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UNIVERSITY OF LOUISVILLE

THE NATURAL FACTORS IN THE SELECTION OF DIET

A Dissertation

Submitted to the Faculty

of the

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In Partial Fulfillment of the

Requirements for the Degree

Of Master of Science

Department of Chemistry

By

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1931

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THE NATURAL FACTORS IN THE SELECTION OF DIET

It is obvious that numerous factors are to be considered in the selection of foods for Plant and Animal. We may choose, however, to make two general classifications for animals--namely, the natural and the scientific factors. By natural factors, we mean the tendency to follow the appetite, which is not only influenced by, but even directed by, such factors as age, climate, occupation, and social habits. The scientist would follow more definitely the so-called balanced ration of foods with less regard for the instinctive tendencies of the animal.

It is very true that there is a distinctive overlapping in the contentions of these two groups, yet we believe there is sufficient reason to warrant a more serious consideration of the natural selection than has been accorded in past years by laymen, medical advisors, and dietitians.

Our purpose in the discussion of this subject is to bring before our readers considerable evidence that natural factors in the selection of diet have been too often disregarded in the

establishment of a scientifically sound diet. We shall also attempt to bring concrete evidence supported by experimental examples to support our contention that natural selection of foods is our future hope for longer and better living.

In the beginning, God created the Heaven and the earth, and upon the earth He created every living thing and man in His own image.

Man, because of his faculty of reason, was made ruler over all earthly things; all other living organisms were placed at his disposal, and he was taught that certain of these substances were adaptable to his needs for sustenance.

History

In looking through the pages of nutritional history, we find little written which treats of the natural selection as a dependable guide. In his writings, Hippocrates¹ (460-370 B.C.) said many ailments of man would be relieved, not by medicine but by proper food, and he also stated that different kinds of natural foods contained a specific universal nutrient principle necessary to nourish the body.

We know ancient Egypt had preparations of bread, meat, and other foods which, although simple in character, were well compounded and compared favorably with those of the present day. The funeral meal tables were laden with such viands as fruits, breads, cakes, meats, and eggs, as well as wines. This technical knowledge, with bread the main article of nutrition, was gradually passed on by the Egyptians to other countries.

The Romans, especially those of rank, ate meat of animals, milk, bread and cheese. Their habits of eating have followed them to other countries and are retained to the present day. Even as early as the French Revolution, the bread question was a very important factor in the cause of the conflict. Eastern Germany, Poland, and Russia still use much rye bread, while necessity only compels other countries to use it. Legumes and grains such as oats, barley, and buckwheat have been imported for human consumption but, in turn, have failed to replace the popularity of wheat.

During the sixteenth century the attention of the scientists was attracted to a malady commonly found in the armies, among sailors and

prisoners, and among the inhabitants of besieged cities. The significance of this malady was not generally known until two centuries later. At that time Lind,² a surgeon in the British Navy, determined to his satisfaction that the disease was what is now commonly known as scurvy and was due to a lack of fresh vegetables in the dietary. This observation was entirely the result of human experience, and much confusion was caused by the evident effects of exposure to cold and wet, of excessive fatigue, of a diet of cooked and dried foods, and of the frequency of epidemics.

In 1881 Lunin³ wrote a scientific article reviewing a feeding experiment in which some mice were fed on whole milk, while others were given the different constituents synthesized from milk. He found that the mice lived for months in apparently good health on the whole milk, but that they invariably died within a month when fed the synthetic mixture. His conclusions were that whole milk contained substances necessary for nutrition other than caseinogen, fat, lactose, and salts.

Atwater,⁴ the outstanding American investigator of the nutritive value of foods before 1900, made many useful suggestions to the housewife in various bulletins published by the United States Department of Agriculture. Even as late as 1911, he said that the simplest or most monotonous dietary, so long as it supplied the required amount of protein, carbohydrates, fats, and calories, was physiologically adequate. He made no mention of the hazard of too much restriction in the diet or its relation to the deficiency as now known to exist.

