

# PUBLIC HEALTH--DISEASE PREVENTION

COLLECTED ARTICLES  
ON  
PUBLIC HEALTH,  
DIETETICS AND ALLIED SUBJECTS  
FOR  
PREVENTING DISEASE

CONTRIBUTED TO NEWSPAPERS DURING 1925-'26

BY

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1921 CENSUS OF TRAVANCORE.

WITH A FOREWORD

BY

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*Dedicated with Permission*

*To*

*Her Highness The Maharanee Regent of Travancore.*





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## FOREWORD.

Chance brought me into contact with Dr. M. S. Krishnamurthi Ayyar a little more than 2 years ago. The acquaintance so began had rapidly matured into a friendship. I fancy it is the knowledge of the fact that I have been a student of dietetics for the last 4 years that induced my friend to request me to write the foreword for this publication and I readily and gladly complied with his request, as he was interested in and of use to me in the study of dietetics. Having gone through the views expounded in this publication, I can only say they have confirmed me in the opinion, which I had formed of him that he is a doctor, who is out of the ordinary groove of his profession. Obviously by such a statement no reflection is intended on his brothers in the profession. All that I mean is his studies and thoughts are not confined to the routine of medical practice but go farther and touch larger problems of a wider scope than the mere symptomatic treatment of diseases. I am bold enough to assert that his medical studies cover books with whose names many a medical practitioner and even specialists, whom I have known, are not acquainted.

The notes in the following pages have impressed me so well that I am not venturing on a doubtful prophecy when I say that institutions such as Local Boards, Municipalities, Schools, etc., will find the sections relating to Public Health and its administration and medical inspection in schools of great practical utility, and most individuals will find the sections on dietetics, antenatal life and childhood, fasting, etc., of much value and interest. One outstanding feature of these notes is that they are thought-provoking and suggest more things than they actually contain. They show a wide range of reading, originality and keen observation.

His work as Census Commissioner in Travancore has given him an unique experience which is not available to most doctors. Even a casual perusal of his report of the 1921 census of Travancore suffices to convince any one of the exceptional equipment possessed by my friend in directions other than the ordinary qualification of a medical man. This explains the

ability with which he deals with statistical questions in the interesting and instructive manner in his notes. His Census Report is cast in an original scientific mould, different from other Census Reports, and his originality, practical, analytical and critical mind, and penetrating insight, are not only disclosed in it but also in the following pages and as I have known personally, in his diagnosis and treatment of even obscure diseases. Lastly I have only to call the attention of the readers to the extremely useful and interesting tables appended at the end of the book which are not available to the general public except in publications, which are either costly, or not heard of, or not obtainable in India. It is a matter worthy of observation that my friend practices what he preaches and presents a youthful appearance full of vigour. I am only sorry that his many-sided activities had been exercised in a limited sphere in an Indian State—Travancore—and not in a wider one where they might have been better appreciated and useful and beneficial to a larger public. It is not late now, with his énergy and enthusiasm, to utilise his matured experience, knowledge of men and things and administrative capacity for the benefit of humanity.

V. RAMESAM.

## INTRODUCTION.

Having for well-nigh 25 years occupied the post of the Sanitary Commissioner in Travancore and conducted in the State the operation of the 1921 Census, which gave me an opportunity of gauging the results of the working of the Sanitary Department and revealed the fact that the State occupied a high place in India, in point of Public Health, I thought that, after retirement and return to Madras, occasional contributions to newspapers on matters connected with Public Health and allied subjects, would be useful to the Public, who had been given of late a responsible share in the administration of the country and held out hopes of further instalments of responsibilities. For the purpose of correct discharge of the onerous duties, the country requires persons of long experience of conditions of life and matured mind, free from all prejudices and passions. While in England out of every 1,000 persons born, 530 reach 50 years of age when only they become mature and fit for taking leading parts in public affairs, in India only 186 reach that age. This is, indeed, lamentable and demands every effort from all concerned to remedy the defect. My contributions were appreciated by the Public and I was requested to write a connected series of articles on Public Health including Dietetics and allied subjects and I consented to do so and "the Hindu" kindly agreed to publish them. The articles published have interested the public so much so that I was requested to collect them together and publish in a book-form so as to facilitate ready and easy reference. The present publication is in response to that request. I may be permitted, before proceeding further, to express my thanks to the Editors and Proprietors of "the Hindu" and "the Rural India" for permission given to me for the re-publication in the book-form, of my articles published in those journals. I have added as an appendix to the book, to widen the scope of its usefulness, three tables showing the nature and quantity of amino-acids, mineral salts and vitamins contained in the chief articles of food-stuffs.

