One Health: Activities and Achievements (2017-19)

Introduction

The One Health process advances a multidisciplinary approach to health risks for humans, animals, plants and the environment. During the U.S. Chairmanship (2015-17) of the Arctic Council, the U.S. and Canada introduced a One Health project designed to strengthen regional knowledge sharing and coordination regarding a variety of Arctic One Health concerns, such as infectious and vector borne diseases, water and food safety, environmental contamination, and changes in animal species distribution. The project advances operational One Health networks in the region by promoting knowledge sharing, exercises, and collaborative investigations of One Health phenomena.

In fall 2017, Finland joined the project as a co-lead. This report is a summary of the Finnish, U.S. and Canadian activities and achievements in One Health project during the Finnish Chairmanship of the Arctic Council. The main actions include a study tour in the U.S. under International Visiting Leadership Program (IVLP), a Table Top Exercise (TTX) in Ottawa, One Health conference in Oulu, the establishment of the TremArctic network, two published papers and two manuscripts, joint sessions and presentations in scientific conferences, seminars and workshops, and joint meetings and collaboration with the other Arctic Council Working Groups, scientific projects, organisations and the University of the Arctic. The report concludes with some updated proposals for further work, based on previous works and reflecting progress over the past two years.

Joint activities in 2017-19

International Visitor Leadership Program to the United States

In May 2018, the United States hosted Health Surveillance in the Arctic under the auspices of the International Visitor Leadership Program. The program had the following objectives:

- Highlight good practices for mitigating animal disease transmission in the context of One Health (human-animal-environmental joint risk management)
- Examine federal, state, local, tribal, and nongovernmental innovations and approaches
- Explore U.S. culture, learn about the culture of Arctic communities, and identify linkages between cultural patterns and One Health phenomena

Nine participants visited the United States and represented five Arctic states (Canada, Finland, Iceland, Norway, and Russia).
The group visited a number of key locales specializing in One Health, with a focus on innovative training programs, technologies, and processes that serve to operationalize One Health in the Arctic context. The group’s stops included Minneapolis, Minnesota; Anchorage, Alaska and Fairbanks, Alaska. A site visit to Alaska Sea Life Center in Seward, Alaska was also included in the programme. Detailed programme of the visit is annexed to this summary report.

The IVLP trip focused on ways to build concrete linkages between human, animal, and environmental health stakeholders, to advance Arctic regional resilience and reduce health risks. The program focused on three key aspects of One Health innovation: innovative processes to increase collaboration among human, animal, and environmental health stakeholders; innovative training programs to build One Health capacity; and innovative technologies to facilitate the practice of One Health in the Arctic.

All of the visits included a heavy emphasis on project demonstration, and on cultivating an active discussion about the similarities and differences among Arctic communities from across the circumpolar region. While many key aspects of human, animal, and environmental health are locally distinct, the group identified a number of collaborations on scientific study, training, and technologies that are of mutual interest across geographic borders.

Relationships formed during this visit directly informed the Arctic Council One Health Table Top Exercise, convened in Ottawa in December 2018.

Figure 1: Group photo of the IVLP participants, Kenai, Alaska, May 2018
Table Top Exercise in Canada

A One Health Table Top Exercise (TTX) was held as a side meeting at the ArcticNet Annual Scientific Meeting in Ottawa, Canada, December 10-11, 2018. The TTX assessed networks for preparing and responding to two hypothetical health emergencies, one scenario focused on a transboundary disease outbreak among land animals that are raised or hunted for subsistence (such as Chronic Wasting Disease in caribou). This scenario focused on the coordination and information flow needed to rapidly diagnose and respond to the outbreak. The second scenario focused on the grounding of a ship carrying international civilian passengers and a related disease outbreak. This scenario focused on the coordination and information flow needed to support health aspects of effective emergency response.

The TTX involved circumpolar participation, with participants from Finland, Iceland, Canada, the United States, and representatives from Canadian Permanent Participant organizations in attendance. Various animal and human health experts, community stakeholders, policymakers, and other relevant attendees contributed to the exercise. The exercise included participation from a master facilitator from the University of Minnesota and applied the One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART™). Participants concluded by devising action plans with concrete next steps that they intended to pursue. Several community-based participants expressed interest in replicating TTX activities in their home communities.

Detailed report of the TTX is annexed (Annex 2). A copy of the report is also available in Inuktitut.

Figure 2 and 3: Breakout discussions at the One Health Table Top Exercise in Ottawa
The conference was held in Oulu February 7 – 9, 2019, drawing nearly 100 registered participants from 16 countries, including 24 early career researchers and Indigenous participants with travel grants from the U.S. National Science Foundation. The meeting served as an integral part of Finland’s Arctic Council Chairmanship program and was open to scientists, students, policy makers, businesses and all other interested stakeholders. Science sections focused on all the multidisciplinary themes of One Health approach - health of environment, wildlife, semi-domestic animals and humans - from social aspects to technological solutions. One Health enhances participatory community-based approaches for identifying and responding to health and well-being issues in communities, which take into account traditional and local knowledge. In the first day there were keynote sessions, the second day was for oral and poster presentations and the third day was for planning joint activities and next steps in One Health actions.

In the first day there were keynote sessions, the second day was for oral and poster presentations and the third day allowed for planning joint activities and next steps in One Health actions. Key areas for further exploration and work included:

• The need for more exchange and educational programs to learn about best practices and how they can be adapted to other Arctic communities
• The need for better communication, data management and data sharing practices
• The need for inclusion of non-traditional stakeholders (such as social science and the private sector) in One Health activities, as well as women, youth, and indigenous communities
• The need for greater collaboration and coordination between Arctic and sub-Arctic projects and communities, since many One Health phenomena extend beyond the Arctic region
• The importance of addressing new phenomena (such as vectors carrying emerging diseases, marine debris, etc.) and applying new technologies (such as improved diagnostics) to address One Health issues
• The difficulty and importance of building networks with common language and shared goals across complex and different systems and sectors
• The importance of demonstrating impact
• The continuation of One Health conferences such as this one

The conference program and abstracts are annexed (Annex 3).

Publications and TremArctic Network

Finnish One Health team from the University of Oulu¹, National Institute for Health and Welfare² (THL), University of Helsinki³ and the Finnish Food Authority⁴ published two papers and prepared two manuscripts on human and wildlife health. In addition, a TremArctic network was established. This work was supported by a grant from the Ministry for Foreign Affairs of Finland. Short summaries of the papers and manuscripts and TremArctic networking can be found below.

Current status of contaminants and their health effects in Arctic human populations (Abass et al. 2018)

Humans are exposed to environmental contaminants through ingestion, inhalation and dermal absorption. In the Arctic, consuming a traditional diet is one of the main sources of exposure to persistent organic pollutants (POPs) and toxic metals. These contaminants have the potential to be transported and accumulated in wildlife and humans from other parts of the globe. Recent reviews of contaminant trends showed that Arctic environment and ecosystem changes are expected to impact directly or indirectly the distribution profiles of environmental contaminants in the Arctic.

Although use of POPs has been either phased-out or limited, POPs still exist in humans and biota. Levels and existence of POPs vary considerably between geographical areas and between species. Data presented by Arctic Monitoring and Assessment Programme (AMAP) depends on each of the Arctic countries’ National Implementation Plans in order to produce relevant information needed for Arctic monitoring research. The aim of this report was to provide a firm basis for future levels and effects of pollutants in humans of the Arctic under climate and environmental changes (see Abass et al. 2018 for more details and references).

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² Ilkka Miettinen, Hannu Kiviranta
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Time series of 31 contaminants in humans by different lengths of time-series and periods in the Arctic cohorts were studied. International restrictions have decreased the levels of most persistent organic pollutants in humans and food webs with the exception of oxychlordane, HCB, PBDE153 and PFCs. On the other hand, broad ranges of new chemicals of emerging Arctic concern have been identified (AMAP 2017), and it is essential to continue monitoring in different environmental mediums as well as in human biological matrices over wider geographical areas.

Studies on the impact of pollutants on human health are challenging to undertake with many other confounding factors influencing health at the same time. There have been several EU projects to investigate the link between exposure to environmental contaminants and their risks for human health, such as relationships between exposure and neurobehavioral, reproductive, cardiovascular, endocrine, and carcinogenic effects. Human health risk assessment from exposure to contaminants could be evaluated through several approaches, i.e. long-term retrospective epidemiological studies, modelling, systematic review, and toxicological cutoff reference values.

Future research should focus on new emerging contaminants as well as establishing toxicological cut-off points to evaluate the health consequences for humans. Furthermore, new approaches need to be developed to estimate the magnitudes of health effects of exposed populations as well as determine the effects of mixtures.

Current status of human and wildlife infectious diseases in the Arctic (Waits et al. 2018 and 2019)

Tuberculosis, sexually transmitted infections, zoonotic and vector-borne diseases, and food- and waterborne diseases are significant burdens to Arctic residents’ health. Changes in the Arctic, especially climate change and globalization, add additional challenges with regard to infectious diseases. Climatic factors and climate change are causing environmental changes, significantly impacting zoonotic and vector-borne diseases, and food- and water-borne diseases. The growing number of tourists and immigrants adds additional risk for introduction of pathogens. Increased prevention, vaccination, and education will be important in mitigating the effects of climate change on infectious disease rates in the Arctic, even if opportunities for infection may increase as a result of climate change. Additionally, monitoring and data compilation across the Arctic will help to predict and reduce economic costs and risks to humans.

Food sources, habitats, migratory timing, distribution patterns, and reproductive success of different species are changing with globalization and climate changes. As a result, changes in wildlife infectious diseases are occurring. As the climate gets warmer and becomes more favorable for development and reproduction of certain pathogens and insect vectors, there is a greater risk for wildlife infections. New disease exposures and stresses put additional risk for wildlife. Surveillance, vaccination, and education of people interacting with the Arctic wildlife will be crucial for mitigating the changes in wildlife infectious diseases.
The existing legislation requires equal rights to safe drinking water (DW) and sanitation. National statistics on DW and sanitation services indicated that improved services prevail in large population centres. Improved DW and sanitation systems are not available for all rural inhabitants. A specific challenge in circumpolar region is related with permafrost soil preventing usage of ground water in many areas. Running water systems for DW are not always feasible in Arctic regions. Pipelines need to be properly isolated preventing from getting frozen. Emerging problem is related with thawing of permafrost which may disrupt DW and waste water systems. Thus, alternative drinking water sources/transport options need to be applied. This may include usage of self-hauling water sources or transportation of DW with tanks. Water quality problems may occur, hampering public perception (trust) on DW or even causing a risk to waterborne infections. In some regions, lack of adequate domestic water jeopardizes adequate amount of water required for every-day hygiene to prevent water-washed diseases. Lack of running water may also influence to cost of water, which can be a remarkable economic burden. (See more: coming report, Finnish Food Authority)

*TremArctic Networking (Oksanen and Lavikainen)*

The primary aim of the TremArctic Network is to foster collaboration within zoonotic fish-borne trematode infection research in the circumpolar North. Secondary aim has been to promote collaboration in cestode research. Even though there is no indication that the North American liver fluke *Metorchis conjunctus* would be disappearing from the wildlife cycle, human cases have become rare, possibly mostly due to change in diet with less consumption of raw sucker fish (Catostomidae). This may, however, change, if the increasing interest in eating raw fish will also cover sucker fish and/or invasive cyprinid species potentially spreading in northern North America. In this case, fish-borne liver flukes could rapidly re-emerge in North America.

