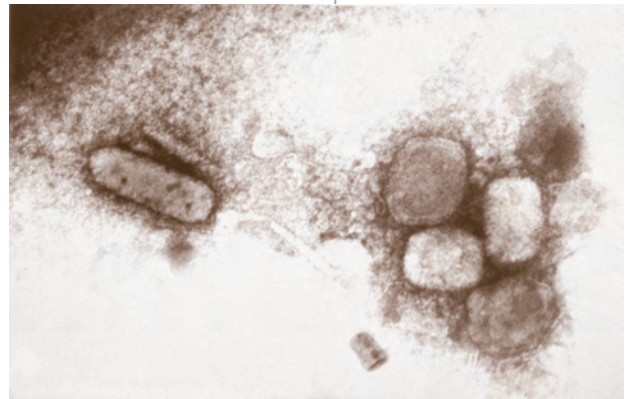


Historical Context

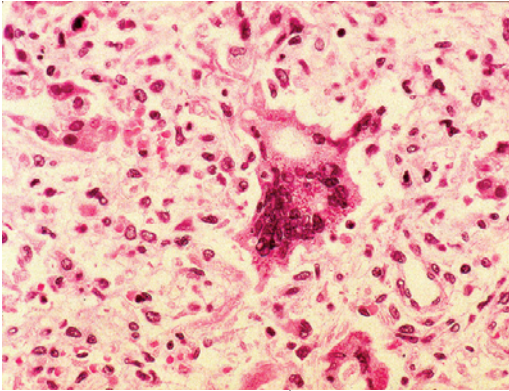
The cause of disease remained highly debated until approximately the mid-part of the nineteenth century. At this time, the two most prominent theories were the new germ theory, which was being debated against the long-standing miasma theory. The miasma theory, based on Greek and Roman medicine, stipulated that disease was caused by noxious vapors emanating from the earth. It was not until the 1840s, that person-person, animal-person, and environment-person transmission was demonstrated. Still, the description and treatment of diseases has a far longer history.^{167,168}

Diseases such as smallpox, gonorrhea, measles, and the black (bubonic) plague ravaged most of the world long before their agents were known. Mumps was first noted by Hippocrates in 5th century B.C., smallpox was described in Chinese text in the 4th century A.D. and measles in the 7th century. Common remedies were often based on speculation and typically did not provide any benefits to the infected individuals (some even were detrimental); other treatments and preventative techniques were based on empirical studies and proved highly beneficial. An example of effective prevention occurred during the late 1400s when a virulent form of syphilis spread rapidly through Europe. Control measures included: examination and registration of prostitutes, closure of communal bathhouses, isolation in special hospitals, reporting of the disease, and expulsion of sick prostitutes or strangers. The isolation techniques, though they did not cure the disease, aided in stemming the number of individuals exposed to the disease-causing agent.

The miasma theory was a strong proponent of minimizing exposure to disease agents, and subsequently cleaning the filth in towns as a method of preventing infectious diseases. Early cities were often covered in garbage, sewage, animal carcasses, and wastes. Legislation in the 1830s in Britain and Canada improved the ability of municipalities and boards of health to cope with sanitation of community water supplies and sanitation, moving the responsibility for the sanitation of cities away from individual homeowners, and instead placing it on government boards. The resulting sanitation greatly improved health conditions



Smallpox virus



Histopathology of measles pneumonia

Environment-carried diseases that had propagated in the wastes of the city were directly studied in the mid 1800s by such epidemiologists as John Snow. In 1854, Snow investigated deaths due to cholera in a city where two water companies supplied homes with overlapping water mains. One of these companies moved its water intake to a less polluted part of the river, while the other company left its intake in a part of the river heavily polluted with sewage. Most individuals who were infected with cholera had been drinking from the pump supplied by the second company. His research illustrated that it was not miasmas that caused the illness, but the disease agent (cholera)

being transmitted through sewage-contaminated water, thereby supporting environmental transmission of an agent.

In 1846 Peter Ludwig Panum described person-to-person transmission of infectious diseases when he investigated an outbreak of measles in the Faroe Islands, which had been measles-free since 1781. Panum visited all of the island, tracing the chain of transmission of the disease from location to location, and the immunity of those exposed during the 1781 epidemic.

Through the work of such scientists as Panum and Snow, the theory of vector-borne disease transmission became popular. Studies were prompted which looked at intermediate hosts to the disease. Parasitic diseases of animals and people were investigated in many centres during the nineteenth century. In 1883, Jacob Koch established criteria for linking the cause of a disease to a particular parasite or agent. He stated that an organism (agent) must be shown to be present in every case of the disease, that the agent should not be found in cases of any other disease, that once isolated, the agent should be grown in a series of cultures and must be capable of reproducing the disease in experimental animals, and that the agent must then be recovered from the disease produced in the experimental animals.

With individual agents being identified as the cause of a number of diseases, immunization to these agents was therefore identified as a method to prevent incidence and spread of disease. The history of immunization precedes the theories of agent causality. The first efforts to prevent smallpox occurred in China and India in the eighth century and involved intentional inoculation of a susceptible person with scab material from a person with smallpox. However, this method was extremely dangerous and could result in smallpox infection from the vaccine. In 1798 Edward Jenner developed a smallpox vaccine that was derived from cowpox. His vaccine was widely accepted through the world, and became compulsory in many countries. By the late 20th century, the vaccine had aided in the eradication of small pox worldwide.

The success of the smallpox vaccine has resulted in goals to eradicate other vaccine-preventable diseases. Among these are such childhood ailments as poliomyelitis (polio), which has been essentially eradicated from the Americas and most of Europe. This vaccine is given in Alberta as part of the as part of the DTaP-IPV-Hib vaccine cocktail, which encompasses vaccines for: diphtheria, tetanus (1924), pertussis (1930), poliomyelitis (1955), and *Haemophilus influenzae* type b (Hib). Further childhood immunizations in Alberta include Mumps (1948), Measles (1963), Rubella (1965), Varicella/Chickenpox (2001), and Meningococcal Disease (2001).

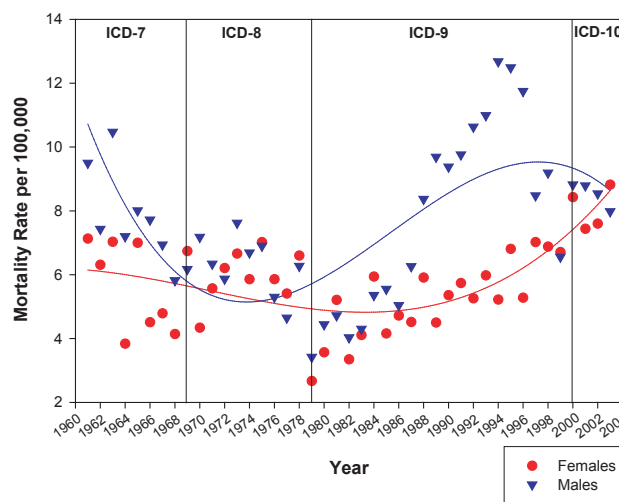


Provincial Archives of Alberta, PA2887/1
Polio vaccination - 1959

Communicable Disease Mortality

Figure 114 displays the mortality rates attributed to communicable disease in Alberta from 1961 to 2003. Communicable disease mortality declined between 1961 and 1980 for both sexes. Beginning in the 1980s, the mortality rate began to raise, particularly for males. More time is needed to see if this trend will continue.

Figure 114 Communicable disease mortality rates per 100,000 population, Alberta 1961 to 2003



Sexually Transmitted Infections (STIs)

Chlamydia

Description

Identification: The primary manifestation of chlamydia in men is urethritis and in women mucopurulent cervicitis. Asymptomatic genital chlamydial infections also occur. It has been estimated that 50 per cent of cases in males and approximately 70 per cent in females are asymptomatic.

Infectious Agent: Chlamydia is caused by the bacterium *Chlamydia trachomatis*

Occurrence: Worldwide. Chlamydia is one of the most frequently reported sexually transmitted infections (STI).

Reservoir: Humans

Mode of transmission: Chlamydia is primarily transmitted from person to person by sexual contact. This infection can also be transmitted vertically from infected mothers to their newborns during delivery. The transmission is more efficient from male to female than from female to male.

Prevention Measures: Correct and consistent use of condoms is an effective way of preventing STIs, including Chlamydia. Other effective methods of prevention include abstinence, limiting the number of sexual partners, being knowledgeable about a partner's past sexual history, avoiding having sex with an infected person, and partner notification and treatment in case of an infection.

Chlamydia Disease Trends

Figure 115 Chlamydia incidence per 100,000, Alberta 1989 to 2004



Chlamydial infections are the most common reportable STI in Canada accounting for more than three quarters of all STIs. In Canada, chlamydia infections have shown a general decreasing trend over time. However, the incidence since 1998 has increased.

Genital chlamydia became reportable in Alberta in 1989. It is the most common reportable STI in Alberta. The rate of chlamydial infection in Alberta has remained above the national average since 1990. The number of cases in the province declined from 7,727 cases (305.8 per 100,000) in 1989 to 7,356 cases (263.5 per 100,000) in 1997. In 1998 the number of cases began increasing. In 2004, 8,339 (262.3 per 100,000) cases were reported and the number of cases continues to increase.

Women are more likely to be diagnosed with chlamydia than men. In 2003, the female to male ratio was approximately 2:1, down from the ratio of 3:1 reported in 1989. This difference may be related to more screening in women accessing health services for other reasons. Since 1998, women aged 20 to 24 years have had the highest rate of infection followed by women 15 to 19 years of age.

Gonorrhea

Description

Identification: The primary manifestation of gonorrhea in men is urethral discharge and painful urination. In women the predominant symptom is mucopurulent cervicitis and occasionally urethritis with symptoms including vaginal discharge, dysuria and bleeding. Many gonorrheal infections are asymptomatic, or have minor symptoms.

Infectious Agent: Gonorrhea is caused by the bacterium *Neisseria gonorrhoeae*

Occurrence: Worldwide. Gonorrhea is the second most common reportable sexually transmitted infection in Canada.

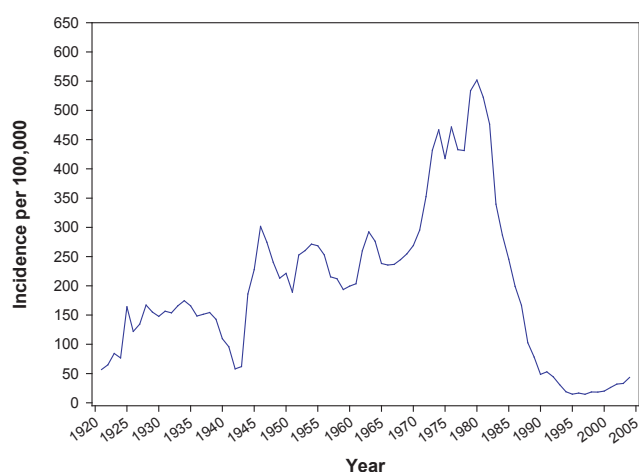
Reservoir: Humans

Mode of transmission: Gonorrhea is primarily transmitted person to person via sexual contact. The bacteria may also spread from the primary site of the infection to other sites causing infection.

Prevention Measures: Prevention of gonorrhea is essential as resistance to the antibiotics traditionally used to treat the infection is increasing. Correct and consistent use of condoms is an effective way of preventing both gonorrhea and HIV transmission. Other effective methods of prevention include those noted under Chlamydia.

Gonorrhoea Disease Trends

Figure 116 Gonorrhoea incidence per 100,000, Alberta 1921 to 2004



The first case of gonorrhoea was reported in Canada in 1924. The Canadian infection rate declined steadily from 1981 to 1997. Part of this change might have been changing sexual practices due to increased awareness of the threat of HIV/AIDS. After reaching a low in 1997, gonorrhoea rates have begun to climb in Canada.

In Alberta, the incidence of gonorrhoea declined steadily from 1980 to 1995. The number of reported cases has slowly increased from 401 in 1995 to 1,376 cases in 2004. Some of the increase in cases from 2001 to 2004 is attributable to regional outbreaks of this infection.

In Alberta, more cases of gonorrhoea are reported in males compared to females. Between 2000 and 2004, men were 1.5 times more likely to be diagnosed with gonorrhoea than women. Approximately 50 per cent of gonorrhoea cases are under 24 years of age.

