

THE EFFECT OF FOOD RESTRICTION
DURING WAR ON MORTALITY
IN COPENHAGEN

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As I have already pointed out,¹ the blockade placed the people of Denmark in a very serious situation. We had been importing more than half of our bread cereals and a very considerable amount of corn and oil cakes for the use of domestic animals. While Denmark had only half as large a supply of rye and potatoes per capita as Germany, Denmark had proportionately twice as many domestic animals. The reason for this advantageous state of affairs was that the committee which had charge of proportioning the crops between man and animals (April 4, 1917) was converted to the newer ideas on nutrition.

1. No attention was paid to the protein minimum; it was held that this minimum was so low for man that it could not be reached, provided sufficient calories were furnished.²

2. While fat was regarded as a very valuable addition to the dietary, it was not considered as being necessary.³

3. Bran was considered to be a very valuable food, one which was well digested by man.⁴

As research had also shown that man can retain full vigor for a year or longer on a diet of potatoes and fat and for half a year or more on a diet of barley and fat,⁵ reliance was placed on our potatoes and the large barley crop, which was given to man and not to the pigs, as heretofore, with the result that the pigs died of starvation, but the people received sufficient nutrition. Furthermore, we ate all our bran ourselves. We not only ate whole rye bread, but we mixed all our wheat bran with the rye flour and were able to bake good bread in this way. The Germans were unable to bake good rye bread. Their bread was too sour and too soggy. We were fortunate in having had more than a hundred years of experience in this direction. Our principal foods were bran bread, barley porridge, potatoes, greens, milk and some butter. Pork production was very low; hence the farmers ate all the pork they raised, and the people of the cities and towns got little or no pork. Beef was so costly that only the rich could afford to buy it in sufficient amount. It is evident, therefore, that most of the population was living on a milk and vegetable diet. As the potato and barley dishes were not "to Mr. Sorenson's liking" (Danish expression) to the same degree as meat, "he" ate less than before, and hence often lost weight.

The Danish food regulation was a most interesting problem for me. It was a low protein experiment on a large scale, about 3,000,000 subjects being available. What was the result? What was the effect on the health of the people? What was the death rate? At a later time I hope to be able to report on the death rate for both sexes, at different periods of life and from

various diseases. In the accompanying table I give some data on the numbers of deaths per 10,000 population in Copenhagen, between the ages of 25 and 65 years.

Food restrictions were initiated in March, 1917, and by October, 1917, they had become very severe. Therefore, my calculations embrace a year beginning and ending October 1. I could not continue my studies after October, 1918, because of the epidemic of influenza then existing. The death rate, as is known, has decreased in the last decades, as the result of a fall in the rate for epidemic diseases and tuberculosis. The cause of these diseases being known, we are able to combat them successfully. The deaths for all other diseases have been practically the same since 1900 or even earlier than this. Placing the average for the period from 1900 to 1916 (109) at 100, the variation (ratio) is small, from 93 to 107, until food regulation began. During the year of severe regulation, it fell to 66, a decrease of 34 per cent. It would seem, then, that the principal cause of death lies in food and drink. It must be remembered in this connection that we took the cereals and potatoes from the distillers so that they

NUMBER OF DEATHS PER TEN THOUSAND MEN
BETWEEN THE AGES 25 AND 65

Year	All Diseases	Epidemic Diseases and Tuberculosis	Other Diseases	Ratio
1900	152	46	106	97
1901	151	41	110	101
1902	131	30	109	100
1903	142	34	108	99
1904	137	36	101	93
1905	148	41	107	98
1906	144	33	111	102
1907	145	31	114	105
1908	152	35	117	107
1909	142	31	111	102
1910	135	26	109	100
1911	148	32	116	106
1912	138	30	108	99
1913	130	28	102	94
1914	133	27	106	97
1915	134	26	106	97
1916	145	35	110	101
1917	123	33	90	83
1917-1918*	99	27	72	66

* From Oct. 1, 1917, to Oct. 1, 1918.

could not make brandy, and one half of the cereals from the brewers, so that the beer output was reduced one half. Is it possible that this reduction in the output of alcoholic beverages is wholly responsible for the lower death rate? This question cannot be answered; but beyond a doubt while the lessened alcohol consumption is a great contributing factor to the lowered death rate, it is not the only one. The death rate for women has also been lowered 17 per cent. in the four year period 1910-1914. It is difficult to imagine that women consumed so much alcohol that this reduction in the death rate among women is to be charged solely to greater abstention from alcoholic beverages.

