exposure to moderate-to-heavy environmental tobacco smoke

is associated with increased frequency of nighttime symptoms (cough, wheeze and shortness of breath) in inner-city children with asthma. The study found that exposure to higher levels of environmental tobacco smoke was associated with a nearly three-fold increase in nighttime symptoms in children with asthma.[39]

But smoking has not increased over this decade – so that, while parental smoking is clearly related to asthma in children, it does not explain the increase.

Women

Women. Women are also more likely to suffer from asthma than men. In 2003, 11.6 million females had asthma compared to 8.2 million males.[40]

In 2002, women represented a total of 288,000 hospital discharges, whereas men represented 196,000 hospital discharges.[41]

But asthma doesn't begin to disproportionately affect females until puberty. In fact, in early childhood, asthma is more common in boys than in girls. In 2003 the asthma prevalence rate for boys aged 0-17 years (95.5 per 1,000) was more than 27 percent higher than the rate among girls (75.1 per 1,000). The difference in rates between sexes was significant in both children and adults.[42]

African Americans and Puerto Ricans

Racial disparity. Asthma prevalence rates are 39 percent higher among African Americans than whites. African Americans are also almost three times more likely to be hospitalized and five times more likely to seek care for asthma at an emergency room than their white counterparts.

Studies have suggested that Puerto Ricans have higher asthma prevalence rates and age-adjusted death rates than all other Hispanic subgroups and non-Hispanic whites and blacks.

More at **Lung Disease Data in Culturally Diverse Communities 2005** on **lungusa.org** or call 1-800-LUNG-USA.

What causes asthma?

Asthma is characterized by excessive sensitivity of the lungs to various stimuli. Triggers range from viral infections and allergies, to irritating gases and particles in the air. Each person reacts differently to the factors that may trigger asthma, including:

Triggers

- respiratory infections, colds
- cigarette smoke
- allergic reactions to such allergens as pollen, mold, animal dander, feather, dust, scents, food, and cockroaches
- vigorous exercise
- exposure to cold air or sudden temperature change
- excitement/stress
- exercise

Asthma may also be triggered by some over-the-counter drugs. One study found that one adult asthmatic in five can suffer a potentially life-threatening reaction to aspirin.[43]

There is increasing evidence that air pollution plays a major role in triggering asthma episodes, and researchers are exploring this area. Acidic particles, sulfur dioxide, and ozone have been linked to increases in patients' medication use, emergency room visits, and hospital admissions. One study found that children living within 50 yards of roads where more than 33,000 vehicles passed by each day were almost twice as likely to suffer from asthma as other children. [44]

In another example, pollution from coal-fired power plants is estimated to cause more than 603,000 asthma attacks per year, 366,000 of which could be avoided by cleaning up power plants to modern standards.[45]

Indoor air pollutants such as dust mites, molds, animal dusts, insect (especially cockroach) detritus, and tobacco smoke have also been strongly associated with increased respiratory problems for people with asthma. A study concluded that indoor allergens and pets account for 44.4 percent of doctor-diagnosed asthma attacks among older children and teenagers.[46]

Eliminating asthma triggers in the home would have a profound effect on the health of children and the medical costs of asthma, researchers concluded. Another more recent study of pets and asthma found that while allergies to cats caused most of the reactions in 809 asthma patients studied (72 percent reacted), dogs, which affected 38 percent of the patients, caused the most severe reactions.[47]

Can people die from asthma?

Asthma mortality

Although uncommon, asthma can be fatal. In 2002, over 4,000 people died of asthma in the United States. Approximately 63 percent of asthma deaths in 2002 occurred in women. Age-adjusted death rates in females were 42 percent greater than in males. African Americans were three times more likely to die from asthma than whites.

Fortunately, mortality figures for asthma have been continuously declining for the past five years.

How is asthma diagnosed and treated?

Asthma diagnosis

During the diagnosis, a doctor will take your medical history, give you a physical checkup and do some lab tests. These tests may include a chest x-ray, blood and allergy tests, and lung function tests, such as spirometry. In spirometry, you blow into a device called a spirometer, which measures the air you breathe in and out of your lungs.

Another diagnostic test that shows promise is a sensitive means of monitoring oxides of nitrogen in the exhaled breath, as these compounds are produced by inflammatory cells.[48]

Asthma treatments

Once the doctor decides that you do, indeed, have asthma, then medical treatment can start. Doctors and other health professionals rely on guidelines developed by the National Asthma Education and Prevention Program (NAEPP), a multi-disciplinary body to determine the best management and treatment routine.

The guidelines sum up currently approved drug therapies; outline a proven approach to medication regimen emphasizing early use of anti-inflammatories, as well as teaching patients about self-management and the prevention of crises; identify new classifications of asthma severity; and include detailed information on allergy testing.

Those who suffer from asthma must typically take a variety of medications, usually on a regular basis, to prevent exacerbations or counter acute attacks. They include bronchodilators, corticosteroids and other anti-inflammatory agents.

Bronchodilators are highly effective in opening airways narrowed by asthma. They include beta-adrenergic agonists, methylxanthines, and anticholinergics.

Anti-inflammatory drugs interrupt the development of bronchial inflammation and have a preventive action. They may also modify or terminate ongoing inflammatory reactions in the

airways. These agents include cromolyn sodium, corticosteroids and other anti-inflammatory compounds.

Leukotriene modifiers are a newer class of oral anti-inflammatory asthma drugs that block the activity of chemicals called leukotrienes that are involved in airway inflammation. They include Accolate, Singulair and Zyflo, and are available by prescription.

Some patients will need to take both a bronchodilator and an anti-inflammatory drug. In July 2003, the Food and Drug Administration approved Xolair, the first biotechnology product to treat people 12 years of age and older with moderate to severe allergy-related asthma inadequately controlled with inhaled steroid treatments. Xolair is a monoclonal antibody, a type of genetically engineered protein, which is taken by injection once or twice a month. Allergy-related asthma results from the immune system's overreaction to inhaled allergens such as dust mites or animal dander. The body forms antibodies in response to the allergen and this immune system reaction leads to inflammation, causing airway narrowing and other symptoms. Xolair blocks this immune response.

Despite the numerous drugs available, asthma is still poorly controlled and several studies indicate that the NAEPP guidelines are not being followed uniformly.

The Asthma in America National Population Study found that current use of anti-inflammatory drugs was reported by only 20 percent of people with asthma. Of people with persistent asthma symptoms in the previous month, only 26.2 percent reported current use of some form of anti-inflammatory medication.[49]

Another study reported that 72 percent of men and 86 percent of women with asthma had symptoms 15 years after they were first diagnosed with the disease. Only 19 percent of these people, however, were still seeing a doctor and only 32 percent used any medication to regularly manage their asthma.[50]

One study tested doctors' knowledge of the new asthma guidelines and found that many doctors underestimate the severity of a patient's asthma, which can lead to undertreatment. The study also found that asthma specialists (allergists and pulmonologists) had the best overall understanding of the government's new asthma guidelines. Doctors appropriately estimated patients' disease severity in 46 percent of patients; even asthma subspecialty physicians only correctly estimated severity in 63 percent of patients, according to the study.[51]

What are the costs associated with asthma?

Asthma incurs an estimated annual economic cost of $16.1 billion to our nation. This consists of $11.5 billion in direct healthcare costs and $4.6 billion in indirect costs (e.g., lost productivity). Prescription drugs represented the largest single direct medical expenditure, at $5 billion.

What is the American Lung Association's role in asthma?

Asthma research support

Asthma, once thought of as a 'simple' hypersensitive reaction, is now known to be a complex condition with a range of causes and contributing factors, with airway inflammation as its central attribute. There has been a recent explosion of research, and in the not-too-distant future, a better understanding of the disease process is expected to lead to improved therapies.

The American Lung Association supports extensive research in asthma in a number of critical areas including genetics, infections, mechanisms of the allergic and inflammatory responses, management and treatment.

ACRC network

As part of our commitment to fight asthma, the **American Lung Association Asthma Clinical Research Centers Network** (ACRC) was created. The network consists of 20 centers and a data coordinating center that conduct clinical studies around the country on patients with asthma.

The American Lung Association has made a significant commitment to asthma research through our ACRC network. The network consists of 20 centers around the country plus a Data Coordinating Center that develop large clinical trials to provide useful information about asthma that benefits patients directly. Our first study found that influenza vaccines are safe for children and adults with asthma. The study, published in The New England Journal of Medicine, puts to rest previous concerns about possible side effects of the flu shot in people with asthma. This finding will prevent many thousands of days of suffering, including hospital stays and visits to the emergency room, and will save many hundreds of millions of dollars.

For participating or learning more about our program, please go to the ACRC section of **lungusa.org**.

In our second study, we have shown that for add-on medication, if an asthma sufferer's breathing problems are not controlled, a very inexpensive older drug may be as effective as a very expensive newer drug. We are now completing studies that look at the value of patient education in improving the quality of life of people with asthma. We are also studying the connection between sinusitis and asthma, and between gastroesophageal reflux (GERD, or acid reflux) and asthma. When we have the results of these studies, we will then be able to make recommendations for very specific therapeutic approaches to improve the quality of lives of people with asthma. The ACRC already has begun to leverage the expertise of our leading asthma researchers by attracting financial support from the National Institutes of Health and pharmaceutical companies. We have made significant progress in the first six years of the program, and we are confident that working with our partners, a cure for asthma is within reach.

Asthma education

In addition to research the American Lung Association provides various health education programs to the public.

Open Airways for Schools is an asthma management program available in English and Spanish that educates and inspires children through an interactive approach. Developed at Columbia University's College of Physicians and Surgeons, the **American Lung Association Open Airways for Schools** program uses stories, games, role-playing, and other proven techniques to familiarize eight to eleven-year-olds who have asthma with the warning signs of an asthma attack, the environmental factors that can trigger attacks, and better ways to manage their illness. The program has been tested in the New York City elementary schools, with such measurable impact as fewer and shorter acute asthma episodes, as well as improved school performance.

The Lung Association also has teamed up with Sesame Workshop to tell preschoolers and their caregivers about asthma through **Sesame Street's Asthma Awareness Project**. A 12-minute bilingual Sesame Street video and caregiver's guide are available through local Lung Associations. The project is designed to promote public awareness of children's asthma and to give families, child-care providers and public health specialists support in helping preschool children understand and cope with asthma.

The American Lung Association is a co-sponsor of the **Indoor Air Quality Tools for Schools** kit, developed by the U.S. Environmental Protection Agency. The kit helps school personnel identify potential indoor air quality problems and offers simple, low-cost solutions. Through Tools for Schools, the Lung Association is aiming to improve indoor air for children in one of the places they spend the most time.

Local Lung Associations around the country also participate in **Asthma Awareness Days**,

and the American Lung Association participates in many city, state and national asthma coalitions to raise public awareness of asthma as a public health problem.

Asthma advocacy

As a result of federal legislation that promotes the adoption of state laws that provide access to inhalers in schools, the Lung Association has been more engaged in passing legislation that allows children to carry inhalers and epi pens on their person.

Bronchopulmonary Dysplasia (BPD)

What is bronchopulmonary dysplasia (BPD)?

Bronchopulmonary dysplasia (BPD) is a chronic lung disease that develops most often in premature babies who are born with underdeveloped lungs. It involves abnormal development of lung tissue and is characterized by inflammation and scarring in the lungs.

The lungs in babies born earlier than 30 weeks are often not formed well enough to support breathing. The poorly formed lungs do not provide enough surface area or the fine network of blood vessels to allow the oxygen from the air to travel into the blood stream, or for the carbon dioxide to travel from the blood across the surface of the lungs, into the air.

Symptoms

Babies with BPD struggle to breathe and show signs of distress that are found with other breathing problems. These include rapid, shallow breathing, sucked-in ribs and chest, cough, wheezing, raising or stretching the neck by using the neck muscles to push more air into the lung, poor posture of the neck, shoulder and trunk, repeated periods of 'bluing' (the blue skin color is due to the low amount of oxygen in the blood).

Who gets BPD?

Incidence and Prevalence

About 5,000 to 10,000 babies in the United States get BPD each year. Along with asthma and cystic fibrosis, BPD is one of the most common chronic lung diseases in children.[52]

Today, most babies with BPD (nine out of 10) weigh about three and a half pounds or less at birth. Children with extremely low birth weight (less than 2.2 pounds or 1,000 grams) are most at risk for developing BPD. About one out of three of these babies gets BPD. White male infants seem to be at greater risk for developing BPD, for reasons unknown to doctors.

Recently, BPD has been seen in adults with adult respiratory distress syndrome.

What is the cause of BPD?

BPD is most commonly diagnosed as a complication of respiratory therapy in premature infants with respiratory distress syndrome. It is thought to be related to prolonged oxygen therapy administered by positive pressure respirators for the treatment of respiratory distress syndrome (RDS).

BPD also can arise from other adverse conditions that a newborn's fragile lungs have difficulty coping with, such as trauma, pneumonia, and other infections. All of these can cause the inflammation and scarring associated with BPD, even in a full-term newborn or, very rarely, in older infants and children.

Genetics may contribute to some cases of BPD as well.

Can babies die from BPD?

Because more babies weighing less than three pounds live past four weeks, more babies get BPD today than 30 years ago. Although most of these infants eventually outgrow the more serious symptoms, in rare cases BPD – in combination with other complications of prematurity – can be fatal.

How is BPD diagnosed and treated?

Diagnosis

BPD is typically diagnosed if an infant still requires additional oxygen and continues to show signs of respiratory problems after 28 days of age (or past 36 weeks' postconceptional age). Chest X-rays may be helpful in making the diagnosis. In babies with RDS, the X-rays may show lungs that look like ground glass. In babies with BPD, the X-rays may show lungs that appear spongy.

Treatment

There is no treatment that is specific for BPD; rather, treatment is supportive. Doctors treat the symptoms; help the baby breathe; make sure the baby has enough oxygen, is properly fed, warm, treated for infections, and given the right amount of fluids and nourishment. This gives the baby's lungs time to mature.

Babies first diagnosed with BPD receive intense supportive care in the hospital, usually in a newborn intensive care unit (NICU), until they are able to breathe well enough on their own without the support of a mechanical ventilator. Some babies also may receive jet ventilation, a continuous low-pressure ventilation that is used to minimize the lung damage from ventilation that contributes to BPD. Not all hospitals use this procedure to treat BPD, but some hospitals with large NICUs do.

Infants with BPD are also treated with different kinds of medications that help to support lung function. These include bronchodilators (such as albuterol) to help keep the airways open and diuretics (such as furosemide) to reduce the buildup of fluid in the lungs.

Antibiotics are sometimes needed to fight bacterial infections because babies with BPD are more likely to develop pneumonia. Part of a baby's treatment may involve the administration of surfactant, a natural lubricant that improves breathing function. Babies with RDS who have not yet been diagnosed with BPD may have disrupted surfactant production, so administering natural or synthetic surfactant may reduce the chance that BPD develops.

Recent efforts have focused to preventing the development of BPD, and studies thus far suggest that adding dexamethasone – one of the corticosteroids – to surfactant therapy for RDS is helpful in that effort.

The time spent in the NICU for infants with BPD can range from several weeks to a few months. The NIH estimates that the average length of intensive in-hospital care for babies with BPD is 120 days. The overall costs of treating BPD in the United States are estimated to be $2.4 billion. [53] Even after a baby leaves the hospital, he or she may require continued medication, breathing treatments, or even oxygen at home. Although most children are weaned from supplemental oxygen by the end of their first year, a few with serious cases may need a ventilator for several years or, in rare cases, their entire lives.

Chronic Obstructive Pulmonary Disease

What is Chronic Obstructive Pulmonary Disease?

Chronic obstructive pulmonary disease (COPD) is a term referring to two lung diseases – chronic bronchitis and emphysema – characterized by obstruction to airflow that interferes with normal breathing. These conditions frequently co-exist, hence physicians prefer the term COPD. COPD is preventable and treatable. It does not include other obstructive diseases such as asthma.

Chronic bronchitis

Chronic bronchitis is the inflammation and eventual scarring of the lining of the bronchial tubes. When the bronchi are inflamed and/or infected, less air is able to flow to and from the lungs and a heavy mucus or phlegm is coughed up. Once the bronchial tubes have been irritated over a long period of time, excessive mucus is produced constantly, the lining of the bronchial tubes becomes thickened, and an irritating cough develops. Air flow may be hampered, and the lungs become scarred. The bronchial tubes then make an ideal breeding place for bacterial infections within the airways, which eventually impedes airflow.[54]

Symptoms of chronic bronchitis include chronic cough, increased mucus, frequent clearing of the throat and shortness of breath.[55] The condition is defined by the presence of a mucus-producing cough most days of the month, three months of a year for two successive years without other underlying disease to explain the cough.

Emphysema

Emphysema begins with the destruction of air sacs (alveoli) in the lungs where oxygen from the air is exchanged for carbon dioxide in the blood. Damage to the air sacs is irreversible and results in permanent holes in the tissues of the lower lungs. As air sacs are destroyed, the lungs are able to transfer less and less oxygen to the bloodstream, causing shortness of breath. The lungs also lose their elasticity, which is important to keep airways open. The patient experiences great difficulty exhaling.[56]

Symptoms of emphysema include cough, shortness of breath and a limited exercise tolerance.

AAT emphysema

Alpha1-antitrypsin deficiency-related (AAT) emphysema is caused by the inherited deficiency of a protein called alpha1-antitrypsin (AAT) or alpha-1 protease inhibitor. AAT, produced by the liver, is a 'lung protector.' In the absence of AAT, emphysema is almost inevitable.

Who gets COPD?

Over 10.7 million U.S. adults (aged 18 and over) were estimated to have COPD in 2003.[57] However, close to 24 million U.S. adults have evidence of impaired lung function, indicating an underdiagnosis of COPD. [58]

In 2003, an estimated 8.6 million Americans were diagnosed with chronic bronchitis by a health professional. Chronic bronchitis affects people of all ages, but is more prevalent in those over 45 years old. [59]

Females are more than twice as likely to be diagnosed with chronic bronchitis as men. In 2003, 2.7 million males were diagnosed compared to 5.8 million females.[60]

Of the estimated 3.1 million Americans ever diagnosed with emphysema, 95 percent were 45 or older.[61]

Close to 55 percent of people with emphysema are male and 45.2 percent are female. However, within in the past year, the prevalence rate for women has seen a 5 percent increase whereas males have seen a decrease of 10 percent. Therefore, the difference in prevalence rates between the sexes has become statistically insignificant.[62]

Alpha1-antitrypsin deficiency-related (AAT) emphysema is responsible for 5 percent or less of the emphysema in the United States.[63] An estimated 100,000 Americans, primarily of northern European descent, have AAT deficiency emphysema. Another 25 million Americans carry a single deficient gene that causes Alpha1 and may pass the gene onto their children.[64] A recent study suggested that there are at least 116 million carriers among all racial groups, worldwide.[65] Carriers have approximately 35 percent of normal levels of alpha1-antitrypsin and therefore do not develop AAT emphysema.

