

## Microbiota in foods from Inuit traditional hunting

The foods we eat contain microorganisms that we ingest alongside the food. Industrialized food systems offer great advantages from a safety point of view, but have also been accused of depleting the diversity of the human microbiota with negative implications for human health. In contrast, artisanal traditional foods are potential sources of a diverse food microbiota. Traditional foods of the Greenlandic Inuit are comprised of animal-sourced foods prepared in the natural environment and are often consumed raw. These foods, some of which are on the verge of extinction, have not previously been microbiologically characterized. We mapped the microbiota of foods stemming from traditional Inuit land-based hunting activities. The foods included in the current study are dried muskox and caribou meat, caribou rumen and intestinal content as well as larval parasites from caribou hides, all traditional Inuit foods. This study shows that traditional drying methods are efficient for limiting microbial growth through desiccation. The results also show the rumen content of the caribou to be a highly diverse source of microbes with potential for degradation of plants. Finally, a number of parasites were shown to be included in the biodiversity of the assessed traditional foods. Taken together, the results map out a diverse source of ingested microbes and parasites that originate from the natural environment. These results have implications for understanding the nature-sourced traditional Inuit diet, which is in contrast to current day diet recommendations as well as modern industrialized food systems.

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## The microbial composition of dried fish prepared according to Greenlandic Inuit traditions and industrial counterparts

The practices of preparing traditional foods in the Arctic are rapidly disappearing. Traditional foods of the Arctic represent a rarity among food studies in that they are meat-sourced and prepared in non-industrial settings. These foods, generally consumed without any heating step prior to consumption, harbor an insofar undescribed microbiome. The food-associated microbiomes have implications not only with respect to disease risk, but might also positively influence host health by transferring a yet unknown diversity of live microbes to the human gastrointestinal tract. Here we report the first study of the microbial composition of traditionally dried fish prepared according to Greenlandic traditions and their industrial counterparts. We show that dried capelin prepared according to traditional methods have microbiomes clearly different from industrially prepared capelin, which also have more homogenous microbiomes than traditionally prepared capelin. Interestingly, the locally preferred type of traditionally dried capelin, described to be tastier than other traditionally dried capelin, contains bacteria that potentially confer distinct taste. Finally, we show that dried cod have comparably more homogenous microbiomes when compared to capelin and that in general, the environment of drying is a major determinant of the microbial composition of these indigenous food products.

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## Seroprevalence for *Brucella* spp. in Baltic ringed seals (*Phoca hispida*) and East Greenland harp (*Pagophilus groenlandicus*) and hooded (*Cystophora cristata*) seals

Zoonotic infections transmitted from marine mammals to humans in the Baltic and European Arctic are of unknown significance, despite given considerable potential for transmission due to local hunt. Here we present results of an initial screening for *Brucella* spp. in Arctic and Baltic seal species. Baltic ringed seals (*Pusa hispida*, n = 12) sampled in October 2015 and Greenland Sea harp seals (*Pagophilus groenlandicus*, n = 6) and hooded seals (*Cystophora cristata*, n = 3) sampled in March 2015 were serologically analysed for antibodies against *Brucella* spp. The serological analyses were performed using the Rose Bengal Test (RBT) followed by a confirmatory testing of RBT-positive samples by a competitive-enzyme linked immunosorbent assay (C-ELISA). Two of the Baltic ringed seals (a juvenile male and a juvenile female) were seropositive thus indicating previous exposure to a *Brucella* spp. The findings indicate that ringed seals in the Baltic ecosystem may be exposed to and possibly infected by *Brucella* spp. No seropositive individuals were detected among the Greenland harp and hooded seals. Although our initial screening shows a zoonotic hazard to Baltic locals, a more in-depth epidemiological investigation is needed in order to determine the human risk associated with this.

**Forfatter:** C. Sonne ; E. Andersen-Ranberg ; E.L. Rajala ; J.S. Agerholm ; Eva Cecilie Bonefeld-Jørgensen; J.P. Desforges ; I. Eulaers ; B.M. Jenssen ; Anders Koch; A. Rosing-Asvid ; U. Siebert ; M. Tyrland ; Gert Mulvad; T. Härkönen ; M. Acquarone ; E.S. Nordøy ; R. Dietz ; U. Magnusson **Type:** Article | Artikel **Årstal:** 2018  
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## Future directions for monitoring and human health research for the Arctic Monitoring and Assessment Programme

For the last two and a half decades, a network of human health experts under the Arctic Monitoring and Assessment Program (AMAP) has produced several human health assessment reports. These reports have provided a base of scientific knowledge regarding environmental contaminants and their impact on human health in the Arctic. These reports provide scientific information and policy-relevant recommendations to Arctic governments. They also support international agreements such as the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Minamata Convention on Mercury. Key topics discussed in this paper regarding future human health research in the circumpolar Arctic are continued contaminant biomonitoring, health effects research and risk communication. The objective of this paper is to describe knowledge gaps and future priorities for these fields.

**Forfatter:** B. Adlard ; S.G. Donaldson ; J.O. Odland ; P. Weihe ; J. Berner ; A. Carlsen ; Eva Cecilie Bonefeld-Jørgensen; A.A. Dudarev ; J.C. Gibson ; E.M. Krümmel ; K. Olafsdottir ; K. Abass ; A. Rautio ; I.A. Bergdahl ; Gert Mulvad **Type:** Article | Artikel **Årstal:** 2018 **Emner:** Arctic; Human health; Biomonitoring; Environmental contaminants **Titel på tidsskrift:** Global Health Action **Volume på tidsskrift:** 11  
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## Prevalence of antibodies against *Brucella* spp. in West Greenland polar bears (*Ursus maritimus*) and East Greenland muskoxen (*Ovibos moschatus*)

Zoonotic infections transmitted from terrestrial and marine mammals to humans in European Arctic are of

unknown significance, despite considerable potential for transmission due to local hunt and a rapidly changing environment. As an example, infection with *Brucella* bacteria may have significant impact on human health due to consumption of raw meat or otherwise contact with tissues and fluids of infected game species such as muskoxen and polar bears. Here, we present serological results for Baffin Bay polar bears (*Ursus maritimus*) (n = 96) and North East Greenland muskoxen (*Ovibos moschatus*) (n = 32) for antibodies against *Brucella* spp. The analysis was a two-step trial initially using the Rose Bengal Test (RBT), followed by confirmative competitive enzyme-linked immunosorbent assays of RBT-positive samples. No muskoxen had antibodies against *Brucella* spp., while antibodies were detected in six polar bears (6.25%) rendering a seroprevalence in line with previous findings in other Arctic regions. Seropositivity was not related to sex, age or biometrics i.e. size and body condition. Whether *Brucella* spp. antibodies found in polar bears were due to either prey spill over or true recurrent *Brucella* spp. infections is unknown. Our results therefore highlight the importance of further research into the zoonotic aspects of *Brucella* spp. infections, and the impact on wildlife and human health in the Arctic region.

**Forfatter:** C Sonne ; E Andersen-Ranberg ; EL Rajala ; JS Agerholm ; Eva Cecilie Bonfeld-Jørgensen; JP Desforges ; I Eulaers ; BM Jenssen ; Anders Koch; A Rosing-Asvid ; U Siebert ; M Tryland ; Gert Mulvad; T Härkönen ; M Acquarone ; ES Nordøy ; R Dietz ; U Magnusson    **Type:** Article | Artikel    **Årstal:** 2018  
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