Stepp,⁵ while working on lipids and fat substances in 1909, found both very necessary to a balanced diet, and that mice died in a very short time when a fat-free diet was given. He also found that the addition of lecithin and other fats, or even the addition of boiled lipoids, was not sufficient to take the place of the normal fats. When given the alcoholic extracts of certain foods such as egg yolk, these mice seemed perfectly normal. At that time he did not know that he was dealing with the fat-soluble vitamin and the vitamin "B".

M. Hindhede,⁶ a Swedish doctor, relates the following experience concerning the influence of diet on tuberculosis: As a theological student, a young clergyman had gone from one sanatorium to another, both at home and abroad. Finally he was pronounced an incurable and discharged with the diagnosis of amyloid degeneration. A diet of meat and salt was prescribed, but he adopted a salt-free diet with meat and milk added. At the end of the first year his lung had healed to the extent that he felt entirely well and passed his examinations. This patient is not the only one who has gone his own way and prospered.

A review of the above articles, submitted by the most outstanding scientists of their respective professions and countries, have clearly portrayed a tendency to follow a balanced diet. We cannot conclude, however, from these articles that there are not other more vital factors which enter into the solution of the problem relative to some definite line of procedure to follow. For example, E. V. McCollum⁷ relates that the prevention of a deficiency of the vitamins only, which is regarded by some as of paramount importance, is far from the actual fact, because many other substances are

necessary to maintain the body nutrition. The adequate diet is fairly complex chemically. Those who have studied during the last three decades fully appreciate the significance of considering the diet as a whole, including its thirty-five or more nutrient principles, and the short-sightedness of elevating the vitamins to an exalted position at the expense of other equally important dietary factors in any discussion of the subject of human or animal nutrition.

Dietetic Factors

In the light of historical references, we shall consider more in detail the factors which should enter into the ~~structure or~~ content of diet and the elements which should govern the dietitian in his effort to construct a safe diet for future use to animal life.

The standard essential requirements of diet are as follow: (1) It must yield adequate fuel or energy value to meet the daily needs of the human machine; (2) It must contain suitable protein, lipoids, and other nutriment to build, replace, and repair body tissues in the most effective manner; (3) It must possess minerals to

assist in various necessary bodily processes; (4) It must have water to act as a solvent, a carrier, and a regulator; (5) It must be abundantly supplied with the vitamins which are essential to growth, reproduction, good health, and proper functioning of the human system; (6) It must be digestible. Nourishment should not only serve the purpose of appeasing hunger, but also of giving man a certain measure of satisfaction. This result can best be obtained through the art of cooking tasty and stimulating foods.

The most important functions of living things, whether plant or animal, are self-preservation and propagation of its species. From the beginning, Nature has developed each living organism so that it shall have protection from its parasitic neighbor; the gain of one organism is invariably at the expense of another, whether or not it is of the same class or kind. These organisms, through the ages past, have undergone a type of evolution or change which has been in proportion to the changed conditions affecting their preservation and propagation.

Where climatic and physical handicaps abound against the establishment of the plant,

thousands of seed are produced that a few may survive, as illustrated by the milkweed. The first struggle of plant and animal life alike is for food; for animals, protection from danger is provided by the parent. In most seed, enough food is stored to last the dormant embryo for one or more seasons, after which it germinates, producing roots, stems, and leaves. The young animal, after the mechanism of respiration has been established, immediately begins the hunt for food.

In general, Nature places these young in surroundings adaptable to their needs, the seed in moist soil and the young animal at its mother's breast. Their food is regulated in a natural way. The food of the young plant is restricted through a very limited amount of absorptive tissue; the food of the young animal is regulated by the change in the strength of the mother's milk, or its natural food.

The first week after parturition, the human mother's milk should be about two per cent fat, five per cent sugar, and one-half per cent protein, with a small amount of mineral salts present. These percentages change as the infant grows until near

the eighth month the protein, carbohydrate, and fat content are about equal to that of cows' milk.