In Russia, especially in Siberia, *Metorchis bilis* and *Opisthorchis felineus* liver flukes are important zoonotic agents. The recent discovery of the former species in the Gulf of Finland has caused concern both in Russia and in Finland, and has led to research collaboration. Common interest in Taeniidae tapeworms has initiated Russian-Finnish genetic research of *Echinococcus* spp. and *Taenia* spp. from the Siberian (Nenets Autonomous Region) and Northwest-Russian (Nenets Autonomous Region and Murmansk Oblast) reindeer herding areas, as well as from Finland. As the rodent-borne *Echinococcus multilocularis* is emerging in Canada, and the moose- and caribou-borne *Echinococcus canadensis* is prevalent in wolves and hunting dogs in Canada, and apparently also in Alaska, mutual interest has been expressed to identify parasite isolates in the circumpolar Arctic.
Joint sessions and presentations in conferences

As part of the One Health project, a special session on Arctic One Health was held at the 5th International One Health Congress in Saskatoon, Saskatchewan, on June 22 - 25 2018. Canadian, American, and Finnish health experts and project collaborators (Corriveau, Hennessy, Cox & Oksanen) presented a poster titled “International Circumpolar Partnerships in One Health: Role of the Arctic Council” (see below). The poster showcased ongoing and growing One Health concerns in the Arctic, One Health activities, and the future direction of One Health priorities in the Arctic. In addition, a breakout meeting with the Alaska and Canadian experts also took place to discuss the emerging issue of pathogens such as anthrax emerging from thawing permafrost. The poster presenters drew the attention of event organizers to the need for a One Health approach in the Arctic. Congress organizers believed that future Congresses would benefit from including an Arctic One Health focus, at the 6th One Health Congress in Scotland in 2020.

In the 17th International Congress of Circumpolar Health in Copenhagen, August 12- 15, 2019 One Health project was also featured and well received through a panel session and workshop presentation titled “International Circumpolar Partnerships in One Health; Role of the Arctic Council” under an Arctic Council sponsored panel hosted at 2018. The One Health project collaborators (Hennessy, Corriveau & Rautio) presented key outcomes of the One Health project.

The U.S. Embassy in Copenhagen has supported One Health activities, including a six-week visit of Dr. Tom Hennessy of the U.S. Centers for Disease Control and Prevention under the auspices of the U.S. Embassy Science Fellows program in 2017.

In addition of these presentations there have been oral and poster presentations concerning One Health project in several conferences, seminars and workshops. All these occasions are important to discuss the SDWG’s One Health project achievements and introduce research and education collaboration across the Arctic.

Collaboration with other Arctic Council Working Groups and other organisations

There are human health expert groups under the Arctic Council SDWG (AHHEG) and AMAP (HHAG) Working Groups (WGs). During the last two years there have been two joint meetings (Inari 2017 and Copenhagen 2018) focusing on identifying potential areas of closer collaboration. One important common topic is One Health. It is important to continue and strengthen collaboration with AMAP, but also to inform other WGs about the actions and projects on One Health under SDWG and AMAP.

The University of Alaska (Fairbanks) has joined the UArctic Thematic Network of Health and Well-being in the Arctic, which enhances collaboration and improves visibility on
The Circumpolar North and One Health
- The region north of 60° latitude includes:
  - 44 M square kilometers of land
  - 10 million human inhabitants, dozens of indigenous groups
  - Diverse environments and harsh weather
  - Rapid warming and environmental change

- **One Health is a good match for the North**
  - Strong history of health issues at human, animal, environment nexus
  - Aligns with indigenous holistic perspectives
  - Can enhance community engagement and use of local and traditional knowledge
  - Builds upon existing multidisciplinary collaborations
  - Rapid environmental and societal changes demand integrative responses and policies

Examples of One Health Issues in the Circumpolar North
- Zoomers: Ticks in wolves, fibres in fox and dogs
- Anthropogenic: contaminants and subsistence foods
- Wildlife health: animal die-offs, range expansion of ticks
- Food Security: altered abundance and phenology
- Increasing Wildfires: threats to habitations, air quality, habitat loss

- Climate and environmental change
  - Permafrost thaw, infrastructure damage, habitat change
  - Range expansion of southern species, “shrubification” of the tundra
  - Loss of sea ice, impact on sea dependent species
  - Ocean temperature rise, risk of harmful algal blooms

The Role of the Arctic Council
- The leading intergovernmental forum promoting cooperation, coordination and interaction on common Arctic issues.
- Founded 1996, chairmanship rotates every 2 years
- Participants include the Arctic States, Arctic indigenous communities and other Arctic inhabitants

- The Arctic States are:
  - Canada, Kingdom of Denmark (Greenland), Finland, Iceland
  - Norway, the Russian Federation, Sweden and the United States
- Permanent Participants (PP, Arctic Indigenous Peoples)
  - Arctic Council International Association, Arctic Indigenous Council, Council of Arctic Council Members, Russian Association of Indigenous Peoples of the North, Swam Council
- Decisions made by consensus of States, with full consultation of PP
- Implementing actions is responsibility of each individual Arctic State
- Issues include: sustainable development and environmental protection

- Six Working Groups:
  - Arctic Contaminant Action Program
  - Arctic Monitoring and Assessment Program
  - Conservation of Arctic Flora and Fauna
  - Emergency Prevention, Preparedness and Response
  - Protection of Arctic Msher Environment
  - Sustainable Development Working Group

Operationalizing One Health in the Arctic
- **Objective**
  - Promote use of a One Health approach in the Arctic

  **PHASE I: 2015 – 17**
  - Activities
    - Survey of One Health Awareness and Practice, 2016
      - Web-based, promoted through Arctic Council
      - “Chain response” methodology
      - Respondents answered and pass web-link to 3 others
      - 26 questions, multiple choice and open-ended
      - 336 respondents, 14 nations, including all Arctic States
      - 51% familiar with OH, only 13% had formal training
      - 93% interested in international OH collaboration
      - Strong interest, need for further training and opportunities to apply OH in the Arctic

    - Knowledge Sharing Events and Workshops
      - Activities to educate and promote a OH approach to Arctic audiences
        - Oulu, Finland
          - 2015, Circumpolar Health Congress
        - Anchorage, Alaska
          - 2015, Arctic Council
        - Hanover, New Hampshire
          - 2016, Arctic Fullbright Conference
        - Fairbanks, Alaska
          - 2016 Arctic Science Summit
        - Anchorage, Alaska
          - 2017 Alaska Forum on Environment
        - Washington, DC
          - 2017 Int’l Arctic Science Conference
        - Fairbanks, Alaska
          - 2017 Arctic Council Ministerial
        - Minnesota and Alaska
          - 2018 Int’l Visitor Leadership Program

    - 3. One Health Table Top Exercise, February 2017, Anchorage, Alaska
      - Used “OH SMART” tool by USDA and U of Minnesota
      - https://foodprotection.unr.edu/one-health-smart
      - Simulates an event, identifies strengths and gaps
      - 40 participants, US, Canada, Norway, Finland, 2 PP groups
        - Mix of local, regional and national representatives
        - 2 Scenarios
          - Wildlife
            - Acute response, long-term effects
          - Marine Mammal Die-Off
            - Detect, monitor and determine cause
        - Food security and safety impact
        - Demonstrated benefits from regular contact
        - Identified gaps in communication and policy to address

    - Objectives
      - Continuous knowledge and information sharing
      - Create network of animal disease laboratories
        - Example: “Tronkuls” network on zoonotic flukes
      - Further simulation exercises for capacity building
      - Develop cooperative activities for observation
      - Identify OH Hubs or Points of Contact for each region

The Future for One Health in the Circumpolar North
- The Arctic region is ready for an applied OH approach
- Many new and ongoing health issues
- Strong interest and an identified need for OH training, applications
- Existing network of international scientific and diplomatic support
- Arctic Council can provide forum for ongoing efforts

Contact
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  - 9072663127
- Sarah Cox, Government of Canada, Representative to SDWGS
  - Sarah_cox@canada.ca
- Antti Oksanen, Finnish Food Safety Authority Evira
  - Antti.Oksanen@evira.fi

Figure 7: Poster presented at the International One Health Congress in Saskatoon, June 2018
One Health education and research (e.g. Masters’ program on One Health). Collaboration with INTERACT (https://eu-interact.org/, EU funded project, monitoring of possible vectors for zoonotic diseases), Nunataryuk (https://nunataryuk.org, Horizon project, modelling and risk assessment of anthrax and contaminants), and CLINF (https://clinf.org, Nordic Centre of Excellence, climate change effects on infectious diseases) will give opportunities to share knowledge, which is needed when planning next steps of the One Health approach.

**Proposed action items for further work**

1. The Arctic Council and SDWG should continue to promote One Health as a key strategy for regional resilience.

2. The Arctic Council and SDWG should continue to play a valuable role by forming a platform for knowledge sharing, simulated exercises, and collaborative investigations of One Health phenomena, and by creating avenues for the inclusion of Traditional and Local Knowledge (TLK) as a key aspect of One Health understanding and practice in the Arctic region.

3. The Arctic Council, SDWG, Member States, Permanent Participants, Accredited Observers, and Arctic communities should promote regular and recurring Table Top Exercises as well as other international collaborative investigations, educational programs and exchange as tools for continued capacity building and relationship strengthening. Sharing plans for, progress toward, and results of international collaboration with affected communities is a key to successful work. Nongovernmental groups should be encouraged to participate in the work.

4. Arctic Council member states, Permanent Participants, and Accredited Observers should identify and empower One Health Hubs/Points of Contact (POCs)

**References**


ANNEX I

ONE HEALTH IVLP TRIP TO THE U.S.

Minneapolis, Minnesota May 14 - 16, 2018
Opening session
Global One Health Initiative, College of Veterinary Medicine, University of Minnesota
USDA-One Health Coordination Center

Anchorage, Alaska May 16 - 20, May 25-26, 2018
US Department of Agriculture, veterinary medical officer
US Department of Interior, Wildlife Health specialist
Alaska Native Tribal Health Consortium
Alaska Department of Health and Social Services
Alaska State Veterinarian
Alaska State Epidemiologist
Trip to Denali National Park

Fairbanks, Alaska May 20 - 25, 2018
Alaska Department of Fish and Game, Wildlife Veterinarian
University of Alaska Fairbanks, Department of Veterinary Medicine
Trip to Seward, Alaska

The first set of meetings, in Minnesota, focused on the U.S. Department of Agriculture’s collaboration with the University of Minnesota and the One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART™). OH-SMART™ is the framework used for Arctic Council One Health Table Top Exercises in both 2017 and 2018.

Meetings in Anchorage, Alaska focused on the role of federal, state, local, tribal, and nongovernmental stakeholders in advancing One Health operations within Alaska, and comparing these processes with those from the visitors’ home countries. Several of the meetings included members of the Alaska One Health Working Group. A site visit to the Portage Valley was also arranged, to learn about monitoring of disease in local wildlife populations, some of which may be zoonotic (transmissible from other animals to humans).

Meetings in Fairbanks, Alaska focused on the University of Alaska-Fairbanks’s teaching and research programs related to One Health, including lectures from a number of professors and a visit to the university’s Large Animal Research Station. The group also met with state and federal agencies and visited with engineers who design and produce water and sanitation products for decentralized sewer service in cold climate communities.
Finally, the group’s tour included a side visit to the Alaska Sea Life Center in Seward, Alaska – focused on the Center’s work to monitor and detect health risks in marine animals, which play a key role in the health and subsistence of many Arctic communities.
TABLE TOP EXERCISE

DESCRIPTION

What is a Table Top Exercise (TTX)?
In an emergency management TTX, stakeholders are assembled in a common space and presented with a hypothetical scenario, such as a disease outbreak or a natural disaster. Stakeholders – who are selected to represent a diversity of backgrounds, disciplines, sectors, and levels of governance – are then asked to walk through the steps of a response. For example, they may be asked who they would communicate with, what tasks they would undertake and in which sequence, and so on. Disconnects are flagged and plans are established to close gaps or resolve discrepancies. A master facilitator and several group facilitators guide the process and ensures that everyone participates. The first-ever Arctic Council One Health Table Top Exercise was convened in Anchorage, Alaska, USA from February 1-3, 2017; the second-ever exercise was convened in Ottawa, Ontario, Canada from December 10-11, 2018.

