

openheart Increase in the intake of refined carbohydrates and sugar may have led to the health decline of the Greenland Eskimos

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To cite: DiNicolantonio JJ. Increase in the intake of refined carbohydrates and sugar may have led to the health decline of the Greenland Eskimos. *Open Heart* 2016;3:e000444. doi:10.1136/openhrt-2016-000444

Accepted 28 June 2016

Recently, Fodor *et al*¹ performed a systematic review to determine if the claims made by Bang and Dyerberg in the 1970s were true that the Greenland Eskimo had a low incidence of coronary artery disease. The authors concluded, 'The results of these investigations confirm that the prevalence of CAD in Inuits (Eskimos) is as high or *higher* compared to non-Eskimo populations'. Almost all of the evidence that was gathered by Fodor *et al*'s systematic review came from 1979 or afterwards. Based on the evidence, there can be little doubt that the Greenland Eskimos were indeed at a similar or even greater risk of atherosclerosis or coronary artery disease. However, the authors did find one study, from the late 1940s, that confirmed a lower risk of atherosclerotic disease in the Greenland Eskimo. Since western foods have been known to negatively impact the health of numerous isolated societies, the author decided to investigate what dietary changes may have occurred that might explain the increase in atherosclerotic disease in the Greenland Eskimos.

When looking at earlier evidence, there were two main publications discovered by Fodor *et al* that they considered as level of evidence I (the highest level of evidence), which were 'based on actual investigation, clinical, autopsies imaging techniques'. Oddly enough, these two reports from the 1940s came to opposite conclusions, one in supporting the notion that the Greenland Eskimos had less atherosclerosis (Ehrstrom²), and one suggesting a similar or greater prevalence in the Eskimos (Bertelsen³).¹

To address the supportive evidence first, Ehrstrom studied Eskimos in the same region as Bang and Dyerberg (Umanak district), which makes his findings a relevant comparison. Ehrstrom measured 'sclerosis' in 1071 Eskimos (531 women and 540 men) from

Umanak district in North Greenland, and 857 people from Korpo, Finland, between 1948 and 1949. To be included in the group of sclerotic, one or more of the following symptoms had to be present: 'palpable arteriosclerosis, roentgenological elongation, dilation or calcification of the aorta, enlargement of the heart with or without coronary insufficiency not congenital or due to infection, intermittent claudication and cerebral apoplexy (haemorrhage or thrombosis)'.²

Ehrstrom found that the number of sclerotics was about four times lower in the Eskimos of Umanak (7.5%, 80/1073) than in Korpo, Finland (29%, 300/887). When broken down by age, in those over 40 years, there were twice as many sclerotics in Korpo Finland versus the Umanak Eskimos (51% vs 25%), and in those over 50 years, there were almost four times as many (36.4% vs 10.5%). Ehrstrom concluded, 'With this age-distribution Korpo might be expected to have 2 or 3 times more sclerotics than Umanak... In no circumstances however, can it be denied that the incidence of clinical manifestations of arteriosclerosis, in relation to the age-distribution, is lower in Umanak in North Greenland than in the Korpo District in the southwest of Finland'. Ehrstrom also took blood pressures from the same sample and wrote, 'Arterial hypertension of the malignant nephrosclerotic type has never been diagnosed in North Greenland and essential hypertension is rare except for the type pseudohypertension'. In summary, from a study of over 1000 Greenland Eskimos in the late 1940, the rate of atherosclerotic disease was apparently low (7.5%), about 2–3 times lower than that in Finland at the time.²

Thus, it can be assumed that the health of the Greenland Eskimos began to decline in the early 1900s, when the level of atherosclerotic disease reached a level similar to or worse



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Table 1 An increase in the intake of refined carbohydrate and sugar paralleled the rise in atherosclerotic disease in the Greenland Eskimos

