

**UNIVERSITY OF MANITOBA
ANTHROPOLOGY PAPERS**

NUMBER 30

**The Social Histories
of Smallpox and Tuberculosis in Canada
(Culture, Evolution and Disease)**

by

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April 1989

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ISSN 0227-0072-030

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FORWARD

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Most of the faculty in Anthropology know Ethel Thorpe, but few of us are very much aware of her contributions to society and her tremendous experience. In 1977 she was awarded a Queen's Silver Jubilee Medal honouring her distinguished career in nursing. Like the aware anthropologist she is today, she called her award, with much amusement, "one of the trappings of colonialism" -- but nevertheless it pleased her. We were also pleased and congratulated her. It reminded us of a life's work we profoundly respect.

Ms. Thorpe's Master's thesis, "Culture, Evolution and Disease," retitled here in its revision The Social Histories of Smallpox and Tuberculosis in Canada, is a study of the history of small-pox and tuberculosis in the early years of North American settlement, the effects on the populations, and the roles of culture and poverty in their devastating incidence among native peoples.

Ms. Thorpe entered the Master's program in Anthropology at the University of Manitoba in 1973. Her letter of application is a classic. It begins:

Sir:

I am forwarding an application to enter a graduate programme in Anthropology because, at the age of sixty-five, I find myself at the end of a long career in nursing and hospital administration and I do not want to vegetate in retirement. Anthropology seems to offer much that is interesting to someone with my background, and I enclose various papers and articles which will indicate past interests.

Ethel Thorpe was born and raised in Norwich, England, and graduated in psychiatric nursing from Hellsdon Hospital, Norwich. In her final year of training (1937), she was awarded the Alfred Langdon Scholarship for the best all-round nurse of the year. She was also runner-up for the Royal Society of Cordwainers Gold Medal Award. While Ms. Thorpe was at Kingston County Hospital, war broke out and with the evacuation of other medical staff from London, she became sister-in-charge of the emergency theatre.

In March, 1940, Ms. Thorpe was called up for military service and became a sister in Queen Alexandra's Royal Army Nursing Corps (T.A.N.S.), serving first at Stoke Military Hospital in Plymouth where she was sister-in-charge of the surgical division at the time of the fall of France and the evacuation from Cherbourg and Brest. She remained at Plymouth during the heavy raids on that city, culminating in the blitz of April, 1941.

Following the blitz and the evacuation of Stoke Military Hospital, Ms. Thorpe proceeded to Basrah in Iraq at the end of 1941. That she possessed a poetic and very British sensitivity to her surroundings is evident in this excerpt from her writings at that time:

Baghdad the beautiful is most beautiful by night, for darkness shuts down on the heat and the dust of day. Lights twinkle all along the Tigris and across the bridge, turning the riverside into an enchanted fairyland, while palm trees look truly lovely seen in silhouette against a star-studded sky In the chaikanas Arabs sit on wooden benches leisurely sipping small glasses of milkless tea. These men appear rarely to talk to one another, but look out on the passing life of Baghdad with wise and brooding eyes. (1942)

In August, 1942, Ms. Thorpe was one of 18 British nursing sisters who were sent to Teheran, Persia, to cope with the sick among 200,000 Poles released from Russia following two years internment in Siberia. These Poles later became General Anders' 4th Carpathian Brigade and went from Persia to Iraq and thence to Palestine and finally into the campaign in Italy.

When the evacuation through Teheran was over Ms. Thorpe returned to Iraq and was sent to Mosul where she nursed British and Indian soldiers in a 500 bed hospital carved out of caves underground. Repatriated to the United Kingdom at the end of 1943, Ms. Thorpe was stationed at the Military Hospital in Chester until proceeding to India in 1944, where she served in Madras, Avadi, Poona and Dacca in Bengal (now Bangladesh).

In India she rose to the rank of Lt.-Colonel and Principal Matron. She opened two hospitals from scratch in 1945 (Avadi), helped to receive and repatriate to the UK via Bombay returning internees from the Far East (at Poona) and closed down what had once been the hospital for a forward area for the 14th Army at Dacca — disbanding hospitals, the work was arduous and required loading onto hospital river steamers and ambulance trains, and setting up again at Tezgaon to carry on when the garrison pulled out.

Ms. Thorpe then went to Calcutta to take charge of 600 army sisters and Red Cross nurses who were being sent home for re-deployment and release. It proved an exciting trip home for two cases of smallpox occurred among the troops en route with six thousand people on board in extremely crowded conditions, and the whole lot had to be vaccinated twice.

After a short stay in the U.K., Ms. Thorpe set out for China as matron of the County Hospital in Shanghai, which was in very bad shape due to recent occupation and looting. It was not an easy task to rehabilitate the hospital at a time of post-war shortages, inflation and civil war.

From 1950 to 1963, Ms. Thorpe was a member of Queen Elizabeth's Overseas Nursing Service in Jamaica. In this capacity, she converted Bellevue Hospital into a psychiatric training centre, which soon developed into a hospital that now has the highest recovery rate among all mental hospitals in the British Commonwealth. During this period, Ms. Thorpe helped to originate a number of professional organizations in Jamaica and was involved in various planning committees and research projects.

For her many contributions to society, Queen Elizabeth in 1956, made Ms. Thorpe a member of the Most Distinguished Order of the British Empire.

In 1963, she came to Manitoba as nursing consultant for the four hospitals of the Sanitorium Board of Manitoba. Her major task was then the disbanding of the Sanitorium and the integration of patients and hospital staffs into the Manitoba Health Services system. All this came as a result of the new treatment of tuberculosis with antibiotics and changing concepts of the disease. Since that time she has authored a number of articles that dealt with matters of concern to the nursing profession, and she has participated in founding a number of nursing associations. One of these was the Newfoundland Nurses' Respiratory Society founded in 1970.

Ms. Thorpe has continued active in nursing and research since completing her Master's degree in Anthropology. Most recently, at the age of 80, she delivered the Ted Meany Memorial Lecture, a series established by the Newfoundland Nurses' Respiratory Society, at the 1988 annual meeting of the Canadian Lung Association in St. Johns, Newfoundland. The title of her paper, "AIDS and Pulmonary Diseases" represents her current interest in the changing concepts of diseases and disease processes. Through long years of experience she is especially interested in such changes, and in the discoveries of long periods of latency of some infections, especially viruses.

Ms. Thorpe's master's thesis which she has revised and retitled for publication in the Anthropology Department's series, has attracted the attention of Canadian historians, medical anthropologists, and specialists in social and preventive medicine. A steady demand and expressions of appreciation for the linking of her own depth of medical experience and knowledge of epidemic diseases with the social and economic contexts which are essential features of their incidence, and her close attention to the historical archives which provide the setting in Canadian history -- these encouraged us to make her essay more widely available. And finally, Ethel Thorpe's articulate and magisterial writing invests the histories of these epidemics with the qualities of stories well told with important and significant implications for all of us to understand.

-- L.E. Sweet

PREFACE

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The problem has been to find an explanation for the high mortality from infectious diseases among the North American Indians from the time of early contact with Europeans to the middle of the present century. To say the "white man" was responsible for introducing these diseases is an oversimplification of events, for these diseases were very old and had long been a part of human evolution and experience in Europe, Asia, Africa, and the Middle East. The "white" (i.e. European) man was an instrument of their dispersion on the North American continent, but he was also their victim. Why these diseases occurred in North America at the particular time they did is part of the history and geography of epidemiology, as well as man's progression from warmer to cooler climes.

To talk of people of "older races" being inured to these diseases and having some genetic immunity means very little until such time as more is known of the origins and antiquity of man. The Indians also came to North America from elsewhere, and estimates of the date of their arrival are being pushed progressively farther back in time. They, too, are members of an older race, with a long genetic heritage. At some time in the past they may have brought as many infections to North America as the white man did, but, if so, this has been lost in antiquity and no evidence exists of the totality of those who may have died.

The context of the problem in Anthropology is that it is part of the search for an understanding of man and the inter-relatedness of biological inheritance, culture, and interaction with the environment. In this paper, a challenge is posed to some long held concepts; alternative hypotheses are supported by documented evidence, as well as logical reasoning.

The general introduction to this paper reviews what is known of the health of the Native North American Indians prior to white contact, where early contact was effected, and the results of such contact on the Native peoples.

Part One deals with the introduction of smallpox to the North American continent in 1520. It discusses epidemics in New England three years prior to the arrival of the Pilgrim Fathers and its subsequent spread into Acadia, New Brunswick, the Lake Huron area, the Saint Lawrence River Valley, and Quebec, involving primarily the Hurons and the Iroquois and affecting the wars between them, as well as the wars between the English and the French into which the Indians were drawn. The spread of the disease to western Ontario, and what is now Manitoba, is discussed, as is the spread of the disease south from Hudson's Bay into Assiniboia, and from the United States, north, into the heart of the Canadian West. Its further spread, as the Cree Indians pushed north-west into the territory of the Slave, Beaver, Hare, and Dogrib Indians, is documented as is its dissemination from the U.S.A. into

Alberta, affecting the Piegan, Crow, and Blackfoot tribes. On the west coast, ships from China and Japan brought smallpox to Vancouver Island and British Columbia, whilst miners moving from California into B.C. and the Yukon in search of gold also brought the disease with them. Finally, as the Canadian Pacific Railway was extended west and northwest, smallpox reached Fort Nelson in Northern B.C. The whole sweep of the infection came full circle when a traveller from Australia, who disembarked at Vancouver, crossed Canada via the new railway and brought the disease to Winnipeg, Fort William, and Port Arthur and points further east.

An attempt is made, when documenting the spread of this disease across Canada and among its Native people, to relate the incidence to the reduction in the population strengths of the various Indian tribes, basing this upon the estimates of Mooney, Morice, Swanton, Jenness et al and confirmed, as far as the Micmacs and Malecites of Nova Scotia are concerned, by Joseph Howe in the Sessional Report of the Government of Canada for the Year 1872.

It is documented that the epidemics which began in 1520 continued unabated until the end of the nineteenth century, after which, due to vaccination and an understanding of the principles of quarantine, they gradually subsided although endemic outbreaks of a milder form of the disease were continuing until 1920.

As this part of the paper is developed, cultural, climatic and environmental factors associated with the spread of the disease are analyzed for relevance.

Part Two considers the epidemiology of tuberculosis in Canada from 1850 to the present time, and the comparative incidence of the disease among Indians and Whites. The nature of the tubercle bacillus is reviewed, as also is the type of disease produced. The intent is to emphasize the struggle all living things endure in order to survive.

Special attention is given to statements that the incidence of tuberculosis was ten times higher among the Indians than it was among the Whites, and that the death rate was twenty times as high. These statements are considered to be seriously flawed, for reasons which are presented in the text.

The socio-cultural, political, and economic consequences of the development of anti-microbial drugs are discussed.

The Conclusion will present the hypothesis that given his biological inheritance, and within the constraints imposed by the environment, man is responsible for his own evolution, and that man's biological evolution is culturally controlled. Culture provides a frame of reference for man's interaction with the environment, which includes the micro-organisms of disease.

* * *

This extended essay on the social history of smallpox and tuberculosis in Canada, and especially Manitoba, originated as a thesis in partial completion of my Master's degree in Anthropology, received in 1982. It has been revised and a postscript added to the concluding chapter.

E. L. M. Thorpe

February 1989

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CHAPTER ONE

OF MICROBES AND MAN: SMALLPOX IN NORTH AMERICA

Very little is known of the state of health of the aboriginal North American Indian prior to white contact. One barrier to effective records is that the origin of the Indians is not known, although it is generally accepted today that they migrated from Asia via the Bering Straits some time prior to the last (Wisconsin) glaciation, after which time the land bridge disappeared and migration ceased. This would be at least ten thousand years before present, and perhaps as long as forty thousand years ago. According to Josephy (1968:37), "Some experts have speculated that the earliest migrants could have reached North America during the Sangaman inter-glacial period, before the Wisconsin glaciation. That would have been seventy-five thousand years ago." The environmental implications of the ice age are not known; nor is it known whether the migrants to North America were effectively stopped by the glaciers, or became locked in.

There are other theories concerning the possible origins of the Native North American Indians, but in the absence of supporting evidence they appear untenable. Until recently, the North American Indian had no written language, and what is known of them prior to contact is dependent upon oral traditions and the archaeological record.

Acceptance of the Bering Straits migration theory is based on physical characteristics, such as similarities in skin colour and hair form among North American Indians and Mongoloid and Polynesian people, similarities in facial structure, eye colour, the presence of an epicanthic fold among some North American Indians, similarities in blood group determinants, the frequency of occurrence of Wormian bones, and such genetic markers as shovel-shaped incisors. Bergman's rule concerning habitat variation, which states there is an increase in skeletal length in people living in high environmental temperatures and a body mass increase among those living in cold temperatures, seems valid as far as the Eskimos are concerned but applications of this rule to other North American Indians is difficult because of the great variation in physical traits between and within different populations. Added to this is the problem of admixture, for the aboriginal North Americans were extremely mobile, today's political boundaries were non-existent, and a good deal of trading, raiding, slavery, inter-marriage and adoption was taking place.

Whether the North American Indians suffered from tuberculosis or not, and if so, to what extent, is an open question. There are claims that archaeological evidence and statuary items depicting pre-Columbian Indians

indicate they suffered Pott's disease, or tuberculosis of the spine, but the consensus of opinion is that the evidence from statuary is dubious and may only be an art form, whilst evidence from bones is inconclusive and may be due to diseases other than tuberculosis.

Hrdlicka (1909) cites many references to tuberculosis among North American Indians, but most of these were written in the 19th century and are reporting the incidence and types of tuberculosis among the Native North American Indians as it was occurring at that point in time. Furthermore, as late as 1904, the nature of tuberculosis was still not fully understood and there are unscientific as well as biased statements.

Hrdlicka quotes Mathews (1888:142) as saying: "We have evidence that the wildest Indians in the earliest historic times were subject to consumption: yet they were not subject to it in a high degree, and it is probable that they suffered then from a different form of the malady to that which troubles the modern Indian. But we have evidence that scrofula begins to prevail among them when they cease to live by chase, and that is a condition predisposing to consumption among them."

According to Hrdlicka, Holder (1892:178) maintains that the Indians were never free from tuberculosis and scrofula and blames the "transition" period for the spread of diseases. Holder refers to specimen 17:223, Peabody Museum, Cambridge (pictured in Bradford and Lovett 1892), as showing evidence of pre-historic tuberculosis.

Ackerknecht (1965:101) says: "In North and South America, bones and sculptures evidencing that bone tuberculosis existed here long before the Spanish conquest have been found."

Ackerknecht (1965:102) further states: "Tuberculosis of lymph glands is the same thing as scrofula. Tuberculosis of lymph glands, as well as bone tuberculosis, are caused by the bovine type of tubercle bacillus."

Such a statement fails to recognize that one function of lymphatic glands is to filter, contain, and destroy if possible, disease organisms already present and circulating in the body. When they fail to limit the infection, the glands themselves become infected, and this localized infection of lymphatic glands is therefore a secondary and not a primary disease process. Scrofula, in fact, is usually secondary to a small, primary, sub-clinical infection in the lungs (Ghon complex). The North American Indians had no domesticated herds or flocks, and no conception of the milk of animals as a source of food for humans. Milking comes with domestication and was only introduced into the Americas with European colonization. Even today, Native peoples do not use milk. The source of scrofulous infection among them is, therefore, not satisfactorily explained. They had access in certain regions to plentiful wild herds of buffalo and flocks of mountain sheep and goats until relatively late in time. As tuberculosis occurs in all animals, it is necessary to consider these as possible sources of infection. Furthermore, the ability of the tubercle bacillus to move from animals to humans and vice versa, and its ability to adapt to new hosts also needs consideration.

Morse (1967:249-267), after reviewing the evidence from antiquity and considering the best of the presented specimens, thinks that possibly four of the fifteen may provide evidence that tuberculosis did exist among pre-Columbian Indians, but that the case is in no way proven.

In our own time, excavations at the Kleinberg site in Ontario have provided evidence of advanced tuberculosis among the skeletal remains exhumed. The people who lived at the Kleinberg site are thought to have been pre-contact Indians as the area was unpopulated when the first white men arrived. However, among the artifacts discovered were some trade beads, which raises questions as to whether these Indians had met white men elsewhere on this continent, or whether they had obtained the trade beads from other Indians who had been in contact with Europeans, or their servants or their slaves.

Despite the identification of disease-specific organisms, there is no single cause for any infectious disease, and whilst medical treatment of such diseases has been based upon the "germ theory" of causation and such medical treatment has been instrumental in controlling many of the horrific situations which formerly plagued man, there is a tendency, as Williams (1971:5-8) points out to overlook the fact that more than organisms are involved.

A necessary pre-requisite for major epidemics to occur is large aggregations of populations, for demographic isolation protects man from most organisms except those with which he had already established an equilibrium. A Negro in the employ of the Spaniard, Narvaez, was allegedly responsible for bringing smallpox from the West Indies to Mexico in 1520, as a result of which "three and a half million Mexican Indians died." Heagerty (1928:17) and Zinser (1967:194) A statement such as this, which blames an individual, takes no cognizance of antecedent and surrounding events, namely, how smallpox was present in the West Indian Islands, the technological development of ocean-going ships, and the navigational skills to sail such ships across vast distances; the historical and social circumstances which placed a Spaniard and a Negro in a master-servant relationship; and the political and economic pressures which brought the white man from the Old World to the New. Those pressures were part of the white man's culture. As for the Negro, he, like the Mexican Indians, was also a victim of exogenous circumstances, for smallpox is a viral disease with a lengthy incubation period, usually ten to fourteen days, during which time the unfortunate person harbouring the virus is entirely free of symptoms, yet is able to transmit the infection to others. One thing is certain, the Negro contracted it from someone else, most likely a companion aboard ship during the voyage to the American continental area.

Parasitic organisms have to be virulent and the human hosts susceptible for successful infection to occur. Even so, not all exposed persons succumb. The immune response may be depressed in certain individuals, or may vary from time to time, as discussed later in this paper. In addition to this, customs, beliefs, and the mores of a people also enter into patterns of disease, as do diet, nutrition and social conditions.

In general, when an infectious disease occurs in an area where it has not hitherto been experienced, the reaction is severe because populations have had no time to develop immunity. The mortality rate among aboriginal populations is likely to be in the nature of thirty to fifty percent of the morbidity rate, which is the incidence of the disease occurring in the population. There is no proof to support theories that certain races have higher mortality rates from first exposure to infectious diseases than do others. Fabrega (1974:73), speaking of the work of Neel et al (1970) concerning the response of the Yanamamo Indians to a measles epidemic, says:

Although a genetic susceptibility has been presumed, An implication of Neel's recent observations is that secondary factors (such as the behaviour of the subject during the infection - in particular his apathy - the absence of fluid replacement, and the general collapse of village life during the epidemic) probably accounted for much of the morbidity and mortality associated with this disease. A serologic follow-up on a small scale revealed that ... 'the ability of the Indian to form antibodies to an antigen to which he may not previously have been exposed appears no different from that of the much exposed Caucasian'. Thus the long held view regarding an innate 'susceptibility' to measles in the American Indian is seriously challenged by this data.

Many would agree that the panic, chaos, and fear, or, on the other hand, the resignation and despair that may overcome a population suddenly swept by an unknown disease, is itself a potent factor in mortality.

Immunity to disease is of two kinds: natural immunity, which is thought to have a genetic basis, and acquired immunity, which is an individual response to infection, sometimes without manifest symptoms of disease but more usually, following infection, prostration and recovery. The individual who acquires immunity has a modification of blood proteins as a result of this and is thought to be able to transmit this modification inter-generationally, which is the basis of natural immunity. The exact nature of immunological processes is imperfectly understood, but knowledge is increasing at an accelerating rate. Lymphocytes, leucocytes, and erythrocytes are all involved. Many authorities are inclined to believe the haptoglobins are largely responsible. Viral templates repeat patterns of alterations and it is believed that immunity, over time, modifies the nature of diseases and the general pattern is to make them less severe. Acquired immunity of another kind is that developed by medical technology, which makes it possible for persons to be inoculated by optimal doses of infection which are sufficient to stimulate immune processes without producing disease. But this is a development of the present century.

Newman (1965:351) says, "Explanations for disease distributions are usually multi-factorial." Some diseases are endemic as well as epidemic; others occur in certain climatic zones. But whether it is climate, per se, which is the determining factor of the distribution, or whether certain climates promote changes which are ecologically favourable to certain disease organisms, is not always clear. Some climates vary little throughout the

year, and disease organisms adapted to such climates are always in a climax state. Other seasonally marked climates have adjustment periods between summer and winter, or wet and dry seasons, and these ease transitions for ecological systems. Canada, although generally regarded as having a healthy climate, has two major seasons, summer and winter, between which, especially in some areas, are only very brief spring and fall transitions. Seasonal temperature variations are extreme in much of Canada, as often are the differentials between diurnal and nocturnal temperatures, or between one day and the next. A differential of forty degrees Fahrenheit in a twenty-four hour period is not exceptional. Dubos (1967:62) says, "Evidence derived from epidemiological, clinical, and experimental observation strongly suggests that sudden atmospheric changes, rather than any climatic factor per se, are the events most likely to be associated with exacerbation of pathological states." He quotes Hippocrates as saying, "But seasons which come on gradually are the safest, as are gradual changes of regimen and temperature."

There are interesting references in the Jesuit Relations and Allied Documents to specific climatic conditions in connection with the smallpox epidemics raging in Canada at the time of early contact. These confirm for the past what is known today about the smallpox organism's resistance to cold. Thus, in the 17th century, Le Mercier, writing to Le Jeune says:

The contagious epidemic affecting the Indians continues to increase, causing many deaths; and even the coming of winter fails to check it. The town of Ossossané is ravaged by the disease, and Brébeuf and his assistants journey thither several times during the winter, to give spiritual aid to their wretched parishioners. (JR 13:2-3)

Ossossané afflicted with a contagious disease. We had hoped that, as generally happens in France and elsewhere, the first frost would arrest the progress of this contagious malady. But just the opposite happened, and the depth of winter was also the severest period of the disease, so that from the 10th or 12th of November we saw ourselves almost surrounded by it on every side. (JRAD 13:165)

Our poor village continued to be afflicted until spring and is almost entirely ruined. (JRAD 13:165)

On the fourth of December, having learned the news from Ossossané that the disease was spreading there, and that some of its people had recently died, the Father Superior sent thither Father Charles Garnier and me ... over 50 ill. (JRAD 13:165)

On the 20th (of December) we returned to Ossossané where the malady was continuing to make great ravages. (JRAD 13:197)

On this same 23rd (of December) one Entaraha said to the Father Superior that porcelain collar they had accepted the year before, at a general council held on the occasion of the Feast of the Dead, was now the cause of their death, and that this was the belief of all the people, - inasmuch as the Father had told them that this

present was not for the dead, and that it was not his intention that they should place it in their grave, but that he desired to open to the living the way to heaven, and to encourage them, thereby to surmount all difficulties which prevented them from taking that route. (JRAD 13:209)

This same Captain one day, when he felt sick asked what kind of weather it was; he was told that it was snowing. 'I shall not die, then, today,' he said, 'for I am not to depart this life except in fine weather.' (JRAD 13:213)

Tonneraoutanont did not succeed in his cures any more than in his prophecies. He had predicted that no more than five of them would die, and that the sickness would cease at the end of nine days; and yet before the Father's departure there were ten dead, and since then more than fifty; and on the 14th of January, when the Father went away, there were nearly as many sick people as usual, yet it was the 13th day after this fine prophecy. (JRAD 13:213)

The Indians had resolved to re-embark every one of the Priests in the Spring and send us back to Kebec. (JRAD 13:217)

... seventy Bissiriens died in January (JRAD 13:217)

... on the 17th, the epidemic continued to rage at Ossossané, (January). On the 28th he found the demon let loose, and poor people in a deeper affliction than ever. A Feast was held 'Come, let the contagion cease.' And they held a dance called Turkey Wings. (JRAD 13:217)

We have had a long winter this year; it began on the 10th or 12th of October, and had greatly encroached upon the Spring. (JRAD 13:249)

4.2.1638 The disease still rampant. (JRAD 13:225)

The sorcerer said that if they did not do as he told them the sickness would last till July. (JRAD 13:259)

There was everywhere three feet of snow ... February 8th. (JRAD 13:261)

On the 20th (February), we learned from anons a new opinion concerning the malady, - that a report was current that it had come from a nation in the direction of Virginia and was a punishment to all men because they did nothing but make war. (JRAD 14:9)

On the 2nd (of March) the disease had not yet departed. On the 7th a young man was found dead. (JRAD 14:11)

On the 15th (of March) there were a great many sick people. (JRAD 14:15)

On the 1st day of April they visited some sick people. (JRAD 14:29)

On the 13th of April, when some of our domestics were going on a visit to the Tobacco nation, which is two days journey from us, Father Garnier asked the Father Superior's permission to go with them, simply to visit the sick there who were, according to what we were told, quite numerous. (JRAD 14:35)

On the 19th, the Bissiriens, seeing the ice broken and the lake open, embarked to return to their own country, and carried away in seven canoes seventy bodies of those who had died while they wintered among the Hurons. (JRAD 14:37)

On the 23rd (of April), the Father Superior sent us, Father Isaac Jogues and me, to visit the sick of two or three little villages. We baptized four children; two died the next day, and a third a few days afterwards. What a favour from Heaven for these little Angels. (JRAD 14:39)

On the 19th (May) we had a real winter day; nearly half a foot of snow fell. (JRAD 14:47)

On the 24th of May a feast was made for the health of a man and his daughter ... the worst is over. (JRAD 14:63)

Contagion still present 16.6 ... the people who fall sick are those who have all winter helped others. (JRAD 14:105)

The most destructive of all the smallpox epidemics broke out at Tadoussac in the winter of 1669 -1670. Midst cold and hunger, two hundred and fifty persons died of the Montagnais, Algonkins, Papinachois, and Micmac, from Sillery to Tadoussac. One shipload 'all resembled monsters rather than human beings, their bodies were so hideous, emaciated, and full of corruption.'. (Bailey 1969:78 and quoting from JRAD 53:69)

Whereas from a thousand to twelve hundred Indians had formerly frequented Tadoussac scarcely a hundred remained in the summer of 1670. It is said that six score had died at Tadoussac alone. (JRAD 53:77)

The smallpox virus is relatively heat stable but thrives at temperatures of minus twenty below zero Fahrenheit. Specimens for laboratory purposes are preserved during transportation by being packed in dry ice. Thus we understand one factor, cold resistance of the virus in the devastating and irresistible persistence of smallpox in Canada in the seventeenth century; and the relevance of the references to the winter epidemics in the preceding quotes.

Hare (1965), discussing how acute infections in disease organisms

themselves disappear when recovery or death of the host occurs, points out that the viruses also have a struggle for survival:

Whether the patient dies or recovers, the organisms are usually available for transfer to other persons for no longer than the acute stage of the disease, that is about seven to fourteen days.

A second disadvantage faced by these organisms is that they are so readily transmitted from person to person that if they reach a non-immune community virtually everyone goes down with the disease within a very short time.

A third impediment is that with the possible exception of influenza those who recover are not only immune for the rest of their lives but cannot even act as symptomless carriers of the organisms.

Thus survival and permanent establishment of the organisms responsible will only occur if the population is large enough to ensure a constant supply of susceptible children and is not so widely dispersed that person to person transmission is difficult.

It is therefore highly improbable that any of these organisms would have become established in a scattered community with a paleolithic culture.

As we shall see below, at least the Iroquois and Huron of Upper Canada lived in villages: evidently in population clusters large enough to provide host conditions for smallpox virus survival for over two hundred years in the case of the Iroquois, and, as far as the Huron were concerned, until such time as they were virtually eliminated.

According to Mazur (1932:309-314): "Infectious diseases have surely been one of the major selective forces throughout the history of man. He has had to adapt or perish. His adaptation to infectious diseases has necessarily been a somewhat different process from his adaptation to inanimate factors because the disease organisms themselves are alive and also constantly adapting and evolving."

Hence the decimation of North American Indian populations by epidemics provides a tragic picture of a near genocide; whether "adaptation" has now taken place must be considered.

Baker (1965:2-11) suggests: "A re-examination of evolution from a theoretical viewpoint and an examination of the factual data has shown that man, as other mammals, has been subject to the selection pressures of the physical and biological environment and has responded not only by the process of culture formation but also by the process of biological adaptation. We may, therefore, probably investigate human adaptability by beginning with the concepts of the ecologists, first by examining man's relationship to the biological environment but also remembering that he has created a new category of environment ... the cultural environment. Culture remains the most elusive element since it not only creates adaptations to the previous

environment but also creates stresses within itself to which man must adapt as surely as he must adapt to the physical world."

Newman (1964:351) quotes Stewart (1960:265) as suggesting the cold of the Far North served as a screen, preventing the movement of pathological germs along with their human hosts. The cold screen theory offers one possible explanation as to why, at the time of first European contact, the Indians lacked many disease entities common to the Old World and, consequently, were so vulnerable to the diseases introduced by the Europeans.

Although the Eskimos and the Indians themselves came from the Old World to the New, they came as paleolithic hunters, in small groups, and as Hare has told us above, small and relatively isolated groups would be unlikely to provide adequate host populations for infectious disease organisms. The aboriginal North Americans were cut off from the Old World long before the rise of dense populations, especially in areas in any proximity to their regions of origin, and the 'cold screen' may have further isolated them.

The cold screen theory gains support from evidence emanating from the McMurdo Research Station in Antarctica, suggesting that geographic isolation plus an extremely cold climate and a constant environment are conducive to good health.

In an unsigned feature article which appeared in the Winnipeg Daily Tribune, Saturday, February 8, 1975, page 19, it was claimed: "The remote outposts of human life strewn across the continent may prove to be one of the healthiest places on earth ... at least during the long winter, when they are completely out of physical contact with the rest of the world. The main clinical drawback is that when the inhabitants return to more hospitable parts they become ill much more readily than other people, their immunity systems apparently having atrophied."

According to Dr. Michael Hummer: "We have found that people isolated here quickly lose white blood corpuscles because of the lack of challenge from outside organisms. A normal person in the outer world may have a white blood cell count of from 5,000 to 10,000 per cubic millimetre of blood. After six weeks here the count falls to about 3,500."

The question then arises, was the aboriginal North American Indian protected by his isolation and climatological factors, and, at the same time, rendered extremely vulnerable to new diseases because of a leucopenia (an abnormally low white cell count) which had atrophied his immunological responses? Was a leucopenia the reason for differential morbidity and mortality? There is no way to know if this was so. The climate of North America has not significantly changed in the last four hundred years. There is nothing in current medical records to show that the North American Indian has leucocyte counts that differ from those of other residents of North America unless and until such time as normal readings are affected by drugs or disease. But these readings are three to four hundred years after contact, after the epidemics which decimated the aboriginal population, and after slow recovery.

The trouble with the cold screen theory is that infectious diseases are rife among the Native populations of Alaska and sub-Arctic. However, in spite of modern communities and the availability of store bought food and clothing, living conditions are in no way comparable with those enjoyed by whites. Man needs multiple resources with which to withstand extreme cold and "traditional" resources, such as shelter, clothing, high protein diet, etc., which once may have protected the Native peoples, have been almost completely destroyed. The transitional period, which is the present, is stressful for sub-Arctic peoples.

As for Antarctica, early in 1976 there was an announcement in the lay press to the effect that one of the research stations, which was unnamed, was being closed down and the personnel flown out because they had succumbed to some mysterious infection. Headlines said, "Organisms dormant for millions of years" were responsible. Later reports, more subdued, were to the effect that the people flown out were suffering from infectious hepatitis. There was no public explanation as to how the viruses had survived - or existed - in the reportedly germ-free Antarctic environment.