Before this time has been reached, the child begins the hunt for other foods and nature has provided it with certain natural appetite requirements for the deficiencies in the diet supplied. When these requirements become abnormal by reason of factors such as disease or improper balance in food, the natural functions of appetite and food selection also become abnormal and must be specifically guided. For example, the sensation of hunger appears after the absence of food for a period during which time the body is calling for more fuel; if this is not supplied, the body requirements are diverted to the reserve or stored foods. As a result of this consumption, we find the hunger sensation becomes weakened and, as the reserve food is consumed, the body likewise becomes weakened until the digestive and metabolic processes become almost completely disabled.

Formerly it has been said if a baby lived to erupt his temporary teeth, nothing but violence could kill him. There is much evidence to support

this statement. The high rate of infant mortality has been the result of errors in diet, precipitating abnormal cravings and disabled digestive organs to the extent that the individual is unable to digest the normal or regular diet. Parents' lack of knowledge of proper diet has often caused the child to starve on an abundance of food.

The digestive ferments or enzymes are very high in the child and lower in the older, but the hydrochloric acid in the child is slightly more than fifty percent of that of the adult. During the early life of the child, rapid growth and expendable energy necessarily require a high carbohydrate diet. The lipoids not only have their part in body growth, but aid in retaining in the body certain mineral salts necessary for special tissue growth.

The increase in cell growth is chiefly through the increase in cell cytoplasm, the chief constituent of which is water. The maintenance of a mature cell, however, requires a more uniform percentage of cell replacement and building, which is a demand for protein.

As the individual passes the active age and approaches old age, wasting takes place, partly

by phagocytic action and diminished blood supply as well as by the general failure of the usual metabolic processes.

Experiments by Dr. Alexis Carrell⁸ and others have proved definitely that cells do not wear out but that death is accidental and not an unavoidable event. This is in opposition to the theory of the terminal developmental process, and the question arises whether the accidents of present day living are really unavoidable events.

Dr. Alexander Weinstein,⁹ in his article on heredity and development, makes the point that chromosomes of the animal cell are similar to enzymes which stimulate the intra-cellular activity to growth and which carry with them the function of hereditary instinct. Each species of animal has in its germ cell a constancy of the number of chromosomes; even the egg and sperm cells generally have the same number, and within these cells are found the units of heredity or genes. The cytoplasm, under the influence of genes, displays such characteristics as different position, size, shape, and chemical constitution of the cell, but abnormal stimuli sometimes create local differences and chemical reactions. This may

be illustrated in the vestigial organs -- the eyes of deep sea animals. The tail of the tadpole and in many amphibia, the lens of the eye are formed under the influence of the optic cup. In spite of the transplantation of the optic cup to another region of the body, so long as the skin cells are present, the lens will form, but if placed too deeply below the skin, will fail to grow. A gene may exert an influence on any part of the body and at any time during its development; its effect may be large or small, morphological, physiological, psychological, normal, or pathological.

Hereditary and environmental influences are so closely allied in cell growth that at present it would be difficult to evaluate them separately. We may reliably assume, however, that environment alters the cytoplasm of some cells or the influence of the genes on these cells and, in turn, the characteristics of these cells; hence organ and body functions are also altered.

Food allergy reactions are manifestations of an idiosyncrasy of groups of cells to the metabolism of certain food products. Although this condition has attracted wide-spread attention, there are definite family characteristics, whether hereditary

or environmental, we cannot state. One family will be affected, displaying a characteristic symptom, while the same food will cause very different symptoms in another. Such staple foods as wheat flour and cow's milk give gastric disturbances to one group; in others we find a skin reaction as its chief manifestation.

The inheritance of desire for certain foods is not only a family characteristic but it becomes a national one. One family or nation will live on a high animal diet from natural selection with a health and longevity record of which they may be proud, while a neighbor will use a high vegetable diet with the same results.

Before the sense of taste has been developed sufficiently, the very young have some method of food selection not yet explained by our scientists. In experiments by the dietetics department of the University of Chicago, fourteen babies were fed different foods. Not one selected or ate spinach, yet other foods were taken with a certain expression of relish.

