PILOT PROJECT ON HEALTH RISKS RELATED TO CONSUMPTION OF BIVALVE SHELLFISH, SALLUIT, NUNAVIK

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Context

Many communities eat raw bivalve molluscs (blue mussels, oysters and clams) in Nunavik. These organisms have regularly been implicated in the transmission of enteric diseases worldwide. Therefore, it is important to evaluate the microbiological quality of molluscs consumed by Nunavik communities. *Escherichia coli E. coli* has traditionally been used as an indicator for the quality of water and shellfish in national and international standards but many authors now suggest various other indicators.

Objectives

Prior to the study on health risks related to the consumption of bivalve shellfish in Nunavik, a pilot project was undertaken to validate the sampling methods (including the shipping) and to determine which micro-organisms to include in the study.

The general and specific objectives of the study on health risks related to the consumption of bivalve shellfish in Nunavik are the following:

- To evaluate the risks for health related to the consumption of raw bivalve shellfishes in Nunavik;
  - To evaluate the presence of fecal indicators in molluscs and in salted water at the time of sample collection;
  - To document water and mollusc flesh contamination by various pathogens;
  - To determine contamination by collection site.

photo : Isabelle Dubois (NRBHSS)

Inuluk Papigatuk from Salluit, gathers mussels on shore at low tide.

photo : Isabelle Dubois (NRBHSS)

View on the community of Salluit and the ship anchored in front.

Methods

A report from Environment Canada describing the most popular sites for shellfish harvesting in Nunavik was used to identify communities for the study. These sites were located in the communities of Salluit, Quaqtaq, Kangirsuk, Aupalluk and Tasiujaq (Figure 1).

During the cruise of the Amundsen in the fall of 2004, blue mussels and water were collected in the village of Salluit at two harvesting sites. Site selection was based on their sources of pollution as described in the report by Environment Canada (figure 2): one site potentially contaminated and one potentially non-contaminated.

Mussel samples were collected when the tide was low, along the bank, at a distance of 120 meters. Five hundred grams of mussels were collected and kept on ice.

Water samples were collected from both sides of the mussel bed along the shore in waters of at least 1.3 meters deep (8 stations, respectively separated by a distance of 10 meters from each other). Two samples were collected at each station, at a depth of 30 cm. One extra water sample was collected at the station located in the middle of the beach for analyses subsequently realized at the Ministère de l'Agriculture, des pêcheries et de l'alimentation du Québec (MAPAQ).

Mussels and one sample of water from each of the two sites were shipped by plane to the MAPAQ, according to a specific protocol, where they were analyzed by molecular or culture detection. Mussels were tested for indicators: fecal streptococcus, *E. coli*, F-specific coliphages and *Clostridium perfringens*; and for pathogens: Norovirus, *Salmonella sp.*, thermotolerant *Campylobacter sp.*, *E coli* O157:H7, *Shigella sp.* and *Yersinia enterocolitica*. Water was analyzed at the MAPAQ for F-specific coliphages. Other water samples were analyzed on the ship by filtering membrane method and tested for enterococcus and *E coli*.

Results

Table 1 presents the pathogens and indicators analyzed in mussels from the contaminated and non-contaminated sites. These analyses revealed the presence of coliphages (2625/100g in mussels of the contaminated site and 850/100g in those of the non-contaminated site) and *Yersinia enterocolitica* (positive/25g but only for non human pathogenic strains, in both sites). Other agents assessed were found to be either negative or under the detection limit.

Table 2 presents the pathogens and indicators analyzed in water samples. These analyses revealed no enterococcus and no *E. coli* among samples from the potentially non-contaminated site, no *E. coli* and a mean of less than 1 colony forming unit (CFU)/100 ml of enterococcus among samples from the presumably contaminated site. F-specific coliphages were observed in water from the potentially contaminated site (presence of CFU/100ml) but not in water from the non-contaminated site.

Figure 1

Sites investigated during the pilot study and projected to be investigated through the Study on health risks related to consumption of raw bivalve molluscs, Nunavit

