# ”Slutrapport” / end of project report

## Välfärd för den minskande population av grönländska slädehundar/

## Welfare and health status of the declining pop. of GL sled dogs

## N2019-0014

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## Abstract:

Our project “Welfare and health status of the declining pop. of GL sled dogs” was fortunate to receive 105.000SEK as co-funding from Agria och Svenske Kennelklubbens Forskningsfond (“the Foundation” from here on).
Overall, the project has achieved a very high amount of data from a geographically wide range of Greenland sled dogs in Greenland as well as from their owners. This is particularly true in the light that the QimmeqHealth project, which this project was seeded in, did not achieve large scale (millions) funding for a post doc or PhD. But for the amount received, our act is, to be frank, difficult to follow. This report will explain why. To give a brief summation: Our studies are still ongoing in QimmeqHealth, but we have so far, by the help from the Foundation collected data pointing to several impinging health challenges for the unique Greenland sleddog: An extremely high parasite frequency and in some animals burden, high puppy mortality rate because of trauma and viral infectious disease, suffering due to the general lack of veterinary assistance, malnutrition, high-mortality viral epizootics and, perhaps, hypothyroidism. For the owners, dog-related problems include increased price of commercial feed and decreasing availability of marine resources, remote locations of designated dog areas, and risk of zoonotic infections.

Our results have, if anything, underlined the uniqueness of the Greenland sleddog, and the need for action to meet basic health requirements for welfare and sustainability, but also the need for further research.

## Background (large parts of this text is copied from the original application):

Follow this link to find the trailer for 5 short-movies as well as to find the individual movies which have been produced by the Qimmeq-project (mother-project of QimmeqHealth):
https://vimeo.com/325856390

The unique Greenlandic sled dog (GSD) is risking extinction – and with it, it takes a thousand-year-old sled dog culture (> 10.000 year old if we include the earliest escavations of dogs and dogsleds in Siberia, unpubl. information!) that, in itself, plays a major role in the self-identity and national pride of Greenland (Sonne et al. 2018). The decline of these dogs is due to social- and climatic factors, but also due to frequent outbreaks of infectious diseases (Vernersen and Jensen 2018). These

outbreaks are poorly defined and there is a need to understand these events before the population reaches a critical low. The dogs not only die from infectious diseases however; while virtually no veterinary assistance is attainable for the GSD, many thereby die or are culled, on behalf of minor diseases or trauma, that could be readily treated by a veterinarian. Moreover, animal welfare issues are an ongoing problem in Greenland (pers. comm. S. Wennerberg, 2017-2019, official Greenlandic veterinarian). Knowledge concerning the health and diseases of sled dogs in Greenland is close to non-existing. QimmeqHealth works to protect the Greenlandic sled dog by pro-actively meeting these challenges related to sled dog health and welfare.

In Greenland, there is a great and broad interest among the people and government to protect their unique sled dog culture, and conserve a healthy and sustainable population of the Greenlandic sled dog. Nevertheless, the population of dogs has rapidly declined during the last few decades, and an overview of the situation, as well as a contingency plan, is needed if the GSD and related culture are not to vanish forever. It was similarly shown recently, that the dogs which partnered with native Americans long before the arrival of horses to the Americas, went extinct after the European colonization, and along with the dogs, a thousand-year-old culture and history of the native Americans disappeared. In fact, we now also know, that the closest relative to these ancient native American dogs are the GSD (Leathlobhair et al. 2018).

Socio-economical and climatic factors offer part of an explanation for the decline of GSD, but it is evident that health-related factors play an important role too, although evidence-based data concerning details of their health is meagre. Outbreaks have periodically swiped away local dog populations in Greenland for as long as systematic reports have been produced (>150 years) (Vernersen and Jensen 2018). In spite of the hardiness of the GSD, they are far from unreceptive to the outbreaks that intermittently ravage local populations. These diseases are likely of viral origin and are exacerbated by intestinal parasites and poor (lack of -) feeding, but the true character of outbreaks is not fully defined. Moreover, a relatively high number of dogs die suddenly of unknown causes – perhaps because of unacknowledged trauma or disease or due to hunger, which is still a considerable problem among many GSD (our data and pers. comm. S. Wennerberg 2017-2019, official Greenlandic veterinarian).