HISTORICAL VIGNETTE

Syphilis in Alberta

In 1918, the first *Venereal Disease (VD) Prevention Act* in Canada was passed by the Alberta Legislature. Two years later, the first free VD clinic in Canada was started by Dr. Harrold Orr, in Alberta¹. Clinics were opened in Edmonton, Calgary, Lethbridge, and Medicine Hat for the diagnosis and treatment of venereal disease. "It is particularly encouraging to note the readiness with which syphilitics are applying for treatment" (1920 Annual Report of the Division of Social Hygiene). Other Alberta programs include consultation to physicians with free drugs for treatment and venereal disease examination for all persons admitted to jails.

The 1939 Annual Report of the Division of Social Hygiene noted that the city of Lethbridge had the highest syphilis rate in the province, and the suggestion was made that the existence of several recognized "houses of prostitution" in the centre of that city was the direct cause of the excessive syphilis rate there. With large numbers of soldiers being trained in Lethbridge, the matter of suppressing open prostitution was considered urgent. As stated in the 1940 Annual Report "Every venereally infected soldier is always a temporary and sometimes a permanent war casualty, just as surely as if struck by an enemy bullet". By 1942, Alberta had the lowest incidence of syphilis of any Canadian province. The late 1940s saw the introduction of penicillin for the treatment of both gonorrhoea and syphilis. Compulsory premarital blood tests to control the incidence of syphilis

were instituted in Alberta in 1947 and not repealed until 1986. In 1949, a mobile clinic to enable contact tracing of sexual partners throughout the province first hit the road.

Between 1983 and 1987, Alberta experienced an outbreak of infectious syphilis with rates more than double the high incidence experienced during the 1950s and 1960s. In 2004, the Capital Health region (Edmonton and area) experienced a significant rise in syphilis cases. This was of particular concern considering the expected number of cases during this period should be zero. Most of the cases stemmed from people involved in casual or anonymous sex. The majority of cases were among heterosexual men. Approximately half of the heterosexual men concerned reported sex with a sex trade worker².



Syphilis – long term damaged internal organs



Serology of Syphilis class

Sources:

Elaine Benjamin, Disease Control and Prevention Branch, AHW

¹ [http://www.albertadoctors.org/bcm/ama/ama-website.nsf/0/00707B190EE25FC487256F9D0072CB58/\\$File/FACT_SHEET.PDF?OpenElement](http://www.albertadoctors.org/bcm/ama/ama-website.nsf/0/00707B190EE25FC487256F9D0072CB58/$File/FACT_SHEET.PDF?OpenElement)

² Public Health Agency of Canada, (http://www.phac-aspc.gc.ca/bid-bmi/dsd-dsm/nb-ab/2004/nb4104_e.html)

Syphilis

Description

Identification: Undiagnosed or untreated syphilis progresses through several stages: primary, secondary, latent and tertiary. These stages are grouped into three categories: Infectious syphilis (primary, secondary, early latent); non-infectious syphilis (late latent, tertiary); and congenital syphilis (transmission from an infected mother to her infant). The infection may persist for life. Syphilis is sometimes referred to as the ‘great imitator’ or the ‘great imposter’ due to the extensive variability of symptoms.

Infectious Agent: Syphilis is caused by the bacterium *Treponema pallidum*

Occurrence: Worldwide.

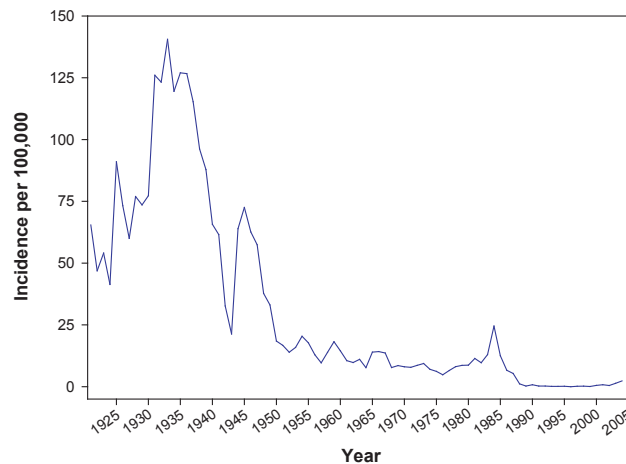
Reservoir: Humans

Mode of transmission: Syphilis is transmitted through direct sexual contact with an infected individual, or contact with their blood. This disease can also be transmitted vertically from infected mothers to their newborns. Groups at highest risk of contracting syphilis are individuals with more than one sexual partner, injection drug users and their partner(s), people whose sexual partner has syphilis and people who have been diagnosed with another STI.

Prevention Measures: Correct and consistent use of condoms is an effective way of preventing syphilis infection. Other effective methods of prevention include those noted under other sexually transmitted infections (chlamydia). Furthermore, infection in infants can be prevented through prenatal screening, testing, and treatment for syphilis. The prenatal program currently in place in Alberta screens pregnant mothers for a number of blood borne pathogens and works towards preventing vertical transmission of the disease.

Syphilis Disease Trends

Figure 117 Infectious Syphilis incidence per 100,000 population, Alberta 1921 to 2004



Syphilis has been a notifiable disease in Canada since 1940 when rates were very high. Infectious syphilis rates have declined since 1984, following a peak of 24.5 cases per 100,000. Rates reached their lowest point in 1996 when only 36 cases (1.3 cases per 100,000) of infectious syphilis were reported. This improvement was credited to aggressive public health interventions such as screening, education, diagnosis, contact tracing and partner notification. The syphilis rate in Canada has subsequently shown a significant increase to 3.0 cases per 100,000 in 2003.

In Alberta a significant syphilis outbreak occurred in 1984 when 574 cases were reported. Subsequent years showed a decline in the number of cases. Since 1990, fewer than 100 cases have been reported annually in the province, although the rate of syphilis in Alberta is increasing. In 2004, 74 cases of infectious syphilis (2.3 cases per 100,000) were reported.

More than 90 per cent of infectious syphilis cases in Alberta are reported from the Calgary and Capital (Edmonton) Health Regions. Calgary Health Region experienced isolated outbreaks of syphilis in 2000 and 2001 as did Capital Health in 2003. Currently, men are three times more likely to be diagnosed with syphilis than women with men age 20 to 24 years mostly likely to be diagnosed.

Hepatitis C

Description

Identification: Hepatitis C causes an inflammation of the liver. Symptoms include anorexia, abdominal pain, nausea and vomiting with progression to jaundice. A high proportion of cases are asymptomatic (90 per cent) although most HCV infections will become chronic. Diagnosis is primarily by detection of HCV antibody.

Infectious Agent: Hepatitis is caused by the hepatitis C virus (HCV), an RNA virus.

Occurrence: Worldwide. The Middle East has the highest prevalence of disease. Certain risk groups such as injection drug users are more likely to be infected.

Reservoir: Humans

Mode of Transmission: Hepatitis C (HCV) is primarily transmitted through exposure to infected blood. Transmission occurs more often in people with large or repeated direct exposure to blood or blood products. The most frequent method of transmission is injection drug use (IDU). Since 1990, the risk of transmission from screened, donated blood, manufactured blood products and transplanted organs has been minimal.

Prevention Measures: Avoidance and education about high risk behaviours is the best way to prevent hepatitis C. Health care workers should use universal precautions and report needle stick injuries immediately. There is no vaccine or post exposure prophylaxis for hepatitis C.

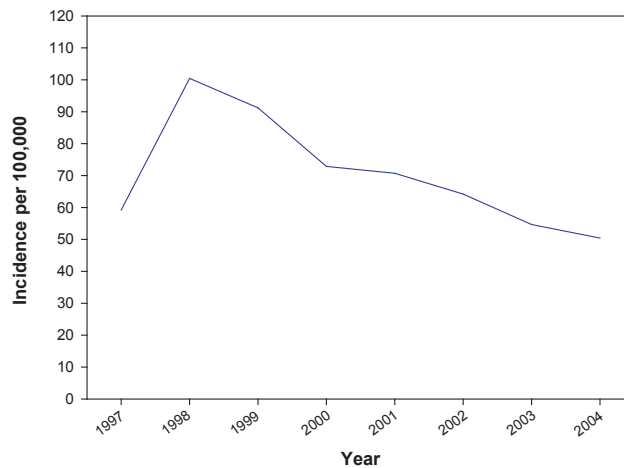
Hepatitis C Disease History and Trends

Hepatitis C is a major public health concern worldwide. It is estimated that approximately three per cent of the world's population, or 170 million persons worldwide, are infected. In Canada in 2000, it was estimated that approximately 0.8 per cent of the population, or more than 240,000 people were infected by hepatitis C.

When hepatitis C was first identified in 1989, it was originally known as “non-A, non-B” hepatitis. In 1997, Alberta designated hepatitis C as a notifiable disease. After the initial spike in reported cases, due to new and old cases being reported, the rate of newly diagnosed hepatitis C has been decreasing. In 2004, there were 1,603 cases of hepatitis C (50.4 cases per 100,000) reported in Alberta.

In Alberta, almost twice as many males as females are diagnosed with hepatitis C; the rate of infection is greater in males in every age category. The peak rate of HCV infection occurs among men 40 to 59 years of age, which may reflect infection acquired several years prior to diagnosis.

Figure 118 Age-standardized hepatitis C incidence, Alberta 1997 to 2004



HIV/AIDS

Description

Identification: Initial infection with HIV usually presents as an acute infection (known as seroconversion illness) with symptoms including: fatigue, headache, rash and weight loss. The infection then becomes asymptomatic for an undetermined period of time.¹⁷⁷ Late stage infection is known as AIDS (Acquired Immunodeficiency Syndrome) and characterized by opportunistic infections and cancers.

Infectious Agent: HIV is caused by human immunodeficiency virus, a retrovirus.

Occurrence: Worldwide. HIV is endemic in sub-Saharan Africa, South East Asia, Latin America, parts of the Caribbean, and in many developing nations.

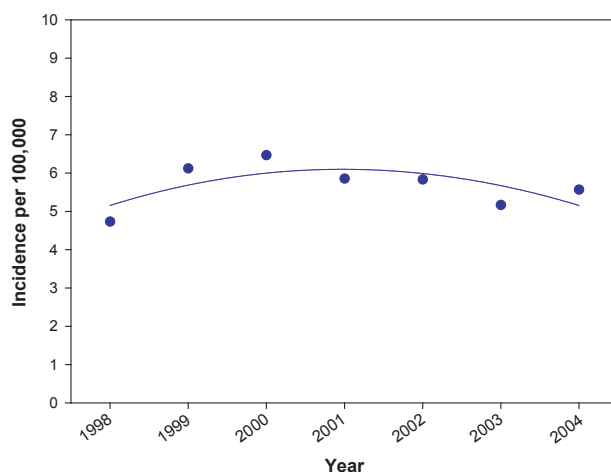
Reservoir: Humans

Mode of Transmission: HIV is transmitted through direct sexual contact with an infected individual, or contact with their blood. This disease can also be transmitted vertically from infected mothers to their newborns.

Prevention Measures: Correct and consistent use of condoms is an effective way of preventing HIV transmission.¹⁷⁸ Other effective methods of prevention include those noted under sexually transmitted infections (chlamydia).

HIV Disease Trends

Figure 118 HIV incidence per 100,000 population, Alberta 1998 to 2003



AIDS was first recognized in 1981 though isolated cases occurred in the 1970s. AIDS has been documented in virtually all countries of the world, among all races, ages and social classes. The World Health Organization (WHO) estimated that at the end of 2001, over 40 million people worldwide were living with HIV/AIDS.¹⁷⁹

AIDS in Canada was first recognized in the early 1980s and testing programs became available in 1985. Initially, the disease was most prevalent among the male homosexual population. As the infection in North America became more prevalent, new at risk populations emerged, with an increasing proportion of people becoming infected through unprotected heterosexual intercourse and intravenous drug use.

The first HIV positive person was identified in Alberta in 1979.¹⁸⁰ AIDS became reportable in 1983 and HIV became a notifiable disease in 1998. Since 1998, an average of 176 new HIV positive individuals are identified each year. The three most common risk categories for HIV infection in Alberta are injection drug use, men who have sex with men, and heterosexual relations with a partner who is at risk.

Men are more than twice as likely as women to be diagnosed with HIV. In 2003, the highest rate of HIV infection was among men 30 to 39 years of age with 50 cases (21.1 cases per 100,000) reported.

Food and Waterborne Communicable Diseases

In addition to diseases transmitted directly from person to person, a number of diseases are transmitted through food and water. Although a comprehensive list contains hundreds of enteric disease, this section will focus on the five enteric diseases most common in Alberta: campylobacteriosis, giardiasis, *E.coli* O157:H7, salmonellosis, and typhoid/paratyphoid.