Northwest Greenland Eskimos 1940s and prior	Northwest Greenland Eskimos 1970 onward
<i>Low rate of atherosclerotic disease (2–4 times less atherosclerotic disease*)</i>	<i>Normal or higher rate of atherosclerotic disease**</i>
<i>Carbohydrate intake=2–8% of total calories (1855)</i>	<i>Carbohydrate intake=39% of total calories (by 1955)</i>
<i>Refined sugar intake=6 g/day (1855)*** 1½ teaspoonful of sugar/day</i>	<i>Refined sugar intake=164–175 g/day (1970s) 40–44 teaspoonful of sugar/day</i>
<i>Description—a near absence of refined sugar in the diet</i>	<i>Description—‘sugar was used abundantly, about five times a day, mostly in coffee or tea’. Indeed, the Eskimo had ‘terrible teeth from their habit of sipping their coffee through a sugar cube’.</i>

*Versus Korpo, Finland; **versus western populations; ***Eskimos in the Southern Inspectorate.

than that of other western countries by the late 1970s. It was then discovered by this author that carbohydrate intake in the diet of the Greenland Eskimos (calculated in 1855 by Rink) went up from only 2–8% to 40% in the Greenland Eskimos who were studied by Bang *et al*⁴ in the 1970s (over half of the carbohydrates coming from refined sugar).⁵ In fact, in 1855, the intake of refined sugar in the Greenland Eskimos was just 6 g/person/day, increasing to 164–175 g/day by the 1970s.^{4–6} When Dyerberg and colleagues visited the Eskimos, they noted that the Eskimos had ‘terrible teeth from their habit of sipping their coffee through a sugar cube’.⁷

The dietary intake of the Umanak Eskimos, which was documented by Bang *et al*⁴ and published in 1976, was calculated from 7 consecutive days of food intake. All meals were collected and weighted from seven Umanak Eskimos who were asked not to change their habitual diet. All foods were weighed, homogenised and aliquots were frozen until these could be analysed in Denmark. The average daily consumption of sugar in these Greenland Eskimos was noted as 164 g/day, 134 g of bread, biscuits and rye flour, 31 g rice, and 42 g potatoes. This equates to 371 g of carbohydrate per day. A similar study, but this time looking at the dietary intake of 50 Greenland Eskimos, was carried out by Bang *et al*,⁶ and it found similar results, thus strengthening their prior dietary intake estimates. The high-carbohydrate western foods consumed by these Eskimos came from a shop run by the Royal Greenland Trading Company, where the primary foods available were bread, biscuits, sugar, margarine, potatoes, rice, coffee, tea, milk powder, flour and beer.⁴ In fact, by the 1920s and particularly after the 1950s, the diet of the Greenland Eskimos mainly consisted of shop food. By 1976, ‘sugar was used abundantly, about five times a day, mostly in coffee or tea’. Indeed, the average number of meals during 1 week, which contained one or several food components, was 35.4 meals for sugar, 13.6 meals for bread, and 12.1 meals for whale and seal (when combining both meat and blubber). In other words, the Greenland Eskimos, studied by Dyerberg and Bang in the 1970s, were not consuming the traditional Greenland Eskimo diet at all.

The contradictory evidence by Bertelsen indicating that the Greenland Eskimos had a similar or greater incidence of atherosclerosis at face value was discouraging to the notion that the Greenland Eskimos were indeed healthier than the people in the western world. However, according to Bertelsen, the consumption of sugar (and chocolate) in West Greenland went up from just 11 lbs per person per year in 1901–1903 to 87 lbs per person per year by 1930–1933.⁸ Bertelsen also noted that the intake of cereal in West Greenland increased from 74 lbs/person/year in 1901 to 205 lbs/person/year by 1931.⁹ Thus, the intake of refined carbohydrates and sugar significantly increased in West Greenland during the early 1900s, which would explain why Bertelsen noted a similar or even greater incidence of atherosclerosis in the Greenland Eskimos whom he studied. **Table 1** summarises how an increase in the intake of refined carbohydrate and sugar paralleled the rise in atherosclerotic disease in the Greenland Eskimos.