The GSD is still largely a working dog (hunting, tourism and racing), and the dogs are a main source of income for many people in Greenland. Furthermore, as a symbol of the Greenlandic culture – in other words, as a symbol of adventurousness, hardiness and cohesion with nature – the sled dog has an equally high value. But the individual dog is not always regarded as one of significant value... This of course plays a negative role in terms of welfare. We however believe that the individual dog also represents an intrinsic value in itself, one worthy of protection from otherwise avoidable suffering. In reality, the health of these dogs is nevertheless only prioritized to a level that the individual owner can afford/decides, and even then, there is practically no veterinary assistance available for any of the GSD (pers. comm. S. Wennerberg 2017-2019, official Greenlandic veterinarian). QimmeqHealth seeks to promote way to increase the value of each individual sleddog, e.g., by supporting breeding and export overseas where the breed is sought after for its hardiness and stamina.

To meet the health and welfare challenges of the GSD we must gain insights into current affairs of sled dog health: what is compromising the health and welfare of these dogs, and what can be done? *This is why we initially applied for Agria och Svenske Kennelklubbens Fond. We applied for funding to analyze blood samples for standard biochemical parameters including for example thyroid status and muscle factors Creatinine, ASAT and Creatinine Kinase.*

The Qimmeq/QimmeqHealt project has initiated- and contributes to forming a scientific and practical basis for larger national schemes to build upon; schemes that will ensure that the future Greenlandic sled dog will be a healthy sustainable breed and not a formalin-fixed object in a national museum. The team behind QimmeqHealth is a group of veterinarians and researchers that are passionate about the protection of this unique breed and culture. With relatively few funds, our group has more than doubled the amount of data-based knowledge concerning the health of this breed. QimmeqHealth has moreover exposed the issue to the World, among other through the renowned journal Science (Sonne et al. 2018) as well as through numerous other media. We are proud of our current results which have only been possible to obtain due to a close cooperation with the Greenlandic Government, the people and the dog owners, as well as the Danish military unit Arctic Command. However, QimmeqHealth has not yet reached our final goal: To ensure an increased welfare of the Greenlandic sled dog.

The motivation for this application relies on our need to analyze all our current blood samples for thyroid status and muscle integrity. To be able to compare adequately between groups, we also need standard biochemical values for 90 samples recently collected.
Thyroid status and muscle integrity are central factors to asses due to their relation to the sled dogs' coping mechanisms in their extreme environment; an environment characterized by extreme temperatures, high physical demands and frequent periods of starvation. Previous studies (Case et al. 1993; Panciera et al. 2003; Lee et al. 2004; Krogh et al. 2014) have revealed interesting results in terms of thyroid status in other sled dog breeds. In spite of an extreme level of continued activity in extreme low temperatures, sled dogs markedly decrease their thyroid levels to levels below reference range for other breeds. Training usually results in the opposite picture in people and greyhounds (Panciera et al. 2003; Lee et al. 2004; Wakshlag et al. 2004). Both hyper- and hypo-activity of the thyroid gland can cause severe disease. It is unknown, however, how the thyroid function is affected by starvation in GSD and if these dogs suffer from clinically relevant (pathological) hypothyroidism? This ancient breed may even have evolved to cope with extreme lows in thyroid-hormone. If so, how? And might such a mechanism be extrapolated to improve our treatment of hypothyroid dogs, which is a common disease in canine patients?
Data on muscle factors CK and ASAT has not yet been analyzed in our samples. These are important to assess in relation to starvation (break-down of muscles) and assessment of catabolism/anabolism in relation to feeding, training and other management-related factors. There is a broad understanding in Greenland that dogs need to be kept thin (< 3/9) in order to perform optimally. This belief is mainly rooted in myths/unconfirmed stories of e.g. dogs collapsing during exercise if they are not thin. Data from other sled dog breeds confirm collapse during racing but do not relate this to body condition (Dennis et al. 2008). Being pathologically thin affects the status of several body systems in itself (Beisel 1996; Rosen et al. 2017), but it is furthermore putting the dogs on the brink of existence when the undernourished dogs are tied on the ice or snow, without shelter on open lands during temperatures often below -20C and even below -35C in winter. Finding

emaciated dogs, dead overnight during a cold spell, is as such not an uncommon finding according to the official vet in the dog district (pers. comm. S. Wennerberg 2017-2019, official Greenlandic veterinarian). Investigating the status of muscle integrity, will not only increase our general understand of the Greenlandic sled dog and its' coping mechanisms, but will potentially also provide us with highly valuable information that can act as an evidence-based foundation for directing owners' management of high-performance as well as other Greenlandic sled dogs.

