

Overview

Cancer is not a single disease. It is a group of more than 200 different diseases. Cancer can be generally described as an uncontrolled growth and spread of abnormal cells in the body. Cells are basic units of life. All organisms are composed of one or more cells. Normally, cells divide to produce more cells only when the body needs them.

Sometimes cells keep dividing and thus creating more cells even when they are not needed. When this happens, a mass of tissue forms. This mass of extra tissue is called a tumor. Tumors are found in all kinds of tissue, and can be benign or malignant.

Tumors

Benign

Benign tumors are not cancer. They usually can be removed and, in most cases, they do not come back. Most important, cells from benign tumors do not spread to other parts of the body. Cells from benign tumors stay together and often they are surrounded by a containing membrane. Benign tumors are not usually a threat to life.

Examples of Benign Tumors

- Papilloma A projecting mass on the skin (for example, a wart)
- Adenoma A tumor that grows in and around the glands
- Lipoma A tumor in fatty tissue
- Osteoma A tumor originating in the bones
- Myoma A tumor of muscle tissue
- Angioma A tumor usually composed of small blood or lymph vessels (for example, a birthmark)
- Nevus A small skin tumor of one variety of tissues (for example, a mole).

Malignant

Malignant tumors are cancer. Cancer cells can invade and damage tissues and organs near the tumor. Cancer cells also can break away from a malignant tumor and enter the lymphatic system or the bloodstream, which is how cancer can spread to other parts of the body. The characteristic feature of cancer is the cell's ability to grow rapidly, uncontrollably, and independently from the tissue where it started. The spread of cancer to other sites or organs in the body through the blood stream or lymphatic system is called metastasis.

Malignant tumors generally can be classified in two categories.

Carcinomas. These cancers originate in the epithelium. The epithelium is the lining cells of an organ. Carcinomas are the most common type of cancer. Common sites of carcinomas are the skin, mouth, lung, breast, stomach, colon and uterus.

Sarcomas. Sarcomas are cancers of connective and supportive tissue (soft tissues) of all kinds. Sarcomas can be found anywhere in the body, and they often form secondary growths in the lungs.

Characteristics of Benign and Malignant Tumors

Characteristic	Benign	Malignant
Differentiation	Tumor cells resemble the original mature cells	Tumor cells might not resemble the original mature cells
Growth Rate	Slow; might stop or regress	Rapid, autonomous; usually does not stop or regress
Type of Growth	Expand and displace	Invade, destroy, and replace
Metastasis	No	Yes
Health Effect	Usually does not cause death	May cause death if not diagnosed and treated

Some Causes of Cancer

Different types of cancer have different causes and are likely to depend on many factors. Some cancers are more common than others, and chances for survival vary among different types. Most cancers do not have known causes from a chemical, environmental, genetic, immunologic, or viral origin. Cancers also can arise spontaneously from causes that are thus far unexplained.

The causes of cancer are very complex, involving both the cell and factors in the environment. Much progress has been made in identifying possible causes of cancer, including:

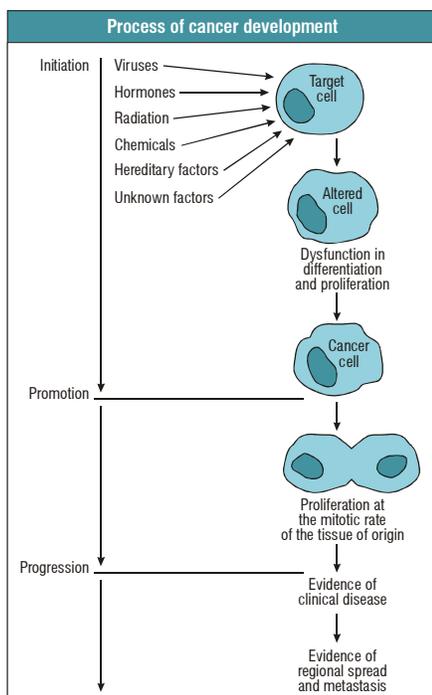


Chemicals and other substances. Being exposed to substances such as certain chemicals, metals, or pesticides can increase the risk of cancer. Any chemical that is known to cause cancer is called a carcinogen. Asbestos, nickel, cadmium, uranium, radon, vinyl chloride, benzidine, and benzene are examples of well-known carcinogens. These may act alone or along with another carcinogen, such as cigarette smoke, to increase the risk of cancer. For example, inhaling asbestos fibers increases the risk of lung diseases, including cancer, and the cancer risk is especially high for asbestos workers who smoke.