It is considered that the nomadic life is a healthy life among aboriginal peoples. Mobility renders man less likely to contract disease because in moving freely over vast distances he leaves his excrement behind him. Burnett (1962:1-2) says that from the ecological point of view "disease has always been part of the everyday experience of life and a general recognition of the association of disease with civic filth and personal uncleanliness goes back to classical times."

How effectively man shelters himself from the elements has an important bearing on health, and dwelling conditions at the time of early contact varied considerably in different parts of the country and included everything from the long houses of the Iroquois, the semi-subterranean winter houses of the Athapascan tribes, the buffalo-hide tents of the Plains Indians, the birch bark lodges of the Chippewa and some eastern tribes, the frame houses of the Kwatiutl Indians and the snow houses of the Arctic Eskimos. Each type of shelter was an ecological adaptation and was rational for the purpose for which it was constructed, utilizing the raw materials, facilities and technology available on the continent at that point in time.

The Jesuit, Lafitau, has left a description of the Iroquoian Long House which recognizes the purposefulness of its construction, as well as man's successful exploitation of his environment. Moreover, it is the scene of domestic life which was to be disrupted by both Jesuits and smallpox:

. . . It is not without reason that the name of Hotinnonsioni or Builders of Cabins has been given to the Iroquois; they are indeed the most comfortably lodged of all America. Nevertheless, this name is not so exclusively their property that it cannot also be applied to the Hurons and to some other of their neighbours, who have adopted from them the same manner of building.

These cabins are also in the form of a vault or garden arbor; they are five or six fathoms wide, high in proportion, and vary in

length according to the number of fires. Each fire adds twenty to twenty-five feet to the length of a cabin of a single fire, which does not exceed thirty or forty feet. Each of these cabins rests on four posts for each fire which are the base and support of the entire structure. Around the entire circumference, that is to say, all the length of the two sides and the two gable ends, pickets are planted to secure the pieces of elm bark which form the wall and which are bound together with strips made from the interior coating or inner bark of white wood. The square frame being raised, the roof framing is made of poles bent to the form of a bow, which also are covered with pieces of bark a fathom long and a foot or fourteen inches wide. These pieces of bark lap one over the other like slate. They are secured outside with fresh poles similar to those which form the roof frame underneath, and are still further strengthened by long pieces of saplings split in two. These run along the whole length of the cabin, from end to end, and are fastened to the extremities of the roof, on the sides, or on the wings, by pieces of wood cut with hooked ends, which are regularly spaced for this purpose.

The pieces of bark are prepared a long time before using. They are removed from the trees, after girdling, when the sap is rising, because then they are more easily stripped off; and after the outer surface, which is too knotty, has been removed from them, they pile them compactly one on the other that they may not warp, and thus they are left to dry. The poles and the wood necessary in building the structure are prepared in the same way, and when the time has come to commence work, the youth of the village, for whose encouragement a feast has been provided, are invited, and in a day or two all the work is set up, more from the multitude of hands working upon it than by the diligence of the workers.

After the body of the building is finished, those for whom it is especially intended work leisurely to embellish the interior and to make the necessary compartments after their usages and needs. The middle space is always the place of the fire, from which the smoke escapes by an opening made directly above it in the roof and which also serves to give light. These buildings being without windows are only lighted from above in the same manner as the celebrated Rotunda built by Agrippa, which may still be seen entire in Rome. This opening is closed by one or two moveable pieces of bark, which are moved back and forth as desired during the heavy rains or certain winds which would cause a back draft for the smoke, and render the cabins very uncomfortable. I speak here only of the cabins built like those of the Iroquois; as those which are found, or are built in the manner of an ice cellar, have not even the opening in the top, so that they are both darker and inmates more of a prey to the smoke.

Along the fires there extends on each side a platform of twelve to thirteen feet in length by five or six in width and nearly as high. These platforms, shut in on all sides except that towards the fire,

serve as beds and as chairs to sit down upon; on the bark which forms the floor of the platform they spread rush mats and furs. On this bed, which is hardly a fit support for the effeminate or lazy, they stretch themselves without ceremony, wrapped in the same clothes that they wear during the day. They hardly know what it is to use a pillow. Some of them, however, since they have seen French ways, make pillows of wood or of mats rolled up. The more luxurious ones use them made of skin and stuffed with the hair of the deer or the moose; but in a little while they are so greasy and dirty and are so disgusting to look at that it is only such slovenly people as these savages who could endure them.

The base of the platform, on which they sleep, is elevated at most one foot from the ground; it is given this elevation to avoid the dampness, and it is not greater, on the other hand to avoid the inconvenience of the smoke which is insupportable in the cabins when standing erect, or even a little raised.

The bark which covers the platforms above and which forms the ceiling of the bed, serves them as a closet and larder, where they place, in the view of everyone, their dishes and all the little utensils of their household. Between the platforms are placed large chests of bark, in the form of tuns, and five or six feet high, where they put the corn when shelled.

The cabins of the Iroquois have two exits. At each end there is a kind of separate lobby or small apartment and an exterior vestibule.

There are in these lobbies, as well as in the free space between the platforms, small closets on the two sides where they place the mats of straw or fresh reeds which are for the young people when the family is numerous, or for their own use in the season when the vicinity of the fire is no longer necessary. These closets are raised three or four feet to insure them from the importunity of the fleas; below is placed the supply of small wood.

The exterior vestibule is closed in winter with pieces of bark and serves them as a shed for large wood, but in summer it is opened to the air on all sides, and some in the warmest weather place their mats on the roofs of these vestibules, which are flat, and not raised as high as the cabins. They sleep thus in the air without minding the evening damp.

While it is possible to walk back and forth in the cabins on either side of the fires between the hearths and the mats, it is nevertheless not a comfortable place for a promenade; moreover, the savage, wherever he is, unless he is actually travelling, is always either seated or lying down, and never walks. They are even surprised to see the Europeans walking back and forth over the same paths as were the people of Spain, of whom Strabo speaks, who seeing some Centurions of the Roman army thus walking supposed them

to have lost their wits, and offered to conduct them to their cabins. For they thought that they should either remain quietly seated in their tents, or that they should desire to flight.

The doors of the cabins are pieces of moveable bark, suspended outside by the top, without lock or key. In former days nothing was locked with the savages. When they went for a long time abroad, they contented themselves with closing their doors with a bar of wood, to protect them from the dogs of the village. During all the centuries that have preceded us, they have lived in perfect security, and without much protection from one another; the most suspicious would leave their most precious belongings with friends, or would bury them in holes made expressly under their mats, or in some secret place in their cabins. Some now have chests or small boxes, others fortify their cabins by gables formed of rudely made boards, and then put doors of wood with locks which they buy off the Europeans, whose vicinity has frequently taught them, at their expense, that what they have closed is not always in security.

They double their doors to protect themselves from the cold and the smoke; and make what seems like a second door with blankets of skin or wool. In the common and ordinary cold weather, their cabins are sufficiently warm, but when the northwest winds blow and there occurs one of those severe Canadian spells which last seven and eight days in succession, and are cold enough to split stones, then the cold having penetrated in, I cannot understand how they can endure it, being as little covered as they are, especially those who sleep far from the fire.

During the summer they are cool enough, but full of fleas and bed-bugs, they are also very unsavoury when they dry their fish in the smoke . . .

These passages are quoted in full because of the way they describe social structure and function, environmental adaptation, social customs, health hazards (cold, smoke, lice and dirt), the incipient adoption of some items from the intrusive French culture, as well as a shrewd appreciation by the Indians of some of the less desirable traits of some of their new neighbours. One wonders at the appellation "les sauvages".

The semi-subterranean log and sod house of the Athapascan people utilized a principle of protection from cold that is equal to basemented houses of today, and the grass and birch bark with which the Athapascans covered their roofs and sealed small apertures differs only in materials and technology from today's insulation. Moreover, there is a growing realization that the frame houses of Canadian white society are unsuitable for the north and there is a recent official recommendation that there should be a return to log houses, improved, of course, for northern areas.

The tent provided portable housing in the summer, especially for nomadic groups, and the "white man" has borrowed the idea for his vacation trips.

One thing which appears to have made the Native North Americans more vulnerable to diseases after contact was overcrowding in the Long Houses and other dwellings, and the close physical contact in which they lived. The Jesuits complained of the lack of ventilation and found that smoke from fires served one useful purpose in that it repelled insect pests but it was hard on human lungs and eyes.

Nutrition and diet are major factors in the maintenance of health, and extra calories, fat, vitamin D, and vitamin C are all needed in cold climate. Under-nutrition and malnutrition are very different conditions and either or both can cause stress. The pre-contact Indians were entirely dependent upon the environment and like all hunters and gatherers their major activity was procuring food. The largest numbers of Indians were congregated in areas where resources were rich enough to support such populations; along the Atlantic and Pacific seaboards, in North Western Alaska, along the Mackenzie Delta, in the wooded forests of Nova Scotia and New Brunswick, along the northern and southern shores of the Saint Lawrence River, and in the lush areas of South Eastern Ontario and the Niagara Peninsula. In Eastern Canada an agriculture something more than incipient was being practised by the Hurons and the Iroquois, for there is a record that a contingent of British soldiers destroyed 400,000 bushels of Indian corn, and, on another occasion, it took soldiers three whole days to burn some planted fields. (Johnston 1964:21)

The Alaskan-Athapaskan Indians had plentiful supplies of salmon and shellfish which, together with available land animals such as moose, caribou, beaver, bear, and rabbits, provided a diversified food supply. There was plenty of game in the Mackenzie Delta, and the rivers were full of fish. A variety of wild fruits and berries such as saskatoons and chokecherries were available. In eastern Canada, there was seafood, lake and river fish, beaver, deer, rabbit, bear, moose, wild turkey, and other game. There were wild strawberries, apples, cranberries, blueberries, and a variety of edible roots. Maize, peas, beans, pumpkin and squash were being cultivated and, in some areas, wild rice and potatoes. The food supply was plentiful but irregular, especially when bands were away hunting and trapping; and the Jesuits tell us that sometimes there were plagues of grasshoppers which destroyed the Indians' crops, and sometimes the snow failed to come and replenish the ground and that some of the Indians were starving. There is no evidence that starvation was a major problem until such time as trapping for furs seriously depleted the game; and the buffalo herds finally failed, and an upsurge in population pressures due to immigration imposed stress upon the environment.

There is some evidence that hunting techniques were wasteful. Champlain describes the Iroquois Neutrals driving deer into a pen and said that they captured as many as one hundred and twenty in three days by this method. The implication is that this was unnecessary. According to Champlain, the rationale was that the Indians believed that if they did not kill all the deer those that survived would go away and tell other deer to keep away from the area. Champlain does not tell us how many people were going to share the deer, or if there was any way of storing surplus meat. (Champlain in Biggar 1299:64)

Lowie (1963:21) says the introduction of the horse among the Plains Indians is generally blamed for the extinction of the buffalo herds but argues that the Indians were making effective drives against the buffalo long before the advent of the horse.

Setting fire to grasslands was one means of driving buffalo, and the Miamis caught four hundred a day by this method. Impounding, as well as driving buffalo over cliffs were other methods of slaughter. It was not until relatively late (1670) that the Blackfoot acquired horses. The Assiniboiné, Cree, Blackfoot and the Gros Ventre all knew how to successfully impound big game. (Lowie 1963:21)

The horse and the gun have indeed been blamed for the death of the buffalo but David Thompson's narrative of his explorations in Western America (1916:323-24), and talking of smallpox among the Indians of the Plains, says:

With the death of the Indians a circumstance took place which never has, and in all probability, never will be accounted for. I have already mentioned that before that dreadful disease appeared among the Indians they were numerous, and the Bison, Moose, Red, and other Deer were so in proportion and provisions of meat, both dried and fresh in abundance. Of this all the Traders and Natives, were fully sensible, and it was noted by the Traders and Indians, that the death of the latter, and there being thus reduced to a small number, the numerous herds of Bison and Deer also disappeared both in the woods and in the Plains, and the Indians about Cumberland House complained the same of the Moose, and the Swans, Geese and Ducks with the Gulls no longer frequented the lakes in the same number they used to do; and where they had abundance of eggs during the early part of the summer, they now had to search to find them. As I was not in the country at this time I can only give the assertion of the Traders and Natives, who could have no interest in relating this sad state of the country. In the early part of September, 1786, I entered these countries and from that time can speak from my own personal knowledge.

Serendipitously, here is evidence that game of all kinds was abundant in the prairie regions of Canada until the latter years of the eighteenth century.

Agriculture with primitive tools was extremely hard work, and it was largely carried out by women. The Indians had no animal labour, except the dog, and had not invented the wheel. Their implements were digging sticks, primitive rakes and hoes made from the scapulae of large game such as moose.

Fuel for cooking consisted of such things as rotten bark, wet grass, and animal dung. Meat was roasted on a spit over an open fire. Root vegetables were baked in holes dug in the earth, which were lined with heated stones.

Feeding utensils were of birch bark and wood, and from all accounts were

thick with the grease which accumulated over time, and were passed from person to person, so that they were used indiscriminately by all. Likewise, the tobacco pipe was passed from person to person, so that all sucked from the same stem. Spitting was habitual.

Their huts were allegedly over-heated, and sometimes the Natives would go outside, exposing themselves to sub-zero temperatures. Bonnycastle tells us that inflammation of the lungs and rheumatism "due to wet and exposure" were among their most ordinary complaints. They also suffered from malaria and blamed water-sodden timber rotting near shorelines as the cause of this. They painted their bodies with grease in order to protect themselves against the bites of insects. (Bonnycastle 1841)

For most of our information concerning the health of the Native North American Indian at the time of early contact, we are dependent upon records left by explorers, fur traders, and the Jesuit priests.

Those priests who were earliest on the scene were harsh in their judgement of all they saw; but their judgement was the measure of their own culture shock, which sharpened their perceptions. Those who came later knew what to expect and their reactions were kinder until such time as Bressani (1653) could write, "Indeed there is nothing savage about them but the name."

The Jesuits tell us "Indians readily despair of the sick and abandon them, neither providing food nor care for them in any way." (JRAD 1:101) They knew epilepsy, and there is a reference to "numerous weaknesses of the race." (JRAD 1:247, 257-61) Women were said to be naturally prolific, abortion was prevalent, and there were many premature births, which were attributed to hard work. Child rearing was said to be extremely difficult, and many infants failed to survive. People afflicted with protracted illnesses were killed in order to end their sufferings. Orphans were also killed. There are references to dysenteric troubles, and "these miserable people continually weakened by hardship". (JRAD 1:149)

Infanticide was practised, and the aged were often killed or left to die. Of the Montagnais, specifically, it was said that the sick and aged were killed because they could not keep up on the trail. (JRAD 4:199) There were frequent references to scrofula. There are references to fissure-in-ano, which was thought to be tubercular in origin. However, the commonest cause of anal fissures among primitive peoples is the cultural practice of cleansing the peri-anal area after defaecation with such things as sand, gravel, topsoil and leaves, which practice breaks the skin and predisposes to infection. One statement in the Jesuit Relations mentions infants being cleansed with powdered rotten wood.

From ossuaries, we have plenty of evidence that the North American Indians suffered badly from arthritis, and this is particularly true of the Iroquois.

Like any other human population, the Indians obviously had their share of ill health, but their illnesses were chronic conditions to which they had long adjusted. The introduction of acute infectious diseases by the incoming

whites created a situation for which the Indians were in no way prepared, and which they could only explain in terms of the supernatural - an explanation fostered by their own medicine men because it excused their own impotence.

The population profile was controlled by cultural practices. Abortion and infanticide, together with poor child-rearing practices, kept the base of the population structure narrow. Neglect of the sick and the dying, as well as geronticide, eliminated the aged from society, whilst warfare and ritual cannibalism exerted control mechanisms on the young male section of the population. This, in turn, would favour the practice of polygamy and the birth of too many children. Abortion and infanticide would make sense in such circumstances in a hunting and gathering society.

In general, the health of the Native peoples of North America is well documented from the year 1535 onward, though diagnoses may not always have been accurate. The first disease to alarm the French was the Indians' Plague (scurvy), which the French named "mal de terre" (the land disease). Scurvy is usually associated with long sea voyages and the lack of fresh fruits and vegetables, which are rich in vitamin C, but there is evidence that in cold climates large amounts of this essential health element are excreted from the body via the urinary system. (Merck Manual 1967:271) Unless this was understood, and replacement therapy undertaken, the loss would pre-dispose to scurvy.

The earliest mention of disease in Canada occurs in the report of the meeting between Jacques Cartier and the Indian Chief Agouhanna at the village of Hochelaga, where Montreal now stands, in the year 1535. Agouhanna was paralyzed in all four limbs, and after Cartier had touched his arms and legs, which the Indian had indicated he had wanted him to do, other sick persons were pushed and carried forward, as if being touched by Cartier could restore them to health. (Biggar 1942:164)

Shortly after Cartier returned to Stadacona, which was to become the site of Quebec City, he found some of his men already sick, and the rest alarmed because the Indians' plague was rampant in the village and it was rumoured that fifty persons were already dead. (Biggar 1924:204)

The Indians knew a cure for scurvy and they told Cartier of this so that he was able to save the lives of some of his men. What is difficult to understand is that notwithstanding knowledge of this cure, scurvy continued to be prevalent among English and French settlers and the Jesuit Priests until the end of the seventeenth century. Alfred Goldsworthy Bailey (1937:76) offers one explanation. He says it was the Laurentian Iroquois who had saved the lives of Cartier's men. The eastern Algonkians knew nothing of the remedy and could do nothing to help the early Quebec, and the Saint Croix and Port Royal colonies.

The medical historian, Heagerty (1928) tells us there were epidemics of scurvy at Saint Croix, in the Bay of Fundy, in 1604 and 1605. It occurred at Port Royal (Annapolis) in 1606. It was rampant in Quebec in 1608 and 1609. There were epidemics at Trois Rivières in 1634 and 1635. In 1642, scurvy was prevalent among the pioneers in Montreal. It was also recorded at

Richibucto, and at Chedabucto in Acadia (Nova Scotia). There was scurvy among the troops at Fort Saint Anne in 1666 and at Lake Champlain in 1667. It was prevalent at Cataragui in 1672, and at Niagara in 1687. In 1689 it was again rampant in Montreal, and it was occurring among English settlers at Hudson's Bay in 1702. Quebec had outbreaks in 1759 and 1760, and there were reports of scurvy among American troops in 1775 who were received into the hospital at Trois Rivières where they overflowed the wards and were accommodated in the chapel. By 1880, the cause of the disease was well understood and it ceased to be a problem in Canada. (Heagerty 1928 1:1-16)

There is a reference to paralysis in connection with scurvy, which was common at Miscou in 1643: "Father Andre Richard remained on the island (Miscou) after the departure of his companion who had become a paralytic." (JRAD 12:265)

When two societies are in contact there is an interchange of trade, ideas, and genes. Diseases are transmitted, too, and in the long, long, perspectives of evolutionary time some strange things happen. The "white man" may, indeed, have communicated tuberculosis to the American Indian, but the American Indian introduced the white man to the potato as a staple item of food. In one year of severe environmental stress, an extraordinarily wet season favoured the potato virus which brought about the potato disease which caused the Irish potato famine of 1847, which caused massive emigration from Ireland, where the incidence of tuberculosis was high, to the United States and Canada. As a result of this, there was an upsurge of tuberculosis across the whole North American continent.

In addition to this, and in the context of culture change, one might consider that the North American Indian introduced the white man to tobacco, to which he has since become so addicted that he is now dying in increasingly large numbers from lung cancer, in the causation of which tobacco is heavily implicated. What is not known, because there is no present evidence for or against, is whether tobacco can be implicated in the causation of cancer in regions of the body other than the lungs. What is known, is that lung cancer is presently occurring in some persons who have never smoked but have been heavily exposed to tobacco fumes from smoking family members and/or friends.

The white man's cultural gift of alcohol to the Native peoples of North America, together with its deplorable physiological, psychological and sociological effects has been well documented and needs no emphasis, here.

CHAPTER TWO

SMALL-POX: THE DISEASE; THE BIOLOGICAL AND THE CULTURAL FACTORS: A DISCUSSION

CHAPTER TWO

SMALLPOX

The epidemic disease which terrified Native North American populations and wiped out whole villages, bands, and tribes was smallpox. This once rampant and pandemic disease has been virtually eliminated during the twentieth century, as the result of massive inoculation programmes, and is now known to exist only in one or two isolated regions of Ethiopia. Very few people, today, who are under fifty years of age, have any knowledge or experience of the disease, but older people can still recall its threat and horrors.

Taber's Cyclopedic Medical Dictionary (1965:V6-V7) has this to say about smallpox:

Smallpox. Virus closely resembling the vaccinia virus. Acute, contagious. More common during colder seasons. No age exempt. Contagion direct, chiefly. May also be spread through the handling of articles contaminated by the patient. Susceptibility practically universal in those unprotected by proper vaccination, or before a first attack of smallpox. pitting is not an inevitable misfortune in all cases but depends principally on extent to which the true skin is involved. However, though pitting does not occur marked pigmentation may exist at the sites of the lesions and continue to attract attention for many weeks following recovery from an acute attack.

The disease is defined as occurring in one of three forms.

1. Modified or discrete smallpox, in which the outcome may be considered favourable in practically all instances.
2. Confluent smallpox, in which pustules run together. As this eruption progresses, the lesions enlarge until destroyed by breaking down of their walls and so pustular material flows together into small pools. The temperature does not show the same remission as in the discrete type, the toxæmia is much more profound, the throat symptoms are likely to be unusually severe, and swallowing may be practically impossible. In confluent smallpox, recovery is always doubtful.
3. Haemorrhagic smallpox ... with haemorrhage into the vesicles. In the haemorrhagic type, following customary onset ... profuse subconjunctival haemorrhages and/or profuse haemorrhages from nose and throat may develop and patient die within 24 to 48 hours with no prior loss of consciousness. In the haemorrhagic types, death is almost inevitable.

If these medical descriptions are kept in mind, there can be little doubt that the Jesuit priests and other witnesses were faithfully describing

what they saw during the North American epidemics. Furthermore, given the virulence of the smallpox organism and the susceptibility of human hosts, plus the fact of no previous exposure to the disease, there is no evidence at all that the North American Indians reacted any differently than would any other virgin population and theories of a differential reaction genetically based are not sustained. The nature of the disease is almost enough to account for the carnage. Almost, but not quite. There are still some factors which tease and intrigue and prevent any simple explanation of why so many died.

Smallpox is first known to have appeared in the Americas, in the West Indies, in 1507. Spanish troops introduced it into Mexico in 1520. It swept through the Indians of Massachusetts in 1633; and in 1634 nine hundred and fifty out of one thousand Indians who lived in a palisaded fort above the river Conigtecute (Connecticut) died and, according to Bradford, quoted by Heagerty (1928:1: 18-19):

Many of them did rott above ground for want of burial.... This spring also, those Indians that lived about their trading house there fell sick of the smallpox, and dyed most miserably: for a sorer disease cannot befall them; they fear it more than the plague; for usually they that have this disease have them in abundance, and for want of bedding and lining and other helps, they fall into a lamentable condition, as they lie on their hard matts, the poxe breaking and mattering, and running one into another their skin cleaving (by reason thereof) to the mattes they lye on; and when they turn them, a whole side will flea off at once (as it were) and they will be all of a gore blood, most fearful to behold; and then being very sore, what with cold and other distempers, they dyed like rotten sheep. The condition of this people was so lamentable, and they fell down so generally of this disease, as they were (in the end) not able to help one another; no, not to make a fire, nor to fetch a little water to drink, nor any to bury the dead; but would strive as long as they could, and when they could procure no other means to make a fire, they would burn the wooden trayes and dishes they ate their meat in, and their very bowes and arrows; and some would crawle out on all fours to gett a little water, and some dye by the way, and not be able to get in againe. But those of the English house (though at first they were afraid of the infection) yet seeing their woefull and sad condition and hearing their pitiful cries and lamentations, they had compassion on them, and dayly fetched them wood and water, and made them fires, gott them victuals whilst they lived, and buried them when they dyed. For very few of them escaped notwithstanding they did what they could for them, to the hazard of themselves. The Cheefe Sachem himself now dyed, and almost all of his friends and kindred. But by the marvellous goodness and providens of God not one of the English was so much as sick, or in the least measure tainted with this disease, though they dayly did these offices for them for many weeks together. And this mercy which they shewed them was kindly taken, and thankfully acknowledge of all the Indeans that knew or heard of the same and their Mrs. did much

commend and reward for the same.

This is one of the many statements existent in the literature which draws attention to the differential reaction to smallpox as it affected Indians and whites. How much these statements may have contributed to the development of the belief that the difference was a racial distinction it is impossible to assess.

It has been offered as an explanation of the differential morbidity and mortality of the white settlers in North America in connection with the smallpox epidemics, wherever they occurred, that coming from Europe, as they did, where smallpox had long been prevalent, they had a natural immunity to the disease. (JRAD)

The history of smallpox among the Indians of Canada at the time of early contact has been well-documented by the Jesuits in their Relations, which contain many references to the disease. In 1635, it was widespread among the Montagnais Indians, who lived along the banks of the Saint Lawrence. The Jesuits tried, originally, to spread the Christian doctrine among this Algonquin tribe, but being unsuccessful, turned their attention and their efforts to the Hurons. They established a mission near Georgian Bay, but almost as soon as they did so smallpox erupted among the Hurons and devastated them. The disease was attributed by the Hurons to the "medicine" of the "black robes". In 1636, there was another epidemic among the Hurons, who were now fully convinced that the disease was given them by the Jesuits and determined to kill them.

Le Jeune (1637) tells us:

It was upon the journey which the Hurons had made to 'Kebec' that it was started in the country ... our Hurons, while again on their way up here, having thoughtlessly mixed with the Algonquins, whom they met on the route, most of whom were infected with smallpox. The first Huron who introduced it came ashore at the foot of our house, newly built on the bank of a lake ... whence being carried to his own village, about a league distant from us he died straightway after.

Without being a great prophet one could assure oneself that the evil would soon be spread abroad through all these regions; for the Hurons ... no matter what plague or contagion they may have ... live in the midst of their sick, in the same indifference and community of all things as if they were in perfect health. In fact, in a few days, almost all of those in the cabin of the deceased found themselves infected; and the evil spread from house to house, from village to village, and finally became scattered throughout the country.

The villages nearer to our new house having been the first ones attacked, and most afflicted, the devil did not fail to seize his opportunity for reawakening all the old imaginations, and causing all the former complaints of us, and of our sojourn in these

quarters to be renewed; as if it were the sole cause of all their misfortunes and especially of the sick. They no longer speak of aught else, they cry aloud that the French must be massacred. These barbarians animate one another to that effect; the death of their nearest relatives takes away their reason, and increases their rage against us so strongly in each village that the best informed can hardly believe that we can survive so horrible a storm. They observed with some sort of reason that since our arrival in these lands those who had been the nearest to us had happened to be the most ruined by the disease, and that whole villages of those who had received us now appeared utterly exterminated; and certainly they said, the same would be the fate of all the others if the course of this misfortune were not stopped by the massacre of those who were the cause of it.

This was a common opinion not only in private conversation but in the general councils held on this account, where the plurality of votes went for our deaths ... there being only a few elders who thought they greatly obliged us by resolving on banishment. What powerfully confirmed this false imagination was that at the same time, they saw us dispersed throughout the country ... seeking all sorts of ways to enter cabins, instructing and baptizing those most ill with a care they had never seen. No doubt they said it must needs be that we had a secret understanding with the disease, (for they believe it is a demon), since we alone were full of life and health although we constantly breathed nothing but a totally infected air ... staying whole days close by the side of the most foul smelling patients, for whom everyone felt horror; no doubt we carried the trouble with us since wherever we set foot death or disease followed us.

These tribes believe that we poison and bewitch them, carrying this so far that some of them no longer use the kettles of the French. They say that we have infected the waters, and that the mists which issue thence kill them; that our houses are fatal to them; that we have with us a dead body which serves us as black magic; that to kill their children, some Frenchmen penetrated the horrible depths of the woods, taking with them the picture of a little child which we have pricked with the points of an awl, and that therein lay the exact cause of their death. They even go farther ... they attack our Saviour, Jesus Christ; for they publish that there is something, I know not what, in the little Tabernacle of our chapel, which causes them to die miserably.

In consequence of all these sayings, many had us in abomination; they expelled us from their cabins, and did not allow us to approach their sick, and especially children; not even to lay eyes on them ... in a word we were dreaded as the greatest sorcerers on earth. Wherein truly it must be acknowledged that these poor people are in some sense excusable. For it has happened very often, and has been remarked upon more than a hundred times, that where we were most welcome, where we baptized most people, there it

was in fact where they died the most; and on the contrary, in the cabins to which we were denied entrance, at the end of a few days one saw every person prosperously cured. (JRAD)

The Hurons watched all that the Jesuits did with hatred and suspicion. They ordered the mission clock to be stopped, claiming that every time it struck it marked the death of a Huron. The weathervane on the priests' house was suspect, it being thought that whichever way it pointed indicated death to the sick. Crucifixes above the priests' house were struck down; crucifixes were snatched from their hands; one of the missionaries was clubbed. The church rites were considered "infernal incantations", and pictures of the Judgement struck terror into Huron hearts.

Tragically, the Hurons may have been right for the wrong reasons. Lister and Pasteur were two hundred and fifty years in the future. The principles of cross-infection and antisepsis were not yet conceived. We know, in another context, that the Jesuits slept in their robes when they were closely associated with the Hurons because of the prevalence of fleas. How and how frequently were their black gowns washed; and were their crucifixes cleansed in any way between ministering to one sick person and another? The priests were in close and constant contact with the smallpox victims, and their contaminated clothing and other articles could have been a source of spreading the disease among the Hurons. As Father Lalemant wrote: "Since I left France I have not taken off my gown except to change my linen." (JRAD 15:167) This is an admission that under intense pressure there was little time to be mindful of hygiene.

There was the invocation of countervailing magic. Rosen (1965), in a preface to Ackerknecht's History and Geography of the Most Important Diseases, says: "Faced with the problems of epidemic or endemic disease, individuals and groups have acted in terms of some prevailing concept of the nature of illness. On the primitive level of knowledge this is generally couched in supernatural terms."

Both the Jesuits and the Indians were invoking the aid of the supernatural. At Quebec, in 1646, several Indians were cured by wearing European religious relics, in the efficacy of which the French also believed. (JRAD 29:197-199)

Since the Jesuits were free from the current diseases, a Montagnais shaman recommended to a sick man the wearing of black stockings like those worn by the Black Robes in order to be cured. This the Manitou had told him. (JRAD 9:113)

These nations persuade themselves that they die almost entirely through charms; and hence, measuring us by the same standard, they think and believe we are greater sorcerers than they, themselves. (JRAD 12:87)

In 1635 the Montagnais accused the Jesuits of having killed one of their number by having given him a statue of Jesus, after which he died. (JRAD 8:169)

Since the priests only sprinkled sacred water on those Indians who were about to die, it was not unnatural that "these barbarians for a while had this idea that baptism was fatal to them." (JRAD 8:251-253)

To the argument that intemperance was a cause of their decline the Indians said: "It is not those drinks that take away our lives, but your writings; for since you have described our country, our rivers, our lands, and our woods, we are all dying, which did not happen until you came here." (JRAD 9:207)

Sometimes things worked otherwise. In 1647 "an abandoned sorcerer recovered from his illness after he had been baptized." (JRAD 31:197)

That the smallpox epidemics which were sweeping the country were extraordinarily virulent is apparent. Heagerty (1928) and others have expressed the opinion that there were many cases which were haemorrhagic. This is supported by an eye witness's report by Gyles, who was a prisoner among the Malecites at Medoctec when over a hundred persons died, "that a person seemingly in perfect health would commence bleeding at the mouth and nose, turn blue in spots and die in two or three hours." (Gyles in Bailey 1967:79)

The present writer, who has had much experience of smallpox in various areas of this world, and who once saw one case of the haemorrhagic type and hopes never to see another, supports the view taken by Heagerty et al.

