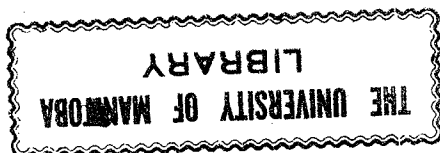


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by

The Thiamin Content of Manitoba  
Vegetables and The Effects of  
Cooking, Storage and Canning on  
the Thiamin Content.

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## INTRODUCTION

From a public health standpoint the nutritional deficiency diseases are not a cause for undue alarm in Canada. Cases of this nature are comparatively rare, e.g. at the Hospital for Sick Children (40) in Toronto in 1925 there were 154 cases of rickets. Ten years later, in 1935, there were only four. However, from dietary surveys made in Canada and the United States it is quite apparent that of the populations of both countries as many as one-third are receiving diets which are not in line with optimum health. The point stressed in these surveys was that the diets of the people of both countries are deficient in vitamin B<sub>1</sub> or thiamin. Surveys in Canada show that the average daily intake ranges from less than 0.6 to 1.2 milligrams per day (30). This is to be contrasted to a recommended daily intake of 1.8 milligrams for men and 1.5 milligrams for women, approved by the Canadian Council on Nutrition in 1942.

From the large numbers of assays which have been made of a wide variety of animal and vegetable tissues it is clear that thiamin is of nearly universal occurrence in quantities ranging from 0.1 to 2.0 micrograms per gram. In the wide variety of products in the plant world these amounts are exceeded only in seeds and yeast grown in rich media. The task of estimating the thiamin supplied by mixed diets requires accurate analysis of a large number of essential foods. Vegetables rank high in the dietaries of not only Canada but also other countries of the world. A knowledge of

the amount of thiamin present in such home products is necessary in order that programs to alleviate the above mentioned lack of this factor may be initiated.

As a consequence of a "sophistication" of the modern food supply, it is becoming increasingly difficult to set up dietaries that will ensure adequate nutrition. Extensive educational programs have failed to bring about a greater appreciation and usage of the natural foodstuffs such as whole wheat flour and bread. We insist on employing methods of cooking that cause a loss of most, if not all, of the essential minerals and vitamins. A continuation and extension of the preference for nutritionally inferior foods poses a question of grave concern with respect to the effect on the public health.

This is essentially true in view of the health problem that has come to light during the past war. The medical profession and nutritionists have at the present time, and in Winnipeg, a splendid opportunity to study a nutritional disease which is relatively rare in Canada. The Winnipeg Grenadiers returned some weeks ago, and we know that these boys, having undergone untold misery, are suffering from beriberi as a result of lack of Vitamin B<sub>1</sub> and general malnutrition. Recently I had the opportunity of visiting one of our local military hospitals and of interviewing one of the doctors and several of the patients. The following are a few of the facts as taken from one of the hospital case histories:

The patient was shipped out to Hong Kong in October, 1941. The Government surrendered Hong Kong December, 1941. Food in the camp in which he was placed was very poor. He was given one can of "vegetable soup" made from grass and herbs per day with two small buns made of white bread and one cup of tea, given at dinner. He had meat twice for the duration of his stay in Hong Kong (Jan. '42 - Sept. '42.)

He was shipped to Japan in 1943. His feet were sore and weak and he had burning pains in his legs. Finally his feet became numb and he went blind. Shortness of breath developed in the summer of 1944 and a pain over the apex of the heart radiating to underneath the shoulder blades began in the fall of 1944. He was in Koki hospital for six months with beriberi and malnutrition. This was in November 1944 until April 1945. When taken prisoner he weighed 228 pounds. While a prisoner he came down to 98 pounds. His present weight is 198 pounds.

It is in such cases as this that as complete a knowledge as possible of the chemical composition of foodstuffs is essential.

With the availability of greatly improved methods of assay it has become a relatively simple problem to determine the vitamin supply in our foods. However, it is becoming more and more important that we determine values for foods as they are consumed. The vitamin content of the vegetables prior to cooking or processing may be affected by long periods of holding in the retail stores. There is considerable interest in improved cooking methods and evidence of this better vitamin retention through their use is now available. Losses due to home and commercial canning of vegetables have heretofore been regarded as inevitable but many of these losses may be reduced as easily as those encountered in the final cooking procedure.



It is for this reason that a study of the thiamin content of Manitoba vegetables and the effects of processing and storage on the thiamin content has been undertaken. A large representative group of vegetables has been covered and the effects of canning, storage, and cooking have been determined.

It has also been suggested that soil type and nutrient supply both have an effect on the thiamin content of vegetables. It is clear, however, that only a few of the many possible relationships have been studied. An attempt is made in these experiments to study the variation in thiamin content of Manitoba vegetables over a considerable area. Seven districts have been considered and although it was impossible to secure data on soil type, the degree of variability has to some extent been determined.

#### REVIEW OF LITERATURE

Although scurvy, rickets, beriberi, and pellagra are widely spread and have been known throughout recorded medical history, it is only during the most recent years that the causes of such diseases have been found to be that of dietary origin.

It was Takaki, Director-General of the Japanese Navy, who early discovered that the occurrence of beriberi could be reduced to a minimum by the addition of more meat and vegetables to the sailors' diet. Following this Dr. Christiaan Eijkman in 1897 found that fowls fed on polished rice developed convulsions and opisthotonus. This is a spastic condition characterized in birds by retraction of the head and protrusion

of the abdomen.

In 1911 Funk attempted to isolate from rice polishings the substance active in the cure of beriberi, and in 1912 he assembled the facts concerning beriberi, scurvy, rickets and pellagra. He advanced the theory that other vitamins similar to his so-called "anti-beriberi vitamine" must exist and that these substances would be capable of curing these deficiency diseases. By a long and troublesome extraction Jansen and Donath (24) in 1926 isolated from rice polishings, in extremely small yields, a highly active hydrochloride which analyzed for the empirical formula  $C_6H_{10}N_2O$ . Application of the methods of Jansen and Donath to the extraction of yeast enabled a group of workers in the Gottingham Laboratory of Professor Windaus (46) in 1932 to isolate small amounts of a highly active material. This proved to be essentially identical with Jansen and Donath's substance, but was found to contain sulphur. Williams and his co-workers (44) in 1934 were able to devise a method for securing consistent yields of anti-neuritic vitamin hydrochloride, and in 1936 Williams (42) revised his formulation. Together with Cline, (43) he published a preliminary communication on the synthesis of the vitamin which was called thiamin.

The first systematic study of the distribution of the antiberiberi vitamin in foodstuffs was made at the Lister Institute of Preventive Medicine by Cooper (5) in 1912. This investigator used the prevention of polyneuritis in pigeons as a criterion. Not only did he deal with the