Unlike other lung diseases, white Americans in the United States are more prone to COPD than other racial/ethnic groups. Not only are they more at risk of developing the disease, but they are also more likely to die from it.

What causes COPD?

Smoking is the primary risk factor for COPD. Approximately 80 to 90 percent of COPD deaths are caused by smoking. Female smokers are nearly 13 times as likely to die from COPD as women who have never smoked. Male smokers are nearly 12 times as likely to die from COPD as men who have never smoked.[66]

Other risk factors of COPD include air pollution, secondhand smoke, history of childhood respiratory infections and heredity. A recent study suggests that certain genes in mice appear to influence the risk of developing emphysema. The researchers said that this may explain why some smokers remain disease-free. If similar genes are identified in humans, these findings may one day help identify people who are at risk well in advance of symptoms.[67]

Alpha1-antitrypsin deficiency-related (AAT) emphysema is caused by heredity. It strikes persons in their 30s and 40s instead of the middle-aged and elderly.

Occupational exposure to certain industrial pollutants also increases the odds for COPD. A recent study found that the fraction of COPD attributed to work was estimated as 19.2 percent overall and 31.1 percent among those who have never smoked.[68]

Can people die from COPD?

COPD is the fourth-ranking cause of death, claiming the lives of 120,555 Americans in 2002.[69]

Over the past 30 years, the death rate due to COPD has doubled while death rates for the leading three causes of death (heart disease, cancer and stroke) have decreased by over 50 percent.

In 2002, the age-adjusted death rate in males was 1.5 times higher than the rate in females. However, women have exceeded men in the number of deaths attributable to COPD since 2000. In 2002, over 61,000 females died compared to 59,000 males.[70]

What are the costs associated with COPD?

Chronic bronchitis and emphysema take a heavy toll on our economy. According to estimates by the National Heart, Lung, and Blood Institute, in 2004 the annual cost to the nation for COPD was $37.2 billion. This included $20.9 billion in direct health care expenditures, $8.9 billion in indirect morbidity costs and $7.4 billion in indirect mortality costs.

How is COPD diagnosed and treated?

COPD doesn't strike suddenly and is often neglected by individuals until it is in an advanced state, because people mistakenly believe that the disease is not life-threatening. By the time a patient goes to his or her doctor the lungs have frequently been seriously injured. Then the patient may be in danger of developing serious respiratory problems or heart failure.

Diagnosis

COPD can be easily diagnosed with a pulmonary function test known as spirometry. Spirometry measures how well the lungs exhale. In a spirometry test, a person breathes into a mouthpiece that is connected to an instrument called a spirometer. The spirometer records the amount and the rate of air that is breathed in and out over a specified time.

Other tests that may be undertaken for the assessment of a patient with COPD are bronchodilator reversibility testing (to rule out asthma), chest x-ray (to exclude alternative diagnoses), arterial blood gas measurement and/or alpha1-antitrypsin deficiency screening. This screening should be performed when COPD develops in patients under 45, or in patients with a strong family history of COPD.

The disease is often silent and unrecognized until a person's lung function is half gone and he suddenly gets breathless merely crossing a room. A recent survey by the Lung Association revealed that half of all COPD patients (51 percent) say their condition limits their ability to work. It also limits them in normal physical exertion (70 percent), household chores (56 percent), social activities (53 percent), sleeping (50 percent) and family activities (46 percent).[71]

Treatment

COPD lung damage is irreversible, but there are treatments that can improve a patient's quality of life. Smoking cessation is the single most effective – and cost effective – intervention to reduce the risk of developing COPD and slow its progression.

Pharmacologic treatment can improve and prevent symptoms, reduce the frequency and severity of exacerbations, improve health status, and improve exercise tolerance.

Bronchodilators are used to help open the airways in the lungs and decrease shortness of breath. Inhaled or oral steroids are used to help decrease inflammation in the airways in some people. Antibiotics are often used to treat infections. Expectorants are sometimes used to help clear mucus from the airways.

Non-pharmacologic treatment such as pulmonary rehabilitation, oxygen therapy, and surgical interventions can improve a person's quality of life.

Patients of all ages benefit from rehabilitation programs that focus on supervised exercise training which plays an important part in helping to maximize the patient's ability to perform daily activities. The minimum length of an effective rehabilitation program is two months; the longer the program continues, the more effective the results.

The long-term administration of oxygen (>15 hours per day) to patients with chronic respiratory failure increases survival and has a beneficial impact on exercise capacity, lung

mechanics, and mental state. Close to one million persons living in the U.S. are on long-term oxygen therapy.

Lung transplantation is now being done and may be a more readily available option in the future. Techniques have been improving, many more such operations are being performed each year, and pulmonary specialists are hopeful about the procedure's lifesaving potential for this devastating disease.

If AAT deficiency is discovered in a child or young person in whom emphysema has not yet developed (in children, liver disease may also occur, and the defect can be detected by a blood test), a remedy may be liver transplantation, effectively preventing emphysema. If lung disease is already evident, lung transplantation is sometimes considered.

A second treatment alternative is administration of the missing protein, produced from normal human donor plasma. AAT replacement therapy is costly, however, and it must be given intravenously, on a weekly basis, for life. Its long-term effects are still being studied.

Scientists have identified the specific problem: A single gene, situated on human chromosome number 14, bears the code that triggers the liver's AAT production. Future therapy may be actual correction of the hereditary defect by delivering to the liver or other organs DNA carrying the missing genetically coded 'message.'

There has been much interest in an operative procedure called lung volume reduction surgery (LVRS), in which a portion of the most severely damaged lung tissue is removed in order to ease the burden on the remaining tissue and chest muscles. However, there is currently no sufficient evidence that would support the widespread use of LVRS.

Findings from the National Emphysema Treatment Trial (NETT), a five-year, multicenter study to evaluate the role of LVRS in the treatment of severe emphysema, found that LVRS increased the chance of improved exercise capacity but did not confer a survival advantage over medical therapy.[72]

A study sponsored by the National Heart, Lung, and Blood Institute (NHLBI) suggests that a vitamin derivative known as retinoic acid, a derivative of vitamin A, reversed emphysema-like lung damage in rats. After the treatment, damaged air sacs in the lungs reverted to their normal size and number, the researchers reported, adding that it was still too early to tell if the potential treatment would be effective in humans.[105] Additional research on this topic is currently being conducted through FORTE, an NHLBI-funded clinical trial. The FORTE study, which began in the spring of 2001, is investigating the biological effects and safety profile of retinoic acid treatment in patients with emphysema, providing information that may ultimately be used to design large clinical trials to definitively evaluate the effectiveness of retinoic acid in treating the disease.

Patients with COPD also need psychosocial support. COPD patients' inability to be as active as they once were, and their increasing dependency on others and even on machines, can lead to profound depression and dependency, often further complicating the physical illness.

What is the American Lung Association's role in COPD?

Research support

Funded by the American Lung Association, researchers working in the lab and with patients are looking for answers to fundamental questions about how the lungs are damaged in chronic obstructive pulmonary disease and what can be done to treat and prevent this disease. Several examples of the many COPD studies being funded by the American Lung Association include:

- Researchers are studying the role of a substance known as Transforming Growth Factor beta (TGFß) in the disease process that leads to emphysema.
- Scientists are studying cells from different groups of COPD patients to identify which ones will benefit most from prolonged treatment with anti-inflammatory drugs.
- Researchers are investigating the mechanisms involved in the production and transport of alpha1-antitrypsin, which is an important substance in the body's defense against emphysema.

Education

The American Lung Association is currently working on a nationwide initiative to create state-of-the art programs and services using field expertise and patient experience as well as to facilitate collaborative partnerships with key organizations who share the Association's commitment to improve the quality of life for people living with COPD.

Advocacy

In the area of advocacy, the American Lung Association is a leader in the U.S. COPD Coalition's policy workgroup. It has worked with key members of Congress to create a new Congressional COPD Caucus which is designed to promote public awareness, prevention and early detection of COPD. Additionally, the Lung Association has urged the adoption of legislation that would fund COPD research programs as well as secure Medicare funding for proper treatment of the disease. However, the nature and scope of the Association's work and performance measures require the availability of state and national COPD data. As a first step, the Centers for Disease Control and Prevention will be collecting data as part of its National Health and Nutrition Examination Survey, thanks to the advocacy efforts of the Caucus and Coalition.

The Lung Association has engaged thousands of patients with COPD through opportunities to comment on federal rules to broaden the use of portable oxygen concentrators and other approved devices on airlines, increasing the mobility of COPD patients. These e-advocacy campaigns have proven to be a great way to engage COPD patients to advance the Lung Association's COPD policy and advocacy agenda.

Our tobacco advocacy agenda helps prevent COPD by actively supporting measures to help smokers quit, prevent people from starting to smoke and protecting everyone from secondhand smoke.

Cystic Fibrosis

What is cystic fibrosis?

Cystic fibrosis (CF) is a life-long, hereditary disease that causes thick, sticky mucus to form in the lungs, pancreas and other organs. In the lungs, this mucus tends to block the airways, causing lung damage and making breathing difficult. In the pancreas, it clogs the pathways leading to the intestines, interfering with the digestive processes that help break down and absorb food. In 90 percent of cases, the airways are affected.

Although CF begins at conception, symptoms may not appear for several years. Diagnosis is sometimes delayed for decades because of the mildness of the symptoms or failure to recognize them. Only about 10 to 15 percent of babies with cystic fibrosis have symptoms at birth. Typical symptoms include:

Symptoms

- wheezing
- persistent cough and excessive mucus
- repeated bouts of pneumonia
- abnormal bowel movements
- salty-tasting skin (which parents often notice when they kiss their child)
- failure to gain weight despite a good appetite
- swollen belly accompanied by abdominal gas and discomfort
- broadening of the fingertips and toes

Children with CF are highly susceptible to lung infections, and the chronic lung dysfunction itself can cause severe debilitation and may also lead to pulmonary hypertension, which may in turn cause heart disease.

Of all the aspects of CF, lung disease is by far the most critical, causing a combination of airway obstruction, infection, and inflammation that accounts for almost all deaths from the disease.

Who gets cystic fibrosis?

Approximately 30,000 Americans have CF and there are approximately 1,000 new cases diagnosed each year. It occurs equally in male and female babies and affects nearly every race.[73]

Cystic fibrosis occurs most commonly among whites. It is estimated that one in 3,200 white births are affected in comparison to one in 10,500 Native Americans, one in 11,500 Hispanics, one in 14,000 to 17,000 African Americans, and one in 25,500 Asians.[74] More than 80 percent of patients are diagnosed by age three, and nearly 10 percent of newly diagnosed cases are aged 18 or older.[75]

What causes cystic fibrosis?

Causes

Cystic fibrosis is the second most common, life-shortening, childhood onset, inherited disorder in the United States, behind sickle cell anemia. More than 10 million Americans are symptomless and unaware carriers of the defective cystic fibrosis gene.

An individual must inherit a defective gene from each parent to have cystic fibrosis. Each time two carriers of the defective gene conceive, there is a 25 percent chance that their child with have cystic fibrosis; a 50 percent chance that the child will be a carrier of the gene; and a 25 percent chance that the child will be a non-carrier. The odds remain the same with each child.[76]

The severity and manifestations of the disease vary considerably, based on genetic mutations. Some cases are atypically mild so that CF is not diagnosed until adulthood.

Can people die from cystic fibrosis?

In 2002, 484 Americans died of cystic fibrosis.[77] Treatment of the disease has improved substantially over the past 25 years. The median age of survival in 2002 was 33 years compared to 25 years in 1985, 14 years in 1969 and five years in 1955.

What are the costs associated with cystic fibrosis?

Costs

The annual treatment costs of cystic fibrosis in 1992 were approximately $10,000 per patient per year, but current estimates show an excess of $40,000 per year in direct medical costs and $9,000 per year in ancillary costs.

How is cystic fibrosis diagnosed and treated?

Diagnosis

The sweat test is the standard diagnostic test for cystic fibrosis. This test measures the amount of salt in the sweat. A high salt level indicates that a person has CF.

Cystic fibrosis can also be identified before birth through prenatal screening and after birth through newborn screening. In 2001, the American College of Obstetricians and Gynecologists recommended that pregnant women be offered screening for CFTR mutations. Currently, 20 percent of pregnant women in the United States receiving prenatal care are being screened for CF.[78]

Recently, the Centers for Disease Control and Prevention (CDC) issued a recommendation that all states consider routine screening for CF in all newborns. In 2000, approximately 400,000 children born in the United States were screened for CF; this number is expected to increase to 800,000 by the end of 2004.[79]

The specific gene responsible for the disease was identified in 1989 and since then, more than 600 mutations and DNA sequence variations have been identified in the Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) gene. The Delta F508 mutation is the most common and is found in almost all racial and ethnic groups. There are about 15 to 20 other 'common' mutations, which account for two to 15 percent of CF alleles depending on the ethnicity of the patient group studied. Most of the remaining mutations are rare.[80]

Genetic testing is available, but it is not commonly used and only has a detection rate of 70 to 75 percent of potential defective genes. It does not show all the mutations.

Treatment

Theoretically, gene therapy is possible – delivering a 'healthy' gene to the victim to replace the defective one. In April 2003, researchers announced encouraging results from the first-of-its-kind gene therapy trial involving cystic fibrosis patients and a new DNA technology in which strands of DNA are tightly bound so that they are tiny enough to pass through a cell membrane and into the nucleus of the cell. The goal is for the DNA to produce a protein needed by people with CF to correct the basic defect of CF cells. The Phase I (safety) trial involved 12 patients, all of whom completed the trial without significant effects, and the treatment was well tolerated, according to researchers at Case Western Reserve University, University Hospitals of Cleveland, and Copernicus Therapeutics.[81] *Note: Successful gene therapy would affect only the individual patient; it would not prevent the defective genetic messages from being relayed to off-pring.*

Until a cure for CF is developed, there are various treatment options. Treatment depends upon the stage of the disease and the organs involved. Chest physical therapy to clear mucus from the lungs is an important part of the daily CF treatment regimen.

Antibiotics are used to treat lung infections and are given intravenously, with pills and/or medicated vapors, which are inhaled to open up clogged airways. Some of the most common antibiotics used in CF treatment include TOBI, an aerosolized antibiotic used to treat lung infections; and azithromycin, an antibiotic that improves the lung function of people with CF whose lungs are chronically infected with *Pseudomonas aeruginosa* bacteria, the most common cause of respiratory infection in people with CF. A recent study found that patients who took azithromycin experienced an average of six percent improvement in lung function, a nearly 50 percent decrease in days spent in the hospital for the treatment of lung problems, and weight gain, a positive effect for people with CF.[82]

Drugs by aerosol delivery have represented an important breakthrough in treatment of the lung-disease aspects of cystic fibrosis. One such drug being used is a genetically engineered enzyme called recombinant human deoxyribonuclease, also known as rhDNase, or simply DNase. The enzyme, administered in aerosol form, thins out the viscous mucus clogging CF patients' airways, reducing the number of lung infections and improving lung function. The prescription drug, trade-named Pulmozyme, does not replace standard therapies but is used in addition to them.

Bronchodilators have helped to deal with chronic dysfunction, and state-of-the-art diagnostic techniques, such as nuclear imaging, have permitted more accurate assessment of patient status. Corticosteroids and other anti-inflammatory drugs have been evaluated in several studies.

In some cases, lung transplantation has been attempted; over the past ten years, double-lung transplantation has replaced heart-lung as the preferred procedure, and there has been steady improvement in the outlook with refinements in both surgical techniques and anti-rejection measures. As in other areas of medicine, there is a lack of donors, and there are lengthy waiting lists.

Today, nearly 40 percent of the cystic fibrosis population is aged 18 or older. With the advances in treatment, however, adults with cystic fibrosis experience additional health challenges including CF-related diabetes, osteoporosis and infertility in men.[83]

HIV/AIDS-related Lung Disease

What is the connection between HIV/AIDS and lung disease?

Human Immunodeficiency Virus (HIV) is the virus that causes Acquired Immunodeficiency Syndrome (AIDS). HIV kills an important kind of blood cell called the CD4 T-lymphocyte. As these cells die off, the body becomes more and more vulnerable to other diseases. Germs take this opportunity to invade the body and cause infections. When people with HIV get these infections – and/or when their cell levels get too low – they develop AIDS.

These infections are often called 'opportunistic,' describing an infection that would probably not occur in an individual with a normally functioning immune system and that is seen only extremely rarely in the non-AIDS population. The lung is a major target of infection in people living with HIV and AIDS.

What lung diseases are associated with HIV/AIDS?

Some of the most common lung diseases seen in people living with HIV or AIDS are *Pneumocystic carinii* pneumonia, tuberculosis, mycobacterium avium complex, fungal infections, and viral and bacterial pneumonia.

Pneumonia

Pneumocystis carinii pneumonia (PCP) is the first sign of illness in more than half of all persons with AIDS in the United States. Without preventive medicine, over 80 percent of people with HIV will likely get *Pneumocystis carinii* pneumonia. However, it can be successfully treated.[84] Therapy – both to treat the active infection and as a prophylactic (preventive) measure – may include a number of drugs. An antibiotic combination of trimethoprim and sulfamethoxazole (also known as TMP-SMX) or co-trimoxazole (Bactrim, Cotrim, Septra), given intravenously or orally, has often been used.

Another frequently used drug is pentamidine, which is given intravenously or, for prevention, often in the form of aerosol mist, in order to deliver the major portion of the drug directly to the lungs, avoiding adverse side effects on other organs. Delivery of the agent even more directly, using pulmonary surfactant as a vehicle, is now being explored. Other drugs used for PCP include atovaquone (Mepron), used chiefly for milder illness, and trimetrexate (Neu-Trexin), which was approved by the Food and Drug Administration (FDA) at the end of 1993 for moderate to severe cases. Still other drugs are under investigation.

Tuberculosis

Tuberculosis (TB) is caused by the bacillus *Mycobacterium tuberculosis*. The AIDS epidemic was a major contributing factor in the increased number of TB cases in the early 1990's in the United States. Approximately 11 million people worldwide are infected with both HIV and TB. An individual who is infected with both HIV and TB has a seven to 10 percent chance per year of developing active TB compared to a 12 percent lifetime chance for people without HIV.[85]

MAC

Mycobacterium avium complex, or *M. Kansasii*, afflicts up to 30 to 50 percent of HIV-infected persons with CD4 counts <50 cells/μL or microliter.[86] The bacterium exists throughout the environment, but rarely causes illness in healthy people. In the presence of HIV it causes lung disease, anemia and swollen lymph nodes, hepatitis and other serious problems. A combination of two or more antibiotics is usually used, typically azithromycin or clarithromycin (Biaxin) plus ethambutol and/or clofazimine, rifabutin, rifampin, ciprofloxacin, or amikacin. Rifabutin is also employed prophylactically (it is taken indefinitely).