\* The medical science, including Public Health, has enormously advanced in the last few years, particularly after the

World-War, as the result of the experience gained in it, in all European countries and in America and the methods of diagnosis of diseases and their treatment have been brought to a very high level of precision and efficiency. The advancement is so astounding and revolutionary, that a practitioner qualified more than 10 years ago, if he had not brought up his knowledge up to date, but adopted the old methods of diagnosis and treatment, taught in his school days, might in all probability stand the chance of being prosecuted for misdemeanour and sued for compensation. Unfortunately no such improvement is perceptible in Madras but, on the other hand, the Western allopathic system of medicine is losing popularity and other systems are being encouraged. For this state of affairs the medical profession is not solely responsible. As pointed out in the book, the instruction and training given in Schools, Colleges and Hospitals, the economic condition of the private practitioners, who should justly form the backbone of the medical profession, produced by the unequal and unfair competition with the Government-paid Medical Officers, a species unknown in the civilised countries and the poverty of the people, are the outstanding causes.

The country is poor, no doubt, and so Japan and some countries in Europe are ; still they are sufficiently advanced. The Public here do not take adequate interest in the matter. Even the newspapers, while they publish weekly supplements on Engineering and Commercial subjects, do not think worthwhile to publish, at least fortnightly if not weekly, matters connected with Public Health. The present line and method of administration of Public Health and Hospitals require radical changes to suit the changed conditions. The mortality is very high and adding four sick to every death, the value of the number of lives lost and that incapacitated temporarily or permanently for work from illness, if converted into money, would represent a huge sum. A large portion of this loss is avoidable. In the matter of administration, taking one department, say, the Civil Medical Department, as an example, considerable saving of money and wholesome improvement in medical relief can be effected, if instead of spending a large sum of money in permanent and pensionable appointments of medical officers, temporary and honorary appointments are made as in other countries. All except the

Presidency and District Head-quarter Hospitals, required for the treatment of infectious diseases, Police and clinical purposes, may be handed over gradually, as opportunities occur, to private enterprises and charities.

There are ways and means, other than those of curtailing departmental expenditure, to improve the economic condition of the people. At present, refined sugar, which is declared by competent authorities to be unwholesome, if not actually injurious, is imported into India annually to the value of 15 crores of Rupees. By extending the cultivation of sugar-cane and other plants from which sugar is extracted and using raw sugar, as jaggery or brown sugar which are not unwholesome, much money may be saved. If the cooking of the vegetables is correctly done, so that the salts contained in the water in which they are cooked is not thrown away as is done now, the consumption of common salt may be reduced and thereby the money spent on it may also be saved. The expenditure of fuel for cooking can be curtailed if fruits and nuts which are more nutritious than cereals and which do not require cooking are freely used as food. As their cultivation and maintenance do not require much capital outlay of money and are less affected by the vagaries of the monsoons, sufficient encouragement should be given for their cultivation in preference to that of cereals, tea and coffee, the last two of which are unwholesome luxuries. In order to obtain the maximum benefit of the school medical inspection, made compulsory now, the appointment of qualified medical graduates as teachers in schools and entrusting them not only with medical-inspection of pupils but also with teaching Hygiene and Physiology which should be made compulsory, will be economical and advantageous. To improve the dietary, scientific cooking should be taught in schools and, for this purpose, school medical officers may be entrusted with this duty and made wardens of hostels attached to schools, where they can supervise cooking, and bring it into a line with what they teach in schools. It is said that in America posters giving particulars of vitamins, and chemical composition of food-stuffs are exhibited in class rooms and hotels. The ultimate goal of medicine is prevention of diseases and prevention is cheaper in the long run than the treatment of diseases. If the school medical officers and family physicians detect



pre-disposition to diseases early enough, they may be easily prevented. For the proper administration on the lines sketched above, the Ministry of Health must be composed of persons of scientific training and bent of mind, whose outlook upon life is wider than that of "precedent and antiquity".

