SEROPREVALENCE OF ZOONOSES IN NUNAVIK: SURVEILLANCE AND RISK FACTOR ASSESSMENT

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Hypothesis and aim of the study

As a result of their lifestyle and food habits, exposure of Inuit to zoonoses (infectious diseases transmitted from animals to humans) is probably higher than what is found in the South. To verify this issue, project 2.3.1 has three main objectives:

1) to evaluate the seroprevalence of eight zoonoses among the Inuit of Nunavik;

2) to describe the profile of individuals with positive serologies;

3) to identify determinants associated with infection.

The achievement of these objectives will contribute to the development of relevant intervention strategies.

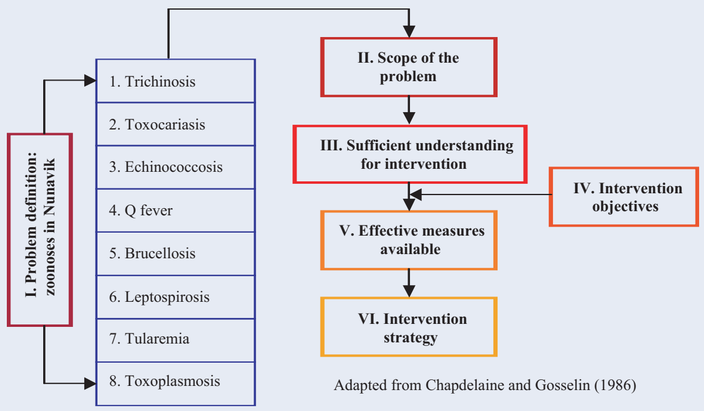
source : http://www.avataq.qc.ca

Theoretical background

The conceptual model in figure 1 shows the steps involved in assessing the existence of a health problem prior to the implementation of a preventive intervention.

Figure 1

Steps I to VI of the decisional algorithm for prevention



Adapted from Chapdelaine and Gosselin (1986)

The information on this poster illustrates the actions that were undertaken to fulfill the different steps presented in the preceding theoretical model.

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Step I: Problem definition: zoonotic diseases (zoonoses)

Contact with the environment places Inuit at higher risk for contracting infectious diseases conveyed by wildlife. Table I gives a brief description of the eight zoonoses investigated in this project.

Source : www.nunavik-tourism.com

Table 1

Zoonoses investigated in Nunavik, Inuit Health Survey, 2004

Disease	Transmission	Hosts	Manifestations	Prevention
1. Trichinosis Parasite: *Trichinella nativa*	➢ Consumption of raw or undercooked contaminated meat	Common hosts in Nunavik : ➢ **Black bear** and **polar bear** ➢ **Walrus** ➢ Other **carnivorous** and **marine mammals**	➢ Possibly asymptomatic ➢ Intestinal and muscular symptoms (diarrhea, nausea, abdominal pain, myalgia, etc.).	➢ Walrus meat inspection ➢ Thorough cooking of game meat
2. Toxocariasis Parasite: *Toxocara canis*	➢ Ingestion of infective eggs in soil or on fruits and vegetables ➢ Consumption of raw liver or organs from an infected animal	Definitive host: ➢ **Canids** (dog, fox, wolf, etc.) – particularly puppies Incidental host: ➢ Various **mammals** and **birds** (e.g. rabbit) – encysted larvae	VLM : *Visceral larva migrans* ➢ Often asymptomatic ➢ Non-specific symptoms (fever, malaise, cough, eosinophilia, etc.) ➢ Affects mainly the liver and lungs (hepatomegaly, pneumonitis) *- Children from 1 to 4 years old are particularly at risk -* OLM : *Ocular larva migrans* ➢ Inflammatory mass in the eye	➢ Prevent children from eating dirt or putting objects in their mouth ➢ Wash hands regularly ➢ Dogs treatment with antihelmintics ➢ Proper disposal of dog feces ➢ Thorough cooking of liver and organs
3. Echinococcosis (hydatid disease) Parasite: *Echinococcus granulosus*	➢ Ingestion of infective eggs on contaminated animals, soil, plants, fruits or vegetables	Definitive host: ➢ **Canids** (wolf, dog, etc.) Incidental host: ➢ **Cervids** (moose, caribou, etc.) and other **herbivores** – encysted larvae	➢ Often asymptomatic ➢ Affects generally the **liver** or **lungs** (hydatid cyst) *- It is presumed that only 5% of individuals infected with the nordic biotype show clinical signs -*	➢ Wash hands regularly ➢ Wash wild berries and plants before consumption ➢ Wear gloves when skinning animals ➢ Destroy infected organs
4. Q Fever Bacteria: *Coxiella burnetii*	➢ Exposure to infected products or aerosols (birth fluids, urine, feces, milk, fur, manure, etc.) ➢ Insect bites	Main reservoir: ➢ Mainly **ruminants** (cattle, sheep, goats) ➢ **Ticks** and other **arthropods** Secondary hosts: ➢ Many **mammals** and **birds**	➢ Possibly asymptomatic ➢ Influenza-like symptoms (fever, headache, chills, fatigue, etc.) ➢ Pneumonia (cough, chest pain) ➢ Hepatitis and other liver disorders	➢ Adequate protection when handling animals ➢ Material disinfection after use ➢ Wash hands after handling catches ➢ Prevent insect bites ➢ Destroy carcasses and aborted materials
5. Brucellosis Bacteria: *Brucella* sp. (*B. suis biovar 4*)	➢ Contact with infected animal or material (tissue, blood, urine, etc.) ➢ Consumption of raw or undercooked infected meat ➢ Contaminated aerosols	Main reservoir: ➢ **Ruminants** (caribou, muskox, etc.) ➢ **Marine mammals** (seals, walrus, beluga, etc.) *- Marine mammals are not recognized to play a significant role in human infection -*	➢ Possibly asymptomatic ➢ Non specific symptoms (fever, sweats, malaise, headache, etc.) ➢ Gastrointestinal, hepatic and nervous system disorders ➢ Osteoarticular complications	➢ Adequate protection when handling animals ➢ Wash hands after handling catches ➢ Thorough cooking of game meat ➢ Destroy carcasses and aborted materials
6. Leptospirosis Bacteria: *Leptospira* sp. *(L. interrogans)*	➢ Contact with infected urine, tissues, feces or water ➢ Ingestion of contaminated water or food ➢ Contaminated aerosols	Main reservoir: ➢ **Rodents** Secondary hosts: ➢ Various **herbivores** and **insectivores** – renal carriers	➢ Possibly asymptomatic ➢ Influenza-like symptoms (fever, headache, chills, fatigue, etc.) ➢ Liver, kidneys, nervous system disorders	➢ Adequate protection when handling animals ➢ Prevent contact with potentially contaminated water, soil or animals ➢ Rodent control
7. Tularemia Bacteria: *Francisella tularensis*	➢ Handling or consumption of infected animals ➢ Contact with contaminated water or aerosols ➢ Insect bites ➢ Bite by an infected or carrier animal	Main reservoir: ➢ **Rodents and lagomorphs** (muskrats, beavers, rabbits, etc.) *- Infected animals may have white spots on the liver and other organs -* ➢ **Ticks** and other **arthropods**	➢ Possibly asymptomatic ➢ Influenza-like symptoms (fever, headache, chills, fatigue, etc.) ➢ Local skin ulcer ➢ Regional lymph nodes inflammation ➢ Gastrointestinal or respiratory symptoms	➢ Adequate protection when handling animals ➢ Prevent contact with potentially contaminated water or animals ➢ Wash hands after handling catches ➢ Thorough cooking of game meat ➢ Prevent insect bites
8. Toxoplasmosis Parasite: *Toxoplasma gondii*	➢ Consumption of raw, dried or undercooked infected meat ➢ Ingestion of contaminated water, food or soil particles ➢ Transplacental infection	Definitive host: ➢ **Felines** (cats, cougars, etc.) Incidental host: ➢ Many **mammals** and **birds** (caribou, seal, ptarmigan, etc.)	Adult ➢ Often asymptomatic ➢ Non specific symptoms (fever, sweats, malaise, lymphadenopathy, etc.) Fetus ➢ Non specific signs ➢ Chorioretinitis, blindness ➢ Psychomotor or mental retardation	➢ Adequate protection when handling game animals ➢ Wash hands after handling catches, meat or soil ➢ Thorough cooking of meat ➢ Proper disposal of cat feces