Other infections

Fungal infections such as candidiasis may cause illness in the non-AIDS population, but the infections are more common, more severe and more difficult to treat in AIDS patients. A number of antifungal drugs are in established use, and others are under investigation; among those currently employed are amphotericin B, miconazole, ketonazole, and flucytosine. Fungal infections of the lung are not transmissible to healthy people.

Viral and bacterial pneumonia are easily contracted by persons with AIDS and HIV. Major causes of viral pneumonia in persons with weak immune systems are members of the herpes virus family, which have shown to be stubbornly resistant to treatment. Bacterial pneumonia can be caused by various bacteria strains such as *Haemophilus influenzae*, but can be treated with antibiotics.

Who's at risk?

AIDS is caused by infection with a virus called human immunodeficiency virus (HIV). This virus is passed from one person to another through blood-to-blood and sexual contact. In addition, infected pregnant women can pass HIV to their babies during pregnancy or delivery, as well as through breast feeding.

AIDS is a worldwide epidemic. Most cases are in Africa, but the disease is spreading most rapidly in Eastern Europe and Asia. According to the Joint United Nations Program on HIV/AIDS, as of the end of 2004, 39 million people are estimated to be living with HIV/AIDS. Of these, 37.2 million are adults; 17.6 million are women, and 2.2 million are children under 15.

At the end of 2003, an estimated 1,039,000 to 1,185,000 persons in the United States were living with HIV/AIDS. Approximately 25 percent of persons are unaware of their HIV-positive status. The CDC estimates that approximately 40,000 persons become infected with HIV each year.

The first AIDS case in the United States was reported in June 1981. By the end of 2003, there were a total of 929,985 AIDS cases reported and 524,060 are known to have died.[87]

At the end of 2003, the five leading states reporting the highest number of cumulative AIDS cases among residents were New York (149,341); California (123,819); Florida (85,324); Texas (56,730); and New Jersey (43,824).[88]

Racial Disparity. In the United States, HIV/AIDS is distributed unevenly among culturally diverse communities. Since the epidemic began in 1981, racial and ethnic minority populations have constituted 61 percent of AIDS cases.[89]

Of the 31,790 AIDS cases newly diagnosed in 2003, 48 percent were in non-Hispanic blacks, 38 percent in non-Hispanic whites, 12 percent in Hispanics, and less than one percent in Asians and American Indians.[90]

Overall, as of December 2003, 36 percent of AIDS cases have been in non-Hispanic whites,

42 percent have been among non-Hispanic blacks, 20 percent in Hispanics and less than one percent in Asians and American Indians, respectively.[91]

For more information on AIDS-related lung disease and racial disparity please review **Lung Disease Data in Culturally Diverse Communities 2005** under the Data and Statistics section of our website at **www.lungusa.org** or call the American Lung Association at 1-800-LUNG-USA (1-800-586-4872).

How is HIV/AIDS diagnosed and treated?

Diagnosis

Many people with HIV do not get tested until late in their infection, and many people who are tested do not return to learn their test results. The standard diagnosis test is the EIA (enzyme immunoassay), performed on blood drawn from a vein, used to detect the presence of antibodies to HIV. Other body fluids such as saliva and urine can be used to screen for HIV antibodies. However, the results of this test take up to a week.

A new test – the OraQuick® HIV rapid test – was approved by the FDA in November 2002. This simple, rapid test provides HIV results in 20 minutes, requires no special equipment, and can be performed outside the doctor's office or a clinic. Although using the new test will allow for quick results, HIV-positive results will still require confirmation by standard HIV tests.[92]

Treatments

In addition to drugs for specific conditions that may occur in persons with AIDS, medications are used to counter HIV infection itself and to attempt to minimize the basic onslaught on the immune system. Since the introduction of combination antiviral therapy the number of new AIDS cases and deaths has declined substantially. Between 1994 and 2000, the number of deaths due to AIDS declined 67 percent. This means that people with HIV/AIDS are living longer lives.

Usually it takes many years for HIV to weaken the body's immune system to the point of AIDS. Anti-HIV drugs do not cure or reverse the disease but may slow the progress of the virus by interfering with its reproduction and proliferation, helping people with HIV infection live longer and healthier lives. Even when a person already has AIDS, these drugs can still help. Combinations of these powerful medicines work very well, but they often have serious side effects, such as vomiting, diarrhea and fatigue. Also, people with HIV have to keep taking these drugs daily for the rest of their lives.

In recent years, the FDA has approved potent new drugs called protease inhibitors and nonnucleoside reverse transcriptase inhibitors to treat patients with HIV diseases. These drugs, however, interact with rifampin and other drugs used to treat TB, reducing the effectiveness of both the protease inhibitors and the TB drugs.

To reduce the likelihood of drug interactions while providing optimal anti-TB care for HIV-infected persons, the Centers for Disease Control and Prevention recommends that healthcare workers treating TB and those involved in HIV clinical care coordinate their efforts to ensure the best outcome for their patients. These treatments are best supervised by physicians with substantial experience in the treatment of HIV disease.

Nearly two dozen new anti-HIV drugs are now in development. They include drugs that interfere with HIV's ability to enter a cell and drugs that interfere with HIV's ability to insert its genes into a cell's normal DNA. In addition, researchers are studying ways to help boost the immune system's response to the virus to make existing anti-HIV drugs more effective.

Currently, researchers are conducting a phase III trial on an experimental AIDS vaccine. Unfortunately, initial results suggest that the vaccine failed to protect high-risk people in general.

However, it seems that African American and Asian volunteers produced higher levels of antibodies against HIV than Caucasian and Hispanic volunteers.[93] Unfortunately, results from a nationwide study by the Agency for Healthcare Research and Scientific Affairs and Quality reported that African American and Hispanic HIV patients are only about half as likely as non-Hispanic whites to participate in clinical trials of medications designed to slow the development of the disease.[94]

Influenza and Pneumonia

What are influenza and pneumonia?

Flu symptoms

Influenza (flu) is a highly contagious viral infection that is one of the most severe illnesses of the winter season. Influenza is spread easily from person to person, usually when an infected person coughs or sneezes.

Symptoms include fever, headache, cough, chills, sore throat, nasal congestion, muscle aches, loss of appetite, and general malaise.

Avian flu

An emerging type A strain is the **avian influenza virus or bird flu**. Bird flu viruses do not usually infect humans, but several cases of human infection with bird flu viruses have occurred since 1997 especially in Asia. The death rate for these reported cases has been about 50 percent. The virus is mainly transmitted to humans by direct contact with live, sick or dead poultry; however, it is thought that a few cases of human-to-human spread have occurred.

SARS

SARS, a potentially more serious illness, may start like the flu. Check with your doctor immediately if complications such as difficulty breathing occur in areas where SARS is found.

Pneumonia symptoms

Pneumonia is a serious infection or inflammation of the lungs. The air sacs in the lungs fill with pus and other liquid, which blocks oxygen from reaching the bloodstream. If there is too little oxygen in the blood, the body's cells cannot work properly, which can lead to death.

Symptoms of pneumonia include fever, wheezing, cough, chills, rapid breathing, chest pains, loss of appetite, and general malaise.

Who gets influenza and pneumonia?

The persons most at risk for these infections and their complications are those whose defenses against disease are operating at less than peak efficiency. They include the very young, the very old, those suffering from chronic respiratory or circulatory problems, and those whose immune systems have been compromised by birth defects, medications (including some drugs used to treat malignancies), or AIDS.

About 10 to 20 percent of the population contracts the flu each year. Influenza in the United States generally strikes between December and March, although it may appear a little earlier. It is responsible for an average of 200,000 hospitalizations and 36,000 deaths in the United States each year.[94] In 1996 (latest year for which final U.S. figures are available), an estimated 95 million cases of influenza occurred.

Pneumonia can strike anyone at any time of the year. In 1996 (latest data available), there were an estimated 4.8 million cases of pneumonia resulting in 54.6 million restricted-activity days and 31.5 million bed days.[95]

Along with other respiratory conditions, such as the common cold and acute bronchitis, these disorders are major contributors to days lost from work and school.

Influenza and pneumonia are most likely to require hospitalization in those under 15 and over 65. In fact, data from 2003 shows that persons aged 65 and older accounted for 58 percent of the total number of hospital discharges from influenza and pneumonia, while those under 15 years of age accounted for 50 percent of the total number of hospital discharges from influenza.[96]

What causes influenza and pneumonia?

Viral strains

A person can have influenza more than once because the virus that causes influenza may belong to different strains of one of three different influenza virus families, A, B, or C. Type A viruses tend to have a disproportionate effect on adults, while Type B viruses have a disproportionate effect on children. Both A and B have strains that cause illness of varying severity. The influenza A family has more strains than the B family.

Pneumonia can have over 30 different causes. There are five main causes of pneumonia: various chemicals, bacteria, viruses, mycoplasmas, and other infectious agents, such pneumocystis (fungi). Certain diseases, such as tuberculosis, can also cause pneumonia.

In May 2004, the U.S. Surgeon General added pneumonia to the list of diseases caused by smoking. In addition, Pneumonia can also be caused by the inhalation of food, liquid, gases or dust.

Can people die from influenza and pneumonia?

Influenza and pneumonia are significant causes of illness and death. Together these conditions are ranked as the seventh leading cause of death in the United States and the fifth leading cause in people over 65 years of age.

In 2002, the age-adjusted death rate for influenza and pneumonia was 22.6 per 100,000. Overall, 65,681 deaths from these diseases were recorded in 2002. Of these, pneumonia caused the majority of deaths (64,954). Close to 90 percent of influenza and pneumonia deaths occurred in persons aged 65 and over.

Influenza deaths have increased substantially in the last two decades, in part because of the aging population.[97]

What are the costs associated with pneumonia and influenza?

Together, pneumonia and influenza represented a cost of $37.5 billion to the U.S. economy in 2004, more than 19 percent ($5.6 billion) due to indirect costs. Direct costs are estimated at $31.9 billion.[98]

Can influenza and pneumonia be prevented?

The Advisory Committee on Immunization Practices (ACIP) recommends influenza vaccination for all children aged six months or older, unless contraindications are present. Health experts recommend immunization against both influenza and pneumonia for all persons aged 50 and up, for those at risk due to chronic conditions, and for people who come into contact with those at risk.[99]

There are two vaccine options available in the United States for influenza: the flu shot and the flu nasal spray (FluMist).

Nasal spray

FluMist is approved to prevent influenza illness due to influenza A and B viruses in healthy people ages 5-49. In clinical trials, the efficacy of the vaccine in preventing influenza was approximately 87 percent among children. In healthy adults ages 18-49, FluMist was effective in reducing severe illnesses with fever and upper respiratory problems which may have been caused by influenza infection.[100]

The safety of FluMist in people with asthma or other reactive airway diseases has not been established; FluMist should not be given to people with a history of these problems. In a large safety study, children under five years of age were found to have an increased rate of asthma and wheezing within 42 days of vaccination compared to children receiving a placebo, or inactive nasal spray, and so FluMist is not recommended for young children. For people age 50 years and over, the safe and effective use of FluMist has also not been established.

FluMist should also not be given to people with chronic underlying medical conditions that may predispose them to severe flu infections. For these people, the flu shot is indicated.

Flu shot

The 2005-2006 trivalent inactivated flu shot virus strains are A/Moscow/10/99 (H3N2)-like, A/New Caledonia/20/99 (H1N1)-like, and B/Hong Kong/330/2001-like antigens.[101]

For maximum protection for the duration of the flu season, the best time to receive the flu shot is October or November. The flu shot may be given at the same time as other routine immunizations, and it is safe for use during pregnancy. Protection lasts approximately six months. Children at risk for influenza-related complications can receive the vaccine at the same time that they receive other routine vaccinations, including pertussis. Older persons are also advised to receive the pneumococcal vaccine since pneumonia is a major complication of the flu. Medicare covers flu shots and pneumoccocal vaccines for people over age 65.

Flu shot and asthma

A study conducted by the **American Lung Association Asthma Clinical Research Centers Network** recently found that flu shots are safe for children and adults with asthma. The study puts to rest previous concerns about possible side effects of the flu shot in people with asthma. Influenza causes substantial illness in both children and adults with asthma. The study found that people with asthma did not have any higher rates of side effects for the 14 days after receiving the flu shot compared to those who received a placebo, or inactivated shot.[102]

A national health objective for 2010 is to increase influenza and pneumococcal vaccination levels to greater than 90 percent among persons ages 65 and older. That goal, however, is far from being achieved. According to Behavioral Risk Factor Surveillance System (BRFSS) data for 2004, only 67 percent of American adults over 65 years of age received a flu shot and only 64.5 percent received the vaccine for pneumonia.

Communities of color are less likely to receive these vaccines. In 2003, among people ages 65 and older, non-Hispanic whites were more likely to report receiving an influenza vaccine (67.6 percent) than Hispanics (44.7 percent) and non-Hispanic blacks (46.6 percent). The racial disproportion was also great for the pneumonia shot: In 2003, 57.5 percent of whites, 34.8 percent of non-Hispanic blacks, and 30 percent of Hispanics received a pneumonia vaccine.

There is great variation across the country in vaccination rates in those over 65. For the influenza vaccine, 2004 rates ranged from 59 percent in Nevada to 78 percent in Minnesota. For the pneumonia vaccine, rates ranged from 51 percent in the District of Columbia to 72 percent in Montana.

The pneumococcal vaccine protects against 23 types of pneumococcal bacteria. According to the CDC, pneumococcal infection accounts for an estimated 40,000 deaths a year in the United States – more than any other vaccine-preventable bacterial disease.

How are influenza and pneumonia diagnosed and treated?

Diagnosis

There are a number of laboratory tests available which will confirm the diagnosis of influenza and/or pneumonia including sputum and blood cultures, chest X-rays, and blood tests.

In August 1999 the Food and Drug Administration cleared for marketing a simple, quick urine test for detecting *Streptococcus pneumoniae*. The laboratory test provides results in 15 minutes. It is intended to be used in conjunction with review of a patient's symptoms to rule out other potential causes of pneumonia. Test results can enable doctors to make a probable diagnosis more quickly and start treatment with the appropriate antibiotics sooner. Conventional methods for diagnosing pneumonia, primarily using sputum or blood, are lengthy (requiring two days to several weeks for results), often complex and not always reliable.

Usually your physician will make the diagnosis of influenza based on your symptoms and physical examination findings.

Treatment

There are four influenza antiviral drugs available in the United States: amantadine, rimantadine, zanamivir and oseltamivir.

Amantadine and rimantadine are useful for treating influenza A if given as soon as possible after exposure to or onset of influenza. However, a recent study found that worldwide resistance to amantadine and rimatadine has increased 12 percent since the mid-nineties.[103] Both drugs may be used as preventive medications, but they must be taken daily as long as influenza cases continue to occur in the community. Both may cause mild side effects. The CDC has stressed that these drugs are not substitutes for vaccination.

Zanamivir (Relenza) and oseltamivir (Tamiflu) have been shown to to reduce flu symptoms if taken at the onset of the disease. These newer drugs can be used to treat strains from both the Influenza A and B viruses. Oseltamivir can also be used to prevent influenza.

In 2000, oseltamivir was approved for influenza prevention in people age 13 and older. Studies have also shown that oseltamivir might be effective in reducing secondary complications due to the flu such as pneumonia in adults and otitis media (ear infections) in children.

There are no generally effective treatments for most types of viral pneumonia, which usually heals on its own. Early treatment with antibiotics can cure bacterial pneumonia and speed recovery from mycoplasma pneumonia. However, the disease has become more resistant to these drugs, making treatment of pneumococcal infections more difficult.

What is the American Lung Association's role in influenza and pneumonia?

The American Lung Association works with other public health organizations to advocate for more funding for vaccine research and surveillance and support for increased vaccine supply. We have actively advocated for legislation and encouraged members of Congress to support legislation through electronic advocacy campaigns.

In addition to advocacy to ensure that all people who want a flu shot are able to get one, the Lung Association is engaged in coalition efforts to raise the visibility of the flu pandemic and garner resources to prepare for the upcoming pandemic.

Lung Cancer

What is lung cancer?

Lung cancer is the uncontrolled growth of abnormal cells in one or both of the lungs. While normal lung tissue cells reproduce and develop into healthy lung tissue, these abnormal cells reproduce rapidly and never grow into normal lung tissue. Lumps of cancer cells (tumors) then form and disturb the lung, making it difficult for it to work properly.

There are two major types of lung cancer: small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). Sometimes a lung cancer may have characteristics of both types, which is known as mixed small cell/large cell carcinoma.

NSCLC

Non-small cell lung cancer is much more common than small cell and accounts for 80 percent of all lung cancer cases. It usually spreads to different parts of the body more slowly than small cell lung cancer. There are three main types of non-small cell lung cancer. They are named for the type of cells in which the cancer develops: squamous cell carcinoma, adenocarcinoma, and large cell carcinoma.

SCLC

Small cell lung cancer, also called 'oat cell cancer,' accounts for the remaining 20 percent of all lung cancers. This type of lung cancer grows more quickly and is more likely to spread to other organs in the body. Smoking almost always causes it.

Symptoms

Lung cancer symptoms may include persistent cough, sputum streaked with blood, chest pain, and recurring pneumonia or bronchitis.

Who gets lung cancer?

An estimated 350,679 Americans are living with lung cancer.[104] The majority of lung cancer patients living have been diagnosed within the last five years. Lung cancer is predominantly a disease of the elderly. From 1998-2002, the median age at diagnosis was 70 years of age.

During 2005 an estimated 172,570 new cases of lung cancer will be diagnosed, which will represent 13 percent of cancer diagnoses.[105]

In 2001, Kentucky had the highest age-adjusted lung cancer incidence rates in both males (140.5 per 10,000) and females (73.3 per 100,000). Utah had the lowest age-adjusted lung cancer incidence rates in both males and females (40.0 per 100,000 and 22.1 per 100,000). These state specific rates were parallel to smoking prevalence rates.[106]

Gender and lung cancer

Men have higher rates of lung cancer than females. In 2002, 77.8 per 100,000 men compared to 50.8 per 100,000 women were diagnosed with lung cancer in the United States. However, over the past 30 years, the lung cancer age-adjusted incidence rate has decreased 9 percent in males compared to an increase of 143 percent in females.[107]

The incidence of lung cancer in men reached a peak in 1984, when 102.1 of every 100,000 men had the disease, then declined to 77.8 per 100,000 men in 2002. In sharp contrast, the incidence of lung cancer in women continued to rise to a peak of 52.8 per 100,000 women in 1998, and then remained relatively stable at 52.3 to 50.8 per 100,000 women from 1999 to 2002.[108]

Race and lung cancer

Racial Disparity. African Americans are more likely to develop and die from lung cancer than persons of any other racial or ethnic group. The lung cancer incidence rate among African American men is more than 50 percent higher than for white men, even though their overall exposure to cigarette smoke, the primary risk factor of lung cancer, is lower. Equally disturbing is the fact that the lung cancer incidence rate for African American women is equal to that of white women, despite the fact that they smoke fewer cigarettes.