The lower animals instinctively select the food best suited to their needs. (Dr. Weston A.

Price) The cow will avoid ragweed and wild lettuce that give a bad taste to her milk unless better food is not available, but, searching for the mineral salts that she requires, will eat enough tobacco stalks to kill her.

Corn and corn products are the most universal food for the domestic animals, and the natural selection is well proven in these instances. In the summer, cows invariably select dry corn even though there is an abundance of other grain or food from which to select.

During the years 1906 to 1911, a most remarkable experiment¹⁰ was conducted at the University of Wisconsin. The object was to determine rations which were chemically alike and which would prove to be of equal nutritive value for growth and vigor. Heifer calves as nearly alike as possible, were divided into groups of four animals each and were limited to the experimental ration. The first group was fed all the products of the wheat plant; the second, the products of the corn plant; the third, the products of the oat plant; and the fourth, a ration of the same chemical composition but derived from equal parts of wheat, corn, and oat products.

Equal care and attention as to salt and exercise was given to each group in order that the results of the experiment might be reliable.

After a period of one year, the four groups were scored with the following results: the wheat-fed animals were rough coated, gaunt in appearance, and small in girth; the corn-fed calves were sleek and fine, evidently in a splendid state of nutrition, but having little or no difference in weight from the wheat-fed group. The groups fed oat products and those fed the mixed ration scored between the two lots just described. Thus it may be noted, contrary to our supposition, the animals fed the mixed ration did not compare favorably with the corn-fed animals. The reproductive records of the groups showed no less surprising results. The offspring of the corn-fed cattle were strong, vigorous, and normal in size; the offspring of the wheat-fed group were the reverse in all respects -- some were dead at birth, others died soon after birth. Calves from the oat-fed group were weak at birth; one was dead, two soon died, and the other, after great care, was saved. The young from the group fed on the mixture

were weak in most cases: one was born dead, another died within six days. The reproductive records during the following years were essentially the same as those in the first experiments.

The record of milk production during the first thirty days of the first lactation period showed an average of 24.03 pounds for corn-fed animals, 8.04 pounds for wheat-fed animals, 19.38 for oat-fed animals, and 19.82 pounds for those fed on the mixture. There was a marked difference in the tissue of the offspring, as well as a decided differentiation in the character of the fat in the milk of the several lots. The urine of the wheat-fed group was distinctly acid in reaction, whereas that of the other lots was alkaline or neutral. It was not possible for the biological chemists to account for these marked differences in the physiological well-being of the groups.

National and racial characteristics are expressed in the food consumed. Sometimes this is governed by custom or habit, climatic and economic conditions, and many other causes, but the actual difference in foods consumed varies but

little when expressed in terms of gramme weight of protein, fats, and carbohydrates, and in caloric values. The following table, prepared by M. Rubner,¹¹ will show the proportionate share of protein, fats, and carbohydrates of a population, expressed in calories per capita:

	Per Gramme			
	Protein	Fats	Carbo- hydrates	Calories
Japan	81	29	485	2553
Italy	88	58	466	2612
Russia (old)	79	43	473	2666
Germany	87	60	428	2770
Austria (old)	81	57	478	2825
France	88	67	485	2973
England	90	105	403	2997
North America	89	—	430	—
Average	85.4	59.8	459.6	2790.6

Japan lives almost exclusively on a vegetable diet. The food ratio and caloric value are very slightly below the average, but are high when considering the amount consumed by body weight. The greatest variation in food ratio is in the fats and carbohydrates. The diet of the people of Eastern Asia and Japan show a pronounced poverty of fats as compared to that of the middle European, Anglo-Saxon, and North American people.

The great variations in the composition of national diets show that the sources of vitamins are not as limited at present as is believed. Furthermore, it is shown that there is at least an adequate supply of ash elements which, naturally, is quite variable in the different nations. By the large variety of edibles which it supplies, nature gives the various people the greatest latitude in choosing diets. Every people, every race, holds fast to its own peculiarities.