The Public will be better able to judge of the utility of this book, in the light of the appreciation contained in the foreword of the Hon'ble Mr. Justice V. Ramesam, whose profound knowledge of Dietetics is well known to the Public and to him, I am truly grateful. Last, though not least, my thanks are due to the Proprietor of the Madras Law Journal Press, Mylapore, whose earnest co-operation in the undertaking has greatly facilitated the prompt publication of the book.

The repetitions frequently met with are unavoidable in a publication like this which is but a collection of articles contributed to newspapers at long intervals.

16, Chittrakulam St.,  
Mylapore,  
31st January, 1927. }

M. S. KRISHNAMURTHI AYYAR.

# PUBLIC HEALTH— DISEASE PREVENTION.

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## I.

### GENERAL.

THE subject of Public Health is a large one and embraces within it almost all the activities of life. There is not a Science which does not contribute its quota to it, nor a religion which has not a moulding influence on it. Life itself, according to Herbert Spencer, is a continuous and constant adaptation to environment, and as the environment, on account of the activities or interference of man is changing, there is no finality of adjustment to it, and in consequence life has no final stage. It is therefore necessary, before adopting any measures, administrative or social, to improve Public Health, that steps should be taken to correctly gauge the nature and extent of all the factors bearing on it. Though it is held by some scientists that the Cro-Magnon man had attained the fullest physical development in body and brain and that further advancement of mankind consists in the development of societies, some hold that physical development is still incomplete and that there has been no complete adaptation to environment. The circulatory system consisting of heart and blood vessels in man is unsuitable for his upright position and the horizontal position obtaining in animals is more suited for the circulatory system and abdominal viscera, as varicose veins, hernia, viscero-ptosis are unknown among the latter. When animals during rest lie down they maintain the horizontal position and it is said that the elephant does not lie down when sleeping and maintains always, during work, and rest and sleep, the same position. Perhaps it may be the reason why it has the longest life among animals. Men only have to maintain two positions. one horizontal at rest and sleep and the other vertical during work. If aerial transport becomes common, and men prefer to spend most of their time in the air, high up in a rarefied atmosphere bringing into operation a new environment, and if the circulatory and respiratory systems

do not make suitable adjustment to it, they will have to suffer. Again, if transport at the bottom of the sea, in submarines, etc., comes into vogue, further adjustment is necessary to cope with the tremendous pressure obtaining there, as in the case of eels, the flatness of whose body is attributed to the high pressure at the bottom of the deepest sea, where they go to spawn and remain there for some time. In the environment as at present exists, man does not live the maximum length of his life. The maximum length of life among animals including men is said to be five times the period of their maximum growth. The growing periods of horses, dogs, camels, cats and men are 5,  $2\frac{1}{2}$ , 8,  $1\frac{1}{2}$  and 25 years and their maximum length of life should therefore be 25, 12, 40, 8 and 125 years respectively. Now, while the average length of life of the animals comes up to the maximum length, in the case of men alone, it has not reached even to one-half of it. The average length of human life in the United States of America has risen from 35 to 56 in the last 150 years, while the average longevity of Indians is oscillating between 25 and 30 years. Certainly this state of affairs is more or less due to their ignorance and the faulty life they lead. They are surely acting against nature. The mere length of life is not sufficient; it must be healthy and useful. Long and chronic invalidism is worse than useless and is a misery to sufferers and trouble to others. The present-day life lengthening process is to some extent invalidism. Partly on account of absence of frequent wars, and partly on account of the comparative absence of epidemic diseases or by their diminished virulence, brought about by improvement in sanitation and by the use of prophylactic and curative vaccines and serums, some of the persons that survive the attacks become chronic invalids. There is no doubt that serums, vaccines, etc., have beneficial effects in checking the onset and virulence of diseases but they have other effects not quite beneficial to long and healthy life. McDonagh is of opinion that since the advent of arseno-benzene in the treatment of syphilis, overdosing with metallic preparations is a cause of hypertension requiring serious consideration. According to him, there are in the blood plasma protein particles, the balance of the electric reactions of which contributes to the health of the organism. Certain of the particles are charged with negative

electricity and act as electrons while others are charged with positive electricity and act as protons. As long as the electric balance is maintained, everything goes on well. If, however, a toxin is introduced into the system, it disturbs the electrical equilibrium by reinforcing the protons and causes disease. When metals and non-metals are introduced into the system, some reinforce the electrons and are called conductors and others which reinforce the protons are called condensers. This theory of Dr. McDonagh has some force in it and brings the ultimate action of the whole universe, from mighty stars to the ultra-microscopic proteins in the blood, to depend upon the action of electrons and protons and thus establish the unity of life. This may well be closed with the following observations of the late Sir William Osler regarding the medical profession :

