

What Is Cancer?

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What Is cancer?

- Not a single disease; it is a group of more than 100 different diseases
- Many different types of cancer exist
- Uncontrolled growth and spread of abnormal cells in the body

What Is Cancer?

- All cancers are not the same
- Different types of cancer have different rates of occurrence, different causes, and different chances for survival
- The development of cancer is a multi-step process
- The “latency period” is usually decades long, often 30 years or longer

What Is Cancer?

- This means that many cancers diagnosed today may be due to genetic changes that occurred in cells a long time ago.
- Cancer is the irregular growth of abnormal cells.
- In the human body, normal cells grow, divide and die in a normal process.
- Cancer cells outlive normal cells and continue to grow and make new abnormal cells.

Cancer Spreads

- Cancer cells will clump together and form tumors.
- These tumors can invade and destroy normal cells and tissue. Tumors can be malignant (cancerous) or benign (non-cancerous).
- Cancer cells can travel (metastasize through the blood or the lymph system to other areas of the body where they can settle and form new tumors)

Cancer Occurrence

- Some cancers, such as leukemia, do not form tumors, but invade the blood and blood-forming organs.
- Benign (noncancerous) tumors do not spread to other parts of the body and are usually not life-threatening (unless they are in the brain).

Causes of Cancer

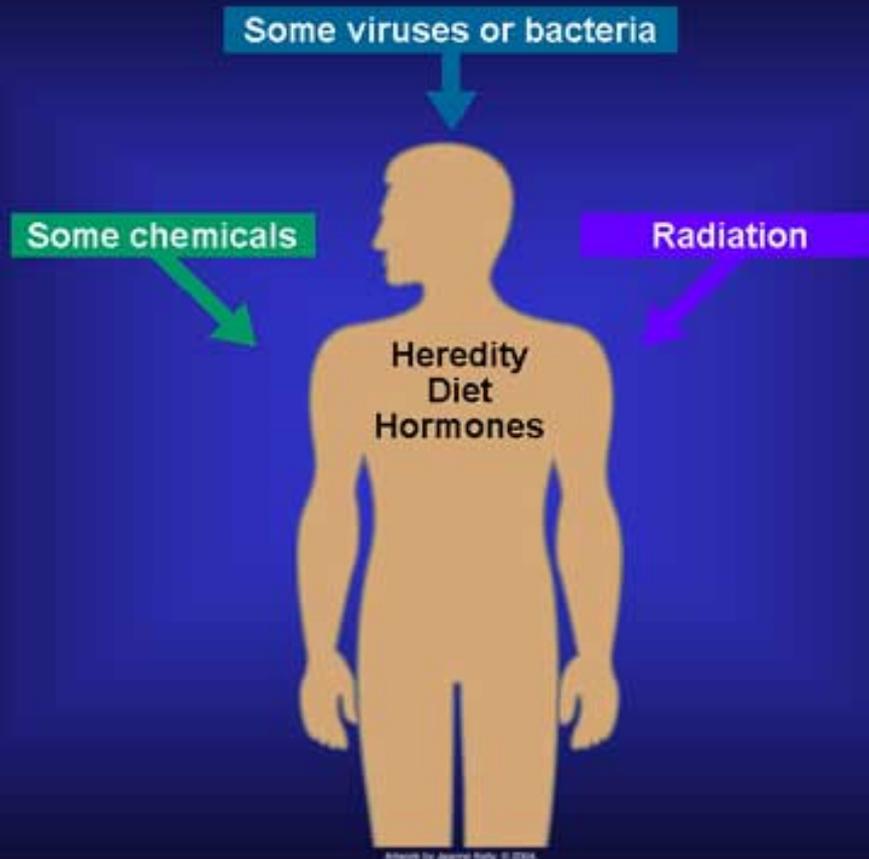
- In many cases, the exact cause of cancer is not known.
- We know certain changes in our cells can cause cancer to start, but we don't yet know exactly how this happens.
- There are a lot things we **do** know about cancer.

