Station 1: Vaccine-Preventable Diseases

**Chickenpox (Varicella)**

Before the chickenpox vaccine was licensed in 1995, almost all people in the United States had suffered from chickenpox by adulthood. Each year, the virus caused an estimated 4 million cases of chickenpox, 11,000 hospitalizations, and 100 to 150 deaths. A highly contagious disease, chickenpox is usually mild but can be severe in some people. Infants, adolescents, adults, pregnant women, and people with weak immune systems are at particular risk for serious complications. Since the vaccine was introduced, the number of hospitalizations and deaths from chickenpox has declined more than 90 percent.

**Hepatitis B**

The hepatitis B virus (HBV) attacks the liver. Chronic (long-lasting) HBV infection increases a person’s risk of liver disease, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death.

In 1981, the year the HBV vaccine was introduced, about 21,000 new cases of the severe (acute), symptomatic form of HBV infection were reported in the United States. Many cases were not reported, so the actual number may have been as high as 70,000 per year. In 2006, about 4,700 new cases of acute hepatitis B were reported, a decline of about 75 percent of reported cases since 1981.

About 12.5 million people in the United States have been infected with HBV at some point in their lives, and about 1.25 million have chronic infection. Approximately 25 percent of children who have chronic HBV infection are likely to die of related liver disease as adults. About 5,000 people die each year from HBV-related liver disease.
A young boy who has contracted measles.

Measles

Before the measles vaccine became available in 1963, nearly everyone in the United States contracted the disease. Until then, about 500,000 people a year in the United States reported having measles. The actual number of people who caught the disease was probably much higher, in the range of 3 to 4 million per year. Approximately 450 measles-associated deaths were reported each year between 1953 and 1963.

One of the most characteristic symptoms of measles is a rash that begins on the face and proceeds down the body. Up to 20 percent of people who become infected with measles in the United States need to be hospitalized. Seventeen percent of measles cases have had one or more complications, such as ear infections, pneumonia, or diarrhea. Pneumonia is present in about 6 percent of cases and accounts for most measles deaths. Some people with measles develop encephalitis (swelling of the lining of the brain), which can result in brain damage. In the United States, as many as 3 out of every 1,000 people with measles will die. Measles is one of the most infectious diseases in the world and is frequently imported into the United States from countries where the vaccine is not widely used.
Mumps

Before the mumps vaccine was introduced, about 150,000 people reported contracting the disease in the United States annually. Mumps is usually a mild viral disease. However, rare conditions such as swelling of the brain, nerves, and spinal cord can lead to serious side effects such as paralysis, seizures, and fluid in the brain. Mumps used to be a major cause of deafness in children, occurring in approximately 1 in 20,000 reported cases. Serious side effects of mumps are more common among adults than children. An average of one death from mumps per year was reported during 1980–1999.

After the vaccine became available in the United States in 1967, the incidence of mumps declined dramatically, with 266 reported cases in 2001. Recently, however, the number of mumps cases has risen again, and more than 6,000 were reported in 2006.

Polio

Most people who become infected with poliovirus do not show any symptoms. A small fraction of them (less than 1 percent) do have severe symptoms such as paralysis. The paralysis can lead to permanent physical disability and even death. Of people who become paralyzed, about 2 to 5 percent of children and 15 to 30 percent of adults die from the disease.

Two types of polio vaccines are available. An injectable one containing chemically inactivated virus was introduced in 1955, and an oral one containing live but weakened virus, in 1961. Before then, 13,000 to 20,000 cases of paralytic polio were reported each year in the United States. The annual epidemics of polio often left thousands of victims—mostly children—in leg braces, using crutches, in wheelchairs, and needing “iron lungs” (machines that helped them breathe). The disease had lifelong effects.

A worldwide effort has led to the elimination of polio from the Western hemisphere, Europe, and the Western Pacific. In 2006, only 2,000 cases were reported worldwide.
Smallpox

Smallpox is a serious, contagious, and often fatal infectious disease. Of those who contract the most common form, 30 percent die. There is no specific treatment for smallpox disease, and the only prevention is vaccination. In the years before the introduction of the vaccine, approximately 50,000 people in the United States became ill with smallpox each year.

The pox part of smallpox is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person. Historically, people in China and India exposed themselves to smallpox in attempts to create immunity but would often get the disease in the process. In 1796, Edward Jenner discovered that exposing a person to material from a related virus (cowpox) could lead to immunity to smallpox, and vaccination with cowpox (and later a different, related virus, vaccinia) became widespread.

Smallpox outbreaks occurred from time to time for thousands of years, but the disease was eradicated by a successful worldwide vaccination program. The last case of smallpox in the United States was in 1949. The last naturally occurring case in the world was in Somalia in 1977. The World Health Assembly declared the world free of the disease in 1980. After that, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.