The death rate for Denmark for the year October, 1917, to October, 1918, was 10.4 per thousand. It never had been lower than 12.5 (1913, 1914). A difference in the death rate of 2.1 per thousand for a population of 3,000,000 means a saving of 6,300 lives. Hence, the saving of lives in Denmark as a result of the allied blockade was considerable.

This result was not a surprising one to me. Since 1895, when I began my experiments with a low protein diet (mostly vegetarian), I have been convinced that better physical conditions resulted from this standard of living. It may be said that a vegetarian diet is a more healthful diet than the ordinary diet. As the

1. Hindhede, M.: Ugesk. f. Lager **81**: 183 (Jan. 30) 1919; abstr. J. A. M. A. **72**: 1198 (April 19) 1919.
 2. Hindhede, M.: Skand. Arch. f. Physiol. **30**: 97, 1913; **31**: 259, 1914.
 3. Hindhede, M.: Skand. Arch. f. Physiol. **30**: 78, 1913; published in German in 1919; Research was begun, Aug. 25, 1916. By April 4, 1917, after nine months' experience with a fat free diet, we were convinced that adults could live without fats, provided they were given greens.
 4. Hindhede, M.: Skand. Arch. f. Physiol. **23**: 59, 1915.
 5. Hindhede, M.: Skand. Arch. f. Physiol. **35**: 294.

result of extensive studies in this field I am convinced that overnutrition, the result of palatable meat dishes, is one of the most common causes of disease.⁶ I agree with McCollum⁷ that:

Lactovegetarianism should not be confused with strict vegetarianism. The former is, when the diet is properly planned, the most highly satisfactory plan which can be adopted in the nutrition of man . . . The only successful combination of natural foods or milled products for the nutrition of the animal are: (a) combinations of seeds or other milled products, tubers and roots, either singly or collectively, taken with sufficient amounts of the leaves of plants; (b) combinations of the foodstuffs enumerated under (a), taken along with a sufficient amount of milk to make good their deficiencies.

I wish to call attention to the unusual amount of bran consumed by the people of Denmark during the period of food restriction. In other countries, for example, Germany, Holland and Norway, the question was discussed whether grain should be milled to yield 70, 80, 90 or 94 per cent. of bolted flour. We not only milled our rye to 100 per cent. but, profiting by previously made experiments, we added all our wheat bran to the whole rye bread; and as we added also 24 per cent. of barley meal (milled to 95 per cent., only the coarsest shells being removed) we had more than twice the amount of bread we would have had if we had milled only to 70 per cent. As the difference in digestibility was only 9 per cent. (94—85) we got about twice the amount of digestible bread. And, be it emphasized, we could bake good bread with this mixture. People entered no complaints; there were no digestive troubles, but we are accustomed to the use of whole bread and we know how to make such bread of good quality. If further proof were needed, this war experiment on such a large scale has demonstrated that bran is excellent food.

These findings agree with those of Osborne and Mendel.⁸ These investigators found that bran is a very good food for rats, and that mixed with white flour it can take the place of meat and eggs. Their results lead me to conclude—if I may be permitted to apply results obtained on rats to human beings—that: As bran can replace meat and eggs, man should eat whole bread and not so much of the more costly foods. Mendel concludes contrariwise: As people eat enough of meat and eggs, "no practical advantage on this score can be expected by converting the entire grain into flour." In my opinion, Mendel not only overlooks the economical question, but also that there are good reasons for believing that a diet composed mostly of meat, eggs and white bread—a common diet of the well-to-do—is far from being a healthful diet. Even in the case of rats, a meat diet seems eventually to be harmful. Although rats can thrive quite well on a meat diet—which man cannot do—the young of meat fed rats seldom survive.⁹ The fact of the matter is that it is claimed that rats, like human beings, will not choose an exclusive meat diet from natural instinct. That statement does not, however, apply to the rat. Watson says, on the basis of his numerous experiments on rat feeding: "I have never seen a young rat which would look at porridge or milk if meat was available."