Tobacco. The most common carcinogens in our society are those present in cigarette smoke. Tobacco smoke is known to contain at least 60 carcinogens and 6 developmental toxicants. In addition to being responsible for 80 to 90 percent of lung cancers, cigarette smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, kidney, and bladder. Avoiding tobacco products is one way to decrease a person's risk of cancer.

Ionizing radiation. Certain types of radiation, such as x-rays, rays from radioactive substances, and ultraviolet rays from exposure to the sun, can produce damage to the DNA of cells, which might lead to cancer.

Heredity. Certain types of cancer occur more frequently in some families than in others, indicating some inherited predisposition to the development of cancer. Even in these cases, however, environment plays a part in the development of cancer.



How Cancer Develops

Cancer can develop in people of all ages, but it is more common in people over 60 years old. One of every three people will develop cancer at some point in their lives. Because people are living longer, the risk of developing cancer is increasing.

The development of cancer is a long process that usually starts with genetic changes in the cells, and continues in the growth of these cells over time. The time from genetic change to development of cancer is called the latency period. The latency period can be as long as 30 years or more. This means that some cancers diagnosed today may be due to genetic changes that occurred in the cells a long time ago.

Theoretically, the body develops cancer cells continuously, but the immune system recognizes them as foreign cells and destroys them. The body's ability to protect itself from cancer can be impaired by some drugs and viral infections.

Source: Medical/Surgical Nursing, 5th Edition, (2000), Chapter 14, pg 272.

Diagram Definitions: 1) **Differentiation** -characteristic trait distinguishing one cell from another; 2) **Proliferation** - the rapid and repeated production of new cells; 3) **Mitotic** - cell division resulting in the formation of two new nuclei each having the same number of chromosomes as the parent nucleus.

Symptoms of Cancer

Everyone should be familiar with certain signs that may indicate early cancer. It is important to report them immediately, before the condition spreads. It is unfortunate that early stages of cancer are typically painless; because they are painless, diagnosis and treatment are often delayed.

Early symptoms can include

- unaccountable weight loss
- unusual bleeding or discharge
- persistent indigestion
- the presence of white patches inside the mouth or white spots on the tongue

Detection of Cancer

Early detection and prompt treatment are directly responsible for increased survival rates.

Tools for cancer detection include

- Self-exams
- Biopsy (the removal of living tissue for the purpose of microscopic examination of cells)
- Ultrasound (the use of reflected high-frequency sound waves to differentiate various kinds of tissue)
- Computed tomography (CT) (the use of x-rays to produce a cross-sectional picture of body parts)
- Magnetic resonance imaging (MRI) (the use of magnetic fields and radio waves to show changes in soft tissues without the use of x-rays).

Health Promotion Tips

- Reduce or avoid exposure to known or suspected carcinogens or cancer-promoting agents, including cigarettes and sun exposure.
- Eat a balanced diet that includes vegetables, fresh fruit, whole grains, and adequate amounts of fiber.
- Reduce the amount of fat and preservatives in the diet, including smoked and salt-cured meats.
- Participate in regular exercise.
- Obtain adequate, consistent periods of rest (at least 6 to 8 hours per night).
- Eliminate or reduce stress and enhance the ability to effectively cope with stress.
- Go to annual health check-ups.
- Enjoy consistent periods of relaxation and leisure.
- Learn to practice self-examination (breast and testicular).
- Seek immediate medical care if cancer is suspected.

Risk Factors for Cancer

Because cancer is not a single disease, it does not have a single cause. Many causes or risk factors can contribute to a person's chance of getting cancer. Risk factors are different with each type of cancer. It is important to remember that 1 in 3 people will develop a cancer during their lifetime.

Risk factors are things that can increase the chances of getting cancer.

Most cancers are likely to be related to more than one risk factor.

Some risk factors can be controlled and others cannot.