In conclusion, an increase in the intake of refined carbohydrate and sugar paralleled the rise in atherosclerotic disease in the Greenland Eskimos. While the total carbohydrate intake of the Greenland Eskimos was just 2–8% of total calories in 1855, this increased to around 40% of calories by 1955.⁵ The Greenland Eskimos studied by Bang and Dyerberg in the 1970s no longer consumed a traditional healthy Eskimo diet. Indeed, the intake of refined sugar in the Greenland Eskimos increased by almost 30-fold from 1855 (6 g/person/day or around 1½ teaspoonful of sugar) to the 1970s (164–175 g or around 40–44 teaspoonful of sugar). Moreover, the intake of refined carbohydrate increased 5–7-fold from 1855 (18 g/day from bread) to the 1970s (84–134 g/day from bread, biscuits and rye flour).

In summary, the intake of refined carbohydrate and sugar by the Greenland Eskimos increased in parallel to the rise in atherosclerotic disease. Considering that a similar event occurred in the USA¹⁰ and that the overconsumption of refined sugar is a principal driver of type 2 diabetes,¹¹ hypertension^{12 13} and coronary heart disease,¹⁴ this most likely explains the health decline of the Greenland Eskimos.

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Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

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REFERENCES

- Fodor JG, Helis E, Yazdekhasi N, *et al.* "Fishing" for the origins of the "Eskimos and heart disease" story: facts or wishful thinking? *Can J Cardiol* 2014;30:864–8.
- Ehrstrom MC. Medical studies in North Greenland 1948–1949. VI. Blood pressure. Hypertension and arteriosclerosis in relation to food and mode of living. *Acta Med Scand* 1951;140:417–22.
- Bertelsen A. Grønlandskmedicinskstatistikognosografi. Bd. III: Detsædvanlige grønlandske sygdomsbilleder, [Medical statistics and nosography in Greenland: the usual disease pattern in Greenland]. *Meddelelser Grønland* 1940;3:117.
- Bang HO, Dyerberg J, Hjøorne N. The composition of food consumed by Greenland Eskimos. *Acta Med Scand* 1976;200:69–73.
- Krogh A, Krogh M. A study of the diet and metabolism of Eskimos undertaken in 1908 on an expedition to Greenland. *Medd Grønland* 1913;51:1–52. https://archive.org/stream/meddelelseromgr511915denm/meddelelseromgr511915denm/meddelelseromgr511915denm_djvu.txt
- Bang HO, Dyerberg J, Sinclair HM. The composition of the Eskimo food in north western Greenland. *Am J Clin Nutr* 1980;33:2657–61.
- Allport S. *The Queen of fats: why omega-3s were removed from the Western diet and what we can do to replace them*. University of California Press, 2006.
- Pedersen PO. Dental investigations of Greenland Eskimos. [Summary.]. *Proc R Soc Med* 1947;40:726–32.
- Baarregaard A. Dental conditions and nutrition among natives in Greenland. *Oral Surg Oral Med Oral Pathol* 1949;2:995–1007.
- DiNicolantonio JJ. The cardiometabolic consequences of replacing saturated fats with carbohydrates or Ω -6 polyunsaturated fats: do the dietary guidelines have it wrong? *Open Heart* 2014;1:e000032.
- DiNicolantonio JJ, O'Keefe JH, Lucan SC. Added fructose: a principal driver of type 2 diabetes mellitus and its consequences. *Mayo Clin Proc* 2015;90:372–81.
- DiNicolantonio JJ, Lucan SC, O'Keefe JH. An unsavory truth: sugar, more than salt, predisposes to hypertension and chronic disease. *Am J Cardiol* 2014;114:1126–8.
- DiNicolantonio JJ, Lucan SC. The wrong white crystals: not salt but sugar as aetiological in hypertension and cardiometabolic disease. *Open Heart* 2014;1:e000167.
- DiNicolantonio JJ, Lucan SC, O'Keefe JH. The evidence for saturated fat and for sugar related to coronary heart disease. *Prog Cardiovasc Dis* 2016;58:464–72.



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Open Heart 2016 3:

doi: 10.1136/openhrt-2016-000444

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