For more information on lung cancer and racial disparity please review **Lung Disease Data in Culturally Diverse Communities 2005** under the Data and Statistics section of our website at **www.lungusa.org** or call the American Lung Association at 1-800-LUNG-USA (1-800-586-4872).

What causes lung cancer?

Tobacco

It may take years, even decades, to measure tobacco's impact on the lungs. Smoking is the main cause of both types of lung cancer and about 90 percent of lung cancer deaths are caused by it. In this way, lung cancer is one of the most tragic forms of cancer because in most cases it could have been prevented.

Nonsmokers who breathe in smoke from others' cigarettes are also at increased risk of lung cancer. Nonsmoking spouses of smokers have a 30 percent greater risk of developing lung cancer than do spouses of nonsmokers. Workers exposed to tobacco smoke at work also are more likely to develop lung cancer.

Doctors are treating more nonsmoking women for lung cancer these days and now believe the reason might be that nonsmoking women are more susceptible to other carcinogens. According to the Director of the Thoracic Oncology at Boston's Dana-Farber Cancer Institute nonsmokers make up only 10 percent of men with lung cancer but 20 percent of women with the disease.

Radon

It is estimated that radon is the second leading cause of lung cancer. The number of deaths from lung cancer caused by radon exposure is approximated to be between 15,000 and 21,000 in the U.S. annually.[109]

Researchers report that even at concentrations far below official guideline levels, residential radon may lead to a 2.5-fold rise in the risk of lung cancer.[110]

Occupational exposure

Lung cancer can also be caused by occupational exposure, including asbestos, uranium, and coke (an important fuel in the manufacture of iron in smelters, blast furnaces, and foundries). Environmental exposure can also increase the risk of lung cancer mortality. In one study, authors found that long-term exposure to fine particulate air pollution was associated with an approximate eight percent increased risk of lung cancer mortality.[111]

Diet

There is quite a bit of disagreement over whether diet influences lung cancer risk. Three studies failed to confirm the hypothesis that beta-carotene reduces the risk of lung cancer among

smokers; this finding was surprising because previous studies had found low beta-carotene levels were associated with increased risk of lung cancer among smokers.[112] However, two studies have found that consumption of fruits and vegetables was associated with a lower lung cancer risk. Carotene-rich foods, tomatoes and tomato-based products were found most beneficial in one study.[113]

A more recent study found that phytoestrogens, plant-derived compounds found in soy products, grains, carrots, spinach, broccoli and other fruits and vegetables, have a protective effect against some solid lung tumors.[114]

Can people die from lung cancer?

Lung cancer is the leading cause of cancer deaths in both men and women in the United States. This year about 163,510 Americans are expected to die of lung cancer, accounting for 29 percent of all cancer deaths.[115]

Before the 1940's, smokers were overwhelmingly men. That has changed – and so have the statistics. In 2002, 42.8 percent of lung cancer deaths occurred in women compared to 26 percent of deaths in 1979.[116]

Between 1997 and 2001, an average of 123,836 Americans (79,022 males and 44,810 females) died of smoking-attributable lung cancer annually. Exposure to secondhand smoke causes approximately 3,000 lung cancer deaths among nonsmokers every year.[117]

Survival rates for lung cancer tend to be much lower than those of most other cancers. The expected five-year survival rate for all patients in whom lung cancer is diagnosed is 15.3 percent compared to 64 percent for colon, 88 percent for breast and 99.8 percent for prostate cancer.[118]

Outlook for survival

The prognosis for a patient with lung cancer depends, to a large extent, on the stage of the cancer. Staging is used to determine whether the cancer has spread and, if so, to what parts of the body. Stages include localized (within lungs), regional (spread to lymph nodes) and distant (spread to other organs). The five-year survival rate is 49 percent for cases detected when the disease is still localized. However, only 16 percent of lung cancer cases are diagnosed at an early stage. For distant tumors the five-year survival rate is 2.1 percent.[119]

About six out of 10 people with lung cancer die within one year of being diagnosed. Between seven and eight will die within two years.[120]

What are the costs associated with lung cancer?

The financial costs of cancer are staggering. According to the National Institutes of Health, cancers cost the United States more than $170 billion in 2002. It is estimated that direct medical cost for treatment of lung cancer is approximately $5 billion.

How is lung cancer diagnosed and treated?

All cancer patients benefit from early intervention, at a stage when the malignant growth is localized and has not seeded distant parts of the body with tumor cells. But lung cancer poses a particular problem: Early stages may be symptomless, without any signal such as coughing, pain, or shortness of breath. Thus, when the disease is discovered, it may already be far advanced.

Diagnosis

When a patient goes for an exam, the doctor asks about the patient's medical history, including exposure to hazardous substances. The doctor will also give the patient a physical exam. If the patient has a cough that produces sputum (mucus), it may be examined for cancerous cells. Tests include chest x-ray, analysis of cells in sputum and fiberoptic examination of the bronchial passages. Newer tests such as low dose spiral computed tomography scans and molecular markers in sputum have produced promising results in detecting lung cancers at earlier, more operable stages.[121] However, some critics believe that the risks of screening may outweigh the benefits.[122]

Trials

In 2003, The National Cancer Institute (NCI) launched a new study to determine if screening people with either CTs or chest x-rays before they have symptoms can reduce deaths from lung cancer. The National Lung Screening Trial (NLST) will enroll 50,000 current or former smokers and will take place at a total of 30 sites throughout the United States.[123]

Treatment

If lung cancer is found relatively early, treatment – surgery, radiation, drug therapy, or a combination of approaches – is sometimes effective. Choice of treatment, as well as prognosis, may also depend upon the specific type of tumor. Many clinical trials are underway to study new lung cancer treatments.[124]

In May 2003, the Food and Drug Administration approved the drug Iressa to treat advanced non-small cell lung cancer patients who have been treated unsuccessfully with conventional chemotherapy. Unfortunately, the government just restricted access to Iressa because it failed in a key study intended to show it could improve survival.

However, Tarceva – a similar drug – extended survival by an average of two months in tests on about 700 patients with advanced non-small cell lung cancer. Patients were more likely to respond to Tarceva if their tumors contained a certain protein or had lots of copies of a particular gene. The study also confirmed that patients most likely to benefit from the drug included women, nonsmokers, Asians and those with an adenocarcinoma.[125]

New treatment developments

Researchers announced many new developments in lung cancer treatment in the last year, including:

- A substance related to vitamin A called 9-cisretinoic acid may be able to repair some of the genetic damage done by smoking, and may even prevent lung cancer.[126]
- A drug originally used to treat dry mouth, called anethole dithiolethione or ADT, may prevent lung cancer in some people at risk. Researchers at the British Columbia Cancer Agency studied 101 current and former smokers with an irregular growth in their lungs and high risk for developing lung cancer. After six months, patients taking ADT three times a day had about half the number of growths become cancerous, and developed fewer new growths, than those who took a placebo (dummy) medicine.[127]
- The GVAX lung cancer vaccine is being tested in patients with advanced non-small cell lung cancer. The vaccine is made by directly modifying the patient's tumor cells. In one study of 33 patients with advanced stage lung cancer, most of whom had failed chemotherapy and/or radiation, three patients had complete disappearance of their tumor, with a median duration of 17.8 months. The median survival of all 33 patients was 11.6 months, compared with 5.7 to 7.0 months in patients treated with docetaxel (Taxotere) or 4.6 months for patients receiving supportive care.[128]

- In December 2002, the Food and Drug Administration approved Taxotere in combination with Platinol (cisplatin) for initial therapy in the treatment of inoperable, advanced non-small cell lung cancer.
- Japanese researchers found that irinotecan (Camptosar) plus cisplatin is an effective treatment for small-cell lung cancer that has spread beyond the lung.[129]
- Researchers at The University of Texas M.D. Anderson Cancer Center and The University of Texas Southwestern Medical Center at Dallas identified three lung cancer tumor suppressor genes that dramatically reduced human lung cancer growth in mice. The researchers said they expected gene therapy trials with humans to begin within a year.[130]
- Studies supported by the American Lung Association are using molecular genetics and cell biology techniques to study immune system regulation of lung cancer cells, with the hope of defining how the cellular immune system may control cancer. These findings may ultimately be used to detect lung cancer in its early stages, and eventually to develop gene therapy treatment.

What is the American Lung Association's role in lung cancer?

Lung Cancer Discovery Award

The American Lung Association and the **LUNGevity Foundation** have joined together to provide resources to researchers seeking new treatments and a cure for lung cancer. Created in 2004, the **Lung Cancer Discovery Award** provides funding for investigators in addition to supporting clinical, laboratory, epidemiological and any other research that focuses on improving medical treatment and finding a cure for lung cancer.

Advocacy

Our tobacco advocacy agenda helps prevent lung cancer by actively promoting efforts to help smokers quit, prevent people from starting to smoke and protect everyone from secondhand smoke.

Research support

The American Lung Association supports increased federal funding for a broad range of lung disease-related biomedical research, treatment and prevention programs conducted by the National Institutes of Health, Centers for Disease Control and Prevention, Department of Veterans Affairs and other federal agencies.

NexCura profiler

The American Lung Association provides help with treatment options through the NexCura profiler on lung cancer. The profiler enhances the discussion between physicians and patients and their families, and helps patients make better-informed treatment decisions using information from evidence-based, peer-reviewed medical literature.

For more information on the above, please visit **www.lungusa.org**.

Obstructive Sleep Apnea

What is obstructive sleep apnea?

Obstructive Sleep Apnea (OSA) is a disorder in which the throat repeatedly narrows, either partially or totally blocking the airway during sleep. This blocking of the airways can cause a person to stop breathing or breathe uneasily. The partial blocking leads the person to snore loudly and the apnea causes them to wake up often. As a result, affected persons have unrestful sleep and excessive daytime sleepiness.

Symptoms

Sleep apnea may or may not be evident to the patient or to others. It may be manifested by marked daytime drowsiness – or noted by a spouse who is frequently awakened by the snoring, which almost always accompanies obstructive sleep apnea.

Sleep apnea is considered a health problem because so many individuals lose so much sleep due to this condition that their lack of alertness poses a serious hazard. It is also associated with hypertension and heart disease.

Sleep apnea may also cause impaired mental functioning, delayed reaction times, and difficulty maintaining vigilance and concentration. In its severe form it is accompanied by high pressure in the lung arteries leading to heart failure.

Who has obstructive sleep apnea?

Sleep apnea occurs in all age groups and both sexes, but it is more common in males and in those over age 40. An estimated four percent of middle-aged men and two percent of middle-aged women have sleep apnea along with excessive daytime sleepiness.[131]

Estimates suggest that as many as 18 million Americans have sleep apnea. Men are more susceptible than women, evidently due to hormonal influences (sleep apnea is rarely seen in premenopausal females). OSA may occur in kids with enlarged tonsils and adenoids.

A recent study examined a group of National League Football (NFL) players and estimated the prevalence of sleep disordered breathing to be 14 percent overall and 34 percent within the high-risk group. Offensive and defensive linemen accounted for 85 percent of the cases of sleep apnea. Although young and ostensibly in excellent physical condition, professional football players have many risk factors for sleep-disordered breathing. For a group that is young (less than 30 years of age), healthy, and physically fit, this is a worrisome finding.[132]

Race and sleep apnea

African Americans tend to be at increased risk of sleep apnea. According to a recent study that looked at risk factors for sleep-disordered breathing, African American children were more than three times as likely as children of other races to develop obstructive sleep apnea.[133]

Elderly African Americans are more than twice as likely as elderly whites to suffer from sleep-disordered breathing. Researchers at the University of California, San Diego studied

54 African Americans and 346 whites aged 65 and older. They found that 17 percent of the African American subjects had sleep apnea compared to eight percent of the whites.[134]

What causes obstructive sleep apnea?

Race and sleep apnea

Basic factors, such as airway anatomy (e.g., adenotonsillar hypertrophy), nasal obstruction, presence and distribution of body fat, and muscle tone, may contribute alone or in combination to the presence and severity of this disorder.

Obesity, even if moderate, is the most common predisposing factor but other risk factors include depression, hypertension, height and weight (BMI greater than 28), collar size of snoring patients (greater than 17 in. for men, 15 for women), enlarged adenoids and swollen nasal turbinates and polyps, underactive thyroid and excessive fat around the neck area.[135]

Sleep apnea also seems to run in some families, suggesting a possible genetic basis. It is exacebated by the use of alcohol and sleeping pills.

How is obstructive sleep apnea diagnosed and treated?

Symptoms

Because of the lack of awareness of the public and healthcare professionals, the vast majority of people with the illness remain undiagnosed and therefore untreated.[136]

Untreated, sleep apnea can cause high blood pressure and other heart diseases, depression, irritability, learning and memory difficulties, weight gain, impotence and headaches.

One study found that people with sleep apnea are at special risk for high blood pressure. The study found that middle-aged and older adults with sleep apnea have a 45 percent greater risk of high blood pressure than people without the condition.[137]

Moreover, untreated sleep apnea may be responsible for injuries on the job and deadly car crashes. In fact, a recent study found that more than 800,000 drivers were involved in vehicle crashes related to sleep apnea in 2000, at a cost of nearly $16 billion and 1,400 lives.[138]

Treatment

Fortunately, sleep apnea can be diagnosed and treated. Several treatment options exist, and research into additional options continues. Therapy for sleep apnea is tailored to the individual patient based on medical history, physical examination, and the results of polysomnography, which is a test that records different body functions during sleep.

Continuous positive airway pressure (CPAP) is the most common effective treatment for sleep apnea. Nasal CPAP prevents the airways from closing by delivering air through a mask that forces the air out through the nasal passages. This enables a person with sleep apnea to have a good night's sleep, preventing daytime accidents.

A study suggests that the wake-promoting drug modafinil (Provigil) may be a useful additional treatment for managing residual daytime sleepiness in patients with sleep apnea who are regular users of nasal CPAP.[139]

Recently, French doctors reported that forcing the heart to beat faster during sleep can significantly relieve sleep apnea. The researchers reported that when the heart rate was 57 beats per minute, breathing stopped nine times an hour. When the pace was increased to 72 beats per minute using a pacemaker, the number of episodes dropped to three per hour. The scientists said

this finding could be useful for patients who already have a pacemaker; they noted it remains to be shown whether pacemakers should be installed as a treatment for sleep apnea.[140]

Sometimes supplementary oxygen is used and obese patients are generally given nutritional counseling.

Surgery to increase the size of the airway and behavioral therapy, such as smoking cessation are also used but are less common. However, general anesthesia suppresses upper airway muscle activity, and it may impair breathing by allowing the airway to close. Sedatives and alcohol may increase the number and length of sleep apnea episodes and decrease the amount of oxygen in the blood. Anesthesia does so as well. Attention to sleep apnea should continue after any kind of operation because the remaining sedative effects of the anesthesia on the lungs can pose difficulty, as can some pain relievers.

Occupational Lung Diseases

What are occupational lung diseases?

Occupational lung disease is the number one cause of work-related illness in the United States in terms of frequency, severity and preventability.

There are two broad categories of occupational lung disease:

Types of occupational lung diseases

- Diseases that are not occupation-specific, but are aggravated at work.
- Diseases related to a specific occupation such as asbestosis, coal worker's pneumoconiosis (black lung), silicosis, berylliosis, byssinosis (brown lung) and farmer's lung. Adult-onset asthma, COPD and lung cancer can also be triggered by workplace exposures.

Occupational lung cancer

Worldwide, about 20 to 30 percent of the male and five to 20 percent of the female working-age population may have been exposed to agents that cause cancer in the lungs during their working lives. Asbestos, arsenic, chloroethers, chromates, ionizing radiation, nickel, and polynuclear aromatic hydrocarbons in industrial settings have been associated with lung cancer.

These occupational exposures account for about 10.3 percent of cancer of the lung, trachea and bronchus, the most frequently occurring occupational cancers.[141]

Occupational asthma

The most common form of occupational lung disease is occupational asthma. An estimated 15 to 23 percent of new adult onset asthma cases in the U.S. are due to occupational exposures. These exposures within the workplace can also aggravate pre-existing asthma.[142] Symptoms usually occur while the worker is exposed at work, but in some cases, they develop several hours after the person leaves work, and then subside before the worker returns to the job the next day. In later stages of the disease, symptoms may occur away from work after exposure to common lung irritants.

Occupational asthma is usually reversible, but permanent lung damage can occur if exposure continues. According to a recent study, men working in forestry and with metals and women in the service industries (waitresses, cleaners and dental workers) have the highest risk for occupational asthma.[143]

Asbestosis

Asbestosis is a progressive disease involving scarring of lung tissue as a result of exposure to the microscopic fibers of asbestos. Asbestos was previously widely used as an insulator and fire retardant until it became known that its microscopic fibers are carcinogenic.

An estimated 1.3 million employees in construction and industry face significant asbestos exposure on the job.[144] Between 1980 and 2002 6,343 deaths were due to asbestosis.[145]

Mesothelioma

Mesothelioma is an otherwise rare cancer of the chest lining caused by asbestos exposure. There are estimates that by the year 2030 asbestos will have caused 60,000 instances of mesothelioma that will have resulted in death.[146] Mesothelioma has a lengthy latency period, ranging from 10 to 30 years.

Byssinosis

Byssinosis (brown lung disease) is a chronic condition involving obstruction of the small airways severely impairing lung function. It is caused by dust from hemp, flax, and cotton processing. Between 1979 and 2002 byssinosis caused approximately 140 deaths.[147] However, more than 35,000 textile workers have been disabled by byssinosis.[148] In the United States, byssinosis is almost completely limited to workers who handle unprocessed cotton.

Coal workers' pneumoconiosis

Coal workers' pneumoconiosis (black lung disease) is a chronic condition caused by the inhalation of coal dust that becomes imbedded in the lungs, causing them to harden, making breathing very difficult. An estimated 2.8 percent of coal miners are affected; about 0.2 percent have scarring on the lungs, the most severe form of the disease.[149] Each year, close to 400 people die from black lung disease.[150]

Silicosis

Silicosis results from exposure to free crystalline silica in mines, foundries, blasting operations, and stone, clay and glass manufacturing that causes scar tissue to form in the lungs. Each year 200 people die with silicosis listed as an underlying or nonunderlying cause of death on their death certificates, a rate that has been stable since the early 1990's.[151] About one million workers are believed to have been exposed to silica dust and almost 60,000 are expected to suffer from some degree of silicosis.[152]

Evidence indicates that workers who do not have silicosis but who have had long exposures to silica dust may be at increased risk of developing TB. The American Thoracic Society recommends that tuberculin tests be administered to persons with silicosis and to those without silicosis who have had at least 25 years of occupational exposure to crystalline silica.

