H. pylori and Associated Diseases in Aboriginal Peoples of Canada

Karen J. Goodman
University of Alberta

Canadian Helicobacter Study Group 2010
Aboriginal Peoples of Canada:
% of Population by Province

- Nunavut: 85%
- NWT: 51%
- Yukon: 23%
- Manitoba: 14%
- Saskatchewan: 14%
- Alberta: 5%
- BC: 4%
- Ontario: 2%
- Quebec: <1%

[Map of Canada showing % Aboriginal by province](http://images.google.com/Map_Canada_political-geo.png)
Northern Canada

Political Definition
- Northern Territories
  - Nunavut
  - NWT
  - Yukon

Physiographic Definition
- North of Tree Line
  - Most of Nunavut
  - Northern parts of
    - NWT
    - Yukon
    - Manitoba
    - Ontario
    - Quebec
    - Labrador
Aboriginal Peoples of Northern Canada

- Aboriginal Groups (2001 Census Data)
  - North American Indian (First Nations)
    - ~29% of Northwest Territories population
    - ~20% of Yukon population
  - Metis (mixed European and First Nations ancestry)
    - ~10% of Northwest Territories population
  - Inuit
    - ~85% of Nunavut population
    - ~12% of Northwest Territories population
People of Northern Canada

- **2006 Population**

<table>
<thead>
<tr>
<th>Region</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nunavut</td>
<td>29,474</td>
</tr>
<tr>
<td>Northwest Territories (NWT)</td>
<td>41,464</td>
</tr>
<tr>
<td>Yukon</td>
<td>30,372</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>101,310</strong></td>
</tr>
</tbody>
</table>
## H. pylori Prevalence in Canada

### Multi-ethnic Populations

<table>
<thead>
<tr>
<th>Place</th>
<th>Population</th>
<th>Age (yrs)</th>
<th>n</th>
<th>HP+%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nova Scotia</td>
<td>Van Zanten 1994</td>
<td>18-72</td>
<td>316</td>
<td>38</td>
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<tr>
<td>Manitoba</td>
<td>Perez-Perez 1997</td>
<td>&gt;20</td>
<td>469</td>
<td>35</td>
</tr>
<tr>
<td>6 provinces</td>
<td>Thomson 2003</td>
<td>18-86</td>
<td>1013</td>
<td>30</td>
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<td>4 provinces</td>
<td>Jacobson 2005</td>
<td>5-18</td>
<td>246</td>
<td>5</td>
</tr>
<tr>
<td>Southern Quebec</td>
<td>Births (cord blood)</td>
<td>Maternal</td>
<td>99</td>
<td>10</td>
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<td>Northern Quebec</td>
<td>Hodgins 1998</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Manitoba</td>
<td>Bernstein 1999; Sinha 2002</td>
<td>Adult 0-12</td>
<td>306</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Wasagamack Cree (First Nations) village</td>
<td>0-12</td>
<td>163</td>
<td>56</td>
</tr>
<tr>
<td>Nunavut</td>
<td>McKeown 1999</td>
<td>All ages 0-15</td>
<td>256</td>
<td>51</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>Goodman, unpublished</td>
<td>All ages 0-14</td>
<td>313</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Inuvialuit (Inuit) &amp; Gwich’in (First Nation) hamlet</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# H. pylori Prevalence in Northern Canada & Other Circumpolar Populations

<table>
<thead>
<tr>
<th>Place</th>
<th>Population</th>
<th>Age (yrs)</th>
<th>n</th>
<th>HP+%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Manitoba</td>
<td>Wasagamack Cree (First Nations) village</td>
<td>Adult</td>
<td>306</td>
<td>95</td>
</tr>
<tr>
<td>Bernstein 1999; Sinha 2002</td>
<td></td>
<td>0-12</td>
<td>163</td>
<td>56</td>
</tr>
<tr>
<td>Nunavut</td>
<td>Inuit communities</td>
<td>All ages</td>
<td>256</td>
<td>51</td>
</tr>
<tr>
<td>McKeown 1999</td>
<td></td>
<td>0-15</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>Inuvialuit (Inuit) &amp; Gwich’in (First Nation) hamlet</td>
<td>All ages</td>
<td>313</td>
<td>58</td>
</tr>
<tr>
<td>Goodman, unpublished</td>
<td></td>
<td>0-14</td>
<td>59</td>
<td>53</td>
</tr>
<tr>
<td>Chutkotka, Russia, Reshetnikov 1998</td>
<td>Chutkotka Native coastal Arctic village, males</td>
<td>Mean=32</td>
<td>34</td>
<td>77</td>
</tr>
<tr>
<td>Nuuk, Greenland</td>
<td>Population survey</td>
<td>22-76</td>
<td>71</td>
<td>47</td>
</tr>
<tr>
<td>Milman 2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sismiut, Greenland</td>
<td>Population-based sample</td>
<td>15-87</td>
<td>685</td>
<td>58</td>
</tr>
<tr>
<td>Koch 2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norton Sound, Alaska</td>
<td>Rural Alaska Native villages</td>
<td>All ages</td>
<td>610</td>
<td>80</td>
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<tr>
<td>Zhu 2006</td>
<td></td>
<td>0-24</td>
<td></td>
<td>72</td>
</tr>
</tbody>
</table>
Little Data on *H. pylori*-associated Disease in Aboriginal Canadians