Causes of Cancer

- Since cancer is not a single disease, it does not have a single cause.
- The causes of cancer are better known as “risk factors.”
- These factors act over many years to increase an individual’s chance of developing cancer.
- There are things we do in our daily lives that can increase our chance of developing cancer.

Causes of Cancer

What Causes Cancer?



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NATIONAL
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Risk Factors

- A risk factor is anything that increases a person's chance of getting a disease.
- Some risk factors, such as tobacco use, can be changed, and others, such as age, cannot.
- “Lifestyle factors” include: cigarette smoking; heavy drinking; eating foods that have excess calories or high fat; and not eating enough vegetables.
- Other lifestyle factors that increase risk have to do with reproductive patterns, sexual behavior, and exposure to sunlight

Risk Factors

- Having a risk factor for cancer means a person is more likely to develop the disease at some point in his or her life.
- However, having one or more risk factors does not always mean a person will get cancer.
- Some people with one or more risk factors never develop the disease.

Risk Factors

- Even when a person who has a risk factor is diagnosed with cancer, there is no way to prove the risk factor actually caused the cancer.
- In reality, getting cancer is probably due to the combination of risk factors rather than one single factor.

Causes of Cancer

- Cigarette smoking is a leading cause of cancer deaths in the U.S. today.
- Approximately 30 percent of all cancer deaths are related to smoking.
- In fact, smoking is the most preventable cause of death in our society.

Source: National Cancer Institute

Cigarette Smoking and Cancer

Tobacco Use and Cancer

Some Cancer-Causing Chemicals in Tobacco Smoke

aminostilbene
arsenic
benz[a]anthracene
benz[a]pyrene
benzene
benzo[b]fluoranthene
benzo[c]phenanthrene
benzo[*f*]fluoranthene
cadmium
chrysene
dibenz[a,c]anthracene
dibenzo[a,e]fluoranthene
dibenz[a,h]acridine
dibenz[a,j]acridine
dibenzo[c,g]carbazone
N-dibutyl nitrosamine
2,3-dimethylchrysene

indeno[1,2,3-*c*]pyrene
S-methylchrysene
S-methylfluoranthene
alpha-naphthylamine
nickel compounds
N-nitrosodimethylamine

N-nitrosomethylethylamine
N-nitrosodiethylamine
N-nitrosornicotine
N-nitrosoanabasine
N-nitrosopiperidine
polonium-210



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Who Gets Cancer?

- Cancer may strike at any age.
- However, cancer is mostly a disease of middle and old age.
- Cancer is the second-leading cause of death in the United States.
- It is estimated that half of all men and one-third of all women in the United States will develop cancer during their lifetimes.

Risk Factors and Cancer

- Cancers in different parts of the body are often caused by different risk factors.
- For example, smoking and asbestos are recognized risk factors for lung cancer, but not for breast cancer.
- Exposure to radiation or benzene is among the risk factors for certain types of leukemia, but not for colon cancer.

Other Causes of Cancer

- What you eat and how long you sit are factors for colon cancer.
- Exposure to sunlight is a risk factor for skin cancer, but not for most other cancers.

Other Causes of Cancer

- Using tobacco products, a poor diet and lack of physical activity account for about 65% of cancer deaths.
- Less than 5% of cancers are believed to be due to factors in the environment.

Avoiding Causes of Cancer

- The risk of developing most types of cancers can be reduced by changes in a person's lifestyle.
- By quitting smoking, eating healthier, and exercising, you can reduce your risk of developing cancer.

Genetic Causes of Cancer

- For many cancers, such as breast and colon cancer, genetics play a role.
- This means that a family history can be a risk factor for some types of cancers.
- It is not unusual for several cases of the same type of cancer to occur within a family.

What About Cancer in Children?

- Many pediatric cancers occur early in life and parents want to know why.
- Nearly 1 in 450 children will be diagnosed with cancer before the age of 15.
- In most cases the causes remain largely unknown.

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Cancer in Children

- Organ systems of children are especially vulnerable to injury when undergoing periods of rapid growth and development.
- Factors that are *suspected* of playing a role in childhood cancers: genetics, infectious diseases, prenatal conditions, environmental pollutants, radiation, and medications.