Hypersensitivity pneumonitis

Hypersensitivity pneumonitis results from repeated exposure to fungus spores from moldy hay, bird droppings, or other organic dusts that causes the air sacs of the lungs to become inflamed; parts of the lungs may then develop fibrous scar tissue and cease to function normally in breathing. Deaths from hypersensitivity pneumonitis have been generally increasing from less than 20 per year in 1979 to 57 in 1999.[153]

Sick building syndrome

Sick building syndrome results when a substantial number of building occupants experience symptoms that do not fit the pattern of any particular illness and are difficult to trace to any specific source. Sick building problems may arise because of poorly designed or maintained heating, ventilating and air conditioning (HVAC) systems, office equipment, furniture and supplies, and operations in the building.

To save rising energy costs, new buildings are tightly sealed and modern ventilation systems recycle a large portion of inside air. If the system is not carefully designed or maintained, fresh air may not reach the worker. For example, use of flexible office partitions in large open spaces can interfere with air distribution. Energy costs in older buildings are reduced by adding insulation, caulking and weather-stripping. Windows are made air-tight and outside air dampers are closed.

Whether a building is old or new, the same recirculated air is breathed again and again by the people working in these buildings. The problem is made worse by increasing numbers and varieties of pollutants from furnishings, air conditioning, heating and ventilating systems, modern

office equipment and supplies, humidifiers and dehumidifiers, and secondhand tobacco smoke. In fact, according to the National Institute of Allergy and Infectious Disease, poorly ventilated office spaces aid in the transmission of pneumonia to three million people annually.[154]

What causes occupational lung diseases?

Occupational lung disease is mainly caused by long-term exposure to irritating or toxic agents in the workplace (mineral and/or organic dusts, smoke, fumes, gases, mists, sprays and vapors). It is possible, however, to develop occupational lung disease from several single exposures.

Smoking can increase the severity of these diseases. Smokers who are exposed to cancer-causing agents, such as asbestos and radiation, greatly increase their chances of getting lung cancer and other lung diseases.

Although occupational lung diseases are often not curable, they are always preventable. Improving ventilation, wearing protective equipment, changing work procedures, and educating workers are the key factors for prevention.

Who's at risk?

In 2002, there were about 294,500 newly reported cases of occupational illness in the private industry, and 22,000 newly reported respiratory conditions. Overall, 2.5 per 10,000 full time workers developed nonfatal occupational respiratory diseases.[155] Workplace exposures have also been associated with deaths from respiratory diseases other than cancer.[156]

A total of 2,591 work-related respiratory illnesses with days away from work (2.4 per 100,000 workers) occurred in private workplaces in 2000. The highest total for days away from work due to respiratory illnesses was in the manufacturing sector.[157]

Racial disparity

Certain racial and ethnic groups are traditionally employed in lower-wage sectors of the workforce where they are overexposed to occupational respiratory hazards. They are more likely to be employed in industries such as agriculture, mining (coal, silica), textiles, demolition, manufacturing (asbestos), and service maintenance (cleaning supplies) – all of which have been associated with lung disease.

In Colorado and New Mexico, Native Americans have been disproportionately employed in uranium mines. That fact has been associated with an inordinately high rate of lung cancer, due to exposure to radon byproducts (radon results from radioactive decay of radium, which in turn, is a decay product of uranium).

More information at *Lung Disease Data in Culturally Diverse Communities 2005* on **lungusa.org**.

What are the costs associated with occupational lung diseases?

The cost of occupational injuries and illnesses in the United States totals more than $170 billion per year.[158]

According to the U.S. Department of Energy (DOE), improving buildings and indoor environments could reduce healthcare costs and sick leave and increase worker performance, resulting in an estimated productivity gain of $30 to $150 billion annually. For the United States, the corresponding annual healthcare savings plus productivity gains are:

- $6 to $19 billion from reduced lung disease,
- $1 to $4 billion from reduced allergies and asthma,
- $10 to $20 billion from reduced Sick Building Syndrome symptoms, and
- $12 to $125 billion from direct improvements in worker performance unrelated to health.[159]

Primary Pulmonary Hypertension

What is primary pulmonary hypertension?

Primary pulmonary hypertension (PPH) is a rare disease that results in the progressive narrowing of the blood vessels of the lungs, causing high blood pressure in these blood vessels and eventually leading to heart failure.

Secondary pulmonary hypertension (SPH) is the result of other types of lung disease, abnormal breathing processes or heart disease.

Symptoms

The most common symptoms include shortness of breath following exertion, excessive fatigue, dizziness, fainting, weakness, ankle swelling, bluish lips, hands, and feet and chest pain.

Who gets primary pulmonary hypertension?

The true incidence of PPH is unknown. However, it is estimated that there are one to two cases per million or 300 new cases per year.[160] In 2002, there were 60,000 hospital discharges in which one of the diagnoses was PPH.[161] It is more common in women between the ages of 20 and 40; however, it can affect anyone at any age, and has no racial predilection.[162] There is often a family history of primary pulmonary hypertension or sudden death.

Women

Women are two to five times more likely than men to develop PPH.[163] The disease is diagnosed most often in the third decade of life.

Newborns

Persistent pulmonary hypertension of the newborn (PPHN) is a syndrome of acute respiratory failure, characterized by systemic hypoxemia associated with extrapulmonary shunting of venous blood and evidence of elevated levels of pulmonary artery pressure in the absence of congenital heart disease. This syndrome is seen more commonly in term infants who have underlying diseases such as respiratory distress, sepsis or lung hypoplasia. In some cases, it may be idiopathic PPHN. In the United States, approximately 10,000 newborns per year suffer from PPHN.[164]

What causes primary pulmonary hypertension?

No one knows what causes PPH; however, research into the cause suggests a number of factors that may be responsible for the disease. Possible causes include genetic or familial predisposition, immune system disease, or drug or other chemical exposures.

Use of certain appetite suppressants has been found to increase the risk of developing PPH, especially use lasting longer than three months. Studies estimate that treatment with certain appetite suppressant drugs increases the risk of getting PPH from about one to 28 cases per million person-years (one person-year represents a patient treated for one year). Two drugs

associated with PPH, fenfluramine and dexfenfluramine, were taken off the market in September 1997 after being linked to heart valve damage.

Genetic factors have long been suspected since women are two to five times more likely than men to develop PPH. The reason might be that PPH is likely to worsen during labor and delivery, resulting in a high maternal mortality rate.

Can people die from PPH?

In 2002, 3,549 deaths were attributed to primary pulmonary hypertension. More than half of those deaths were women.[165]

The prognosis for patients with PPH can be quite variable. Many patients report that by changing some parts of their lifestyles, they can go about many of their daily tasks. The median period of survival is three years after diagnosis, although the survival rate is generally longer for those patients without heart failure and for those patients diagnosed after 40.

How is PPH diagnosed and treated?

Diagnosis

Diagnosis may be delayed for several years since initial symptoms of PPH may be very minor.

In addition, it is difficult to detect PPH in a routine medical examination. Even when the disease has progressed, the signs and symptoms may be confused with other conditions that affect the heart and the lungs. To determine if a patient has pulmonary hypertension, a physician may recommend a cardiac catheterization with, perhaps, angiography.

PPH is diagnosed only after several possible causes of pulmonary hypertension are excluded; additional tests are usually needed.

Primary pulmonary hypertension is treated with a number of drugs. None of the drugs cure or halt the progression of this disease, but they may relieve symptoms and slow the progression of the disease. Some patients take vasodilators, which help to dilate the blood vessels in the lungs, reducing the blood pressure in them. Anticoagulants may be used to decrease the tendency of the blood to clot in the lungs.

Treatment: drugs

Remodulin (treprostinil sodium), also called UT-15 and Uniprost, is a form of prostacyclin, a very powerful vasodilator that helps most PPH patients who take it. The drug is made by United Therapeutics, Inc. and was approved by the FDA for use within the United States in May 2002. Remodulin is the second FDA-approved treatment (after Flolan) for PPH patients.

Remodulin is injected through a catheter into the patient, usually near the stomach. The drug is slowly absorbed after being injected into fat cells. It then works it way to the blood vessels of the lung, relaxing them and enabling the patient to breath easier. Some researchers believe it may also slow the PPH scarring process.

The downside is that the injections are extremely painful. Pain at the point of injection is the biggest complaint and nearly eight percent of patients cannot tolerate the pain and must try another therapy. After six months the pain subsides in some people. Other side effects can include jaw pain, foot cramps and flushing. The drug is very expensive, with the reported wholesale price at $65 per milligram; the treatment runs well into the tens of thousands of dollars. United Therapeutics distributes Remodulin through Priority Healthcare Corporation and Gentiva Health Services. Two new oral drugs include bosentan and sidenatil.

Treatment: surgery

Although some patients do well with medication, others may need and be eligible for a heart-lung transplantation. The pressure in the lungs even with treatment will get progressively worse and cause the right ventricle to fail. As the right ventricle gets larger and larger, the patient can develop irregular heart rhythms that can lead to sudden death. Over time, the blood vessels in the lungs will get weak and be at risk for rupturing and causing massive bleeding in the lungs. Patients will get progressively weaker and more easily fatigued, so that their quality of life will be affected. The only true cure for this problem is a heart-lung transplant. As technology advances these are becoming more and more successful.

The diagnosis of persistent pulmonary hypertension of the newborn is usually made within 24 hours after birth and most patients are born at hospitals without extracorporeal membrane oxygenation (ECMO).

The standard therapy for PPHN typically includes conventional mechanical ventilation, oxygen, sedation, paralysis, alkalosis, inotropic support, intravenous vasodilators, and antibiotics. Results of a recent study of inhaled nitric oxide (I-NO) found that for term infants with PPHN, early I-NO as the sole adjunct to conventional management produced an acute and sustained improvement in oxygenation for 24 hours without short-term side effects, and suggests that ECMO use may be reduced.[166]

Respiratory Distress Syndrome

What are RDS and ARDS?

Respiratory distress syndrome (RDS) is a life-threatening lung disorder that mainly affects premature infants. Babies with RDS have lungs that are immature and cannot survive outside the womb.

Acute respiratory distress syndrome (ARDS) is the rapid onset of respiratory failure (inability to adequately oxygenate the blood) that can occur in critically ill persons of any age over one year. The condition can be life-threatening and occurs when the lungs cannot perform normal gas exchange due to severe fluid buildup.[167]

Both syndromes are characterized by rapid breathing, nasal flaring, grunting noise with each breath, and blue around lips and nail beds, which indicates a lack of oxygen.

Who gets RDS or ARDS?

Incidence and Prevalence

Despite the progress made in perinatal care, RDS continues to be the major cause of morbidity among preterm infants. The surviving premature infants are, furthermore, at risk of long-term morbidity (chronic lung disease of prematurity and neurosensory disorders).

RDS affects an estimated 10 percent of all premature infants born alive in the United States; approximately 24,000 infants in 2002.[168] The incidence of RDS declines with the amount of time a child stays in the womb. RDS occurs in 60 percent of babies born at less than 28 weeks' gestation, 30 percent of those born at 28 to 34 weeks, and fewer than five percent of those born after 34 or more weeks. Full-term pregnancy is defined as lasting between 37 and 42 weeks; babies born after 35 weeks rarely develop RDS.

The incidence of ARDS has been difficult to determine partly because of the variety of causes, clinical manifestations and differing criteria used to define it. Various published estimates have ranged from 1.5 to 75 cases per 100,000 persons.[169] The NHLBI estimates that approximately 150,000 Americans are affected each year.[170]

What causes RDS or ARDS?

Causes

RDS has some similarities with ARDS, but its causes are different. RDS is caused by a lack of pulmonary surfactant, a chemical that normally appears in mature lungs. Surfactant keeps the air sacs in the lungs from collapsing and allows them to inflate with air more easily. In respiratory distress syndrome, the air sacs collapse and prevent the child from breathing properly. Symptoms

usually appear shortly after birth and become more severe over time. This condition used to be known as 'hyaline membrane disease,' for the glassy appearance of certain membranes in the lungs.

Risk factors for RDS are premature birth, diabetes in the mother, and stress during delivery that produces acidosis in the newborn at birth. RDS infants may develop several complications, such as an infection of the bloodstream due to their lung problem (sepsis), as well as other problems related to premature birth, such as bleeding into the brain. These and other complications can cause convulsions, shock-like states, and in some cases, death.

ARDS is mainly caused by extensive lung inflammation and small blood vessel injury due to sepsis (generalized infection), trauma and/or severe pulmonary infection such as pneumonia. However, ARDS can be associated with multiple transfusions, inhalation of salt water, smoke inhalation of toxic chemicals, narcotics, sedatives and/or tricyclic antidepressants overdoses and shock from any cause.[171]

Onset usually occurs within 24 hours to three days of the original illness or injury. At 72 hours, 85 percent of patients have clinically apparent ARDS.[172]

Can people die from RDS and ARDS?

A generation ago, most babies born with RDS did not survive. Annual RDS deaths decreased from 25,000 in the 1960's to 943 in 2002, representing 3.4 percent of infant fatalities. In 1979, the syndrome was still the second-ranking cause of infant deaths (after congenital anomalies); by 2002, it had dropped to seventh. In 2002, the RDS mortality rate (per 100,000 live births) among African Americans was 56.9 versus 18.4 among whites – a difference of more than 209 percent.[173]

The fatality rate due to ARDS is approximately 30 to 40 percent. [174] Deaths usually result from multisystem organ failure due to the lack of oxygen, rather than lung failure alone. The cause of a patient's ARDS helps predict his chances for survival. Younger people and those with fewer chronic health problems are more likely to recover. It is known that people with milder forms of ARDS tend to have a better chance of recovering than those with a more severe form of the illness. For example, patients who develop ARDS due to sepsis usually do not do as well as patients whose ARDS is related to trauma or pulmonary infection.

How are RDS and ARDS treated?

RDS treatment

Researchers have made much progress in lifesaving discoveries for RDS. If complications during pregnancy indicate that a premature birth is likely, doctors can test the amniotic fluid for surfactant in order to track the fetus' lung development so delivery can be delayed as long as possible until the lungs are mature.

If the birth cannot be delayed the mother may be given adrenal hormones – notably, dexamethasone – to speed fetal lung maturity.

Doctors can also deliver the baby and give surfactant to the infant and/or partial liquid ventilation in an infant with severe RDS by the use of mechanical respirators designed to prevent the alveoli from collapsing.

Two forms of replacement surfactant have been approved. One is derived from cattle; the other is synthetic. The surfactant is given either as soon as the premature baby is born or when it becomes apparent that RDS is present. Surfactant therapy is usually not required beyond the first day of life, because the turnover of surfactant is slow in newborns, and the rapid differentiation of alveolar tissue leads to sufficient endogens within days after birth in most cases. These therapies have led to a dramatic decrease in mortality associated with RDS, from nearly 100 percent to less than 10 percent.[175]

Inhaled nitric oxide is known to improve gas exchange, decrease pulmonary vascular lability, and reduce pulmonary inflammation. A study of 207 premature infants found the use of low-dose inhaled nitric oxide, when initiated soon after birth, reduces the incidence of chronic lung disease among premature infants with RDS. The use of nitric oxide may also decrease the risk of severe bleeding and oxidative stress, which are important neonatal complications associated with prematurity.[176]

ARDS treatment

Treatment of ARDS involves supportive care in an intensive care unit (ICU). Treatment consists of supplemental oxygen and mechanical ventilation along with careful attention to fluid balance and a supportive breathing technique called positive end expiratory pressure (PEEP). These are combined with continuing treatment of the precipitating illness or injury.[177]

The goal of mechanical ventilation is to support the patient's breathing during the time needed for the patient's lungs to heal. New advances in mechanical ventilation are taking place. In a recent National Heart, Lung and Blood Institute study, preliminary results suggested that receiving small, rather than large, breaths of air from a mechanical ventilator reduced the number of deaths by 22 percent and increased the number of days without ventilator use.

Lung function in most survivors of ARDS will return to normal or near normal within several months; however, some will have lasting damage to their lungs or to other areas outside the lungs. A study found that survivors of ARDS may have persistent functional disability one year after discharge from the intensive care unit, most commonly suffering from muscle wasting and weakness.[178]

Respiratory Syncytial Virus

What is Respiratory Syncytial Virus (RSV)?

RSV is a very contagious virus that causes infection of the lungs and breathing passages. RSV can also affect the mouth, nose and throat.

After each RSV infection, the body forms some immunity to the virus, but that immunity is never complete. Re-infections can occur several times during a lifetime, causing more severe illnesses (like pneumonia) in infancy, but only a common cold in adulthood.

RSV infections occur throughout the year, but there are typically widespread outbreaks during the winter months, peaking in January and February.

Symptoms

Symptoms of RSV can be mild and include cough, stuffy or runny nose, mild sore throat and fever. Additional symptoms can include decreased interest in surroundings, listlessness, irritability, poor appetite, bluish color of the lips or fingernails, abnormally rapid breathing and apnea.

Who gets RSV?

Incidence and Prevalence

RSV affects people of all ages, but is the most common cause of bronchiolitis and pneumonia among infants and children under one year of age.[179]

RSV causes an estimated 31 bronchiolitis-associated hospitalizations per 1,000 children aged less than one year each year.[180] Rates of bronchiolitis-associated hospitalizations for American Indian/Alaska Native children are approximately twice that for the general population of U.S. children.[181]

During their first RSV infection, between 25 percent and 40 percent of infants and young children have signs or symptoms of bronchiolitis or pneumonia, and 0.5 percent to two percent require hospitalization. Most children recover from the illness in eight to 15 days, but it can be fatal in infants and children born prematurely or with chronic lung, heart, or immune deficiency diseases.

More than 80,000 children (the majority of them under 24 months old) are hospitalized due to RSV and approximately two percent die each year.[182]

Although RSV is most common in infants and young children, it can cause respiratory illness throughout life, especially among those with compromised respiratory, cardiac, or immune systems and the elderly. A study found that more than 78 percent of RSV-associated underlying respiratory and circulatory deaths occurred among people aged 65 years or older.[183]

How does RSV spread?

RSV passes from person to person through infected nasal and oral fluids. It can enter the body when eyes or nose are touched. It may also be spread by droplets from a cough or sneeze.

How is RSV diagnosed and treated?

Standard tests such as antigen detection assays are used to diagnose RSV disease.

Treatment

For children with mild disease, no specific treatment is necessary other than the treatment of symptoms (e.g., acetaminophen to reduce fever). Children with severe disease may require oxygen therapy and sometimes mechanical ventilation. Ribavirin aerosol may be used in the treatment of some patients with severe disease. Some investigators have used a combination of immune globulin intravenous (IGIV) with high titers of neutralizing RSV antibody (RSV-IGIV) and ribavirin to treat patients with compromised immune systems.