Why are TTXs helpful?
TTXs are a critical tool for understanding and strengthening how people from different sectors work together on problems of human, animal, plant, and environmental health. The exercises are also designed to build a network of trained participants who can effectively address One Health challenges locally, nationally, and regionally. While several TTX tools have been created, the One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART™) has been used in the United States and internationally to strengthen coordination between potential partners. More information on OH-SMART - including a video demonstration - is available here: https://www.vetmed.umn.edu/centers-programs/global-one-health-initiative/one-health-systems-mapping-and-analysis-resource-toolkit The tool is licensed for (free-of-charge) use, see here for further information: https://secure.nouvant.com/umn/technology/20170369/license/661

PARTICIPANTS

The first-ever Arctic Council One Health Table Top Exercise was convened in Anchorage, Alaska, USA from February 1-3, 2017; the second-ever exercise was convened in Ottawa, Ontario, Canada from December 10-11, 2018. Thirty participants attended and represented four Arctic states (Canada, Finland, Iceland, and the United States).
Participants came from a variety of backgrounds, including public health, food safety, medicine and veterinary medicine, emergency response, academia, diplomacy, and public policy. The project team would like to express its appreciation to all those that took part in this rich, thought-provoking, and path-breaking exercise.

AGENDA AND WORKSHOP DETAILS

Workshop OH-SMART Master facilitator:
Dr. Heidi Vesterinen, DVM, DACVPM, Veterinary Public Health and Preventive Medicine Resident, University of Minnesota veste012@umn.edu

Workshop Supporting Facilitators:
Josh Glasser, U.S. State Department, GlasserJL@state.gov
Dr. Andre Corriveau, Territorial Medical Director, NWT, Andre_Corriveau@gov.nt.ca
Dr. Emily Jenkins, Associate Professor, University of Saskatchewan, Emily.jenkins@usask.ca

Local Hosts:
Sarah Cox, Director, Circumpolar Affairs Directorate & Head of Delegation for the Sustainable Development Working Group, Crown Indigenous Relations and Northern Affairs Canada
Jyoti Bhargava, Policy Lead, Crown Indigenous Relations and Northern Affairs Canada

Workshop objectives:
- Promote international, national, regional and local health cooperation and networking
- Learn how the OH-SMART™ toolkit can support collaboration
- Introduce participatory leadership methods
- Examine the challenges and best practices of coordinating and sharing information during an outbreak or an emergency.
- Examine how to form practical action plans aimed to improve multi-agency, cross-sectoral collaboration needed for successful outbreak or emergency response.

The exercise included two hypothetical scenarios. One scenario focused on a transboundary outbreak of disease among land animals that are raised or hunted for subsistence. The disease may be zoonotic (capable of crossing from animals to humans). This scenario focused on the coordination and information flow needed to rapidly diagnose and respond to the outbreak.

The second scenario focused on the grounding of a ship carrying an international manifest of civilian passengers. Passengers, local communities, and local wildlife may be suffering from injuries as well as exposure to contaminants or infectious diseases due to the accident. This scenario focused on the coordination and information flow needed to support health aspects of effective emergency response.
## Agenda - Day 1

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<tr>
<th>Time</th>
<th>Agenda</th>
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<tr>
<td>8:00-8:40</td>
<td>Opening words</td>
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<td>8:40-9:00</td>
<td>Opening Circle - getting to know who is who</td>
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<tr>
<td>9:00-9:55</td>
<td>Introduction to OH-SMART:</td>
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<td>Step 1: stakeholder mapping</td>
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<td>Step 2: stakeholder interview</td>
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<td>9:55-10:00</td>
<td>Group picture</td>
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<td>10:00-10:30</td>
<td><strong>Coffee break</strong></td>
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<td>10:30-11:00</td>
<td>Focus groups: Stakeholder mapping</td>
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<td>11:00-12:00</td>
<td>Focus groups: Stakeholder interviews</td>
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<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
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<td>13:00-13:30</td>
<td>Step 3: introduction to system mapping</td>
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<td>13:30-16:30</td>
<td>Focus groups: Facilitated system mapping</td>
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<td>16:30-17:00</td>
<td>Group report outs</td>
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## Day 2

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<td>8:30-9:00</td>
<td>Introduction to action planning (steps 5 and 6) - Identifying how to improve the system</td>
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<td>Time</td>
<td>Event Description</td>
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<td>9.00-10.00</td>
<td>Focus groups:</td>
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<td>Step 5: Analyzing system maps for best practices</td>
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<td>Step 6: Action planning</td>
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<td>10:00-10:30</td>
<td>Coffee break</td>
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<td>10:30-11:30</td>
<td>Group report outs</td>
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<td>11:30-12:00</td>
<td>Closing Circle, post workshop evaluation &amp; path forward</td>
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**SCENARIO DETAILS**

*Land mammals disease outbreak*

**Hunters across North America and Scandinavia are finding that the animals they are hunting for sustenance are found in increasingly poor body condition.**

**Advice:**
- After exploring how the initial response to these types of cases would go (sample collection, diagnostics…) you can decide what disease your group wants to map. Possible examples include for example Chronic Wasting Disease and Tuberculosis.
- You can start two different outbreak lines on the same map for North America and Scandinavia respectively, both of them starting from the middle of the paper, but so that there’s a number of empty swim lanes between them. This way you have room to add stakeholders to the map and you can compare responses across regions/continents.
- There is no “correct way” to map. Discuss in your group what would likely happen, and what challenges might be encountered.
- Mark areas of confusion or disagreement with a star. Don’t try to resolve them! (Resolutions to issues and action plans will follow later.)

**Guiding questions**

1. How does your organization first hear of a suspect case/sample?

2. Who delivered this information to your organization?
3. Who is contacted within your organization?

4. Once you have the information about a suspect case, what is the next step (e.g., sampling and diagnosis)?

5. Does your organization contact and alert other organizations?

6. How long will you wait for the next step?

7. The sample is confirmed positive for __________ disease in an animal.

8. How is your organization informed of a confirmed positive sample?

9. What is the next step for you or your organization?

10. What other organization should be involved at this time?

11. Do you or anyone in your organization communicate with other organizations that may be involved with the suspect case? If so, who initiates this communication? How do you communicate?

12. What are those other organization responsible for?

13. Who will facilitate continued sampling and testing?

14. How do sectors interact if a case is found in a domesticated animal? How are these cases identified?

15. How does the international communication flow? What level does it happen? Will local actors interact across borders?

16. How is the health of indigenous populations and general public protected?

17. What information are you lacking? Who might have this information? What stakeholders are you missing out?

18. How will you handle the media?
Image 1: Table Top Exercise: Response to a disease outbreak among land mammals

**

Grounding of ship

A ship carrying 250 international civilian passengers has grounded in the arctic region. Due to the grounding, the ship is leaking oil into the environment, an important breeding habitat for both waterfowl and sea animals. Before grounding, the ship had been experiencing electricity issues, causing malfunctioning of some of its cold storage systems. At least dozen passengers, whom include both elderly, children and two pregnant women are experiencing gastrointestinal issues. Around 30 passengers have injuries.

Advice:
- start the emergency mapping from the middle of the paper, leaving multiple swim lanes empty over and under the first event
- there is no “correct way” to map. discuss in your group what would likely happen, and what challenges might be encountered
- mark areas of confusion or disagreement with a star

Guiding questions

1. Who responds first to an event like this?
2. Who informs the first responders? How?
3. Will the first responders contact others?
4. How will the international passengers be dealt with? Who will be in charge of communicating with their loved ones

5. How will the response be handled?

6. Does the main responding organization contact and alert other organizations?

7. What possible risks might occur after the grounding? How do you prepare for these? How do you handle them when they happen?

8. What other organizations should be involved at this time?

9. How, if at all, the environmental and human health responders interact?

10. How, if at all, will outside responders interact with the local community of people? Who initiates and coordinates this?

11. How is the health of indigenous populations and general public protected?

12. What information are you lacking? Who might have this information? What stakeholders are you missing out?

13. How will you handle inquiries from the media?

Image 2: Table Top Exercise: Grounding of a ship

**SUMMARY REPORT**
The OH-SMART™ tool asks participants to simulate who would be involved in response to a precipitating One Health event, such as the grounding of a ship or a disease outbreak among wildlife that
could spread to humans (a “zoonotic disease”). Participants identify potential stakeholders, then construct individual maps of the process, drawing a “lane” for each stakeholder and drawing shapes and arrows to describe, for example, who would be included at which stage and how information would flow. The areas where there are uncertainties or discrepancies between individuals’ maps are flagged. These areas become the focus of discussion and action planning for improving the process moving forward. An example of a map is show here:

![Image 3: OH-SMART map of response to disease outbreak among land mammals.](image)

Through the activity, the participants identified a variety of challenges and strategies for overcoming those challenges. A summary of the conversation is included here.

The 2017 exercise was the first time that the OH-SMART™ tool was used in an Arctic context, and some of the training materials lacked a “lane” for community groups or tribal organizations. The tool now includes a stakeholder mapping step, which was used to good effect in the 2018 exercise.

One group focused on the ship grounding scenario. Their discussion identified relatively clear systems in place for addressing acute needs such as treating casualties. However, potential impacts on the health of local communities, wildlife populations, and environmental quality were much less well-understood. The group proposed a series of risk assessments, potentially via academic institutions in consultation with governmental, nongovernmental, and community partners. In the future, these studies might form a basis for elucidating risk-based mechanisms such as insurance and bonding.
Another group focused on the wildlife zoonotic disease scenario, with a focus on chronic wasting disease (CWD). CWD is an emerging prion disease with zoonotic potential and few available treatment options, and there is considerable concern about its emergence in parts of the Arctic. While the group identified many uncertainties about the disease that need to be addressed by research and surveillance, the group also emphasized the need for clear and risk-based communication, so that residents of the Arctic do not unnecessarily abandon local subsistence food sources. In an era of extensive social media saturation, the group also stressed the need for circumpolar communication networks, to promote clear and consistent messaging.

A third group also addressed the wildlife disease scenario, assessing a potential tuberculosis or brucellosis outbreak in North American wildlife. This group focused on the need for tight feedback loops between observation, analysis, and risk communication – stressing in particular the need for rapid diagnosis and the communication of results from diagnosis back to hunter/trapper organizations and those relying on wildlife for subsistence. The group also focused on the importance of building capacity among key “connectors” – such as wildlife officers – who are situated within communities but who are linked to outside networks such as public health or veterinary lab networks.

Several key themes also cut across multiple groups. For example, each scenario involved potential impacts on both local communities and on people traveling through the Arctic – including researchers, tourists, and those in transit. Yet most One Health systems do not bridge this gap – they are focused either on local communities or on travelers, but not on the interface between the two. Future work might focus on ways to bolster exchange of information across this key sectoral boundary.

Similar to the first exercise, new technologies were identified as both a challenge and an opportunity for One Health. Greater connectivity and social media access is generating far greater streams of information regarding life in the Arctic, but can also spread mis-information. Moreover, new techniques are emerging to support safe sampling and timely disease diagnosis. But these techniques need to be paired with capacity building and awareness raising at the local/community level – as well as steps to ensure that results of such diagnosis cycle back to those affected in a timely manner. Future work might take a more focused look at the interface between One Health and new technologies in the Arctic context.

Finally, participants discussed ways for continuing to conduct One Health Table Top Exercises – the act of exercising these connections makes the networks and relationships stronger. Several participants offered ideas for a third iteration of the circumpolar exercise, potentially during Iceland’s chairmanship. Meanwhile, sub-national groups are interested in conducting exercises that can take a more focused look at issues and context most relevant to their communities.