As a rule, the European will eat a Chinese menu only with terror and disgust, and the Chinese despise the European's food as barbaric. But in spite of the multiplicity of these manifestations, a definite and convincingly important classification may be ascertained. When the civilized nations are regarded according to their choice of foods, the following picture results:

Of 100 calories, there are in

	Italy	France	Germany	England
Cereals	63.7	55.2	40.8	37.7
Potatoes	1.9	6.7	18.0	6.3
Sugar	2.2	3.4	5.9	14.3
Meat	5.9	11.9	15.8	16.0
Milk	1.5	4.3	8.6	7.1

None of the nations so far investigated have exploited its possibilities as regards the choice of foods. As a rule, the fat diet consists of four-tenths animal fat and of six-tenths vegetable fat. The proportion of the consumption of meat is as follows:

Japan	1
Italy	2
France	4
Germany	6
England	8

Germany uses much pork and sausages and England uses more beef and mutton, but this is only a difference in variety of meats. Germany and England consume more animal fats than any of the older nations.

The desire to live on the products of its land is probably the predominating characteristic of a people in the choice of its food. Although it is always a deficiency of meat that forces a people to a vegetarian diet, yet there are countries where domestic animals are used merely as draft animals, and neither the meat nor the milk of the cow are used as food.

McCollum states that people who have employed the leaf of plants as their sole protective food are characterized by small stature,

relatively short span of life, high infant mortality, and are content to adhere to the employment of the simple mechanical inventions of their forefathers; yet it must be said that climatic, religious, social, and political factors have their share in the formation of the character of a nation. Periodic gastro-intestinal disturbances which are both seasonal and yearly, are found in countries like Spitsbergen¹² which produce no food except whale oil and a few fur-bearing animals, and which depend on canned and preserved food, or, at best, very stale foods of the so-called fresh type. The cause has not been definitely determined but it is thought by Funk and others to be a decrease in the vitamin "C" content of their food.

The Chinese¹³ have a very low animal fat and protein diet and are generally thought to have many of the deficiency diseases. It must be admitted, however, that they have a sturdy physique and are, in general, healthy and fruitful; it is alleged that they constitute one-third of the world population. Their diet, although deficient by our standards, is not badly suited to them; for

centuries they have thrived and multiplied on it. If a Chinaman is placed in a different country, or if his labors are changed, he will require an increase in animal fat and protein over that of his parental diet, in order to maintain his body balance.

The better known civilized countries, with the exception of Japan, live on a mixed diet, forty percent of which consists of animal products. In regard to the consumption of cereals, the nations are separated into two groups. Bread eaters constitute approximately forty per cent of the world population; the remaining sixty percent are rice or porridge eaters. The diet of the bread eaters surpasses that of the porridge eaters in many ways and as yet is not sufficiently appreciated. Bread is much more durable, less bulky, and easily preserved after preparation. It may be served cold, easily combined with other foods, and may be varied one meal with another, while porridge must be served in large vessels and must be prepared over a fire, with little variation at each meal.

Wheat is the most used of the bread cereals, there being about one hundred and thirty million tons produced yearly; rye is second with a production of forty-three million tons. The nutritive substances of the bread eaters' mixed diet combined with a greater consumption of animal foods have a greater fat and protein content, therefore making a much more concentrated dietary. In most cases, the bread eaters are breeders of cattle and sheep, and these meats are the compensating foods, while the leather and wool are used for clothing.

Rice is the important cereal of the porridge eaters, almost all of which is produced in China, southern and eastern Asia, and the Malayan countries.

The ability of a country to grow its own bread-stuff regulates its adoption as a normal diet. Countries adapted to the breeding of cattle and the production of dairy foods to supplement the mixed diet of the bread eaters, as is found among the Anglo-Saxon, the Romanic, and the Germanic races, will some day rule the world unless the diet of the other nations is patterned after them.