Cancer in Children

- The types of cancer most often seen in children are different from those seen in adults.
- The three most common types of cancer in children are:
 - (1) leukemias;
 - (2) tumors of the brain and nervous system; and
 - (3) lymph-node cancers.

In contrast, the most common types of cancer in adults are:

- lung cancer;
- breast cancer;
- colon or rectal cancer; and
- prostate cancer.

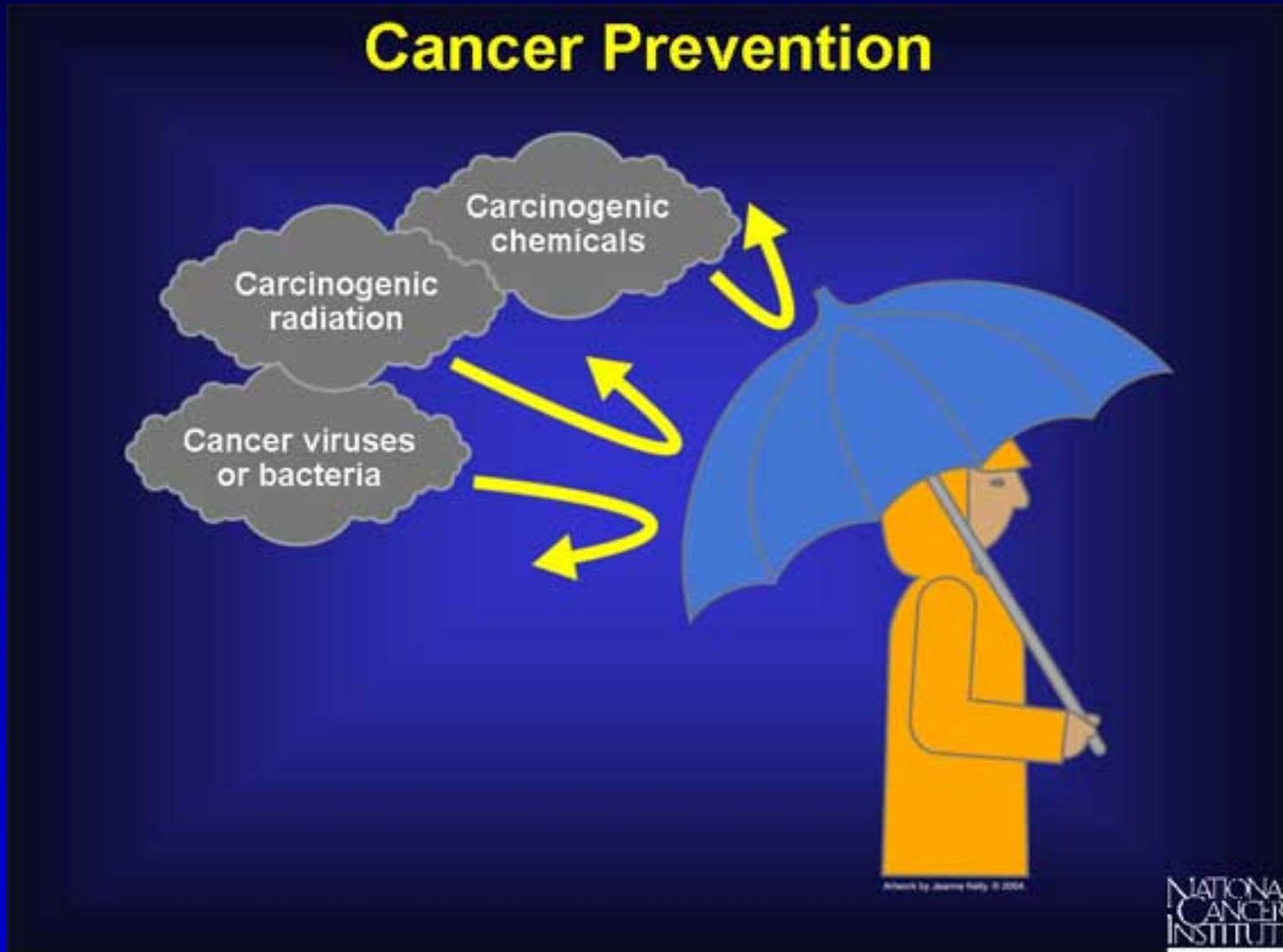
Chemicals in the Environment

- Exposures to certain chemicals in the environment may also contribute to an individual's risk of developing cancer.
- Some toxic substances can increase the risk of cancer to those who are exposed to these substances.
- The IARC has classified these substances as “*known human carcinogens.*”

Chemicals in the Environment

- Some chemicals have been shown to cause cancer in animals, but there is not enough evidence to show that these chemicals cause cancer in humans.
- These chemicals are classified by IARC as “*possible or probable (suspected) human carcinogens.*”

Prevention of Cancer



Chemicals in the Environment

- Most of what we know about the role of chemicals in human cancer comes from observations of workers.
- The most significant exposures to cancer-causing chemicals have occurred in workplaces where large amounts of toxic chemicals were used.
- That is why safe work practices, personal protection, ventilation, and other controls are so important in protecting workers and their families.

Carcinogens at Work

Avoid Carcinogens at Work

Some Carcinogens in the Workplace

| Carcinogen | Occupation | Type of Cancer |
|-------------------|--|--------------------|
| Arsenic | Mining, pesticide workers | Lung, skin, liver |
| Asbestos | Construction workers | Lung, mesothelioma |
| Benzene | Petroleum, rubber, chemical workers | Leukemia |
| Chromium | Metal workers, electroplaters | Lung |
