

Sustainable Development Working Group Human Health Project Proposal

Prevention and Control of Emerging Infectious Disease in the Arctic

(presented in part to the sustainable working group meetings in Anchorage, May 16 1999, Washington DC, November 17 1999, Fairbanks April 26-28, and the AMAP Human Health Expert Group meeting, Ottawa, Canada September 20-22 1999)

I. Project Goal

Establish an integrated International Circumpolar Surveillance (ICS) system through a network of hospital and public health laboratories Authorities throughout the Arctic.

II. Issues to be addressed

A. Relevance and Importance

Arctic populations have long endured the debilitating effects of both endemic and epidemic infectious diseases, the effects of which have impacted social and economic development in circumpolar regions of the globe. With the advent of antibiotics, tuberculosis and other life threatening infections seemed conquerable. The incidence of diseases of childhood such as diphtheria, whooping cough, and meningitis were reduced dramatically through the use of vaccines. These advances, together with improvements in sanitation and water quality, dramatically lowered the incidence of infectious diseases in many peoples throughout the developing world including those of the Arctic. However, as we enter the 21st Century, the specter of new virulent and antibiotic-resistant forms of old diseases such as tuberculosis, measles, diphtheria, and meningitis once again is threatening circumpolar communities. Our communities are now faced by a number of newly emerging diseases, such as HIV, hepatitis C, and a host of food and waterborne illnesses. Moreover several infectious agents have now been commonly associated with the development of malignancies in Arctic peoples: hepatitis B virus and, hepatitis C virus (liver cancer), *Helicobacter pylori* (gastric cancer), human papilloma virus (cervical cancer), Epstein-Barr virus (nasopharyngeal cancer).

B. Significance to Arctic Residents

The goal of the sustainable development program of the Arctic Council is to “*propose and adopt steps to be taken by Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment, the economies, cultures and health of indigenous communities and other inhabitants of the Arctic, as well as to improve the environmental economic and social conditions of Arctic communities as a whole*”. Human health is a critical component of any sustainable development program. Sustainable economic development is frequently accompanied by changes in a number of factors which impact human health and the emergence of infectious disease problems. These include rapid population growth; depopulation of small arctic communities; urbanization of arctic peoples and ensuing social and economic difficulties; changes in governments, self-governance, and fiscal policies; increased regional and global travel; changes in the food supply; changes in human behaviors such as increased substance abuse, intravenous drug use and risky sexual behavior; the use of more antibiotics in remote arctic communities, hastening the development of antimicrobial resistance; and contamination of the subsistence food supply with heavy metals and pesticide residues with deleterious effects on the developing immune system. Infectious disease incidence is an important indicator of human health. Establishment of a surveillance system to monitor changes in infectious diseases is critical to maintenance of sustainable development in the Arctic, and to disease prevention and control activities.

B. Related International Activities Underway

The US Centers for Disease Control and Prevention's Arctic Investigations Program together with the Indian Health Service, the State of Alaska's Division of Public Health, and Alaska Native Health corporations and organizations have a long history of initiating and maintaining infectious disease surveillance and prevention and control activities

among Native and non-Native residents of the US Arctic¹. In 1994 the US Centers for Disease Control and Prevention developed a plan to address the threat of emerging infectious diseases in the United States². The plan, updated in 1999³, calls for revitalizing critical public health functions such as surveillance, applied research, infrastructure and training and prevention and control capabilities not only in the US but world wide. In addition, the Committee on International Science Engineering and Technology Policy (CISSET), recommended that the U.S. government develop partnerships with other countries, with World Health Organization(WHO), and with other international organizations to improve worldwide disease surveillance, reporting and response⁴. Consequently a number of alliances have now been created within Europe and between the US and European Countries to promote international emerging infectious disease surveillance and response networks. In addition Health Canada through its Laboratory Centre for Disease Control and Bureau of Infectious Diseases maintains national surveillance for emerging infectious diseases. The national health surveillance infrastructure initiative of Health Canada also contributes to the enhancement of surveillance through the development of Internet based tools such as the Spacial Public Health Information Exchange (SPHINX). The establishment of an infectious disease surveillance system within Arctic Council countries will allow linkage of surveillance information to other established systems thereby contributing to the global surveillance and prevention and control of emerging infectious disease problems.