Nineteen participants answered to the post workshop assessment, all of them indicating that the workshop fulfilled their expectations. Seventeen of the responders were interested to do similar Table Top Exercises in the future. The participants appreciated the workshop atmosphere and the networking, information sharing and problem solving opportunities it created. Many commented they would have liked to have even more time to work on the topic.
Image 4: Group photo of the One Health Table Top Exercise participants, Ottawa, Canada, December 10-11
ANNEX III

ONE ARCTIC – ONE HEALTH CONFERENCE IN OULU, FINLAND: PROGRAM AND ABSTRACTS
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<td><strong>AHHEG meeting</strong></td>
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<tr>
<td>10:00</td>
<td>Registration</td>
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<tr>
<td>13:00-14:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00-15:00</td>
<td>Opening session</td>
</tr>
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</table>
| **Welcome words** | René Söderman, Senior Arctic Official for Finland, Ministry of Foreign Affairs, Finland  
Joshua Glasser, Foreign Affairs Officer, U.S. Department of State, USA  
Jyoti Bhargava, Policy Lead, Crown-Indigenous and Northern Affairs Canada, Government of Canada |
| 15:00-15:30| Coffee break                               |
| 15:30-17:00| **Opening session**                        |
| **Keynote speeches** | Heikki Henttonen, Finland: Biome specific zoonotic epidemiologies  
Khaled Abass, Finland: Contaminants in Arctic human populations  
Tuula Hollmen, USA: One Health approach toward Arctic community resilience in Alaska  
Emily Jenkins, Canada: Emerging infectious disease issues at the One Health interface in the northern North America |
| 17:00-18:00| Icebreaker event                           |

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<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>8:30</td>
<td>Registration</td>
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<tr>
<td>9:00-10:15</td>
<td>Session 1</td>
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<tr>
<td>9:00-9:15</td>
<td>Audrey Waits, Finland: Human infectious diseases.</td>
</tr>
<tr>
<td>9:45-10:00</td>
<td>Tomas Thierfelder, Sweden: Climate-change Effects on the Epidemiology of Infectious Diseases in the Arctic. Linking landscape effects of climate change to the geographic spread of zoonotic infectious diseases.</td>
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<tr>
<td>10:00-10:15</td>
<td>Q&amp;A</td>
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<tr>
<td>10:15-10:35</td>
<td>Coffee break + posters</td>
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<tr>
<td>10:35-12:00</td>
<td>Session 2</td>
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<tr>
<td>10:35-10:50</td>
<td>Kriya Dunlap, USA: Sled dogs as a model for human health in the circumpolar north.</td>
</tr>
<tr>
<td>10:50-11:05</td>
<td>Sanna Malkamäki, Finland: <em>Echinococcus canadensis</em> in reindeer in Northern Europe and Northwestern Siberia.</td>
</tr>
<tr>
<td>11:05-11:15</td>
<td>Anna Nikanorov, Russia: Ticks (Acari: Ixodidae ) are bloodsuckers and vectors of dangerous pathogens and diseases. Ticks genera of Dermacentoz and Ixodes the most adapted in the Central and North-Western latitudes of Russia. Short presentation + poster</td>
</tr>
<tr>
<td>11:15-11:30</td>
<td>Ann Albihn, Sweden: Ticks on the move to the north – increased risk for new zoonotic infections?</td>
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<tr>
<td>11:30-11:35</td>
<td>Elisa Stella, Italy: On the transmission of anthrax disease in the Arctic region. Short presentation + poster</td>
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<tr>
<td>11:35-11:40</td>
<td>Anton N. Tokarev,Russia: Muscle parasites in reindeer: differential diagnostics and Russian food safety legislation. Short presentation + poster</td>
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<tr>
<td>11:40-11:45</td>
<td>Audrey Waits, Finland: Wildlife infections. Short presentation + poster</td>
</tr>
<tr>
<td>11:45-12:00</td>
<td>Q&amp;A</td>
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<tr>
<td>Time</td>
<td>Session/Activity</td>
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<td>Lunch</td>
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<tr>
<td>13:00-14:20</td>
<td><strong>Session 3</strong></td>
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<tr>
<td>13:00-13:15</td>
<td>Arleigh Reynolds, USA: Sled dog husbandry as approach to supporting transfer of traditional knowledge and resilience to at risk youth in rural Alaska.</td>
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<tr>
<td>13:15-13:20</td>
<td>Muhammad Asaduzzaman, Bangladesh: Environmental dimension of Antimicrobial Resistance (AMR); Occurrence and Spatial diversity of airborne resistomes in the poultry and household environment in Bangladesh. Short presentation + poster</td>
</tr>
<tr>
<td>13:50-13:55</td>
<td>Ilia Avrusin, Russia: Do we really need to use special charts to assess physical development of indigenous children of the North? Short presentation + poster</td>
</tr>
<tr>
<td>13:55-14:10</td>
<td>Heidi Aklaseaq Senungetuk, USA: Inuit sayakturut, aġiruat: The people are healthy, they are dancing.</td>
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<tr>
<td>14:10-14:20</td>
<td>Q&amp;A</td>
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<tr>
<td>14:20-14:50</td>
<td>Coffee break + posters</td>
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<tr>
<td>14:50-17:00</td>
<td><strong>Session 4</strong></td>
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<tr>
<td>14:50-15:05</td>
<td>Jenifer Huang McBeath, USA: Strategies for developing an environmentally-responsible plant production system in Alaska.</td>
</tr>
<tr>
<td>15:05-15:10</td>
<td>Hannele Savela, Finland: INTERACT – building capacity for terrestrial research and monitoring in the Arctic and beyond. Short presentation + poster</td>
</tr>
<tr>
<td>15:25-15:40</td>
<td>Joshua Glasser, USA: Applying a Diplomatic Toolkit to Advance One Health: The Case of the Arctic Council</td>
</tr>
<tr>
<td>15:40-15:55</td>
<td>Erica Lujan: Environmental observation, social media, and One Health action: A description of the Local Environmental Observer (LEO) Network</td>
</tr>
<tr>
<td>15:55-16:10</td>
<td>Sappho Z. Gilbert and Nora D. Moraga-Lewy, USA: “All of the Above” to “American Energy Dominance”: a One Health-based analysis comparing US energy policy impacts in Alaska</td>
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<tr>
<td>16:10-16:25</td>
<td>Rada Bulgakova, Russia; Marija Launonen, Finland: View of Western Siberian Indigenous peoples on Opisthorchiasis</td>
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<tr>
<td>16:25-16:30</td>
<td>Kayla Buhler, Canada: Role of a nest flea as a potential bridge vector for <em>Bartonella henselae</em> transmission between nesting geese and Arctic foxes, <em>Vulpes lagopus</em>, in Nunavut, Canada. Short presentation + poster</td>
</tr>
<tr>
<td>16:30-16:35</td>
<td>Émilie Bouchard, Canada: <em>Toxoplasma gondii</em> and other zoonotic endoparasites in foxes and lynx in Arctic and Subarctic Québec, Canada. Short presentation + poster</td>
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<tr>
<td>16:35-16:40</td>
<td>Elena Benusova, Russia: Interaction of Authorities and NGO in Social Health Issues of Children at Crime Risk. Short presentation + poster</td>
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<td>16:40-16:45</td>
<td>Rajnish Sharma, Canada: Trichinella in wolverines of northwestern Canada, Sentinel Species and One Health. Short presentation + poster</td>
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<tr>
<td>16:45-16:50</td>
<td>Javier Sanchez Romano, Norway: Emerging diseases in a changing reindeer herding system. Short presentation + poster</td>
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<tr>
<td>16:50-16:55</td>
<td>Ekaterina Bubnova, Russia: The traditional livelihood of indigenous populations and the climatological conditions of the circumpolar world. Short presentation + poster</td>
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<tr>
<td>16:55-17:15</td>
<td>Q&amp;A</td>
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<tr>
<td>18:30</td>
<td>Dinner <em>Restaurant Vanha Paloasema</em> (Kauppurienkatu 24A)</td>
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<th>Title</th>
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<tr>
<td>9:00-10:30</td>
<td>Session 5</td>
<td><strong>Ilkka T. Miettinen, Finland: Water safety in the Arctic region</strong></td>
</tr>
<tr>
<td>9:00-9:15</td>
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<td><strong>Sarah Yoder, USA: The public health response to arsenic contamination of drinking water wells in Alaska</strong></td>
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<tr>
<td>9:15-9:30</td>
<td></td>
<td><strong>Veronica M. Padula, USA: Plastics in the Bering Sea: Marine Debris and Associated Contaminant Exposure in Subsistence Species</strong></td>
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<tr>
<td>9:30-9:45</td>
<td></td>
<td><strong>Evgenia Tsupadina, Russia: Association between polymorphisms of NAT2 gene and lung cancer susceptibility in Yakut population. Short presentation + poster</strong></td>
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<tr>
<td>9:50-9:55</td>
<td></td>
<td><strong>Nathaniel Hansen, USA: Mental healthcare performance measurement in circumpolar regions. Short presentation + poster</strong></td>
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<tr>
<td>9:55-10:00</td>
<td></td>
<td><strong>Kennedy Jensen, USA: Multidisciplinary Collaborations for Community Wellness within Circumpolar Regions. Short presentation + poster</strong></td>
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<td>10:00-10:05</td>
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<td><strong>Samantha Salter, Canada: A One Health approach to emergency preparedness in health and social services: Incorporating animal care into emergency social services planning. Short presentation + poster</strong></td>
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<tr>
<td>10:05-10:10</td>
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<td><strong>Lidia Rakhmanova, Russia: &quot;We live like on a boiling pot&quot;: parallels between climate change, ecology and health in local community members’ interpretation. Short presentation + poster</strong></td>
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<td>10:10-10:30</td>
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<td><strong>Q&amp;A</strong></td>
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<td><strong>Coffee break + posters</strong></td>
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<tr>
<td>11:05-12:00</td>
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<td><strong>Closing discussion</strong></td>
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<tr>
<td>10:50-11:05</td>
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<td><strong>Morten Tryland, Norway: Arctic hosts and pathogens on the move</strong></td>
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<tr>
<td>12:00-13:00</td>
<td></td>
<td><strong>Lunch</strong></td>
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Affiliation and author information:
Audrey Waits\textsuperscript{1,3}, Anastasia Emelyanova\textsuperscript{2}, Antti Oksanen\textsuperscript{3}, Khaled Abass\textsuperscript{1}, and Arja Rautio\textsuperscript{1,2}

\textsuperscript{1} Arctic Health, Faculty of Medicine, University of Oulu, Finland
\textsuperscript{2} Thule Institute & University of Arctic, University of Oulu, Finland
\textsuperscript{3} Finnish Food Safety Authority Evira (FINPAR), 90590 Oulu, Finland

ABSTRACT:

Climatic factors, especially temperature, precipitation, and humidity play an important role in disease transmission. As the Arctic changes at an unprecedented rate due to climate change, understanding how climatic factors and climate change affect infectious disease rates is important for minimizing human and economic costs. The purpose of this systematic review was to compile recent studies in the field and compare the results to a previously published review. English language searches were conducted in PubMed, ScienceDirect, Scopus, and PLOS One. Russian language searches were conducted in the Scientific Electronic Library “eLibrary.ru”. This systematic review yielded 22 articles (51%) published in English and 21 articles (49%) published in Russian since 2012. Articles about zoonotic and vector-borne diseases accounted for 67% (n=29) of the review. Tick-borne diseases, tularemia, anthrax, and vibriosis were the most researched diseases likely to be impacted by climatic factors in the Arctic. Increased temperature and precipitation are predicted to have the greatest impact on infectious diseases in the Arctic.
Local Partnerships in the Detection, Identification, Surveillance, and Public Health Aspects of Viral Zoonotic Pathogens in the Bering Sea Region