| Leather dust | Shoe manufacturing | Nasal, bladder |
| Naphthylamine | Chemical, dye, rubber workers | Bladder |
| Radon | Underground mining | Lung |
| Soots, tars, oils | Coal, gas, petroleum workers | Lung, skin, liver |
| Vinyl chloride | Rubber workers, polyvinyl chloride manufacturing | Liver |
| Wood dust | Furniture manufacturing | Nasal |

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Avoiding Carcinogens at work

To protect yourself from carcinogens at work

- Use personal protective equipment
- Follow OSHA regulations

Chemicals in the Environment

- Toxic chemicals found in food, air, and drinking water are typically at much lower levels than in the work environment.
- Cancer risk from environmental exposures is often thought to be very low compared with the risk in occupational settings.
- In fact, the cancer risk from environmental exposures is so low that it is difficult to measure in scientific studies.

Interpreting Information in the News About Cancer and the Environment

- ** A single study on the causes of cancer is seldom conclusive.*
- Scientists look for multiple studies with consistent results before drawing conclusions.

Interpreting Information in the News About Cancer and the Environment

- *The dose determines the poison.*
- The results of a scientific study are usually specific to a particular dose, route of exposure, or a specific population being studied and cannot be generalized to other doses, routes, or populations.

Interpreting Information in the News About Cancer and the Environment

- Each individual's chance of getting cancer from an exposure will be different depending on:
 - The amount of a contaminant to which a person is exposed
 - The length of time a person is exposed
 - The number of times a person is exposed
 - How the person was exposed, for example, by eating, breathing, or touching the substance