Campylobacteriosis

Description

Identification: Campylobacteriosis has variable severity of symptoms. Common symptoms include diarrhea, malaise, fever and abdominal pain. It may cause a bacteremia – which most often occurs in persons with underlying medical conditions. In general, campylobacteriosis is self-limiting and symptoms cease within two to five days. One in every 1,000 cases also reports cases: Guillain-Barré syndrome.¹⁸² This syndrome occurs when a person's immune system is triggered to attack the body's nerves, thereby resulting in paralysis.¹⁸³

Infectious Agent: Campylobacteriosis is caused by *Campylobacter* species most commonly *Campylobacter jejuni* or *Campylobacter coli*. There are over 90 biotypes and serotypes.

Occurrence: Worldwide. *Campylobacter* causes 5 to 14 per cent of diarrheal illness worldwide and is an important cause of traveler's diarrhea.

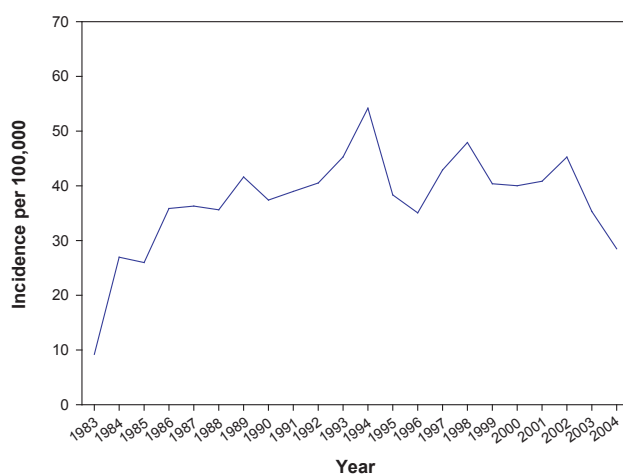
Reservoir: *Campylobacter* bacterium is found in domestic and wild animals, especially poultry, dogs, cats, and pigs.¹⁸⁴

Mode of transmission: The most common source of transmission of campylobacteriosis is the ingestion of contaminated food - in particular raw or undercooked poultry or meat, unpasteurized milk, or contaminated water. Direct contact with animals and pets that are infected is a significant mode of transmission. Person to person transmission (fecal-oral) occurs as well.

Prevention Measures: Practicing preventative techniques is the best way to stop the spread of campylobacter bacterium. Methods of prevention include ensuring that food is thoroughly cooked, milk is pasteurized and hands are washed after contact with pets and animals.¹⁸⁵

Campylobacteriosis Disease Trends

Figure 120 Campylobacteriosis incidence per 100,000 population, Alberta 1983 to 2003



Campylobacteriosis is more common in the warmer summer months in Alberta and Canada.¹⁸⁶ The rate of campylobacteriosis in Canada has been decreasing slightly over the past 10 years. The national rate in 2003 was 29.3 cases per 100,000 population.

Campylobacteriosis is the most common enteric disease in Alberta. Between 1987 and 1999, Alberta's rate remained below the national average. Since 1993, Alberta has reported between 900 and 1,400 cases of campylobacteriosis each year. The rate in 2004 was 28.5 cases per 100,000 (906 cases) – higher than the national rate. Infants and young children are infected with *Campylobacter* more frequently than any other age group.

Southern Alberta is disproportionately affected by campylobacteriosis compared to the central and northern parts of the province.

Giardiasis

Description

Identification: Giardiasis is often asymptomatic. Symptomatic individuals may suffer a variety of symptoms including: acute watery diarrhea, abdominal cramps, distention, and anorexia. Periods of diarrhea may alternate with constipation until treated or symptoms resolve spontaneously. Vomiting and fever occur less commonly.

Infectious Agent: Giardiasis is caused by the parasite *Giardia lamblia*

Occurrence: Worldwide. *Giardia* is one of the most common causes of endemic and epidemic diarrhea throughout the world. International travelers and those who spend time in the wilderness may be at a high risk for infection.

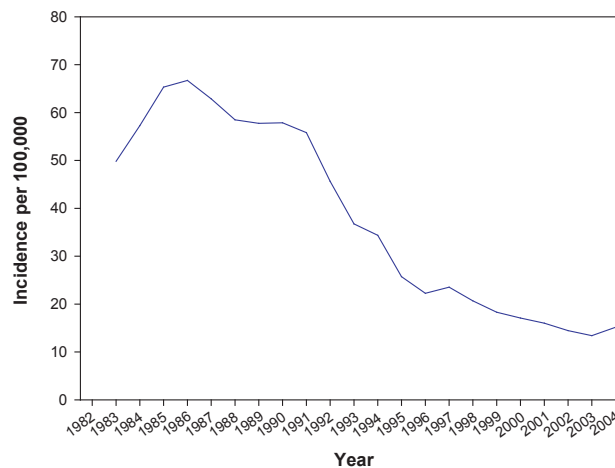
Reservoir: Humans are the principle reservoir of *Giardia lamblia*. Domestic and wild animals, including beavers and bears, have also been identified as potential reservoirs.

Mode of transmission: The primary mode of transmission is through consumption of contaminated water and occasionally from swimming in contaminated water. Person to person transmission (fecal–oral) is the second most common mode of spread. Foodborne transmission has also been documented.

Prevention Measures: Practicing preventative techniques is the best way to stop the spread of Giardiasis. Methods of prevention include exercising personal hygiene, thoroughly treating any drinking water, and properly cooking food.

Giardiasis Disease Trends

Figure 121 Giardiasis incidence per 100,000 population, Alberta 1983 to 2002



The most common enteric parasite in Canada is *Giardia lamblia* - the most frequent cause of non-bacterial diarrhea. Giardiasis is more common in the warmer summer months in Alberta and Canada.¹⁸⁷

In Alberta, the rate of giardiasis has decreased from 66.7 cases per 100,000 in 1986 to 15.1 cases per 100,000 in 2004. The number of cases reported decreased from 1,635 in 1986 to 482 in 2004. Young children are infected with *Giardia lamblia* more frequently than any other age group. Generally, the highest rates of infection are in southern Alberta and along the western border of the province.

Haemorrhagic Colitis (*E. coli* O157:H7)

Description

Identification: *E. coli* O157:H7 is one of many strains of the *Escherichia coli* bacteria.¹⁸⁸ These bacteria produce a toxin that attacks the lining of the intestine.¹⁸⁹ Diarrhea, which may be bloody, is the most common symptom. Approximately two to seven per cent of cases develop a serious complication called Haemolytic Uraemic Syndrome (HUS).¹⁹⁰ HUS results in the destruction of red blood cells and the failure of the kidneys.¹⁹¹

Infectious Agent: Haemorrhagic colitis is caused by the *E. coli* O157:H7 bacteria.

Occurrence: *E. coli* O157:H7 is a significant issue in North and South America, Europe, South Africa, Japan and Australia.

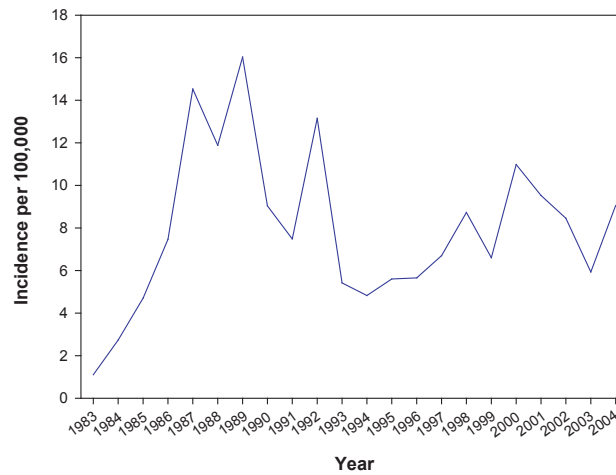
Reservoir: Cattle are the principle reservoir of *E. coli* O157:H7. Humans may also serve as a reservoir.

Mode of transmission: The predominant mode of transmission is through the ingestion of contaminated food, often related to inadequate cooking, or through cross-contamination during food preparation. Infection can also occur through ingesting contaminated drinking water. Person to person transmission (fecal-oral) occurs as well.

Prevention Measures: Practicing preventative techniques is the best way to stop the spread of Haemorrhagic Colitis. Methods of prevention include exercising personal hygiene, thoroughly cooking any suspect food (especially beef), and avoiding contaminated water.

Haemorrhagic Colitis Disease Trends

Figure 122 Haemorrhagic colitis incidence per 100,000 population, Alberta 1983 to 2003



Sporadic cases and outbreaks of *E. coli* O157:H7 have occurred in Canada since the first reported outbreak in the United States in 1982. In Canada, the incidence of *E. coli* has remained stable with 4.1 to 7.1 cases per 100,000 reported between 1990 and 1999 with an average of 1,407 cases reported annually. In 2000, there was a significant increase in national cases due to an outbreak in the town of Walkerton, ON. More than 2,000 cases of *E. coli* O157:H7 were reported, bringing the national rate up to 9.8 cases per 100,000 in 2000.

Alberta typically has a higher incidence of *E. coli* O157:H7 than the national rate. Since 1991, Alberta has reported approximately 300 cases of *E. coli* annually. The rate in 2004 was 9.1 cases per 100,000 (288 cases). *E. coli* O157:H7 is most common among children one to 14 years of age, particularly among children one to four years of age. Typically, the highest rate of infection is in southern Alberta.

Salmonellosis

Description

Identification: Salmonella bacteria attack the digestive system.¹⁹² Salmonellosis symptoms include: diarrhea, cramps and headache. A small number of persons will go on to develop pains in their joints, irritation of the eyes, and painful urination.¹⁹³ These sequels may last for months or years and can lead to chronic arthritis.¹⁹⁴

Infectious Agent: Salmonella is caused by bacteria from the *Salmonella* group

Occurrence: Worldwide. Salmonellosis is endemic in many parts of the world.

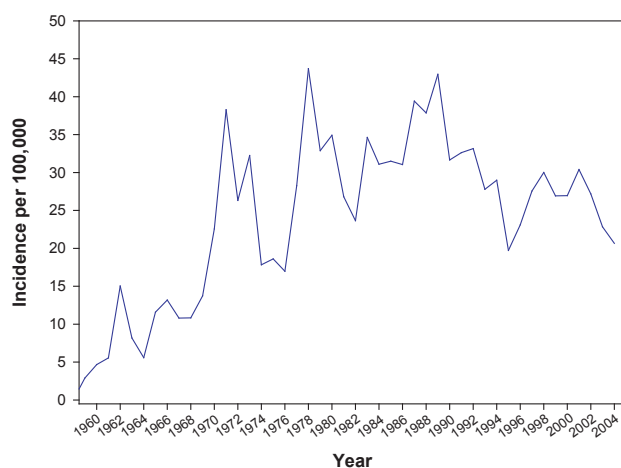
Reservoir: Many wild and domestic animals, including reptiles, birds, dogs, cats, horses and farm animals.¹⁹⁵ Humans may also serve as a reservoir.

Mode of transmission: The predominant mode of transmission is through the ingestion of contaminated food, often related to inadequate cooking or through cross-contamination of foods during preparation. Foods of animal origin are the predominant source of transmission. This includes poultry, red meat, eggs, unpasteurized milk and other dairy products. Pet reptiles are another potential source of these bacteria. Person to person transmission (fecal–oral) also occurs.

Prevention Measures: Preventative techniques are the only way to stop the spread of salmonellosis. Methods of prevention include exercising personal hygiene, thoroughly cooking any suspect food, and avoiding contaminated water. Due to the high enteric outbreak potential of salmonellosis, the prompt reporting of a salmonellosis case for outbreak investigations also aids in prevention.

Salmonella Disease Trends

Figure 123 Salmonella incidence per 100,000 population, Alberta 1960 to 2003



Salmonellosis is not endemic in Canada; Approximately 5,500 cases are reported each year. In 2003, the national rate was 14.5 cases per 100,000.

Alberta typically has a higher incidence of salmonellosis than the national rate. Recently, rates of salmonellosis in Alberta have ranged from 22.9 to 30.6 cases per 100,000 population; this represents approximately 900 cases per year. The highest rate of salmonellosis are among those four years of age or less. The occurrence of approximately 10 to 15 small outbreaks annually can impact the age and geographical distribution of cases.

Typhoid/paratyphoid

Description

Identification: Both typhoid and paratyphoid cause similar symptoms with paratyphoid producing a less severe infection. Common symptoms include: fever, headache, malaise and constipation. Complications associated with these diseases include confusion, delirium, intestinal perforation, and death (15 to 20 per cent of untreated cases).¹⁹⁶ In most cases, typhoid is not a chronic disease, however, a few people remain infected for life.

Infectious Agent: Typhoid and paratyphoid are caused by *Salmonella typhi* and *Salmonella paratyphi* bacteria, respectively.