- Peptic Ulcer Disease

- Increased ratio of gastric ulcer to duodenal ulcer
  - Inuit of northern Labrador (*William* 1985)
  - Also observed in studies of
    - Alaska Natives (*Thompson* 1975; *Sacco* 2007)
    - Native Greenlanders (*Ingeman-Nielsen* 1990)
    - Residents of Arctic Norway (*Eriksen* 1995)
Little Data on *H. pylori*-associated Disease in Northern Canada

- Study of Registered Indians in Manitoba
  - Increased hospitalizations associated with peptic ulcer disease diagnoses
    - Registered Indians had nearly 2x rate of other persons
  - No increase in gastric cancer
Gastric Cancer in Northern Canada

- Little information on rates in Aboriginal Canadians or northern territories
- Statistics Canada, 1997-2006
  - Annual number of new stomach cancer cases suppressed for low counts

<table>
<thead>
<tr>
<th>Region</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yukon</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>NWT</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Nunavut</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>
Gastric Cancer in Northern Canada

- Northwest Territories, 1990-2000

  (Cancer in the Northwest Territories. NWT Health and Social Services, 2003)

  - Age-adjusted incidence rate for NWT males 2x Canadian rate
  - 4th most frequently diagnosed cancer in NWT males
    - versus 10th for males across Canada
  - Accounts for 7% of potential years of life lost due to cancer for both men and women
    - versus 2.7% for men and 2.2% for women across Canada
Gastric Cancer in Northern Canada

Northwest Territories, 1992-2000

(Cancer in the Northwest Territories. NWT Health and Social Services, 2003)

- 22 cases diagnosed in NWT males
  - 6.6% of total cancer cases in males

- Comparing incidence rate in regional centre men (higher % aboriginal) to men across Canada, standardized incidence ratio:
  - 2.9 (95% CI, 1.3, 5.5) (*based on 9 cases*)
Gastric Cancer in Northern Canada

Northwest Territories, 1990-2000

(Cancer in the Northwest Territories. NWT Health and Social Services, 2003)

- In Dene (Athabascan First Nations) men
  - 3rd place (tied with prostate) at 7% of cancers diagnosed
  - 10% of cancer deaths

- In Inuit men
  - 2nd (after lung) at 16% of cancers diagnosed
# Gastric Cancer in Northern Canada

- **Northwest Territories, 1998-2007**  
  (Source: NWT Health and Social Services)  
  - 2006 population ~41,000

## New Cases of Stomach Cancer

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>19</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td><strong>&lt;60 years</strong></td>
<td>7</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td><strong>&gt;=60 years</strong></td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
</tbody>
</table>
Gastric Cancer in Northern Canada

- Yukon, 1997-2006
  
  (from Brendan Hanley, Medical Officer of Health, Yukon; data source: BC Cancer Agency)

  - average population ~31,000
    - 17 new cases of gastric adenocarcinoma
      - 11 in men
      - 6 in women
Community-driven research on Helicobacter pylori infection in Northern Canada

Karen J Goodman, Janis Huntington & CANHelp Working Group
(Canadian North Helicobacter pylori)

Circumpolar H. pylori Workshop
Copenhagen Sept 22, 2010
Research Context

- Aboriginal communities in Yukon and Northwest Territories express concern about health risks from *H. pylori* infection and seek research to find solutions.