## Materials and Methods

Blood samples were collected from 4 different expeditions to Greenland: Daneborg 2018, Ilulissat 2018, Qaanaaq 2019 and Qeqertassuaq 2019. We analyzed blood and performed clinical exams from 265dogs. The analysis of these blood samples was where the foundation directly contributed. And the analyses were performed as described in the attached publication: Gjalbæk et al. 2021 QimmeqHealth - Thyroid status of Greenland Sled Dogs (*Canis lupus familiaris borealis*).

## Results

There is still ongoing work related to the analysis supported by the Foundation. Work which has been finalized is the thyroid analyses which have amounted to a peer reviewed publication in Acta Vet Scand: Gjalbæk et al. 2021 QimmeqHealth - Thyroid status of Greenland Sled Dogs (*Canis lupus familiaris borealis*). This publication has been attached, and we would like to direct the reader to this attachment for the cutting edge results on thyroid status in Greenland sleddogs, which differ significantly from other breeds! This work has been the first to elucidate thyroid hormone behavior and status in Greenland sleddogs in a Greenland environment, and apart from describing these subjects, the work has also lead to further interesting questions regarding sleddog hardiness in a brutal environment and sometimes similar management.

In our reapplication for the 2$^{nd}$ year of funding, we asked permission from the foundation to redirect the final grant towards slightly different analyses. We had initially aimed at collecting more blood samples and performing more blood analyses, but COVID-19 prevented us from travelling and collecting more blood (we particularly aimed at getting samples from East Greenland dogs. This is now finally being done as I am sending this report to you). Instead, we requested the Foundation if we could use most of the remaining grant to analyze blood samples at hand for zoonotic diseases which have already been detected in human Greenlanders but without any indications of source. Several of the zoonoses previously found in these people (unpublished material, in writing), can be carried by dogs and can make them diseased. We therefore wished to analyze serum samples for specific antibodies against *Brucella* spp. and *Leptospirosis interrogans* in particular. This was done at Statens Serum Institut in Denmark. Status of this work, is, that it is unfortunately still on going. We hoped to be able to include this in this report, but results were not ready. The reason for the delay is partly because of a central prioritization of mine: I prioritized number of samples analyzed over analytical speed. I.e., we were able to reduce the price significantly per sample, if we agreed upon potential extra time in finalizing the analyses. The lab has more over faced extra challenges recently

which have further delayed the process. We will send this information in a follow up report (or forwarded peer reviewed publication), once we have it.

At last, we are working on a large-scale publication on the general assessment of the sleddog health in Greenland. All the blood work, which the Foundation has contributed to, will be included in this publication and will be forwarded to the Foundation once ready. A retrospective review of 20 years of police reports and charges regarded animal neglect/cruelty, is also meant to be included in this report, but this review lacks funding before it can be undertaken. We have applied for another grant from the foundation for this purpose, and we are happy that the Foundation has let us continue to "steg 2" in this regard. If we receive the funding, we will, if not before, include the final health report in the "slutrapport" of that project.

In brief, and apart from the results presented in the attached publication, our blood work has among other revealed a high frequency of low grade muscle damage among the sleddogs. The source of this damage is unknown, but may be related to shivering, frequent inter-individual fights and/or preferential break down of muscle tissue (amino acids) instead of fatty tissues in a fasting state. Blood samples also revealed abnormal phosphorus values, signs of starvation and serology (and fecal analyses) has revealed zoonotic parasites such as *Toxoplasma*, *Cryptosporidium* and *Giardia*. An array of parasitic studies has also been performed on the dogs but was not part of this grant. Still, I would like to announce that another large-scale and cutting edge study on the parasitic burden and microbiome of the sleddogs is also currently being produced, and if the Foundation is interested, we would gladly share these results with the Foundation. If we are lucky to receive another grant (we currently have to applications with the Foundation), we can share these results along with the end of project report or re-application – whatever suits the Foundation.

## Discussion of significance

It is easy to spot the significance of our work. If nothing else, this is the first systematic study of the health of a unique dog breed in a uniquely harsh environment. Virtually every stone we have turned, has never been turned before in this regard.