Affiliation and author information:
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\(^1\)Department of Biological Sciences, University of Alaska Anchorage, Anchorage, AK 99508
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\(^4\)Aleut Community of St. Paul Island, St. Paul Island, AK 99660
* Presenter

ABSTRACT:

Recent advances in molecular virology have led to the identification of many different human or related viruses in diverse species of birds, marine mammals, and bat species. Even apparently healthy animals are now known to carry pathogens that are virulent in humans ("zoonotic disease"). The high potential for wide-spread dispersal of influenza, rabies, and other pathogenic viruses by bird and bat populations is high due to their unusual immune system that allows persistent infection and shedding of viral pathogens for months, their ability to fly and migrate, their gregarious social structure (which contributes to the amplification of viruses in breeding colonies), and the close association of arctic human communities with hosts through locality and subsistence. We discuss our use of single sample pan-viral assays for the detection of RNA viruses of wildlife and human concern: Orthomyxoviruses (Influenza A), Coronaviruses, Orthoreoviruses, Paramyxoviruses, and Lyssaviruses (Rabies). Emerging viruses including avian influenza viruses (AlV) can cross species barriers to spread into new ecological niches, hosts, and infection locality foci. A systematic data analysis of viral genotypes, virus infections in animal models, and host factors governing species specificity, replication potential, transmission and pathogenicity may contribute to understanding zoonotic and epidemiological patterns of infection. We are now focusing study on the community-wide assembly of likely zoonotic pathogens in selected localities in the Bering Sea region, the changes through time associated with breeding cycles, and how LEK, TEK, and local subsistence activities can engage and be informed in the survey activities.
ABSTRACT:

Introduction
An ongoing epidemiological surveillance is a core issue in a primary prevention of birth defects (BD). The aim of the study was to assess the prevalence of BD based on population-based birth registry data and to compare the completeness of registration with data of Federal BD monitoring system.

Materials and methods
The Arkhangelsk County Birth Registry (ACBR) and Federal BD monitoring system data were used in this retrospective cohort study. The ACBR includes information on all 57944 live- and stillbirths at gestational age 22 and more weeks registered in Arkhangelsk County, Northwestern Russia, in 2012-2015. Totally, 57449 newborns without missing information on BD were included in the study.

Results
In 2012-2015, 2841 various BD in 2274 newborns were registered in Arkhangelsk County according to the ACBR. The total prevalence of BD in the ACBR was 39.6 per 1000 newborns (95% CI: 39.6 – 41.2), the total prevalence in the Federal monitoring system was 16.2 per 1000 newborns (95% CI: 15.2 - 16.2) The completeness of registration varied across groups of BD and their severity: the accuracy and completeness of information on neural tube defects and chromosomal abnormalities were higher in Federal BD monitoring system, while registration of cardiovascular and genital-urinary malformation was more complete in the ACBR.

Conclusion
The total prevalence of BD in the ACBR was higher compared to that reported by the Federal BD monitoring system. Population-based registries can supplement the current system of BD surveillance to make an estimation of prevalence more precise.
Climate-change Effects on the Epidemiology of Infectious Diseases in the Arctic.

Linking landscape effects of climate change to the geographic spread of zoonotic infectious diseases.

Affiliation and author information:
Berggren C¹, Omazic A², Evengård B³, Thierfelder T¹.

1. Department of Energy & Technology, Swedish University of Agricultural Sciences, 750 07 Uppsala, Sweden
2. National Veterinary Institute, 751 89 Uppsala, Sweden
3. Department of Clinical Microbiology, Umeå University, 901 85 Umeå, Sweden

ABSTRACT:

Introduction: Climate change is considered to have a significant impact on the epidemiology of Arctic infectious diseases, that threatens Arctic societies by terms of socio-economy, culture, health, welfare, security, animal husbandry, and food supply (etc.). With arctic societies being generally dependent on husbandry animals, the erosion of animal welfare introduced with emerging zoonotic diseases adds to the effects of human exposure, where the resulting dynamic scenario requires a holistic OneHealth study-approach. The OneHealth approach requires interdisciplinary collaboration across disciplines such as ecology, veterinary and human medicine, earth sciences, and mathematical statistics, in order to address the processes and effects of potentially spreading infectious diseases.

Methods: The authorities that administer national programs of infectious diseases control have been engaged in the acquirement of diseases data covering Denmark/Greenland, Iceland, Norway, Sweden, Finland, and Russia through the past 30-year climate reference period, regarding incidences of anthrax, borreliosis, brucellosis, cryptosporidiosis, leptospirosis, hantavirus infection, Q-fever, tick born encephalitis, and tularemia. These data were supplemented with satellite-sensed climate data covering the same reference period of time with approximately 35 standard variables ranging from different temperature cumulations, via snow-cover duration, to chlorophyll density. The selection of diseases and climate variables was made via a process of expert review. When combined, a geographic information system was used to down-scale climate data into the climate-characteristics of individual administrative diseases report districts (basically at county-level). The resulting dataset was statistically inferred regarding the orthogonal linear combinations of climate data that best explain the observed variation of diseases incidences across report districts.
Results: Preliminary studies indicate strong climate sensitivity regarding some diseases, and lesser sensitivity regarding others. This conforms well with empirical observations, where climate sensitivity indicates a potential of diseases to migrate with climate change, and where this potential is much regulated by the ecological characteristics of the vector and reservoir organisms that carry diseases pathogens through the landscape.

Discussion: By determining statistical relations across the geographic spread of climate and diseases through the 30-year climate reference period, future diseases scenarios may be predicted in accordance with the standard IPCC climate scenarios. Such projections of future diseases scenarios constitute invaluable decision support in the process of strengthening the climate resilience of Arctic societies and cultures.
Sled dogs as a model for human health in the circumpolar north

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ABSTRACT:

Dogs are an important biomedical research model whose relationship and parallel evolution with man embodies the essence of One Health. In the circumpolar north, sled dogs were historically part of the traditional subsistence lifestyle; used for trapping, packing and transportation. In rural Alaska, sled dogs eat many of the same foods and are exposed to many of the same environmental stressors as their human counterparts, making them a unique model for studying the impact of diet and environmental contamination on disease. Their robust energy expenditure makes them an ideal model for studying metabolism and exercise research. The extreme environment in which these animals thrive allows for the study of cold adaptation and thermoregulation. I will present the highlights from nearly two decades of research in which sled dogs were used as a sentinel for human health. Example studies that will be discussed include diet and exercise in insulin signaling, the influence of season and activity on vitamin D levels, mercury exposure in fish fed population, and seasonal adaptations and diurnal variations in northern latitudes. Several sled dog studies have paved the way and refined techniques that were employed in follow up human studies in populations living in the circumpolar north.
ABSTRACT:

Tapeworm *Echinococcus canadensis* is one of the causative species of cystic echinococcosis, a significant zoonotic disease. Dogs and wolves are definitive hosts for *E. canadensis*, and in Northern regions cervids act as intermediate hosts. Two mitochondrial genotypes, G6 and G10, have been reported in reindeer. The parasite has disappeared from reindeer population in Norway and Sweden. In Finland, only one or a few cases are found annually in meat inspection. Endemic human cases have not been reported from reindeer husbandry area of these countries for 40 years. The parasite is maintained only in wildlife cycle (wolves and wild cervids) in backwoods of Eastern Finland. In Murmansk region, prevalence of reindeer echinococcosis is ca 2%. Two human cases were reported during the past 10 years, but their origin is unknown. In Yamalo-Nenets Autonomous Okrug (YaNAO), Northwestern Siberia, prevalence of echinococcosis in reindeer is ca 4%. The number of human cases in YaNAO was halved over the past 15 years, but still 16 cases were diagnosed in 2017. The patients were reindeer herders or their family members. Survival of traditional nomadic reindeer herding culture in YaNAO, with an extensive use of dogs, can explain the foothold of echinococcosis. Despite significance of reindeer echinococcosis in Northern Russia, knowledge on parasite genotypes is based only on very limited data from Sakha Republic. In this winter, as a joint research between Finland and Russia, One Arctic – One Health project is aiming to clarify genetic diversity, phylogeography and epidemiology of *E. canadensis* in reindeer in Northern Russia from Murmansk region to YaNAO. Specimens will be collected for sequence analyses in reindeer slaughterhouses during routine meat inspection.
Ticks (Acari: Ixodidae) are bloodsuckers and vectors of dangerous pathogens and diseases. Ticks of the genera Dermacentor and Ixodes the most adapted in the Central and North-Western latitudes of Russia.

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Vasilevich Fedor Ivanovich, Moscow State Academy of Veterinary Medicine and Biotechnology named after KN Skryabin
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ABSTRACT:

Objective: to study the fauna and ecology of cold-resistant ticks in the Kaluga region.
Results and discussion:
For determining the tick fauna, tick specimens were collected from large mammals, small vertebrates and free from the environment plants. Altogether 1256 ticks were collected, 685 adults from large animals and 245 from plants, and also 218 larvae and 108 nymphs from small mammals. We found ticks of the species Ixodes ricinus and Dermacentor reticulatus. The identified hosts of the larvae and nymphs in the Kaluga region are Myodes glareolus, Apodemus agraris, Apodemus uralensis, Rattus norvegicus, and Mus musculus.

We found the number of ixodid larvae and nymphs depending on the activity of the hosts. The parasitic activity of larvae and nymphs in small and big mammals begins in the second week of April with parasite number increasing till the maximal number between May 10th and 20th. The larval abundance of I. ricinus and D. reticulatus is reduced deeply in mid-June and mid-August, respectively.

The low temperature threshold for larva and nymph evolution was determined as 9 °C ± 1.5 °C, although some individual specimens were discovered at 6-7 °C.

Imagoes of I. ricinus are active in the end of March. The first activity peak is in May, the second is in the second half of August and September.

Dermacentor reticulatus reproduces every year if larvae and nymphs find their hosts. The temperature threshold of larva, nymph and imago evolution was determined as 10 °C ± 1.5. °C.

Dermacentor reticulatus ticks are mobile in late March and early April with a peak of activity in mid-May-June, the second peak of activity in ticks of this species is less pronounced and falls on the second and third week of September. Both well-fed and hungry D. reticulatus spend winter
in imago stage. In the Kaluga region, *I. ricinus* mites belong to forest biotopes and in turn *D. reticulatus* ticks belong to agriculture and suburban biotypes.
Ticks on the move to the north – increased risk for new zoonotic infections?

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ABSTRACT:

Introduction
Climate change expands the geographical distribution of ticks to higher latitudes and altitudes. Ticks are vectors for several zoonotic diseases e.g. granulocytic anaplasmosis and babesiosis. The role of ticks bringing tick-borne pathogens into the north is unclear. Globally anaplasmosis and babesiosis cause relevant diseases in several species including humans and in the southern half of Sweden they infect especially ruminants. The present study aims to investigate the northern expansion of ticks and tick-borne pathogens in Sweden.

Methods
Through a citizen science study 2018, SVA received around 4500 ticks found on animals or humans in the northern half of Sweden. Morphological species identification and microbiological analysis with FLUIDIGM, a microfluidic PCR-based technique for an array of pathogens will be performed.

Results
Preliminary results concerning the tick species identification and expanded geographical distribution will be presented. Retrospective collection of Swedish official animal disease data revealed 24 cases of babesiosis year 2005-2016. For anaplasmosis there were no cases officially reported but 310 cases were diagnosed on ruminants year 2008-2018 at SVA.