- Health authorities in Northern Canada seek information
  - to improve clinical management of *H. pylori* infection given perception of frequent treatment failure
  - to inform public health policy related to *H. pylori* infection

- Some northern communities are remote with respect to advanced medical services.
CANHelp (Canadian North *Helicobacter pylori*) Working Group

Community Organizations
- Aklavik Health Committee
- Vuntut Gwitchin First Nation General Assembly, Old Crow
- Crystal Lennie, Inuvialuit Regional Corporation

NWT Agencies
- Rachel Munday, Nurse in Charge, Aklavik Health Center
- Leah Seaman, Public Health Physician, Beaufort-Delta Regional Health Authority
- Kami Kandola, Chief Public Health Officer, NWT Health and Social Services
- John Morse, Former Medical Director, Stanton Territorial Health Authority
- Susan Chatwood, Director, Institute for Circumpolar Health Research

Yukon Agencies
- Brendan Hanley, Yukon Medical Officer of Health
- Jodi Butler Walker, Arctic Health Research Network Yukon
- Norma Kassi, Arctic Health Research Network Yukon
- Nurse in Charge, Old Crow Health Centre
- Darius Elias, MLA, Yukon Legislature

Alberta Health Services
- Robert Bailey, Director, Northern Health Services Network
CANHelp (Canadian North Helicobacter pylori) Working Group

Investigators

University of Alberta

◆ Epidemiology: Karen Goodman
◆ Anthropology: Christopher Fletcher
◆ Gastroenterology: Sander van Zanten
  Justin Cheung
  Amy Morse
  Richard Fedorak
◆ Microbiology: Monika Keelan
◆ Pathology: Safwat Girgis

External Advisors

◆ Health Policy: Carl Phillips
◆ Arctic Investigations: Michael Bruce
CANHelp Working Group Goals

◆ Collaborative infrastructure development
  - University of Alberta
  - Northern Health Care Providers and Decision-makers
  - Northern Health Services Network, Alberta Health Services
  - Northern Health Research Networks
  - Northern Community Leaders and Representatives

◆ Develop research to investigate *H. pylori* infection in northern Canada to address community concerns and improve clinical management

◆ Collaborate with circumpolar *H. pylori* researchers to achieve common goals
CANHelp Working Group Research Program

- We use a collaborative and participatory approach in pursuit of the following aims:
  - To obtain representative data from diverse Arctic communities for developing public health strategies for control of *H. pylori* infection in the circumpolar north
  - To conduct policy analysis to identify cost-effective *H. pylori* management strategies that account for ethics, economics, and local cultural concerns for northern communities
  - To develop knowledge exchange strategies that help northern communities understand *H. pylori* health risks, available solutions and unsolved challenges for reducing these risks
CANHelp Working Group Pilot Project: The Aklavik H. pylori Project
Initial Study Community
Aklavik, NWT

Why Aklavik?

- Suggested by NWT health authorities as a starting place for this research
  - Community leaders had been asking for research
  - High level of community concern due to stomach cancer deaths in some families
  - Enthusiasm from local health authorities
Hamlet of Aklavik, Northwest Territories

• 2006 population: 590
  • 90% Inuvialuit (Inuit) or Gwich’in Dene (First Nation)

• Access
  • Reached only by air, water, or winter ice-road
Aklavik Health Centre
Initial Research Project
Aklavik *H. pylori* Project Goals

1) Investigate *H. pylori* infection in Aklavik
2) Include community members in research planning and conduct
3) Develop effective activities to inform community members of the research results
Aklavik *H. pylori* Project Specific Aims

Investigate *H. pylori* infection in Aklavik

» Screen residents for *H. pylori* infection, family history, symptoms
» Collect epidemiologic data on risk factors
» Offer upper endoscopy to:
  - Estimate prevalence of endoscopically significant abnormalities
  - Obtain biopsies to:
    - Characterize histopathology in relation to *H. pylori* infection
    - Estimate prevalence of strains with antibiotic resistance and virulence factors
» Evaluate effectiveness of anti-*H. pylori* therapies
Overview: Aklavik *H. pylori* Project

- **Component I**
  - Community Survey
    - (*H. pylori* screening, clinical/epidemiologic data collection)

- **Component II**
  - Endoscopy

- **Component III**
  - Treatment

- **Component IV**
  - Knowledge Exchange

- **Component V**
  - Policy Development
Aklavik H. pylori Project Participation

- Participants recruited: 379
- Clinical surveys completed: 345
- Individuals with breath test results: 333
- Aklavik residents consenting to endoscopy: 200
- Individuals from whom biopsies were obtained: 194
- Treatment trial participants: 111
- Epidemiology surveys completed:
  - Household: 165
  - Individual: 286
Questionnaire items: knowledge of *H. pylori* and reasons for community concern

2. Have you heard of *Helicobacter pylori* or *H. pylori* infection?
   - Yes 162
   - No
   - Unsure / don’t remember
   - Refused to answer