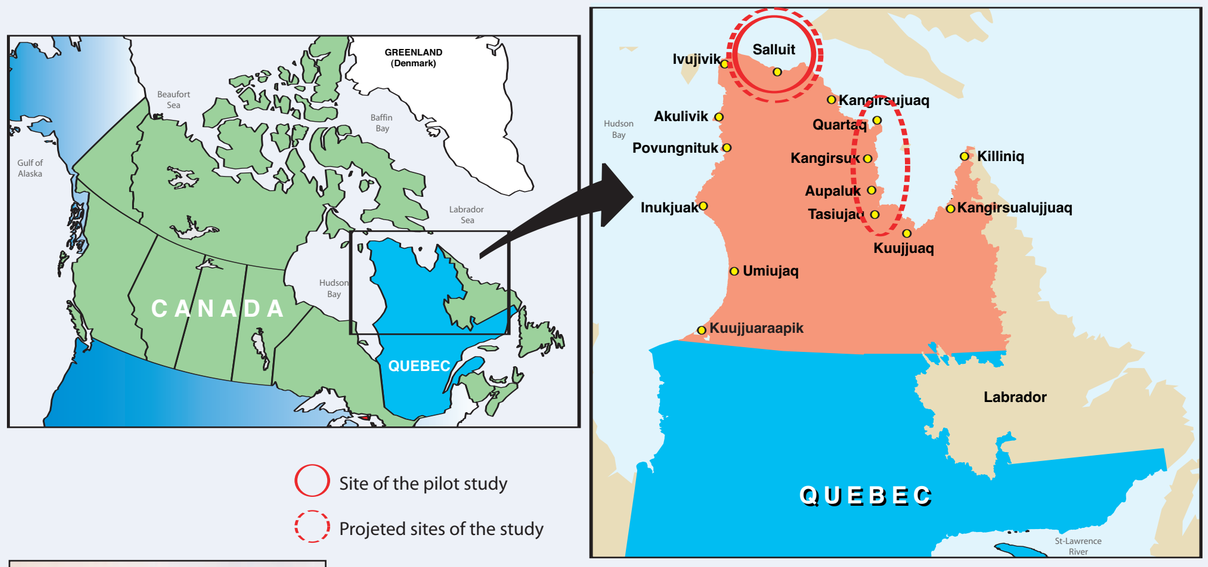
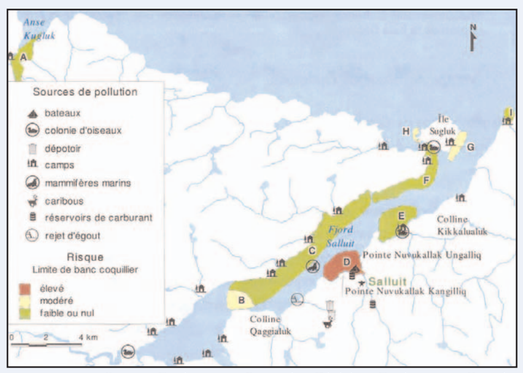


photo : Isabelle Dubois (NRBHSS)

Members of the Health Survey team feast on fresh mussels that have been offered to them by the Salluit community.

Figure 2

Sources of contamination and risk associated with consumption of molluscs per collection site, Salluit, Nunavik



Source: Environment Protection Division, Environment Canada.

Table 1

Pathogens and indicators analyzed in mussels from the contaminated and non-contaminated sites in the village of Salluit, Nunavik

Pathogen/indicator (mussels)	Contaminated site	Non-contaminated site
fecal streptococcus	< 10/g	< 10/g
E coli	< 10/g	< 10/g
F-specific coliphages	2625/100g	850/100g
Clostridium perfringens	< 100/g	< 100/g
Norovirus	negative[1]	negative[1]
Salmonella sp.	negative[1]	negative[1]
Thermotolerant *Campylobacter sp.*	negative[1]	negative[1]
E coli O157:H7	negative[1]	negative[1]
Shigella sp.	negative[1]	negative[1]
Yersinia enterocolitica	positive/25g, only for non pathogenic strains	positive/25g, only for non pathogenic strains

[1] Detection limit = 1.

Table 2

Pathogens and indicators analyzed in water samples from the contaminated and non-contaminated sites in the village of Salluit, Nunavik

Pathogen/indicator (water)	Contaminated site (CFU/100 ml)	Non-contaminated site (CFU/100 ml)
Enterococcus	< 1[1]	0[1]
E coli	0[1]	0[1]
F-specific coliphages	presence	absence

CFU: colony forming unit.
[1] Mean, over 12 samples.

Conclusion

As a whole, from a public health standpoint, molluscs and water collected in the village of Salluit during this pilot project were of very good microbiological quality, particularly in the presumed non-contaminated site. There were very few variations between the two sites. Small differences were observed regarding F-specific coliphages in mussels and in water, but they are not significant on the analytic ground. The methods implemented for data collection appear to be robust, which strongly supports the continuation of the study. In the fall of 2006, water and mollusc sampling will be extended to the five communities identified by Environment Canada, using the same methods and assessing the same indicators and pathogens. In addition, we plan to add two other human parasites to the list of already screened ones: *Girardia sp.* and *Cryptosporidium parvum*.

Acknowledgements

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