Conclusion
When diseases show up in new areas, the unawareness may compromise protection of a population and the recognition of clinical symptoms. In addition, in an immunologically unprotected population, a new infection may give higher mortality rate or more severe clinical pictures. With new knowledge regarding the northern distribution of ticks and tick-borne pathogens, we may be able to identify new risk areas and suggest measures to minimize diseases.
On the transmission of anthrax disease in the Arctic region

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*Presenter

ABSTRACT:

Recent cases of anthrax disease have severely affected reindeer herds in Siberia. Experts believe that these outbreaks have been caused by the presence of infected carcasses emerged from the thawing permafrost, underlying therefore the emerging character of such disease in the Arctic region due to climate change. Anthrax occurs in nature as a global zoonotic and epizootic disease caused by the sporulating bacterium Bacillus anthracis. It principally affects herbivores and causes high animal mortality. Its transmission occurs mainly via environmental contamination through spores which can remain viable in permafrost for more than 100 years.

We propose and analyze a novel epidemiological model for anthrax transmission that is specifically tailored for the Arctic region. In particular, the model investigates the transmission of disease between susceptible and infected animals in the presence of environmental contamination, including also herding practices (e.g. seasonal grazing) and a seasonal environmental forcing caused by the thawing permafrost.

We show how the temporal variability of these factors influences the transmission of anthrax disease and how pathogen invasion may be favored as the endemic state of the infection changes.

On the basis of our results, further analyses, which may also include spatial dynamics, can establish optimal procedures to prevent uncontrolled diffusion of anthrax infection in herding areas in the Arctic.
ABSTRACT:
Reindeer muscles and therefore meat can be affected by Protozoa, Arthropods or Helminthes. In October 2018, heard of reindeer of the Nenets breed of various sex-age groups (from 6 months to 7 years) was slaughtered in the Zapolyarny region of the Nenets Autonomous District. During the veterinary and sanitary examination in several carcasses (obtained from adult males and females), elongated whitish objects, not characteristic for deer the muscle tissue, were found. They were delivered to the Department of Parasitology SPbSAVM and studied macroscopically and microscopically in its native form and with lactic acid clearing. It was found that objects were of different lengths (ranging from 1 to 3 mm) with a width of up to 0.03 mm; they were motionless and had a cavity divided into chambers. Objects were assumedly identified as cysts of Sarcocystis rangi. To clarify the diagnosis, it is advisable to conduct a genetic and histological examination. According to the current "Rules of veterinary inspection of slaughter animals and veterinary and sanitary examination of meat and meat products" (approved by the General Directorate of Veterinary Medicine of the USSR Ministry of Agriculture on December 27, 1983), the meat invaded by Sarcocystis if not damaged can be sold without restrictions. The proposed by the Ministry of Agriculture, but not yet in force "Rules in the field of veterinary and sanitary examination of meat and other products of slaughter" (March 22, 2017), demand the use of such meat for the manufacture of canned food or cooked sausages.
One Arctic One Health: Wildlife infections

Affiliation and author information:
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ABSTRACT:

The relationship between humans and wildlife in the Arctic is uniquely intertwined. For indigenous populations, wildlife plays a significant role in culture, traditional food, and livelihoods. For Arctic industry, wildlife provides food, sport, recreation, and are a valuable contributor for tourism. Because of the close connection and recurrent interaction between wildlife and humans, understanding wildlife infections is important for animal, human, and environmental health. In this review, we are investigating the literature that has been published about infections in a few key Arctic species: gulls, geese, grouse, ducks, salmon, pike, cod, reindeer/caribou, moose, hares, foxes, bears, wolves, and sled-dogs. We are using PubMed, Scopus, and the Russian database, Scientific Electronic Library eLibrary.ru. Using a “One Health” approach, our aim is to establish a baseline review of what research is being conducted on infections in wildlife and explore what infections are emerging and important for human health, and what are the ramifications to wildlife, human, and environmental health. Our results are still in progress but we anticipate new insights into the current status of wildlife infections by using both English and Russian language databases.
Sled dog husbandry as approach to supporting transfer of traditional knowledge and resilience to at risk youth in rural Alaska

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ABSTRACT:

Sled dogs have long been integral to the identities of the indigenous societies of the arctic, where for millennia they have been used for transportation, hunting, recreation, and protection. The sudden plunge of these societies into the modern world, with its notions of individualism versus collectivism and materialism versus spiritualism, has resulted in a difficult cultural transition, creating dramatic social and economic upheaval. In the final years of his life, Athabaskan elder and world champion sled dog racer, George Attla, conceived of a program that engaged youth in learning sled dog husbandry as a means of transferring traditional cultural knowledge from elders, provided a sense of self-identity, and improved the mental, behavioral, and physical resiliency of young people and their communities. Using elders to teach mushing related traditional skills such as hunting and fishing, and food preparation, as well as fire-building and arctic survival, students in the FAYSUDP program spend time in working kennels, where they gained a sense of cultural history and self-esteem. Improvements in student behavior, and student outcomes have been observed, resulting in a positive transformation for the entire community. The work that Attla started in his home village of Huslia has grown, and is now being used as the model for an expanded A-CHILL project that serves nine other schools in Alaska’s Interior, with high school students learning traditional skills while taking University courses and preparing for village based careers in the fast growing healthcare fields.
Environmental dimension of Antimicrobial Resistance (AMR). Occurrence and Spatial diversity of airborne resistomes in the poultry and household environment in Bangladesh

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ABSTRACT:

Background
Antimicrobial resistance (AMR) is an alarming issue with environmental evolution and transmission to a larger extent. We studied whether the outdoor environment (air) in Bangladesh acts as a reservoir for bacteria that can confer resistance to antibiotics with spatial diversity.

Methods
We collected air samples during January to July 2018 from both urban and rural settings in four distinct outdoor environments- i) Urban live bird markets (LBM) ii) Urban residential area (URA) iii) Commercial poultry farms (CPF) and iv) Rural households (RHH). We used standard plates and media supplemented with 3rd generation cephalosporin (3GC), carbapenem, oxacillin and vancomycin to obtain the gram negative resistant organisms, both 3GC resistant (3GCr) and carbapenem resistant Enterobacteriaceae (CRE) as well as gram positive resistant organisms like Methicillin (Oxacillin) resistant Staphylococci (MRS) and Vancomycin resistant Enterococci (VRE) respectively.

Results
All types of resistant organisms were present in each of the study sites. We found the presence of 3GCr, CRE, MRS and VRE in 85%, 60%, 100% and 80% air samples respectively. Considering sampling sites, 3GCr, CRE and MRS were found highest in the air samples obtained from the environment of commercial poultry farms and VRE was present higher in the live bird markets. The alarming finding is the presence of resistant organisms like MRS, VRE and 3GCr in urban residential area with high frequency (>90%) whereas the rural household were heavily burdened with 3GCr and MRS (60-100%).

Conclusion
The presence of airborne resistomes highlights the importance of intervention in outdoor environments which act as both reservoir and medium of spread of resistance.
A Legacy of Contaminated Sites and Possible Links to Health and Lifestyles in Alaska Native Communities

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*Presenter

ABSTRACT:

Introduction: Contaminated sites exist across Alaska, many within or proximal to Alaska Native villages. Available literature shows the incidence and mortality rates of different cancers, Parkinsonism, Lupus, fetal and neonatal birth defects vary throughout Alaska, most are much higher among Alaska Native populations when compared to non-Alaska Natives. Some communities experiencing higher and multiple disease rates have concerns about environmental contamination and request health assessments. Due to such small populations, national public health reports typically aggregate data of Alaska Natives with all American Indians to establish sample sizes large enough for robust findings, sometimes masking findings.

Methods: Authors used GIS to look at potential associations between known contamination sites and health disorders experienced in Alaska.

Results: In December 2018, authors presented preliminary findings, including maps at the Alaska Tribal Conference on Environmental Management in Anchorage Alaska. Cards were dispersed with a simple questionnaire to gain feedback on communities’ concerns and interest in developing participatory community-based studies. Four different community representatives completed cards.

Conclusions: Environmental contamination is a concern in many Alaska Native communities. Authors are developing an approach utilizing a Tribal Participatory Research (TPR) framework coupled with participatory community-based studies for better understanding of environmental health in several communities. We plan to use TPR to identify the appropriate criteria for aggregating health data on small populations. Combining data from several communities with similar concerns can help create a more statistically, culturally significant, and representative dataset. Outreach to interested communities to address concerns with qualitative participatory knowledge and input is planned.
Births before arrival to hospital – specialist ambulance nurses experiences

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*Presenter

ABSTRACT:

Introduction: To work as ambulance, nurse means to interact with and care patients in need of different emergency medical- and other conditions, such as births before arrival to the hospital. Even though most deliveries are uneventful, they are a clinical challenge in the pre-hospital setting. They are rare but increasing due to the centralization of maternity wards, especially among women living in remote areas.

Aim: The aim was to describe specialist ambulance nurses experiences of assisting birth before arrival to hospital.

Method: We conducted a qualitative approach and interviewed nine specialist ambulance nurses who had assisted with one or more prehospital births. Data were analysed with thematic content analysis.

Findings: The analysis revealed a theme; Feeling fright and exhilaration and three categories. The findings showed that births before arrival to hospital causes feelings of anxiety and stress. The experience is also associated with joy and relief when the baby is born. Childbirth is a situation for which specialist ambulance nurses feel less prepared. They experience a lack of knowledge, and wish for more education.

Conclusion: Specialist ambulance nurses face challenges in the pre-hospital care environment during births before arrival to hospital, with long distances, a lack of equipment aboard the ambulance, and no assistance from midwives. To feel secure in the complex role that is required when assisting mothers during delivery, specialist ambulance nurses should have opportunity to receive scenario training.
Do we really need to use special charts to assess physical development of indigenous children of the North?

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ABSTRACT:

Introduction
Factors that affect physical growth of a child are numerous, ethnic origin being one of them. Using existing growth charts to assess physical development of indigenous children of the North leads to ambiguity: pediatricians must change the diet in boarding schools because children have low weight and/or short stature, but to change the diet means to face many associated health issues. The aim of this study is to assess the appropriateness and feasibility of establishing the regulatory frameworks to monitor the growth of indigenous children from birth to young adulthood.

Methods
We have analyzed data collected in the years 1996 – 2017 in the Yamal-Nenets Autonomous region (total number of Nenets, Khanty and Slavic children 5940, age 3 – 17 years) and in Yakutia (total number of Sakha, 5 ethnic groups of indigenous and Slavic children 278793, age 0 – 17 years). We used standard methods of parametric statistics.

Results
We confirmed that in most indigenous peoples the body length and mass, being at birth the same or even higher than in non-indigenous folks, after the age of 3 years became significantly lower. Arterial pressure in Nenets children becomes lower than in non-original settlers beginning from the age of 10 years although the arterial pressure in indigenous children of Yakutia is higher than in non-original settlers. There are also differences in normal sonographic liver and aorta sizes, salt taste sensitivity in some ethnic groups.