Japan is now preparing itself for a new method of nutrition and the same will be the case in the other Asiatic countries adjoining Europe. Sugar is now in the diet of almost all, while in years gone by, it was confined to the diets of the well-to-do. The sugar of the poor was supplied by the simple sugars digested from the ever-plentiful starch and sweet fruits. America's annual consumption of sugar has increased about one hundred pounds per person in the last century, and this, perhaps, is the one outstanding food substance requiring a restriction of the appetite or physical desire.

Vegetables are universally used, but England uses less vegetables and fruit than any of the larger countries. Italy, on the other hand, uses fruit to the extent of ten percent of their entire diet. Germany is the only country in whose diet the potato plays an important part; it constitutes eighteen percent of the total caloric value and twelve percent of the food value. The potato is an American product, but the abundance of bread foods make it only an incident in the Americans general dietary, mainly by reason of its high starch content and basic reaction. Where potatoes are used, it is at the expense of the bread ration.

M. Hindhede¹⁴ says that man is the most sickly animal in the world, the domestic animal ranking next, and that wild animals do not have the diseases common to civilization.

An original experiment on man was performed by Hindhede to determine the value of potatoes as a human food. In 1912, he, Fr. Madsen, his assistant, and another man began to live on potatoes, vegetable margarine, and water. Fr. Madsen required five pounds of potatoes and five ounces of margarine daily while doing ordinary work, but when performing strenuous labor, increased it to eight pounds of potatoes and eight ounces of margarine, always using the water in which the potatoes were cooked as it contained much of the salts and vitamins necessary for body growth and maintenance.

In this experiment it was hoped to ascertain how much meat and eggs should be added to the potatoes to supply the protein balance requirement. After living on the strict diet for several months, he was surprised to find that no physical changes had taken place and that the potatoes and margarine were a complete nutriment. His assistant remained on the diet for 835 days and at the end of that time

was stronger, more vigorous, and could perform more manual labor than his associates living on the regular civil diet. Following this experiment he made a visit to western Ireland where he found the poorest people he had ever seen. He ate with them and was offered potatoes with a little buttermilk to drink; sometimes they also had a very little bread, butter and tea. On this diet he found the strongest people in all Ireland.

Professor Abderhalden in Halle and Professors Hockhaus and Koster in Cologne, carried out experiments similar to Dr. Hindhede's with the potato and made the following comments: "There is no longer any doubt that it is possible to live on potatoes alone," and "Our experiments fully confirm the correctness of the statements of Dr. Hindhede."

The outcome of an experiment with whole wheat bread made by Dr. Hindhede was similar to the experience with the potato diet, but when the white bread was used, the subjects became very weak and dizzy within three weeks.

Dr. Hindhede says that potatoes are not only a complete, healthy nutriment but actually a remedy, and that economically, they are the cheapest of foods. The work of this very noted doctor has helped and will help to prolong the lives of the civilized people. Already he has popularized his diet in his native country, Denmark. Small in size and sparsely populated as is this country, it is strange to note that it has produced as many outstanding men in science and athletics as have many of the much larger countries, our own not excepted. In spite of a population of less than 3,000,000, Denmark had won the Nobel prize seven times prior to 1926 while, at that time, the United States, with a population of more than 100,000,000, had only equalled that record.

I cannot believe that Dr. Hindhede intends to suggest that we live on the monotonous diet he has outlined nor that he believes a naturally selected diet of balanced protein, carbohydrates, and fats is causing the increase in the diseases of civilization affecting our people so much more than the people of his country. Dr. Hindhede is not taking into consideration the differences in the habits, mode of living, and restless disposition.

Science¹⁵ does not subscribe to the belief in the wisdom of allowing financial means and custom to select the diet, and claims that much of the physical inferiority can be attributed to improper food.