I have seen "human" rats who would not eat porridge when beefsteak was available! And we know that beef, in large amount, is not good food for either man or rat.

While not all readers will agree with what I have said, no one can dispute the fact that the people of Denmark have no cause to regret that during the war their diet consisted mostly of milk, vegetables and bran. If Central Europe had adopted a similar diet, I doubt that any one would have starved. It seems to me, however, that the German scientists, as represented by Rubner, have not learned anything from the war. Rubner¹⁰ writes about the "necessity of bringing the supply of live stock up to the prewar basis. . . . From what I have stated, it follows that meat products must again form an adequate proportion of our diet."¹¹ Rubner wants an abundance of meat in order that the people can be "aufgefüttert." I do not agree with him. The people must first have bread, potatoes and cabbage in sufficient quantity, and then some milk. Meat is the last requirement to be met. If the people must wait until pigs and cattle have sufficient food, they will die of starvation one year before they can get an abundance of meat.

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LOCAL ANESTHESIA IN NEURO-SURGERY

WITH SPECIAL REFERENCE TO ITS VALUE IN
EVULSION OF THE SENSORY ROOT OF
THE GASSERIAN GANGLION

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Those of us who were so fortunate as to participate in the medical and surgical work in France during the recent war are often asked the question, "To what extent have the principles and practices evolved by military surgery benefited civil medicine and surgery?"

Without attempting to answer such a broad question, I wish to discuss briefly the use of local anesthesia in neurosurgery, with special reference to its application in the operative relief of trifacial neuralgia, believing that the routine use of local anesthesia in the war wounds of the central and peripheral nervous systems is responsible for its wider application in neurosurgical problems of civil life.

Local anesthesia has been used in certain selected neurosurgical operations for many years, and is therefore in no sense a method which originated during the recent war. For example, Thomas and Cushing¹ reported the removal of a brain cyst under cocaine anesthesia after four previous operations under general anesthesia had been abandoned on account of excessive hemorrhage due, presumably, to the fulness of the vessels, produced by the anesthesia. They say:

Although the undertaking was premeditated, in consequence of our previous unfortunate experience in administering general narcosis to this patient, we must confess to surprise at its successful accomplishment. Contrary to all expectations, the dura proved to be insensitive to such manipulations as were

6. Hindhede, M.: *Moderne Ernährung*, Berlin, W. Vobach, 1915; 12. *Beretning fra Hindhedes Kontor for Ernæringsundersøgelser*, Copenhagen, Jakob Lind, 1919.

7. McCollum: *The Newer Knowledge of Nutrition*, pp. 52, 81.

8. Osborne, O. T., and Mendel, L. B.: *J. Biol. Chem.* **37**: 557 (April) 1919.

9. Watson, Chalmer: *The Influence of Diet on the Structure of the Tissues*, Edinburgh, 1910.

10. Rubner: *Schädigung der deutschen Volkskraft durch die feindliche Blockade*, Denkschrift des Reichsgesundheitsamtes, Berlin, 1911.

11. "Nothwendigkeit der Wiederherstellung des Viehbestandes. Aus dem gesagten folgt, dass die Fleischnahrung wieder den entsprechenden Anteil an der Ernährung nehmen muss."

1. Thomas, H. M., and Cushing, Harvey: *Removal of a Subcortical Cystic Tumor at a Second Stage Operation Without Anesthesia*, *J. A. M. A.* **50**: 847 (March 14) 1908.