In haemorrhagic smallpox, lesions the size of blueberries cover the body, and they look particularly sinister on a darker skin. They are filled with blood, and the blood is dark because it is shut off from oxygenation. There is haemorrhage into body cavities and from all the body orifices. Blood is voided with the urine, which is bright red in appearance. Blood is passed with faeces, which appears like tar because it has been partially digested (malaena). There is bleeding into the gastric fundus, and it is rejected as emesis. The vomited matter has the appearance of coffee grounds (haematemesis) because it has been partially digested by the protein splitting enzymes of the gastric juice. There are haemorrhages into the eyes . . . which accounts for the symptom of blindness . . . and from the mouth and nose. Any minor wound inflicted fails to heal because blood will not clot due to a thrombocytopenia (a diminished number of blood-clotting elements called thrombocytes). Wherever the body exerts any pressure, the skin lesions rupture and leak putrefying blood. Purexia may rise to 106 degrees Fahrenheit and is accompanied by delirium. There is progressive and rapid emaciation until death supervenes, which it does because there is, or was, no way of stopping the haemorrhage.

The custom of Indians jumping into rivers and lakes when suffering from smallpox might well be explained by fever and delirium.

The Jesuit records tell us that the whole country was ravaged. Everywhere the priests went, whether by intent or accident, they found dead or dying Indians. In the Relation of 1639 it is stated that some savages

returning from the country of the Abanaquois brought a very contagious epidemic of smallpox back with them to Sillery.

Father Lalemant, (1640 Relation), writes: "We have baptised more than a thousand - most of them during the malady of the smallpox which fastened itself, indifferently, upon all sorts of persons - a goodly number who went out of this world and among them more than three hundred and sixty children under seven years without counting more than a hundred other little children, who having been baptized in the preceding years have been harvested by this same disease and been gathered by the Angels like flowers of Paradise." (JRAD)

The Attikamegues, who were attacked by the Iroquois in 1651 and 1652 suffering very heavy losses, were finally wiped out by a smallpox epidemic in 1661. There is a reference to this epidemic in the Relation of 1661-1662: "The smallpox gathered a rich harvest of those innocent souls; for more than two hundred of those who received Holy Baptism during the winter, there were over six score who died soon after, to take their flight to heaven." (JRAD)

What is interesting about both of these reports is that only the deaths of baptized persons, eligible for entry into paradise, are being cited. How many died without baptism we shall never know. We are told only that the cabins of the Christians were most afflicted.

Smallpox was prevalent among the Iroquois in 1663, 1664, and 1665. Of 1663 we are told "more than three hundred dying children were baptized by some captive Frenchmen"; and of the 1664 and 1665 epidemics, "smallpox swept away more than a thousand Iroquois".

In the years of 1669 and 1670, smallpox was again rife among the Algonquins and the Montagnais. Two hundred and fifty are said to have died, and the trading post at Tadoussac was virtually abandoned. (Heagerty 1928)

In 1671, there were many deaths on Lake Saint John. An epidemic among the Indians of Caughnawaga took many lives in 1678. In 1679 there were an immense number of dead among the Iroquois. (Heagerty 1928)

Heagerty, quoting from John Romeyn Brodhead, says that Frontenac, who had returned to Canada, reports to the Minister on November 13th, 1690, that, "The English and Mohegans having been attacked by the smallpox, sent to the rendezvous some persons who were still red with the marks of it; which greatly incensed the Iroquois who told them that they were bringing the plague among them. That disorder did, in fact, break out in their midst, and destroyed more than three hundred of them." (Brodhead in Heagerty 1928)

In the same year, 1690, the Indians of Acadia were stricken "with a mortal plague, smallpox, which swept them away by hundreds." (Heagerty 1928)

In 1694, "there was an epidemic among the Indians of Maine and Acadia which was believed to be haemorrhagic smallpox . . . Great numbers are said to have died at Pentaquet, and more than a hundred at Medoctec." (Heagerty

1928)

Also in 1694, the Bersiamites, Porcupine Indians, the Oumaniweks and Papinachois were infected with smallpox by the Montagnais.

We are told further that "smallpox reigned all winter in Canada in 1733 and half the Souontouans died of the disease."

According to Heagerty (1928), about this same time, smallpox appeared among the Piegan Indians of the Canadian Northwest, who caught it from the Snake Indians whilst at war with them. The Piegan scouts, having observed a Snake Camp, decided to make an attack:

Next morning at the dawn of day, we attacked the tents, and with our sharp flat daggers and knives, cut through the tents and entered for the fight; but our war whoop instantly stopped, our eyes were appalled with terror; there was no one to fight with but the dead and the dying, each a mass of corruption. We did not touch them but left the tents, and held a council on what was to be done. We all thought the bad spirit had made himself master of the camp and destroyed them. It was agreed to take some of the best of the tents, and any other plunder that was clean and good, which we did, and also took away the few horses they had, and returned to our camp. The second day after this dreadful disease broke out in our camp, and spread from one tent to another as if the Bad Spirit had carried it. (Heagerty 1928.1:32-33)

Further reference to smallpox among the Indians of Canada, quoted by Heagerty (1928.1:32-56) are listed below, together with the relevant dates.

1735 - Smallpox prevalent among the Abenquois.

1738 - Smallpox which was brought from Hudson Bay, broke out among the Monsoni, Crees, and Assiniboines when they were marching on the Sioux, who had massacred the French at the Catholic Mission on Lake Pepin. (1736) Two hundred and fifty Monsoni and Crees and eight hundred Assiniboines involved.

1750 - Among the Chippewas of Lake Superior. "A war party of about one hundred young men . . . having visited Montreal for the purpose of assisting the French in their existing troubles with the English, became infected with the disease, and but a few of the party survived to reach their homes."

1753 - . . . the Missisagues, who have lately come down to Montreal, report that the disorder continues there with the same virulence and that it rages in like manner in all the Iroquois villages.

1755 - M. de Vaudreuil in a letter to M. de Machault, dated Montreal 25th 7ber (sic) 1755 refers to it.

Smallpox prevails in the cities and in rural districts few houses are exempt from it. It exists also in the Indian villages . . .

In this year, 1755, the epidemic was so widespread and terrible in its ravages that for years it was referred to as the year of the great smallpox epidemic. It spread to Montreal and to points west at least as far as Niagara, and south through New England. At this time it took a terrible toll of life. The disease spread far and wide. Indians, French and English were in turn decimated.

All the Indians towards Acadia and New England . . . afflicted by the Smallpox in all their villages.

1756 - Smallpox at Niagara. Terrible ravages.

That the smallpox was at Niagara, Cataragui and Swegmachi.

1757 - In the year 1757 Montcalm, with a force of 6,000 French and 2,000 Indians, made a dash at Fort William Henry. Here there were about two thousand, five hundred men under the command of Colonel Munro . . . Fort William Henry fell into their hands. The Fort was small and unsanitary and smallpox was raging. The Indians butchered the inhabitants (English), plundered and looted the fort. Just retribution in the way of smallpox overtook them . . . A number of the Upper country Indians died on their way home.

1770 - About the year 1770 the disease appeared a second time among the Chippewas, but unlike the preceding epidemic (1750) it was communicated to more northern bands.

. . . and of those Indians then at Fond du Lac (about three hundred in number), nearly the whole were swept off by it. Nor did it stop here, for numbers of those at Fond du Lac at the time the disease made its appearance took refuge among the neighbouring bands; and although it did not extend easterly on Lake Superior, it is believed that not a single band of Chippewas north or west from Fond du Lac escaped its ravages.

1781 - The exact date when smallpox first appeared among the Indians of Hudson's Bay is uncertain, but it appears to have been at its height during the year 1781 and to have gradually diminished during 1782. Thompson in his exploration in Western America, 1784-1812, when describing his voyage in the neighbourhood of Hudson's Bay, says: 'The following year we went to York Factory with the furs . . . and looked into the tents, in many of which they were all dead and the stench was horrid . . . From what we could learn three-fifths had died of the disease. They informed us that as far as they knew all the Indians were in the same dreadful state as themselves.'

Heagerty, quoting Thompson, says:

From the best information this disease was caught by the Chippaways . . . and the Sieux about the same time in the year 1780 by attacking some families of the white people who had it and wearing their clothes. From the Chippaways it extended over the Indians of the forest to its northward extremity, and by the Sieux over the Indians of the Plains and crossed the rocky mountains . . . The countries were in a manner depopulated, the Natives allowed that far more than one half had died and, from the number of tents that remained, it appeared that about three-fifths had perished . . . All the wolves and dogs that fed on the bodies of those that died of the smallpox lost their hair, especially on the sides and belly.

1783 - Quebec was again swept by the dread disease. In that year eleven hundred died in Quebec City alone from smallpox. In all of these epidemics the Indians suffered as did the French.

1802 - In 1802 or 1803 the smallpox made its appearance among the Indians residing at Saulte Saint Marie . . . The disease was brought by a voyageur, in the employ of the Northwest Company, who had just returned from Montreal; and although all communication with him was prohibited, an Indian, having imprudently made him a visit, was infected with and transmitted the disease to others of the band. When once communicated it raged with great violence and, out of a large band, scarcely one of those then at the village survived . . . From this band the infection was communicated to a band residing upon Saint Joseph's Island and many died of it . . .

1803 - Smallpox among the Indians of Saint Francis. These were the Abenakis Indians.

1823 - Smallpox in the year 1823 is noted as being present among the Indians of the Lake of the Two Mountains and Caughnawaga.

1824 - . . . the smallpox again made its appearance among the Indians at Sault Sainte Marie. It was communicated by a voyageur to Indians upon Drummond's Island, and through them several families at Saulte Saint Marie. Of those belonging to the latter place, more than twenty in number, only two escaped. The disease is reported to have been extremely fatal to the Indians at Drummond's Island.

1836 - The Winnebagos suffered from several invasions of smallpox the last of which occurred in 1836 . . . The Assiniboines, who were located about Winnipeg as early as 1670, suffered greatly at this time. Up to 1835, when smallpox broke out, they numbered about twelve hundred lodges . . . at this time they were reduced to four hundred lodges, and after the epidemic of 1856 there were left only two hundred lodges.

C. Hill-Tout in his work, The Native Races of the British Empire, in writing of the Indians of British Columbia, says: "The whole

Native population of the Province today numbers 25,000 whereas in the early part of the last century there were five times that number." Smallpox is largely responsible for their disappearance.

1842 - In the year 1842 the total number of Indians in the Northwest was given as 3,040. This number was composed of 640 Blackfeet and 2,400 Assiniboines. John McLean in his Canadian Savage Folk, says that they were reduced to 1,340 by smallpox. . .

1856 - There was a smallpox outbreak in Manitoba and the Northwest Territories in the fall of 1856.

1862 - Heagerty, quoting A. G. Morice, History of the Catholic Church in Western Canada (1910, Vol. 11), says: "Eight or ten thousand white men entered British Columbia in quest of gold during the year 1862. This invasion was injurious to the Indians. These men came largely from California and brought with them smallpox, which rapidly thinned their ranks." The Reverend A. G. Morice, O. M. I. . . . , says that when he reached Victoria in July, 1880, he was assured by the priests that, but a few years before, the ground of the surrounding woods was still white with the blanched bones of the victims of smallpox.

1862 - During the years 1862 and 1863 we find this disease present among the Indians along the north shore of the Saguenay and Saint Lawrence Rivers, and in 1865 among the Northwestern tribe.

1866 - In 1866 it was among the Penetanguishene Indians . . .

1869 - In 1869 there was a severe outbreak along the Missouri River in Montana, amongst the Indians, who in turn, brought it to Wood Mountain in that year, and to Saskatchewan in 1870. In this year smallpox broke out among the Indians and half-breeds in Saint Albert, Alberta, whose ranks it thinned to an alarming extent . . . In a few weeks one hundred and twenty died.

Father Lacombe, while at Lac la Biche in the year 1870, heard that the Indians to whom he ministered were suffering from smallpox at Saint Albert . . . 'Your Indians are dying like flies; and running away from the sickness, they die along the trail.' . . . Father Lacombe estimated that there were over 2,500 deaths among the Cree and Blackfeet. Others place the numbers of deaths among the Cree and Blackfeet at well over 3,000. "Old Timers" along the Saskatchewan use the year 1870 from which to date all local events.

1875 - Smallpox present on Vancouver Island, among the Indian people. The Reverend Brabant buried the dead.

1882 - The disease was introduced into Winnipeg and Saint Boniface in 1882 by Indians who were returning from a visit to relatives in Saint Joseph, North Dakota.

The purpose of this lengthy documentation has been two-fold. One, to offer evidence of what really depopulated the Native tribes of Canada, and, two, to be able to hypothesize, that with such raging epidemics of smallpox occurring all across Canada from 1635 until 1882, if the Indian ever suffered to any extent from tuberculosis it would hardly be remarked upon because all attention was focussed upon smallpox.

European Penetration and Environmental Stress on Early Settlers

If the Native populations of North America were subject to environmental stress, deriving from European invasion, for almost three hundred years, the white immigrants who were forming part of the new society were also under stress; and the record of their tribulations has much of the same broad sweep of disaster. The earliest killers of European groups as they came in seem to have been winter cold, famine and scurvy, not epidemic diseases. These came later, as the numbers of Europeans increased, settlements were developed, populations became large enough to support epidemics, and there was increasing contact between Indians and whites. In some instances, the two populations were equal victims of ecological pressures and the net result was to preserve the Indians from being entirely overwhelmed.

The white man came for various reasons. Explorers and adventurers were often in the pay of foreign kings. Norman, Basque and Breton fishers were early operating off the coasts of Newfoundland and there are records that they came ashore and traded with the Natives. Real penetration came with the fur traders, men at the peak of physiological fitness, who often lived and travelled with the Indians, and sometimes married or cohabited with Indian girls. After the traders came the priests, with a fervent mission to save the souls of "savage" people; sometimes fulfilling a self-sought martyrdom which stemmed from the Catholic abnegation of the Protestant Reformation. Huguenots came seeking freedom to worship without persecution, and they tended to form closed and isolated communities. There were dispossessed refugees from war and civil strife, who wanted nothing more than peace. There were prisoners released from European gaols, and young aristocrats in search of adventure, but with no serious purpose in mind.

Early penetration was sporadic and in some instances there is no record of contact having been established with the Natives. The Vikings were probably the first on the scene, but there are no reliable accounts of their voyages. Cabot, exploring for Britain, discovered Newfoundland and Labrador in 1499. The Spanish came looking for gold and, according to a Spanish tradition, finding none they left, saying ca na da ("here is nothing"). There is an echo of this in Bressani's Relation, 1652-1653.

Some have supposed that these countries were, in former times, discovered by the Spaniards, from whom, perhaps they got the name of Canada - Canada as if they meant to say 'ca na da', there being almost nothing but woods. But it is certain that this region was taken possession of for the first time by the French in the year

1504; and from them it received the name of New France, without losing that of Canada, which some have wished to apply to the more northern part. (JRAD 38:227)

Corté Real, a Portuguese, arrived in 1501. He took sixty "Nasquapee" (Naskapi) Indians captive, secured them below hatches, and set sail with them for Lisbon. (Biggar 1911:16) In 1502, two Portuguese who had become naturalized Englishmen returned to Bristol with "three men from an Iland foree beyond irelond, the which were clothes in Beestees skynnes and ate raw fflesshe and were in demeanure as beestees." (Biggar 1911:20) In 1509, a Norman ship took seven Indians and a canoe to Rouen. (Biggar 1911:22) Fagandus, another Portuguese, was in the Gulf of Saint Lawrence in 1520; and there is evidence of a Portuguese colony in Newfoundland, circa 1520-25. Biggar (1911) cites a manuscript, No. 620 (175, antigo deposito) fol. 80, among the political and historical papers in the University Library, Coimbra, translated in part by the Reverend George Patterson in the Transactions of the Royal Society of Canada, (1891:8:sec.ii,163-4) which reads:

It will be 45 or 50 years ago that certain noblemen associated themselves together and in view of the information in their possession regarding the Codfish land of Newfoundland determined to settle some part thereof, as in truth they did in a ship and a caraval, but finding the region to which they were bound very cold, they sailed along the coast from east to west until they reached that running northeast and southwest, and there they settled. And as they had lost their ships, nothing further was heard of them, save from the Basques who continue to visit that coast in search of the many articles to be obtained there, who bring word of them and state they (the settlers) asked them to let us know how they were, and to take out priests; for the Natives are submissive and the soil very fertile and good, as I have been more fully informed, and is well known to those who sail thither. This is at Cape Breton, at the beginning of the coast that runs north, in a beautiful bay, where there are many people and goods of much value and many nuts, chestnuts, grapes and other fruits, whereby it is clear the soil is rich. And in this company went also some families from the Azores islands whom they took on board on their way out, as is well known. May our Lord in his mercy open a way by which to succour them.

The Portuguese effort may have been greater than is known because Champlain said the Portuguese had introduced some cows and bullocks on to Sable Island.

In 1534, Cartier, with two ships and a total crew complement of one hundred and twenty-two men sailed up the Gulf of Saint Lawrence. He was back the next year with three ships and, leaving most of his crew to construct a fort in front of the ships at Cap Rouge, near Stadacona (Quebec) he proceeded with a small party in two well-provisioned long boats to Hochelaga (Montreal), trading with Indians encountered along the way. He spent three months at Hochelaga and, we are told, the cold was intense. On returning to Quebec he found the men he had left there suffering from scurvy, which they thought was infectious and which they believed to have contracted from the

Indians in the village of Stadacona, where it was epidemic, and fifty people had already died of the disease.

Before the end of February, 1536, only ten of Cartier's one hundred and nine personnel were not affected by the disease and, in his own words, this was "a most sad and pitiful case considering the place we were in." Of these Frenchmen, twenty died and were buried in the snow, because all the others were ill and none had the strength to dig the frozen soil. These are believed to have been the first European deaths in Canada. They may not have been.

There is a record of the voyage of one Master Hore and divers other gentlemen to Newfoundland in 1536. They saw some Beothuks, in a boat, coming towards their ship, and put out a boat to go and meet them, whereupon the Beothuks fled. Going ashore, Hore's men found the remains of a fire, one moccasin, and a very warm mitt. Subsequently losing their own ship, and being near starvation, some of Hore's crew resorted secretly to cannibalism in order to survive, allowing it to be believed that certain crew members had been lost. When the truth was discovered, and accepting the idea of cannibalism as inevitable, the survivors cast lots as to who should die next, but were saved when they saw a French boat, which they captured. Henry VIIIth, hearing of this matter later, and being sorry for the plight of Hore and his men, recompensed the French king for the loss of the ship.

Returning to France, Cartier found himself ignored, and no one interested in Canada. It was not until the year 1540 that Francis I was receptive to suggestions for further exploration in the New World and Roberval was appointed first Viceroy, with permission to recruit volunteers who would attempt a permanent settlement in Canada. Cartier was appointed chief pilot and Captain General to Roberval.

Cartier arrived in Canada before Roberval and anchored at Quebec. The colonists started to clear some land for cultivation, and made preparations to spend the winter in the country. They were left in peace to do this but when spring arrived the Indians became hostile, rumours were that hundreds were massing to attack, and Cartier, a victim of propaganda, embarked his colonists on board. Cartier and Roberval met off Quebec, but Cartier refused to turn back.

Roberval proceeded to establish a colony at Cartier's abandoned fort at Cap Rouge, and spent the following winter there (1542-43). Fifty of his two hundred colonists died of famine and scurvy, and most of the others panicked and fled. Some of them were picked up by Basques at Tadoussac.

In 1549, Roberval organised a second expedition to Canada but was lost on the voyage out from France, together with all his followers, after which all projects for colonising Canada with French nationals were for the time being abandoned.

The Marquis de la Roche (1590) succeeded Roberval as "agent" for the King of France on the shores of the Saint Lawrence. He arrived with what is described as an "ill-favoured crew", some of whom were left on Sable Island,

where the Baron de Lery had attempted to found a colony in the earlier part of the century (1518). Meanwhile, de la Roche went to seek a favourable place on the mainland but his ships were blown off course and back to France. It was not until 1603, thirteen years after they had been left there, that the survivors of the group put ashore by de la Roche were rescued from Sable Island. When they were found, their condition was so deplorable that it created a scandal in France.

Meanwhile, in the years 1600 to 1603, two entrepreneurs, Chauvin and Pontgrave, had made a series of successful trading excursions up the Saint Lawrence.

In 1604, both De Monts and Champlain sailed into the Bay of Fundy and discovered Port Royal. Champlain went on to Montreal. Seventy-nine people landed on the Island of Saint Croix in June and remained to spend the winter there. Of the seventy-nine, thirty-four died of scurvy, the remaining forty-four being rescued by Pontgrave in the spring of 1605. They settled at Port Royal, Nova Scotia, where they founded the first French agricultural settlement in Acadia. The following year, 1606, Champlain records that twelve out of forty-five persons died of scurvy on Saint Croix.

De Monts, who was a Calvinist, had been given the Vice-Royalty and fur trade monopoly of Acadia. He brought Huguenot ministers with him for the benefit of the settlers, as well as Catholic priests (Recollets) who were to begin a mission for the "savages". No missionary work was started at this time, however, because the priests became victims of scurvy.

Five years later, Champlain established a "habitation" at Quebec, and after a hundred years of effort, New France appeared an accomplished fact. It was Champlain's decision (1615) that the time had come to establish missions to the Indians along the Saint Lawrence Valley, and work was begun by four Recollets. One served among the Montagnais of the Lower Saint Lawrence, another among the Hurons west of the Ottawa River, whilst two others went to Quebec, one to minister to the needs of the colonists, and the other to spread the gospel among the Indians who either came to trade or socialize with the settlers, or to escape the raiding Iroquois. Needing the friendship of his Indian neighbours, Champlain formed an alliance with the Hurons, and helped them in their wars against the Iroquois. From that time on, the politics of Europe involved the Indians.

The Recollets served at Quebec for ten years. Others of their order, in 1619, began to work among the French fishermen and the Micmac Indians of Nova Scotia, New Brunswick and the Gaspé. They made very little progress and eventually joined the others in Quebec. Even in Quebec, there was no real progress and the Recollets sought help from the more powerful and experienced Jesuits. In response to this appeal, Fathers Masse, Lalemant and Brebeuf came out to New France.

The settlements of Port Royal and Quebec were little more than collections of a few wooden huts enclosed within palisades, and when attacked by English naval units in 1628 and 1629, they readily capitulated. The priests became prisoners of war and were transported to England.

In 1632, England and France concluded a peace, and as part of the settlement, Canada was returned to France. The French Government decided that the Recollets with their vows of poverty, grey cotton gowns, and wooden sandals, and who suffered horribly in the severe Canadian winters, were not the most effective representatives of the Catholic Church in France; and the task of converting the "savages" was officially entrusted to the Jesuits. Their work was not easy. The Indians had no wish to change their old beliefs. In addition, was the problem of the Indians' nomadic way of life. They gathered at the trading posts of Tadoussac, Quebec, and Trois Rivières during the summer months, but scattered into the countryside for winter hunting. Uninvited, the priests went with them on the trail, sharing the winter hardships, in part fascinated and in part repelled by their experiences.

Statistics from Quebec, dating back to 1608, show that the growth of New France was at first very slow, and there was a heavy mortality rate among the European population. Others came and failed to stay, and by 1665 the total European population in Canada was somewhere between two thousand and two thousand and five hundred persons of European origin.

Pleas to the Government of metropolitan France to send out artisans and, in general, a "better type" of immigrant, finally led to more successful colonization, and with this came supporting services such as those provided by nursing sisters and teaching nuns. Many male settlers came unaccompanied by women, and the Indian girls trained in mission schools made excellent wives for early pioneers. The French-Indian marriage rate was high and was politically approved. Champlain told the Indian chiefs, "Our sons shall marry your daughters and we shall be one people." (JRAD)

Colbert had an appreciation of the value of colonial possessions and was rapidly expanding France's mercantile fleet to serve colonial needs. As settlement in New France grew, there developed the need of protection for the immigrants, not only against Indian opposition, but also against the rival British fur trade, which had its own need for protection. With the troop ships and the immigrants came disease.

In 1663, Colbert devised a plan for colonizing Canada. Three hundred immigrants would arrive each year, and those with no experience of field labour, would be sent to live amongst the rural residents of New France, and after three years training, they would be made a grant of public lands. It was further decided, that before the end of the current year, two thousand veteran troops would be sent to Canada and be demobilized and settled there. But these plans failed to materialize. Three hundred colonists did, in fact, sail from La Rochelle that year, but of this number, sixty died on the voyage out, seventy-five were disembarked at Newfoundland, leaving only one hundred and sixty-five to reach Quebec. As most of these were unattached young men such as clerks, students, and other persons unaccustomed to any kind of work, they proved to be not very suitable and "several of these gentry sickened and died after landing." (Bell, 1874:1:182)

A great number of families, artisans, and engaged persons are said to

have arrived in 1665, but statistics for the Province of Quebec show a total population of only three thousand and four hundred people by the year 1670. After that, population rose by about three thousand every ten years until 1710, and then expanded rapidly until there were one and a quarter million people in the Province by 1890, and the number of births had reached fifty-two thousand a year, or a thousand a week.

Health and Disease Among the Early European Settlers

Much information regarding the health of the early European settlers in Canada is to be found in Heagerty's Four Centuries of Medical History in Canada (1928). Heagerty studied the available records, and his two volumes cover the period of early penetration by Europeans until 1928. His sources of information include the Jesuit Relations and Allied Documents, L'Histoire de L'Hotel Dieu de Quebec, records of the Ursuline Nuns, missionaries other than the Jesuit priests, records of pioneer physicians in Canada, and records from Universities and Canadian Medical Schools. The greatest sources, however, are from Provincial Archives, the Public Archives of Canada, Military Records, and early historical documents pertaining to New England and the State of New York. I have summarized his account here, emphasizing the information on smallpox among the European population.

Smallpox was epidemic among the French in 1640, as is recorded in Father Le Jeune's Relation. It was again epidemic in the years 1659, 1664, 1670, 1678, 1684, 1685, and 1687. In 1688, there were one thousand and four hundred deaths among the French residents when the total population of Quebec was only ten thousand persons. Smallpox was epidemic again in 1689, in 1690 at Lake Champlain, in 1690 in Montreal; and in Quebec City in 1699, where one hundred persons died. In 1702, when the total population of Quebec City was twelve thousand (out of a total provincial population of sixteen thousand and three hundred), three thousand died of smallpox, a mortality rate of twenty five per cent. In 1711, smallpox was again epidemic among the settlers. By 1713, people were getting wiser and an international quarantine was established between Canada and the United States. This still did not stop the epidemics. There was one in Quebec City in 1717, and another in 1732 when one thousand and eight hundred persons died. Quebec City was stricken again in 1733, and five years later smallpox was prevalent throughout French Canada. There were outbreaks again in the years 1740 and 1745. In 1749 it was again raging in Quebec, and this time it was specifically stated to have been brought in from Louisburg, where it was present among the troops on board the transports L'Intrepide and Jean Elie.

Smallpox occurred later among the English in Canada than it did among the French, being first mentioned in 1740, 1745 and 1747. In 1749, it occurred among the English in Halifax, which was by this time a thriving port, and one thousand people are said to have been infected.

In 1755, a particularly severe epidemic of smallpox swept through all of New France and extended south from Quebec and Montreal to the Niagara Peninsula. By 1757, the French colonists were desperate, and more and more epidemics were originating from the troop ships which were bringing in

military reinforcements. Montcalm gives the numbers in Quebec hospitals that year as between two thousand five hundred and two thousand six hundred. As the population of Quebec for the years 1751 to 1760 is given as 57,000, the smallpox incidence rate would be approximately five per cent, and the mortality rate among those afflicted is recorded as 500, or more than twenty per cent.

In the eight year period from 1757 to 1765, it was apparently impossible to keep accurate records because the state of the country was so chaotic. Historical events at this time were that Quebec fell to the British in 1759; and in 1763, at the Treaty of Paris, France ceded Canada to Britain.

There is reference to smallpox in a letter from Colonel Bouquet dated 1758; and there are frequent references to diseases among the British troops assembled in front of Quebec and Louisburg, but the main problem seems to have been scurvy. In 1759, twenty to thirty deaths each day were occurring among the Acadians in Quebec.

In 1801, smallpox was sweeping through Nova Scotia, where 8,532 cases were reported. The mortality rate was 182 persons. At the end of that same year, vaccination with cowpox was introduced, but the end was not yet. Smallpox was occurring on prison ships in 1812 and 1813, and in 1820 it was again present in Quebec. A Bureau de Vaccine was established in Quebec in 1821. Ships from Ireland brought the disease to Quebec once more, in 1824. In 1827, the disease was occurring at Halifax, and in 1829 it was spreading in the country districts around Sainte Marie de la Beauce. Ships again brought it into Quebec in 1830, by which time cholera was also raging, and in 1833 the Irish ship "Henry", out of Belfast, had brought it to Grosse Isle.

In 1842, smallpox was widespread throughout Canada. In 1854, it was again among the French in Quebec. This particular outbreak was blamed by the residents on the opening up of an old burial ground for the purpose of creating sewerage and waterworks. In 1867, there was smallpox at Sault Sainte Marie.

During the years 1872 and 1880, there were 4,791 deaths from smallpox in Montreal and in 1885, again in Montreal, 3,164 deaths of which 2,717 were children ten years of age or under. In spite of this, there was bitter antagonism to vaccination from the French Canadians when this practice was subsequently introduced, and there were riots in the streets of Montreal.

Smallpox was occurring among the white people in British Columbia in 1892. There were numerous cases reported, but the death rate was not very large. In the year 1900 it was widespread in many areas between Winnipeg and Montreal, and twenty nine deaths were recorded in Winnipeg.

Between 1884 and 1904, there were a total of six thousand, four hundred and eighty two cases of smallpox in Ontario, among these, in 1902, at Galt, were eighty seven cases of haemorrhagic smallpox, of whom thirteen died. In other areas of Ontario two hundred and seven people succumbed. There were one thousand, three hundred and fifty

two cases of a mild type of smallpox in Ottawa in 1921, but there were only four deaths. In 1924, sixty-seven cases of a virulent type occurred in Windsor. After that, the epidemics subsided and smallpox has not been a problem in Canada since that time. (Heagerty 1928:1:311-355).

Typhus, Typhoid and Other Epidemic Diseases, Especially Cholera

Smallpox was not the only infectious disease to give rise to problems among the settlers. There was typhus, often called "ships' fever" or "gaol fever"; there was typhoid, and the so-called disease of the Bay of Saint Paul, which appears to have been an atypical syphilis and, as already mentioned, in 1830 there was cholera.

Cholera was epidemic in both England and Ireland in 1830, and Canada was warned to take precautions against its entry here. In spite of this, it reached Lower Canada in the same year, and among the half million population there the death rate was heavier in the three months June to September than it was among Britain's fifteen million people in twice that length of time. Part of the higher incidence in Canada may have been due to climatic reasons for cholera needs humidity and high temperature, both of which are present in Eastern Canada in the summer months.

