Food safety in the Arctic and human health: contaminant exposure by dietary intake

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www.oulu.fi/arctichealth
University of the Arctic: TN Health and well-being in the Arctic (established 2005)

- **Master’s program** Health and well-being in the circumpolar area (2009), UArctic program
- **Joint summer/winter schools** of Master’s and PhD students and international conferences and seminars (since 2010)
- **Research projects**, e.g. Arctic health risks (ArcRisk, leaded by AMAP, 2009-14), Kolartic-ENPI projects (2012-14, research projects between BCBU projects 2009-13)
- **UArctic PhD program** in Arctic health and well-being (2012-14) - funded by Nordforsk
PhD program & courses 2010 - 2013

- **Norden, Top-level Research Initiative program** (2010-2013, for Nordic PhD students and teachers) - UArctic, & Global change TN
- **UArctic PhD program on Arctic health and well-being** (Arctic Co-operation Programme 2012-2014)

Winter/summer schools, seminars:
- Copenhagen, May 2010: Dietary assessments
- Oulu, November 2010: People in changing climate
- Kautokeino, March 2011: Reindeer herding
- Oulu, June 2011: Risk assessment and Risk communication
- Abisko, May 2012: Snowtalks
- Fairbanks, August 2012: Health literacy and women’s health
- Oulu, November 2012: Security in changing world
- Abisko, May 2013: Health impact assessment and climate change
- Nuuk, September 2013: Health, society, and environment in relation to large-scale industrial projects
- Anchorage, August 2014

- Collaboration with the University of the Arctic thematic networks
- Collaboration between different universities in the Arctic, national doctoral programs and research networks, like NCHR and IUCH
Contaminant exposure
Mercury in maternal blood (AMAP, 2003, 2004)
Mercury Emissions, 2000
diffuse + point sources

Mercury emissions (tonne/0.5 degree grid cell)
- < 0.0002
- 0.000200 - 0.020000
- 0.020001 - 0.100000
- 0.100001 - 0.300000
- 0.300001 - 0.700000
- 0.700001 - 1.500000
- 1.500001 - 3.000000
- 3.000001 - 9.000000
- 9.000001 - 19.123400

no projection (geographic)
Arctic Health Risks: Impacts on health in the Arctic and Europe owing to climate-induced changes in contaminant cycling

www.arcrisk.eu  www.arcrisk.eu
Hg - Europe  Helle Knutsen, NIPH

Blood Hg

Hair Hg

* min-max (no 5 or 95-perc), ** no 5-perc, max (no 95-perc)
Simplified causal diagram of how climate change may influence contaminant exposure via seafood consumption

Based on current predictors of contaminant exposure, the influence of climate changes on future contaminant exposure will to a large degree depend on the consumption of fish and other seafood.

Russian birth cohorts 2001-2012

- 18 native communities (407 birth cohort pairs, 1514 adults)
- Aims: to reduce the human exposure to environmental contaminants and related health effects; and to develop the scientifically sound, technically feasible and ethically acceptable recommendations on community-based approach and strategy to reduce risks associated with environmental contaminants of health importance.
Нельзя!!!

Курить, пить, пить, пить и пить водку, водку, водку.

Для хранения воды, приготовления пищи необходимо использовать только чистую воду, которая не содержит никаких вредных примесей. Не пить бутилированную воду, которая может содержать вредные химические вещества. Рекомендуется использовать питьевую воду, которая прошла очистительные процедуры.

Что нужно знать о традиционном питании на Крайнем Севере

Рекомендации для малочисленных коренных народов, проживающих в Мурманской области, в Ненецком и Таймырском АО, а также во внутренних районах Чукотского АО

В жизни коренных народов Севера за последние 10 лет произошли большие изменения. Были местные животные, птицы, рыбы и олени. Судя по изменениям, которые произошли в последние годы, необходимо следить за состоянием здоровья местных жителей.

Соблюдение этих советов поможет Вам сохранить свое здоровье и здоровье Ваших близких.

Если вы соблюдаете эти советы, вы можете заметить в своем здоровье улучшение.