The U.S. Food and Drug Administration has licensed two products (RespiGam and Synagis) to prevent serious RSV disease in children under age two who have lung problems due to prematurity or bronchopulmonary dysplasia. Although both products must be given in five monthly doses, the newer product, Synagis, is given intramuscularly, rather than by intravenous infusion over a period of hours, and is more concentrated than RespiGam – an advantage since infants with certain pulmonary diseases may retain excess fluids.

Development of an RSV vaccine is a high research priority, but one is not yet available. Current prevention options include good infection control practices. Frequent handwashing and not sharing items such as cups, glasses, and utensils with persons who have RSV illness should decrease the spread of virus to others. Excluding children with colds or other respiratory illnesses (without fever) who are well enough to attend child care or school will probably not decrease the transmission of RSV, since it is often spread in the early stages of illness.

Sarcoidosis

What is sarcoidosis?

Sarcoidosis is a disease that causes inflammation of the body's tissues. This inflammation produces small lumps, called granulomas, that can be either inside the body or on its exterior, as sores on the face or shins. Sarcoidosis can attack any organ and always affects more than one of the body's systems. However, more than 90 percent of patients with sarcoidosis will have lung involvement.[184] Pulmonary sarcoidosis can cause loss of lung volume, which is the amount of air the lungs can hold, and it can cause abnormal lung stiffness.

Sarcoidosis is often asymptomatic and as such is never reported. Despite the difficulties this poses for tracking the disease, sarcoidosis is known to be the most common fibrotic lung disorder in the United States.

Symptoms

Symptoms of pulmonary sarcoidosis may include a dry cough, shortness of breath, or mild chest pain accompanied by fatigue, weakness, and weight loss.

Who gets sarcoidosis?

Incidence and Prevalence

Sarcoidosis occurs primarily in adults younger than 40 years of age, although all ages can be affected. The peak incidence occurs in the third decade of life.[185] However, newer research suggests that a second peak occurs in patients over 50 years old, especially in women.[186] Estimates of the prevalence of sarcoidosis range from less than one case per 100,000 persons to 40 cases per 100,000.

Sarcoidosis is more common among females than males. One study found that the rate of disease in men was 5.9 cases per 100,000 persons and 6.3 cases per 100,000 for women.[187] Sarcoidosis appears to occur more commonly in nonsmokers than in smokers.[188]

African Americans, especially young women, along with Swedes and Danes, have the highest prevalence rates of sarcoidosis in the world. In the U.S., the lifetime risk of sarcoidosis is three times higher among African Americans than whites.[189] People of German, Irish and Puerto Rican origin are also more prone to sarcoidosis than the general population.[190]

Studies have shown that certain populations have a greater likelihood of manifestations outside the lung.[191] African Americans are more likely to have chronic uveitis (inflammation of the eye) and lupus pernio (painful skin lesions associated with discoloration of the nose, cheeks, lips and ears). Puerto Ricans, Mexicans and Europeans tend to suffer from Erythema nodosum (tender, red bumps, usually found on the legs).

What causes sarcoidosis?

The cause of sarcoidosis is not yet known, but researchers have several theories. Most researchers agree that sarcoidosis involves an altered immune system, but do not know the source of the problem or what triggers such a response. Some researchers believe that sarcoidosis may result from a respiratory infection caused by a virus, bacteria or an unidentified environmental toxin.

Rural activities

One recent study suggests that behaviors associated with rural living play some role in the development of sarcoidosis. The study suggests that exposures involving the handling or burning of wood such as in using wood stoves or fireplaces for home heating may in part explain this rural association.[192]

Occupational exposure

Several studies have explored occupational and environmental risk factors for sarcoidosis. Researchers have noted higher rates of sarcoidosis among healthcare workers, and in the 1940's, cases of 'sarcoidosis' in women in the fluorescent light industry in Salem, MA led to the recognition of beryllium exposure as the cause of 'Salem sarcoid.' It is now considered a separate disease called Berylliosis. Beryllium is a hard, grayish metal found in rocks, coal and soil that is commercially mined. Researchers have also identified an increased risk for sarcoidosis among people who have worked on a U.S. Navy aircraft carrier at some point in their lives. It is not known, however, whether the high detection rates were from the more frequent use of routine screening for tumors in this setting. More research is needed to better understand how environmental and occupational exposures may increase the risk of sarcoidosis.[193]

Environmental exposure

Increases in the prevalence of sarcoidosis in the rural southeastern and middle Atlantic United States led to studies that looked at possible causes in soil, plants and pollen, proximity to forests, water supply, use of firewood, proximity to lumbering and wood milling, and exposure to pets and farm animals, among others. Neither animal experiments nor human studies have proven these hypotheses.

Heredity

Sarcoidosis occasionally runs in families, which suggests that genetics may play a role. One study found that the risk for sarcoidosis was increased 4.6-fold in parents and siblings of patients with the disease.[194]

Can people die from sarcoidosis?

Although not common, death from sarcoidosis can occur if the disease causes serious damage to a vital organ. Fatality occurs in fewer than one in 20.[195] Mortality is due most commonly to lung failure.

In the United States, the mortality rate among African Americans is more than 16 times that of whites.[196]

How is sarcoidosis diagnosed and treated?

Diagnosis

Diagnostic tests include chest x-rays, pulmonary function tests and special blood tests. In most cases a biopsy is necessary to fully establish the diagnosis. It has also been suggested that even the mildest cases of sarcoidosis should be evaluated at regular intervals, such as annual examinations.[197]

Sarcoidosis is usually not disabling and most people with the disease can live normal lives. In the majority of cases (60 to 70 percent), the condition appears only briefly and disappears on its own without treatment.

In cases where the lumps do not heal and disappear, the tissues tend to remain inflamed and become scarred. About 20 to 30 percent of people with sarcoidosis are left with some permanent lung damage and in 10 to 15 percent of patients the disease is progressive.

Treatment

Oral corticosteroids and other drugs that control inflammation represent the mainstay of sarcoidosis treatment. Many patients with sarcoidosis are unable to tolerate corticosteroids and alternative therapeutic agents due to side effects or have disease unresponsive to these agents.

As a second line of therapy, immunosuppressive agents may be of some benefit. Lung transplantation can be considered as the treatment of last resort for intractable sarcoidosis unresponsive to immunotherapy.[198]

A recent study reported that patients with refractory sarcoidosis, including lupus pernio, uveitis, hepatic sarcoidosis and neurosarcoidosis, may be able to find some relief by using Infliximab, which appears to be an effective and safe treatment. Nine out of 10 patients receiving infliximab were reviewed and reported symptomatic improvement with therapy, and all 10 demonstrated evidence of improvement. It was also recommended that patients receiving the drug should be screened for latent tuberculosis and lymphoproliferative disorders.[199]

Sudden Infant Death Syndrome

What is Sudden Infant Death Syndrome?

Sudden Infant Death Syndrome (SIDS), often called crib death, is a mysterious disease that mainly occurs between the ages of two and four months. It is defined as the sudden death of an infant less than one year of age that remains unexplained after a thorough case investigation, including an autopsy, a death scene investigation, review of the infant's health status before dying and a family medical history.

What causes SIDS?

There are many theories as to what actually causes SIDS. Some health experts believe that a defect in an infant's breathing control mechanisms that is stressed during common respiratory infections causes an atypical breathing reaction, resulting in death.[200]

Another theory is that SIDS babies are born with brain abnormalities that make them unable to awaken from sleep when exposed to high carbon dioxide or low oxygen levels, which leads to abnormal breathing or heart function. In a recent study, researchers found that infants who died from SIDS tended to arouse less by the end of the night than the control group. The babies who died from SIDS also had incomplete arousals more frequently and for a longer period of time in the first part of the night (between 9:00 PM and 12:00 AM) and fewer full arousals during the latter part of the night (between 3:00 AM and 6:00 AM).[201]

There are many potential risk factors for SIDS, including young maternal age, late or no prenatal care, premature birth and/or low birth weight, bed sharing, overheating and being male.

The Consumer Product Safety Commission has also warned of an association of SIDS with thick, soft, or fluffy bedding materials that can easily cover the nose and mouth of a face-down infant; the agency recommends that no such materials, including plush toys or pillows of any type, be placed in the crib. A study found a significant association between use of a used infant mattress and an increased risk of SIDS, particularly if the mattress was from another home.[202]

However, the most important risk factors to be aware of are:

Risk factors

- Maternal smoking during pregnancy
- Prone sleep position (lying face down), which can cause the baby to breathe in too much carbon dioxide and not enough oxygen

Maternal smoking during pregnancy is estimated to double the risk of SIDS. A large multicenter study recently investigated the link between SIDS and maternal smoking in Sweden and in five U.S. race/ethnic groups. The researchers found that SIDS incidence was highest in teenage mothers, lowest for mothers in their thirties and forties, and higher among infants with low birth weight (less than 1,500 grams or 3.3 lbs). For all population groups, SIDS risk was found to be

significantly higher among smoking than nonsmoking mothers, and rose with the number of cigarettes smoked per day. The link between SIDS and maternal smoking remained strong even after controlling for maternal age, birth order and birth weight, and was found in both Sweden and the United States despite differences in race/ethnicity, nationality and healthcare system. The excess SIDS risk may be prevented if expectant mothers, especially teenage girls, stop smoking.

In 1992 the American Academy of Pediatrics recommended that infants be placed to sleep on their backs to reduce the risk of SIDS. In 1994, the CDC initiated a national 'Back-to-Sleep' education campaign to encourage healthcare providers and the public to make sure all infants sleep on their backs or sides. This campaign has been so successful that the frequency of prone (face down) sleeping has decreased from 70 to 20 percent and the SIDS mortality rate has decreased by more than 50 percent in the United States. As of 2000, approximately 20 percent of United States infants continue to sleep face down.

How many babies die from SIDS?

Sudden infant death syndrome is the third-ranking cause of death for infants between one month and one year of age. Of the 28,034 infant deaths that occurred in 2002, about one in 11 (8.0 percent) succumbed to SIDS. In 2002, 2,295 infants died of SIDS – a death rate of 57.1 per 100,000.[203]

SIDS and race

While overall SIDS rates have declined in all populations throughout the United States, disparities in SIDS rates and prevalence of risk factors remain in certain groups. African American and American Indian infants are 2.5 times more likely to die from SIDS than white infants.[204]

More information at *Lung Disease Data in Culturally Diverse Communities 2005* on **lungusa.org**.

Tobacco Use

What is the connection between tobacco use and lung disease?

The evidence that smoking kills is overwhelming. Over 438,000 Americans die from diseases directly related to cigarette smoking each year.[205] Smoking is responsible for one in five U.S. deaths. About half of all regular cigarette smokers will eventually be killed by the habit. The earlier someone quits smoking, the more years he can restore onto his life expectancy.

Primary effects from smoking

Cigarette smoke contains over 4,800 chemicals, 69 of which are known to cause cancer. Smoking is directly responsible for 90 percent of lung cancer deaths and approximately 80 to 90 percent of COPD (emphysema and chronic bronchitis) deaths.[206] Smoking is also a major factor in coronary heart disease, stroke and pneumonia; causes malignancies in other parts of the body, including the esophagus; has been associated with other cancers of the gastrointestinal tract, urinary tract, and cervix; and has been linked to a variety of other conditions and disorders, including slowed wound healing, impotence, infertility, peptic ulcer disease, ectopic pregnancy, miscarriages and bone-density deficits in women.

Other effects from smoking

About 8.6 million people in the U.S. have at least one serious illness caused by smoking. That means that for every person who dies of a smoking-related disease, there are 20 more people who suffer from at least one serious illness associated with smoking.[207]

Smoking can also increase the effects of other hazards, particularly those of occupational lung diseases (see that section for a discussion of those diseases). Smoking both increases the risk of developing such diseases (depending on the exposure level) and can worsen those conditions. Exposure to cigarette smoke, for example, greatly raises the risk of lung disease for workers exposed to coal, silica, grain, or cotton dusts. Smoking enhances the effects of allergens that may be encountered in the workplace and plays a major role in occupation-associated lung cancer. For example, nonsmoking asbestos workers are five times more likely to develop lung cancer than nonsmokers not exposed to asbestos – but if they also smoke, the risk jumps to 50.

A recent study found smoking even one to four cigarettes a day nearly triples a woman's risk of death from heart disease and quintruples her risk of dying from lung cancer than if she had never smoked.[208]

Who are the smokers?

An estimated 44.5 million American adults 18 or older (20.9 percent) smoked in 2004 – 23.4 percent of men and 18.5 percent of women. The annual prevalence of smoking declined from 25.0 percent in 1993, a modest decrease among adults. Adults over 25 who had earned a General Education Development (GED) or high school diploma only had the highest prevalence of smoking (27.8 percent); people with masters, professional and doctoral degrees had the lowest prevalence (10.2 percent) in 2003. Smoking rates are highest among people aged 25 to 44 years (23.8 percent) and lowest for those older than 65 years of age (8.8 percent).[209]

Older adults

Older smokers are at greater risks from smoking because they have smoked longer (an average of 40 years), tend to be heavier smokers, and are more likely to suffer from smoking-related illnesses. They are also significantly less likely than younger smokers to believe that smoking harms their health.[210]

In 2003, close to 13 million Americans over the age of 50 smoked, accounting for over 28 percent of all adult smokers. As of 2004 close to nine percent of Americans over 65 years of age smoked.[211]

Men 65 or older who smoke are twice as likely to die from a stroke, and women smokers are about one and a half times as likely to die from a stroke than their nonsmoking counterparts. The risk of dying from a heart attack is 60 percent higher for smokers than nonsmokers 65 or older.[212] Older smokers are more than twice as likely as nonsmokers to develop dementia of any kind and Alzheimer's disease.[213] Older smokers also have two to three times the risk of developing cataracts, the leading cause of blindness and visual loss, as compared with nonsmokers.[214]

Smoking has frequently been associated with early menopause. One study found the risk of being postmenopausal is approximately double for current smokers compared to nonsmokers among women aged 44 to 55 years.[215]

Quitting smoking has proven health benefits, even at a late age. When an older person quits smoking, circulation improves immediately, and the lungs begin to repair damage. After one year, the added risk of heart disease is cut almost in half, and risk of stroke, lung disease, and cancer diminishes. Among smokers who quit at age 65, men gained 1.4 to 2.0 years of life and women gained 2.7 to 3.4 years.[216]

A recent study found middle-aged smokers and former smokers with mild or moderate chronic obstructive pulmonary disease both breathed easier after quitting. After one year the women who quit smoking had twice the improvement in lung function of that of the men who quit.[217]

Children

Ninety percent of adults who smoke started by the age of 21, and half of them became regular smokers by their 18th birthday. Every day nearly 5,000 children under 18 become established smokers; one third of these will die from a disease attributed to smoking.[218]

Current cigarette smoking among high school students is beginning to decline after increasing throughout the first half of the 1990's. In 2004, 22.3 percent of high school students smoked cigarettes, down from 36.4 percent in 1997.[219]

In 2004, the most prevalent forms of tobacco used by middle school students were cigarettes (8.1 percent of middle school students said they smoked cigarettes) and cigars (5.2 percent), followed by smokeless tobacco (2.9 percent), tobacco in pipes (2.6 percent), bidis (2.3 percent), and kreteks (1.5 percent). Among high school students, the most prevalent forms of tobacco used were cigarettes (22.3 percent) and cigars (12.8 percent), followed by smokeless tobacco (6 percent), pipes (3.1 percent), bidis (2.6 percent) and kreteks (2.3 percent).[220]

Individuals who began smoking at an early age are at increased risk for smoking-related diseases. A study found that smoking during childhood or adolescence may lead to lasting genetic damage of the lungs, which increases the risk of lung cancer, even after the smoker quits. The study looked at alterations of DNA that are known to be caused by tobacco and are linked to cancer. Levels of alterations, called DNA adducts, were lowest in patients who had never smoked. In ex-smokers they were somewhat higher, and in current smokers, they were higher still. In ex-smokers, the highest levels were found in those who started smoking as children or teens, regardless of their age when they quit.[221]

Another study supported these results by suggesting that adolescence is the critical period in which these alterations occur.[222]

Films influence teens in their decision to start smoking, according to a study. The study found a strong, direct and independent association between seeing tobacco use in films and trying cigarettes.[223] Another study provides strong evidence that viewing smoking in movies promotes smoking initiation among teenagers. Researchers found that teens who were exposed to the greatest amount of smoking in movies were 2.7 times more likely to start smoking themselves compared to those teens who watched the least amount of smoking in movies. Furthermore, in teens with nonsmoking parents, 52 percent who started smoking did so because of exposure to smoking in movies.[224]

Television also has an effect on smoking, according to a study.[225] The study found that youth ages 10 to 15 years who watched five or more hours of TV per day were six times more likely to initiate smoking than those who watched less than two hours. The researchers note that despite bans on television tobacco advertising, smoking on television remains widespread.

A recent study found that the Master Settlement Agreement with the tobacco industry, which prohibits tobacco advertising that targets people younger than 18 years of age, seems to have had little effect on shielding young people from exposure to cigarette ads. The agreement was signed in 1998 by the attorney generals of 46 states and the four largest tobacco companies. According to the study, expenditures for youth brands in youth-oriented magazines were $56.4 million in 1995, $58.5 million in 1998, $67.4 million in 1999, and $59.6 million in 2000. In 2000, magazine advertisements for youth brands of cigarettes targeted more than 80 percent of young people in the United States, an average of 17 times each, the study concluded.[226]

Women

A report by the Surgeon General published in 2001, 'Women and Smoking,' declared that smoking-related disease is a full-blown epidemic among women.

In the past 25 years the gap between male and female smoking rates has narrowed. In 1965, 51.9 percent of men and 33.9 percent of women smoked. As of 2004, 23.4 percent of males currently smoke compared to 18.5 percent of females.

With a much smaller gap between men's and women's smoking rates, women now carry a much larger burden of smoking-related diseases. In 2002, 42.8 percent of lung cancer deaths occurred in women compared to 26 percent of deaths in 1979. Current female smokers aged 35 and older are 12 and 10.5 times more likely than nonsmoking females to die prematurely from lung cancer and COPD.[227]

Women who smoke also have increased risk of various adverse reproductive outcomes.[228] Smoking by expectant mothers accounts for an estimated 20 to 30 percent of lowbirth weight babies, up to 14 percent of preterm deliveries, and 10 percent of all infant deaths.[229]

Healthy full-term babies of smokers have been found to be born with narrowed airways and curtailed lung function.[230] One in 10 preterm infants suffers from respiratory distress syndrome.