Conclusions
Our data support the appropriateness and feasibility of establishing the regulatory frameworks for studied indigenous populations.
Inuit sayakturut, aġiruat: The people are healthy, they are dancing

Affiliation and author information:
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ABSTRACT:

Alaskan Indigenous peoples have known music and dance as playing a role in healing processes for millennia. Group singing, drumming and dancing is recognized in a one-health Indigenous view regarding ways of negotiating and alleviating individual health issues as well as promoting community health. The Kingikmiut Dancers and Singers of Anchorage, an urban Inupiaq dance group with ancestral ties to the Native Village of Wales, began dancing and singing as a way of claiming a healthy lifestyle for Inupiaq people living in Anchorage, Alaska’s largest urban center. As an Indigenous participant-observer in the Kingikmiut Dancers and Singers of Anchorage, the author experienced the benefits of singing and dancing with the group. She also observed elders as they navigated their age-related health conditions through participation in regular dance practices and performances, and also witnessed social cohesion of the group as they continue to practice and perform their cultural heritage. This paper also provides evidence from scientists and musicologists that corroborate with ancient methods of maintaining health and promoting community healing. Inupiaq dancing and singing not only provides individual practitioners with health benefits such as increased aerobic exercise, but also strengthens communities as a cohesion-building activity. Recent scientific studies confirm what Indigenous peoples had already long established: that group singing and dancing is healthy for people.
Strategies for developing an environmentally-responsible plant production system in Alaska

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ABSTRACT:

Food security is one of the most serious problems affecting Alaska. Food acquisition and production are closely associated with ecosystems and climate. In the Arctic, changes in climate make harvesting and gathering of wild foods more difficult and costlier. Transition to store-bought foods subjects households to the vagaries and vulnerabilities of the global food system and to unintended health consequences. Food produced in the subarctic region provides an attractive alternative. As climate in the Arctic becomes warmer and wetter, and growing seasons longer, it is also increasingly more hospitable to migrant insect pests and pathogens, especially as they survive and become established in the environment. Conventional agricultural practices which rely heavily on the use of chemicals could have especially serious consequences in the far North because of the long persistence of pesticides in the still cold soils. Chemical pesticides taking days to degrade were found persisting for years in the soils in Alaska. The subsequent bioaccumulation of chemical pesticides in plant tissues also endangers the health of residents. To minimize the need for chemical pesticides, promote environmental sustainability and food safety, a system which involves exclusion, surveys, detection and biological control was developed. Plant Helper, a cold-tolerant, beneficial mycoparasite, discovered and developed in Alaska, provides a powerful tool in the protection of agricultural, horticultural and economically important crops against a wide range of diseases. The resulting environmentally-responsible plant production system will support the policies of governments of Alaska, and circumpolar regions in producing fresh, wholesome, nutritional foods for their people.
Rapid response to environmental emergency alerts. An INTERACT initiative

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ABSTRACT:

INTERACT - International Network for Terrestrial Research and Monitoring in the Arctic is an infrastructure project funded by the EU. Its main objective is to build capacity for identifying, understanding, predicting and responding to diverse environmental changes throughout the Arctic.

The “Rapid Response” work package within INTERACT has a main goal to help protect Arctic and global residents from potential environmental emergencies or hazards. The work package is focused on identifying, observing and documenting potential risks and hazards and working with relevant agencies and organisations to help response actions. The Rapid Response work package’s main output will be the development of protocols for monitoring of potential environmental risks and hazards and a subsequent set up of an alert system for Arctic research stations and adjoining territories.

Climate sensitive infections were identified as one of the important group of hazards. As a trial, we cooperate with the Laboratory of Arbovirology of the Czech Academy of Sciences, on the determination of the prevalence of selected tick – and mosquito-borne diseases in the Arctic (such as influenza). The data obtained will serve as a baseline for the monitoring of future shifts in the distribution of selected diseases.

The whole project is dependent on efficient networking throughout the Arctic, for which INTERACT provides a great platform with its comprehensive net of more than 80 research stations where sampling and observations can be carried out simultaneously and in the same way across a wide range of territories and often in remote regions.
Applying a Diplomatic Toolkit to Advance One Health: The Case of the Arctic Council

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ABSTRACT:

Since 2015, the Arctic Council Sustainable Development Working Group has supported Operationalizing One Health, a project to strengthen human-animal-environmental health collaboration in the circumpolar region. Because the Arctic Council is a diplomatic forum rather than a technical body, it is an unorthodox One Health stakeholder. Nonetheless, the project has drawn from a unique array of diplomatic tools to advance One Health. Specifically, the project has created avenues for information sharing and exercises among Arctic Council member states and Permanent Participant organizations, while also identifying areas for collaborative investigations. This presentation will explain the origins of the project, delineate the methods used to implement it, and specify results to date. It will conclude by elucidating lessons learned for operationalizing One Health in the Arctic region, and lessons for other diplomatic fora seeking to advance One Health.
Environmental observation, social media, and One Health action: A description of the Local Environmental Observer (LEO) Network

Affiliation and author information:
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*Presenter

ABSTRACT:
As a result of the close relationships between Arctic residents and the environment, climate change has a disproportionate impact on Arctic communities. Despite the need for One Health responses to climate change, environmental monitoring is difficult to conduct in Arctic regions. The Local Environmental Observer (LEO) Network is a global social media network that recruits citizen scientists to collect environmental observations on social media. We examined the processes of the LEO Network, numbers of members and observations, and three case studies that depict One Health action enabled by the system. From February 2012 to July 2017, the LEO Network gained 1870 members in 35 countries. In this time period, 670 environmental observations were posted. Examples that resulted in One Health action include those involving food sources, wild fire smoke, and thawing permafrost. The LEO network is an example of a One Health resource that stimulates action to protect the health of communities around the world.
“All of the Above” to “American Energy Dominance”: a One Health-based analysis comparing US energy policy impacts in Alaska

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ABSTRACT:

Introduction: The Obama administration’s energy strategy, dubbed “all of the above” (AOTA), aimed to pursue “every source of American-made energy.” Although the Trump campaign and administration previously borrowed the Obama-era phrase, they now call for “American energy dominance” (AED), particularly in fossil fuels and notably in Alaska.

Methods: Using a One Health-based approach, we analyzed the benefits and impacts of these two federal executive energy policy approaches in the Alaskan context. We systematically identified and mapped the effects of AOTA and AED on human, wildlife, environmental, and planetary health.

Results: The implications and benefits of the two strategies spanned multiple geographic and temporal scales. Additionally, human, wildlife, environmental, and planetary health opportunities and impacts were found to be manifested through several intersectional pathways, including climate change, pollution, infrastructural investments, and social and economic development. Gaps in both AOTA and AED were also identified that must be addressed in pursuit of a more sustainable, community-engaged US energy policy approach.

Conclusion: Given the geographic and temporal distribution of the two strategies’ implications, policymakers at all levels must seek to realign incentives and structures such that local, immediate human livelihoods are not sacrificed at the expense of mid- and long-term benefits. In order to achieve a more sustainable energy policy approach, a better understanding of the magnitude and immediacy of these considerations is needed. Affected communities’ perceptions of these costs and benefits must be centrally integrated into energy policy- and decision-making processes to ensure a just transition to our collective energy future.
**Toxoplasma gondii** and other zoonotic endoparasites in foxes and lynx in Arctic and Subarctic Québec, Canada

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**ABSTRACT:**
The Canadian North is undergoing unprecedented climate and landscape change, which may alter distribution and prevalence of parasites. Understanding current trophic relationships and parasite ecology is key to predicting the potential for altered zoonotic risks for northern human populations. We are establishing baseline host and geographic distributions for zoonotic endoparasites of wild carnivores in Nunavik and subarctic regions in Québec, including helminths such as tapeworms (*Echinococcus multilocularis* and *E. granulosus/E. canadensis*), roundworms (*Trichinella* and *Toxocara* spp.), and protozoans (*Toxoplasma gondii, Giardia, and Cryptosporidium* spp.). Carcasses of red and arctic foxes (*Vulpes vulpes, V. lagopus; n=227*), and lynx (*Lynx canadensis, n=81*) were collected by trappers during the winter of 2016/2017. We used morphological, molecular, and immunological methods to detect zoonotic parasites. Fecal samples were analyzed by sugar flotation to detect parasitic eggs. Real-time PCR and melting curve analysis were used to detect and identify DNA from coccidian species in feces. Adult worms were collected from the small intestines by the scraping, counting, and filtration method. We detected DNA of *T. gondii* in foxes and lynx using a magnetic capture technique on brain and heart tissues. Lynx are the proposed definitive host of *T. gondii* in subarctic regions, but intestinal infection has not been definitively demonstrated. As high trophic level carnivores, fox and lynx provide a better idea of distribution and transmission of zoonotic parasites, especially foodborne parasites, in northern ecosystems. This work generates significant information on status of zoonotic parasites in wildlife of Québec, which will inform future predictive models.
Interaction of Authorities and NGO in Social Health Issues of Children at Crime Risk

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ABSTRACT:
The article discusses ways of interaction between authorities and NGOs in order to raise the level of social health of children who have conflict with the law. Examples of joint activities of government agencies and NGOs are given. The author relies on the system of development of child-friendly justice in the sphere of criminal proceedings in Arkhangelsk region. The author investigates the peculiarity and role of non-profit organizations in rendering assistance on social adaptation of children at crime risk on the example of Arkhangelsk region. The place of NGOs in the system of social services of population is revealed. In conclusion we analyze problems and prospects of development of the NGOs as a providers of social services, representing a resource for effective solution of social health issues of adolescent offenders.
Trichinella in wolverines of northwestern Canada, Sentinel Species and One Health

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ABSTRACT:
Trichinellosis, an important parasitic zoonosis is caused by nematodes of Trichinella spp. Wolverines (Gulo gulo) are an economically important species across much of its Holarctic range because of their valuable fur. Due to their position in northern food webs as a high-level predator and scavenger, wolverines could play role as “bioaccumulators” and indicators of foodborne parasites such as Trichinella spp. Our study was designed to explore the utility of apex carnivores as sentinels for occurrence and circulation of Trichinella spp. in northwestern Canada. Muscle samples (tongue and diaphragms) were collected from 465 wolverine carcasses submitted by licensed fur trappers. Muscles were artificially digested using pepsin-HCl digestion method to detect and recover Trichinella spp. larvae. Larvae were identified to species level using Multiplex Polymerase Chain Reaction (PCR). Overall, 340 wolverines were found positive for Trichinella spp. larva indicating a prevalence of 73%. Trichinella T6 was the predominant genotype followed by: T. nativa (T2); a previously undescribed species of Trichinella; T. pseudospiralis; and T. spiralis. This is the first recorded occurrence of T. spiralis and T.
*pseudospiralis* in the Canadian sub-arctic region. Mixed infections (both T6 and *T. nativa*) were also detected. Our findings suggest a wider diversity of species of *Trichinella* in wolverines in northwestern Canada as compared to previous reports. We validate molecular methodologies for broad scale survey of zoonotic parasites and concurrently reveal the power of wolverines as sentinels in building a One-Health infrastructure to explore the pathways and circulation of parasitic diseases in northwestern Canada because samples are readily available, protocols are well-tested, and prevalence, intensity, and genetic diversity are relatively high compared to other wildlife.
Emerging diseases in a changing reindeer herding system

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ABSTRACT:

Supplementary feeding and corralling have become more common in Sweden and Norway due to pasture fragmentation and climate change. A less traditional reindeer herding system with increased gathering, corralling, handling and transport of reindeer will also increase stress and animal-to-animal contact, and the occurrence of suboptimal hygienic conditions, all contributing to a heightened risk of disease outbreaks, challenging animal welfare and the herder’s economy. Disease outbreaks of oral necrobacillosis, contagious ecthyma and eye infections in semi-domesticated reindeer have been investigated clinically and with serological (ELISA) and molecular (PCR) assays. Results indicated that infections with Fusobacterium spp. (necrobacillosis), Orf virus (ORFV, contagious ecthyma), and cervid herpesvirus 2 (CvHV2) and Chlamydia spp. (eye infections) are present in the Fennoscandian reindeer herds, causing disease outbreaks. While, simultaneous presence of multiple agents has been registered. There are clear indications that these and other emerging and re-emerging infectious diseases are associated with the changing herding conditions and their prevalence may hence increase over time, with the subsequent risks for reindeer herds and herders. Furthermore, the risk of zoonotic and inter-species transmission of some of these pathogens exist. Preventive measures must be taken while working with affected animals to avoid exposure of herders, veterinarians and other people, as well as the infection of other susceptible species in contact with the affected herds, such as other cervid species or domestic animals.
ABSTRACT:

Background: Clean, safe fresh water is one of the most important natural resources. Thus, safely managed drinking water (DW) services are one the WHO’s Sustainable Development Goals (SDG 6.1). Water is not, however, evenly available for all human settlements. The aim of the study was to collect and assess information about water services in the Arctic region.