Occurrence: Worldwide. Typhoid and paratyphoid are endemic of many developing countries, particularly the Indian subcontinent, South and Central America, and Africa.

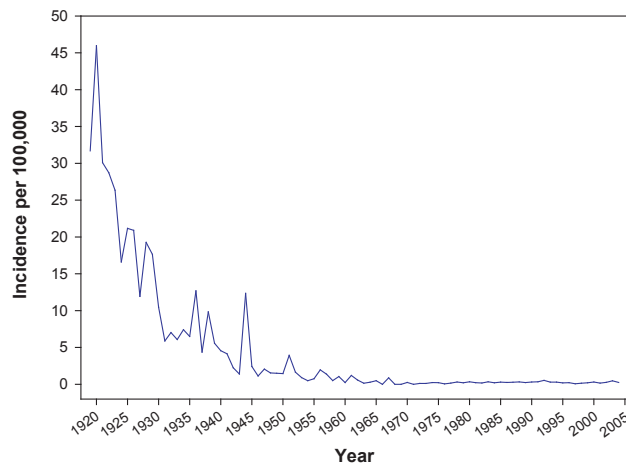
Reservoir: Humans

Mode of transmission: The predominant mode of transmission is through the ingestion of contaminated food or drinking water. Person to person transmission (fecal-oral) also occurs.

Prevention Measures: Immunization is recommended for travellers at risk for acquiring typhoid. Prevention also reduces the risk of typhoid and paratyphoid. Methods of prevention include exercising personal hygiene, thoroughly cooking any suspect food, and avoiding contaminated water. Due to the high enteric outbreak potential of typhoid and paratyphoid, the prompt reporting of a suspected case for outbreak investigations also aids in prevention.

Typhoid Disease Trends

Figure 124 Typhoid incidence per 100,000 population, Alberta 1919 to 2003



The annual incidence of typhoid fever is estimated at about 12 to 33 million cases worldwide with approximately 600,000 deaths.

The incidence of typhoid in Canada is very low with the number of cases reported annually remaining fairly constant. Between 1993 and 2002, 806 cases were reported in Canada, with an average of 73 cases per year. The greatest risk of typhoid infection for Canadians occurs while they are traveling in countries where sanitation is poor.

In Alberta, all typhoid and paratyphoid cases are the result of foreign travel, especially to areas where typhoid is endemic. A case of typhoid is uncommon in Alberta. Eighty eight cases were reported between 1993 and 2004 with an average of six cases per year.

HISTORICAL VIGNETTE

Typhoid in Alberta

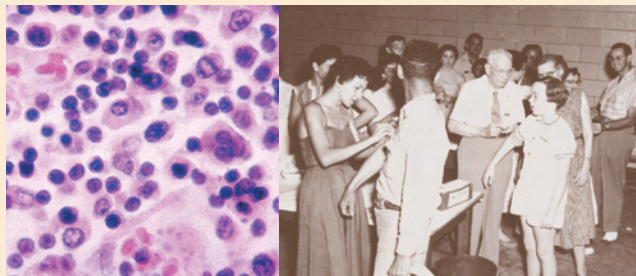
Mary Mallon seemed a healthy woman when a health inspector knocked on her door in 1907, yet she was the cause of several typhoid outbreaks. Since Mary was the first “healthy carrier” of typhoid fever in the United States, she did not understand how someone not sick could spread disease.¹ Typhoid fever is a life-threatening illness caused by the bacterium *Salmonella Typhi* which lives only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract. In addition, a small number of persons, called carriers, recover from typhoid fever but continue to carry the bacteria. Both ill persons and carriers shed *S. Typhi* in their feces.²

In Alberta in 1908, the Provincial Health Officer (PHO) stated that “Owing to the rapid growth of the municipalities and villages in many cases sanitation has failed to keep abreast of the increase in population, and the inevitable penalty – typhoid fever – has appeared, with its heavy toll in lives and money”. This has also been the case in many mining and railway camps. Immunization for typhoid fever became available after 1911; still 638 cases of the disease were reported in Alberta in 1913. The larger cities reported over three-quarters of the cases but the PHO was quick to indicate that “This does not mean these cities are insanitary, but being hospital centres, many cases originating in nearby towns are brought in to them for treatment.” Deaths from typhoid during the year were 160; this is a high percentage, the explanation of which is two-fold. Firstly, many mild cases are not reported and secondly, very many of the cases which occur in construction camps only get to the hospital after a

long and exhausting journey (Report of the PHO, 1913).

Better sanitation and a more general recognition of the protection afforded by the typhoid vaccine accounted for a significant drop in typhoid cases in Alberta in the years that followed. The University of Alberta was now producing typhoid vaccine at very low cost and the use of the vaccine had met with a great deal of success, especially among the employees of the Canadian Pacific Railway (Report of the PHO, 1913, 1914). By 1917, the number of typhoid cases in Alberta had dropped to 127.

Typhoid fever is still common in the developing world, where it affects about 21.5 million persons each year. Typhoid fever can be contracted by consumption of food or beverages handled by a person who is shedding *S. Typhi* or if sewage contaminated with *S. Typhi* bacteria gets into the water used for drinking or washing food. Watching what you eat and drink when traveling is as important as being vaccinated.



Typhoid - histopathology of lymph node

Sources:

¹ <http://history1900s.about.com/library/weekly/aa062900a.htm>

² http://www.cdc.gov/ncidod/dbmd/diseaseinfo/typhoidfever_g.htm

Report of the Provincial Health Officer, Department of Agriculture, Alberta, 1908, 1913, 1914, 1917

Vaccine-Preventable Communicable Diseases

Diphtheria

Description

Identification: Diphtheria bacteria target the respiratory track, specifically the tonsils, pharynx and larynx. A less dangerous form of the infection occurs in cutaneous diphtheria, where the skin is affected. Myocarditis, polyneuritis, and airway obstruction are common complications of respiratory diphtheria; death occurs in five to 10 per cent of respiratory cases.¹⁹⁷ Some cases of diphtheria are asymptomatic.

Infectious Agent: Diphtheria is caused by the toxin-producing strain of *Corynebacterium diphtheriae*.

Occurrence: More common in temperate weather zones. Diphtheria is a rare disease in countries where immunization rates are high.

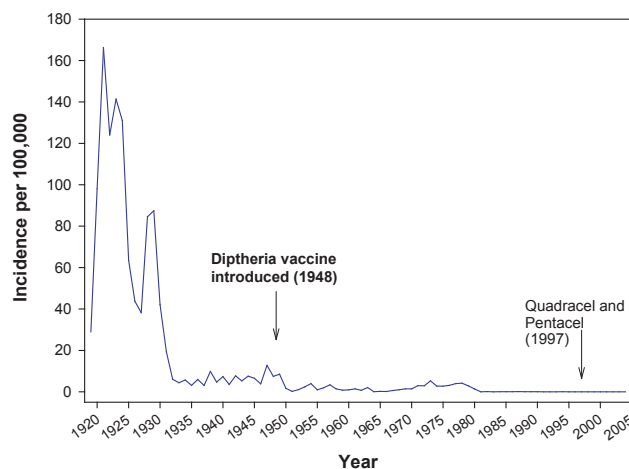
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with a case or carrier. Sporadic cases most often result from exposure to carriers who are asymptomatic.

Prevention Measures: Mass diphtheria prevention can only be achieved through vaccination, and in cases of active disease, the isolation of the index case and the treatment of contacts with antibiotics.

Diphtheria Disease Trends

Figure 125 Diphtheria incidence per 100,000 population, Alberta, 1920 to 2003



HISTORICAL VIGNETTE

Diphtheria in Alberta

Diphtheria is caused by bacteria infecting the nose and throat so a person may have trouble breathing or they may have skin or ear infections. The bacteria also produce a poison that can cause paralysis or heart damage.¹ Before 1900, diphtheria was one of the most common causes of death in children under five years of age, especially babies. Diphtheria is a severe disease; even with treatment, about 10% of people infected with diphtheria die.

In Alberta in 1908, diphtheria was prevalent, particularly in Calgary, Edmonton, Lethbridge and Pincher Creek. The Report of the Provincial Health Officer also notes that, "Great difficulty was experienced in controlling and stamping out an outbreak of diphtheria amongst the Galicians and Ruthenians in the vicinity of Mundare."

Approximately 12,000 cases and 1,000 deaths due to diphtheria occurred every year in Canada until 1920. Diphtheria toxoid, the vaccine against diphtheria, was developed in France and Canada in the 1920's. In 1929, Dr. Harold A. Hamman made five dogsled trips in 25 days and covered 300 miles to diagnose, treat and vaccinate the inhabitants of Fort Vermillion and Little Red River in an effort to protect two towns from diphtheria.

By the 1930's, routine immunization became widespread. Still, from 1937–1938, Alberta suffered from serious smallpox, influenza and diphtheria epidemics.² Infectious diseases were the leading cause of death worldwide during the early 1900's. Now, as the result of immunization programs, vaccine-preventable diseases cause less than 5 per cent of all deaths in Canada. By 1983, fewer than five cases of diphtheria were reported in Canada; there were no deaths.³

Despite these successes, vaccine-preventable diseases are still with us. There is a grave potential for the disease to resurface due to low levels of immunity among Canadian adults. When immunization coverage rates fall, epidemics of disease occur. Falling immunization rates in Russia have resulted in tens of thousands of cases of diphtheria.



Diphtheria

Sources:

¹ http://www.health.gov.ab.ca/public/immunizations/pdf/CD88_dTap_ivp.pdf
Report of the Provincial Health Officer, Department of Agriculture, Alberta, 1908.

² [http://www.albertadoctors.org/bcm/ama/ama-website.nsf/0/00707B190EE25FC487256F9D0072CB58/\\$File/FACT_SHEET.PDF?OpenElement](http://www.albertadoctors.org/bcm/ama/ama-website.nsf/0/00707B190EE25FC487256F9D0072CB58/$File/FACT_SHEET.PDF?OpenElement)

³ <http://www.immunize.cpha.ca/english/consumer/con-idv/diphther.htm>

Diphtheria is typically a disease of colder months in temperate climates usually involving children who are not immunized, or groups of adults whose immunization has been neglected.¹⁹⁸ In Canada the number of diphtheria cases has decreased significantly as the result of vaccination.

The highest ever recorded number of diphtheria cases in Canada was in 1924 when approximately 9,000 cases were reported. In 1926, diphtheria toxoid was licensed for use in Canada and introduced into routine immunization in 1930.¹⁹⁹ This led to a substantial decline in diphtheria morbidity and mortality. Since 1983, there have been fewer than five cases reported in Canada each year with no deaths. The majority of cases have occurred in adults with inadequate protection.

From 1981 to 1994, five cases and four carriers were reported in Alberta. Only two of the cases were among infants less than two years of age. No cases have been reported since 1995.

Hepatitis A

Description

Identification: Hepatitis A illness often has an abrupt onset of symptoms that include: fever, malaise, anorexia and abdominal discomfort. However, with Hepatitis A, many adults and most children may be infected (and infectious), but have no or very mild symptoms.

Infectious Agent: Hepatitis A is caused by the hepatitis A virus (HAV).

Occurrence: Worldwide. The risk groups for hepatitis A varies between developed and developing countries.

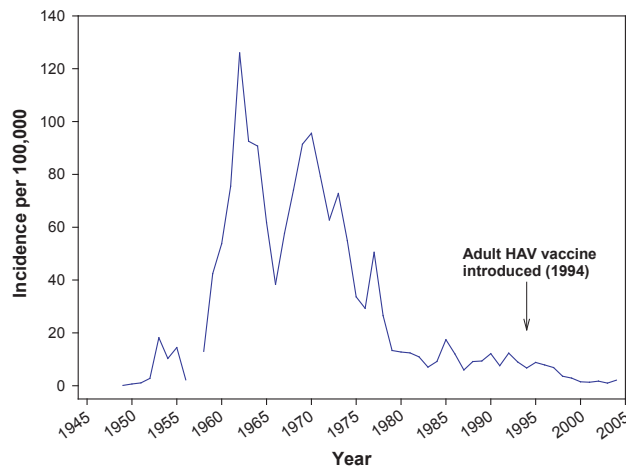
Reservoir: Humans

Mode of transmission: The predominant mode of transmission is through the ingestion of contaminated food, or drinking water in countries where hepatitis A is endemic. Person to person transmission (fecal–oral) also occurs. In Canada and other industrialized nations, individuals at increased risk include foreign travellers, children and staff of day-care facilities, injection drug users, and individuals with multiple male sex partners.