Risk factors can include such things as age, race, sex, genetic factors, diet, and exposure to chemicals, radiation, and tobacco.

Genetics play a large role for many cancers, such as breast and colon cancer. This means that a family's health history can be a risk factor for some types of cancers.

Lifestyle Factors

Personal choices we make about the way we live our lives can increase our chance of developing cancer. These choices are called lifestyle factors, and they include smoking, heavy drinking, and eating foods that have excess calories, high fat, and low fiber. Other factors that increase risk are related to sexual contact and sunlight exposure.

Tobacco

Thirty percent of all cancers are attributed to smoking or chewing tobacco. Cigarette smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, kidney, and bladder.

Diet

Researchers found that different types of food you eat affect your risk of developing cancer. Approximately 30% of cancers are related to diet.

Infectious Agents

Some viruses have the ability to transform cells into cancer. Examples include (a) human papilloma virus (HPV) and cervical cancer, and (b) Epstein-Barr virus and lymphoma.

Occupational Exposure

Occupational exposure includes high-risk occupations such as uranium miners, asbestos factory workers, certain chemical plant workers, and workers in nuclear power plants.

Reproductive Factors

The reproductive factors category refers mostly to women's risk factors. For example, the risk of breast cancer goes up if a woman does not have children before the age of 30. Sexually transmitted diseases also increase the risk of cervical cancer.

Sedentary Lifestyle

Not moving around much during the day may increase the risk of cancer. The body's own defenses work better when you exercise and maintain an ideal weight. Moderate exercise such as walking or climbing a flight of stairs can help.

Alcohol/Drugs

Alcohol contributes to the risk of developing cancer. People who drink too much or abuse drugs may not eat well or take care of themselves, which will increase their overall risk of cancer.

Pollution

Although people think environmental pollution is a major of cancer, in fact few cancers have been found to be caused by pollution, but research is still ongoing. The cause of many cancers is not known. Other factors that interact to increase the risk of cancer are age, hormonal balance, response to stress, and status of the immune system.

Risk and Protective Factors in the Development of Cancer

Protective Factors

Risk Factors

Type of Cancer	Vegetables	Fruits	Physical Activity	Alcohol	Obesity	Tobacco Use	Environmental Exposure
Lung	✓✓✓	✓✓✓	✓	X		XXX	XX
Colon/Rectum	✓✓✓		✓✓✓	XX	X	X	
Breast	✓✓	✓✓	✓	XX	XX		
Prostate	✓						X
Stomach	✓✓✓	✓✓✓					X
Oral/Pharynx	✓✓✓	✓✓✓		X		XXX	X
Kidney	✓				XX	X	
Ovary	✓	✓					
Pancreas	✓✓	✓✓				XXX	
Liver	✓			XXX			X
Cervix	✓	✓				XXX	
Bladder	✓✓	✓✓				XXX	XX
Esophagus	✓✓✓	✓✓✓		XXX		XXX	X
Larynx	✓✓	✓✓		XXX		XXX	X
Thyroid	✓	✓					XX
Uterus	✓	✓			XXX		
Gallbladder					X		
Nasopharynx						XX	X

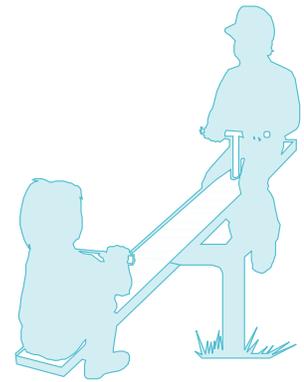
Adapted from: Westcott S. A Journey Into Cancer's Causes. Anchorage (AK): Alaska Native Health Board; 1999. p. 11..

Legend

✓✓✓	Greatly lowers your risk	XXX	Highly raises your risk
✓✓	Somewhat lowers your risk	XX	Somewhat raises your risk
✓	Might lower your risk	X	Might raise your risk

Cancer and Children¹

It can be especially difficult to understand and accept when a child develops cancer. The most common cancers in children are leukemia, brain tumors, and lymphomas. Nearly 1 in 450 children will be diagnosed with cancer before the age of 15.



