secretion or marked deficiency of secretion is a much less common consequence of disturbed innervation than is hypersecretion. And if we admit that achlorhydria may be purely functional at the outset, who knows that if it persists it may not lead to changes in the blood or in the spinal cord, because of increased toxins that its absence permits to develop in the intestinal tract? It seems reasonable to conclude at least that achlorhydria never occurs in the normal individual, and that it may be the forerunner of several vital ailments has been positively proved. Can we, therefore, ever regard its discovery with complacency?

The statements in this paper are based largely on personal observations in medical wards during the last twenty years and also on the study of the experience and researches of other men.[1]

Shreve Building.

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# THE EFFECTS OF AN EXCLUSIVE, LONG-CONTINUED MEAT DIET

## BASED ON THE HISTORY, EXPERIENCES AND CLINICAL SURVEY OF VILHJALMUR STEFANSSON, ARCTIC EXPLORER

CLARENCE W. LIEB, M.D.
NEW YORK

The dietetic observations and experiences of Vilhjalmur Stefansson during his career as an arctic explorer are worthy of careful scrutiny by students of nutrition. Because of his contributions, he is entitled to prominence in many departments of science, among them anthropology, geography, geology, oceanography, languages and comparative religions. Whether reading Stefansson's books, attending his lectures, or in private conversation with him, one is impressed not only by his broad knowledge of biology but also by the keenness of his observations and deductions in the domain of metabolism, particularly as applied to the science of practical dietetics. An anthropologist by training, an arctic explorer by choice, he became a student of nutrition by necessity. Perhaps there is no other man living today whose experimental studies have been so well controlled and done on so large a scale. His laboratory was the arctic circle, his experimental subjects human beings, and his experimental material, meat.

This paper reviews the medical history of this unique man. It is hoped that the facts gleaned from the study of his arctic dietetic regimen and body physiology may throw additional light on a subject about which our knowledge is still somewhat vague and controversial; namely, protein metabolism.

During the month of September, 1922, I made a medical survey of Mr. Stefansson. He suggested at that time that the facts elicited from the studies might be of sufficient scientific interest to warrant publication. The present paper represents the work done on him at that time, amplified by a clinical survey of his condition some two years later.

### MEDICAL HISTORY

Stefansson's paternal grandfather and grandmother lived to a very old age, the exact figures not being available. His maternal grandfather died young, through drowning, the maternal grandmother living to the age of 90. His father died at 62, his mother being still alive at 82, though blind since 1916. Two sisters and one brother are living and in good health.

He was delicate during childhood. Born one year before a famine, for the greater part of one year he lived mainly on fish. At 10 years of age, he had a severe attack of measles. While in college, he had an attack of mumps. At 14 one tooth was extracted. Two molars were filled in 1906. No further dental trouble occurred until recently. During the winter and spring of 1918, while in the Far North, he had typhoid fever with pneumonia and two attacks of pleurisy, and spent three months in bed. During the first three or four days of the headache and fever, at the onset of the typhoid, he was in camp. He then walked about 40 miles against a blizzard. He was given low caloric feeding until, taking matters in his own hands, he insisted on being hauled by sled about 300 miles from Hersalul Island on the arctic coast of Canada to the Episcopal Hospital at Fort Yukon. During the journey, Mr. Stefansson ate frozen raw fish and later, large meals of caribou meat and fish, sometimes boiled and sometimes raw and slightly frozen. His strength returned as soon as this dietary was adopted. The journey took twenty-seven days, during which time he fully recovered from typhoid and gained 30 pounds (13.6 Kg.).

Out of eleven and one-half years in the polar regions, Mr. Stefansson lived about nine years on a meat diet; that is, meat and water. For at least six years of the nine, he lived entirely without salt. The longest continuous period without food, other than meat, was about nine months.

At the present time, Mr. Stefansson is in excellent health, working intensively in writing books and giving lectures. He travels a great deal, takes practically no exercise and eats anything placed before him, but his tendency is to eat more meat than the average person. Since returning to civilization, he has had a tendency to constipation and has infrequent colds, but is otherwise never ill.

In 1922, when he was 43, he weighed 156 pounds (70.8 Kg.). He was 5 feet 11 inches (180.3 cm.) tall, and well developed and nourished. He looked his years, but no older. The hair was thick and brown with a dry scalp. The face was somewhat asymmetrical. The eyes were normal. The von Graefe, Möbius and Dalrymple signs were not present. The pupils were equal and reacted to light and in accommodation. The ears and nose were normal. The tonsils were medium sized and cryptic, with a slight purulent secretion on aspiration. The teeth, objectively, were in good condition, with healthy gums and normal gingival margins. There was no struma. The posterior cervical glands could not be palpated.

The chest measurements were: inhalation, 37 inches (94 cm.); exhalation, 34½ inches (87 cm.); at rest, 35½ inches (90 cm.). A pea-sized cyst was present on the third rib to the right of the sternum. The lungs were normal throughout to auscultation, palpation and percussion. Fluoroscopy showed peribronchial thickening. The apex beat of the heart was mediad to the left maxillary line; the aortic second beat equaled the pulmonic second; no murmurs were elicited. There was normal response to cardiac functional tests. The pulse was 60, equal, regular, and synchronous. The vessel walls were barely palpable. There was no tremor of the outspread fingers.

The systolic blood pressure was 115 and diastolic, 55, in both arms.

Slight eczema could be seen between the toes, on the right instep and behind the right ear.

The tache cérébral was normal. No dystrophy or cyanosis of the nails was present.

The crines of the abdomen were triangular; the hirci were of the female type. No tenderness or masses were felt.