Prevention Measures: The best way to prevent the spread of hepatitis A is to practice preventative techniques. Methods of prevention include exercising personal hygiene, thoroughly cooking food, and avoiding contaminated water. It is also possible to be vaccinated against hepatitis A. Immunization is recommended for foreign travelers and other high risk groups. The prompt reporting of a hepatitis A case for outbreak investigations also aids in prevention.

Hepatitis A Disease Trends

Figure 126 Hepatitis A incidence per 100,000 population, Alberta 1945 to 2003



Canada has a relatively low incidence of hepatitis A. Approximately 1,000 to 3,000 cases are reported each year. The rate has varied from over 10 cases per 100,000 population in 1991 to 3.6 cases per 100,000 in 1998.

Hepatitis A became reportable in Alberta in 1969. The incidence of the disease has been decreasing steadily since the 1970s. Hepatitis A vaccine was introduced in 1994 and is primarily used for travelers and those at high risk. The average incidence over the last ten years is 7.7 cases per 100,000. The rate of hepatitis A is highest among those five to nine years of age with 16.9 cases per 100,000. In the past five years, 235 cases of Hepatitis A were reported (2000 to 2004). The possible source of infection was not known for approximately half (46 per cent) of the cases.

Hepatitis B

Description

Identification: Hepatitis B is an inflammation of the liver. Symptoms include anorexia, abdominal pains, nausea and vomiting, with progression to jaundice. About 10 per cent of adults develop a chronic disease, which can lead to cirrhosis and cancer of the liver later in life. Approximately 10 per cent of adults and 90 per cent of infants who get infected with the hepatitis B become carriers of the hepatitis B virus.

Infectious Agent: Hepatitis B is caused by the hepatitis B virus, a DNA virus

Occurrence: Worldwide. Hepatitis B is endemic in parts of Africa and Asia.

Reservoir: Humans

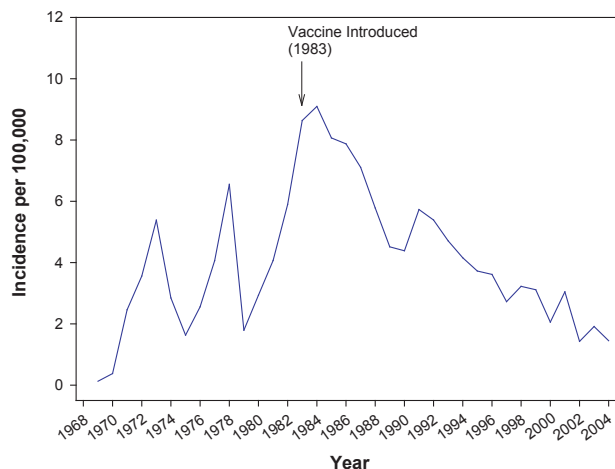
Mode of transmission: The most common mode of transmission is via exposure to blood and body fluids, sexual contact or vertical transmission from mother to infant.

Prevention Measures: Hepatitis B transmission can be prevented by active immunization with a hepatitis B vaccine; adopting safe sex practices; and administering hepatitis B immune globulin to people who have had recent contact (seven days or less) with infected body fluids.²⁰⁰

Infection in infants can be prevented through prenatal screening and testing for hepatitis B. The prenatal program currently in place in Alberta screens pregnant mothers for a number of blood borne pathogens and works towards preventing vertical transmission of the disease.

Hepatitis B Disease Trends

Figure 127 Hepatitis B incidence per 100,000 population, Alberta 1969 to 2003



In Canada, acute hepatitis B has been reportable since 1969. The disease rate has been decreasing since 1994, when the rate was 10.6 cases per 100,000. In 2003 the national rate of hepatitis B was 2.7 cases per 100,000. This decrease is partially the result of the universal hepatitis B immunization programs for children and adolescents across Canada. Hepatitis B is more common in certain risk groups such as injection drug users, individuals with multiple sex partners and health care workers that handle blood products.

The rate of acute hepatitis B disease in Alberta has been decreasing since 1983. The average disease rate between 2000 and 2003 is 2.1 cases per 100,000. In the fall of 1995, Alberta Health and Wellness began immunization of grade five students with the hepatitis B vaccine. The rates of acute infections, especially among those under 20 years of age have continued to drop significantly since then. In 2004, no cases of acute hepatitis B occurred among those under 20 years of age. Chronic carriers exist, but as they are not currently reportable, it is very difficult to judge how many there are in Alberta.

Haemophilus Influenzae type b (Hib)

Description

Identification: Invasive *Haemophilus Influenzae* type (Hib) bacteria target the lower respiratory tract and are a cause of meningitis, pneumonia, and epiglottitis in children. An infection with Hib bacteria is fatal in three to six per cent of cases, and up to 20 per cent of surviving patients have permanent hearing loss or other long-term sequelae.²⁰¹

Infectious Agent: *Haemophilus Influenzae* type b is a bacterium.

Occurrence: Worldwide. In developed countries, Hib is not common. Hib continues to be a major cause of infection in infants and children in developing countries.

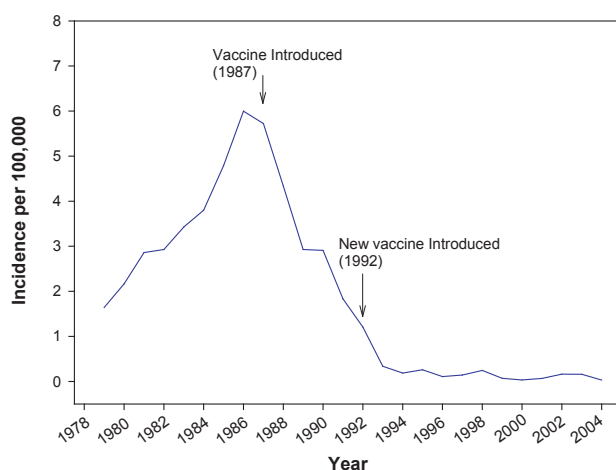
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with a case or carrier.²⁰²

Prevention Measures: Immunization is the best way to prevent invasive Hib disease.²⁰³

Haemophilus influenzae Type B Disease Trends

Figure 128 *Haemophilus influenzae* type B incidence per 100,000 population, Alberta, 1978 to 2003



Hib was once the most common cause of meningitis, causing a serious infection in approximately one in 300 Canadian children.²⁰⁴ The first Hib vaccine was licensed in 1985 for children over two years of age. A conjugate vaccine was licensed in 1988 for infants two months of age and older. Prior to the introduction of Hib conjugate vaccine, there were approximately 2,000 cases of Hib reported each year. The number of cases has declined since 1988.

Alberta reported 147 cases of Hib in 1986. Rates were highest in children less than one year of age followed by children aged one to four years. In 1989, after the introduction of the conjugate vaccine, 76 cases of Hib were reported. In 1992, a new Hib vaccine was introduced in Alberta. By 1993, rates in children less than one year of age had drastically declined; there were no cases of Hib among infants less than one year of age. Since 1999, only three cases of Hib have occurred in infants less than one year of age. Only 51 cases of Hib were reported in Alberta between 1993 and 2004.

HISTORICAL VIGNETTE

Influenza in Alberta

Influenza is an infection of the lungs and airways caused by a virus. As with many other viral illnesses, there is no cure. While influenza can be mild in some people, in others it can be very serious - contributing to the development of illnesses such as pneumonia and can even result in death.¹ While influenza is a yearly affliction, rarely does it reach epidemic proportions.

When an epidemic occurs over a wide geographic area and affects a large proportion of the population, it is referred to as a pandemic.² The Spanish Influenza pandemic of 1918-19 is the catastrophe against which all modern pandemics are measured. It is estimated that approximately 20 to 40 per cent of the worldwide population became ill and that over 20 million people died – more than during World War I. Many people died very quickly; some people who felt well in the morning became sick by noon, and were dead by nightfall.³ One of the most unusual aspects of the Spanish influenza was its ability to kill young adults; the attack rate and mortality was highest among adults 20 to 40 years old.

Returning soldiers brought the worldwide flu epidemic to Alberta in October 1918. It quickly made its way to even the remotest communities. When it was over, 38,000 people in the province had been infected and 4,000 had died.⁴ A variety

of home remedies and many cures were marketed to “beat the ‘flu’”. Some sprinkled sulphur in their shoes, others wore face masks, while salt herring tied around the neck was also touted as a remedy.⁵ Influenza not only brought death but social and economic disruptions as well. Schools throughout all of Canada were closed; all celebrations and get-togethers were discouraged as well as mass gatherings at sporting events.⁶

In recent times, influenza pandemics have occurred a few times, but the severity of the Spanish Influenza virus has not been seen again. With about one quarter of Canadians contracting the virus during the winter months, annual influenza vaccinations are given to persons considered to be at risk. Medical experts predict that an influenza pandemic could occur again at any time. In response, the Government of Alberta began work in 1999 to prepare the health system and the province for an influenza pandemic.⁷



Provincial Archives of Alberta, UV6

Sources:

- ¹ <http://www.health.gov.ab.ca/influenza/Index.html>
- ² <http://www.answers.com/topic/pandemic>
- ³ <http://www.health.gov.ab.ca/influenza/PandemicHistory.html>
- ⁴ Alberta History publication / Spring 2005
- ⁵ Lung Association of Canada (<http://www.Lung.ca/ca/articles/19991201killers.html>)
- ⁶ <http://www.elkpointhistory.ab.ca/Steve/Events/flu.htm>
- ⁷ <http://www.health.gov.ab.ca/influenza/PandemicPlan.html>

Influenza

Description

Identification: Influenza causes a variety of symptoms including fever, malaise, sore throat and cough. This virus can cause mild to severe illness including: secondary bacterial pneumonia, dehydration, worsening of chronic medical conditions, sinus problems, ear infections, and at times death.²⁰⁵

Infectious Agent: Influenza is caused by the influenza virus.

Occurrence: Worldwide

Reservoir: Humans

Mode of transmission: Transmission of influenza is airborne from an infected person into the air. Direct contact with respiratory secretions will also transmit disease.

Prevention Measures: Immunization is the best way to prevent influenza. The influenza vaccine causes less severe infection in the vaccinated individual. The virus changes its coat every season, making each year's version of the flu unrecognizable to the immune system.²⁰⁶ Subsequently, immunity to the flu must be re-established with a new flu shot every fall.²⁰⁷ In addition to immunization, hand washing can reduce the transmission of influenza.

Influenza Disease Trends

Figure 129 Age Standardized influenza incidence per 100, Alberta 1986 to 2003

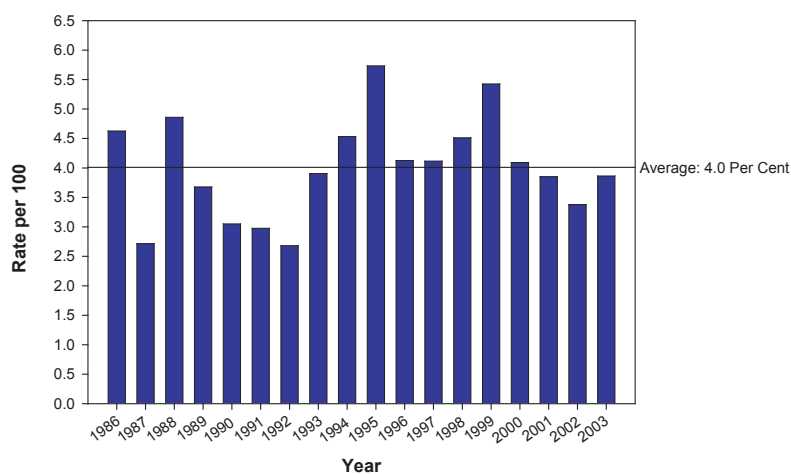
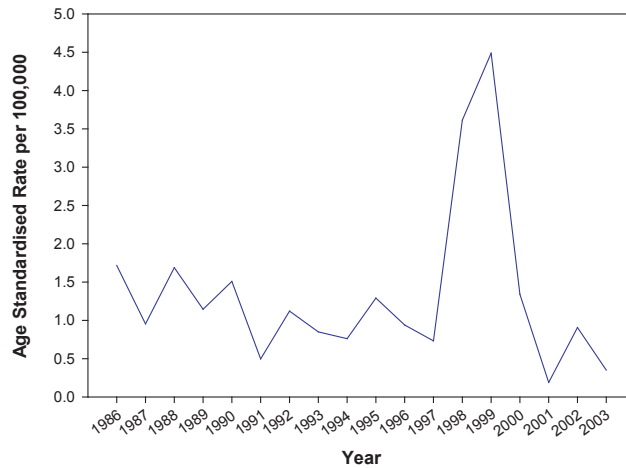


Figure 130 Age standardized mortality attributable to influenza per 100 population, Alberta 1986 to 2003



The influenza virus can rapidly produce epidemics and pandemics. The Spanish flu of 1919 resulted in 20 to 50 million deaths worldwide. Since then, pandemics have occurred in 1957 and 1968. Another pandemic is expected to occur sometime in the near future

Throughout Canada and Alberta, outbreaks of influenza are common in the winter. Long-term care facilities and schools are most frequently affected by outbreaks. In Alberta, the rate of clinically diagnosed influenza has remained fairly constant over the past 15 years with approximately 4.0 cases per 100. In 1999, Alberta experienced a particularly virulent strain of influenza that caused increased mortality. Influenza infection resulted in 109 deaths that year compared to an average of 33.4 deaths for the previous five years.