III. Project Structure

A. Activities

The project will initially focus on establishing an international circumpolar surveillance (ICS) system for diseases caused by *Streptococcus pneumoniae*. This bacterium causes pneumonia, meningitis and bacteremia in both the very young and the elderly. Once easily treatable with antibiotics, this bacterium is now becoming resistant to commonly used antibiotics. This is of great concern to the public health community and is increasingly a target for surveillance by many countries world wide. A vaccine is available for use in persons 2 years of age and older. In the US Arctic this vaccine is recommended for all those over 55 years of age. A new vaccine for infants is being developed and is anticipated to be licenced in the US in 2000. The fact that diseases caused by *Streptococcus pneumoniae* are already being monitored by many public health organizations within the Arctic Council countries make establishing a circumpolar surveillance system for this infection feasible. In addition the availability of a vaccine for adults and the potential of a vaccine for infants makes preventable much illness caused by *Streptococcus pneumoniae*.

Key components of ICS includes:

- i Identifying key public health contacts within Arctic Council countries. These persons should be familiar with infectious disease surveillance systems in place (particularly surveillance systems for diseases caused by *Streptococcus pneumoniae*) in the member country. Through correspondence, individual or working group meetings, the scope and gaps of individual surveillance systems will be determined.
- ii Determining the comparability of laboratory and data collection methods, and negotiating standard protocols, quality control programs (which will define comparable laboratory and data collection methods).
- iv Sharing and reporting data in agreed formats.
- v Establishing a working group of key laboratory and public health contacts to coordinate pneumococcal surveillance within their respective jurisdictions. This group will meet on an annual or biannual basis to review problems, progress, compliance, report generation, and future plans.
- vi Establishing a steering committee of national representatives to coordinate new objectives and initiatives within ICS.

Once established this program will form a framework by which other infectious disease surveillance and prevention and control programs can be added. Other infectious diseases of circumpolar community concern include; tuberculosis, HIV, hepatitis, food (botulism, brucellosis), waterborne diseases, respiratory diseases of children such as those caused by respiratory syncytial virus, and chronic conditions related to infectious agents(hepatitis B virus and liver cancer, human papilloma virus and cervical cancer). In addition the surveillance model developed by this program for infectious disease may be adapted to monitor other human health priorities of community concern.

B. Participation

Canada

The US CDC's Arctic Investigations Program, together with Health Canada's Laboratory Centre for Disease Control, Bureau of Infectious Diseases, have initiated a pilot program linking public health laboratories in Alaska, the new territory of Nunavut, Yukon Territory, Northwest Territories, northern Quebec, and Labrador to monitor invasive diseases among indigenous populations caused by *Streptococcus pneumoniae*. This surveillance system, which now spans the entire arctic region of North America and has allowed the standardization of laboratory and data collection methods, the assessment of disease rates in arctic communities, and will allow the evaluation of effectiveness of vaccination programs on disease rates, the monitoring of emergence of antimicrobial resistance treatment failures associated with these infections, and focused design of collaborative applied research on risk factors for infection and prevention strategies. A summary of results collected in 1999 is attached(Attachment)

Greenland/Denmark

Discussions with the Chief Medical Officer for Greenland, were begun in November 1999. A system is being developed whereby the 17 regional laboratories, serving the Greenland population of 55,000, will submit isolates of *Streptococcus pneumoniae* identified in blood, CSF, or other normally-sterile body fluids, to the main laboratory in Nuuk for confirmation of identification. Confirmed pneumococcal isolates then will be forwarded to the reference laboratory at Statens Serum Institute in Copenhagen, Denmark, for serotyping and antimicrobial resistance testing. Basic demographic and clinical information regarding the case will be collected by the Chief Medical Officer and the information forwarded along with the reference laboratory's results to the Arctic Investigations Program. Surveillance is expected to be in place by the second quarter of 2000.

Preliminary discussions have occurred with the key public health officials in Iceland, Finland, Norway and Sweden (contacts listed below), and identification of a contact in Russia is anticipated. A working group meeting of collaborators was held during 11th International Congress of Circumpolar Health, Harstad Norway June 4-9 2000.

IV Relationship to other Arctic Council Programs

A. Arctic Monitoring and Assessment Program(AMAP) activities and priorities.

Exposure to persistent organic pollutants (POP's) and heavy metals are of primary concern because of their accumulation in the marine food chain and ultimately in the subsistence food sources of many Arctic residents. The potential effects of these pollutants on human fetal, infant and child development are of concern and are now priority areas of investigation by both the AMAP and Sustainable Development human health working groups or the Arctic Council countries. Studies have also shown that both POP's and certain heavy metals impact key elements of the immune system thereby compromising the human primary defense against bacterial, viral, and parasitic infections. The surveillance of infectious diseases in Arctic populations will allow measurement of baseline rates of disease, comparisons of disease rates between Arctic regions, and evaluation of environmental pollution as risk factors for increased rates of infectious diseases.