One study found that babies whose mothers smoked as few as six cigarettes a day during pregnancy appeared to suffer from nicotine withdrawal after birth. The study also found that the newborn's scores on a variety of behavioral tests were similar to those children whose mothers used cocaine or heroin during pregnancy.[231]

However, according to one study, breastfeeding might offset some of the harm posed by smoking during pregnancy. Researchers found that children whose mothers had smoked during pregnancy but breastfed for more than three weeks scored similarly on tests of reading, math and spelling to breastfed children of mothers who didn't smoke.[232]

Fortunately, smoking during pregnancy has been declining. In 2003, 10.7 percent of women smoked during pregnancy, a decline of 40 percent since 1990. American Indian women have the highest rate of smoking during pregnancy (18.1 percent). In 2003, 14.3 percent of non-Hispanic white mothers were smokers compared to 8.3 percent of non-Hispanic black mothers.

The smoking rate for Hispanic women during pregnancy is generally low (2.7 percent). However, rates differ considerably within subgroups. Since 1996, teenagers have had the highest rates of maternal smoking. In 2003, 15 percent of teens aged 15 to19 smoked during pregnancy.[233]

Neonatal healthcare costs attributable to maternal smoking in the U.S. have been estimated at $366 million per year, or $740 per maternal smoker.[234]

Women have been extensively targeted in tobacco promotion and advertising, dominated by themes of a link between social desirability, independence, weight control and smoking, conveyed through advertisements featuring slim, attractive, and athletic models.[235]

Racial disparity

Various minority populations are at an increased risk for lung cancer, premature childbirth (which is associated with both newborn respiratory distress syndrome and sudden infant death syndrome), acute infections, asthma, and lung disease related to occupational and environmental hazards. Smoking can be a cause of some of these diseases and can exacerbate all of them. For the many minority groups with high rates of heavy smokers, these risks are significantly greater.

More information at *Lung Disease Data in Culturally Diverse Communities 2005* on **lungusa.org**.

As of 2004, the prevalence of smoking is highest among American Indians/Alaskan Natives (33.4 percent), intermediate among non-Hispanic whites (22.2 percent) and non-Hispanic blacks (20.2 percent), and lowest among Hispanics (15 percent) and Asians (11.2 percent). The smoking rate among Asians is substantially lower than that in other races due to the low rate of smoking among females. Black men have consistently had higher smoking rates than white men. In 2004, however, the smoking rate of black males has dropped below that of white males. The trend is reversed in females, with white women having slightly higher rates than black women.[236]

What is secondhand smoke and is it as dangerous as active smoking?

Secondhand or 'passive' smoke (also known as environmental tobacco smoke or ETS) – smoke involuntarily inhaled by nonsmokers from other people's cigarettes – can also exacerbate illness and cause death. The EPA has classified secondhand smoke as a known human (Group A) carcinogen (cause of cancer). The EPA found that secondhand smoke is responsible for approximately 3,000 lung cancer deaths annually in U.S. nonsmokers.[237] Secondhand smoke is also estimated to cause 35,000 heart disease deaths each year.[238]

Heart disease

A study found that nonsmokers exposed to environmental smoke were 25 percent more likely to have coronary heart disease than nonsmokers, not exposed to smoke.[239] Those living with a smoking spouse or working in a location where smoking occurs have an increased risk of heart attacks. The average daily number of cigarettes smoked by a spouse was correlated with the risk of a heart attack, as was the number of years of environmental smoke exposure.[240]

Childrens' health

Parents who smoke have also been associated with a wide range of adverse health effects in their children, including exacerbation of asthma, increased frequency of colds and ear infections, and sudden infant death syndrome.

Approximately 21 million (or 35 percent of) American children live in homes where residents or visitors smoke in the home on a regular basis.[241] Inside the home, the tobacco-toxicity levels can be up to eight times higher than in homes where parents smoke outside. But even in the homes where parents smoke outside there is not much of a difference. The levels of tobacco contaminates are still seven times higher than in a household of nonsmoking parents.

In children 18 months and younger, exposure to secondhand smoke causes 150,000 to 300,000 lower respiratory tract infections (pneumonia and bronchitis) that result in 7,500 to 15,000 hospitalizations each year and causes 1,900 to 2,700 sudden infant death syndrome (SIDS) deaths annually.[242] Secondhand smoke exposure causes buildup of fluid in the middle ear, resulting in 700,000 to 1.6 million physician office visits per year. Middle ear infections are the most common cause of childhood operations and childhood hearing loss.[243]

Exposure to secondhand smoke also increases the severity and frequency of asthma episodes; 200,000 to 1,000,000 children with asthma experience aggravated symptoms due to secondhand smoke in the United States annually.[244] Numerous reports suggest that environmental tobacco smoke causes asthma. Researchers in Colorado found that children with asthma have worse lung function just one day after being exposed to secondhand smoke. However, when parents don't smoke at home or in the family car, the effect of smoke on their child's lungs is less severe. In addition they found that children living with smokers were exposed to more airborne particles than children in nonsmoking households. But when parents smoked only outside the house, their children were exposed to 30 percent fewer particles than children whose parents smoked indoors.[245]

Another study found that secondhand smoke exposure is associated with increased respiratory-related school absenteeism among children ages 8 to 12, especially those with asthma.[246]

Can other tobacco products harm the lungs?

Cigars

Increased publicity of cigar use by celebrities has helped to create a glamorous aura around a deadly product. In 2004, Americans smoked an estimated 4.9 billion cigars. Nationwide, it is estimated that 19.6 percent of the adult population are current cigar smokers (meaning they have smoked on one or more days of the 30 days preceding the survey). Latest data available indicates that cigar manufacturers' total expenditures on advertising and promotion increased 32 percent between 1996 and 1997, from $30.9 million to $41 million.[247]

Regular cigar smoking can increase the risk of coronary heart disease, chronic obstructive pulmonary disease and cancers of the upper digestive tract and lung, according to a study of almost 18,000 men.[248]

Cigars are a major source of secondhand smoke, containing more than 4,000 chemicals. At least 63 of these compounds are known to be carcinogenic, including 11 known human carcinogens.[249] Studies have shown that men who smoke at least five cigars a day are two to three times more likely to die of lung cancer than nonsmokers. A recent study found that cigar smokers were nine times more likely to develop lung cancer than nonsmokers.[250]

Daily cigar smoking causes cancer of the lip, tongue, mouth, throat, larynx, esophagus, and lung, as well as chronic obstructive pulmonary disease and coronary heart disease.[251]

Bidis

These skinny cigarettes, in candy-like flavors, first became popular with teens in the 1990's. New research shows that smoke from bidis contains roughly three times as much nicotine and carbon monoxide and five times as much tar as smoke from regular filtered cigarettes.[252]

Marijuana

Marijuana is the most commonly used illicit drug in the United States. More than 83 million Americans (37 percent) age 12 and older have used marijuana at least once.[253] Marijuana smoke, like cigarette smoke, can harm the lungs. A person who smokes marijuana regularly may have many of the same breathing problems as tobacco smokers, such as regular cough and phlegm,

more frequent severe chest infections, an increased risk of lung infections, and an increased risk of obstructed airways. Marijuana also contains irritants and cancer-causing agents, and therefore has the potential to promote cancer of the lungs and other parts of the respiratory tract.

What are the costs of smoking?

The economic costs of smoking are astronomical. Smoking-related diseases are conservatively estimated to cost the United States at least $167 billion each year in direct health care costs including $92 billion in mortality-related productivity losses and $75.5 billion in excess medical expenditures.[254]

How can you lessen the risk of smoking attributable diseases – cessation?

Quitting smoking at any age lessens the health risks immediately. Within a day's time, risk of a heart attack decreases and after 15 years the risk of dying returns to nearly the level of never-smokers.[255]

There are 46 million ex-smokers in the United States. This is the second straight year that the adults who have quit smoking outnumber the people who continue to smoke. Between 1965 and 2003, the proportion of former smokers doubled, a change of 107 percent. By 2004, 52.4 percent of people ages 18 years and older who had ever smoked had quit.[256]

A recent study found that life expectancy among smokers who quit at age 35 exceeded that of continuing smokers by 6.9 to 8.5 years for men and 6.1 to 7.7 years for women. Smokers who quit at younger ages realized greater life extensions, but even those who quit much later in life gained some benefits. Among smokers who quit at age 65, men gained 1.4 to 2.0 years of life, and women gained 2.7 to 3.7 years.[257] Just cutting down on cigarettes, but not quitting entirely, does not reduce mortality risks from tobacco-related diseases, according to a study published in 2002.[258]

A recent study found that women smokers who quit recover their ability to breathe more quickly than men who quit. The study followed 5,300 people over five years, and found that by the end of the study, the lung capacity of women who quit had improved an average of nearly two percent, while men's capacity had improved by 0.4 percent.[259]

However, it takes several quit attempts for the average smoker to be able to quit successfully. In an average year, 70 percent of current smokers will want to quit, 40 percent will attempt to quit but less than five percent will actually succeed.

Nicotine addiction

Probably the most important factor in the high rate of failure and relapse among those who attempt to quit smoking is the fact that nicotine – an alkaloid found in the tobacco leaf and nowhere else – is an addictive drug. Nicotine is the primary component in tobacco that acts on the brain. Nicotine is absorbed through the skin and mucosal lining of the mouth and nose or by inhalation in the lungs.

A poison at high doses (it has been used as an insecticide), nicotine in smaller amounts may appear to reduce stress and provide a sensation of alertness or relaxation, varying with the circumstances – without interfering with normal activities.

As with other addictive drugs, smokers develop a tolerance to nicotine. Up to a point, smokers typically increase the dose; eventually, daily consumption is maintained at each individual's level of satisfaction. A recent study found that nicotine may be a possible promoter of cancer progression in human lungs.[260]

Not all smokers are addicted – but for most smokers, quitting can involve both mental and physical withdrawal symptoms. The reactions may range from anxiety and irritability to headaches and gastrointestinal upset.

Nicotine withdrawal

Nicotine replacement therapy can help relieve withdrawal symptoms people may experience when they quit smoking. Nicotine patches, nicotine gum and nicotine lozenges are available over-the-counter, and a nicotine nasal spray and inhaler, as well as the non-nicotine pill Zyban, are currently available by prescription.[261]

Although most former smokers preferred quitting cold turkey, less than 10 percent will achieve long term success. Of all methods, bupropion and the nasal spray have the greatest success rates of 30.5 percent.[262]

Researchers have found that success is even more likely when nicotine replacement therapy and behavioral techniques (which may include an array of aids from counseling on self-management skills to teaching would-be quitters how to cope with continuing smokers) are used simultaneously. Positive input from a variety of sources (physicians, family, friends, and clinical programs) which most likely lead to success.

What is the American Lung Association's role in tobacco control?

Education

The American Lung Association is committed in the fight to eliminate tobacco use in future generations. The American Lung Association sponsors programs (*Freedom From Smoking*®) and also publishes helpful literature to assist people who have decided to quit.

For people who prefer the convenience and anonymity of an online smoking cessation program, the American Lung Association offers *Freedom From Smoking Online*, available at **www.lungusa.org/ffs**.

Physicians and dentists can offer guidance as well as advice on pharmacological therapy. A self-help smoking cessation guide – *7 Steps to a Smoke-Free Life* – was published in 1988 by John Wiley & Sons. This book was based on the American Lung Association's award-winning *Freedom From Smoking*® program.

To help teenagers quit smoking, the American Lung Association, in collaboration with researchers at West Virginia University, have developed *Not on Tobacco* (N-O-T), a state-of-the art teen smoking cessation program. N-O-T helps teenagers quit smoking or reduce cigarette use for those who can't quit completely their first time.

The American Lung Association also sponsors the nationwide *Teens Against Tobacco Use* (TATU), a peer-teaching tobacco control program aimed at deterring youngsters from taking up smoking. TATU uses a 'kids helping kids' approach to teach elementary school children about the dangers of tobacco use.

Advocacy

The American Lung Association leads efforts to pass state laws and local ordinances to provide smokefree workplaces. In addition it strongly advocates for state investment in comprehensive tobacco control education and cessation programs and increasing cigarette taxes to discourage consumption.

The American Lung Association strongly believes that Congress should enact legislation to provide the Food and Drug Administration (FDA) with full authority to regulate tobacco products in order to reduce the death and disease they cause. No federal agency currently has the authority to regulate tobacco.

In the absence of meaningful FDA oversight, the tobacco industry has been marketing new and existing cigarettes and smokeless tobacco products as posing 'reduced risk' to consumers. The American Lung Association is concerned that this marketing tool will hook new, young tobacco users and reduce the number of current users who would otherwise quit entirely. The American Lung Association is urging Congress to pass legislation to grant the FDA full and effective authority over 'reduced risk' and other tobacco products and reject the loophole-filled legislation advocated by tobacco companies. The Lung Association intervened in 2005, in the Department of Justice's Racketeer Influenced and Corrupt Organizations case against the tobacco companies, suggesting strict remedies to prevent and restrain tobacco industry conduct, including preventing illegal marketing and claims, as well as providing funds for cessation.

On May 21, 2003, the World Health Assembly approved the first-ever global public health treaty, the Framework Convention on Tobacco Control (FCTC). The treaty is a significant first step in the global battle against tobacco use and addiction. The FCTC was negotiated by representatives from 171 nations, known as the Intergovernmental Negotiating Body (INB), under the auspices of the World Health Organization. Subsequent meetings were held to continue negotiating terms of the treaty.

Key provisions of the treaty ban tobacco advertising and promotion unless constitutional barriers exist, limit public exposure to secondhand smoke and require health warning labels on cigarette packages to cover at least 30 percent of the display area. The treaty also prohibits false, misleading and deceptive language – which may include 'low tar,' 'light,' or 'mild' – that implies that a tobacco product is less harmful.

The American Lung Association has been actively involved since the beginning of the treaty process and has attended all of the INB meetings. American Lung Association representatives also have participated in public hearings to provide guidance to members of the official U.S. delegation.

Throughout the process, the American Lung Association has called for a strong, enforceable global tobacco-control treaty, calling on the U.S. government to reject weakening provisions backed by the tobacco industry.

Eighty-seven countries have ratified the treaty as of September 2005, well over the 40 countries required for it to go into effect. The first meeting of the Conference of the Parties, the governing body of the FCTC, takes place in early 2006, and a country must have ratified the treaty by November 8, 2005 to actively participate.

Each year, the American Lung Association summarizes and assigns grades to federal and state tobacco control laws and regulations in our **State of Tobacco Control** report at **lungusa.org**.

In addition we publish the **State Legislated Actions on Tobacco Issues** (SLATI) report (more information at http://slati.lungusa.org).

Tuberculosis

What is tuberculosis?

Tuberculosis has been with us since ancient times. In the first half of the 20th century, it was generally spoken of as 'consumption' - a fatal illness that led to long stays in special hospitals called sanatoriums.

Tuberculosis (TB) is an airborne infection caused by the bacterium *Mycobacterium tuberculosis* that primarily affects the lungs. Although TB primarily affects the lungs, other organs and tissues may be affected as well.

Not everyone infected with TB bacteria becomes sick. People who are not sick have what is called latent TB infection. People who have latent TB infection do not feel sick, do not have any symptoms, and cannot spread TB to others. However, some people with latent TB infection go on to develop active TB disease.

People with active TB disease can be treated and cured if they seek medical attention. Even better, people with latent TB infection can take medicine so that they will not develop active TB disease.

Symptoms

Several symptoms are associated with TB disease, including prolonged coughing (sometimes including coughing up of blood), repeated night sweats, unexplained weight loss, loss of appetite, fever, chills, and general lethargy. Because these signs may be indicative of other diseases as well, a person must consult a physician to determine the cause of these symptoms.

Who gets tuberculosis?

Incidence and Prevalence

It is estimated that nearly one billion people will be newly infected with TB, over 150 million will become sick and 36 million will die worldwide between now and 2020 – if control is not strengthened further. Each year there are more than 8.8 million cases of TB.[263]

There are an estimated 10 million to 15 million persons in the United States with latent TB infection.[263] About 10 percent of these infected individuals will develop TB disease at some point in their lives. A much higher proportion will develop TB disease if also infected with HIV, the virus that causes AIDS. Because HIV weakens the immune system, someone with TB infection and HIV infection has a seven to 10 percent chance per year of developing TB disease compared to a 10 percent lifetime chance in people without HIV. Approximately 10 percent of the national total of TB cases is reported in people living with HIV.[264]

During 2003, a total of 14,874 active TB cases were reported to the CDC – a 1.3 percent decline from 2002, a 44.2 percent decline from the 1992 peak of the TB resurgence, and the lowest recorded TB rate (5.1 per 100,000 persons) in the U.S. since reporting began 50 years ago.[265]

The year 2002 marked the 11th consecutive year of declining TB cases reported in the United States. In part, this decline reflects the impact of federal resources to assist state and local TB-control efforts, wider screening and preventive therapy for those at high risk, and growing support for TB prevention programs among HIV-infected persons. The 1.3 percent decline in 2003 was the smallest decline since 1992.[267]

Racial disparity

Despite the decline in TB rates nationwide, those among communities of color and foreign-born persons have increased.

These groups account for over 80 percent of all TB cases. The TB incidence rate was 21 times greater in Asians (29.7 per 100,000), 15 times greater in Native Hawaiians and other Pacific Islanders (21.5 per 100,000), over eight times greater in non-Hispanic Blacks (11.5 per 100,000), nearly eight times greater in Hispanics (10.5 per 100,000), and nearly six times greater in American Indians/Alaskan Natives (8.0 per 100,000) than in non-Hispanic Whites (1.4 per 100,000). Several factors likely contribute to the uneven burden on minority groups. Unequal distribution of TB risk factors such as HIV infection and low socioeconomic status, particularly crowding, contribute to increased risk for TB.[268]

More information at *Lung Disease Data in Culturally Diverse Communities 2005* on **lungusa.org**.

Foreign-born

Tuberculosis cases reported among persons born outside the United States and its territories (i.e., foreign-born persons) account for 53 percent of total reported cases compared to 27.3 percent of reported cases in 1992. The TB case rate among foreign-born persons is almost nine times greater than that for U.S.-born persons. Most cases of active TB disease among foreign-born persons residing in the United States result from infection with the tuberculosis germ in the person's country of birth. Of the foreign-born cases reported in 2003, five countries (Mexico, the Philippines, Vietnam, India and China) accounted for approximately 58 percent.[269]

How is tuberculosis spread?

TB is spread through the air from one person to another. The bacteria are released into the air when a person with active TB disease of the lungs or throat coughs or sneezes. People nearby may breathe in these bacteria and become infected.

When a person breathes in TB bacteria, the bacteria can settle in the lungs and begin to multiply. From there, they can move through the blood to other parts of the body, such as the kidneys, spine or brain.

TB in the lungs or throat can be contagious. This means that the bacteria can spread to other people. TB in other parts of the body, such as the kidney or spine, is usually not infectious.

People with active TB disease are most likely to spread it to people they spend time with every day. Repeated exposure to someone with TB disease is generally necessary for infection to take place. TB patients with active disease become noninfectious soon after beginning treatment; their own therapy must continue for a period of time, but they cannot transmit the disease to others.

Can people die from tuberculosis?