The liver was not felt, nor was the dulness increased. The spleen was not palpable. The gonads were normal.

The knee jerks were active and equal. The Babinski reflex was negative.

Slight external hemorrhoids were present. The prostate was normal. The spine was straight, with free and painless movements.

Men in the various specialties have examined Stefansson, and reports have been entirely negative. Laboratory examinations of the blood (including morphologic, biologic, and chemical, urine, stool, basal metabolism and kidney function tests were normal.

1. These are recorded in a bibliography which appears in the author's reprints.

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The following facts regarding Stefansson's life in the Far North are noteworthy:

1. He spent altogether eleven and one-half years within the arctic circle.
2. He lived for a number of days, totaling nine years, on an exclusive meat diet.
3. He lived for nine successive months on an exclusive meat diet.
4. He reached his maximum weight while subsisting on meat (fish).
5. His sense of physical and mental well being was at its best during that period of his life.
6. He found that the exclusive meat diet worked as well when he was inactive as when active, and as well in hot weather as in cold.
7. Constipation was never present. One month's entire absence from exercise produced neither constipation nor muscular weakness.
8. His hair thickened, and his scalp became healthier.
9. Teeth decay was apparently much less rapid.

Stefansson avers that not a single case of constipation was observed in 600 exclusively meat-eating Eskimos for a period of three years.

COMMENT

Stefansson has remarked in his book "The Friendly Arctic" that unless it is religion there is no field of human thought in which sentiment and prejudice take the place of sound judgment and logical thinking so completely as in dietetics.

His experiences in the Far North should give an intensive stimulus particularly to metabolic inquiry as regards the protein modality. There is an apparent need of a recasting of clinical dietetics based both on his experiences and on the newer knowledge of the rôle of the different sugars reaching the colon in the production of biochemical reactions in the intestinal tract.

Neither Stefansson nor any of his men, so far as we could determine, suffered any ill effects from long continued meat diet.

Stefansson affirms that his observations on the health and longevity of Eskimos led him to the conclusion that the high protein diet has no deleterious effects on their circulation or kidneys. He does feel, however, that the mixed diet to which they have resorted in recent years is making them prematurely old and is producing infirmities in those past middle life similar to those of civilized communities. He considers the prime cause of this to be increase of constipation that has everywhere accompanied the adoption by the Eskimos of imported foods.

I have had two patients who gave a history of living on practically an exclusive meat diet for a period of several years. One of these men was about 45 years of age but looked several years younger. He ate practically nothing but beefsteak three times daily. He boasted of the fact that he never took exercise, and without any previous training could run a hundred yards in twelve seconds, or swim five miles without fatigue. The other man, aged 55, was, when last examined about a year ago, in excellent condition. Neither of these men had symptoms of intestinal toxemia, kidney disease or cardiovascular disorders.

The foregoing data, however inadequate in their scientific check up, can only lead us to question the commonly accepted facts regarding a high protein diet.

366 Madison Avenue.

# VERTIGO

## ITS INCIDENCE IN ENDOCRINE DISORDERS *

DANA W. DRURY, M.D.
BOSTON

Vertigo is one of the most sudden and distressing symptoms that the human body experiences, yet the location of the cause is still obscure. This in part is due to the intermittent character of its manifestation, and in part to a lack of clarity of definition to the condition to which the patient applies the term vertigo, giddiness or dizziness. While we have been accustomed to regard the symptom as vague and lacking outline, the fact remains that it must be caused by a direct inhibition of the labyrinthine semicircular canals.

The term equilibrium, as applied to the condition of the body, whether at rest or in motion, indicates a state in which all the skeletal muscles are under control of nerve centers, so that they combine, when required, either to resist the effect of gravity or to execute some coordinated motion. The preservation of equilibrium is manifestly of fundamental importance in animal life, and we find, accordingly, several mechanisms sharing in this function. That the motor coordinating centers may act properly, they must receive sensory impressions conveying correct information of the relative position of the body at any given time. The integration of these sensations may be characterized as the sense of equilibrium, and it is probably not going too far to assume that every known sensation contributes to this fund of information. Thus, in ordinary life the contact of the surface of the body with various objects is a common source of information as to our relation with the environment. Again while standing upright, and still more when in motion, the muscular sense is active in appreciating the tension, active or passive, of the muscles. As an example, in the erect position, with the eyes closed, a writing point attached to the head will show that the body sways in a peculiar manner, indicating successive contraction of different groups of muscles.

The founder of the modern theory of the functions of the nonacoustic labyrinth was Flourens,[1] who found that, after lesions or excitation of the semicircular canals in pigeons and mammals, characteristic forced movements were obtained. Therefore, we now recognize that the labyrinth is composed of three distinct sense organs: the cochlea with the organ of Corti, for which the adequate physiologic stimulus consists in sound vibrations; the canals with the cristae acousticae, which are physiologically stimulated by the movements of the head; the vestibular saccules with the maculae, the stimulus of which is the movement of the otoliths, and particularly the variations in the rate of the rectilinear movements, both on the horizontal and on the vertical planes. The cochlea is the organ of hearing; the canals are the organs on which depend the experimentally produced sensations of rotatory and galvanic vertigo, and which normally influence the complicated function of equilibrium by means of obscure sensations: the saccules are the organs on which depend the subconscious sensations that are normally ours of the direction of the line of gravity, and thus of the position of the body in relation to the environment.

* From the Evans Memorial (No. 128-A-74).
* Read before the Section on Laryngology, Otology and Rhinology at the Seventy-Seventh Annual Session of the American Medical Association, Dallas, Texas, April, 1926.

1. Flourens: Recherches expérimentells du système nerveux, Paris, 1842.

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