"Some physicians cannot unlearn their old training. The modern treatment of disease relies very greatly on the old so-called natural methods, diet and exercise, bathing and massage, in other words giving the natural forces the fullest scope by easy and rational nutrition, increased flow of blood, and the removal of obstructions to the excretory systems or the circulation in tissues. Experiences have shown us that most drugs had no effect whatever on the diseases for which they were administered."

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## II.

### ANTE-NATAL LIFE AND CHILDHOOD.

NOW that contraceptive measures have come into use, it is possible to get children whenever the mothers are in good health and the economic condition of the families is satisfactory for the proper bringing up of children. On account of the advancement made in the study of endocrine glands, a subject much neglected for a long time, it is said that it is possible to beget children of the required sex. It is known that an oyster is a male, that after it has discharged its spermatozoa, it may be changed into a female at the age of one year and after it has spawned it may again revert to the male condition. Even among human beings women, after their menopause develop male qualities, in the matter of voice, growth of hair on the face and even in the interest taken in study and politics. An equal balance of males and females in a population ensures the maintenance of the nation's morality, and any dislocation of the balance must be viewed with much concern. It appears there is at present, in certain civilised countries, a deficit of 40,000,000 males and the Governments there seem to be very anxious about the matter. In India, however, there is no such fear as the number of males is slightly in excess of females. In Madras, the number of males falls short of the females by about  $2\frac{1}{2}$  lakhs and this is compensated for by enforced widowhood obtaining among the females here. The question of sex has been dealt with fully, in statistics taken specially for the purpose and published in the report of census of Travancore for 1921, in the appendix to the chapter on Sex. For the baby, its mother's milk, as intended by nature, is the best food, provided the mother is healthy. The mother's milk, besides containing the required nutriment, has by its uniform temperature and by the presence of antitoxins in it, contributes to the welfare of the infant and its protection against diseases. It is known that the endocrine glands by its internal secretion confer immunity from

diseases and that they only begin to function in infants after they become one year old. Till then it is the antitoxins in the mother's milk that give the necessary protection. It was found in the Siege of Paris in 1870-71, while the general mortality was doubled, that of infants was lowered 40 per cent. owing to the mothers being driven to suckle their infants. If mother's milk is not available and if it is not possible to get wet nurses, cow's milk will have to be used. The cows should be healthy and fed on green grass as the latter contains vitamins. In order to maintain uniform temperature and to protect against contamination, the milk from the udder of the cow should be pumped into the baby's mouth, by an electrical machine. Perhaps this may appear to be impracticable, but it is said to be vogue in some European countries. But in India it is of course unthinkable, and the best that is possible here is to have the milk drawn, after cleaning the udder and the hands of the milkman and the vessel, and bring the milk to the boiling point, by what is known as flash method, as boiling or heating for a long time destroys all the vitamins, or the fresh-drawn milk may be diluted with the required quantity of boiling water and milk sugar added and given to the baby. Cane sugar, particularly white sugar, is harmful. To the milk either lemon juice or tomatoe juice which contains all the vitamins in sufficient quantity may be added. If it is not possible to get good milk, the powdered milk, sold in markets as Glaxo, Lactogen, is better than condensed liquid milk. It is said to be pure and contains all the vitamins and can be kept in a pure state in stock. Goat's milk is good, and if a goat is kept for an infant the best method is to apply infant directly to the nipple. It will then get the milk free from bacteria. The nipple should be carefully washed frequently with boiled water. If this method is found impracticable, the goat should be milked immediately before each feeding. Sweetened condensed milk should be avoided as it is found that the percentage of decayed teeth in children reared on it comes to 72 per cent. The feeding should be done at regular intervals and not whenever the child cries out, as it may cry on account of stomach-ache. Water may be given at intervals. The breast feeding should not be continued for more than a year, as it would be injurious not only to the child but to the mother also. In this connection the following table

showing the relation of breast feeding to the incidence of rickets will be interesting :—