Tuberculosis is the world's foremost cause of death from a single infectious agent, causing more than 26 percent of avoidable adult deaths in the developing world. The World Health

Organization states that each year, two million people worldwide die from TB. In 2002, 784 people died of tuberculosis in the United States.[270]

What are the costs associated with tuberculosis?

TB takes a heavy toll on our economy. The direct healthcare costs for tuberculosis total $703.1 million. Direct healthcare costs include $423.8 million for inpatient care, $182.3 million for outpatient care, $72.1 million for screening, $3.4 million for contact investigations, $17.9 million for preventive therapy and $3.6 million for surveillance and outbreak investigations. Additionally, $351 million in indirect costs is attributed to TB, bringing the total for direct and indirect costs to $1.1 billion.[271]

How is tuberculosis diagnosed and treated?

Diagnosis

The simplest way to find out if you have a TB infection is to get a TB skin test, widely available at clinics or at a doctor's office. The preferred Mantoux test should be used for screening and diagnosis. A small amount of testing material is injected under the very top layers of skin on the forearm. In 48 to 72 hours the test is read by a trained person, usually a nurse or doctor. If the test is positive, then you probably have TB infection and the doctor will run more tests, such as a chest x-ray, to determine whether you have active TB disease. In some groups, such as the elderly or those with impaired immunity, the skin test may not be positive in the presence TB infection.[272]

Tuberculin screening programs should be targeted to each community's high-risk groups. It is extremely important that these screening programs undergo regular evaluation of their usefulness.

Tuberculin skin-testing is recommended for diagnostic screening among the following high-risk groups:

Risk groups

- persons with signs, symptoms, and/or laboratory abnormalities suggestive of clinically active TB
- people who interact with persons with active TB disease
- poor and medically underserved people
- homeless people
- those who come from countries with high TB incidence rates
- nursing home residents
- alcoholics and intravenous drug users
- people with HIV or AIDS, or who are otherwise immune-suppressed
- people in jail or prison
- healthcare workers and others such as prison guards who work with high-risk populations[273]

Scientists are researching numerous diagnostic tests to replace the time-consuming skin test and sputum analysis used now. The FDA has recently approved a new blood test known as QuantiFERON-TB. Studies have found the test to be comparable to the tuberculin skin test in its ability to detect latent TB infection, and showed several potential advantages over the traditional skin test including a smaller chance of being affected by BCG vaccination (see section below), and reduced variability and susceptibility associated with administering and reading the skin test.[274]

In April 2003, scientists announced the development of a new diagnostic test for TB that could help control the disease by more accurately detecting infections before people develop active TB. A study found that the new test detected latent TB infections more accurately than the standard skin-prick test.[275]

Diagnosis

Employing molecular biology techniques, a faster diagnostic testing method, polymerase chain reaction (PCR), was approved in 1995 by the Food and Drug Administration (FDA). This method of testing is not yet in routine use, since its consistent dependability is still in question. Recently, still newer diagnostic procedures known as nucleic acid amplification or direct amplification tests (DATs) have also received approval; these methods, too, are not consistently and totally reliable but are nevertheless considered useful in the battle against the disease.

A major part of the public health problem is that TB differs from most other bacterial infections. A 'strep' or 'staph' infection, for example, is generally cured by ten days to two weeks of antibiotic treatment. Active tuberculosis requires months of therapy.

Treatment

The CDC and the American Thoracic Society recommend a six-month regimen consisting of an initial two-month period of isoniazid, rifampin, and pyrazinamide, followed by four months of isoniazid and rifampin for patients with fully susceptible organisms who adhere to treatment. Ethambutol (or streptomycin in young children) should be included in the initial regimen until the results of drug susceptibility tests are available, unless the patient has little possibility of drug resistance. (Rifater, a product combining isoniazid, rifampin, and pyrazinamide in a single tablet, was approved by the FDA in 1994.)[121]

The CDC and the American Thoracic Society also issued treatment guidelines for latent tuberculosis infection. For most individuals with latent TB, the new guidelines recommend a nine-month regimen of daily isoniazid as the preferred treatment. The CDC recommends providers use rifampin and pyrazinamide with caution, especially in those currently taking other medications that have been associated with liver injury, and those with alcoholism, even if alcohol usage is discontinued during treatment.[276]

However, with careful clinical and laboratory monitoring, rifampin and pyrazinamide remain an option for patients at high risk of developing active TB disease who are unlikely to complete a nine-month regimen of isoniazid.

Resistant strains

If people with TB disease do not complete therapy for at least 6 months, they can develop and spread strains of TB that are resistant to available drugs. Multidrug-resistant (MDR)-TB is extremely difficult to treat – one case can cost up to $1 million to treat. Forty-five states and the District of Columbia have reported diagnosing and caring for persons with MDR-TB.

Pockets of drug resistance to TB medications began to appear in the mid-1970's. Drug resistance is troubling in dealing with any contagious infection, since it indicates that a strain of 'survivor bugs' is among us – bacteria that have developed the ability to withstand antibiotic attack and are relaying that ability to their progeny, which will, in turn, pass this unfortunate talent along. In other words, resistance spreads with the infection itself; it therefore tends to concentrate in geographically identifiable areas. A major cause of TB drug resistance is inadequate treatment in terms of drugs used or duration of treatment.

In 2003, drug susceptibility results were reported for 90.1 percent of all culture-positive cases for the 50 states, New York City, and the District of Columbia. Overall, 8.2 percent of TB cases were resistant to at least the TB drug isoniazid and 1.1 percent were resistant to isoniazid and rifampin. Instances of MDR-TB have decreased substantially between 1993 and 2002 thanks to a decline in New York City. However, the proportion of MDR-TB cases among foreign-born

persons has increased from 25 percent in 1993 to 73 percent in 2001.[277]

TB therapy and control guidelines

Treatment for MDR-TB is expensive and involves drug therapy over many months or years. Despite the longer course of treatment, the cure rate decreases from over 90 percent for non-resistant strains of TB to 50 percent or less for MDR-TB.

To counter the increasing problems of MDR-TB and noncompliance with treatment, the American Thoracic Society has issued guidelines for physicians and public health officials for therapy and control of the disease. They include recommendations for rapid identification of persons with active disease, relying not only on tuberculin testing (which may give false-negative results) but also on chest x-rays and sputum analysis; screening of high-risk populations, plus comprehensive contact investigation and follow-up; preferred treatment regimens, including management of noncompliance with therapy; environmental control of infection in hospitals and other institutions; prevention of recurrent infection; and protection of healthcare personnel.

The Institute of Medicine published a report in May 2000 that called on U.S. policymakers to intensify the fight against tuberculosis by finding and treating people with latent infections, and strengthening public health services. The report recommended screening programs that would target high-risk communities in the United States and intensify the TB testing process for visa applicants from countries where the disease is most widespread.[278]

The report recommended that the United States:

- improve screening for latent infections among high-risk groups
- reorganize TB control systems to reflect the shifting patterns of the disease
- increase U.S. efforts to assist other countries in fighting the global epidemic
- develop better methods for detecting and treating latent infections

BCG

BCG or Bacillus Calmette-Guérin (named after its French developers) is a vaccine used routinely against TB in some other countries. BCG is not recommended in the U.S., for a number of reasons. The first concern is its unsuitability for persons infected with HIV – who, as noted, constitute the highest-risk group. Another is the failure of repeated trials over the years to clearly demonstrate the vaccine's effectiveness. Results have been inexplicably conflicting, with some studies seemingly showing that the vaccine works, others that it is worthless. One recent retrospective analysis of those studies suggests that it may be, at best, 50 percent effective (generally vaccines approved for U.S. use are at least 70 percent effective).

TB vaccine

The American Lung Association has urged government health officials to follow the recommendations of a federal advisory panel and take action to develop new vaccines to fight tuberculosis. In August 1998 the federal Advisory Council for the Elimination of Tuberculosis (ACET) issued a national call for vaccines to combat TB. ACET recommendations include developing a post-infection vaccine for people who already have been exposed to the disease and test positive when given a TB test but have not yet developed active tuberculosis.

What is the American Lung Association's role in tuberculosis?

The American Lung Association was founded in 1904 to fight tuberculosis. The National Association for the Study and Prevention of Tuberculosis, as we were known, was the first nationwide voluntary health organization aimed at conquering a specific disease.

Research, advocacy, and support

Dr. Joseph Wales, realizing that the small sanatorium on the Brandywine River in Delaware where he worked was down to its last dollar, wrote to his cousin, Emily Bissell, asking for help in raising the $300 he and his fellow physicians needed to keep the sanatorium open. In response, Emily Bissell designed the first American Christmas Seal and borrowed $40 to have 50,000 of them printed. Before the Christmas season was over she had raised not the $300 she had aimed for but $3000.

The National Association joined the Modern Health Crusade that took tuberculosis associations into the nation's schools in a vastly ingenious and successful master plan of health education.

The National Association embarked on a research program that was to become truly significant in its scope and influence. Representative of the myriad of scientific refinements and improvements were those affecting the X-ray and tuberculin test.

The research committee of the National Association began supporting investigations into various improved X-ray machines and techniques. A consultation on improved X-ray was established and, in cooperation with commercial manufacturers, equipment and techniques were radically changed.

The tuberculin test and the X-ray became twin tools of diagnosis. The tuberculosis associations, joined with health departments and U.S. Public Health Services, bought and took these tools to where people were in order to conduct testing and education. In Cleveland, for example, workers in 318 war plants had been X-rayed by March 1944. And on V-Day, World War II, residents of New York City's Harlem celebrated by lining up to get a free chest X-ray.

The National Association began its medical research and teaching fellowships award program that targeted young physicians or students in related fields at the pre- and post-doctoral level. Some of the country's leading specialists in pulmonary medicine received their start through the National Association's fellowship program.

Dr. Edith Lincoln, a National Tuberculosis Association grantee, observed and reported that isoniazid prevented the development of serious complications in children such as miliary tuberculosis and tuberculous meningitis. Public Health Service trials underscored isoniazid's important role as a prophylactic agent for household contacts of tuberculosis patients.

As the American Lung Association, we continue today to fund research on the basic cellular and immune processes that initiate and control TB infection as well as on the molecules and genes in the TB germ that enable it to infect humans and become resistant to drugs. A greater understanding of how the body's immune system protects against TB and why this defense system sometimes fails is being sought. Studies such as these will provide a solid foundation for developing a better vaccine.

The American Lung Association supports increased U.S. government funding for programs aimed at eliminating TB in the United States as defined by the Institute of Medicine: An incidence rate of less than one TB case per million persons each year. The American Lung Association also supports the Healthy People 2010 goal of less than 1.0 new case per 100,000 persons by 2010.

Recognizing that the TB problem in this country is inextricably linked to the worldwide TB problem, the Lung Association also supports increased federal funding to support the development of the Global Plan to Eliminate TB and funding for international TB control efforts at the Centers for Disease Control and Prevention, the Fogarty International Center (National Institutes of Health) and the U.S. Agency for International Development.

Other Lung Diseases

The list of additional diseases that primarily or predominantly affect the lungs is a lengthy one. Among the more familiar:

Acute bronchitis. Inflammation of the bronchial tubes, the major airways into the lungs; it may be caused by a variety of bacteria and viruses and may be primary or secondary to an upper respiratory infection, pertussis (whooping cough), or other infection. It is estimated by the National Center for Health Statistics that there were approximately 13,250,000 cases of acute bronchitis in 1995, about one for every five episodes of the common cold.

Bronchiectasis. A condition involving abnormal dilation of the bronchial tubes and the formation of small pockets of infection. Bronchiectasis typically occurs as a complication of such primary infections as bronchitis, pneumonia, pertussis (whooping cough), or tuberculosis. With effective treatment of bronchitis and pneumonia, and vaccination against pertussis, bronchiectasis has become relatively rare in the U.S.

Bronchiolitis. A condition in which bronchioles, the smaller airways within the lungs (branching from the bronchi or main airways), become inflamed. It is usually due to viral infection – especially infection with the respiratory syncytial virus – and is most common in early infancy. It may be significantly related to parental smoking.

Coccidioidomycosis. Also called 'valley fever,' it is an infection of the lungs caused by inhaling spores of the fungus *Coccidioides immitis*. The fungus is known to be present in the soil of the southwestern United States, California, and parts of Central and South America.

Sixty percent of those infected by the fungus have no symptoms or an apparent cold. In others, there is a flu-like syndrome with fever, weakness, joint aches, cough, and chest pain. Occasionally, pneumonia may develop, and in a very small number of cases, there is disseminated disease involving other areas such as the meninges (membranes around the brain and spinal cord), bones, skin, and other tissues. These serious conditions may occur months after the initial infection.

Disseminated coccidioidomycosis appears to be most likely in those with impaired immunity (as from HIV infection or immunosuppressive therapy), in males, in pregnant women, and in non-whites. A variety of antifungal drugs are used to treat serious cases.

Hantavirus pulmonary syndrome (HPS). A disease that first appeared as a 'mystery' illness in the southwest U.S. (Arizona, Colorado, New Mexico) in the spring of 1993; the hantaviruses are harbored by rodents, especially rats and mice. About three-quarters of patients with HPS have been residents of rural areas. As of September 2004, a total of 379 cases of HPS has been reported in the United States, including 32 retrospectively identified cases that occurred before 1993. Thirty-six percent of all reported cases have resulted in deaths.[279]

HPS occurs most often during the spring and summer, and 75 percent of cases are traced to inhabitants of rural areas. Most cases have occurred among males (62 percent); 37 percent among females and the average age is 37 years. HPS can strike anyone; however, whites currently account for 78 percent of all cases. American Indians account for 19 percent, African Americans for two percent of cases and Asians one percent of cases. About 13 percent of HPS cases have been reported among Hispanics.

The infection is not thought to be transmissible from one person to another but contracted by inhaling airborne saliva or excreta of infected animals (which do not themselves become ill). It triggers an illness at first similar to a severe cold or influenza accompanied by fever and muscle aches, but rapidly progresses to severe respiratory difficulties and eventually to a condition called the acute respiratory distress syndrome (see preceding section).

The CDC has issued guidelines for rodent extermination and avoidance for residents, workers, and campers and hikers in affected areas. Surveillance continues, as does a quest for effective treatment. There is no established therapy, but there has been some experimental use of an antiviral drug, ribavirin, which has been employed against related viruses in other parts of the world.

Histoplasmosis. A relatively common infection of the respiratory tract, it is caused by inhaling the spores of a fungus, *Histoplasma capsulatum*, endemic to most of the central and eastern U.S. The spores are carried chiefly by contaminated bird and bat droppings. Many of the infections are totally symptomless. The illness occurs in two forms: the acute form is self-limited, much like a mild case of influenza, and rarely serious; the chronic form, which is much less common, may resemble tuberculosis. Uncommonly, there may be disseminated disease, tending to occur in the very young, the very elderly, and persons with HIV infection or who are otherwise immunocompromised (as due to cancer therapy); this form of the disease can be life-threatening.

Interstitial lung disease (ILD). ILD is a general term that includes a variety of chronic lung disorders. When a person has ILD, the lung is affected in three ways. First, the lung tissue is damaged in some known or unknown way. Second, the walls of the air sacs in the lung become inflamed. Finally, scarring (or fibrosis) begins in the interstitium (or tissue between the air sacs), and the lung becomes stiff.

Breathlessness during exercise can be one of the first symptoms of these diseases. A dry cough also may be present. People with different types of ILD may have the same kind of symptoms but their symptoms may vary in severity. Their chest X-rays may look alike. Further testing is usually recommended to identify the specific type of ILD a person has. Some ILDs have known causes and some (idiopathic) have unknown causes. In a recent study, researchers found evidence that idiopathic pulmonary disease is linked to a variety of exposures including occupation, cigarette smoking, and viral infections.[280]

Some interstitial lung diseases improve with medication if treated when inflammation occurs. Some people may need oxygen therapy as part of their treatment.

Pertussis (whooping cough). Twenty years ago, there were just 2,000 cases a year of pertussis in the United States; in 2002, there were 8,286 cases. This disease is preventable by vaccination, which is now standard for infants. However, the chief of the U.S. government's National Immunization Program said in early 2002 that severe shortages of vaccines for pertussis and other diseases, due to production problems, have delayed many children's immunizations.

The greatest number of pertussis cases are in children under age one. Young children can die from pertussis. In 2003, 13 children died in the United States. Most deaths occur among children too young to be vaccinated.

The CDC's Advisory Committee on Immunization Practices, the Committee on Infectious Diseases of the American Academy of Pediatrics, and the American Academy of Family Physicians all recommend that children routinely receive five doses of a combination vaccine, DTaP (diphtheria and tetanus toxoids plus a cellular pertussis vaccine) at the ages of two, four, and six months, 15 to 18 months, and four to six years. Some researchers have suggested that significant numbers of pertussis cases may also occur among older children and adults, causing relatively mild illness but providing a reservoir of infection that acts as a threat to infants, and the possibility of booster shots of vaccine for teens or adults has been suggested.

Severe Acute Respiratory Syndrome (SARS). This syndrome made its appearance worldwide in 2003, has been identified as a viral illness that is characterized by fever higher than 100.4° Fahrenheit and symptoms such as shortness of breath, headache, coughing, and malaise.

Approximately 10 to 20 percent of those affected by the respiratory illness progress to severe respiratory difficulty. Death has occurred in nine percent of all probable and suspected cases. The virus comes from a group of viruses known as coronaviruses. As with other respiratory illnesses, the American Lung Association highly recommends that a doctor is consulted for proper diagnosis and treatment if these symptoms are evident. Most cases continue to occur in persons in close face-to-face contact with SARS patients.

Researchers in many countries are currently working to create fast and reliable tests to detect SARS. Several groups have already identified the genome of the virus and their findings show that the virus seems to be different in different parts of the world. This may explain the apparent variations in lethality – for example, SARS appears to be less lethal in the U.S.

Although not yet an epidemic in the U.S., continued vigilance and caution are needed. Research teams have recently discovered several wild animals in Guangdong, China, that carry viruses genetically similar to SARS. The role of animal transmission is important in learning more about the disease and may help in finding a vaccine for it.

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Beginning our second century, the American Lung Association works to prevent lung disease and promote lung health. Asthma is the leading serious chronic childhood illness. Lung diseases and breathing problems are the primary causes of infant deaths in the United States today. Smoking remains the nation's number one preventable cause of chronic illness. Lung disease death rates continue to increase while other major causes of death have declined.

The American Lung Association has long funded vital research to discover the causes and seek improved treatments for those suffering with lung disease. We are the foremost defender of the Clean Air Act and laws that protect citizens from secondhand smoke. The Lung Association teaches children the dangers of tobacco use and helps teenage and adult smokers overcome addiction. We help children and adults living with lung disease to improve their quality of life. With your generous support, the American Lung Association is "Improving life, one breath at a time."

For more information about the American Lung Association or to support the work we do, call 1-800-LUNG-USA (1-800-586-4872) or log on to **www.lungusa.org**.

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