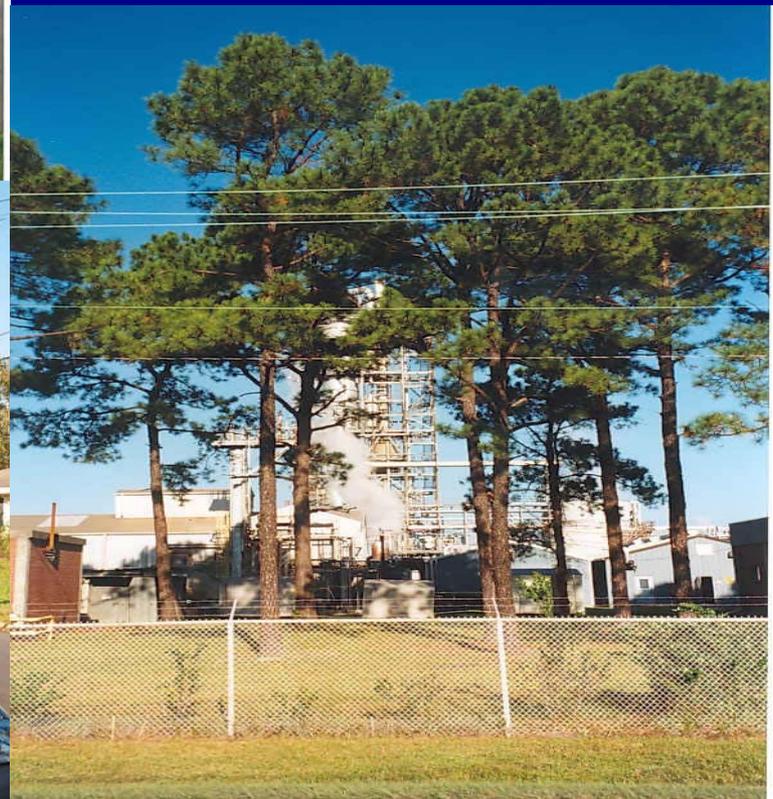
Interpreting Information in the News About Cancer and the Environment

- *Realize that uncertainties are always present in any study of environmental exposure and cancers.*
- Because of cancer's long latency period, it is often difficult to collect information on exposures that might have occurred years or decades before, or to determine whether an exposure will lead to cancer.
- Individual differences interact with lifestyle habits and environmental exposures to cause some people to be more sensitive to developing cancer.

Interpreting Information in the News About Cancer and the Environment

- **“Safety factors” or “uncertainty factors” are used to set acceptable levels of exposure.*
- These factors take into account that certain individuals might be more sensitive to chemicals because of age (children and the elderly), genetic make-up, gender, diet, or health status.
- In addition, people may be more sensitive to the cancer-causing effects of a substance than the mice or rats who were used to test the health effects of the substance.

Chemicals in the Environment



Control of Cancer-causing Chemicals

- Government agencies use safety factors that result in setting acceptable levels of exposure as much as 10,000 times lower than the level that causes cancer in mice and rats.
- Strict federal and state standards have been set to minimize our exposures to cancer-causing chemicals.
- The U.S. Environmental Protection Agency (EPA) is charged to set environmental **regulatory** standards to protect human health and the health of the environment from substances released into air, water or soil.

Control of Cancer-causing Chemicals

- The New Mexico Environmental Department (NMED) has state programs to meet the federal standards for protecting human health and the health of the environment.
- Activities include monitoring of air, water, and soil; conducting scientific research; setting standards; proposing rules; and enforcement of laws and regulations.

Control of Cancer-causing Chemicals

- Public health activities protect health.
- NMED has established standards for chemicals in air (called Health Risk Values) and water (called Health Risk Limits) specifying levels that are considered safe.
- NMED also provides education about hazardous substances for communities and health professionals.

Control of Cancer-causing Chemicals

- Many hazardous substances used in the past continue to be found in our environment.
- Dioxin, for example, is widespread and persistent in the environment. Small amounts of dioxin can be found in our food and in our bodies.
- It will take many years for such persistent chemicals to break down or be removed from the environment

Control of Cancer-causing Chemicals

- Some carcinogens in the environment occur naturally and are much more difficult to control.
- Arsenic in underground rock can get into drinking water wells.
- Radiation from the sun is also a strong cancer-causing agent.
- When necessary, we can purify drinking water or use clothing and sunscreen to protect ourselves from the sun.

*What if I see an unusual number of cancers among my neighbors or co-workers?
Could it be something in our environment?*

- It is not unusual to observe many cases of cancer in a single community, particularly if the community is aging.
- Using information from our cancer surveillance system, we know that cancers *sometimes* occur in clusters.
- Clusters often occur by chance; and cancer cases are not evenly distributed throughout the population.