The Quarantine Station at Grosse Isle, in the Gulf of Saint Lawrence, was set up as a temporary measure in the spring of 1832 as a precaution against the possibility of cholera reoccurring in Canada. A detachment of troops with a battery of guns was dispatched to Grosse Isle to enforce the new regulations. Huts and tents were erected to accommodate people, if necessary. (Heagerty 1928:I:179-211)

In the year 1832, 51,000 immigrants arrived from England and Ireland. Cholera broke out on board the ships whilst they were en route to Canada. The names of the ships, together with the numbers of persons dying on each and being buried at sea, are well documented. The total number of immigrants undergoing health inspection at Grosse Isle that year is given as 51,146. The sick were detained. Those who appeared to be well were allowed to proceed, but very little was known of the disease, and the short incubation period of cholera was overlooked. In one week, in Quebec City, 259 cases were admitted to hospital and of those 161 died. The hospitals filled rapidly, and public buildings were utilized as emergency accommodation. Lord Aylmer had tents to accommodate 500 persons pitched on the Plains of Abraham, and a day of Public Fasting, Humiliation and Prayer was proclaimed. (Heagerty 1928:1:184)

In Quebec, in 1832, the population at that time being 28,000, there were 2208 deaths from cholera. In Montreal, in that same year, among a population of 27,297, there were 4000 deaths. Apparently some influential business interests in Montreal had opposed the enforcement of quarantine measures and the closure of the Saint Lawrence to shipping, and cholera became the political issue of the day, the Governor, Lord Aylmer, being blamed for

deferring to mercantile interests. (Heagerty 1940:81)

In 1834 there were fresh outbreaks in Quebec and Montreal, and in the latter city 913 people died. Hundreds were again dying from cholera in Montreal in 1839. Ten years later there were further outbreaks in Quebec and Montreal. The population of Montreal by this time had almost doubled, now being 55,146; deaths from cholera were 300. Two years later, 1851, cholera was brought into Montreal from the United States, and in that same year it spread to Quebec. In 1852, it had reached Ontario and two emergency hospitals were set up in Windsor to deal with the epidemic. (Heagerty 1928:1:179-211)

But, French Canada was still taking the bulk of the disease. It was present in Quebec City in 1852, and again in 1854, in which year 3486 people died. In Montreal, where the population had increased by 28,000 in the three year period since the 1851 epidemic, 1,186 persons died. In 1870, Montreal was stricken again and the mortality rate was 14.3 percent among the cholera victims. That same year, there were 1500 deaths from cholera in New Brunswick. The total number of deaths from cholera in Quebec City during the twenty two years from 1832 - 1854 is given as eight thousand, three hundred and seventy three. (Heagerty 1928:I:179-211). The British were blamed and accused of deliberately trying to wipe out the French population of Canada. (Heagerty 1940:81)

In the year 1847, there was typhus at the Quarantine Station at Grosse Isle and, in spite of tightened health regulations, it spread to Quebec City, Montreal, and Bytown (Ottawa). Immigrants were pouring into Canada that year and an official British report said that 70,000 had already arrived by August 4th. By November 1st, the total number of immigrants had risen to 100,000 and, according to Heagerty (1940:82) "more than twenty thousand died, of whom over five thousand were buried at sea."

Dr. J. D. Pagé, of the Department of Pensions and National Health, Ottawa, speaking of the Grosse Isle Quarantine Station, said:

The years 1832, 1834, and 1847 were the most tragic in the history of Grosse Isle. During the two former years the dreaded Asiatic cholera made its appearance in Canada, and wrought great havoc throughout the country. Records show that in the year 1832, fifty-one thousand, seven hundred emigrants from England and Ireland arrived at the port of Quebec, and in every city from which these emigrants came, cholera was epidemic. The disease broke out in the ships on their ways across the Atlantic, and there were many burials at sea.

Canada, at that time, was but poorly prepared to cope with the problem. A few wooden sheds had been put up hurriedly at Grosse Isle and converted into hospitals for the sick, but this accommodation proved inadequate, and most of the sufferers had to be sheltered in tents. The situation was aggravated by inadequate medical attendance and the handicaps incidental to a new establishment, also by the extreme virulence of the disease. Under the circumstances the death toll on the island was heavy, especially in 1832. The epidemic

extended to Quebec, Montreal and other parts of Canada, where men, women, and children succumbed in large number.

In the year 1847 following the disastrous Irish potato famine, many thousands emigrated from the country to the United States and Canada . . .

Speaking in the British House of Commons in February, 1848, Mr. Labouchère referred to one year's havoc on board the ships sailing to Canada alone in the following words: "Out of the one hundred thousand emigrants who during the last twelve months crossed the Atlantic for Canada and New Brunswick, six thousand, one hundred perished on the voyage, four thousand, one hundred on their arrival, five thousand, two hundred in the hospitals, and one thousand, nine hundred in the towns to which they repaired. The total mortality was seventeen per cent of the number emigrating."

On May 20th, 1847, thirty vessels anchored at Grosse Isle. They left Ireland with twelve thousand, five hundred and nineteen passengers of whom seven hundred and seventy-seven died at sea and four hundred and fifty-nine on board at the Island. According to official returns the number of emigrants to Canada who died of typhus in 1847 is as follows:

At sea - - - - -	8,000
At Grosse Isle - - - - -	5,424.

(Page 1931:22:45-455)

A small orphanage was opened for the Irish children whose parents had perished during the epidemic, and these children of the victims were adopted by French Canadians.

Typhus hit Quebec again in 1846, when there were said to have been 600 at a time in L'Hopital Général. Ottawa was hit in 1897, and so was Halifax.

After that time, as happened with smallpox, the disease seems to have subsided and typhus was no longer a problem in Canada.

Smallpox in European and Native Populations

If there is no single cause for any one specific disease, so, also, are there multi-factorial causes for its eventual control. Among the circumstances which helped to eliminate smallpox in Canada could be considered the cessation of hostilities between England and France, cessation of inter-tribal wars among the Native people once the European powers no longer needed them as military pawns, the pacification of Canada under a central government, an intensive vaccination programme against small pox, and immigration controls and the promulgation of public health laws, not only by the provincial governments but also at federal level.

The establishment of the reserves served to identify and isolate some of the Native peoples and their immediate needs. Food, shelter, and clothing, however poor in quality or inadequate, were provided for those most severely traumatized and therefore at high risk. There was an expansion of hospital, medical, and social services in Canada, but these were often imposed upon reserve populations under contexts which further traumatized the shattered communities by the coercive isolation of the sick or presumed sick.

Above all, there was an adaptation by the Indians to smallpox, not only because of vaccination but also because the disease had already eliminated weaker members of the Native populations, and those who were left were hardier individuals, including those who had contracted the disease but survived and, in so doing, had developed their own active immunity.

Minor outbreaks of the disease were still occurring as late as 1920. By that time, the manifestations of the disease had modified to such an extent that people who remembered the earlier epidemics were not convinced that what they now saw was indeed smallpox. The possibility exists that the smallpox virus had undergone some change. However, two other passages in the Jesuit Relations, referring to two Indian populations in one geographic area at a specific point in time, one group resident, the other incoming migrants, tends to suggest that it was man who was adapting and the organisms which were not.

Of the Abenaki at Sillery (located on the North shore of Georgian Bay) in 1682 the Relation declared that nearly all had been attacked by smallpox, but adds that 'not many persons have died this year in the mission.' (Bailey 1969:78 and quoting JRAD 62:146)

In 1684, at the instigation of Le Clerc, a Micmac migration was made to Sillery, but 'God has granted the favour to most of these Gaspesians to die at Sillery this year, some time after having arrived there.' (Bailey 1969:78 quoting JRAD 63:69-71)

It would therefore seem that even at this early date some "Native" local groups were showing the same "resistance" as the European population.

Smallpox and the Native Peoples: History

There are thought to have been approximately 250,000 North American Indians in Canada at the time of white penetration. This figure is dubious because the Indians were extremely mobile, and they were constantly crossing and re-crossing what is now the Canadian-U.S. border. Estimates of population can only have been based on aggregations of Indians who were in villages and encampments which were in close proximity to white settlements, on statements by travellers and explorers, and by the Indians, themselves.

The number of Indians comprising individual "tribes" is even more difficult to establish than the totality in the country, because of exogamy, adoptions, and the taking of hostages and slaves. Moreover, the very concept

of "tribe" is European. That people were sparsely scattered in some areas is documented by some of the early travellers. Bonnycastle (1841) says of the origin of Toronto:

This city which now contains nearly 15,000 inhabitants and spreads over a surface of more than two miles in length, by a mile in breadth . . . when Governor Simcoe first came to it, no more than two wigwams were seen in the unbroken and stately forest which towered over the shores of its beautiful bay.

And, Archibald McDonald (1828) was noting, in his record of the journey of Governor Simpson of the Hudson Bay Company to the West Coast via the Peace River Country, such things as: "Today we saw two Indians Today we met a group of twenty Indians."

There are few records to tell us whether European diseases were spread to any great extent into the middle west and north west areas of Canada before settlers moved in to open up the land. More is known about the tribes of Eastern and Central Canada, because that was where the action was. Into the Eastern ports came the troopships, and the waves of immigrants bringing in disease. It is therefore relatively easy to assemble evidence concerning the depopulation of some of the eastern and central tribes, and to document that the depopulation happened long before tuberculosis was recognized as a major health problem.

The Hurons paid very dearly for their association with the French. Between 1600 and 1700 A.D. they lived in several large villages around Lake Simcoe and Georgian Bay. It was recorded that there were eighteen of such villages at the time of Champlain, and that eight of these were fortified. (Biggar 1929). The Hurons were surrounded by Algonkins and were adjacent to the Neutrals and the Tobacco Nation. One Huron village might house eight to twenty-four families, the average number being sixteen. The average number of persons in a family was five. Jenness (1932) estimates that the total Huron population at the beginning of the seventeenth century was approximately 16,000. The dates and the locations of the smallpox epidemics which so badly depleted their numbers are as follows:

1636 Around Lake Huron and Georgian Bay
1637 Around Lake Huron and Georgian Bay
1638 Around Lake Huron and Georgian Bay
1639 Around Lake Huron and Georgian Bay
1640 Around Lake Huron and Georgian Bay

In 1648, already weakened by smallpox, they were attacked by the Iroquois, and three or four villages were destroyed. In 1649, with the coming of spring, there were renewed Iroquois attacks. Many Hurons were killed or captured. Some Hurons fled to the Tobacco Nation, and others to the Neutrals, but this availed them nothing because the Iroquois pursued them and attacked both the Neutrals and the Tobacco Nation. Some of the Hurons who were captured were absorbed into the Seneca, Mohawk, and Onondaga tribes. By 1650, the Hurons were dispersed. Remnants loitered around Lake Huron and Georgian Bay, a few went to Tadoussac, and some eventually founded the Huron

settlement at Jeune Lorette. But smallpox had not finished with them yet. There were further epidemics in 1662, 1663, and 1664. The disease was among them at Tadoussac in 1669 and 1670, and in 1678 and 1740 it was back at Lake Huron and Georgian Bay. (JRAD 1:22; 10:95, 177, 193, 279, 20:43)

Bailey suggests a further reason for the depopulation of the Hurons. He points out that whilst the Hurons were dying through warfare and disease, Christian doctrine was teaching that polygamy was sinful. Converted males were therefore divesting themselves of their plural wives, and this helped to reduce the birth rate at a time when males were becoming scarce. A case is cited where a man with five wives, having been converted, sent four of his five wives away. But they continually returned, so to kill them was the only way to get rid of them, he said. (Bailey 1969:105, quoting JRAD 11:265)

Furthermore, young Huron girls were being educated in convents, where a premium was put on modesty. At Tadoussac, locks, door-bells, and sentinels were among the measures employed to protect the segregated girls. As a result of this, there was a repression of sexual activities and, subsequently, these convent trained girls frequently married French settlers instead of Indian youths, and they and their offspring ceased to be regarded as members of the Indian "race". (Bailey 1969:103, quoting JRAD 22:231-233)

Where the revulsion of feeling against the flesh failed to be sublimated, the will to live relapsed, and despair and untimely death ensued. This may be looked on as a partial adaptation and was one of the causes of the declining birth rate and the resulting depopulation. (Bailey 1969:102)

At the time of contact, the Iroquois were thought to have totalled approximately 16,000 persons. Included were 3,000 Mohawks, 1,000 Oneidas, 3,000 Onondagas, 2,000 Cayugas, and 7,000 Senecas. Subsequently, 1,700 Tuscaroras joined the confederacy, making a total Iroquois strength of 17,720. (Jenness 1960:306) By the year 1668, "Huron and Algonkian ex-captives made up two thirds of the Oneida tribe." (JRAD I:53) Later, Senecas absorbed Neutral and Erie Indians. (Jenness 1960:306). In the eighteenth century, the Iroquois absorbed a number of Europeans. (Jenness 1960:306)

There were no fewer than twenty four major epidemics of smallpox among the Iroquois in a ninety-four year period. The dates and locations of the epidemics have been compiled by Heagerty (1928:2:318-320) and are in the Chronological Index which forms part of the Bibliography of his Four Centuries of Medical History in Canada.

1662	In this epidemic three hundred Iroquois children died and were baptised by some French prisoners of war
1663	Southern shore of Lake Ontario
1664	Southern shore of Lake Ontario
1665	Southern shore of Lake Ontario
1679	Lake District New York State
1679	Among the Cayugas New York State

1679	Among the Onondagas	New York State
1679	Among the Oneidas	New York State
1679	Among the Mohawks	New York State
1691	Among the Oneidas	New York State
1691	Among the Cayugas	New York State
1691	Among the Onondagas	New York State
1691	Among the Senecas	New York State
1736	Among the Iroquois	New York State
1740	Among the Iroquois	New York State
1746	Among the Onondagas	New York State
1755	Among the Senecas	New York State
1756	Among the Cayugas	Niagara Peninsula

In 1803, vaccination against smallpox was introduced among the Iroquois, and, in 1807, as a response to a request from the Iroquois, Sir Edward Jenner sent supplies of lymph, together with detailed instructions on how vaccination should be carried out, to the Chief of the Six Nations, and massive inoculation of the Iroquois followed. (Heagerty 1928, I: Frontispiece.)

The Montagnais-Naskapi of Quebec and Labrador occupied a territory which extended from the River and Gulf of Saint Lawrence to Ungava and James Bay, and included the entire Labrador Peninsula. Those in the Saint Lawrence area were in contact with Europeans in the early 1600s. Those near James Bay were not contacted until some two hundred years later. Montagnais were met by Champlain in 1603 at the mouth of the Saguenay River. Missionary work among them was begun by the Recollets in 1615. They were allies of the French. In 1636, efforts were made to civilize the Montagnais by educating them in the habits of the French. Girls were to be reared as Christians, to be given dowries and married to the French, or to be kept as domestics and dressed in the French manner. This policy alienated them from their own people. "Already those in domestic service care no more for the savages than if they did not belong to their nation." (JRAD 9:103-106)

Tuberculosis is mentioned very early in connection with the Montagnais. We are told that the sick among the Montagnais in 1637 "nearly all die of consumption, becoming so thin that they are nothing but skin and bone". (JRAD 12:7) As early as 1646, the Montagnais were experiencing social disintegration, and the Christian doctrine to love thine enemies had created confusion among them and undermined their fighting prowess. (JRAD, 29:83) A smallpox epidemic swept among the Montagnais on the north shore of the Saint Lawrence in 1635. A second epidemic spread along the north shore and Tadoussac in 1669. In 1862 and 1863 smallpox again decimated the Montagnais on the north shore of the Saint Lawrence and along the Saguenay River. Mooney (1928) estimated the Montagnais-Naskapi totalled 5,500 in 1600. By 1812 they were allegedly reduced to 1,500; in 1857 they were estimated at 1,100. By 1884 they were officially reported as 1,395, but by 1906 their numbers had increased to 2,183. Vaccination and the abatement of the smallpox epidemics may have turned the tide.

The Attikamagues had become devout Christians by 1647, and they were instrumental in spreading the faith, as well as strengthening and extending

political alignment to the Cree and other central Algonkians until smallpox and Iroquois raids annihilated them as a cultural unit in 1660. (JRAD 43:53)

The Micmacs belonged to the central Algonkian stock, represented typically by the Cree. They inhabited Nova Scotia, Cape Breton Island, Prince Edward Island, the head of the Bay of Fundy and, later, Newfoundland. They suffered severely from scurvy in 1637. (JRAD 12:265) In 1684, as has already been mentioned in this paper, a Micmac migration to Sillery ended in death from smallpox for most of this group. (JRAD 63:69-71) According to Jenness (1960:253), in 1764 typhus carried off one third of the Micmacs in Acadia.

Mooney (1928) estimated there were 3,500 Micmacs in 1600. In 1760, they were reported to have decreased in number to less than 3,000. By 1884, their numbers were increased to 4,037. The Canadian Report of Indian Affairs for 1904 cites 3,681, but this number did not include those living in Newfoundland.

The Micmacs suffered severely from culture shock as a result of their contact with Christianity, and they became apathetic. As the Jesuits put it, "The softening influence of Christianity broke down the fighting spirit of the Indians." (JRAD 29:83)

The Malecite Indians were also of Algonkian stock. They were related to the Passamaquoddy, Penobscot, Abenaki, and Pennacook Indians. Most of them were in New Brunswick, but they extended into Maine. Some of them were thought to have been in contact with French and English fishermen and explorers as early as the 1500s. Specific reference to them was first made by Champlain in 1604. When Fort La Tour was rebuilt on the Saint John River, it became a meeting place for members of this tribe. Great numbers of the Malecites and Penobscots died of smallpox in the ten year period, 1690-1700. But, in spite of this, there were 805 Malecite Indians in 1884.

The Beothuks of Newfoundland are said to have occupied the whole of the Island of Newfoundland, but there were never enough of them to have effectively done so. John Cabot is thought to have been in contact with them in 1497. After this, they were probably in occasional contact with Portuguese and Bretons who were fishing off the Newfoundland coasts. Hostilities with the French, as well as the Micmacs of Nova Scotia, caused the Beothuks to flee north to an area near Exploits River. Most of them were killed by the Micmacs with guns they had obtained from the French. Hodge (1907) suggests a few of them may have crossed the Strait of Belle Isle to join the Algonkian Indians of Labrador, but this is not proven. Mooney (1928) estimates the total number of Beothuks in 1600 to have been no more than 500. By 1827 there was no trace of them. The Beothuks, therefore, were eliminated long before tuberculosis was recognized as a problem in Canada.

The Chipewyan occupied an area of the Churchill River, between Great Slave Lake and the Slave River on the west and Hudson Bay on the east. Petitot (1876) says the Chipewyan tribe was living along the Peace River in 1781, that after the Cree had obtained guns they drove the Slave Indians from

their hunting grounds along the Slave River but that the Cree, in their turn, were attacked by the Chipewyans, who drove them from the area. Jenness (1960) says that when the fur trading posts were established on Hudson Bay, the Chipewyan were already in occupation of the area from Great Slave Lake and Lake Athabaska.

Then the Cree pushed northward and seized the country between Lake Athabaska and Great Slave Lake, driving the Beaver up the Peace River and confining the Chipewyan or Northern Indians to the territory designated by Hearne. Then came the smallpox epidemic that decimated both Cree and Chipewyan, but particularly the Cree, who were forced to withdraw from Chipewyan territory.

Mooney (1928) estimated there were 3,500 Chipewyan in 1670. Alexander Mackenzie (1801) said there were about 400 Athabaska Chipewyan at that point in time. By 1906, their number had increased again to 2,420.

The Chippewa, or Objibwa, were a very large tribe, widely dispersed owing to their mode of subsistence and the effect of the fur trade, who spread from Lake Nipissing westward, along the north shore of Lake Superior, to Saulte Saint Marie, into southern Manitoba, and into Minnesota and North Dakota. Dates and locations of some of the epidemics among them are:

- 1750 Small pox raging in the Lake Superior region. Specifically, 100 warriors are recorded as having died.
- 1770 Small pox prevalent among the northern band.
- 1802 Small pox prevalent at Sault Sainte Marie.
- 1803 Small pox prevalent at Sault Sainte Marie.
- 1824 Small pox prevalent at Sault Sainte Marie.

The Cree are one of the two largest divisions of the Algonkian linguistic family. When first contacted by Europeans they extended from James Bay to the Saskatchewan River. They consisted of two groups, the Plains Cree and the Woodlands Cree. The Cree were well known to both French traders and the Jesuits as early as the first half of the 1600s. By the end of the seventeenth century the traders were using them as guides and hunters in order to develop the fur trade. The English first came into contact with them at the posts established on Hudson Bay territory, as early as 1667. The Cree were allied with the Assiniboine who, through the Cree, were able to obtain guns from the Hudson Bay trading posts. With these guns they fought their southern relatives, the Dakota Indians. The Assiniboine alliance brought the Cree into southern Manitoba and the Red River Valley. Their involvement with the fur traders enabled the Cree to penetrate the Peace River District and the Rocky Mountain area. Many descendants of the Cree are now living near Little Slave Lake. There are some of them among the Sarcee and also among the Blackfoot. Jenness (1960) and Mooney (1928) estimated there were 20,000 Cree at the time of first white contact in 1600. By 1670, there was an estimated 21,000 of them. In 1924 they numbered 20,000 so that the Cree population has been well maintained, in spite of the epidemics among them, and a costly raid from the Blackfoot. This was partly because of their role as middle-men between the fur traders and other Indian tribes, as well as their wide dispersion in such small groups that genocidal conditions for

epidemics could not be effected. There is some evidence, which I have not yet been able to locate, that once lymph for vaccination against smallpox was available in Canada, it was early made accessible to the Cree. Some recorded epidemics and casualties among the Cree are:

1738	Smallpox epidemic. Brought from Hudson Bay.
1781	Smallpox among the Cree near Hudson Bay.
1786	Smallpox epidemic
1837	Smallpox epidemic
1881	128 Cree Indians killed by the Blackfoot at Pelly River
1908	Influenza among the Cree
1909	Influenza among the Cree
1917	Influenza among the Cree

Jenness (1960:286) says tuberculosis became almost endemic among the Cree in many districts but gives no details or dates.

The Sarcee (Blackfoot) first became known to Europeans on the upper reaches of the Saskatchewan and Athabaska Rivers. According to Jenness (1960) they include the Blood Indians. They were well known to early traders. In addition to being often attacked by Cree and other tribes, their numbers were badly reduced by infectious diseases, particularly the smallpox epidemics of 1836 and 1870, and one of scarlet fever in 1856. In 1877, together with the Blackfoot and Alberta Assiniboine, they ceded their hunting grounds to the Dominion Government, and in 1880 they agreed to placement upon a reservation, where they declined in numbers until 1920. Mooney (1928) estimated there was a population of 700 in 1670. Jenness (1960:234) estimates their numbers as 400 to 450 in 1880. By 1924 there were only 160 on the reserve, some of whom were originally Blackfoot and Cree. In summary, the major causes of depopulation among the Sarcee were:

1836	Smallpox epidemic
1856	Smallpox epidemic
1860	800 Blackfoot killed on the Saskatchewan by the Cree
1870	Smallpox epidemic

The Blackfoot Indians. Jenness (1960) quotes Mackenzie as estimating there were 9,000 Blackfoot in 1801, and Hind (1858) as 7,600. Six hundred died of starvation just after the disappearance of the buffalo, twenty-five years later, after which many went to Montana to settle.

The Assiniboines. Jenness (1960:316) says, "We have no reliable estimates of the number of the Assiniboines before the first quarter of the nineteenth century. At that period the population fluctuated between 8,000 and 10,000. . . . four thousand or more perished in the terrible smallpox epidemic of 1836."

The recorded dates of smallpox epidemics among the Assiniboines are:

1736	1837
1738	1856
1836	1857.

Today, there are approximately 2,500 Assiniboines in Alberta and Saskatchewan.

The Carrier Indians of the Fraser River and Athabaska were visited by Alexander Mackenzie on his way to the Pacific in 1793. Simon Fraser built Fort McLeod in 1805 to serve as a trading post for the Carriers. A second trading post was built at Fort Saint James in 1806. A Roman Catholic Mission to the Carriers was begun in 1843. After this, white traders, miners, and settlers started to arrive in ever increasing numbers. The Canadian Pacific railway was finally pushed through to Prince Rupert, and this increased white contact. Mooney (1928) estimates the Carrier Indians numbered 5,000 in 1780. They were recorded as having decreased to 2,625 in 1839. Morice (1889) gave an estimate of 1,600 at that time, and the Canadian Office of Indian Affairs reported 1,551 in 1902. By 1909, the number had climbed to 1614. The evidence here, too, is that depopulation occurred long before tuberculosis was a problem in Canada.

Influenza

One other disease which caused heavy casualties among both Indians and whites in Canada was influenza. (The reason for introducing influenza into this paper is that upper respiratory infections were formerly considered a predisposing factor in the causation of tuberculosis. This thinking was based on observation and correlation only and lacked scientific proof. Recent research into cellular immunology to tuberculosis being carried out by Dr. Earl Hershfield of the University of Manitoba indicates that viral infections, among which is influenza, tend to activate the tubercle bacilli in persons who have a latent tuberculosis. It is a clue to the inter-relationship of viruses, bacteria, and man.) In 1826, there was an epidemic in Quebec and one half of the population was said to have been affected (Heagerty 1928:1:213). There was an outbreak in the Canadian North West in 1835, and it was also present among the Indians at Cumberland House (Heagerty 1928:1:213).

Writing of influenza in Canada, Heagerty (1928:1:213) says: "From time to time the disease reappeared but, owing to the almost constant presence of smallpox and occasional epidemics of the more alarming diseases, cholera and typhus, little attention was given to it. This was the case during the pandemic influenza in 1830-1832. During 1832 it was completely overshadowed by cholera. The pandemic of 1836-1837 prevailed generally in Canada, whereas the pandemic of 1847- 1848 was swallowed up in the typhus which was brought to the the country by immigrants."

Influenza was again pandemic in 1888, and it was widespread throughout Canada in 1890. Mortality was high, and the majority of deaths were said to be due to "complications", the most important of which was pneumonia.

Smallpox

The disease, the biological and cultural factors: A discussion

Given the virulence of the smallpox organism and the susceptibility of the hosts, plus the fact of no previous exposure to the disease, there is no

evidence at all that the North American Indians reacted any differently than would any other virgin population. These circumstances are enough to account for the carnage.

An extremely well documented account of a smallpox epidemic occurring in Canada late in time is described by Kristjanson (1965:47-52). This record is important because it not only discusses the epidemic 1876 occurring among the Icelandic settlers along the Western shores of Lake Winnipeg and in the hamlets and islands of the Interlake Region of Manitoba, but also because it makes mention of a concurrent outbreak of the disease at Sandy River, an Indian community on the eastern shore of Lake Winnipeg, approximately thirty miles across the Lake from Gimli. These Indians are described as Christianized and civilized and friendly to the Icelandic people.

The important point is, that here was an epidemic affecting two "ethnic" groups in one small geographic area, at a specific point in time, and under specific and recorded climatic conditions. The groups were not comparable in size, the Icelandic group in Gimli numbering 2,500 and the Indian group across the Lake only 200. In Gimli, 100 Icelandic people died as the result of the disease. The total number of people infected is given as one third to one half of the population, that is, some 800 to 1200 people. At Sandy River, all the people had smallpox, and all the people died. The infection rate among the Indians was, therefore, 30 to 50 per cent higher than it was among the Icelandic people, and the mortality rate among the Indians was twenty five times higher than it was among the whites.

Living conditions between the two groups were not so very different. The Icelandic people were poor. They were existing in crowded conditions in badly ventilated shacks, only a few of which had stoves. In many cases, several families were forced to crowd into one temporary building, and the buildings were very small. As Kristjanson points out, the housing situation alone made it inevitable that the epidemic would sweep through the small colony at Gimli.

Across the lake, the friendly Indians were living in a larger than average community, and their housing was partly tents and partly huts (Lindal 1967:133).

We are told that the disease was previously unknown among Icelandic people, just as smallpox was unknown among American Indians prior to white contact. The great differences in morbidity and mortality rates between the two groups involved in the Gimli epidemic need some explanation and, with environmental factors relatively comparable, the temptation is to accept the long held theory that there were differential biological reactions to infectious disease among Indians and Whites and that these differentials had a genetic or racial basis.

One should, however, consider what has been recorded of some of the factors associated with the Gimli epidemic:

1. There may or may not have been genetic factors affecting the spread of the disease among the Native population. It is my view that there were not.

2. There were certainly socio-cultural factors which limited the disease spread and affected the consequent number of deaths among the Icelandic group in Gimli, and those factors merit careful evaluation.

There was certainly an awareness of the disease because some of the Icelanders had been vaccinated before leaving Iceland for Canada. This, in turn, meant there were among them an undetermined number who had been medically protected and who would have developed an acquired immunity to the disease.

The Icelandic immigrants possessed an extensive knowledge and technique of handling disease. They established a primitive hospital in a government storehouse at Gimli. They segregated the sick, and they organised community based care. At the improvised Gimli Hospital, there was only one death among the first sixty-four cases admitted, and this was attributed to the fact that they had better food and better ventilation than other people in the settlement, among whom there were many deaths.

Medical aid became available to the people of Gimli when two doctors arrived from Winnipeg in response to an urgent appeal for help. A third followed a few days later.

Lymph for inoculation was available to the Icelanders in the Gimli settlement during the smallpox epidemic, and there are two specific references to this fact.

Some vaccine lymph was obtained from Philadelphia that same month, November, but this proved to be ineffective. (Kristjanson 1967:49)

The second reference to the availability of lymph is made by Lindal (1967:133).

During the winter, the need for medical supplies became acute and a midwife, Aldis, Mrs. Grimur Laxdale, after being vaccinated was permitted to cross the quarantine line at Netley Creek.

Summation

The mortality rates for any disease are related to the incidence of the disease and are invariably influenced by sociocultural and economic factors, as well as the environment and the food supply, and the accumulated knowledge of populations. In considering how the epidemic among the Icelandic people was handled, it becomes easier to understand the devastation created by the smallpox epidemics among the Native peoples of Canada.

For the Native peoples, there were the limitations of human knowledge in the given temporal and cultural context. There was a general absence of public health concepts and, insofar as these were present in Manitoba in 1876-77, there is little likelihood the small Indian community which was wiped out had any awareness at all of such ideas. The principles of infection and cross-infection were not understood at all by the Native

peoples of the time. The Indians had a cultural fear of illness, which led to a cultural neglect of the sick and the dying. The only help was that provided by the Shamans, who explained events in terms of the supernatural, which is itself a barrier to acceptance of any theory of the natural causation of disease and could easily account for feelings of apathy when confronted with disaster.

There were congregations of persons in crowded living conditions which were aggravated by poor ventilation. In European terms, there were poor standards of personal hygiene. There was the practice of sharing eating utensils, which were rarely washed, and which were usually thick with grease. There was the cultural practice of pre-masticating food for infants, and also prior to cooking, and the cultural practice of passing tobacco pipes from person to person.

There was an absence of creature comforts. Ground lying was general, with provision of birch mats, or skins, at best. There was inappropriate diet for sick people, and inadequate hydration due to a cultural aversion to fluids, large quantities of which might have diluted the viral-generated toxins had the Native peoples known anything of this therapeutic principle.

There was the Indian habit of travelling in the winter, both for hunting and trapping purposes as well as socializing. Whatever the reasons for winter travel might have been, and Le Jeune offers the simple observation that in winter it was easier to drag things over the ground, this mobility would have facilitated the spread of an infection with a relatively long incubation period during which people already harbouring the infection but free of symptoms could pass it on to others.

Thus, there were not in any of the Native customs any barriers or inhibitions to disease by infection nor to its transmission, and there were customs that could specifically facilitate disease spread, even in small and dispersed communities once the infection appeared.

The lack of defences among the Native people against the disease must recognize not only the total absence of contact and the isolation from it during some 30,000 years of separation of American populations from the old world populations, but, for Canadian Native peoples in particular, the lack of cultural defences and the conditions of life which promoted its spread.

It has been estimated that of the twelve million Indians in the United States when the first white man landed, about six million died of smallpox. (Birkland, J., 1944:345)

When to this estimate is added the three and a half million Mexican Indians who died in Mexico, as the result of contact with a Negro slave, and the thousands, known and unknown, who died in Canada, it is obvious that this one disease not only exerted enormous selection pressures and depopulated the Indian tribes, but also had immense demographic implications for generations to come.

