TRANS-POLAR FAT 2008: an update on atherogenic effects and regulatory issues in Nunavik

December 9th, 2008
ArcticNet Student Day

É Counil, P Julien, E Angiyou, ML Chateau-Degat, A Ferland, P Ayotte, V Blouin, MJ Gauthier, M Grey, T Kauki, B Lamarche & É Dewailly
Importance of store-bought foods

From the Qanuippitaa Health Survey, Nunavik, 2004
Most *trans*-FA occur through the industrial hydrogenation of vegetable oils.
Trans-fat proportion in red blood cell membrane phospholipids reflects usual intakes.
Trans-fat levels are on average thrice as high in Nunavik as in Greenland.

*Short Communication*

**Trans-polar-fat: all Inuit are not equal**

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Trans-fat levels are higher in younger people in Nunavik

As an introduction, trans-fat levels are higher in younger people in Nunavik, while in Greenland, there is no significant difference. The statistical significance is marked as p<0.0001 for the comparison between young and older age groups in Nunavik, and p=0.51 for Greenland.
Why does the situation differ between Nunavik and Greenland?

**Mandatory labelling of trans-fat content of food in Canada, 2005**

**Regulation of maximum content of trans-fat allowed in food in Denmark, 2003**

Energy from store-bought food

<table>
<thead>
<tr>
<th>Age group</th>
<th>Nunavik</th>
<th>Greenland</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>18-24</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>25-34</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>35-44</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>45-54</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>55-64</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>65+</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

% Trans-FA in phospholipids

83.5% 79.0%
Study sample:
- 14 villages, people aged 18 and above
- Exclusions: non Inuit, pregnant, hyperTG when non fasting, incomplete data (n=795)

Biochemical analysis:
- Fatty acids in RBC membranes
- Blood lipoprotein profiles

Statistical analysis:
- Multiple linear regression with bootstrap
- Covariates: age, sex, bay, waist girth, lipid lowering medication, elevated trig, fasting status, omega-3 & omega-6 fatty acids
Results: association between TFA and pro-atherogenic lipid profiles in men

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta \pm \text{SE}$</td>
<td>$p$</td>
<td>$\beta \pm \text{SE}$</td>
</tr>
<tr>
<td>HDL (mmol/L)</td>
<td>$-0.220 \pm 0.052$</td>
<td>$&lt; 0.0001$</td>
<td>$-0.177 \pm 0.052$</td>
</tr>
<tr>
<td>LDL (mmol/L)</td>
<td>$0.119 \pm 0.073$</td>
<td>$0.099$</td>
<td>$0.156 \pm 0.075$</td>
</tr>
<tr>
<td>LDL/HDL</td>
<td>$0.339 \pm 0.100$</td>
<td>$0.001$</td>
<td>$0.333 \pm 0.100$</td>
</tr>
<tr>
<td>Cholesterol/HDL</td>
<td>$0.233 \pm 0.064$</td>
<td>$&lt; 0.0001$</td>
<td>$0.227 \pm 0.065$</td>
</tr>
<tr>
<td>TG/HDL</td>
<td>$0.375 \pm 0.112$</td>
<td>$0.001$</td>
<td>$0.313 \pm 0.116$</td>
</tr>
</tbody>
</table>

**Covariates 1**
- Age
- Waist
- Fasting status
- HyperTG
- Medication
- Bay of residence

**Covariates 2**
- Covariates 1 +
  - % n3-FA in RBC PL
  - % n6-FA in RBC PL

**Covariates 3**
- Covariates 2 +
  - HOMA-IR
  - Tobacco
  - Alcohol

$\beta \pm \text{SE}$: regression coefficient ± SE
## Results: association between TFA and pro-atherogenic lipid profiles in men