Increased Number of Cancers

- Epidemiologists study diseases in populations.
- Epidemiologists look for
 - an unusual pattern of a specific type of cancer, rather than several different types.
 - whether the specific type of cancer is a primary cancer or a cancer that is the result of metastasis (i.e., spread from another organ in the body).

Increased Number of Cancers

- Epidemiologists can determine whether a reported excess of cancer in a population is *really* more than would normally be expected to occur.
- They take into account other characteristics of the population that can affect disease patterns, such as age, gender and heredity.

Increased Number of Cancers

- Most of our knowledge about the causes of cancer in people comes from studying large populations.
- Even our best scientific methods cannot tell us the cause of cancer in an individual, or in a small group of individuals.

What Steps Can I Take to Minimize My Cancer Risks?

- *We can't eliminate all risks in our lives.*
- But we can, to a certain extent, manage them by adopting healthy lifestyles.
- ATSDR endorses the following American Cancer Society recommendations to prevent or minimize cancer risks:
 - * Stop smoking and avoid all tobacco products
 - * Avoid excessive exposure to sunlight
 - * Eat more fruits and vegetables, along with a low-fat, high-fiber diet

What Steps Can I Take to Minimize My Cancer Risks?

- Limit consumption of smoked and nitrite-cured foods
- Limit alcohol intake
- Avoid obesity
- Exercise regularly
- Have routine physical exams because not all cancers have obvious symptoms

What Steps Can I Take to Minimize My Cancer Risks?

- Practice early detection—learn to practice self-examinations and seek prompt medical attention for changes in your body such as:
 - A thickening or lump in any part of your body
 - An obvious change in a wart or mole
 - A sore that does not heal
 - A nagging cough or hoarseness
 - A change in bowel or bladder habits
 - Indigestion or difficulty swallowing
 - Unexplained changes in weight
 - Unusual bleeding or discharge

How Can I Protect Myself from Toxic Exposures in the Environment?

At home:

- The air inside your home may be more polluted than the air outside.
- If you use chemicals in the home, such as pesticides, paints, paint thinners, cleaning solvents, or preservatives, do the following:

Protecting yourself from Toxic Exposures

- The following steps may decrease exposure:
 - Read labels and follow directions carefully
 - Use these chemicals only in a well ventilated environment— outdoors when possible
 - Follow community guidelines for disposal of household hazardous wastes to get rid of partially full containers of old or unneeded chemicals.
 - Substitute less toxic substances

How Can I Protect Myself from Toxic Exposures in the Environment?

At home:

- If you have an older home (built before 1978), your home may contain flooring, roofing, insulation or other products with asbestos –
- Do not disturb or remove any asbestos containing material. Contact <http://www.epa.gov/asbestos/> for more information.

How Can I Protect Myself from Toxic Exposures in the Environment?

- Old paint may contain lead or other toxic metal.
- Peeling paint should be safely removed or covered.
- Contact <http://www.cdc.gov/nceh/lead/> for more information on lead.

How Can I Protect Myself from Toxic Exposures in the Environment?

- **At work:**
- Be aware of any carcinogenic substances used in your workplace
- Participate in training programs that provide information about work hazards
- Read labels and take precautions as directed
- Use recommended personal protective equipment

How Can I Protect Myself from Toxic Exposures in the Environment?

- **In your community:**
- Stay informed. If you have concerns regarding pollutants in your community, contact the agencies responsible for safeguarding our environment and our health, such as EPA, NMED or ATSDR.
- Members of tribal communities may contact their Natural Resource Management or Environmental Health departments.

Resources

Where can I get more information?

- **National Cancer Institute (NCI):**
• <http://www.cancer.gov>
- **National Institute of Environmental Health Sciences (NIEHS):** <http://niehs.nih.gov>
- **Agency for Toxic Substances and Disease Registry (ATSDR):** <http://www.atsdr.cdc.gov>
- **Environmental Protection Agency (EPA):**
<http://www.epa.gov>



Questions???