Rubella

Description

Identification: Rubella is also known as ‘German Measles’. The virus replicates in the nose, throat and the lymph nodes. While rubella is a minor disease in children causing mainly a rash, in adults it can cause sharp and severe pain in the joints, arthritis, inflammation of the brain, and excessive bleeding.

Congenital Rubella Syndrome (CRS) occurs in infants whose mother contracted rubella during pregnancy.²⁰⁸ These infants are often born with complications such as deafness, cataracts, heart defects, abnormal smallness of the head, mental retardation, bone alterations and liver and spleen damage.²⁰⁹

Infectious Agent: Rubella is caused by the rubella virus

Occurrence: Worldwide, especially in unimmunized populations

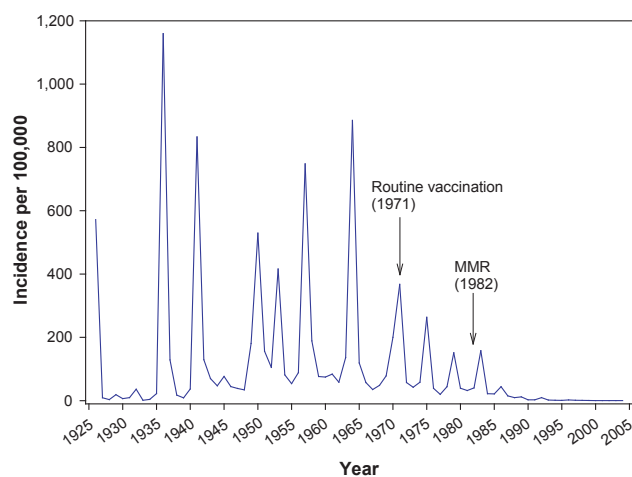
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with a case or carrier.

Prevention Measures: Immunization is the best way to prevent rubella. The vaccine can be administered to anyone at risk of contracting rubella, but it is routinely offered to infants 12 to 15 months of age – in the MMR vaccine – which also contains measles and mumps vaccine. Once vaccinated, the individual is protected from rubella for life.

Rubella Disease Trends

Figure 131 Incidence of reported rubella cases, Alberta 1928 to 2003



Rubella, or “little red” was believed to be a variant of measles until 1814, when it was described as a separate disease.²¹⁰ The first laboratory confirmed cases of rubella in Canada were reported in 1924. In 1942, an epidemic of cases of congenital cataracts in newborns was associated with mothers infected with rubella. Subsequent investigation demonstrated the complications now associated with congenial rubella syndrome²¹¹. A rubella containing vaccine was introduced in 1969. In Canada, the rate of rubella remains quite low with approximately 0.1 cases per 100,000 reported annually, primarily among not immunized groups. Outbreaks are most common in winter and spring.

Although historically a common disease, in the last 10 years, Alberta has had less than 300 cases of rubella reported altogether. Between 1996 and 2004, rates have ranged from 2.4 cases per 100,000 population (65 cases) in 1996 to no cases in 2004. Only two congenital rubella syndrome cases have been reported in the last 20 years.

Two significant outbreaks occurred in Manitoba in the 1990s, which affected rubella rates in Alberta. The first in 1992/1993 contributed to 258 cases reported in 1992. The second outbreak occurred between October 1996 and June of 1997 when almost 4,000 cases (13.4 cases per 100,000) were reported in Canada. In Alberta in 1996, 34 of the 68 cases reported were related to the outbreak occurring in Manitoba. Both the Alberta and Manitoba outbreaks had a similar age distribution, with most cases occurring among those 15 to 19 years of age, with no history of rubella immunization.

Measles

Description

Identification: Measles is also known as rubeola or red measles. Measles virus replicates in the nose, throat and the lymph nodes. Symptoms of measles include fever, conjunctivitis and a distinctive measles rash. Although the measles virus can infect any age group, severe complications are most common among children. Complications associated with measles infection include pneumonia,²¹² inflammation of the brain,²¹³ and death.²¹⁴ This acute infection has an incubation period of 10 to 12 days before showing symptoms.²¹⁵

Infectious Agent: Measles is caused by the measles virus.

Occurrence: Worldwide, though less common in developed nations.

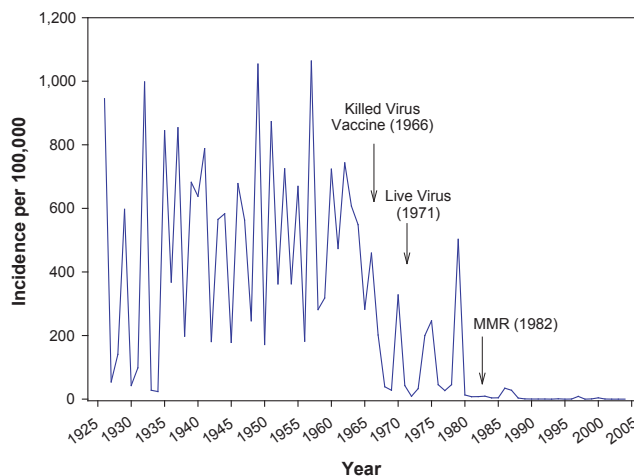
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with an infected individual.

Prevention Measures: Immunization is the best way to prevent measles. The vaccine can be administered to anyone at risk of contracting measles, but it is routinely offered to children 12 to 15 months of age – in the MMR vaccine – which also contains mumps and rubella vaccine. Once vaccinated, an individual is protected from measles for life.

Measles Disease Trends

Figure 132 Measles incidence per 100,000 population, Alberta 1919 to 2003



Due to its highly infectious nature, measles infection was so common historically that 90 per cent of people were immune by age 15,²¹⁶ and epidemics occurred about every two to three years. The introduction of a vaccine to protect against measles was introduced in 1963 and decreased the incidence of measles by 98 per cent.²¹⁷ The World Health Assembly in 1989 set to eradicate the incidence of measles worldwide by 2010.²¹⁸

Following several large outbreaks, the National Consensus Meeting on Measles Control announced in 1992 a plan to eliminate indigenous measles in Canada by the year 2005. Over the past 15 years, national measles rates have been decreasing, except in 1995 when 2,361 cases were reported. Most of these cases were the result of outbreaks in Ontario. The majority of these cases were in the five to 19 year age group. This amount was 10 times the rate in the United States and represented over half of all cases reported in the Western Hemisphere. In 1998, Canada had the lowest level of measles activity ever recorded with only 12 cases reported (0.04 cases per 100,000).

Apart from a number of small outbreaks in the last 20 years, the rate of measles in Alberta has remained extremely low. The first outbreak that significantly affected disease rates was in 1986 when 843 cases were reported. Most of those affected were children between one to four years of age followed by high-school aged children. In 1987, 15 cases of measles were identified in the first week of March. Unlike previous outbreaks, those most affected were students at the University of Alberta and were linked to a student there.

Between 1997 and 2000, two large outbreaks occurred in the province. The first outbreak in 1997 resulted in 242 cases (up from nine reported cases in 1996). The initial cases were imported from British Columbia. A mass measles campaign aimed at school aged children was embarked upon to control this outbreak. The most recent outbreak of measles in Alberta occurred in 2000. All 123 cases were epidemiologically linked to one of two measles clusters. The first smaller cluster included six cases. A traveler to Mexico had returned with clinical measles. The second much larger cluster of 117 cases was linked to a family that returned from Bolivia with clinical measles. A contributing factor to this outbreak was a large family gathering for which relatives from across the province traveled to visit the family while the family was still infectious.

No cases of measles were reported in 2003.

Invasive meningococcal disease

Description

Identification: Invasive meningococcal disease (IMD) is characterized by a sudden onset of fever, intense headache, nausea and often vomiting, stiff neck and frequently a rash.

Infectious Agent: *Neisseria meningitidis* bacteria

Occurrence: Worldwide, endemic in Canada

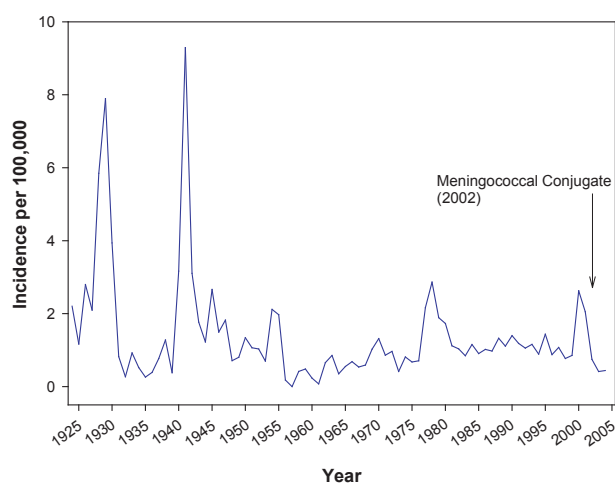
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with a case or carrier.

Prevention Measures: Immunization of children two months of age and older with meningococcal group C conjugate vaccine.²¹⁹ Educate the public about the risks associated with sharing saliva contaminated items such as food and cigarettes.

Invasive Meningococcal Disease Trends

Figure 133 Invasive meningococcal disease incidence per 100,000 population, Alberta, 1924 to 2003



Invasive meningococcal disease has been nationally reportable in Canada since 1924. Periods of increased disease activity occur about every 10 to 15 years. IMD is more common in winter months, but varies by age, geographical area and serotype.

In Canada, between 1989 and 1992, the incidence of IMD was high with 1.6 cases per 100,000 reported annually. The numbers then declined yearly from 1992 to 1998. In 1999, 214 cases were reported (0.7 cases per 100,000) – the lowest in over 10 years.

In Alberta, invasive meningococcal disease has been responsible for outbreaks as well as sporadic cases. IMD normally occurs at a rate of approximately one case per 100,000 annually in Alberta.

A significant outbreak of IMD began in December in 1999, when the Edmonton area experienced an increase in of cases. In January 2000, an outbreak in Edmonton was declared, as the rate of IMD was 10 cases per 100,000 - 10 times greater than expected. The rate was highest in high school age children, which differed from the historical distribution of cases (normally highest among infants). There were over 100 cases of IMD and nine deaths during the outbreak period (between 1999 and 2000). Of those who survived, some had serious long term complications including deafness and loss of limbs.

As part of a preventative and proactive focus in stopping future outbreaks, a province-wide meningococcal immunization campaign took place over a six-month period between April 1 and September 20, 2001. The campaign was designed to protect the disease's most susceptible group – two to 24 year olds. During the province-wide campaign, an immunization rate of 68 per cent was achieved. In 2002, Alberta introduced routine immunization for meningitis to children six months of age; the number of cases decreased to 14 in 2003.

Mumps

Description

Identification: This virus replicates in the nose, throat, and lymph nodes, before infecting the meningitis and other glands.²²⁰ Complications associated with mumps include central nervous system involvement (50 to 60 per cent of cases), deafness, and possibly death.²²¹

Infectious Agent: Mumps is caused by the mumps virus.

Occurrence: Worldwide, especially in heavily populated areas.

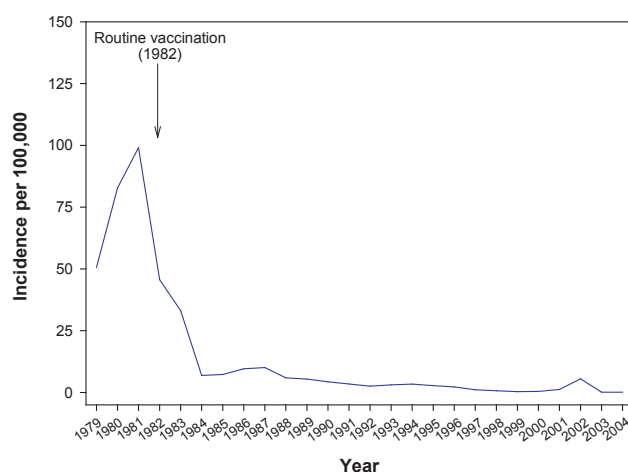
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with a case or carrier.