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<tbody>
<tr>
<td></td>
<td>$\beta \pm SE$</td>
<td>$p$</td>
</tr>
<tr>
<td>ApoA1 (g/L)</td>
<td>-0.081 ± 0.019</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>ApoB100 (g/L)</td>
<td>0.102 ± 0.058</td>
<td>0.080</td>
</tr>
<tr>
<td>ApoB100/ApoA1</td>
<td>0.183 ± 0.065</td>
<td>0.005</td>
</tr>
<tr>
<td>Non HDL-Cholesterol</td>
<td>0.119 ± 0.068</td>
<td>0.077</td>
</tr>
<tr>
<td>LDL mean size (Å)</td>
<td>-0.005 ± 0.002</td>
<td>0.008</td>
</tr>
<tr>
<td>LDL pick size (Å)</td>
<td>-0.007 ± 0.003</td>
<td>0.011</td>
</tr>
</tbody>
</table>

Biological levels of *trans*-FA are associated with pro-atherogenic blood lipid profiles in Nunavik Inuit men.
Results: association between TFA and pro-atherogenic lipid profiles in women

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>p</th>
<th>Model 2</th>
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<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \beta \pm SE )</td>
<td>( p )</td>
<td>( \beta \pm SE )</td>
<td>( p )</td>
<td>( \beta \pm SE )</td>
<td>( p )</td>
</tr>
<tr>
<td>HDL (mmol/L)</td>
<td>-0.096 ± 0.047</td>
<td>0.040</td>
<td>-0.068 ± 0.047</td>
<td>0.144</td>
<td>-0.008 ± 0.049</td>
<td>0.865</td>
</tr>
<tr>
<td>LDL (mmol/L)</td>
<td>-0.050 ± 0.062</td>
<td>0.412</td>
<td>0.002 ± 0.061</td>
<td>0.968</td>
<td>-0.032 ± 0.062</td>
<td>0.603</td>
</tr>
<tr>
<td>LDL/HDL</td>
<td>0.045 ± 0.078</td>
<td>0.562</td>
<td>0.070 ± 0.080</td>
<td>0.379</td>
<td>-0.024 ± 0.082</td>
<td>0.772</td>
</tr>
<tr>
<td>Cholesterol/HDL</td>
<td>0.034 ± 0.045</td>
<td>0.459</td>
<td>0.038 ± 0.047</td>
<td>0.424</td>
<td>-0.009 ± 0.050</td>
<td>0.857</td>
</tr>
<tr>
<td>TG/HDL</td>
<td>0.104 ± 0.089</td>
<td>0.238</td>
<td>0.026 ± 0.090</td>
<td>0.772</td>
<td>0.031 ± 0.096</td>
<td>0.749</td>
</tr>
</tbody>
</table>

\( \beta \pm SE: -0.215 \pm 0.098 \quad p=0.028 \)

Trans-FA → HDL

Women aged 50 years and over (\( n=94 \))
### Results: association between TFA and pro-atherogenic lipid profiles in women

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<tbody>
<tr>
<td></td>
<td>β ± SE</td>
<td>p</td>
<td>β ± SE</td>
<td>p</td>
<td>β ± SE</td>
<td>p</td>
</tr>
<tr>
<td>ApoA1 (g/L)</td>
<td>-0.029 ± 0.031</td>
<td>0.347</td>
<td>-0.023 ± 0.032</td>
<td>0.465</td>
<td>-0.009 ± 0.032</td>
<td>0.787</td>
</tr>
<tr>
<td>ApoB100 (g/L)</td>
<td>-0.046 ± 0.044</td>
<td>0.294</td>
<td>-0.012 ± 0.044</td>
<td>0.795</td>
<td>-0.029 ± 0.046</td>
<td>0.529</td>
</tr>
<tr>
<td>ApoB100/ApoA1</td>
<td>-0.017 ± 0.051</td>
<td>0.741</td>
<td>0.012 ± 0.053</td>
<td>0.826</td>
<td>-0.038 ± 0.055</td>
<td>0.490</td>
</tr>
<tr>
<td>Non HDL-Cholesterol</td>
<td>-0.048 ± 0.051</td>
<td>0.352</td>
<td>-0.012 ± 0.051</td>
<td>0.810</td>
<td>-0.025 ± 0.053</td>
<td>0.631</td>
</tr>
<tr>
<td>LDL mean size (Å)</td>
<td>0.000 ± 0.002</td>
<td>0.780</td>
<td>0.001 ± 0.002</td>
<td>0.576</td>
<td>0.000 ± 0.002</td>
<td>0.826</td>
</tr>
<tr>
<td>LDL pick size (Å)</td>
<td>-0.003 ± 0.002</td>
<td>0.204</td>
<td>-0.001 ± 0.002</td>
<td>0.726</td>
<td>0.000 ± 0.002</td>
<td>0.928</td>
</tr>
</tbody>
</table>