Ододондя, 2013
Climate change effects on human health in Arctic area – hot spots

- Rapidly spreading areal of blood-sucking arthropods capable of transmitting vector-borne diseases;
- Increase in human exposure to air-borne and water-borne infections;
- Remobilization of persistent toxicants from local sources to food and water

Odland, 2013

Odland, 2013
Annual incidence rates of diseases potentially associated with the exposure to POPs in indigenous population

Incidence rate of diseases associated with the human exposure to POPs, new cases per 1000

- Malignancies
- Adverse pregnancy outcomes
- Endocrine disorders

Odland, 2013
Intensity of Tsunami Occurred in the South-East Pacific Region
Moose and reindeer

Finnish semi-domesticated reindeer food chain study – started in 2006 (meat, internal organs; liver, kidneys, abdominal fat, lymph nodes), and reindeer milk, fetuses

Moose is important game animal in Finland; research (liver, meat) – Good pollution indicator – natural pastures

Suutari, 2013
Organic contaminants in moose and reindeer in the Nordic countries

- **Sweden**: 20 years’ program (1986-2006) - very low levels or below the level of detection for most years, decreasing all the time fish > moose, reindeer; PBDEs are not measurable in reindeer & moose (Danielsson et al. Report no 7: 2008, Swedish Natural History)

- **Norway**: Recent studies - low levels of contaminants and Cd high in reindeer meat and liver - recently some high cadmium levels in moose (Hassan et al, Int J Circumpolar Health 2012: 71; 1-7 & Hassan et al Acta Vet Scand 2013; 55:57)

- **Finland**: 2004-2006 very high levels of dioxins in reindeer calves - monitoring project
Starting point: Regular Finnish food supplies monitoring

Change in time of WHO_{total-TEQs} in Finnish reindeer meat samples from 2003 to 2005

WHO_{total-TEQ pg/g fat}

Year


Suutari, 2013
Chemicals

- Polychlorinated dibenzo-\(p\)-dioxins and dibenzofurans (PCDD/Fs)
  - By-products of different burning processes
- Polychlorinated biphenyls (PCBs)
  - Intentionally produced chemicals
- Polybrominated diphenyl ethers (PBDEs)
  - Flame retardants
PCDD/Fs, PCBs and PBDEs in moose and reindeer liver and meat\textsuperscript{1,2}


Modeling
Modeling

- CoZMoMAN
Extrapolated concentrations of PCB153 in plasma lipids (ng/g lipid) for different birth cohorts. The dotted and solid curve bundle estimates PCB153 concentrations for the 50th population percentile. Dashed envelope estimates maximum concentrations of all birth cohorts for the 90th population percentile.

Kolartic-ENPI research project: Food and human security at the borders - Norway, Finland, Russia

Food questionnaires
Samples from local food
Blood samples from pregnant women
Indicators of food and water security in an Arctic health context

• Several conferences, publications and workshops
• Joint effort of the health working groups of Arctic Council, under AMAP and SDWG
• Results of research projects and monitoring data from AMAP and Arctic infection monitoring project
• Started Jan 2012 by literature review, joint workshops Dec 2012 and Jan 2013
• Published papers:
  and Nilsson et al, Int J Circumpolar Health 2013, 72: 21530
Indicators of food and water security

- Healthy weight (BMI, children, >30)
- Self-estimated proportion of traditional food in diet
- Non-monetary food accessibility
- Monetary food accessibility
- Foodborne diseases
- Food-related contaminants
  - Contaminants in food, biological contaminants, chemical contaminants in humans

Per capita renewable water, Accessibility of running water, Waterborne diseases, Drinking water contaminants, Authorized water quality assurance, Water safety plans
Indicators of the food and water security

• 12 indicators suggested, based on existing WHO and FAO indicators - comparative globally
• Starting point for monitoring both indigenous and non-indigenous in rural and urban areas in the Arctic
• Identifying and developing an improved monitoring program by focusing already existing national registers and biomonitoring with eight Arctic countries
Thank you!

Photo: Henriika Salmi