Variolation and Vaccination

The skin lesions so characteristic of smallpox were intensely irritating, and the natural tendency was for a victim to scratch in order to get some relief. Scratching further damaged the skin, promoted re-infection, and increased the severity of the disease. There is no evidence that the North American Indians had any understanding of these risks.

Mechanical vectors of disease include ants and lice and dogs, as well as clothing and tents. We should perhaps consider the role of the ubiquitous fleas, whose bites would most certainly promote scratching and damage to the skin, and consider whether flea-bitten individuals who had been handling infected clothing and persons may have infected themselves.

The appropriate avenue for infection in smallpox is (was) via the respiratory tract, thence to the lymphatics, blood circulation, to the reticulo-endothelial system and, finally, all tissues. (Davidson, Israel, and Henry 1969:22:971-973). However, inoculation via the skin was the principle of vaccination which, even in well-controlled circumstances, could produce a severe vaccinia and desquamation in some individuals. Furthermore, documented evidence that inoculation via the skin could contribute to smallpox epidemics is provided by the fact that prior to Jennerian vaccination, people in North America were trying to protect themselves by human to human inoculation, which involved rubbing infectious material from smallpox victims' sores into the arms of healthy individuals who had never suffered from the disease. The idea was that this would produce new cases of smallpox which, hopefully, would be mild, but which might in fact be very serious. The practice was considered extremely dangerous, and the risks could be greater than smallpox itself to susceptible individuals. The practice was called variolation.

Variolation had long been practised in the Near East and was popularized in England in 1716 by Lady Montague, who had learned of the practice whilst living in Constantinople and who had had her own son inoculated. The practice was introduced to the North American colonies by Boylston at Boston in 1721. The disease produced by variolation, however, was just as contagious as the naturally occurring smallpox, just as severe to those who contracted it, and served to keep the disease prevalent in the population.

The history of smallpox has been intimately associated with war in North America. On June 15, 1775, when George Washington became commander of the U. S. Continental Army, smallpox was rampant among civilians in the combat areas. Washington was faced with the decision as to whether to chance an epidemic, or whether to permit his troops to be inoculated against smallpox. He considered the latter course far too risky, and made human to human inoculation a Court Martial offence.

There was no cure for smallpox, but in 1880 Jenner introduced inoculation with cow-lymph as a preventive measure and so raised an effective barrier against the disease, and this has led, according to the World Health Organization, to its total eradication. But vaccination was for a long time

highly controversial, and there were public demonstrations against the procedure in all parts of Canada, but especially in Quebec. Eventually, fear and hostility were resolved, but it required legislation at provincial, national, and international levels to ensure universal compliance with this major health measure.

One problem remains. The World Health Organisation points out that not one case of smallpox is now known to exist and is urging that all existing stocks of lymph should be destroyed, but people are afraid to let go of the safeguard, fearful that somehow the organism will adapt, find a host other than man, or that somewhere, some day, in some unexpected place a case of smallpox will present itself and the protection will be gone.

CHAPTER III

TUBERCULOSIS

CHAPTER THREE

TUBERCULOSIS

INTRODUCTION

At the close of the nineteenth century, the epidemics of cholera and typhus were over, and smallpox outbreaks, though not yet eradicated, were beginning to subside. The germ theory of causation of disease was well established, and attention had been drawn to the fact that the ravages of infection could be controlled by man. Into this new consciousness penetrated the awareness that tuberculosis was a major health problem. Tuberculosis was a disease whose time for investigation had come, and this was in part because new advances in medicine and biology had resulted in the disease being semantically defined. It had reached an ideological status, and its ideological character became a threat in itself, a tool of racism.

As early as the year 1800, tuberculosis was very prevalent in England and France, and its increased incidence was attributed to the industrial revolution, which had been responsible for the movement of large numbers of wage labour migrants from rural to urban areas. It has been established that as many as three out of every five rural residents moved into urban centres. Once in the cities, numbers of these migrants lived in the dirty, overcrowded, and generally insanitary conditions available to the working class, and a kind of milieu in which a disease such as tuberculosis, sensitive to social change, is apt to flourish.

Once people uproot themselves and make one move, they are very liable to make another. In fact, conditions may serve to drive them further, and some of these wage labour migrants became part of the wider movement of European people to the New World. In most cases, during the early period, there were no immigration barriers, and few questions were asked about incoming migrants' health.

The year 1847 saw an upsurge in tuberculosis in Ireland, and people fleeing from the threat of starvation following the potato famine were bringing the disease to North America, where it soon reached epidemic proportions among both Indians and Whites.

Concurrent with this was the spread of tuberculosis among the Negroes of North America following the abolition of slavery. It had formerly been in the interests of plantation owners to keep slaves healthy, and slaves paid a heavy price for their freedom, when measured in terms of social instability, sickness, lack of occupation, and no financial security.

Above all, there was movement. The movement of freed slaves, the movement of European immigrants into North America, the movement of American Indians crossing and recrossing the U.S.-Canadian border, and the drive by

Canada to populate its Western Territories lest they could be occupied and taken over by the United States. Immigration to the Canadian West was not only politically welcome, it was sponsored and subsidized by free or assisted passages and grants of land. The resultant social upheaval in unorganized territories created conditions favourable to disease.

Tuberculosis: disease, history, treatment

Tuberculosis is a very old disease. Goldstein (1969), quoting Morse, Brothwell and Ucko (1964:540), said a recent review noted that:

Some form of tuberculosis has been with man since neolithic times; and that it is conceivable that the closer contact of man with livestock following the Neolithic Revolution provided a satisfactory 'bridge' over which a mutant variety of the tubercle bacillus was able to cross and survive. (Goldstein 1965)

Goldstein further says,

There is evidence of tuberculosis of bones recovered from a neolithic cemetery in Germany dating back to about 5000 B.C. (1963)

Goldstein's first quoted statement implies that infection originally crossed from cattle to man. The statement concerning skeletal remains might seem to confirm this because bovine tuberculosis, when it occurs in man, has a greater tendency to attack bones and joints and rarely produces pulmonary disease. Birkland (1944:240), however, says this is not necessarily so. Cattle can infect man, but man can also infect cattle and other animals.

Klencke (1846) had traced human infection to milk taken from diseased cattle, and Gerlach was to confirm this finding in 1865. Calmette (1922:219) specifies that Chavreau (1868) demonstrated that transmissibility of human tuberculosis into cattle was possible.

Subsequent experiments, usually by intra-peritoneal injection of human sputa into cattle confirmed this finding. (Calmette 1923:291)

Calmette also cites Dopheide as reporting a case of transmission of tuberculosis from a woman to her horse. (Calmette 1923:353)

Unlike the smallpox virus, the only reservoir for which is man, almost all higher vertebrates, including mammals, birds, reptiles and fish, are susceptible to tubercular infection under favourable conditions and, once infected, become reservoirs and carriers of the disease.

The two types of mycobacterium tuberculosis mammalian which have been most important to the evolution of man are the human and the bovine types, but Calmette was not convinced that the organisms were essentially different.

According to Calmette, "Between the human and bovine types, as ordinarily defined, there exists a whole series of intermediaries which approach more or less either the one or the other. It follows from this that we are not justified in inferring the duality of human and bovine tuberculosis organisms, as Robert Koch claimed. These types differ one from the other only because they have more or less adapted themselves, through a series of cultural generations to a human or bovine environment." (1923:294-295)

That the tubercle bacillus does indeed adapt has since been proven by the drug-resistant strains which have developed as a response to the anti-microbial chemotherapeutic agents used in the treatment of tuberculosis since 1954, and the extraordinary measures researchers have been forced to devise to minimize such adaptation developing. The triple drug therapy which brought tuberculosis under almost total control during the past two decades was based on intimate knowledge of the tubercle bacillus and its extraordinary ability to survive. The first three "front line drugs" were (1) isonicotinic acid hydrazide (I.N.H.), (2) para-aminosalicylic acid (P.A.S.), and (3) streptomycin. The action of each is specific.

Isonicotinic acid hydrazide is an amino-glucoside. It is active against human, bovine, and B.C.G. strains of myco-bacterium tuberculosis. Its mode of action is unknown. It is a highly specific agent and is useless against other disease organisms. Furthermore, it does not affect the tubercle bacillus when the organism is in its metabolic resting stage. When used alone, resistant strains of tubercle bacilli develop very rapidly. When used in combination with other anti-tuberculosis drugs, the emergence of resistant strains of bacilli is delayed.

Para-aminosalicylic acid inhibits the onset of bacterial resistance to streptomycin and isonicotinic acid hydrazide. The precise mechanism by which it inhibits growth of the organism has not been established. However, its effect is increased by the addition of streptomycin and isonicotinic acid hydrazide.

Streptomycin is not absorbed by the gastro-intestinal tract, and therefore, has to be given by intramuscular injection. Streptomycin is active against the tubercle bacillus, but when given alone bacterial resistance develops very rapidly. Its mode of action is interference with normal protein synthesis and the production of faulty proteins.

Resistance of disease organisms to chemotherapeutic agents is by mutation, and the search has always been for better and more potent drugs; but, there is no simple answer. Even with the newer anti-tuberculosis drugs, Rifampin and Ethambutol, it is still necessary to use a combination of two or more drugs for effective treatment. There are those who consider that although the present control of tuberculosis is almost total it is biologically insecure and the concern among researchers is that the adaptability of the *Mycobacterium tuberculosis* mammalian will outstrip the efforts to develop more satisfactory bactericidal agents.

Bovine tuberculosis, when transmitted to humans, manifests itself in glandular tissues and in bones, and sometimes as generalised or miliary

tuberculosis, whereas the human type of infection can affect any organ or tissue of the body but occurs chiefly in the lungs, producing what is known as pulmonary tuberculosis. These points are significant because claims that the American Indian had no experience of tuberculosis until the advent of the white man are based on evidence from skeletal remains recovered from grave sites. There would seem to be relevance in considering when dairy herds were first introduced into North America, and when North American Indians began to include beef and milk in their diet. According to Hrdlicka, the Sioux were eating beef prior to 1906, and that not only was none of this tested for tuberculosis, but much of it was diseased and unfit for human consumption. Sessional Reports of the Government of Canada provide evidence that when Indians were settled on reserves in Western Canada, they were given cattle on loan for breeding purposes, but many of these loaned cattle were eaten. Ferguson (1955:43) says that very little milk or milk products were consumed by Plains Indians until about 1910. The early prevalence of scrofula among the Indians, therefore, is not satisfactorily explained except by glandular limitation (usually the cervical glands) of a primary infection in the lungs.

Coleman (1900) is among those who have categorically stated that tuberculosis was unknown to the North American Indians before European colonization. But the evidence is incomplete. Not enough is known of the health of other animals in the pre-historic North American habitat; and, in any case, prior to the introduction of Christianity, many of the Indian tribes practised cremation of the dead so that what might have been much evidence for, or against, the existence of tuberculosis in pre-contact Indians has been lost.

It was in 1882 that Robert Koch identified the human mycobacterium tuberculosis. Eight years later (1890), Koch developed tuberculin, a protein derivative of the bacillus, for the purpose of inoculation, hoping to create the kind of barrier against tuberculosis that Jenner had achieved with vaccination against smallpox. Inoculations with tuberculin, however, were a failure. Ferguson (1955:86) points out, however:

The discoveries of Koch made possible a determination of the extent of infection by the use of tuberculin . . . it was found that in all but the most sparsely settled and remote communities tuberculous infection was practically universal in young adult life.

Today, tuberculin remains a potent weapon in challenging reactions in subjects who have been exposed to tubercular infection and is one of medicine's greatest diagnostic tools.

Free tuberculin testing of cattle was offered to livestock owners in Canada in 1897, but in spite of the findings of Klencke and Gerlach, the bovine type of bacillus was long thought to have nothing to do with human tuberculosis. Robert Koch, himself, was still making public statements to this effect as late as 1901. It was not until 1904 that Koch was proven wrong, and it was established that bovine bacilli were indeed transmitted to humans via cow's milk. Diet, therefore, became recognized as a major factor in the transmission of the disease, particularly among young children.

A. E. Cameron, writing in the Canadian Public Health Journal in 1929 said: "In 1905, the Supervised Herd Plan was introduced in Canada. Herds were tested, reactors slaughtered and measures taken to prevent re-infection of the herds but no compensation was paid." For that year the figures as given by Cameron are:

<u>Province</u>	<u>Territory</u>	<u>No. of Cattle Tested</u>	<u>% Positive</u>
Prince Edward Island	Whole Province	94,772	0.59
Nova Scotia	Whole Province (Excluding Cape Breton)	191,000	2.2
New Brunswick	Small area	4,745	0.69
Quebec	One area	102,882	6.9
Quebec	One area	67,357	19.8
Ontario	Prince Edward County	24,184	2.1
Manitoba	Carmen Area	22,892	5.7
Saskatchewan	Last Mountain	21,417	0.8
British Columbia	Fraser Valley	46,174	7.9

The tubercle bacillus is parasitic. It is in the interests of the organism to feed upon its host rather than destroy it. Most cases of tuberculosis, therefore, are chronic in nature, beginning slowly, progressing over time, and with symptoms which at first are vague. Hence the old, descriptive term of people going into a "decline". Eventually, if untreated, or if the host has insufficient bodily reserves to combat the infection, the organisms multiply and finally destroy the host. Therefore, another very old but very descriptive name for the disease was "consumption".

Factors which may make a human host particularly vulnerable are (1) faulty or weak immunological processes, about which far too little is still known, (2) poor hygiene and sanitation standards, and (3) semi-starvation on a long term basis, such as occurs during famine or war, or sudden severe food deprivation. To these conditions may be added diseases such as alcoholism and diabetes, the end results of which are nutritional deficiencies, as well as emotional and physical stresses of all kinds, including other infectious diseases. Also, as has already been pointed out, the disease is sensitive to certain kinds of social change. Social change, in the context of this thesis sums up a process which establishes or creates many of the above conditions among the poor.

Tuberculosis is not only water-borne, but dust-borne, air-borne, and passed on by contaminated inanimate objects called fomites when handled by humans on conditions of dirt and squalor. Its most direct form of

transmission is from person to person by droplet infection as the result of uncovered coughing and sneezing - the closer the person to person contact, for example, sibling-sibling, mother-child, or conjugal relationships, the greater the danger. Many people regard repeated exposure as the greatest risk element, but nothing is ever quite as simplistic as this. Repeated exposure, by connotation, evokes a picture of a person being bombarded by numerous organisms over a long period of time. Yet, Ferguson (1955:45) cites Webb (1911) as demonstrating that 2, 5, 7, 10, and 12 moderately virulent bacilli injected sub-cutaneously (inoculation) can infect a child. On the basis of Webb's experience, Ferguson concluded that only a few moderately virulent bacilli would be sufficient to produce disease. Therefore, other factors, such as the susceptibility of the host and the quality of immunological processes might seem equally, if not more, important.

Furthermore, repeated exposure over time is the basis of two arguments: (1) that the white man, having been long exposed to tuberculosis, had developed a resistance to the disease; and, (2) conversely, that the North American Indian, having had no previous exposure, had no such immunity. In any case, repeated exposure to infection in small doses, which we might call "de-sensitizing doses", is the basis of much immunity to disease.

The more acute infectious diseases usually confer on survivors a life-long immunity, but tuberculosis in an individual can reactivate after many years. Sometimes the interval between primary infection and reactivation is so long that it is difficult to determine whether what is being seen is a reactivation or a new infection. Ferguson (1955:72) suggests that resistance to tuberculosis is not maintained at a constant level but may vary significantly. "The development of a lesion may be coincident with intercurrent disease, stress, or run-down condition."

The human mycobacterium bacillus is a tenacious organism. It is surrounded by a waxy encapsulation, which not only protects it but makes it difficult for the organism to ingest material for its own survival. Its multiplication in the human body is very slow, the division of one bacillus into two taking about twenty-four hours. Theoretically, this should be advantageous to the infected host and favour the development of antibodies. In spite of this, the organism has extraordinary powers of survival. It can remain visible outside the human body for many, many years. Brown and McLean (1967) quote Kabler as having demonstrated the presence of mycobacterium tuberculosis in sewage which had been treated with recognized and conventional sewage treatment processes for as long as three years.

Early Reports on Tuberculosis in Canada

There are early Jesuit references to tubercular conditions among the North American Indians, but most of what they reported on was scrofula, a form of tuberculosis characterized by enlarged and suppurative glands. The first report appears in Le Jeune's Relation of 1633-1634; and, as at the time, white contact was minimal, it is conceivable that tuberculosis had indeed existed among Canadian Indians prior to that time period. Writing of the Montagnais, the priest says:

We had three persons in one cabin afflicted with scrofula . . the son of the man whose ear was very disgusting and horrid from this disease; his nephew, who had it in his neck and a daughter who had it under one arm. I do not know whether this is the real scrofula; whatever it is, this sore is full of pus, and covered by a horrible looking crust. They are nearly all attacked by this disease when young, both on account of their filthy habits and because they eat and drink indiscriminately with the sick. (JRAD 6:263, 1633-1634)

Of the sick among the Montagnais in 1637, we are told: "Nearly all die of consumption, becoming so thin they are nothing but skin and bone." (Jesuit Relations, Thwaite's Edition. Vol. XII, p. 7)

Father LeMercier's Relation, 1653-1654, says of some New France Algonquians: "At Tadoussac a child was afflicted in a frightful manner with a scrofula on his neck, and his entire throat was being eaten away by it; while the little girl suffered from a haemorrhage which was reducing her to a skeleton." (Jesuit Relations, Thwaite's Edition. Vol. XLI, p. 196, 1653-1654).

The Relation of 1657-1658, referring to a full-blooded Huron girl who was to become a nun in the convent says: "He (the Lord) visited her with a malady which is common enough among the savages, being a kind of weakness, together with a slow fever; and this so exhausted her that she wasted away before our eyes with an inflammation, accompanied by a severe cough, which affected her whole chest to such an extent that her lungs were gradually destroyed." (Jesuit Relations, Thwaite's Edition, Vol. XLIV, p. 267, 1657-1658)

In Volume LVII (1672-1673), there is mention of "A poor woman who had been consumptive for two years".

Also, referring to the missionary among the Montagnais people, "... sometimes he is made ill by the stench of those who have scrofula, with whom he drinks out of the same kettle." (JRAD 67:61, 1720-1730)

The Saguenay Relation, again concerning the Montagnais, says: "All, with the exception of a young child attacked by scrofula, were in wonderful health."

Secondary sources of information concerning tuberculosis among the North American Indians are available in Hrdlicka's (1909) report in The Bureau of American Ethnology (Bulletin Number 42) where the following references are cited in the Bibliography. (I have taken these citations from Hrdlicka for historical completeness, revising them slightly for readability. Consult the original report for documentation.)

- a. In New England the Indians are afflicted with pestilent fevers, Plague, Black-pox, Consumption of the lungs, Falling sickness, King's Evil, and a disease called by

the Spaniards the Plague in the Back, with an empyema. (Black pox: Haemorrhagic small pox; Falling sickness: epilepsy; King's Evil: syphilis; Plague in the Back with an empyema: Empyema is pus in the pleural cavity. Usual location in the back, just below the scapular. Characterized by pain, redness, swelling, and eventual suppuration via the skin.) (La Hontan, 1703)

- b. It throws all of them into that languishing disorder, which we call consumption: they look pale, livid and ghastly, like skeletons. (Ibid.)
- c. Maladies scorphuleuses, causées par la crudité des eaux, par les eaux de neige, qu'ils sont obligés de faire fondre dans les pays de chasse, pour boire, et pour faire cuire leur sagamité. C'est peut-être du même principe et de ce qu'ils ont toujours l'estomach et la poitrine découverte, qu'ils contractent une espèce de pthisie, qui les minant peu à peu en conduit la plus grande partie au Tombeau, et laquelle ils n'ont pu encore trouver de remède.

... ces sortes d'infirmités ... les prennent d'ordinaire à la fleur de l'âge. (Lafitau 1724, vol. 2:360-364)
- d. Consumption is a disease familiar to all those with whom I have had personal acquaintance; and I think also that I may go further, and state, without fear of contradiction, that it is prevalent among all the Natives of the northern section of our continent. (Norton 1837:312) (Norton includes a letter on consumption among the Indians by Dr. Z. Pitcher and speaks of the Chippewa, Ottawa, Menominee, Osage, Pawnee, Omaha, Kansas, Creeks, Cherokee, Choctaw, Seneca, Shawnee and Delaware)
- e. Consumption is of more frequent occurrence than scrofula among the Indians scrofula per se is oftenest to be seen among those tribes who stand, as it were, midway between the savage and civilized state: but even then not so often as consumption. (Norton 1837:312)
- f. Speaking of the Chippewas, the writer says: "They have conjurers who cure diseases . . . as rheumatism, flux, and consumption." (Farnham 28:159)
- g. Stratton, Thomas (1849) includes Dr. A. Digby's and P. Darling's reports on consumption and scrofula among the Chippewa of Manitoulin Island and the Six Nations along the Grand River. (Period 1840-48) According to P. Darling there were among the 800 Ottawa and Chippewa who came under his observation and whom he treated during the

following periods: 10-10-1840 to 16-8-1841 - Scrofula 2, Enlarged glands 13; 16-8-1841 to 31-12-1842 - Pthisis 12; 1-1-1844 to 31-12-1842 - Pthisis 3. According to Dr. Dibby, there were among the 2200 Indians belonging to the Six Nations between 1-3-1847 and 1-3-1848, a total of fifty-four deaths, with four deaths from pthisis. This would appear to be a remarkably low death rate, over-all, for that point in time, and with only four dying of pthisis out of a total of 2200.

- h. Bouchardat, M. (1861) gives a note on tuberculosis among the Hudson Bay Eskimos.
- i. Williamson (1874) writing about the diseases of the Dakota Indians, refers to the Sioux of Minnesota about the Lac qui Parle region between 1835 and 1846. The article contains observations on about one thousand individuals.

Of those over ten years old who died of disease, I think fully one half died of consumption. I do not think it was much more prevalent among the Indians than among our white population; while from the fact that they were all tainted with scrofula, their mode of life, etc., it might be expected that it would be very much more so.

The great proportion of pthisis was chiefly owing to so few dying of other diseases.

According to Williamson, scrofula was certainly less prevalent among the Indians subsisting on buffalo meat than among those under his observation; those of the Plains "generally appeared real healthy, with the exception of sore eyes".

- j. In 1881 to 1882 consumption was prevalent among the Indians along the northern shore of Hudson Bay, according to J. Andrew (1884).
- k. Orton (1898) noted scrofula and consumption as generally prevalent among the Indians about Lake Winnipeg and along the Nelson River.
- l. Graham (1890) said that at the time of writing scrofula was present in the Sioux tribe.

Very much later in time, Jenness (1960:286), speaking of the Cree, says: "Tuberculosis became almost endemic in many districts, as it has among the tribes of the Mackenzie Valley."

Neither dates nor locations are specified but this reference to

tuberculosis is made just prior to discussing the influenza epidemics of 1908, 1909, 1917.

The Early Reserve Period

Much of what is known about tuberculosis among the Indians of Canada during the epidemic periods has resulted from the placement of Indians upon reserves.

At the time of the establishment of the reserves the Indians were in a vulnerable position. On the plains, their hunting was ended because the herds were already depleted. The aftermath of the Riel rebellion had brought misery to many. In the east, their crops had failed. They were in need of food and had little choice but to accept the "help" offered by the Federal Government.

Early reports from the reserves do not support the stereotype of the Indian as lazy, improvident, and addicted to alcohol, although alcohol was a problem in some areas, particularly where reserves were adjacent to white settlements. From the reports of Indian agents, including details of seeds sown and crops harvested, the Indians appear to have been cooperative and hardworking. In addition to engaging in agriculture and herding, they were building houses, schools, and churches, and helping to cut access roads to and through some of the reserves. Where there were lakes and rivers, they were fishing; and, most tribes, in season, had some of their members still following their aboriginal pursuits.

The Annual Report of the Department of Indian Affairs for 1882 contains many letters from Indian Agents to the Superintendent General of Indian Affairs in Ottawa, which evidence a concern for the people they were trying to help. "Les sauvages" of the Jesuit Relations had become "The Indians of this Reservation". It may be argued that these reports were biased inasmuch as agents were reporting on the results of their own work, but there are enough evidences of bigotry in some reports to counterbalance overenthusiasm in others, and the general impression is one of conscientious and possibly naive people genuinely trying to help the Indians and implement government policy, which was the enumeration, geographical isolation and containment, and the supervision of Indian religious and secular education, diet and mode of dress, all of which led to political control and subjugation which is taking a long time to change.

Sessional papers of the Government of Canada have included official reports on the state of health of Indians on the reserves since the year 1882. It is interesting to look at what was being said in 1882, this being the year of Koch's identification of the tubercle bacillus and the disease tuberculosis being semantically defined:

Part I
of the
REPORT OF DEPARTMENT OF INDIAN AFFAIRS

From J. T. Gilkison, Visiting Superintendent and Commissioner, from the Grand River Superintendency, Brantford, Ontario, 6th of October, 1882.

The Six Nations number	3,195	
Deaths	95	
Births	75	
Decrease	20	(1882:1)

The Mississaugas number	217
Births	7
Deaths	6
Increase	1

An unusual feature is the decrease in the Six Nations, arising from a moral rule adopted last year by the Indian Council to exclude illegitimates; thus following the long established example of Mississauga or Chippewa bands.

The Health of the people is much as usual, they are still subject to malarial fevers and consumption, but the death rate has been less than of late years. Vaccination has been successfully carried out on 931 persons. Now, with the exception of a few individuals (who from pagan and superstitious ideas refused) all are, in a measure, protected from the dreadful disease. (Smallpox is surely referred to here as there was no vaccination against anything else at that point in time.) (1882:1)

From the Western Superintendent, Highgate, Ontario, 20th August, 1882:

There is a small decrease in the population this year . . . There is very little sickness of any kind on the Reserve. (1881:7)

Letters from Northern Superintendent, 4th Division, Prince Arthur's Landing, 1st September 1882:

Along the North Shore of Lake Superior, an epidemic, said to be measles, has prevailed greatly among the Indians; quite a number of them have died; adults as well as children. (1882:10)

Province of Quebec, St. Regis Agency, Dundee, 24th August 1882:

The increase in population for the year is 38, the largest increase of any year for some time. The general health and prosperity of the reserve has been in keeping with the previous years. (1882:15)

Province of Quebec, Caughnawaga Agency, 28th August, 1882:

The population has increased this year as up to the present time the births exceed the number of deaths by 23. (1882:15)

Viger Agency, Rivière du Loup., 25th October, 1882:

An increase of 18 in the census, which is due to the nomadic habits of the Indians, that is to say, they are constantly moving from place to place, and it frequently happens that many families absent for a number of years return all at the same time.

The band enjoyed good health throughout the year. There were five deaths partly caused by consumption. (1882:16)

Province of Quebec, Lake St. John Agency, 17th August 1882:

As you will see by the statement three deaths and eight births took place during the year, making an increase of five. There was no distress amongst them, nor any contagious disease. (1882:16)

Province of Quebec, County of Bonaventure, Ste. Anne of Ristigouche, Cross Point, 2nd September, 1882:

The population is increased by the arrival of strangers who come here to settle, and the decrease is due to the ravages of consumption, which claims victims in many families. My opinion is, that consumption results from severe work in the shanties in winter and dissipation in the summer. (1882:18)

Province of Quebec, County of Ottawa, Maniwaki, October, 1882:

The population is about the same as last year; the births and deaths being about equal.

The health of the Indians during the year has been exceptionally good. (1882:18)

Province of Quebec, County and District of Saguenay, Notre Dame de Bethsiamits, 31st August 1882. Report on the Montagnais Indians, Province of Quebec, Grande Romaine:

During the year there were 21 births and eight deaths, five infants and three adults. Fever and colds were the principal diseases.

At the present time they are all well. (1882:19)

Province of Quebec, Seven Islands:

There were thirteen births and twenty seven deaths . . . ten adults and seventeen children. Many of the adults died of consumption, and the children from heavy colds and inflammatory sore throats.

At the present time there is no sickness amongst them, they are all enjoying good health.

They secured a number of caribou during the winter. (1882:21)

Province of Quebec, Godbout:

The Indians all enjoyed good health during the year; there were no deaths; there was an increase of one by birth. (1882:23)

Province of Quebec, Escoumains:

The Indians were all well conducted during the year. They enjoyed good health and there were no deaths; two children were born. (1882:23)

Province of Quebec, Notre Dame de Bethsiamits:

Last year there were seventeen births and twelve deaths - five adults and seven children. The general health of the Indians was good.

Bethsiamits is the rendezvous for all the widows, old men, etc. (1882:23)

Nova Scotia, Indian Agency Number 2, Cornwallis, 26th July 1882:

Our 1877 Indian population was 74, this year's statement shows 106. The reason is not far to seek. The farmers of King's and Annapolis Valleys are in a very prosperous state and the Indians find a ready sale for all their manufactures, and inform me they can live much more comfortably here than elsewhere, for one large family came in last year from the Reserve, New Germany, and I think will be permanent here.

One family returned from Massachusetts after an absence of eight years, the husband and wife dying within an hour of each other, leaving three helpless children to be cared for.

There have been three heads of families taken away during the year, and two children among our own Indians proper, but several children have come in by adoption. (1882:24)

D. M. Muir, Agent for Colchester, Nova Scotia:

Some deaths have occurred, principally from pulmonary diseases; an attack of diphtheria made its appearance from which two deaths took place. (1882:26)

Parisboro, 29th October 1882:

Nothing worthy of special notice has transpired since my last report. The population is increasing; several families, and individual members of the band, who have been living in New Brunswick, have returned. No deaths have occurred. (1882:26)

District No. 13, Christmas Island, Nova Scotia, 12th September 1882:

The population remains in status quo. There is neither increase nor decrease to report. There were four deaths and four births during the year.

I have to report that diphtheria has lately appeared among the children in Eskaskoni. So far, three deaths have occurred, and as many more had fallen sick recovered. (1882:29)

Western Superintendency, Fredericton, New Brunswick, 4th November 1882.
William Fisher, Indian Agent.

You will notice upon reference to the tabular statement, that there has been an increase in the population during the past year arising from a variety of causes, and from the Indian character being so migratory, moving about as they do from time to time during the years that roll round, it is next to impossible at any period to obtain the exact number of Indian people . . .

The general health of the several bands is good, although there has been more sickness during the year at the Reserves in Kingsclear and St. Mary's and in some parts of Charlotte County, their manner of living being prejudicial to real good health, inasmuch as their houses and wigwams are small and badly ventilated, sometimes being exceedingly hot and at others quite the reverse, and their dwellings are used for many unhealthy purposes, such as the cleaning and oiling of hides and such like, to which I have called their attention repeatedly and suggested a change, but to little purpose. (1882:30)

Prince Edward Island, Lennox Island, 10th November 1882:

A marked improvement is noticeable, but a great drawback to a still greater improvement is the want of teams to put in their crops. Here on Lennox Island they have but one team of horses and a yoke of oxen, and on Morell and Mount Stewart Reserves they have none. The Indians on these Reserves have to hoe in their crops or hire teams from their white neighbours. They are very desirous to get a horse but have no means to purchase one.

There has been an increase in the population this year.

Many of them have been sick. (1882:33)

There are no horror stories in these reports, despite some references to consumption, which one agent opined was the result of severe work in the shanties in the winter and dissipation in the summer. Whether or not environmental conditions were such as to facilitate the spread of disease is not clear, but they obviously left much to be desired and could well have contributed to the spread of any infectious disease.

The statement concerning the decrease in population among the Indians of the Six Nations Reservation at Brantford, Ontario, arising from a moral rule adopted by the Indian Council to exclude illegitimates is interesting. As also is the statement that it followed the long established example of Mississauga or Chippewa bands. One would need to know just what was meant by "illegitimates" before proper evaluations of these statements could be made, but the statements could well be important.