Essentially pre-menopausal women seem to be protected.
### Results: summary

<table>
<thead>
<tr>
<th>Lipid marker</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>«Good» cholesterol</td>
<td>HDL</td>
<td>↓ **</td>
</tr>
<tr>
<td></td>
<td>ApoA1</td>
<td>↓</td>
</tr>
<tr>
<td>«Bad» cholesterol</td>
<td>LDL</td>
<td>↑ *</td>
</tr>
<tr>
<td></td>
<td>Non HDL</td>
<td>↑ *</td>
</tr>
<tr>
<td></td>
<td>ApoB100</td>
<td>↑ *</td>
</tr>
<tr>
<td>Total cholesterol/HDL</td>
<td>↑ ***</td>
<td></td>
</tr>
<tr>
<td>ApoB100/ApoA1</td>
<td>↑ **</td>
<td></td>
</tr>
<tr>
<td>TG/HDL</td>
<td>↑ **</td>
<td></td>
</tr>
<tr>
<td>LDL pick size</td>
<td>↓ *</td>
<td></td>
</tr>
</tbody>
</table>

* * p <0.05  ** p <0.01  *** p <0.001 Model 2
Public health & Nutrition?
March 2007: 1st presentation about exposure to the Nunavik Nutrition and Health Committee (NNHC)
May 2007: scientific argument sent to Makivik Corporation to support a ban
June 2007: President Pita Aatami calls regional and Inuit organisations for a ban
Makivik initiative,
June 2007

Kuujjuaq, June 4, 2007

Mrs. Alacie Arrgak
President
Nunavik Regional Board of Health and Social Services
P.O. Box 900
Kuujjuaq, Qc
J9M 1C0

Dear Mrs. Alacie Arrgak:

You will find enclosed a joint letter, which I have received from Dr. Eric Dewailly and Dr. Emile Counil, both from the Public Health Research Unit of the CHUL-CHUQ. This letter was directed to me as I had recently supported a research proposal that Dr. Dewailly had prepared in order to study the exposure to trans-fats through imported foods in Nunavik, and its health implications.

Dr. Dewailly has been working on public health issues in Nunavik for many years and has been particularly involved in the area of food contaminants impacting on Inuit health. Through his research, he has provided Nunavik the ability to make informed decisions on healthy diets. Despite the fact that there has been bad publicity about contaminants in our country food chain, it has always been the advice of the public health authorities that the benefits of our traditional diet far outweigh the risks. Our traditional foods have been subject to research for many years which has caused our people to question its safety. I am now raising the question as to why the imported foods with all their additives are not being researched as to what they are doing to Inuit health.

With this in mind, I believe that the big risk is the emerging new diet of the Inuit which consists far too much of what we call “junk or fast food”. We are all aware that the diet of young Inuit consists of very unhealthy choices such as heat-ups and soda drinks. These choices of food are a source of large exposure to trans-fats as pointed out in Dr. Dewailly’s letter, not to mention the high intake of sugar from the soda pops and other sources that nearly everyone is consuming from a very young age.