No. of months at breast	The percentage of rickets marked	slight	'Non-rachitic
Not at all	23	16	12.5
1 month	4	3	3.5
2 months	5	2.5	1.5
3 "	5	4.5	3
4 to 6 months	7	6	5
7 to 9 "	7	12.5	16.5
10 to 12 "	21	28.5	33
over 12 "	28	27	24.5

The child should be bathed daily preferably in cold water and made to sleep in a well-ventilated room. A bunch of shining objects should be kept before it, so that their shining could attract its eyes and their jingling its ears. Unless sufficient stimulation is given to all the sense organs, there is the chance of their deficient development. The clothing must be loose and light. After the child gets old and weaned, it is better that it is not made to sleep in the same bed with its parents. If possible, a separate bed-room should be set apart for it. The belief that children up to 2 or 3 years are quite ignorant of sexual matters, used in the wide sense of the term, is proved to be a mistake as the sexual instinct is developed even in infants as evidenced by the sucking of the thumb and tossing of the head before going to sleep. It is only between 2 and 5 years that, as the result, in a large number of cases, of sleeping with their parents on the same bed, such neuroses as stammering, obsessions, etc., are developed and the seeds of all neuroses and psychoses are sown. As human beings differ from animals in the development of central nervous system, and in order to give time to its development, to cope with that of somatic tissue, unlike in the case of animals, the Thymus and Pineal glands of the endocrine system in human beings restrain the development of the somatic tissue (body) till puberty and after that they become functionless. It is only then, the other endocrine glands are set free and full rein is given to the elaboration of the hitherto enleashed somatic tissue. It is at this critical time that, accord-

ing to the predominant part played by the several glands, over one another, the pattern or temperament of the individual is moulded. Thus we get the Adrenal personality, Pituitary personality, and Thyroid personality and if Thymus persists, Thymocentric personality, according to the predominance of the gland concerned. It might happen in some instances that the restraining influence of the Thymus and Pineal glands may be lowered before puberty and it will then lead to gigantism and in the case of females, girls of 7 years look like women of 20 in their physical development and begin to menstruate and even conceive. Such instances are not uncommon. In course of time the hyper-functioning glands exhaust themselves and lead or predispose, to certain diseases, as tuberculosis, etc. It is here the duty of the family physician comes in, to detect the abnormality early and set it right. The endocrine glands are said to be the guiding factors in the evolution of races.

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### III. DIETETICS (CALORIE).

IN speaking of foodstuffs it is the practice to indicate the value of food in calorie on the assumption that the body is more or less comparable to a steam engine and that the fuel put in it to generate energy is like the food given to man to generate energy in him. One calorie is equal to the heat required to raise 1 lb. of water by 4 degrees F. An analogy between a living organism and a man-made machine is fundamentally wrong. In the present case the analogy was made with the steam engine because it was only in existence when the analogy was first made. If the electric machine had been in existence then the human body would have been compared to it. The fuel is required in the case of a steam engine only to produce energy, but in the case of a man the food is required not only to produce energy but the growth, repair and maintenance of his organism. Even in the latest triple expansion steam engine more than 85 per cent. of the heat is wasted leaving only less than 15 per cent. to do the work. The work done by the two ventricles of the heart in a man is estimated at 14,000 kilogram-metres, in other words equal to the amount required to raise a man weighing 70 kilograms to 200 metres high, the height of the highest sky scraper in America. The energy required for breathing, moving and digesting, etc., will be much more. The amount of heat evolved in the production of such a large amount of energy, on the analogy of steam engine, will be something enormous and reduce the man to ashes. After the introduction of fasting as one of the methods of treatment and the discovery of vitamins, catalysts and hormones, the caloric theory is losing ground.