At the time of contact it was estimated that there were 200,000 North American Indians in Canada. At the time of the first census only 102,000 Indians were enumerated. Neither figure is likely to be accurate but it appears that somehow, over a period of three centuries, the Indian population seems to have been reduced by half.

It has always been accepted that the so-called "decimation" of the Indian tribes was the result of deaths from infectious diseases introduced by the White Man. This was undoubtedly true of smallpox, and it may have affected our judgment of the effect of other diseases, including tuberculosis. It would be interesting to explore the results of intermarriage and attempt to establish a correlation over time with the rise of a new population in Canada, the Métis, and a decline in the total number of Indians.

TUBERCULOSIS IN THE TWENTIETH CENTURY:
NAME A DISEASE: FIND A DISEASE

Twenty years later, things were changing on the Reserves. From the year 1902 onwards there are reports of great spring cleaning activities on all the Reserves, of rubbish being collected and burned, and a great drive to get cabins and other buildings whitewashed. Much of this was in anticipation of visits by officials to the Reserves. Health and Sanitation are reported under one heading, and a picture of the Indians huddling in squalor all winter and being persuaded to mend their ways by spring clearly begins to emerge. Official publication of these reports sanctioned the picture presented.

By 1903, tuberculosis is beginning to be documented as the major health problem in all areas except British Columbia. The reports from the Canadian Reserves have been scrutinized for references to tuberculosis among the Indians for this particular year and are presented below. It is important in reading these reports to note not only the location of the Reserves but also population size, especially in relation the total number of deaths among the various Indian groups. The figures do not always match, for drama, the content of the written text.

If the population of a given reservation is five hundred, for example, and the total number of deaths for the year is ten, and most of these deaths are from tuberculosis, the majority of ten cannot be more than nine, so what is being reported is a tuberculosis death rate of not more than two per cent, from which must be deducted deaths from other named causes, including old age.

Excerpts from the Sessional Reports of 1903 follow:

CANADA. DEPARTMENT OF INDIAN AFFAIRS. ANNUAL REPORT. 1903.

1. THE CHIPPEWAS OF GEORGINA AND SNAKE ISLAND. ONTARIO.

The health of the band has been pretty good during the past year. There has been no contagious disease among these Indians except consumption, which is still doing its deadly work, notwithstanding that all sanitary precautions are pretty well observed. (p. 2)

2. THE CHIPPEWAS OF RAMA. ONTARIO

The general health of the Indians has been good during the past year, but that fatal scourge, consumption, is gradually working its way into the band and doing its work. Sanitary precautions are strictly observed, all garbage being collected and burned each spring, and the buildings whitewashed. (p. 5)

3. THE CHIPPEWAS OF SARNIA. ONTARIO

The health of these Indians has been fairly good, no epidemic has broken out. Consumption is quite prevalent. We have found it necessary to fumigate the houses in which consumptives have died. Chlorine gas is the disinfectant used. (p. 6)

Reserve population 446. Births and deaths not given.

4. CHIPPEWAS, MUNSEES AND ONEIDAS OF THE THAMES. ONTARIO.
ONEIDAS OF THE THAMES

The health of these Indians has been good during the year. No epidemic broke out. Consumption is the most prevalent disease. (p. 6)

Reserve population 772. Deaths not given.

5. CHIPPEWAS OF THE THAMES. ONTARIO

Sanitary precautions have been fairly well observed. No epidemic broke out during the year. There is more mortality from consumption than any other disease. (p. 7)

Reserve population 473. Deaths not given.

6. MANITOWANING AGENCY. ONTARIO

Whitefish Lake Band

The health of these Indians for the past year has been fair. The greater number of deaths were due to consumption which seems to be prevalent among the Indians. (p. 13)

Reserve population 158. Total number of deaths 5.

7. TAHGAIWININI BAND. ONTARIO

The Indians of this band generally enjoy good health, with the exception of some cases of consumption. (p. 13)

Reserve population 197. Number of deaths 10.

8. INDIANS OF MANITOULIN ISLAND, UNCEDED. ONTARIO

The health of these Indians for the past year has been fairly good, no contagious disease, other than consumption has visited the reserve. (p. 16)

Reserve population 730. Number of deaths not given.

9. MISSISSAUGAS OF AINICK. ONTARIO

At the present time the health of the band is good, with two exceptions; there is a case of consumption, and a man has trouble in his head and is at the point of death. (p. 17)

Reserve population 230. Number of deaths 8.

10. OJIBBEWAS OF LAKE SUPERIOR, EASTERN DIVISION. ONTARIO

The general health of the band has been excellent during the year. No epidemic of any kind has broken out and no contagious or infectious disease has appeared, with the exception of two cases of consumption of long standing. (p. 22)

Reserve population 451. Number of deaths not given.

11. OJIBBEWAS OF LAKE SUPERIOR. WESTERN DIVISION. PORT ARTHUR. ONTARIO

Nipigon Band

The death rate has been very large and is attributed principally to consumption and grippe. (p. 27)

Reserve population 499. Deaths 26.

12. PROVINCE OF QUEBEC. OKA.

Lake of the Two Mountains Agency

There has been no epidemic of this reserve. The most serious disease is consumption; several are afflicted with this disease. (p. 50)

Reserve population 445. Deaths 9.

13. PROVINCE OF QUEBEC. MONTAGNAIS OF THE LOWER ST. LAWRENCE

Bersimis Agency:

The health of the Indians of this band has been fairly good throughout the year, one of the band died of consumption this spring, but consumption is not so prevalent among them as it is in other bands. (p. 54)

Reserve population 42. Deaths 1.

Bersimis Band:

The health of this band is not very good at any time. Many are consumptive and die young. (p. 54)

Reserve population 446. Number of deaths not recorded.

14. NEW BRUNSWICK. NORTH EASTERN DIVISION; RICHIBUCTO

Eel Ground Band:

The health of these Indians is good, except that there are a number of cases of consumption . . . the smallpox that broke out among the white people of an adjoining district did not spread to this reserve. (p. 61)

Reserve population 148. Deaths 7.

Big Cove Band:

There have been many cases of sickness during the year, chiefly consumption and lung troubles. (p. 62)

Reserve population 291. Deaths 8.

15. NEW BRUNSWICK. SOUTHWESTERN DIVISION

Kingsclear Band:

The health of the Indians for the past year has been remarkably good. A few deaths occurred, chiefly from consumption.

Reserve population 113. Number of deaths not given.

16. NOVA SCOTIA

The Micmacs of Cumberland County

Nearly all the deaths which occurred during the year were caused by tuberculosis in some form. (p. 71)

Reserve population 91. Deaths 7.

17. NOVA SCOTIA

The Micmacs of Digby County:

No disease of a contagious nature appeared among the Indians during the year, except consumption and grippe. Consumption was the cause of five deaths. (p. 71)

Reserve population 125. Total number of deaths not given.

18. NOVA SCOTIA

Micmacs of Inverness County:

As a rule the Indians of this agency enjoyed good health during the year. Consumption is the Indians' chief enemy. Because of poverty, and its common attendant, lack of cleanliness, proper precautions are not taken to prevent the disease germs of this scourge taking hold of new victims. Once it has invaded one of these cramped homes, it is next to impossible to check its progress. The one small room usually serves as kitchen, dining room and dormitory to the family and as hospital for the patient. (p. 74)

Reserve population 136. Deaths 5.

19. NOVA SCOTIA

The Micmacs of Pictou County:

There has been no illness of an epidemic character. Consumption is the great cause of sickness among the Indians. Through the literature distributed among them by the department, the Indians are becoming convinced of its infectious character, and are taking precautions to prevent its further reckless dissemination. (p. 75)

Reserve population 150. Deaths 6.

20. NOVA SCOTIA

The Micmacs of Richmond County:

The prevalence of the fatal disease of consumption is ever on the increase. The once robust and hardy constitutions of the Indians are becoming more and more degenerated, year after year, and in consequence more and more susceptible to contract this dreadful disease. (p. 77)

Reserve population 112. Deaths 12.

21. NOVA SCOTIA

Micmacs of Cape Breton County - Sydney Agency
North Sydney Band:

The health of the band has been fairly good. There is one case of consumption at present. (p. 78)

Reserve population 36. Deaths 2.

22. PROVINCE OF MANITOBA

Clandeboyne Agency:

This year has been marked by excellent health throughout the agency as last year was marked by ill-health. (p. 84)

Reserve population 488. Deaths 55.

23. MANITOBA SUPERINTENDENCY

Rainy River District, Ontario

There has been a great deal of sickness in this band, principally during the early spring. I had Dr. Moore visit this reserve, and he informed me that the deaths had occurred from various causes, principally scrofula and consumption. (p. 89)

Reserve population 46. Deaths 8.

24. PROVINCE OF MANITOBA. PORTAGE LA PRAIRIE AND MANITOWAPAH AGENCIES

Manitowapah Agency:

The health of the Indians generally has been better than usual . . . There were a few cases of measles that passed off without any fatal results, and over and above that there was nothing but coughs, colds, scrofula and consumption, which are to be found on all reserves every winter. (p. 98)

Reserve population 1357. Deaths 41.

25. MANITOBA SUPERINTENDENCY. RAT PORTAGE AGENCY, ONTARIO

Rat Portage Band:

The health of this band has been fairly good. There are a few cases of consumption, scrofula and sore eyes. (p. 101)

Reserve population 192. Deaths 5.

Lac Seul Band:

The health of these Indians has been good, they only having suffered from minor ailments. There have been a few cases of scrofula and consumption. (p. 106)

Reserve population 582. Deaths 11.

Eagle Lake Band:

The general health of this band has been good. There has been no epidemic among them. There are the usual cases of scrofula, sore eyes and consumption. (p. 108)

Reserve population 73. Deaths 2.

26. MANITOBA SUPERINTENDENCY. PORTAGE LA PRAIRIE

Manitowapah Agency:

This has been a healthy year for this agency . . . tubercular troubles are not so much in evidence as formerly. (p. 112)

Reserve population 1330. Deaths 46.

27. NORTHWEST TERRITORIES. ASSINIBOIA - ASSINIBOINE AGENCY

Rolling River Band, No. 67:

The health of the Indians during the year has been fairly good . . . There have been the usual cases of consumption and scrofula. (p. 143)

Reserve population 890. Deaths 39.

28. NORTHWEST TERRITORIES. ALBERTA

Blood Agency

The general health of the Indians has been good during the year, but scrofula and consumption carry off a large percentage year after year. (p. 149)

Reserve population 1185. Deaths 110.

29. NORTHWEST TERRITORIES. EASTERN ASSINIBOIA

Crooked Island Agency, near Broadview

Kakewistahaw Band, No. 72:

With the exception of a number who are afflicted with scrofula and consumption, their health has been very good. (p. 159)

Reserve population 109. Deaths 3.

Cowessess Band, No. 73:

The general health of these Indians has been good. Dr. Allingham, the assistant medical officer, has been very attentive to them, and all precautions were taken to prevent disease, but there were a number afflicted with scrofula and consumption that required treatment, and some of these cases were fatal. (p. 159)

Reserve population 167. Deaths 3.

30. NORTHWEST TERRITORIES. EDMONTON AGENCY

Enoch's Band, No. 135 (Crees):

The general health of the band, apart from some scrofula and consumptive cases, always to be expected, was good. (p. 164)

Reserve population 129. Deaths 4.

31. NORTHWEST TERRITORIES. SASKATCHEWAN - ONION LAKE AGENCY

Keeheewin's Band, No. 123:

The general health of the Indians has been good and there are but few, with the exception of the very old and the blind, who are not able to do work of some kind; but scrofula and consumption are more or less evident in the majority of families. (p. 174)

Reserve population 123. Deaths 6.

32. NORTHWEST TERRITORIES. SASKATCHEWAN - ONION LAKE AGENCY

Chipewyan Band, No. 124:

These Indians have not been troubled with any epidemic during the past 12 months, several of them are afflicted with consumption. (p. 176)

Reserve population 256. Deaths 11.

33. NORTHWEST TERRITORIES, ALBERTA

Piegan Agency, Macleod:

The general health of the Piegan Indians has been somewhat better during the year than it was last year, though some twenty-five deaths have been reported since the annuity payment in November. That scourge of the Indian race, consumption, in its various forms, notably that of scrofula is responsible for much of the heavy death rate. (p. 177)

Reserve population 519. Deaths 25.

Cote's Band, No. 64:

I learn that the health of the Indians in this agency has been good during the year, there having been no epidemic. There are the usual cases of the Indian's bane, scrofula and consumption, to be found amongst them. Tuberculosis appears to have carried off most of the children. (p. 179)

Reserve population 255. Deaths 16.

34. NORTHWEST TERRITORIES: ALBERTA

Stoney Agency:

The health of these Indians has been very good, there having been no epidemics during the year. A few have died during the year of consumption, which is always amongst them. (p. 191)

Reserve population 647. Deaths not given.

35. NORTHWEST TERRITORIES. ASSINIBOIA

Touchwood Agency:

The general health of all seven bands has been good, consumption being the cause of what sickness we had, with a few cases of scrofula. (p. 192)

Reserve population 841. Deaths 28.

36. NORTHWEST TERRITORIES. QU'APPELLE INSPECTORATE

Ochapowace Band, No. 71:

The general health of these Indians has been satisfactory, though there is the usual percentage of cases of consumption and scrofula. (p. 230)

Reserve population 111. No death statistics given.

Sakimay's Band, No. 74: (Mostly Saulteaux. A few Cree)

The health of the Indians of this band has been as usual; there is more scrofula and consumption amongst them than amongst the other Indians of this agency; they had chickenpox and measles last winter. (p. 233)

37. MANITOBA AND THE NORTHWEST TERRITORIES

From the office of the Indian Commissioner, Winnipeg.

It must be admitted that several diseases, chiefly consumption, of which scrofula is one of the main causes, are prevalent among our Indians at Norway House. (p. 238)

38. BRITISH COLUMBIA. COWICHAN AGENCY

Bands in Cowichan District

The health of these Indians has been fair, there have been no contagious diseases or epidemics among them during the year, the chief maladies being scrofula, consumption and rheumatism. (p. 256)

Reserve population 682. Deaths 14.

39. BRITISH COLUMBIA. KOOTENAY AGENCY

Tobacco Plains Band:

There was not much sickness amongst them during the year, and the deaths that occurred were from old age and consumption. (p. 289)

Reserve population 62. Deaths 4.

Lower Kootenay Band:

The health of these Indians has been fairly good; the deaths that occurred were from old age and consumption. (p. 289)

Reserve population 168. Deaths 7.

40. BRITISH COLUMBIA. KWAWKEWLTH AGENCY

The health of these Indians during the past year has only been fairly good; there has been no epidemic among them of any kind; still there has been considerable sickness among them and quite a number of deaths. The most prevalent and difficult disease we have to contend with is consumption. (p. 291)

Reserve population 1345. No death statistics given.

41. BRITISH COLUMBIA. WEST COAST AGENCY:

The health of the Indians in this agency has been good during the past year, there having been no serious illness amongst them, except that consumption, as in the past has claimed a number of them as its victims, and even this, I can say, is on the decrease, owing to a better understanding of the laws of health generally.

Reserve population 2387. Death statistics not given.

It is important when reading these forty-one reports for 1903 to look at the numerical strength of reserve populations and the total number of deaths. The picture which then emerges is less dramatic than the texts indicate.

Among these reports on Indian Health for 1903 are isolated cases of smallpox in Ontario and Quebec, among the Micmacs in Nova Scotia, in New

Brunswick and the Northwest Territories. There were a few cases at Squamish in British Columbia. There was also some smallpox in the Blackfoot Agency, in Alberta, where 600 members fell victim to smallpox in the epidemic of 1870. In 1903, older members of the band would not believe that what they were then seeing was smallpox, the disease having modified considerably.

Once the Indians were settled on the Reserves they were enumerated, which was long before censuses were kept of other groups in society at large, and they were brought into contact with and under the control of the White Man's medicine. No matter how well-intentioned it may have been, it was an administrative intrusion into people's lives as a result of conquest and the establishment of the Reserve system.

There was an organized attempt to determine which diseases the Indians suffered from, and, what was found was tuberculosis, at a time when tuberculosis was the number one public health problem in Canada and the fifth leading cause of death. Tuberculosis was actively being sought, and it was tuberculosis which was being found, just as cancer is being sought in the ethnographic present, and it is cancer which is being found. It was Koch's development of Tuberculin (1890) which made such screening possible, and the fact that medical examinations for Indians were often held at the same time as the payment of Treaty Money, a not unobvious form of coercion, ensured maximum participation.

The Indians are an introverted, solemn looking people, but like all other human beings, they are intensely curious about what is happening around them. They look and look and see no reason to disguise their curiosity. They rarely talk, except among themselves, and they rarely approach people whom they do not know or trust. Their solemnity is often mistaken for unhappiness.

Where reserves were very near white settlements, the Indians were highly visible, and people still alive, who remember those early days, say that the Indians used to "hang around" the white communities, looking so dirty, poor and depressed that people used to feel sorry for them. The reserves were seen as slums in rural areas.

So thus we see the development of the entire stereotype of the Indian - dirty, poor, depressed, and riddled with tuberculosis. General statements were that the incidence of tuberculosis was approximately ten times higher among the Indians than it was among the whites, and that the death rate was correspondingly high. These statements will be looked at in some depth later in this paper.

There is plenty of evidence to suggest that the concern of the white people for the Indians with tuberculosis was tinged with the fear that the Indians posed a threat to the health of the whites. The concern for the Indians served to mask the fact that they were still perceived as inferior.

THE COMPLEXITIES OF TUBERCULOSIS

It has been definitively stated that the incidence of positive tuberculin reactors was ten times as high among North American Indians than it was among the whites. One might suggest that the samples were biased inasmuch as reserve populations were captive populations and demographic isolates, whereas white people selected for tuberculin testing were random samples from the population at large. Testing was by no means universal among the whites, except in selected groups such as student nurses who were considered to be at high risk. No one particularly wanted to be discovered to have tuberculosis, a disease to which a social stigma was attached. Had tuberculin testing been compulsory for all, the Indian-White ratio might have been found to have been very different.

Interpretation of tuberculin tests is a matter for great care. A positive tuberculin reaction does not indicate that a person has ever had active disease, currently has active disease, or, if he has, the extent of such disease. All it indicates is that at some time he has encountered infection and his system remembers the experience when challenged. Further investigations are needed before the significance of a positive tuberculin reaction can be evaluated. However, positive tuberculin reactors may develop active disease if exogenous and endogenous circumstances change and they are subjected to environmental, physiological and/or psychological stress.

A negative tuberculin reaction does not always mean absence of infection. People may lose their reactivity to tuberculin temporarily while suffering from other diseases, and in advanced tuberculosis patients are often tuberculin negative because they are so saturated with their own tuberculin that they fail to react to a small external dose.

Furthermore, a recent epidemiological bulletin in the Medical Services Journal, Canada, and referring to Canada said:

It has been found in recent years that organisms resembling tubercle bacilli are widespread in nature and can infect humans. They sometimes cause disease difficult to distinguish from tuberculosis and are usually resistant to all antibiotics. Also, they may produce a sensitivity which crosses, to a very great extent, with that induced by tubercle bacilli, thus complicating the interpretation of tuberculin tests. (1967, 23:1538-1539)

Some day it may be possible to distinguish between an immunological reaction and active disease. That is, of course, apart from provoked reactions from measured doses of tuberculin.

Burnett (1962:260) says: "In tuberculosis, the majority of individuals manage, normally, to acquire immunity by natural reaction without symptoms. (Tuberculin positive reactors)."

It might seem appropriate to ask, "When is tuberculosis tuberculosis?" The question is relevant because a disease is at any time exactly what society defines it as; and when examining the reported incidence of

tuberculosis, particularly among the North American Indians, one finds lack of consistency in the reporting. Some people are talking about active cases, suspected cases, arrested cases, inactive cases, and probable cases, as well as Roentgenogram evidence of healed lesions, but are not including tuberculin positive reactors. Some are including positive reactors. Some are not specifying exactly what they do mean. Therefore, quoted statistics are confusing.

Prior to the early 1950's, the picture of pulmonary tuberculosis as presented by patients in sanatoria was one of gross emaciation, constant coughing accompanied by the copious production of sputum, consuming fever, night sweats, lowered haemoglobin and red blood cell levels, raised blood sedimentation rates, increased leucocyte counts, clubbing of the fingers, sometimes the development of claw-like fingernails, and X-ray evidence of calcification, caseation and cavitation in lung tissue. Death often came as the result of massive haemorrhages when pulmonary blood vessels were eroded, or very quietly and unexpectedly and commonly, in the night.

The tuberculin positive reactor usually had (and still has) no clinical symptoms of disease apart from a localised reaction to a small dose of tuberculin injected intradermally into the forearm, and according to Ferguson (1955:70), in areas where the infection rate was low, only one in forty to one in fifty of these acquired resistant hosts could be expected to develop active lesions. However, "Whenever a tuberculin reaction is positive, there exists, somewhere, a follicular lesion whose presence can be disclosed by experimental inoculation into the guinea pig." (Calmetts 1923:322) (Author's Note: The human type tubercle bacillus is lethal to the guinea pig.)

In such lesions or glands, no matter how calcified, the tubercle bacilli can remain alive for as long as eighty years or more, as is currently being demonstrated by the number of older people, particularly white males, who are developing active disease from an infection acquired in youth, contained throughout a lifetime, but finally gaining the upper hand as the host ages and is subjected to endogenous and environmental stress. In addition to the normal aging processes, sociocultural factors such as societal rejection of the aged, lower income levels, nutritional deficiencies because of poverty, inactivity and psychological trauma are all part of the cause.

A HALT TO THE DECLINE IN INDIAN POPULATION

Evidence that the depopulation of the Canadian Indian Tribes, which began with the smallpox epidemics of the early 1600's, was halted by the early 1900's, though tuberculosis was still a major health problem, is contained in the following excerpts from Sessional Papers 27-30 dated 1919. In spite of all which has been said to the contrary, tuberculosis was never a disease which "decimated" the Indians, though it caused many deaths in certain areas, at certain points in time. The Blackfoot, for example, were hit by three epidemics between 1880 and 1910.

In 1918, it is reported in the Sessional Papers, concerning the topic of population changes:

Population

Heretofore a census of the Indian population has been taken annually, but as the figures show very little change from year to year, it has been decided that henceforward a quinquennial census will suffice. The following table shows the Indian population according to the census of last year. Reference to the census taken in previous years shows that the Indian population is slowly but steadily increasing.

As was suggested earlier in this paper, the fact that there is so little reference to tuberculosis among North American Indians prior to 1850 may have been because all attention was focused upon the ravages of the more dramatic smallpox epidemics. The manner in which the incidence of one disease can be completely obscured by the incidence of another is clearly demonstrated in the Report of the Department of Indian Affairs for 1920, which is quoted below. In the particular year under review (1919), although tuberculosis was still present among Indians on reserves throughout Canada, the disease is hardly mentioned because of the impact of the post war influenza epidemics.

Incorporated in the Annual Report of the Department of Indian Affairs for the year ended March 31, 1919, which is part of the Sessional Papers of 1920, it is stated that population figures for the year 1917 are still being quoted as no subsequent census has yet been taken. There is a different format for this report, and a great deal of attention is given to the record of Indians in the Great War. As far as Indian health is concerned, the Deputy Inspector General of Indian Affairs, Duncan Scott, summarizes the various agents' reports, province by province. The reports are quoted below in their entirety for they summarize economically the reports on health conditions and show, in fact, that mention of one disease can be completely occluded by the dramatic impact of another, which means of course, that in statistical terms, these reports are biased.

Ontario

Health and Sanitation. The Indians of Ontario in common with other sections of the population suffered very severely from the epidemic of influenza and the mortality among them as a result of this was high.

Quebec

Health. Although influenza was prevalent among the Indians of Quebec, the epidemic was not nearly so widespread as in the other provinces, and the mortality from this cause was much lower. In other respects, the health of the Indians of Quebec has been normal during the past year.

New Brunswick

Health and Sanitation. The Indians of New Brunswick, in common with other sections of the community, suffered heavily from the epidemic of influenza. Otherwise their health has been good during the past year.

Nova Scotia

Health and Sanitation. The Indians of Nova Scotia in common with those in other parts of the Dominion suffered severely during the past year from the epidemic of influenza. They also underwent an epidemic of smallpox. The percentage of deaths as a result of the epidemic of influenza among the Indians in the province, however, was not as high as in the case of the white population.

Prince Edward Island

Health. The health of the Indians has been fairly good. The epidemic of influenza which was so disastrous in other places, did not cause such ravages in this province; only three deaths being directly due thereto.

Manitoba

Health and Sanitation. The Indians in Manitoba in common with other sections of the populations suffered very severely from the epidemic of influenza, and the mortality among them as a result of this cause was high.

Saskatchewan

Health and Sanitation. There was a very heavy mortality among the Indians of Saskatchewan as a result of the epidemic of influenza, which was prevalent on practically all the reserves in the province. Very few of the Indians escaped this malady and many of them have been left in a very delicate state of health as a result thereof. In some localities it was accompanied by a form of bronchial pneumonia of a virulent nature. Unfortunately, it was impossible to secure adequate medical attention for the Indians living in the more outlying parts. Apart from the ravages of influenza, the general health of the reserves in Saskatchewan has been steadily improving from year to year.

Alberta

Health and Sanitation. The Indians of Alberta in common with other sections of the population suffered severely from the epidemic of influenza. Unfortunately, it was impossible to secure adequate medical attention for the Indians living in the more outlying parts. During the summer of 1918 an epidemic of smallpox broke out among the Indians of Hobbema agency, but the disease was effectively checked by quarantine and vaccination, and only two

deaths resulted from it. There has been an improvement in the number of cases of scrofula among these Indians, and sanitary precautions are being practised more carefully by them.

North West Territories

Health and Sanitation. Tuberculosis and scrofula are the diseases most prevalent among the Indians of the Far North. Those who live in tents throughout the year are generally in better health than those who spend the winter in houses.

Yukon Territories

Health and Sanitation. The general health of all the bands may be said to have been good during the past year. The territory is, up to the present date, free from the Spanish Influenza.

British Columbia

Health and Sanitation. The most serious setback to the health of the Indians of British Columbia during the year was the epidemic of Spanish Influenza which was particularly severe in the Kamloops and Lytton bands, the former having a death roll of 194 up to the first week in December, 1918, and the latter of over 100 in the months of October and November. The disease was particularly hard on the aged and those with weak lungs. Several chiefs were among the victims.

THE QUESTION OF INDIAN SUSCEPTIBILITY TO TUBERCULOSIS

It has commonly been claimed that the North American Indian was more susceptible to tuberculosis than was the white man and that this greater susceptibility was biologically based.

An early attempt to determine which diseases were prevalent among the North American Indians was that made by Alex Hrdlicka, Assistant Curator in charge of the Division of Physical Anthropology, United States National Museum, and published by the Smithsonian Institution in 1908 as Bulletin 34, Bureau of American Ethnology, under the title Physiological and Medical Observations Among the Indians of Southwestern United States and Northern Mexico. Tuberculosis was among the diseases included. Hrdlicka's sources of information were:

1. direct observation and inquiry,
2. an official circular requesting information on important pathological conditions from all the physicians of the United States Indian Service,
3. physicians resident on the reservations,
4. U. S. Census reports.

Difficulties encountered were:

1. hostility from Indian medicine men,
2. distrust of the white man,
3. shyness among the Indians,
4. the scattered condition of the people,
5. the limited time for observation,
6. language barriers.

Hrdlicka said that reports returned to him from 102 localities varied in accuracy, chiefly because data from remote areas of reservations were defective. He regarded 91 reports from the 102 localities as acceptable. These reports were applicable to an Indian population of 107,000 persons. The findings listed 2,836 cases of tuberculosis of which there were:

- 1,038 cases of pulmonary disease
- 208 cases of disease of bones and joints
- 1,590 cases of glandular disease.

The proportion of the various forms of tuberculosis to the population was as follows:

Cases per Thousand

Pulmonary tuberculosis	9.7
Tuberculosis of bones and joints	1.95
Glandular (scrofula)	15.00

According to Hrdlicka (1908:186), among the Indians of the U. S. Southwest and Northern Mexico, tuberculosis was most prevalent among the Apache in Arizona and New Mexico. Figures for the San Carlos Reservation (1901-1903) were:

Population	3,000
Deaths from tuberculosis (all forms)	32.5%

Among the Mescaleros for the five-year period 1898 to 1903, there were, among 450 school children, 42 deaths from tuberculosis.

Among the Pima, tuberculosis in its different forms, including scrofula, is quite frequent. According to an estimate made by the writer while with the tribe in 1905, there are about three persons, mostly young with developed pulmonary tuberculosis, to each 1,000 persons in the tribe. Deaths due to tubercular diseases of all classes are, according to Dr. A.E. Marden, the resident physician, more numerous than those from all other causes combined. According to statistics submitted by this physician to the Commissioner of Indian Affairs, the sanitary condition in the Pima Boarding School from 1898 to 1903 was as follows:

1900-1901	Pupils, average, 240
	Deaths from tuberculosis, 2

1901-1902 Pupils, average 275 to 325
Deaths from tuberculosis, 3.
 (Hrdlicka 1908:182)

Among the Opata, Hrdlicka reported "that pulmonary tuberculosis occurs but is not prevalent. It seems to attack the half-breeds oftener than full bloods."

Among other groups, his findings were:

The Yaqui. "Tuberculosis is infrequent."

The Tarahumare. "There was not a single suggestion of tuberculosis."

The Huichol. "Tuberculosis occurs but is rare."

The Cora. "Pulmonary tuberculosis occurs but is rare."

What is being said here is that there is an intra-racial variation of occurrence, and that this variation can occur in a limited geographical area.

Hrdlicka said that whilst there was extensive information concerning the death rate from tuberculosis among North American Indians, this information provided no accurate clue to the extent of the disease among the living.

In all probability the proportion of the several main varieties of tuberculosis is not much larger, if any, among the Indians as a whole than it is among the poorer classes of white people, particularly those of industrial centres as a whole. There are, however, great differences among the tribes. In some the disease is decidedly rare, while in other tribes its proportions are appalling. Among the large tribes the greatest sufferers are the Sioux, the least, the Navaho. The geographical distribution of the disease is somewhat irregular; nevertheless, the most involved are the northwestern and northern regions, west of the lakes - hence the humid and cold parts of the country, with the consequence of much indoor life, and the greater chance of exposure and infection
.

The conclusion seems fully justified that the northern regions, including especially parts of Wisconsin, the Dakotas, and Montana are at present, whatever the direct causes may be, the most unfavourable to the health of the Indians. (Hrdlicka, 1908:111-121)

Hrdlicka's remarks concerning the Sioux are particularly relevant to the incidence of tuberculosis among the Indians of the Canadian Plains, as is his suggestion that restraints imposed by the environment result in socio-cultural practices which, in turn, lead to a high incidence of infectious disease. But he ignores the conditions of poverty, etc., and how these are created.

In a subsequent publication entitled Tuberculosis Among Certain Indian Tribes of the United States and published as Bulletin 42, Bureau of American Ethnology, 1909, Hrdlicka examined more particularly the subject of tuberculosis among the Indians.

Although subscribing to the generally held view that the Indian was more susceptible to the disease than were the whites, he said that the symptoms manifested by tuberculous Indians were much the same, and bacteriological examinations did not indicate the existence of any peculiar racial features.

Concerning the aetiology of the disease, he listed:

1. The facility of the infection, particularly during the rainy season
2. A hereditary taint among the young
3. A lesser racial immunity
4. The presence of tuberculous glands as a favourable condition for the development of the pulmonary form of the disease
5. Exposure to heat and cold . . . liable to bring on abnormal conditions of the respiratory tract
6. The uncertain influences of diseases other than those of the respiratory tract
7. Dissipation and indolence
8. Want and consequent debilitation . . . helpless poverty . . .
9. Infected cattle
10. A radical change of environment when Indian children were placed in non-reservation schools
11. The mental attitude of the Indian (i.e., hopelessness once he knows he is infected)
12. Moral considerations.