B. Sustainable Development Project: Future of Children and Youth of the North.

This project draws attention to a broad range of factors that affect health of children and youth of the Arctic. These range from socioeconomic (social status, poverty or income), to availability of health services, biophysical factors (bacterial water quality, chemical contaminants in water, air, or food), and to psychosocial factors (such as family violence, social support networks, substance abuse and physical activity levels). The biophysical health component examines the effects of contaminants in the water, air and food of northern children and youth, and the biomedical conditions affecting the health of children and youth of the Arctic. Contaminants of concern include; microbial agents, persistent organic pollutants (POP's), toxic metals, radio nuclides. The impact of these contaminants on human health can be measured using a variety of indicators including an assessment of rates of childhood and adolescent infectious diseases. The surveillance of infectious diseases in Arctic populations will allow measurement of rates of disease in this target population.

C. Arctic Climate Impact Assessment (ACIA)

The goal of ACIA is to provide information on the consequences of climate variability and change to the governments, organizations and peoples of the Arctic region. The assessment will collect scientific information predict environmental, human health and socio-economic impacts and recommend actions. Global warming and other extreme climate events directly and indirectly threaten human health and may act as catalysts for outbreaks of infectious diseases. The establishment of a circumpolar surveillance system for infectious diseases should also allow the monitoring of diseases potentially sensitive to both long and short term changes in climate.

V. Anticipated Outcomes of ICS

Significant outcomes of this project include the linkage of public health facilities within the Arctic states to allow the collection of laboratory and epidemiological data which will describe the prevalence of disease caused by *Streptococcus pneumoniae* within Arctic populations. In addition this system will allow the monitoring of drug resistant infections caused by *Streptococcus pneumoniae*. This activity will allow targeting of populations for prevention and control activities such as use of the pneumococcal vaccines, or programs aimed at controlling the spread of drug resistant infections. This project will allow standardization of laboratory methods for the detection and identification *Streptococcus pneumoniae*, and the measurements of drug susceptibility. Epidemiologic data collection and reporting methods will be standardized, allowing comparison of information not only between Arctic Council countries but also between other countries with comparable surveillance systems. Communication established between public health facilities within the Arctic Council countries will allow continued discussion of other public health problems and development of additional collaborative surveillance systems to include other infectious and non infectious disease problems of concern.

VI. Financial and Other Resources

A. Budget FY2000

US\$189,000 Funding for FY2000 is currently being provided by the US (US\$159,000; Centers for Disease Control and Prevention), and Canada (US\$30,000; Laboratory Centres for Disease Control) for project travel, meeting support, personnel costs including a full time coordinator.

In Kind Laboratory costs associated with the isolation, identification, serotyping, antimicrobial susceptibility testing, shipping, handling and long term storage of bacterial isolates.

In Kind Collection, analysis, and reporting of case data.

In Kind Maintenance of the international data base, preparation and dissemination of data

B. Commitment by Country

Countries participating in the surveillance system should bear the cost of travel and accommodation for key personnel to work group meetings to be held annually or biannually. Such meetings can be planned to coincide with scheduled national or international meetings of interest to, and usually attended to by the key public health contacts. Further cooperative activities may require additional resources which may require cost sharing.

In Kind Laboratory costs associated with the isolation, identification, serotyping, antimicrobial susceptibility testing, shipping, handling and long term storage of bacterial isolates.

In Kind Collection, analysis, and reporting of case data.

C. Sustainability:

Each participating country recognizes the importance of human health as a critical part of any sustainable development program. All Arctic Council countries have public health surveillance systems in place and already carry the costs for surveillance of infectious diseases of community concern. Sustainability of the proposed surveillance system will depend on collaboration and enhanced communication between key public health contacts within each participating country, rapid dissemination of information collected accomplished by current Internet technology and report publication. Presenting human health proposals to ministerial representatives of each country raises awareness of the importance of human health issues facing Arctic communities, and consequently may influence additional support for human health projects brought before the Arctic Council by member countries.

VII. Further issues for consideration

While infectious disease are only one area of concern, other health hazards impacting sustainable development in the Arctic include 1) injuries, both occupational and personal; 2) premature death/shorting of life-span; 3) industrial pollutants; 4) alcoholism, depression, suicide; 5) global warming/climatic changes and impacts on subsistence food sources and nutrition; 6) water quality and availability, human and animal waste disposal and solid waste management. The establishment of an integrated circumpolar surveillance for infectious diseases through collaboration, communication, development of standard protocols for methods, data and data sharing, creates a model by which other integrated surveillance systems for other human health problems facing Arctic communities can be addressed.

VIII References

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3. Working Group on Emerging and reemerging Infectious Diseases. Committee on International Science Engineering and technology (CISSET), National Science and Technology Council. Infectious Disease-a global health threat. Washington DC. US Government Printing Office. 1995.

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