Of all the motive powers toward betterment of diet and nourishment, the sense of taste takes first rank. Our entire choice of food is directed from this point of view. The value placed upon taste determines the price, and the relish value is not determined by the raw substance but by the finished food product. These relish values are partly such as are found in sugar which is pleasant to the taste of everyone and, finally, the degree of relish with which a certain diet or dish is enjoyed, will stipulate its definite valuation. The market values, determined by the values of taste and by the degrees in which a food agrees with one, are of great significance to every nation, because they are the stepping stones of the upward trend of the masses.

After all, food has always been and will always remain an expression of social deference. Each step toward higher civilization more nearly equalizes the diet, and nothing but want can alter this upward instinct. As soon as there is an increase

in the income of the masses, first the food, then the clothing, and lastly the housing conditions will be improved.

The diet of the American is much more varied than that of the European and the inhabitants of eastern countries because of less crowded territory, wider range of climatic conditions, perfected commerce, a widely distributed heritage of parental tastes, and improved economic conditions. Very often there is no very definite idea of the physical effects upon the masses; perhaps then these might be classed under the general expression of certain foods agreeing with one, in which event they are said to be "wholesome." Individual experiences are not as decisive in the choice of foods as are the traditional doctrines regarding nutrition; every species of animal has its own inclination toward certain forces, and likewise there are typical human traits which bear a distinct national coloring in the selection of foods.

The choice of the preparation of foods might be purely suggestive; a vegetarian will condemn as unwholesome all animal foods and some religious sects have some foods which are absolutely forbidden. Traditional values of taste and the food instinct are of

extraordinary resistance and remain intact in spite of all artificial attempts to change them. With the approaching super-saturation of inhabitants of the world, a very important factor for the future generations to face is the economic factor of diet.

The factors involved in the increase of the span of life are: (a) natural selection, (b) better economic condition, (c) sanitary science, and (d) nutrition and longevity. It is very doubtful whether nutritional theories now being disseminated through the literature have any influence whatever upon the habits of the people, and whether in the future they will have any bearing upon their selection of food. Even the hunger blockade exerted no lasting influence upon the popular habits and nutrition of the people. A complete and permanent change in the nutrition of the people cannot be accomplished by force. This can be done only in the nutrition of infants, which is really forced feeding.

Not much is to be expected from the present method of instructing the public in the field of nutrition. It cannot be expected, moreover, that the chemical products of the laboratory will replace the natural foods in the near future, as has been maintained. The natural selection of natural foods in

which the nutritive principles still exist undestroyed by age, oxidation, and chemical adulteration shall still hold its very important place in directing nutrition of the people.

It must not be forgotten that the manufactured preparations of protein, carbohydrates, and fats, with the possible addition of salts, are not all that is required for the composition of food. Aside from these substances, vitamins, lipoids, organic combinations with salts, secretory substances stimulating the intestines, stimulants for the normal formation of blood, the improvement of the nutritive value through admixture, and many other factors enter into consideration. Regarding the serviceableness and rational value, it must remain for a future generation to evaluate and test individually the customary composition of foods created empirically by the different nations. For the present and for some time to come, the daily diet of the masses will be guided by experience and, while the individual may err, the masses pursue instinctively certain definite, although only dimly divided aims. The problems now for the dietitian are to know the diet deficiencies and to provide for these

proper foods, without upsetting all natural laws and without making one's metabolic organs do gymnastics to suit the faddist's dietary ideas.

Summary

In the foregoing discussion, we have endeavored to bring before our reader an authentic history of experiments conducted to ascertain if any safe, reliable diet has ever been formulated. Many experiments have been reviewed which have shown varying results. In the light of past experience, we conclude that a diet formulated purely on a scientific basis is impossible by reason of external surroundings and natural deficiencies which no scientific formula has supplied.

We are confronted with unsurmountable difficulties when we attempt to submit a diet constructed purely on the principles of natural selection. It is our conviction that in the past we have adhered too closely to the chemical formula of a so-called scientific diet and waived aside the vital factor of natural selection because the scientist was unable to explain why the plant or animal demanded and thrived on certain foods. We

therefore conclude that the scientist is indispensable in the preparation of diet, but that natural selection bears a far more prominent place in diet-making than has been given it in the past.

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