Prevention Measures: Immunization is the best way to prevent mumps. The vaccine can be administered to anyone at risk of contracting mumps, but it is routinely offered to children 12 to 15 months of age - in the MMR vaccine - which also contains measles and rubella vaccine. Once vaccinated, an individual is protected from mumps for life.

Mumps Disease Trends

Figure 134 Mumps incidence per 100,000 population, Alberta 1979 to 2003



In Canada, the number of reported cases of mumps has decreased by more than 99 per cent since the introduction of mumps vaccine in 1969.²²² From 1995 to 1999, an average of 237 cases per year were reported (high of 402 cases in 1995; low of 90 cases in 1999). In this five-year period, children five to 14 year olds accounted for 44 per cent of cases.

Currently, mumps outbreaks continue among un-immunized populations in Canada. In 1997, an outbreak occurred among university students in British Columbia (BC), resulting in an increased provincial rate three fold to 3.6 cases per 100,000. In 1998, an outbreak occurred in Quebec among school children (26 cases), many of whom were recent immigrants and were not immunized for mumps.

Mumps vaccine has been part of the routine immunization schedule in Alberta since 1982. In 1981, the number of cases in Alberta peaked with over 2,000 cases reported. Since the introduction of the MMR vaccine, the number of cases of mumps has been low. In 2004, only three cases were reported, all among adults.

There has been only one major mumps outbreak in Alberta in the last 15 years. Between fall 2001 and August 2002, 193 mumps cases were reported in a remote northern community in Alberta among un-immunized individuals. Less than 20 per cent of those infected had a history of immunization. The outbreak was the result of an imported case of mumps into this close community.

Pertussis

Description

Identification: Pertussis is also known as whooping cough. This bacterium targets the respiratory track, causing coughing spells so severe, that infected individuals have a difficult time breathing. Complications related to pertussis include pneumonia, apnea, neurological complications, ear infection, weight loss, and dehydration. The disease results in high morbidity and high mortality,²²³ and is especially dangerous to infants less than one year of age.

Infectious Agent: Pertussis is caused by the *Bordetella pertussis* bacterium

Occurrence: Worldwide. Most common among children.

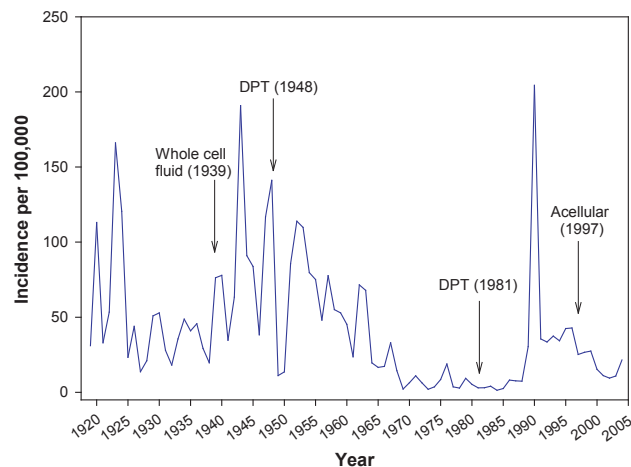
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with an infected individual.

Prevention Measures: Immunization is the best way to prevent pertussis. An acellular pertussis containing vaccine has been used in Alberta since 1997. This vaccine is known as dTap and protects against diphtheria and tetanus. The dTap vaccine is 85 to 95 per cent effective in preventing pertussis.

Pertussis Disease Trends

Figure 135 Pertussis incidence per 100,000 population, Alberta, 1919 to 2003



In Canada, the rate of pertussis has decreased significantly since the introduction of the first pertussis vaccine in 1943. Pertussis is a cyclical disease, with outbreaks expected approximately every five years or so. The last significant rate increase in pertussis was in 1998 when the national rate was 29.1 cases per 100,000. This appears mostly attributable to the increase in cases experienced by Quebec where 4,880 cases (66.2 cases per 100,000) were reported.

In Alberta, the rate of pertussis has remained quite low in the past 10 years. In 2004, there were 685 cases of pertussis (21.5 cases per 100,000). Most likely to be infected with pertussis are those less than one year of age followed by those 10 to 14 years of age.

The most significant pertussis outbreak in Alberta began in the fall of 1989. Between September 1, 1989 and April 1, 1990, a total of 2,921 cases of pertussis were reported. In total, 5,133 cases of pertussis were reported (209 cases per 100,000 people) in Alberta in 1990. The infection rate was highest among infants less than one year of age, followed by children one to four years of age. There was only one death, in a neonate whose mother was infective at the time of delivery (the mother passed her illness on to the newborn). This outbreak was the largest (in terms of geographic distribution and number of cases) ever on record in Alberta.

Poliomyelitis

Description

Identification: Poliomyelitis is commonly referred to as polio. This virus targets the central nervous system. Symptoms of polio include fever, headache, nausea and muscle weakness. Approximately one in 200 people who are infected with polio become paralyzed and the onset of paralysis can occur in a matter of hours.²²⁴ Of those paralyzed, five to ten per cent die when their breathing becomes immobilized²²⁵.

Infectious Agent: Poliomyelitis is caused by the polio virus

Occurrence: Polio cases still occur in parts of Africa and Asia.

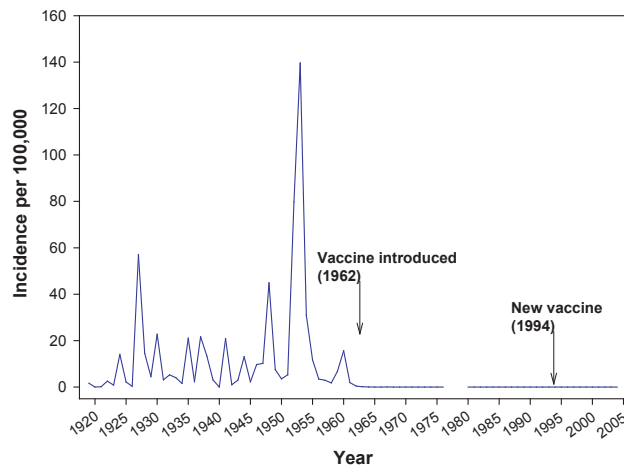
Reservoir: Humans

Mode of transmission: Person to person transmission (fecal–oral).

Prevention Measures: Immunization against polio has almost eradicated this disease.

Poliomyelitis Disease Trends

Figure 136 Poliomyelitis incidence per 100,000 population, Alberta, 1919 to 2003



Poliomyelitis was first described in 1789 by Michael Underwood of England.²²⁶ Prior to the introduction of the vaccine in 1955, outbreaks of polio were common. The vaccine proved to be immensely effective, and caused a drastic fall in the number of poliomyelitis cases. A global initiative to eradicate polio by the end of the year 2000 was initiated. While not eradicated, by the year 2000, cases were down 98 per cent.²²⁷ In 1999, 6,970 cases of polio were reported globally, due to a large wild poliovirus outbreak in Angola.

Polio has historically been a significant source of morbidity and mortality in Canada. The most significant outbreak of polio in Canada was in 1955 when 1,887 cases of polio were reported. The most recent outbreak occurred in 1978/1979 when 11 cases of polio were imported to Ontario, Alberta, and British Columbia. These cases were linked to an outbreak occurring in Holland among un-immunized individuals. The last case of polio in Canada occurred in 1992, and by 1994, Canada was listed as a polio-free region. The last case of vaccine associated polio in Canada was reported in 1995.

There have been three cases of symptomatic polio reported in Alberta since 1968; two were attributed to the vaccine. The third case was reported in 1978 in a child who was not immunized. This case was related to an outbreak in Holland. In 1993, 22 asymptomatic cases of imported wild polio were identified in Alberta. These cases were related to travel to Europe and contact with an infected individual; none of the cases were immunized.

HISTORICAL VIGNETTE

Polio in Alberta

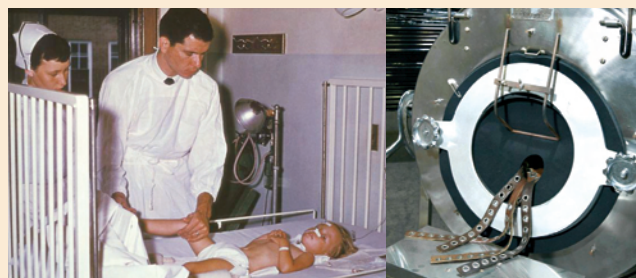
Poliomyelitis (polio) - previously referred to as 'infantile paralysis' - is a highly infectious disease caused by a virus. It invades the nervous system, and can cause total paralysis. It can strike at any age, but affects mainly children under three¹. There is no cure for polio; it can only be prevented through immunization.

Canada recorded its first outbreak of poliomyelitis in 1881. The incidence steadily increased and was followed by waves of epidemics. Polio was one of the most feared diseases in the first half of the 20th century. While rapid advances in science and technology had substantially reduced the impact of several other communicable diseases, early efforts to minimize poliomyelitis infections were less successful.² The worst epidemic in Canada occurred from 1947-1955, with a national case rate in 1953 of 60 per 100,000 – among the highest rates in the world.

Edmonton reeled under the impact of the worst epidemic ever to hit the city. Dr. Russell Taylor commented "it was as if this vibrant, optimistic city had been smitten by a medieval plague; it engendered the same fear and helplessness"². In an attempt to halt the spread of polio, children under 17 years of age were banned from theatres and swimming pools. On a single day in 1953,

(November 12), the *Edmonton Journal* reported 13 new cases of polio in Edmonton and a six day total of 40 cases. Treatment of polio patients was concentrated at the Royal Alex "pest house". At full capacity, the Royal Alex was handling 107 cases on respirators and 33 patients on "iron lungs".

With no remedy for the disease, the development of an effective Salk vaccine at Canada's Connaught Laboratories in the early 1950s had significant international impact. Soon after the introduction of effective vaccines in the late 1950s (IPV) and early 1960s (OPV), polio was brought under control and practically eliminated as a public health problem in industrialized countries. However, in the year 2000, polio was still present in about 30 Asian and African nations. In 2005, polio spread from Nigeria to the Sudan, with 105 confirmed cases. This latest outbreak illustrates "the high risk posed to polio-free areas by the continuing epidemic in west and central Africa"³



Iron lung

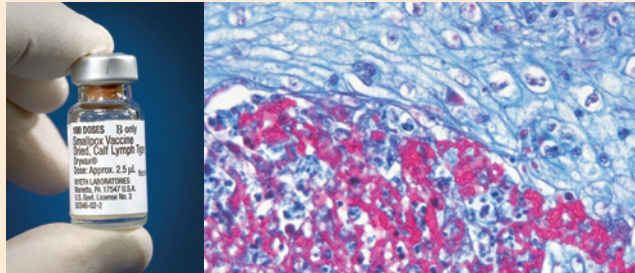
Sources:

- ¹ <http://www.polioeradication.org/disease.asp>
- ² Joy Jaipaul, Capital Health, "In the Shadows: Poliomyelitis and Nursing Care in Edmonton, 1947-1955."
- ³ <http://www.cloudnet.com/~edrbsass/poliotimeline.htm>

HISTORICAL VIGNETTE

Smallpox Vaccine

In 1796, Dr. William Jenner noticed that milkmaids who contracted a mild disease known as cowpox rarely developed the serious condition smallpox. Dr. Jenner wondered if cowpox could somehow prevent smallpox infections. To test his theory, he injected a young boy with cowpox and waited for the disease to present itself and run its course. Once the boy had fully recovered from the mild illness of cowpox, Jenner injected the boy with smallpox. The boy survived the injection and did not develop smallpox – he appeared to be immune. Jenner named the cowpox solution ‘vaccine’, derived from the Latin word *vacca*, meaning cow. The last reported case of smallpox in Alberta and Canada was in 1962 when a young boy traveling from Brazil was diagnosed. The family had falsified the boy’s documents of immunization. In 1977 the last reported case of smallpox occurred in a village in Somalia. The World Health Organization declared the world free of smallpox in 1978.