Methods: The survey study included interviews of water hygiene experts and review of the literature available.

Results: The existing legislation in the Arctic nations should in principle ensure equal rights to safe DW and sanitation. However, national statistics about the access to improved DW and sanitation are dominated by the results of the large settlements. Centralized DW and sanitation systems are not yet available for all people in the Arctic region. Cold climate reduces the disposable time of fresh surface waters and permafrost may prevent the usage of ground waters. Furthermore, running water systems will get frozen if the pipelines are not properly insulated. Alternative drinking water sources and transport options including usage of self-hauling water sources and DW tanks need to be applied.

Conclusions: Hard climate conditions in the Arctic region may reduce the amount of usable household water jeopardizing every-day hygiene to prevent water-washed diseases. Difficulties in maintaining sufficient amount of safe DW may also result waterborne outbreaks. At Arctic the cost of household water can also be a remarkable economic burden.
The public health response to arsenic contamination of drinking water wells in Alaska

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ABSTRACT:

Introduction: Chronic oral exposure to inorganic arsenic (As) is associated with a number of adverse health effects. The most characteristic symptoms of prolonged As exposure include skin changes, although it is also neurotoxic and carcinogenic. In August 2018, the Alaska Environmental Public Health Program (EPHP) learned that elevated concentrations of As had been measured in two groundwater wells that served a public building near Fairbanks, Alaska, USA. Due to the public health risk posed by elevated As in drinking water, EPHP conducted an environmental investigation.

Methods: EPHP administered a survey to assess potential exposure and the occurrence of symptoms commonly associated with acute and chronic As poisoning. EPHP also collected hair samples and conducted an education campaign to increase awareness among residents.

Results: Concentration of As in the wells were above 9,000 µg/L, exceeding drinking water standards (10 µg/L) by several orders of magnitude. Of the hair samples received, 88% exceeded the reference value (0.9 µg/g). Survey results indicated some individuals were experiencing symptoms consistent with acute or chronic arsenic poisoning, including severe abdominal pain, hypertension, and peripheral neuropathy.

Conclusions: The large deposits of As in this region are well known to academic researchers, regulators, and public health officials. Despite repeated historical attempts to notify residents of the potential for elevated As in drinking water, many residents remained uninformed. The findings of our environmental investigation indicate that As exposure is ongoing, and further underscore the importance of interdisciplinary cooperation to inform residents of the risk and to get their well water tested.
Plastics in the Bering Sea: Marine Debris and Associated Contaminant Exposure in Subsistence Species

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ABSTRACT:

The island and coastal communities in the Bering Sea region are intimately connected to the marine environment through their subsistence and cultural resources. Plastic debris pollution can disrupt those connections. For example, local subsistence species are susceptible to entanglement in debris, or they may mistake debris for prey and will consequently ingest it. As plastics are known to be coated in and absorb harmful chemicals, marine organisms risk exposure to these chemicals upon ingestion. Humans are potentially at risk of exposure through consumption of subsistence resources. One prominent group of plastic-associated chemicals is phthalates, which are widely used in plastic manufacture and endocrine disruptors. Therefore, with increasing amounts of plastic entering marine ecosystems, it is imperative to track chemicals like phthalates in the environment. Seabirds are model organisms for studying such contaminants, as they sample from many parts of the food web in marine ecosystems. They are also highly susceptible to plastic ingestion and consequent contaminant exposure. In this study, we build a foundation of knowledge of phthalate exposure in Bering Sea seabirds that leads to better understanding their cumulative effects on ecosystem health. We analyzed six phthalate congeners in the muscle tissue of 111 individuals, representing nine seabird species that breed in the Bering Sea, many of which showed evidence of exposure to at least one congener. These results suggest seabirds are broadly exposed. Furthermore humans are at risk of exposure through consumption of seabirds and their eggs, raising questions about threshold levels of exposure both in wildlife and humans.
Association between polymorphisms of NAT2 gene and lung cancer susceptibility in Yakut population

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ABSTRACT:
Markers of increased risk of lung cancer in Yakuts are the NAT2*857A allele and NAT2*857G/A genotype, the reduced risk is the NAT2*857G allele, NAT2*857G/G genotype.

Introduction
In the structure of cancer incidence among the indigenous people - Yakuts, lung cancer occupies a leading position. Some authors have shown that polymorphic variants of the NAT2 gene contribute to the development of lung cancer.

Methods
A case-control study involving 60 patients (17 women and 43 men) histopathologically diagnosed for lung cancer and cancer-free controls 60 people. For release of DNA was used the phenol–chloroform extraction.

The analysis of polymorphic options 481C>T, 590G>A; was carried out by PCR method on the thermocycler T100 (Bio-Rad). RFLP was carried out by Kpnl, BamHl, TaqI.

Results
We have not found statistically significant differences in the frequency distribution of alleles and genotypes of the 481C>T, 590G>A polymorphism of the NAT2 gene between the control group and the group of patients with lung cancer.

Significant differences in the frequencies of alleles and genotypes were observed for the polymorphic variant 857G>A. Compared with healthy patients, there was a decrease in the frequency of mutant NAT2*857G allele - 64.2% and 78.3% ($\chi^2=42.52; p=0.000$) and an increase in the frequency of wild NAT2*857A allele 35.8%, 21.7% ($\chi^2=42.52; p=0.000$). In the group of patients, the frequency of the NAT2*857A allele (35.8%; $\chi^2=42.52; p=0.000$) and the heterozygous genotype NAT2*857G/A (71.6%; $\chi^2=13.43; p=0.0002$) and the frequency of the homozygous genotype decreased NAT2*857G/G (28.4%; $\chi^2=10.95; p=0.0009$) compared to the control 21.7%, 36.6% and 60.1%.

Conclusion
Thus, markers of increased risk of lung cancer in Yakuts are the NAT2*857A allele and NAT2*857G/A genotype, the reduced risk is the NAT2*857G allele, NAT2*857G/G genotype.
Mental healthcare performance measurement in circumpolar regions

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ABSTRACT:

Introduction
The sparse population distribution, environmental hazards, conflicting government health mandates, and history of the Arctic’s indigenous peoples make measuring the performance of mental health systems in the circumpolar context uniquely challenging. The objective of this study was to identify performance indicators that apply to mental healthcare systems in circumpolar regions and to explore alignment with indigenous models of health and wellness.

Methods
We searched Pubmed, Scopus, High North Research Documents, grey literature and key reference lists. Articles were included if they presented a compendium of mental healthcare indicators or described the indicator development process, and the population of interest included indigenous people, or people receiving mental healthcare in circumpolar, rural or remote regions.

Results
Six articles were included. Three were research articles describing community health interventions, two were literature reviews, and one was a review describing a government-funded indicator development process. We extracted 179 individual health measures and characterized each as either a ‘domain’, ‘indicator’, or ‘determinant’ of mental health status. Many articles described strength-based measures and assessment of a patient’s relationship to their community/environment, though usage of these measures across health systems was limited.

Conclusions
This preliminary scoping study indicates that indigenous values are not widely integrated into evaluation criteria for health systems in circumpolar regions, despite previous implementation at the local level. One Health models that explore human and environmental interactions could provide a framework for a health systems performance measurement lens more in accordance with indigenous models of mental health.
Multidisciplinary Collaborations for Community Wellness Within Circumpolar Regions

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Zander Affleck (Institute for Circumpolar Health Research); Kennedy E. Jensen (Institute for Circumpolar Health Research, Geisel School of Medicine at Dartmouth); Nathaniel F. Hansen (Institute for Circumpolar Health Research)

ABSTRACT:

Introduction:
Within circumpolar regions, the state of community wellness can be impacted by an overlapping, and often compounding, myriad of factors including rapidly changing climates, remote populations, large inequities, and distinct cultures. These multidimensional determinants of community wellbeing require creative intersectoral collaborations. This scoping review seeks to characterize the range of existing cooperative approaches for addressing these complex challenges, particularly those that have spanned traditional divisions between academic disciplines.

Methods:
We searched the Cochrane Library, JSTOR, Medline, Scopus, Ebscohost, CINAHL, Global Health Database, High North Research Documents, and online grey literature. Articles were included if they involved multidisciplinary research within Arctic regions of circumpolar nations and addressed community wellness. Throughout this analysis, ‘indigenous knowledge’ was defined as a discrete discipline different from conventional fields of study.

Results:
Though extraction and analysis are ongoing, initial results drawn from the first stage of review offer preliminary insights. Of the 409 articles identified, most focus on community wellness with regards to physical environment; other common areas of focus included mining, engineering solutions, food and nutrition, physical illness, education, socioeconomic status, community resiliency and social determinants of health.

Conclusions:
This scoping review reveals both the subject matter areas and circumpolar regions where valuable multidisciplinary work has already been implemented, as well as existing gaps for further research. Many of the creative collaborations included could guide work moving forward. Among the most vital disciplines, Traditional Knowledge is emerging as a field of scientific expertise and has much to offer future collaborative efforts.
A One Health approach to emergency preparedness in health and social services: Incorporating animal care into emergency social services planning

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*Presenter

ABSTRACT:
Northern communities are disproportionately vulnerable to climate change given the elevated exposure to Arctic environmental change and high sensitivity of social systems. Climate change effects on Yukoners’ health will include direct impacts, environmental system mediated impacts, and social mediated effects. Extreme weather events are anticipated to increase in Yukon over coming decades, potentially resulting in an increased need for emergency health and social service response. While work in Yukon on climate change adaptation is not new, actions to improve adaptive capacity in the health sector have been limited. Additionally, under the recent Joint External Evaluation for International Health Regulations, challenges were identified for Canada around sustaining response and recovery from a large-scale health disaster, and embracing the One Health triad. Yukon is no different in experiencing these challenges. Response to wildfire evacuations in Yukon during the summer of 2018 exposed vulnerabilities in current Yukon emergency social services plans related to animal care, which can act as a barrier to evacuation and place emergency response workers at risk. Yukon faces several challenges in planning for animal care during an emergency social services response, including a large and diverse animal population (such as sled dogs and pack horses), limited capacity of local veterinarians and animal shelters, paucity of data related to domestic animals in the territory, and large geographic distances between communities. This poster will provide an overview of an approach to incorporating animal care into disaster preparedness, that addresses the challenges posed by living in a remote northern jurisdiction.
"We live like on a boiling pot": parallels between climate change, ecology and health in local community members’ interpretation

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ABSTRACT:
Interdisciplinary research at the interface of climatology, ecology, medicine and anthropology, focused on the process of climate change, can be a challenge when the need to bring together statistical data and series of local observations arises while assembling a project. It’s not only the task of translating everyday impressions into the academic language but the task of operationalizing concepts and triangulating data. Thus we faced the inconsistency of judgments not only residents of different villages, but also with the internal inconsistency of the informants’ responses. If initially the focus of anthropologists were local interpretations and views, observations, feelings of local residents of the Northern regions of Siberia on climate change – the way they are perceived at the local level - then by the end of the expedition it became obvious that it is impossible to obtain accurate data without involving related factors, refracting the perception of climate change in a certain way.
This contextual expansion was inspired by the locals themselves. Speaking about climate change, they moved to the category of weather conditions, environmental conditions, clean water and air, and linked these phenomena with high mortality, the frequency of cancer and cardiovascular diseases. The climate conversation shifted to the proximity of death and the passing away of working-age men, who are the backbone of the community. One interviewee said about sudden deaths and the weakening of community vital resources: "we live like on a boiling pot and never know when we will lose the next of our men."