The mixed breeds resulting from regular marriages between Indians and Whites appear to be freer of infection than either the full bloods, or the mixed breeds due to clandestine unions.

13. The possible effect of close intermarriage.

Socio-cultural factors, poor living conditions and ignorance, were heavily emphasized in the report, but these, in effect, were largely class judgements which tended to blame the victims for their plight. Among the things considered predisposing to infection were poor nutrition, over-

crowding, poor sanitation, dirty personal habits and the cultural practice of eating from unclean vessels and passing such vessels from mouth to mouth, as well as the habit of sharing tobacco pipes (particularly among the Sioux) and wind musical instruments.

Infection through these last named sources is amply proven by the finding of numerous tubercle bacilli in most of the mouthpieces of the musical instruments examined on the expedition. (Hrdlicka, 1909:29)

Regarding the question of a greater susceptibility to tuberculosis among Indians, Hrdlicka (1909:31) said:

Doubtless much of what now appears to be greater racial susceptibility is a result of other conditions, particularly greater opportunities for infection and malnutrition.

On the same subject, Emil Bogen said:

Well reasoned material concludes that environment and education rather than genetic factors are responsible for apparent differences in racial susceptibilities.

If these findings can be generally confirmed, efforts against the environmental factors in the spread of tuberculosis may continue without fear of the hypothetical biological phenomena of racial and inherited susceptibility to the disease which have been conjured up to condemn such activities and justify neglect. (Bogen, 1932)

RACISM AND TUBERCULOSIS: SOCIAL BARRIERS TO UNDERSTANDING

Much valuable information regarding tuberculosis among Canadian Indians is provided by R. G. Ferguson, who was for many years Medical Superintendent of the tuberculosis Sanatorium at Fort Qu'Appelle, Saskatchewan, and Director of Medical Services, Saskatchewan Anti-tuberculosis League. His publications on the subject of tuberculosis were extensive. They reflect the status of the knowledge of the disease at that particular point in time, the ongoing search for solutions, as well as attitudes and prejudices associated with the problem. The language of his 1938 study entitled Tuberculosis Among the Indians of the Great Canadian Plains is dated, bigoted, and, in some instances, almost naive.

Ferguson speaks of the Indians as if they were sub-human types, saying for example, "... like all other carnivora". His judgments were superficial and generally unfair. Although basically hunters and gatherers, the Plains Indians had been on the Prairies for at least eleven thousand years and had at some time been influenced by the Woodland culture. Archaeological evidence shows that they had learned to make pottery, had developed some semi-permanent village sites, and had engaged in a small amount of agriculture. There was no need to develop these things further so long as

game was abundant in the environment. The buffalo provided them with food, shelter, and clothing. Their ceremonial robes were beautiful. Hunting was the Plains Indians preferred way of life.

Ferguson's study is marred by facetiousness. He accuses the White man of depriving the Indian children of "sun-food" by clothing them (as if anyone, Indian or other, could go unclothed in Canada for the major portion of the year), and uses a flippant subtitle, "Before the White Man With the Short Hair Came". Nevertheless, the study is important because it brings some things into perspective and attempts to find explanations for events. Some of his arguments are not valid today; and certainly his description of what he considered the standard Indian physical type is no longer acceptable.

The study concerns some of the Cree, Assiniboine, and Blackfoot Indians, who were in and around the Fort Qu'Appelle region of Saskatchewan. Ferguson (1938:3) quotes A. H. Keane as describing these Indians as 'being in a state of savagery', and says that in such state they remained until the extermination of the buffalo on the Canadian Plains in 1879. It appears that as late as 1938 the White Man's attitude towards the Indians of Canada had altered very little from that expressed by the Jesuit priests some three hundred years earlier.

Considering possible sources of infection, Ferguson (1938:5) says there were only occasional contacts between traders and Indians from 1738 to 1860, and that this was largely because it was impossible to fortify trading posts. By 1840, things were beginning to change, and missions were being established on the watercourses surrounding the Plains, but the missionaries had very little contact with the Indians until 1960, at which time there was a considerable increase in the number of missions and Indian-White contact increased accordingly.

In addition to this, many Sioux, already tuberculised, fled to Canada and into the Plains region following the massacre of whites in Minnesota by the Sioux Indians in the 1860's. (Ferguson 1938:5)

Support for the statement that the Sioux Indians brought tuberculosis to the Canadian Plains is provided by Hrdlicka's studies of the Dakota Sioux among whom he found the following incidence of the disease. Most of the tuberculosis among the Sioux, however, was scrofula. Other tribes crossing and recrossing the U. S. Canadian border are included in the following abridged tables from Hrdlicka's Tuberculosis Among Certain Indian Tribes of the United States (1909, pp. 4-5).

As a third source of infection, Ferguson (1938:5) indicts the Métis, saying: "About the same time the half-breeds on the Red River, who were at that time highly tuberculised, were given access to the Plains. They spread out among the Indians, carried on as free traders, and constituted a serious source of infection."

TABLE 1: Morbidity rates from tuberculosis among Sioux Indians and other tribes who were crossing and recrossing the Canadian/U.S. border. (Hrdlicka 1909:4-5)

DESIGNATION	AGENCY WITH LOCATION	CASES PER 1000 POPULATION		
		PULM.	BONES	GLANDULAR
Sioux Oglala	Pine Ridge Agency S. D.	30.8	16.8	57.7
Sioux	Lower Brule Agency S.D.	20.8	4.2	42.5
Sioux (mixed)	Yankton Agency S.D.	21.7	2.3	5.8
Crow	Crow Agency Montana	13.1	0.5	18.6
Sioux	Devil's Lake Agency S.D.	7.9	1.9	42.4
Piegán	Blackfeet Agency Montana	4.8	2.9	8.3
Sioux	Standing Rock Agency S.D.	4.5	2.0	22.7
Assiniboine & Grosventres	Fort Belknap Agency, Montana	2.4	3.2	8.3

TABLE 2: Mortality rates from tuberculosis among the Sioux and other Indian tribes who were crossing the Canadian/U. S. border. (Hrdlicka 1909:4-5)

TRIBE	AGENCY	1907	DEATHS	
		CENSUS	TBC	PER 1000
Chippewa	Red Lake Minnesota	1,324	31	23.4
Grosventres	Fort Belknap Mont.	553	9	16.3
Sioux	Standing Rock N. D.	3,393	50	14.7
Sioux	Rosebud S. D.	5,011	70	14.0
Oglala Sioux	Pine Ridge S. D.	4,099	51	12.4
Assiniboine	Fort Peck, Montana	561	6	10.7
Yankonai Sioux	Fort Peck, Montana	1,145	11	9.6
Yanktonai Sioux	Yankton, S. D.	1,716	13	7.6
Mandan	Fort Berthold, N. D.	263	2	7.6
Lower Yanktonai				
Sioux	Crow Creek, S. D.	1,028	7	6.6
Winnebago	Winnebago, Nebraska	1,065	7	6.6
Grosventres	Fort Berthold, N. D.	468	3	6.4
Sioux	Fort Totten, N. D.	986	6	6.1

Regarding the influence of the Whites,

In 1878 and 1879, the white settlers began to come in, and by 1882 the Indian Reserves were surrounded by white settlers. Then came

the education of the Indian children. In 1884 boarding schools were established for the education of these Indians, and large numbers of them were concentrated in these schools. Those who were not infected on admission to school were tuberculised very soon afterwards.

Ferguson cites the following as additional causes of tuberculosis among the Plains Indians:

The moral and physical weakening of the Indian has to do with the introduction of the horse, the introduction of firearms, the introduction of liquor, the exchange of their fur tunics for the blanket, the exchange of the clothes necessary for warmth for alcohol, the extermination of the buffalo and the beaver, the concentration upon reserves, the change of housing, the change of food, the exclusion of sunfood by the clothing of children; the compulsory concentration of children in the schools, the change of occupation from hunting and warring to agricultural pursuits, and, on the mental side, the physical depression of conquest by the whites, dependence on Government rations for food, visible ravages of white man's diseases, desertion by, or incompetence of, their Michi-Manitou and triumph of Kitchi-Manitou, and failure of even the white man's religion to protect them. (Ferguson 1938:30-31)

Ackerknecht, discussing sociological aspects of the incidence of disease, remarks that the tuberculosis organism reacts sensitively to changes in social conditions, and it is such changes that Ferguson is highlighting in his study.

Ferguson's studies in tuberculosis among the Plains Indians were largely retrospective studies of the disease among the Indians in the Qu'Appelle Valley area from the time Treaty money was first paid, in 1874, up to 1926. The time period covered was therefore fifty years, and Ferguson (1955:6) says the Indians' health record was predominantly the history of an "acute epidemic of tuberculosis".

Vital statistics records for these Reserves show that the tuberculosis death rate rose from approximately 1,000 per 100,000 in 1881 to 9,000 per 100,000 in 1886, an increase of approximately 8,000 per 100,000 in the same five years. (Ferguson 1955:6)

It could be argued here that one possible explanation for the rise of incidence in these five years is that Koch had identified the tubercle bacillus in 1882 and that the diagnosis of tuberculosis had become more efficient.

Between 1886 and 1895 there was a reduction in the death rate from tuberculosis from 90 to 1,000 to 30 per 1,000 . . . from 1896 to 1901 there was a further drop from 30 per 1,000 to 20 per 1,000.

It is unnecessarily confusing in Ferguson's report that in quoting statistics he changes from a baseline of cases per 100,000 to cases per

thousand. He offers no explanation of the dramatic drop in mortality rates from tuberculosis among Plains Indians in the fifteen years between 1886 and 1901. As the Indians in question were still living on the reserves and the reserve conditions had not significantly changed, and as, moreover, this time period is before any organized attempt to eradicate tuberculosis in Canada which did not begin until 1901, some explanation of the drop in mortality rates might seem to be required. In the absence of such an explanation, theories of the cyclical rise and fall of tuberculosis as an epidemic disease should be considered.

Discussing the effect of inter-breeding between Indians and Whites in relation to tuberculosis, Ferguson (1938:4) claims:

In conclusion it might be said that from evidence available regarding the Plains Indians it would appear that the introduction of white blood is not only a potent factor in civilizing primitive people, altering habits of living, appetites and desires, but also has a noticeable effect on increasing their resistance to tuberculosis.

It is presumed that Ferguson had no intention of suggesting that blood carries social traits, but there seems to have been some inability to distinguish biological from social processes.

Ferguson's opinion was not shared by Williamson, Hrdlicka (1908), or Burns (1932); all of them, however, had the same problem as Ferguson - that is, an inability to sort out what was biological and what was socio-cultural in origin.

Ferguson's cited death rate of 147 per 100,000 at peak is in keeping with Dominion Bureau of Statistics figures, not for Indians, however, but for the whole of Canada's population. This would not seem to support contentions that the Indian death rate from tuberculosis was ten times as high among Indians as it was among whites.

Statistics, however, are at best, only as good as the systems of reporting and at the end of the nineteenth and the beginning of the twentieth centuries such systems were neither uniform nor particularly good. Ferguson (1955:77) points out that prior to the establishment of the Provinces of Alberta, Manitoba, and Saskatchewan (1905) vital statistics concerning Whites and Métis were reported to the Council of the Northwest Territories. Vital statistics regarding Indians, however, were not kept by the Council though observations were made and were reported to the Indian Department. Indian deaths were not reported to the Vital Statistics Division of the Government of Saskatchewan until 1924. One of the reasons for this separation of records was that Indians were wards of the Federal Government and deaths on the reserves were noted and reported to the Department of Indian Affairs. Scrutiny of the Sessional Reports of the Government of Canada, for the years up to and including 1927, has not revealed an unduly alarming state of affairs, all things considered, but this opinion does not downgrade the seriousness of tuberculosis as the number one public health problem of the day.

Ferguson (1955:77) says that a study of the tuberculosis death rate in the Northwest Territories prior to 1905 showed a rate in 1901 of 300 tuberculosis deaths per 100,000 for females and 200 per 100,000 for males, and that these deaths could all be regarded as occurring among the Métis and White population.

These figures are unreliable, given the remoteness of the areas, the paucity of medical services, and the particular point in time.

According to Ferguson, Dr. T. D. Kendrick of the Department of Public Health, Saskatchewan, searched the death certificates for Saskatchewan for the period 1905 to 1932 and discovered only nine registered Indian deaths from tuberculosis, five in 1922 and four in 1923. From this it was concluded that, apart from these nine, all registered tuberculosis deaths in Saskatchewan from 1905 to 1924 may be regarded as non-Indian rates.

When arrangements were made by the Department of Indian Affairs for reporting Indian deaths from tuberculosis to the Saskatchewan Government, forty Indian deaths from tuberculosis were recorded in Saskatchewan in 1925 increasing steadily to 84 in 1927, as reporting improved. (Ferguson 1955:78)

So there we have it. The number of deaths among Indians in Saskatchewan had increased, not necessarily because the incidence of tuberculosis had increased, but because the method of reporting had improved. This means all records prior to 1925 are suspect.

For any figures to be meaningful they would have to be rendered as so many tuberculosis deaths per 100,000 Indian population so that they could be compared with statistics for non-Indians, or, alternatively, related to the total Indian population in Saskatchewan at that time.

In this study of the Qu'Appelle Valley Indians, the types of cases cited by Ferguson are as follows:

Among 392 school children 38 cases were discovered with demonstrable tuberculosis lesions considered unhealed or active.

25 had pulmonary tuberculosis only
1 had active pulmonary and glandular tuberculosis
2 had active pulmonary with inactive glandular (disease)
8 had active glands only
2 had active glands with no pulmonary evidence.
(Ferguson 1938:24-27)

A study of 171 family trees among the Plains Indians of the Qu'Appelle Valley, made by Ferguson, revealed the following situation:

24 were lost by out migration
57 died out on both male and female sides.
30 disappeared because the male side died out.

(There is no mention of the females. They apparently were "not important".)

Of the 87 families eliminated by disease:

12 were from non-tubercular causes
6 died out solely because of tuberculosis
69 died out . . . tuberculosis being a factor.
(Ferguson 1938:16)

Sixty family trees out of 147, that is 171 families minus the 24 lost by out migration, survived three generations. The medical evidence presented here indicts tuberculosis as a biological agent of elimination. However, without control groups for comparison the figures do not mean very much. It would have been particularly interesting to know what factors other than tuberculosis were operative in the elimination of the '69' families which died out.

Ninety-six per cent of the Qu'Appelle Valley Indians were eventually found to be tuberculin positive reactors and were considered to be 'diseased'. Testing for reactions was by means of 1/400 old tuberculin (Koch's original), as standardized by the Health of Animals Branch, Department of Agriculture, Ottawa. There are no details of how much induration was caused, or how much was regarded as significant. As has already been pointed out, the interpretation of tuberculin tests is a matter for extreme caution.

Today (1970) the basis for a diagnosis of tuberculosis is:

- (1) positive tuberculin reaction of more than 10 mm induration to 5 tuberculin units (Purified Protein Derivative)
- (2) abnormal chest Roentgenogram consistent with the diagnosis
- (3) bacterial studies of gastric and other body fluids or tissues
- (4) active disease produced in a guinea pig by inoculation with human sputa.

One other finding by Ferguson (1955:0) was:

Although the proportion of susceptible strains is high in primitive races, there is nevertheless among them a small proportion of highly refractory hosts (as seen in the family studies), suggesting that a small minority may have resistance equal to that of races long exposed and that there is no fundamental difference in the resisting mechanism.

With ninety-six per cent of his population tuberculin positive and considered diseased, the proportion 'resistant' could only have been four per cent. In any case, although innate immunity may be the heritage of an individual, a race, or a species, or other factors such as diet, differences in metabolism or temperature or adaptive features of infective organisms may

be involved.

According to Ferguson, there was an absence of other infectious diseases among the Plains Indians during the acute epidemic of tuberculosis, and that this status pertained for the first decade. Later, outbreaks of other diseases occurred, and these were as follows:

1887 Pertussis (whooping cough) was extensive but caused no deaths. The outbreaks actually coincided with a fall in the general death rate.

1890 Influenza and measles epidemic.
General death rate rose from 60 to 137 per 1,000.
Tuberculosis death rate rose from 40 to 80 per 1,000.

1896 Pertussis epidemic. No noticeable effect on either the general or tuberculosis death rates.

1898 Measles epidemic.
Rise in general death rate from 60 to 80 per 1,000.
Rise in tuberculosis death rate from 30 to 40 per 1,000.

1910 Measles again epidemic.
Caused a rise of 15% in the general death rate.
Tuberculosis death rate rose by 10%

1914 Smallpox epidemic. Caused no deaths.
Coincided with a rise from 30 to 40 per 1,000 in the general death rate.
The tuberculosis death rate was not disturbed.

1918-

1919 Influenza epidemics.
Rise of 30 to 50 per 1,000 in the general death rate.
Tuberculosis death rate not disturbed.

From these figures, Ferguson concluded that the influenza and measles epidemics of 1890 and the measles epidemics of 1898 and 1910 lowered the resistance of the Plains Indians to tuberculosis. (Ferguson 1938:31-33)

THE PROBLEM OF SUSCEPTIBILITY TO TUBERCULOSIS

It is now known that viral infections can depress the immune response to the tubercle bacillus. Hypersensitivity to tuberculin may also be inhibited temporarily by such factors as B.C.G. vaccination, steroid therapy, anergy, or extreme debility (Todd Sanford, Israel Davidson, and John Bernard Henry (eds.) Clinical Diagnosis by Laboratory Methods. W. B. Saunders and Company, Philadelphia, London, Toronto, 1969). These things add meaning to what Ferguson (1955:72) suggested; namely, that resistance to tuberculosis is not maintained at a constant level but may vary significantly in individuals and, therefore, in populations.

Immunity to tuberculosis is cell-mediated. During sub-clinical infection, such as occurs in tuberculin positive reactors, whether such infection is by natural means or is induced by B. C. G. inoculation, the Thymus gland is stimulated to produce lymphocytes, sensitized by tuberculous antigens, enhance the bactericidal action of macrophages. What appears to be implicit is, that without infection, there is no protection. The fear that susceptibility to tuberculosis might increase by decreasing the number of tuberculin positive reactors was for long the basis of objections to B.C.G. (Bacillus Calmette Guerin. A live vaccine given to tuberculin negative reactors, who have no demonstrable previous exposure to tuberculosis, in order to convert them to positive reactors. In very rare instances, B. C. G. can produce tuberculosis.)

Given a 96 per cent incidence of tuberculin positive reactors, as recorded for the Qu'Appelle Valley Indians, one obvious fact is that cell-mediated immunity to infection by the *Mycobacterium tuberculosis* mammalian is the same in the American Indian as in all mankind. From this it can be logically deduced that any higher incidence of progression to active disease and a correspondingly higher death rate in the Indian has to be due to factors other than race; and, that long held beliefs that things were otherwise, therefore, have no credibility. The Saskatchewan situation would have presented an ideal opportunity for a cross cultural study in tuberculosis had it been possible to screen the Whites as intensively as the Indians were screened, and over the same time period. So many variables other than race were involved.

By 1880, white immigrants were moving into isolated rural areas of the province. The living conditions of these new arrivals were only relatively better than those for the Indians of the reserves, but the political differences were poles apart, and therefore, so was the morale. Climatic conditions were the same for both groups. Wooden housing, crude privies, or none at all, and no piped water supply were common to both groups. The Plains Indians had suffered a sudden and severe nutritional deficiency as the result of the disappearance of the buffalo herds, but they were already adapting to the White man's diet. Sometimes the Indians were short of food, but, so, too were the settlers. Both groups were confined for shelter during the long winter months, accumulating their domestic rubbish, and disposing of it with the advent of spring. The Whites had soap, which the Indians did not have, none having been issued to them until 1890. Despite this, and other technological differences which may have affected the way each group behaved, the literature is replete with stories of the hardships which these newcomers to the prairie regions endured. Both groups were adapting to a new way of life, and both groups were locked into situations from which there was no return. The Indians yearned for their hunting days. There must have been many settlers who longed to return whence they came, even though their purpose in coming to Canada was to escape from another bad situation, namely, oppression.

There is plenty of evidence in the Sessional Reports of the Government of Canada that the Indians were living in crowded and badly ventilated accommodation and were adding to their problems by sealing windows and doors, and plugging stovepipes once they were provided with stoves. In such

conditions, where there is airborne infection and poor diffusion of air, air will be constantly recycled through human lungs, and the quanta of infection, the number of people present, and room size become pertinent factors in the spread of disease. The lack of ultraviolet light (sunlight) in these accommodations during winter months can be considered significant because the tubercle bacillus is readily destroyed by exposure to ultraviolet light. Temperature, humidity, and gravitational pull would determine at what levels infectious organisms would remain suspended in the atmosphere, as well as for how long, and cultural practices such as ground-sitting and ground-lying would increase human exposure to heavier particles of infection.

There seems to have been no early systematic comparison of the incidence of tuberculosis among Indians and Whites in relation to how and where they were living, and it was not until anti-tuberculosis measures were begun after 1905, that one finds the beginnings of a breakdown of the incidence of the disease according to organized and unorganized territories, improved and unimproved areas, and can begin to make some rural/urban comparisons.

A later development was the breakdown of disease incidence according to occupational groups, but the occupations listed in early analyses included nothing that the Indians would have been engaged in, except for agriculture.

There is no support for theories that inter-marriage among the Indians contributed, on a genetic basis, to the higher incidence of active disease and a higher incidence of mortality. What is pertinent is that in a situation of almost universal infection there would be double exposure, on a two-family basis, as the result of inter-marriage, and one could expect a socio-cultural correlate of a genetic situation.

One big difference between the Indians and the settlers was that the Indians had been newly concentrated on the reserves, and the Whites were radiating into the Indians' former spatial isolation. If the settlement of the Indians on the reserves is to be considered a major factor for the epidemiology of tuberculosis among them, then, conversely, the white settlers in their prairie homesteads should, theoretically, have been in an advantageous position and consequently freer of infection.

Jackson and McKinnon (1929), talking of the prevalence of tuberculosis among the American Indians, said, "We have made little attempt to learn why tuberculosis is so prevalent among the American Indians. They have been allowed to solve their own tuberculosis problem and have made ghastly progress to this end."

Such statements condemn the White man but ignore motivation. There always has to be some priorities in the treatment of disease, and the White man had trouble enough of his own with tuberculosis. Not until his own problems were resolving could he begin to help the Indians. The true incidence of tuberculosis among the Whites was affected by many things, all of which served to dilute the Indian/White ratio. People with advanced disease were being eliminated. They were dying in their own homes, unable or unwilling to seek medical help. The proverbial sanguine outlook of consumptive people could have been significant since many people in the early

stages of tuberculosis neither feel ill nor look ill, and the slow development of the disease means that physical deterioration is also slow. The so-called malar flush, especially on a white skin, sometimes gave a false impression of good health. Causes of death were often cloaked with euphemisms. (Personal communication from Dr. T. A. J. Cummings, former Executive Director and Chairman, Sanatorium Board of Manitoba, President, Canadian Lung Association (1977-1978), Health Consultant to the Government of Manitoba). There was a social stigma attached to tuberculosis, which was equated with filth and squalor and a low economic status. Known contact with the disease often proved a barrier to employment. Above all, people were afraid. There was fear of the disease, and fear of deportation among the immigrants.

Prior to 1921, the registration of deaths was a provincial responsibility and was compulsory. From 1900 to 1920, therefore, the number of deaths was obtained from provincial records. Where data was lacking, estimates were based on the death rates for neighbouring provinces. The numbers were grossly inaccurate. An attempt was made by the federal government in 1921 to collate existing data, but the data was discarded as unacceptable. Since 1921 The Dominion Bureau of Statistics has compiled the rates (Urquhart 1965:32).

THE STATE INTERVENES TO ATTACK TUBERCULOSIS

The Disease becomes a Public Health Problem. The attack on tuberculosis was politically inspired in 1901, as a direct response to a letter from the Prince of Wales (later King Edward VII) to Lord Minto, Governor General of the Dominion, expressing his concern at the poor state of health of the people of Canada. As an outcome of this, Lord Minto convened an initial meeting of a people at Rideau Hall, and at a subsequent meeting, the Canadian Tuberculosis Association was formed. A committee and officers of the new Association were appointed and the objectives of the Association were defined as the prevention and cure of tuberculosis in Canada. The initial membership of the Association was small, funds were hopelessly inadequate, and were obtained entirely from voluntary sources. Appeals through the media of the public press brought little response, and, finally, the Dominion Government was asked for help. Even so, by 1921, the annual grant was never more than \$10,000.

In the early years of the Association's existence, it was the practice to hold all meetings in Ottawa, hoping by so doing to encourage the Dominion Government to take a greater interest in the health of the people of Canada. Such hopes were raised in 1905 when a resolution was presented from the Senate to the effect that Parliament should take some active steps to lessen the widespread suffering and great mortality among the people of Canada caused by the various forms of tuberculosis. This resolution failed to pass, the reason being that under the provisions of the British North American Act, health was defined as provincial and not a federal responsibility.

At the turn of the century, tuberculosis was the major public health problem and the leading cause of death. The anti-tuberculosis movement was a

bureaucratic response to a public need, but it was the voluntary agency - namely, the Canadian Tuberculosis Association - which mounted the campaign against the disease. Propaganda and publicity are essential to any effort if it is to succeed, and the Association has never relaxed its drive. Since 1908, it has been the policy of the Association to hold its Annual Meetings on a rotating basis in the various provinces and, in this way, to maintain more widespread interest in its work. Since 1921, the federal government, the Canadian Red Cross Society, and some of the provincial governments have contributed funds to special work undertaken by the Association.

In the year 1901, when the Association was formed, the death rate from all forms of tuberculosis throughout Canada was 180 per 100,000 or 9,600 deaths among a total population of 5,400,000.

In 1921, the death rate was 87 per 100,000 or a total of 7,700 deaths for a population which had increased to 8,000,000.

The death rate fell from 44.4 per 100,000 in 1947 to 3.1 in 1966 as the result of anti-microbial drugs. (Heron 1967, 23:1120-1127)

In the span of a lifetime, the situation in Saskatchewan had dramatically changed:

Today, the death rate for tuberculosis in Saskatchewan is 2.1 per 100,000 population. (Canadian Tuberculosis and Respiratory Disease Association. Tuberculosis Summary Statistics, 1973.)

The mortality rates for tuberculosis, however, do not give a true picture of the prevalence of the disease. In many countries where the tuberculosis death rate is now of the order of four or five per 100,000 per annum, the number of new cases brought to light each year is from 30 to 40 per 100,000 per population. (Epidemiological Bulletin. Medical Services Journal, Canada. 1967:1270).

As recently as 1973, the highest incidence of tuberculosis in Canada, and the highest mortality rates were from the Northwest Territories. The incidence of new active cases was 103.2 per 100,000, reactivated cases were 29.1 per 100,000, and the death rate was 16.1 per 100,000. Here are people whose contact with Whites is probably less than anywhere else in Canada, who are living in an area where climatic conditions are severe, and who are without the amenities of civilization (Canadian Tuberculosis and Respiratory Disease Association Bulletin, Vol. 53, No. 3, 1973:10).

Presently, Canadian Indian and immigrant rates are the highest in Canada. Foreign born persons account for 28 per cent of tuberculosis cases in all Canada. The percentage is higher in areas where immigrants tend to congregate, being 50 per cent in Ontario, 40 per cent in British Columbia, and 21 per cent in the prairie provinces. Among all foreign born persons, the highest incidence of tuberculosis is occurring among those migrating from Asia. Delegates at the Canadian Lung Association Conference in Moncton, June 15, 1977, were told that immigration is leading to a sustaining effect of the disease in Canada. But, one delegate, who identified himself as a medical

officer from the Department of Immigration, warned those present to be careful when looking at these statistics because among the foreign born in the survey was a man who came to Canada in 1905 and has been here ever since.

Presumably, these foreign born persons, including the man who arrived in 1905, were considered medically clean on arrival. When one considers reasons for breakdown, they are not hard to find. Many immigrants hold lowly paid occupations, sometimes working at two jobs; they live in sub-standard accommodation and are depriving themselves of things they might otherwise have in order (a) to send money to dependents overseas, (b) to sponsor relatives for admission to Canada, or (c) to save enough money for a trip home.

As for the Indians, many of them are living on reserves where conditions have not greatly changed. Some, who are migrating to urban areas, are joining the welfare system and drifting to alcoholism.

Socio-cultural deprivation and low economic status are common to both groups and are enough to account for what is happening.

Further confirmation as to when tuberculosis really became a problem in Canada is contained in the following report. Dr. C. D. Parfitt, speaking as President to the Annual General Meeting of the Canadian Tuberculosis Association in 1923, traced the evolution of the Sanatorium Movement in Canada and said:

The evolution of the Sanatorium Movement in Canada began in a very small way in 1893 when Mr. W. J. Gage proposed to build a home for consumptives in connection with the Toronto Home for the Incurables ...

When the Ontario pioneers began their work, there were more than three thousand deaths yearly from tuberculosis in a population of two and a quarter millions, a rate of 139 per 1,000,000 and 12 percent of the general mortality...

Here, as elsewhere, an intense pthisisophobia was unfortunately developed which long did harm as well as good.

It is clear from this resume that the year 1904, ten years after the first stirring of interest in tuberculosis, marked the beginning of a countrywide offensive.

The influx of white immigrants into Canada accelerated to such an extent after 1900 that between that year and 1908 almost two million persons entered the country. A country still short of medical personnel and social services, where lines of communication were extensive, there was no satisfactory method in recording vital statistics. As the entry of these newcomers coincided with the epidemiology of tuberculosis, the immigrants were blamed for what was happening. Ferguson (1955:34) says:

From the facts brought out by investigation of cases of

tuberculosis among immigrants in the past; for example, regarding probable date of onset of illness, and from the discovery among them of signs of chronic disease, both pulmonary and non-pulmonary, it must be concluded that at the time of entry into Canada there was, in 50 percent, reasonable evidence of existence of disease. (An additional number who showed some less conclusive signs of long standing disease were excluded because the evidence was not considered irrefutable.)

Political pressures at local, provincial, federal, and international levels demanded that some action should be taken, and immigration laws were tightened.

The Immigration Act of 1869, amended in 1872, was amended in 1902 to read:

24A. The Governor-General may, by proclamation or order, whichever he considers most expedient, and whenever he deems necessary, to prohibit the landing in Canada of any immigrant or other passenger who is suffering from any loathsome, dangerous, or infectious disease or malady, whether such immigrant intends to settle in Canada, or only intends to pass through Canada to settle in some other country.

Provisions under the Act provided for the apprehension, by force, if necessary, and deportation of any person contravening or abetting any person contravening the Act. Over the years, other amendments followed and in 1924 among those prohibited from entry into Canada were: "(b) Persons afflicted with tuberculosis in any form"

Subsequently, persons who developed tuberculosis within five years of entry into Canada also became deportable unless they voluntarily elected to go into sanatoria for treatment. It was among such "deportables", as he called them, during the years 1929 to 1932, again in the province of Saskatchewan, that Ferguson found evidence that 50 percent or more were diseased.

In 1934, all general hospital admissions found to have tuberculosis became notifiable. British Columbia was the last province to comply. In 1955, chest X-ray films were required of all immigrants into Canada. Thus, we see that the Indian/White ratio of the incidence of tuberculosis was being affected by legislation requiring immigrants to be medically clean, remain medically clean, and by the extension of measures to locate such people who might evade the medical sieve. As late as 1955, persons were being arrested in Canada when they were known to have tuberculosis and were evading treatment. Members of the R.C.M.P., bringing such persons in from remote areas, and in some cases sleeping handcuffed to their prisoners were, themselves, contracting the disease (personal knowledge of such cases at Manitoba Sanitorium, Ninette).