Smallpox

Smallpox

Description

Identification: Smallpox virus replicates in the lymph nodes, and then in the oral and pharyngeal mucosa and the skin. Complications of smallpox are severe, with 30 per cent²²⁸ of smallpox cases resulting in death; most survivors are marked with scarring resulting in blindness, limb deformities, and arthritis.²²⁹

Infectious Agent: Smallpox is caused by the Variola virus

Occurrence: Eradicated worldwide

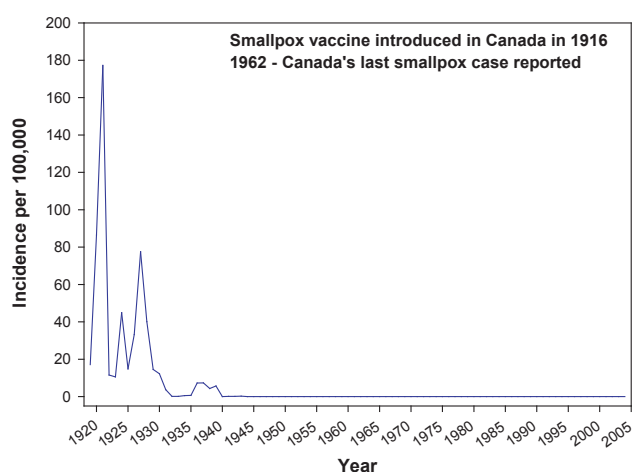
Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with an infected individual.²³⁰ This virus is shed from the rash throughout the course of disease, yet this is not considered as infectious as the aerosolized virus from the respiratory track.²³¹

Prevention Measures: Immunization has eradicated wild smallpox. Routine vaccination for smallpox has been discontinued in Canada.

Smallpox Disease Trends

Figure 137 Smallpox incidence per 100,000 population, Alberta, 1919 to 2003



Smallpox is thought to have originated over 3,000 years ago in India or Egypt.²³² In 1796, the first safe and effective smallpox vaccine was developed by Edward Jenner. The vaccine was 95 per cent effective at preventing smallpox.²³³

In 1967, the World Health Organization launched an intensified plan to eradicate smallpox.²³⁴ At this time the “ancient scourge” threatened 60 per cent of the world’s population. By 1977, the immensely successful campaign resulted in the last case of smallpox being identified in Somalia.²³⁵ In 1980, the World Health assembly endorsed the success of the campaign by acknowledging that wild smallpox had been eliminated.²³⁶

In Alberta, smallpox has not been seen for over 50 years. This is the result of high immunization rates in the population. The last case of smallpox in Alberta was in 1943.

Tetanus

Description

Identification: Tetanus is also known as lock jaw. The toxins produced by the bacteria target the central nervous system, leading to muscle spasms and contractions.²³⁷ Even with modern medicine, 10 to 20 per cent of people who acquire tetanus die.²³⁸

Infectious Agent: Tetanus is caused by *Clostridium tetani* bacteria.

Occurrence: Worldwide

Reservoir: Animals (predominantly horses) and humans. Contaminated soil also harbours bacteria.

Mode of transmission: Deep penetrating wounds with contaminated soil or infected feces. These bacteria only reproduce without oxygen.

Prevention Measures: Immunization is the best way to prevent tetanus. Immunization against *C. tetani* is routinely administered in Alberta using the DTaP vaccine.

Tetanus Disease Trends

Recorded incidence of tetanus date back to the fifth century BC, however, the isolation of the disease did not occur until 1889. Anti tetanus serum (ATS) was discovered in 1880 and contributed to saving the lives of thousands of soldiers during World War I. During World War II the discovery and production of the Tetanus toxoid further reduced the threat of tetanus.

Despite a vaccine, more than 50,000 deaths result from tetanus infections each year. The majority of these cases are in developing countries. The disease is more common in agricultural regions and in underdeveloped areas where immunization may not be adequate and there may be contact with animal feces.²³⁹ Neonatal tetanus accounts for approximately half of all tetanus deaths in developing countries.

Tetanus is rare in Canada and Alberta, resulting from vaccination which began in 1947. In Canada, less than seven cases are reported each year. In Alberta, 10 cases of tetanus have been reported in the last 20 years, the most recent two cases were diagnosed in 2000 and 2001 in adult males living in rural Alberta.

Varicella

Description

Identification: Varicella is also known as chickenpox. The virus replicates in the nose, pharynx and lymph nodes.²⁴⁰ While varicella is considered a mild childhood ailment, it can lead to serious complications. Adults who acquire the disease are at a particular risk for complications which include pneumonia, hospitalization, and death. Approximately 15 per cent of cases report the emergence of zoster (shingles) after infection with VZV.²⁴¹

Congenital Varicella Syndrome (CVS) occurs in infants whose mother contracted varicella during pregnancy. Complications of CVS include birth defects such as skin scars, eye problems, or incompletely formed arms or legs.²⁴²

Infectious Agent: Varicella is caused by the varicella zoster virus (VZV).

Occurrence: Worldwide. Varicella is more common in temperate climates.

Reservoir: Humans

Mode of transmission: Transmission is via respiratory droplets from close intimate contact with an infected individual. Vertical transmission of the virus from mother to infant can also occur.

Prevention Measures: Immunization is the best way to prevent varicella. Currently in Alberta, children are offered the varicella vaccine at 12 months of age or older.

Varicella Disease Trends

Varicella was not differentiated from smallpox until the end of the 19th century.²⁴³ Due to the introduction of routine vaccination in 2001, the rates of varicella disease are decreasing (**Figure 138**). The decrease is evident for all ages under 10 years, but was greatest for those under age five (**Figure 139**).

Figure 138 Varicella (chickenpox) incidence rate per 100,000 population under age five, Alberta, 1986 to 2004

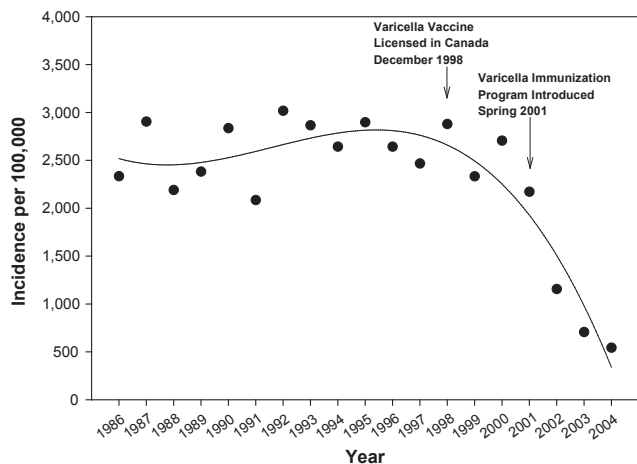
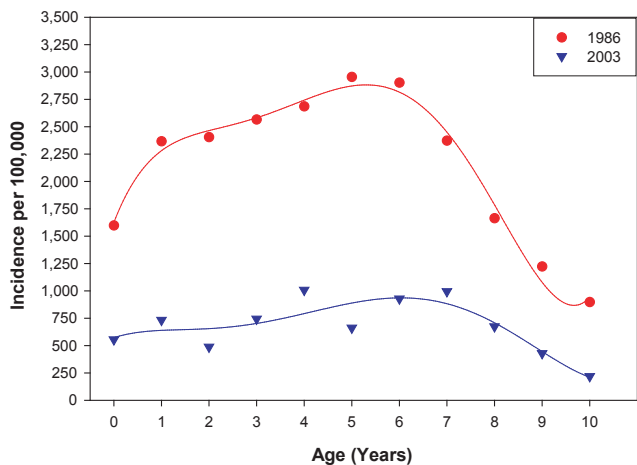


Figure 139 Varicella (chickenpox) incidence rate per 100,000 population age ten years and younger, Alberta 1986 and 2003



HISTORICAL VIGNETTE

Tuberculosis

Tuberculosis, once called 'consumption' is an ancient disease. Hippocrates noted that 'phthisis' (consumption) was the most widespread and fatal disease of his time. In 1882, Robert Koch presented his discovery of *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis (TB). He reminded the audience of terrifying statistics: "If the importance of a disease for mankind is measured by the number of fatalities it causes, then tuberculosis must be considered much more important than those most feared infectious diseases, plague, cholera and the like. One in seven of all human beings die from tuberculosis."¹ The mere mention of the word in the early part of the century struck fear into the hearts of many. Those afflicted by this disease were often given no hope of recovery, and death seemed inevitable and painfully slow.²

One of the first means of treating the disease was to send affected persons to a sanatorium. It was thought that fresh mountain air helped TB patients, so sanatoria were often built near trees. Signs and public service announcements suggesting preventative measures were not uncommon. A public service announcement in the Dallas News preached "do not spit on the floor of your shop, don't drink whiskey, beer or other intoxicating drinks, don't sleep in the same bed with anyone else, and, if possible, not in the same room"²

In Canada, the Prairie Indians were exposed to tuberculosis in the 1850s; high mortality rates decimated communities. While the first Canadian sanatorium opened in 1897, not much was done there for patients and more than 50 per cent of those infected died. In 1910, a group of Calgary women formed a Tuberculosis Society and in 1917, a converted C.P. hotel was designated a sanatorium

and directed by Col. Baker. In 1943, the Alberta Tuberculosis Association donated a mobile X-ray unit to begin mass x-ray screening; in 1962, 189,000 mass X-rays were taken.

An effective drug treatment for TB was well established by 1950 and death from tuberculosis no longer seemed inevitable. Still, Stefan Grzybowski's 1974 review of TB control in Alberta noted that aboriginal tuberculosis rates were 10-20 times higher than the provincial average and that childhood tuberculosis among aboriginals was still high. Today, tuberculosis and other previously common lung diseases are controlled by effective drug treatments, public health interventions, education and better living and working conditions. While the 2000s have shown a gradual decline in TB cases in First Nations communities, 2005 is showing increased overall rate due to the percentage of foreign-born cases.

**Sources:**

Elaine Benjamin, Disease Control and Prevention Branch, AHW

¹ <http://nobelprize.org/medicine/educational/tuberculosis/readmore.html>

² Lung Association of Canada (<http://www.lung.ca/ca/articles/19991201killers.html>)

Tuberculosis

Description

Identification: These bacteria can attack any part of the body though it is usually the lungs.²⁴⁴

Symptoms of tuberculosis include: prolonged coughing, chest pain, night sweats, weight loss and coughing up of blood. A serious tuberculosis infection can result in death. Tuberculosis was once the leading cause of death in America.²⁴⁵

Infectious Agent: Tuberculosis is caused by *Mycobacterium tuberculosis*.

Occurrence: Worldwide

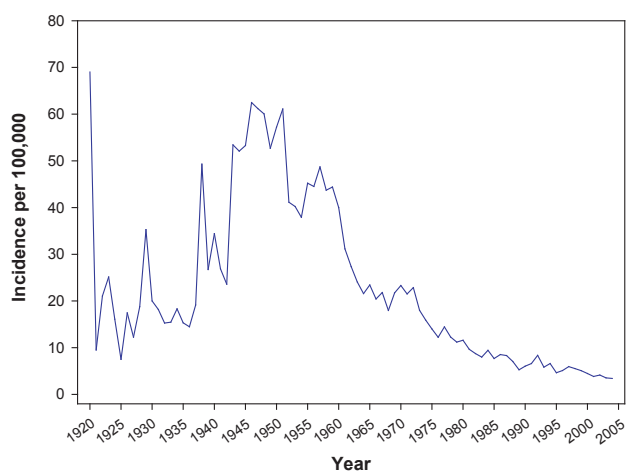
Reservoir: Humans

Mode of transmission: Transmission of tuberculosis is airborne from an infected person into the air. Direct contact with respiratory secretions will also transmit disease.

Prevention Measures: Prevention of tuberculosis includes properly treating active and latent tuberculosis, isolating highly infectious cases, educating the public, and reducing social conditions that help spread tuberculosis.

Tuberculosis Disease Trends

Figure 140 Tuberculosis incidence per 100,000 population, Alberta 1919 to 2003



Historically, Europeans have imported tuberculosis into Canada.²⁴⁶ The efficacy with which the disease spread was alarming, and by 1908, 165 out of every 100,000 Canadians had tuberculosis.²⁴⁷ This is considerably more than the six cases per 100,000 seen today.²⁴⁸

In addition to its contagiousness, the severity of the disease resulted in tuberculosis sanatoriums being opened in Canada - where patients with the disease could be isolated, educated, and helped to recover. By 1909, the first Canadian tuberculosis health nurse began to visit the homes of tuberculosis patients.²⁴⁹ Before the use of antibiotics, a common treatment for tuberculosis was collapse therapy. This therapy included the injection of air into the pleural space, paralysis of the diaphragm, and the removal of ribs.²⁵⁰ Later, surgeries to remove diseased lung tissue were employed.²⁵¹ Treatment for tuberculosis was not a simple matter of taking a prescribed course of antibiotics until 1960.²⁵²

Currently in Alberta, the rate of tuberculosis is quite low; in 2004, 109 cases of tuberculosis (3.4 cases per 100,000) were reported. This compares to a national rate of 5.2 cases per 100,000. Despite these low numbers, certain populations remain over-represented; aboriginals and immigrants are more likely to be infected with tuberculosis than the rest of the population.