Many pediatric cancers occur very early in life and many parents want to know why. The cause of most childhood cancers is not known, although some of these cancers are the result of genetic predisposition (cancer runs in the family). Radiation exposure also contributes to certain types of childhood cancers. Other factors that have been implicated in childhood cancers include infectious diseases, prenatal conditions, environmental pollutants, electromagnetic fields, and use of medications.

Unlike most cancers of adults, childhood cancers are not significantly related to lifestyle risk factors such as tobacco or alcohol use, poor diet, or not enough physical activity. Many organ systems in children are undergoing rapid growth and development in the first years of life. These systems are especially vulnerable to injury during these periods of development.

The types of cancer that occur in children vary greatly from those seen in adults.

Most Common Cancers in Children and Adults

Children	Adults
Leukemias: acute lymphocytic (lymphoblastic)	Lung
Brain and Other nervous system tumor: neuroblastoma	Breast (carcinoma)
Lymph-node cancers (lymphomas)	Colorectal
Bone (osteosarcoma)	Prostate
Soft-tissue sarcomas: rhabdomyosarcoma	Skin (melanoma)
Kidney: Wilms tumor	
Eye: retinoblastoma	
Adrenal gland (adrenocortical carcinoma)	

Acute lymphocytic leukemia (ALL) is the most common childhood malignancy. ALL accounts for almost one-third of all childhood cancers.

Brain and spinal cord cancers are the second most common cancers in children. Most brain cancers of children involve the cerebellum or brain stem. Adults are more likely to develop cancers in different parts of the brain—usually the cerebral hemispheres. Spinal cord tumors are less common than brain tumors in both children and adults.

¹This information on children and cancer was compiled from *Childhood Cancer—General Statement*, published by the American Cancer Society.

Bone cancer is uncommon. The incidence of primary bone cancer (cancer starting in bones) is highest in children and adolescents. Cancer that spreads to the bones is more common than primary bone cancer in all age groups. Osteosarcoma is the most common type of primary bone cancer in children and young adults. Ewing sarcoma is a less common primary bone cancer that occurs mostly in children and adolescents.



Detecting Cancer in Children

Cancers in children are often difficult to recognize. Parents should take their children to regular medical checkups and should be alert to any unusual signs or symptoms that persist. It is important to report unusual signs or symptoms to a health care provider.

Unusual signs or symptoms include

- ◆ unusual mass or swelling
- ◆ unexplained paleness
- ◆ loss of energy
- ◆ sudden tendency to bruise
- ◆ persistent, localized pain or limping
- ◆ prolonged, unexplained fever or illness
- ◆ frequent headaches, often with vomiting
- ◆ sudden eye or vision changes
- ◆ excessive, rapid weight loss.

What About Chemicals in the Environment?

“All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.”

Paracelsus (1493–1541)

Environmental pollutants are only one of the many connections between cancer and our lives. Not all contaminants are deadly or even cause disease.

The amount of a contaminant a person is exposed to

plus the length of time that person is exposed

plus how many times that person is exposed

plus how the person was exposed

equals whether a person will experience negative health effects from an exposure.

Exposures to some chemicals in the environment, at home, and at work may contribute to an individual's risk of developing cancer. Toxic substances such as benzene, asbestos, vinyl chloride, and arsenic can increase the risk of cancer in those exposed to them. The International Agency for Research on Cancer (IARC) classified these substances as known human carcinogens because studies showed a link in humans between exposure to these substances and cancer.

Some chemicals have been shown to cause cancer in animals, but there is not enough evidence to show that

these chemicals also cause cancer in humans. These chemicals are classified by IARC as possibly or probably carcinogenic to humans. Chloroform, DDT, formaldehyde, and polychlorinated biphenyls are examples of such chemicals.

Most of what we know about chemicals and cancer in humans comes from scientists' observation of workers. The most significant exposures to cancer-causing chemicals have occurred in workplaces where large amounts of toxic chemicals have been used regularly.

The amount of toxic chemicals found in food, air, and drinking water are typically much lower than those in the work environment. Therefore, cancer risk from environmental exposures is thought to be lower compared to the risk in occupational settings. In fact, the cancer risk from environmental exposures is often difficult to measure.