Included with this letter is “A call for a ban on industrially produced trans-fats in foods imported in Nunavik” and it is written to provide scientific evidence to show that it is necessary and feasible to ban these food products sold in Nunavik. The argument is built around seven allegations, which provide clear information on the known and suspected harmful effects as well as the vulnerability of Inuit to this exposure. Not only in Nunavik, but throughout the Circumpolar world.

I sincerely believe this is a public health threat and I am calling upon you as fellow leaders to work together on promotion of healthy eating. This can be done through awareness and education in schools and through the health services, public service announcements through the media and convincing our main retail providers on the importance of taking action. As far as trans-fats are concerned, the Laval University has issued a list of trans-free products in 2003. This proves it is possible to choose to import trans-fat-free products to Nunavik. This list must be even longer today since labeling became mandatory in 2003, which encouraged efforts from the food industry to reduce trans-fats levels.

Action taken now will prevent future diseases such as cardio-vascular, as well as diabetes which is already emerging very fast amongst our people. With the already high cost of health care delivery in our region, imagine the future with the emergence of these chronic diseases brought on by unhealthy eating. I would suggest that you start thinking on how this issue might be addressed within your organization and how you can promote healthy food consumption.

Thank you for your usual collaboration, I remain,

Pita Aatami
President

cc: Dr. Serge Dery, Nunavik Public Health Director
Suzanne Bruneau, Coordinator, NNHC
Minnie Grey, Makivik
Makivik initiative, June 2007

Mrs. Alacie Arrgak
President
Nunavik Regional Board of Health and Social Services
P.O. Box 900
Kuujjuaq, Qc
J0M 1C0

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Thank you for your usual collaboration, I remain,

[Signature]

Pita Aatami
President

Kuujjuaq, June 4, 2007
As an introduction

Who could do what to change the situation in Nunavik?

Provincial government

Federal government

Legal restriction

Labelling

Ø !!
Who could do what to change the situation in Nunavik?

- Nutritional education
- Improvement of the quality of the Northern food supply

Change the **food environment** rather than put pressure on people to have them change their eating behaviour.
As an introduction

Who could do what to change the situation in Nunavik?

Regional adm°: Makivik, KRG, KSB, RBHSS

Provincial government

Air Inuit

First Air

daycare

schools

restaurants

stores

hospitals

Change the food environment rather than put pressure on people to have them change their eating behaviour
Who could do what to change the situation in Nunavik?

Change the **food environment** rather than put pressure on people to have them change their eating behaviour.
Timeline of initiatives

- August-Nov. 2007: Feasibility study
  - U Laval, Minnie Grey co-researcher, implication of an Inuk student

- Dec. 2007-March 2008: Presentation at conferences
  - Media coverage (Toronto Star, Nunatsiaq News)

- March 2008: 2nd presentation to NNHC
  - Atherogenic effects and feasibility
  - Mission in Akulivik (Ungava Bay)

- June 2008: memorandum sent to NNHC & RBHSS
  - NNHC takes position

- September 2008: First Air & Air Inuit answer

- November 2008: meeting with Kativik Regional Government
Reducing the *trans*-fat content of foods sold in Nunavik communities

Project of replacement of store-bought foods with high amounts of *trans*-fat with better quality products in Nunavik groceries
T07. IPY 2007-2008 Research:
Health and Well-Being of Northerners
Room 205C

Consumption of Sugar-Sweetened Beverages and Components of the Metabolic Syndrome in Inuit adults of Northern Québec (Nunavik)

Thursday 11th, 10:45 am

Akulivik
Northern Store,
March 2008
Aknowledgements

Thank you for your attention!

Nunavik
All Inuit participants!

My co-authors
Public Health Research Unit
Marie-Ludivine Château-Degat
Annie Ferland
Éric Dewailly
Laval University
Benoît Lamarche
Pierre Ayotte
Valérie Blouin

Lipid Research Centre
Pierre Julien
RBHSS
Marie-Josée Gauthier
Elena Labranche
Serge Dery
NNHC
Eli Angiyou

Makivik Corporation
Minnie Grey
Joanimmarik School
Taqralik Kauki
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