   If yes:
   2a. Can you tell me what kind of illness it causes as far as you know or from what you have heard?
       - Yes; specify all the illnesses: __________________________
       - No
       - Unsure
       - Refused to answer

   2b. Do you know or have an idea about how people get it?
       - 80 Yes; specify: __________________________
       - No
       - Unsure
       - Refused to answer

2c. How did you find out about *H. pylori* infection? (mark all that apply)
   - TV/Radio
   - Health Centre
   - Family members who had it
   - Other; specify: __________________________
   - Unsure/don’t remember
   - Refused to answer

3. Do you believe *H. pylori* infection is a community concern?
   - Yes: please specify the main reason for concern: __________________________
   - No
   - Unsure
   - Refused to answer
Have you heard of *Helicobacter pylori* or *H. pylori* infection?

- Of the 298 respondents aged 12+ years, 167 (56% [50-61]) indicated they had heard of *H. pylori* infection.
Do you know or have an idea of how people get it?

- 80 of 160 (50% [42-58]) indicated they had an idea of how people get it.

![Bar Chart]

- Contaminated water: 63%
- Personal contact/hygiene: 28%
- Germs/infectious agent: 14%
Do you believe *H. pylori* infection is a community concern?

- Of the 298 respondents, 228 (77% [71-81]) agreed that *H. pylori* is a community concern
- 188 respondents stated one or more reasons for concern

![Bar chart showing reasons for concern with the following percentages: 23% Many people have it in our community, 23% Link with Cancer, 15% Causes Illness, 13% "It's in the water", 8% People are worried/want answers, 6% It's a matter of health/safety.](image)
Breath Test Results

- 333 people were tested for *H. pylori* by UBT
- 58% were positive

Disseminating updates on number tested and prevalence in community during the testing period motivated others to participate.
## Aklavik H. pylori Project

### Selected Findings

<table>
<thead>
<tr>
<th>H. pylori Prevalence (by breath test)</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>152</td>
<td>62</td>
</tr>
<tr>
<td>Women</td>
<td>181</td>
<td>55</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inuvialuit (Inuit)</td>
<td>183</td>
<td>66</td>
</tr>
<tr>
<td>Gwich’in Dene (First Nation)</td>
<td>89</td>
<td>55</td>
</tr>
<tr>
<td>Non-aboriginal</td>
<td>41</td>
<td>25</td>
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</tbody>
</table>
## Aklavik H. *pylori* Project

**Selected Findings**

### *H. pylori* Prevalence (by breath test)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>63</td>
<td>52</td>
</tr>
<tr>
<td>15-24</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>25-39</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td>40-59</td>
<td>112</td>
<td>52</td>
</tr>
<tr>
<td>60-79</td>
<td>36</td>
<td>56</td>
</tr>
</tbody>
</table>
Aklavik residents aged >=15 years targeted
Children (10-14 years) enrolled at parents’ request
Endoscopies performed in Aklavik Health Centre
  - By visiting gastroenterologists in February 2008
  - Equipment transported temporarily to Health Center
  - Transnasal ultrathin gastroscopes
  - 5 gastric biopsies obtained from each participant for histopathology and 2 for culture
### Aklavik *H. pylori* Project

#### Endoscopic Abnormalities

<table>
<thead>
<tr>
<th>Condition</th>
<th>Gastric</th>
<th>Duodenal</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apparent inflammation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastritis</td>
<td>13.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duodenitis</td>
<td>6.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Erosions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastric</td>
<td>6.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duodenal</td>
<td>0.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ulcers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastric</td>
<td>3.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duodenal</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cancer</strong></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Esophagitis</strong></td>
<td>10.4%</td>
<td></td>
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</tr>
<tr>
<td><strong>Barrett’s Esophagus</strong></td>
<td>2.6%</td>
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</table>
### Aklavik *H. pylori* Project