Environmental Toxicants

Environmental toxicants are classified by the National Toxicology Program as (a) known human carcinogens and (b) reasonably anticipated to be (suspected) human carcinogens to differentiate the level of evidence available to support the carcinogenicity of a probable toxicant. Carcinogens include a wide diversity of synthetic and naturally occurring substances, including hormones, immunosuppressants, organic and inorganic chemicals, and cytotoxins.

It is difficult to study populations living near a hazardous waste site and determine if their cancers are associated with exposures. A major difficulty for those studying these populations is not knowing the exact level of individual exposure to a carcinogenic agent. Waste sites often contain more than one chemical, which makes it difficult to associate health outcomes to a single exposure. Often other variables must be accounted for before making any associations of the disease outcome to a given exposure from the site.

Because of the long latency period of cancer development and the type of behavioral risk factors associated with cancers (such as tobacco use, alcohol consumption, and diet), it is difficult to collect information about environmental exposures that occurred years ago.

A List of Known and Suspected Human Carcinogenic Agents by Organ

Human Carcinogenic Agent		
Organ	Known	Suspected
Lung	Arsenic Asbestos Benzo(a)pyrene bis(Chloromethyl)ether Chromium Nickel subsulfide Zinc chromate Tobacco smoking Mustard gas Uranium	Acrylonitrile Beryllium Cadmium 1,2-Dibromo-3-chloropropane Polycyclic aromatic hydrocarbons (PAHs)
Kidney	Coke oven emissions Zinc chromate	Tetrachloroethylene
Bladder	Benzidine Cyclophosphamide 4-Aminodiphenyl Tobacco smoking Chloraphazine	Tetrachloroethylene
Stomach	Zinc chromate	Ethylene oxide
Skin	Arsenic Benzo(a)pyrene Overexposure to the sun	PAHs Tetrachloroethylene
Liver	Vinyl chloride Aflatoxin Alcoholic drinks	
Mouth, pharynx, larynx, esophagus	Alcoholic drinks Tobacco smoking Tobacco chewing (mouth only) Mustard gas (larynx)	
Prostate	Cadmium	

Source: Lybarger JA, Spengler RF, DeRosa CT, editors. Priority health conditions: an integrated strategy to evaluate the relationship between illness and exposure to hazardous substances. Atlanta: Agency for Toxic Substances and Disease Registry; 1993. p. 61.

For more information about Cancer:

Contact your Health Care Provider
Your local American Cancer Society Chapter

or visit the following sites on the Internet:

<http://cancernet.nci.nih.gov>

<http://www.yourcancerrisk.harvard.edu/>

<http://cdc.gov/cancer>

<http://www.acor.org/disease/ped-onc>

<http://www.pbs.org/wgbh/nova/cancer>

References

Mosby's Patient Teaching Guide, Editor, Harrison, Alison (1995), Mosby Year Book, Inc.

Medical/Surgical Nursing, 5th Edition, (2000), Lewis, Sharon; Heitkemper, Margaret; Dirksen, Shannon; Mosby.

A Journey Into Cancer's Causes, Wescott, Siobhan, (2001), Alaska Native Health Board

Professional Guide to Diseases, (1995), 5th Edition, Springhouse Corporation

The Human Body in Health and Disease, 7th Edition,(2000) Memmler, R.; Wood, D.; Lippincott Williams & Wilkins

Memmler's Structure and Function of the Human Body, 7th Edition (2000); Cohen, B.; Wood; D; Lippincott, Williams & Wilkins

What You Need to know about Cancer of the Cervix, (1994), National Institutes of Health, National Cancer Institute

Priority Health Conditions: An Integrated strategy to Evaluate the Relationship Between Illness and Exposure to Hazardous Substances; (1993); Lybarger, J.; Spengler, R.; DeRosa, C.; Agency for Toxic Substances and Disease Registry