We now know more about the physiology and health of the Greenland sled dog which can feed into policies regarding animal health, welfare and conservation. Our work is far from finished when it comes the overall goal of QimmeqHealth to increase the general welfare and health (and thus conservation) of the Greenland sleddog, but we are currently actively working for increased veterinary aid in Greenland by creating pop-up clinics, and perhaps most importantly by pushing legislation that promotes veterinary aid in the sleddog district, but also increases the opportunity to increase the value of the individual dog, e.g., by the ability to export the dogs overseas where there is a demand for it, but for which misguided legislation currently stands in the way.

Our work has also spurred further interest and studies on the dog, and multiple spin off projects are currently underway. The support of the Foundation has also been sought in relation to some of these projects, namely 1) reviewing 20 years of police reports and 2) shot gun sequencing of viruses carried by- and potentially initiating epizootics in the sleddogs. Other current projects include microbiome studies and further elucidation of parasites and risk factors thereof, in the sleddogs.

Our work helps to sustain a political, scientific and legislative focus on the unique dog which has been pinned down by diseases, policies, legislations, demographic-, social and climatic changes. A list of activities related to dissemination of our results to the general public, as well as the scientific community, is presented in the following.

## Publications

Bolette Winnerskjold Gjaldbæk, Emilie Ulrikka Andersen-Ranberg, Rikke Langebæk & Anne Kirstine Havnsøe Krogh 2021. QimmeqHealth—thyroid status of Greenland sled dogs (*Canis lupus familiaris borealis*). Acta Vet Scand 63, 51. https://doi.org/10.1186/s13028-021-00617-8. Attached

Poster and presentation: Bolette WG, Andersen-Ranberg, Emilie, Langebæk R, Krogh AKH. Qimmeq Health: Reference Intervals And Effect Of Sex, Season And Management On Thyroid Hormones In 144 Grenlandic Sled Dogs. ASVCP og ISACP joint Congress, nov. 2020.

Unpublished publications, in writing:

1. QimmeqHealth: Health status of the Greenland sleddog Part 1: clinical examinations and owner interviews
2. QimmeqHealth: Health status of the Greenland sleddog Part 2: Blood biochemistry, hematology and zoonoses
3. QimmeqHealth: Health status of the Greenland sleddog Part 3: a review of 20 years of police reports.
4. QimmeqHealth: Health status of the Greenland sleddog Part 3: Gastro-intestinal Parasites. (*Not directly supported by the grant, but indirectly via funding of scientifically supportive parallel studies presented here*)
5. Pamflet or report: Description and control advice for- and against parasites in Greenland sleddogs. (one version for dog owners and one for the Greenland veterinary authorities)

Publications in popular magazines/journals:

1. Sermitisiaq/Grønlandsposten 10th of November 2021: "Slædehundeejere beder om handling" by Inge S. Rasmussen. Attached, PAGE 20-21.
2. Dansk Kennel Klubs Magasin HUNDEN 4th of April 2020: "threoideastatus hos den grønlandske slædehund". Author: DKK, not stated further. The thyroid-study was co-funded by DKK (Dansk Kennel Klub). Attached

Presentations:

1. National Museum of Denmark, oral presentation: "QimmeqHealth: Foreløbige resultater og fremtid". By Rikke Langebæk og Emilie Andersen-Ranberg, during the festival "Nordlysfestival" in Oct. 2021.
2. 28th International Conference of the World Association for the Advancement of Veterinary Parasitology. Oral presentation of "Occurrence of endoparasites in sled dogs in Greenland".

By H Mejer, IH Christiansen, TA Zareba, SR Clausen, IR Larsen, HH Petersen, AW Falch, P Jokelainen, AM Jensen, BW Gjaldbæk, S Wenneberg, Andersen-Ranberg, Emilie, R Langebæk. June 2021. (*not directly funded by the grant, but indirectly supported via support of parallel subprojects*)

3. ASVCP og ISACP joint Congress, nov. 2020. Oral presentations: "Qimmeq Health: Reference Intervals And Effect Of Sex, Season And Management On Thyroid Hormones In 144 Grenlandic Sled Dogs." By Bolette WG, Andersen-Ranberg, Emilie, Langebæk R, Krogh AKH.
4. Nuuk kulturhus/ Katuaq, 5th of Dec 2019, during Greenland Science Week, Nuuk, Greenland. Oral presentation of"QimmeqHealth: Foreløbige resultater og fremtid" by Emilie Andersen-Ranberg og Rikke Langebæk.

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Wennerberg SE (2017) pers.comm., official veterinarian for the Greenlandic Government, only veterinarian physically present in the sled dog district, responsible for reporting cases of neglect among other responsibilities. Contact: sawe@nanoq.gl