#### Histopathology

**Prevalence of selected histopathology classifications**

<table>
<thead>
<tr>
<th></th>
<th><strong>All <em>H. pylori</em>+</strong></th>
<th></th>
<th></th>
<th><strong>All participants</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>n</strong></td>
<td></td>
<td><strong>129</strong></td>
<td></td>
<td><strong>194</strong></td>
</tr>
<tr>
<td>Inflammation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild (%)</td>
<td></td>
<td><strong>8</strong></td>
<td></td>
<td></td>
<td><strong>7</strong></td>
</tr>
<tr>
<td>Moderate (%)</td>
<td></td>
<td><strong>47</strong></td>
<td></td>
<td></td>
<td><strong>31</strong></td>
</tr>
<tr>
<td>Severe (%)</td>
<td></td>
<td><strong>43</strong></td>
<td></td>
<td></td>
<td><strong>29</strong></td>
</tr>
<tr>
<td>Atrophy (%)</td>
<td></td>
<td><strong>21</strong></td>
<td></td>
<td></td>
<td><strong>14</strong></td>
</tr>
<tr>
<td>Intestinal Metaplasia (%)</td>
<td></td>
<td><strong>11</strong></td>
<td></td>
<td></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>
Aklavik H. pylori Project
Selected Findings

◆ Treatment trial
  » Canada’s standard therapy
    • PPI, clarithromycin + amoxicillin (or metronidazole)
    • Canadian eradication rates from meta-analysis: 82-84% 
      (Rodgers & van Zanten 2007)
  » Sequential therapy
    • PPI and amoxicillin for days 1-5
    • PPI, tinidazole, clarithromycin for days 6-10
Aklavik *H. pylori* Project
Selected Findings

- Treatment trial *(preliminary results)*
  - Antibiotic resistance
    - Metronidazole 33%
    - Clarithromycin 13%
    - Both 4%
Aklavik H. pylori Project
Selected Findings

◆ Treatment trial *(preliminary results)*
  » Participants randomized 111
  » Post-treatment UBT result 87

  » Elimination % (negative post-test)
    • Standard 29/48 = 60% (45-74)
    • Sequential 29/39 = 74% (58-87)
Aboriginal residents of Aklavik, NWT have a high prevalence of *H. pylori* infection with elevated frequencies of:

- Erosions and ulcers of the gastric corpus relative to the duodenum
- Severe gastric inflammation
- Gastric atrophy
- Intestinal metaplasia
Endoscopic and histopathologic evaluation of Aboriginal residents of Aklavik, NWT shows a pattern consistent with an elevated risk of gastric cancer.

This assessment suggests that community worries over cancer risks from *H. pylori* infection are well-placed.

The research team aims to expand the research to other northern Canadian Aboriginal communities to obtain representative data for informing regional health policy aimed at reducing health risks from *H. pylori* infection.
From: Darius.Elias [mailto:Darius.Elias@yla.gov.yk.ca]  {Old Crow MLA in Yukon legislature}
Sent: Wednesday, August 20, 2008 11:02 AM
To: Karen Goodman
Subject: Vuntut Gwitchin First Nation Resolution No. 2008-02

Helicobacter Pylori Bacterium study in the community of Old Crow

Whereas; For many years the community members of Old Crow have voiced concerns about the high number of internal body health problems;
Whereas; Many citizens feel there is a need to address H. Pylori health concerns because of its link to developing ulcers and then stomach cancer;
Whereas; It is vitally important to have early detection and prevention of health complications that could lead to cancer and possibly death;
Whereas; H. Pylori is an urgent health concern that effects many residents of Old Crow and which we would like health authorities to address;
Whereas; An H. Pylori research study presentation was described in an information session held at the 2008 International Gwitchin Gathering in Old Crow.

Therefore Be It Resolved;

The Vuntut Gwitchin First Nation General Assembly has considered the value of participating in a H. Pylori research study and we have unanimously decided that such a project be carried out in the community of Old Crow for those citizens willing to participate;

The community of Old Crow, Yukon healthcare professionals and the Division of Gastroenterology, University of Alberta lead and facilitate this project to ensure that it stays focused on community priorities and benefits the people of Old Crow, Yukoners and the citizens of the world.
Next Steps – Expand Research to Include…

- 6 Yukon First Nations Communities
- 5 Inuvialuit Settlement Region Communities
- International Collaboration
  - Alaska
  - Greenland
Next Steps – Expand Research to…

- 5 NWT Inuvialuit communities
Next Steps – Expand Research to...

- 6 Yukon First Nations
Supporters

- Alberta Heritage Foundation for Medical Research
- Canadian Institutes of Health Research (CIHR)
  - Institute of Aboriginal People’s Health
  - Network Environments for Aboriginal Health Research (NEAHR)
    - Anisnabe Kekendazone, Ottawa
    - Nasivvik, Universite Laval
  - w/ Canadian Association for Gastroenterology & Industry Partners
- ArcticNet National Centre of Excellence
- Social Sciences and Humanities Research Council of Canada
- Indian and Northern Affairs Canada
- Canadian Circumpolar Institute
- Public Health Agency of Canada