Cancer Warrior, NOVA On-Line, (2001); www.pbs.org/wgbh/nova/cancer

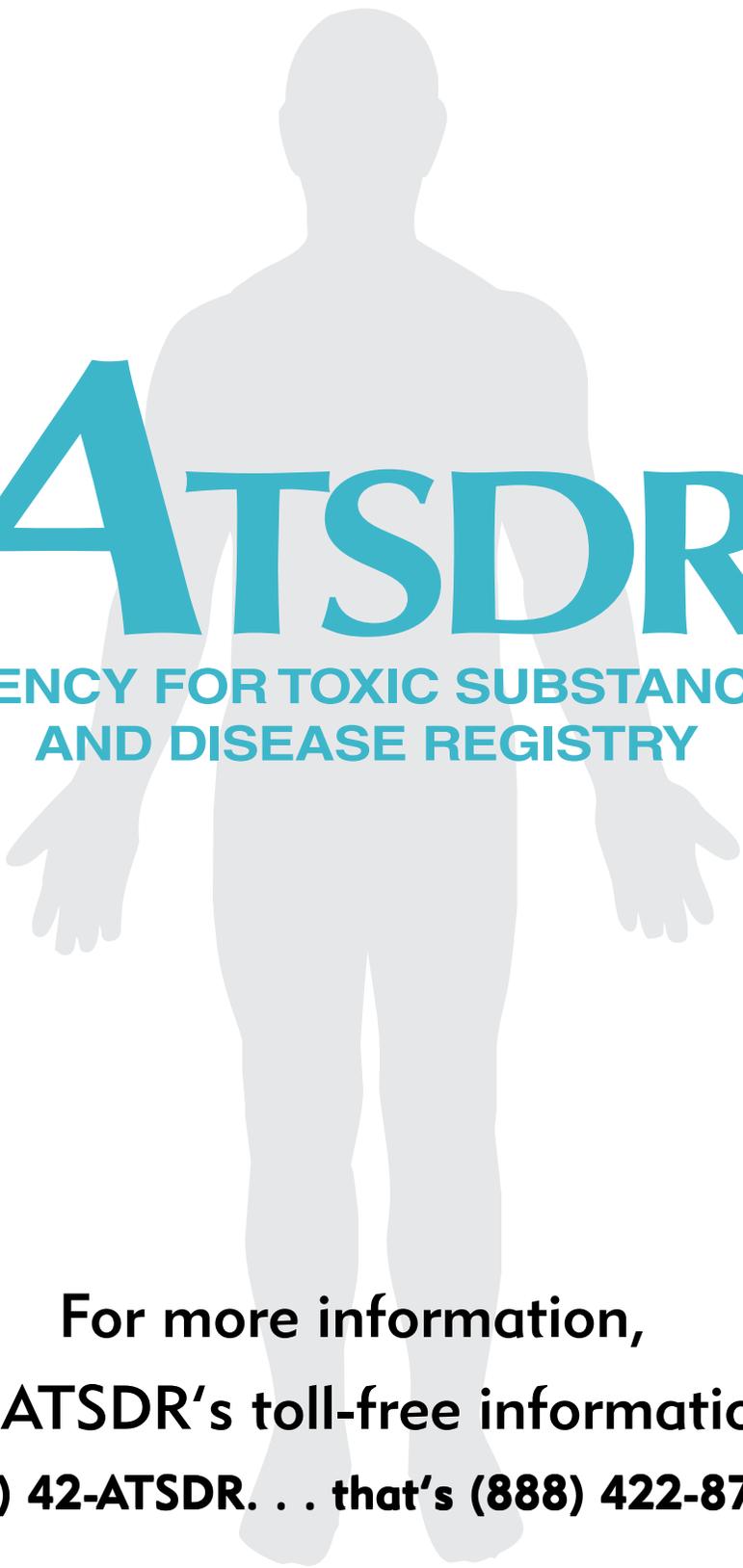
Cancer Source Book for Nurses, 7th Edition; (1997); American Cancer Society

Cancer Facts and Figures 2001; (2001); American Cancer Society

Childhood Cancers; (2001); Pediatric Oncology Resource Center, www.acor.org.diseases/ped-onc/diseases/diseases.html

NCI Fact Sheet: National Cancer Institute Research on Causes of Cancers in Children; (1999); www.oncolink.upenn.edu/pdq_html

Cancer Information Service; www.fhcrc.org/cipr/pnwcis



ATSDR

AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

**For more information,
contact ATSDR's toll-free information line:
(888) 42-ATSDR. . . that's (888) 422-8737**

ATSDR's Internet address is www.atsdr.cdc.gov