One other point of importance is that the White population was rapidly expanding throughout Canada, whilst the Indian population, as shown in the

Sessional Reports was relatively stable until 1917, after which there was an expansion of approximately three per cent per annum.

TUBERCULOSIS CONTROL: THE INSTITUTIONAL AND PROFESSIONAL HISTORY

There has always been a very close alliance between the medical profession and the Canadian Tuberculosis and Respiratory Disease Association (now newly named The Canadian Lung Association) and this high level of co-operation has been paced by scientific and socio-cultural developments and changes in public attitudes.

Once tuberculin testing of persons was confirming the infectious nature of the disease, this led to earlier diagnosis, rapid expansion of sanatoria for the segregation of the sick from the community at large, and a consequent drop in the number of cases reported.

The years of the 1st World War resulted in an increased known incidence of the disease, which was due to cases being discovered when young and apparently fit males were examined for recruitment into the armed forces. Infection of males, subsequent and consequent upon military service, maintained rates for a while; then, in the post war years, the number of cases decreased. There was a rise in incidence during the years of drought and depression, but this was in no way as dramatic as the rise during the years of World War II and the years immediately following that war.

By 1951, society was settling down again, and statistics for tuberculosis continued a downward trend until 1954, after which time the downward trend in the incidence of the disease became more marked, and for victims of tuberculosis there was new hope. A summary of statistics for the incidence of tuberculosis among the people of Canada, after 1925, is herewith appended. The reason no statistics for the years prior to 1926 are given is that Urquhart has said that earlier figures were unreliable. This is supported by Wherrett (1977:109) who states that as late as 1924 "it was a deplorable fact that no definite information was available on tuberculosis among Indians."

In the early years of the tuberculosis epidemic, the medical fight against the disease was based on what was known of the bacillus and the optimal conditions for its survival. Side by side with this was the need to maintain the strength of its victims. Sanatoria programmes for patients so segregated included prolonged bed-rest with three years being not uncommon, nourishing food, and exposure to fresh air and sunlight. Disinfectants, such as carbolic, were widely used, and there was emphasis on the hygienic disposal of sputa.

At the same time, all provinces were beginning to keep a registry of new active cases. 1930 to 1942 saw the development of visiting health nurses and travelling clinics. From 1942 onward, miniature X-ray units were being employed, and there was a continuous increase of case-finding services. Mobile X-ray units were not discontinued until the 1960's when new cases were

so few that the expense involved was no longer justified.

Canada began experimenting with B. C. G. in 1924, but it was not until after World War II ended and international communications became normalized that the successful experiences with B. C. G. in the Scandinavian countries became known and the vaccine became widely used in Canada.

The years 1934 to 1954 can be regarded as the period when surgical measures to combat the disease were introduced and peaked.

TABLE 3: The Incidence of Tuberculosis per 100,000 population
(all of Canada)

1926	59.7		
1927	55.4		
1928	56.9		
1929	57.6		
1930	64.4	-----	Years of world-wide depression
1931	69.4		
1932	84.2		
1933	79.6		
1934	76.3		
1935	81.0		
1936	79.2		
1937	77.4		
1938	81.0	-----	World War II
1939	88.4	=====	
1940	86.6		
1941	80.8		
1942	100.6		
1943	104.5		
1944	125.3		
1945	113.9		
1946	119.1	-----	Post-War Years
1947	105.7	=====	
1948	99.3		
1949	94.8		
1950	87.0	-----	
1951	77.8		
1952	65.7		
1953			
1954	63.0		
1955	58.6		
1956	52.3		
1957	46.2		
1958	42.3		
1959	37.6		
1960	35.5		

Urquhart, M.C., Historical Statistics of Canada, Cambridge: at The University Press, Toronto: The Macmillan Company of Canada, 1965.

Bethune (1934) has described his own experience with treatment by artificial pneumothorax, whereby air is introduced into the pleural cavity to collapse and rest one lung. This air, however, was absorbed in a matter of weeks and "A. P. refills" were needed on a continuing basis until healing occurred. Another surgical technique was phrenic evulsion. The phrenic nerve (on one side) was crushed, and this prevented the rise and fall of the diaphragm, and the constant push and pull on the affected lung. Diathermy was sometimes used to break down adhesions of fibrosed tissue, which were part of the process of healing but which often held open cavities in the lungs which it was desired to collapse. Then came the major processes of thoracoplasty, segmental lung resection, resection of whole lung lobes, and sometimes the removal of an entire lung. Some of these operations took eight hours to perform, required continuous blood transfusion for the patient throughout, and eight hours of continuous anaesthesia, often under curare. There was no such thing as intensive care units in hospitals in those days. The post-operative care of these patients required dedicated skill from surgeons, physicians, and nurses under conditions that would today be considered unbelievable.

With the advent of antibiotics, all this changed. I remember sitting in the Conference Room at Manitoba Sanatorium, Ninette, while Dr. A. L. Paine, the Medical Superintendent, showed me comparative X-rays of a patient before and after treatment with streptomycin. It was difficult to believe what we were seeing.

The impact of the anti-microbial drugs on the disease was only one aspect of what was happening. As early as 1954, health service personnel were predicting there would be no need of sanatoria within ten years, and it became increasingly difficult to recruit doctors and nurses to staff such institutions. Young people no longer saw the challenge of tuberculosis. Older people began to drift from the service whilst they yet had time to move into and develop careers in other medical specialties. A rear-guard of people remained with the situation to the end. A whole way of life for dedicated professionals, whose reward was in long term personal relations with their patients, had gone with the advent of antibiotics. Tuberculosis, which had been segregated on an emergency basis, had by the 1960's returned to the mainstream of medicine as the disease came under control, and it was difficult for many to believe that it had really happened. As with the buffalo, there was no return.

The economic consequences were no less dramatic. Tuberculosis had been costing Canada millions of dollars a year. By 1960, the worst was over, but the average length of stay of patients in sanatoria was still as high as 264 days. (Urquhart, M. Historical Statistics of Canada. Cambridge: At the University Press, Toronto: The Macmillan Company of Canada, 1965). With mounting health care costs, this was traumatic. The new drugs rapidly reduced the length of stay required, and decreasing occupancy of beds to some extent offset the difficulty in recruiting health care personnel.

With the publication of the Hall Commission Report and its indications for the withdrawal of the federal government from cost-sharing of health

services with the provinces, which would inevitably result in direct confrontation between provincial governments and taxpayers, the drive to establish chemotherapeutic treatment of the disease on an out-patient basis was begun. This brought about the need for education of patients (including Eskimos and Indians) regarding their disease. Some people still have to be hospitalized because they live in remote communities. The anti-microbial drugs can and do produce some severe side-effects, and people need to be where specialized services are readily available. This is leading to an impression among the general public that the only people who now have tuberculosis are Eskimos and Indians, who, of course, are very visible.

Whilst attending the 77th Annual General Meeting of the Canadian Lung Association (formerly the Canadian Tuberculosis and Respiratory Disease Association, and before that, the Canadian Tuberculosis Association) held in Moncton, New Brunswick, June 12 to 15, inclusive, 1977, I had the privilege of speaking with Dr. Wherrett about his new book, The Miracle of the Empty Beds, a story of the history of tuberculosis in Canada which was newly off the press.

Wherrett (1977:62) reiterates that the incidence of tuberculosis was ten times as high among the Indians as it was among the Whites. I asked him, "Was this really so?" His reply was, "The Indians and Eskimos were easy to screen because they were congregated on reserves and in small communities", which is one of the points I have been trying to make in this section on tuberculosis.

I also commented on what he has said (Wherrett 1977:64) about deaths among the Whites not being accurately reported, viz, doctors being reluctant to put tuberculosis on death certificates, and causes of deaths being cloaked in euphemisms. His reply to this was, "Look, Dr. Bludon (Federal Bureau of Statistics) is here. He was telling me that tuberculosis is given as the cause of death, or among the causes of death, on many death certificates. This is something we did not know."

As Dr. Wherrett and Dr. Cunnings have both talked about causes of death being cloaked under euphemisms, it would appear that the practice was well known, well understood, and culturally connived at. Wherrett (1977:62) unequivocally states, concerning tuberculosis among the Whites:

"Doctors did not know the number of cases per annum. Doctors did not always report the disease. Doctors avoided disclosure on death certificates."

Finally, evidence is now available from pathology that, in autopsies performed on people who were alive when tuberculosis was rampant, 80 to 85 per cent show evidence of infection. (Personal communication, Dr. Mahdura Jain, Health Sciences Centre, Winnipeg.) This would seem to effectively reduce the alleged ten to one Indian/White ratio to something approaching parity.

If more Indians proceeded from infection to active disease, reasons should be sought in sociocultural factors. One point which has not been emphasized is that in aboriginal populations an infant mortality rate of 30 per cent was common, irrespective of any infections which may have been

rampant in the environment. Such high infant mortality rates have commonly been linked to dietary factors and poor child rearing practices. How this may have affected the Indian death rate from tuberculosis is not clear. The mortality rate from tuberculosis among Indian children was high. According to Ferguson (1928:12):

The age incidence of the disease during the epidemic is of special interest, indicating that at its onset by far the highest mortality occurred among the children under five years of age . . .

In a later statement, Ferguson (1944:35, 111) reported:

Experience in the vaccination of Indian babies during the past ten years has shown a reduction in the mortality of 75 per cent among the vaccinated as compared with the controls. This experience tends to confirm the statement of Calmette twenty years ago that B. C. G. was a vaccine affording protection which would reduce mortality by 75 per cent among babies.

To re-emphasize some of the definitive statements which have been made:

1. "Ninety per cent of individuals over the age of twenty were infected". (Klebs, 1909)

2. "Once tuberculin testing was begun, in all but remote and isolated areas there was an 80 to 85 per cent incidence of positive reactors." (Ferguson, 1955:86)

3. "There was a 90 per cent incidence among the Northern Métis in Alberta". (Card, Hirabayashi, French, et al. Report, 1936, 4:729, 738-39)

4. "On admission to the school at an average of 7.6 years, just over 60 per cent were sensitive to tuberculin. At 11 years of age over 96 per cent were sensitive to tuberculin, and this percentage was maintained until 15 years of age, after which there was a slight reduction in percentage of those reacting to tuberculin. The average incidence of infection among the 374 children at an average age of 12.4 years, as indicated by tuberculin sensitiveness was 92.24 per cent. The 200 full bloods showed slightly higher incidence than the crosses, being 93 per cent as compared with 91.38 per cent." (Ferguson, 1937:26-27)

5. "Studies in Saskatchewan in 1921 showed 80 per cent infected at age 21." (Ferguson, 1955:86)

6. "50 per cent or more of immigrants arriving in Canada had evidence of disease." (Ferguson, 1955:34)

7. "The mortality rates for tuberculosis in Manitoba in 1932 were:

Métis	1290 per 100,000
Indians	820 per 100,000
Others	41 per 100,000 "

(Wherrett (1977), quoting Dr. Hoey, Medical Officer of Health for the Province of Manitoba.)

8. Reports now emanating from pathology show that 80 to 85 per cent of autopsies on people of all social categories who were alive, when tuberculosis was rampant, show tuberculous lesions. (Privileged information given to myself.)

There is nothing in these statements supportive of a differential reaction among Indians and Whites. Nor is there any evidence of racial susceptibility or, conversely, genetic immunity. (The emphasis is mine). As for Ferguson's weird statement concerning the effect of infusion of white blood, namely,

Infusion of white blood by crossing has been shown to have conferred increased resistance. It has not decreased morbidity, but has reduced mortality. (Ferguson, R. G., Tuberculosis Among the Indians of the Great Canadian Plains. 1937:44)

This is completely discredited by the appalling death rate from tuberculosis among the Métis population of Manitoba in 1932. However, in attempting to support studies in monozygotic twins by Kallman and Reisner (21) suggesting genetic factors in resistance, Ferguson seemed to have some doubts:

... any genetic factor operating in an open area over a long period in a human host must operate very slowly or tuberculosis would have bred itself out more rapidly than it has done in the older civilizations. Tuberculosis is still a major cause of death in areas of Egypt, Greece, and Italy. (Ferguson, R. G., Studies in Tuberculosis, 1955:38-39)

Note: By "infusion of white blood", Ferguson means intermarriage (or unions between Indians and Whites). It is a colorful phrase but in no way accurate.

Heagerty (1928:i:339), in another context, rejected the concept of genetic immunity.

In the pre-vaccination days, following an epidemic, there was left in the community a protected population consisting of those who had had the disease and were therefore immune. After a time, a new generation of unprotected individuals grew up, formed fresh material for the disease, and an epidemic promptly ensued.

It is now recognized that cell-mediated immunity does not pass the placental barrier. This negates any theories of racial susceptibility to infectious diseases, or any genetic protection. When there is documented evidence of the efficiency of the immune response, differences in morbidity and mortality between two populations in a shared environment, exposed to epidemics at any given time, would have to be due to sociocultural factors.

That the immune response knows no racial barriers is proven by the fact that optimal doses of infection by means of vaccination have effectively protected people of all races against infectious diseases. In this regard, the World Health Organization has led the drive to immunize populations in the underdeveloped countries.

Politics and economics are unfortunately part of health care.

Some documentary evidence concerning Canadian Indians undergoing treatment in sanatoria was presented by Dr. Percy Moore, Acting Superintendent of Medical Services, Indian Affairs Branch, Department of Mines and Resources, Ottawa, to the fortieth annual meeting of the Canadian Tuberculosis Association, Montreal, June, 1940. Speaking to his topic, Tuberculosis Control in the Indian Population in Canada, Dr. Moore said:

As most of you know, prior to 1937, due to lack of funds, the Indian Affairs Branch was able to accomplish very little in the way of a concerted attack on the problem.

. . . . during the fiscal year 1938-39, a total of \$380,115.55 was spent, over 650 Indians receiving sanatorium treatment.

The greatest number under treatment at one time was 582, and at the end of the fiscal year, 466 were under treatment.

A breakdown of the situation was given as follows:

Province	Indian Population	No. in Sanatoria
Nova Scotia	2,172	13
New Brunswick	1,922	12
Prince Edward Island	274	1
Quebec	14,578	20
Ontario	30,145	79
Manitoba	14,561	62
Saskatchewan	13,020	84
Alberta	12,163	79
British Columbia	24,276	98
Northwest Territories	3,724	16
Yukon Territory	1,550	2
Total	118,385	466

These figures are interesting, but they do not tell us how many more Indians would have been in sanatoria had sufficient funds been available. Nor, is there any way of knowing how this might have affected mortality rates among the Indians from this particular disease.

Whether the American Indian suffered from tuberculosis prior to the advent of the white man, and if so to what extent, is likely to remain unresolved. However, in the light of today's evidence, both from late

development of active tuberculosis from early primary infections, as well as evidence from autopsies, large numbers of persons can be "diseased", live full and useful lives, and remain apparently healthy for any period up to ninety years.

Therefore, if we concede, on the evidence presented in this paper, that the American Indian is the same as any other man in his reaction to the mycobacterium tuberculosis, it is conceivable that the pre-Columbian Indian could have been widely infected and there be no evidence of the fact. Most cases of human tuberculosis occur in the lungs and lymphatic tissues, and, unless post mortem examinations are conducted, soft tissues leave no trace, except in very rare instances where gross infections from the lungs tracks through the pleura and marks the under surfaces of ribs and scapulae.

The inability to determine this issue may have contributed in some measure to the belief that the Indian was "different" in his reaction to tuberculosis, and this, in turn, may have helped to isolate the North American Indian from the mainstream of society.

CHAPTER IV

CONCLUSION
AND
POSTSCRIPT 1987

CHAPTER IV

Conclusion and Postscript 1987

"Man cannot root himself to the earth and wait for the sun and the rain to nourish him. Man has to move in the environment in order to survive." (from the script of television lecture, Biology 123, University of Manitoba, 1973). Survival is basic to evolution. Thompson (1967:71) says:

Activity is a characteristic of all organisms; indeed, it is their primary characteristic. With the human organism, this means that "behavings" precede cognition. Contrary to much contemporary theorizing, in the beginning is not the idea or the "word"; but rather the sensing, the neuromuscular movement, the utterance, the step, etc. Organic activity, although it may appear to be random, actually tends irreversibly in the direction of self-actualization and/or death if viewed in space-time perspective. (Herrick 1949; Russell 1945). With the human organism, primary activity tends in the direction of fulfilling basic organic needs of the primate biogram: maintenance, defense and nutrition, growth and development, sexual reproduction and care of the young, and completion of the life cycle. (Malinowski 1960:91-94; Montagu 1957:51-55).

In the final analysis, all life is movement, for with death all movement ceases.

Thompson (1967:71-72) continued:

Evolution is not orthogenesis. The directing agency of human biological evolution may be natural selection, but the selecting, whether unconscious or conscious, is done by human organisms within certain bio-cultural limitations and potentials. (emphasis mine) (Bidney 1963:15)

In the human species, the processes of biological development and organic evolution are profoundly influenced by cultural factors (e.g., Bielicki 1964: 106; Garn and Coon 1955; Goldschmidt 1960:4; Montagu 1962; Shapiro 1956:21; Washburn 1963), as well as by ecological and other environmental factors, (e.g., Baker et al. 1962).

It was man himself who elected to stand upright and walk with a bipedal gait and, in so doing, changed his centre of gravity, shaped his spinal column into four marked curvatures, broadened his pelvis in order to support his trunk in the upright position, and realigned his lower limbs to his

altered pelvic girdle.

It was man who changed his diet and in so doing obliterated the gonial eversion of his lower jaw, reduced his prognathism, refashioned his teeth and narrowed and heightened his palate, increasing the resonance of breath sounds in cranial and facial sinuses and altering the muscular attachments for his tongue, thus facilitating speech. Massive muscles for mastication were no longer required and therefore cranial bones were no longer deformed into thick ridges for the attachment of such structures. The sagittal crest disappeared over time and the flattening and thinning of the cranial vault permitted accommodation of man's increasing brain size and the development of his intelligence.

It was man who discovered the use of fire, changed his environment by doing this, protected himself from predators, and freed himself from dependency on the sun for illumination and extended his working days. Man noted that seeds grew where they fell, and conceived the idea of growing his food near his resting place, instead of searching far afield. This led to the agricultural revolution, urbanization, and the specialization of labour.

It is man who has freed himself of the tyranny of infectious diseases, and in doing this has profoundly affected his own evolution.

As Burnett (1962:243) has reminded us:

Whatever may have been the significance of disease for animal evolution in general, there is no shadow of doubt that for the last two or three thousand years man has evolved in an environment saturated with infection. An intense selection of those best fitted to resist disease has been constantly in progress.

Baker looks at the totality of biology, environment, and culture and says:

A re-examination of evolution from a theoretical viewpoint and an examination of the factual data has shown that man, as other mammals, has been the subject of selective pressures of the physical and biological environment and has responded not only by the process of culture formation but also by the process of biological adaptation. We may, therefore, probably investigate human adaptability by beginning with the concepts of the ecologists, first by examining man's relationship to the biological environment but also remembering that he has created a new category of environment . . . the cultural environment. Culture remains the most elusive element since it not only creates adaptations to the previous environment but also creates stresses within itself to which man must adapt as surely as he must adapt to the physical world. (Paul T. Baker. Multidisciplinary Studies on Human Adaptability. Theoretical Justification and Method. Yearbook of Physical Anthropology. Vol. 13, pp. 2-11, 1965.)

It may be argued that man, in freeing himself from infection, has

created other problems. For example, in the Arctic, today, tuberculosis is under almost total control, but the incidence of cancer is increasing. Some of the "new" problems may have existed all along but man was too occupied with infectious diseases to notice them. Some, of course, and one thinks immediately of the so-called "degenerative diseases", are increasing, not because the life span has significantly increased, because it hasn't, but because more people are living to achieve old age. This is bringing in its wake a plethora of social problems which man will have to learn to solve.

Given his biological inheritance, and within the constraints imposed by the environment, man's continued existence depends upon how successfully he learns to control and exploit his environment, and man's learning is a product of his culture.

There are many ways of defining culture, but it is essentially the selected and selective knowledge of a group of people, experientially acquired over time, which provides a frame of reference for groups and individuals for successful interaction with the environment. Culture is essentially conservative, but it is never static. Both culture and environment are subject to change. Culture changes in response to changes in climate. Climate changes can favour certain organisms in the ecosystem at the expense of other organisms, including man. Climatic changes are often associated with infectious diseases. Culture changes in response to exposure to other cultures. Such responses, including fresh knowledge, increase man's range of choice.

Culture is least dynamic in closed societies. It is most dynamic where two or more cultures are in contact, and ideas as well as genetic material are exchanged. Men borrow from each other's culture those ideas and behaviour patterns which seem significantly important as a means of enriching their own and improving their interaction with and adaptation to the environment. This interaction is behaviour. It is learned, and what is learned is cultural. Each generation effects changes and modifications in the light of new knowledge: each generation builds on all that has gone before. This is nowhere more evident than in the field of medicine, where what is accepted as correct at any given time is subsequently proven to be inadequate and is discarded. It is not so much that the older methods of treating disease were worthless. They were based on existing knowledge and experience. When knowledge and experience increased, better ways of doing things were devised. Medicine is a part of any group's culture, and changes in medical treatment are arrived at by deductions and inductions made by man's intelligence.

Man's knowledge is limited by the environment, but man has the capacity to change his environment. This is no more clearly demonstrated than by man's incursions into space. Whether what is learned, over genetic time, produces physiological changes because the human organism, consciously or not, relieves mammalian plasticity of certain stresses through selective human behaviour is the basis for attempting to determine physiological reactions to heat and cold and other environmental variables, including diseases. It is also the basis for attempts to prove that certain races of man are "different" which, by inference, means inferior. The evidence around

us is that this is not so.

Man is man wherever he is found. Krogman (1973:191-192) says there are no pure races and no pure skills. This is important because skull formation and cranial size determine brain size, and man's evolution has been accompanied by an enlarging brain. Krogman (1973:195-197) quotes Morant (1936) as saying that racial difference in the mandible are virtually non-existent. Krogman (1973:218) also says:

Man is basically the same wherever he is found and such differences as exist can be attributed to cultural factors.

A great deal of variation in the age of union of epiphyses of bones between and within groups could be explained by cultural practices involving such things as exercise, activity, and diet.

Intra-racial variability is much more marked than inter-racial differences.

Baker (1975) says:

Perhaps one of the problems in Anthropology has been the failure to study the links between the behaviour of a population and its genetic and morphological structure . .

The idea that groups of men vary in their physiological responses and capabilities is certainly not a new idea. As a product of our biologically and culturally based ethnocentricity, most people attribute to other groups not only some inferior functions but also some superior functions. The behaviour of early explorers and scientists was no exception, and they frequently alleged that particular populations had such unique capabilities as better cold tolerance or the ability to survive altitudes and diseases, which they as Europeans did not have. (Baker 1965)

Baker quotes R. Newman as noting that "adult populations do not seem to differ in their basic responses to heat." (Baker 1965)

Referring to human adaptations to heat, Newman (1955) talks of genetic adaptations and thinks that any group residing long enough in a given environment may show morphological tendencies or responses that are adaptive. Newman says that the fundamental problem for man in a hot environment is heat dissipation, and makes the point that man has no unique biological mechanisms for heat dissipation. (Newman, R. and Munro, E. H.) Regarding cold tolerance, Newman and Munro (1955) pointed out:

It is well established that cold weather stimulates both appetite and activity, and heat stress has the opposite effect. (Bass et al., 1953) Also the combination of expanded appetite and muscular activity in the proper proportions results in an increase in the quantity of muscular tissue (proteins and associated fluids) and perhaps bone. If an adequate diet is available throughout the

period of growth, it is reasonable to suppose that larger body weights and therefore higher weight/surface ratios will be found in areas with either a more severe cold stress, or one of longer duration, or both. (Newman and Munro, 1955).

Referring to Eskimos and Bergman's rule, Newman says:

One important point which is often overlooked in equating Eskimos and cold climates re Bergman's rule is that Eskimos are sometimes subjected to severe heat stress. (Newman and Munro 1955)

Newman quotes Stefansson as saying:

When continental Eskimos go inland (in the summer) they meet terrific heat, humid temperatures running towards 100 degrees Fahrenheit in the shade, with the nights almost as hot as the days, the unsetting sun beating upon them the twenty-four hours through . . . Before white men's influence spread over the North American Arctic, the typical Eskimo house in the afternoon and evening resembled a sweat bath rather than a warm room . . . In the Mackenzie house, then, we used to sit stripped, except for the breeches, from around four in the afternoon, when the outdoor work was done, to around ten or eleven, when it was bedtime. There were streams of perspiration running down our bodies constantly, and the children were occupied in carrying round dippers of ice water from which we drank great quantities. (Newman and Munro 1955)

As to the ability to survive in high altitudes, increased thoracic capacity, hyper-inflation of the lungs and the distension of pulmonary alveoli among Andean Indians are due to a self-imposed cultural adaptation to environmental stress. For some reason, these Indians have found their high altitude advantageous. The same physiological modifications occur among heavy cigarette smokers whose emphysematous conditions are behaviourally induced, but in this latter instance there is self-pollution as well as deformation. Yet the smokers consider the price worthwhile.

Human haematology varies between narrowly defined limits. Haemoglobin levels, total and differential leucocyte counts, coagulation time, sodium and calcium levels, and etc. cannot be defined on a racial basis. There are as many differences between groups as there are within groups, unless and until such time as diseases, parasites, drugs, radiation, diet and other stressors alter the picture. It is on these altered and abnormal differences that we link race and disease, and a classic example of this is sickle-cell anaemia and its association with the Negro race because of an intervening variable. Sickling of red blood cells happens after malaria and is a response to the environment. The endemicity of falciparum malaria has been associated with agricultural changes, which are cultural determinants. As Alland (1970:185) has pointed out:

Epidemiological patterns can be expected to differ according to variables imbedded in the behavioural (cultural) systems.

Fabrega (1973:60) says:

Livingstone (1958, 1967) has demonstrated how specific cultural factors have changed and are still changing the genes affecting haemoglobin types among African populations.

Diseases are semantically defined. Smallpox is smallpox, no matter who contracts it, and, as has been earlier remarked, tuberculosis in the North American Indian is the same as tuberculosis in any other person. What varies is the severity of the symptoms and the outcome of the struggle between man and his parasites. The issue can be profoundly affected by cultural factors such as poor standards of personal and public hygiene, physical and emotional stress, inadequate diet, fear based on superstition, and a lack of knowledge of the nature of a disease, the availability of treatment, the effectiveness of such treatment, and the economic means to finance treatment. Bethune (1934) said, "There is a poor man's tuberculosis and a rich man's tuberculosis", meaning that the ability to pay affects the outcome. The ability to pay may not be individualistic. Where governments collect and allocate funds for the treatment of disease, the burden is lifted from the sick and is voluntarily shared by all, because the sick in a society are a menace to the fit, and health care becomes part of the political and economic culture. The effectiveness of treatment depends upon the current state of knowledge, and changes in medical treatment are based upon what we commonly call advances in medical science which, in their broadest sense, are cultural changes. Such changes, however, could never come about without culturally sanctioned time and money spent on research. Medical research is based on politics and limited by economics. Who gets medical care, and when, is culturally determined. Hrdlicka (1909) and others have criticized the white man for his early neglect of the Indian tuberculosis problem, but priorities have to be established when funds are limited, and the white man was the first to receive treatment for tuberculosis. In Canada, the Indian came second for political reasons. The Métis, less favoured than the Indian, came last. But, in the end, all men benefited as the disease was brought under control.

People are conditioned by their culture to react to diseases in certain ways. The immune response alone will not prevent any person dying from an infectious disease. (Neither will pharmaceuticals.) The immune response has to be aided by such basic things as a modicum of creature comfort to ease physiological stress, an adequate nourishing diet to maintain bodily strength, sufficient hydration to dilute toxins circulating in the bloodstream and to promote their elimination from the body. The immediate surroundings of the stricken individual need to be clean and free of insect vectors and all contaminated excreta, whether it be from festering sores and flakes of epidermis as in smallpox, or sputum and droplets of respiratory discharges as in tuberculosis. Segregation of the sick to protect uninfected individuals is essential, but there has to be a certain number of dedicated individuals, free of fear, willing to tend the sick and demonstrate by personal attitudes that nothing too unusual is happening, even if there is. All these things are part of cultural approaches to disease, and what is cultural is learned.

The Indians of Canada had no experience of smallpox until it was spread among them by Europeans, primarily French settlers and voyageurs. How to cope with the disease was no part of their cultural inheritance. Belief in the supernatural causation of disease was an essential part of Indian culture and was an effective barrier to remedial action. It has been postulated that many of the deaths were not due to smallpox per se but to the fact that people had to search for food before they were fully recovered. This may indeed have been so, but there is no documented evidence insofar as the Indians of Canada are concerned. In any case, it was smallpox which weakened them to the point of collapse and which was therefore the primary cause of death. That the Indians of Canada were hunters and gatherers and had not generally learned to store food to meet emergency needs was in part due to their cultural heritage and in part to the fact that the habitat provided food in abundance until such time as increased numbers of human beings entering the country imposed stress on the environment. It is in the summation of these multifactorial things, rather than in singular genetic factors, that we should seek explanations of causation and effects.

Fabrega (1974:73) has already suggested this.

. . . the response of the Yanamamo Indians to a measles epidemic is lucidly described by Neel et al. (1970). Viral agents such as measles have shown an unusual pathogenicity in American indigenous groups. Although a genetic susceptibility has been presumed, some observations have challenged this presumption and raised the possibility that other factors are involved. An implication of Neel's recent observations is that secondary factors are involved (such as the behaviour of the subject during his infection - the absence of fluid replacement, and the general consequences of an essential collapse of village life during the epidemic) probably account for much of the morbidity and mortality associated with this disease . . . (The emphasis is mine.)

Given the two imperatives, biological inheritance and the constraints imposed by the environment, neither of which is any longer immutable by man, man is responsible for his own evolution, and man's evolution is culturally based. Culture provides the means whereby man harnesses his innate energies and makes them pliant to his will. What man does with what man has is man's ultimate choice.

POSTSCRIPT 1987

This presentation has developed from a retrospective study of the role of two infectious diseases, one a viral infection (smallpox), the other a bacterial infection (tuberculosis) - both of which had a devastating effect upon demography and the development of Canada, including Manitoba.

Curiosity about the past leads to a better understanding of the present and sometimes promotes a speculation about the future, which is the impulse behind all research.

Much has been learned of the nature of bacteria, but an understanding of the complexities of viruses has proved elusive. They are again coming under intense scrutiny because of a new infection which has arisen to plague mankind.

Questions which researchers are now asking (1987) is whether viruses have a role in human evolution and the transmutation of species through genetic exchange. One current hypothesis is that viruses have not always been infective agents: they may be endogenous to man, of whom they may originally have been a part. This has been narrowed to suggest that viruses may be part of a gene.

Viruses do have genetic characteristics. They show some of DNA's mnemonic behaviour. They are encoded to reproduce but can only do this by gaining access to a living cell. They can lie dormant for long periods of time, and then reactivate. There is as yet no satisfactory explanation as to how or why. Dormancy seems somehow to produce an increased virulence on reactivation: but this may only be related to human complacency and a feeling that all is well. A virus can attach itself to a bacterium to form a bacteriophage. This attachment is neither penetration nor a mutation but the symbiosis does produce a new organism.

If we consider current hypotheses and use the language of today and apply it to a reconsideration of "selection"; and, regard "genetic exchange" as a natural form of "genetic engineering"; and, if it can be proven that viruses have been agents for such change, this may, in turn, lead to new insights into the causal relationships of culture, evolution, and disease.

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