Step II. Scope of the problem

Data collection

In the fall 2004, approximately 917 participants from 18 to 74 years of age were selected randomly and invited onboard the icebreaker Amundsen to participate to the Inuit Health Survey. Data needed to verify the importance of zoonotic diseases was gathered on this occasion by means of questionnaires and clinical tests. Information about lifestyle and socio-demographic characteristics was collected and a blood sample was drawn from each participant.

Serological analyses

Serological analyses performed to determine the seroprevalence of zoonoses among the Inuit population of Nunavik are described in table II.

Photo : Isabelle Dubois (NRBHSS)

Photo: L. David Mech © Voyageur Press
Source : http://www.arctic.noaa.gov

Table II

Serological analyses

Pathogens	Analyses
Trichinella sp. *Toxocara canis* *Echinococcus granulosus*	Immunoenzymatic methods (IVD inc.) Dr Brian J. Ward, Centre for Tropical Diseases, McGill University
Coxiella burnetii *Brucella* sp. *Leptospira* sp.	Immunoenzymatic methods (Virion\Serion, Serion Immundiagnostica GmbH, Würzburg)
Francisella tularensis	Tube-agglutination test (Snyder, 1980; Stewart, 1981) Dre Bouchra Serhir and Dr Michel Couillard, Laboratoire de santé publique du Québec (LSPQ)
Toxoplasma gondii	Immunoenzymatic methods (AxSYM, Abbott Diagnostics, Abbott Park, Illinois) Dr Michael Libman, Montreal General Hospital

Step III. Sufficient understanding for intervention

Statistical analyses

Descriptive analyses such as comparison of proportions are used to depict the general portrait of zoonose seroprevalence. Logistic regression will be done to determine the relationships between **positive serologies** and **socio-demographic variables**, **fishing and hunting practices** as well as **raw water** and **traditional food consumption trends**. The results of these analyses will contribute to identify the significant determinants of the prevention of zoonotic diseases in Nunavik.

Steps IV-V. Intervention objectives and effective measures

Qualitative interviews

To understand the impact of culture and ecological context on zoonoses, qualitative interviews will be conducted with local informants. This process will help to define concrete goals from the perspectives of inuit and regional organizations. It will also provide information about measures available to support the prevention of zoonotic diseases in Nunavik communities.

Perspectives…

Step VI. Intervention strategy

The results of this study will offer novel insight into the epidemiology of zoonotic infections in Arctic regions and baseline information on the current seroprevalence of these diseases in Nunavik. From a pubic health perspective, the research project will contribute to the description of zoonoses of concern in northern Québec and the identification of risk factors for infection. In addition, data provided by the study will assist local organizations in the definition of effective intervention strategies including education activities and promotion of safe practices.

A first report is scheduled for completion in June 2006. However, complete results will only be available after their dissemination in Inuit communities due on November 2006.

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