#### PROXIMATE PRINCIPLES.

The food taken by man falls under the following heads : Proteins, fats, carbo-hydrates, mineral salts, vitamins and catalysts. Conflicting opinions exist not only as regards the diet of man whether it should be animal food, or vegetable food or mixed

but also about the quantity required in proteins, fats, etc. The vegetarian diet according to some includes milk and its products and according to others eggs and fish. The nature and quantity depend more or less on the climate, occupation, and habits of the people. The present day opinion, which seems to have been formed after experience and experiment, favour vegetarianism either pure, or combined with milk and its products and eggs. As far as India is concerned, and particularly the Hindus, vegetable food with milk and its products is quite sufficient under ordinary circumstances. Binary chemical compounds, *i. e.*, compounds built up of two elements are not fit as food for animals and the compounds must at least be ternary. Thus it will be seen that common salt which is a binary compound is not a food. Taking the proteins which are compounds of nitrogen, oxygen, carbon and other elements, it is found that there are 16 amino-acids which make up the proteins. Of these Tryptophan and Lysine are required for maintenance, and Tyrosin and Cystine for growth. A table showing percentages of the 16 amino-acids contained in the several foodstuffs is given in the Appendix. In general, it may be stated that none of the cereals contain the protein required in sufficient quantity. Soya bean, earth nut and cocoanut contain the protein in required quantity. It is proved by experience that rice may serve the races that rely on it as an almost exclusive source of protein, while wheat is only serviceable for races which take a more varied diet. Rice contains better protein than wheat and wheat better than maize. The fats and carbohydrates are compounds consisting of carbon, hydrogen and oxygen and they are required for the production of energy and heat. Fats burn on the fire of carbohydrates and they are required for the slow and sustained burning of carbohydrates. The chief fats used are found in oils and butter and the chief carbohydrates used are sugar, starch, cellulose, etc. Salts are very essential though their importance has not yet been recognised. In most cases the debilitated condition of the body observed at present is due to demineralisation. The salts are contained in the foodstuffs and are available only if the foodstuffs are correctly cooked, and the salts are not strained and thrown away with the water used in cooking, as is done at present. Commercial salts sold in markets, which are crystalline and binary salts, cannot replace the

salts contained in the foodstuffs. The importance of mineral salts for the body can be understood if the chemical composition of the body as shown below is known

Oxygen	65 p. c.	Potassium	0.35 p.c.	Magnesium	0.05 p. c.
Carbon	18 „	Sulphur	0.25 „	Iron	0.004 p. c.
Hydrogen	10 „	Sodium	0.15 „	Iodine	} very small quantity.
Nitrogen	3 „	Chlorine	0.15 „	Fluorine	
Calcium	2 „	Phosphorus	1.00 „	Silicon	

In the use of foodstuffs, the articles containing these salts should be selected. A table showing the quantity and nature of mineral salts contained in foodstuffs as determined in America is given in the Appendix. Several such tables are prepared in America. It is indeed unfortunate that facilities for finding out the ingredients in the foodstuffs used in India, do not exist in India and so no such tables have been prepared for foodstuffs grown and used in India. It may be stated in a general way that milk, green vegetables and fruits are rich in calcium ; milk, yolk of eggs, and cereals with embryo, are rich in phosphorus ; green vegetables, yolk of eggs, are rich in iron; green vegetables and codliver oil are rich in iodine; spinach contains calcium, iron and secretin (the hormone found in the intestines and which assists the formation of trypsin and acts as a laxative).

#### ACIDOSIS.

It is known that acidity indicates death, as is seen in Rigor Mortis. There is a limit to the acidity and if it is exceeded, untoward effects are produced. Acidity is due to the H-ion concentration and is expressed as  $P^h$ . Each organ and tissue of the body has its normal  $P^h$  and each organism pathogenic or otherwise has its own optimum  $P^h$ , in which only it can thrive or grow. It is stated *vide* page 3 that the proteid elements in the blood plasma consist of electrons and protons and that any interference with them by means of toxins or drugs causes diseases. The toxins or drugs interfere with the electrons and protons by changing the  $P^h$ . So the importance of maintaining the normal reaction becomes evident. By acidosis is therefore meant more H-ion concentration than normal. Acidosis is caused by (a) diet (animal food and cereals), (b) starvation, and (c) withdrawal of carbohydrates. In the last

two cases, the imperfect metabolism of proteins and fats produces acids and this is the case in diabetes where coma is frequent. As regards the diet, animal food should be restricted as much as possible if it is not possible to avoid it. Among the cereals, ragi is the best, as it is the least acidosis-causing. Vegetables and fruits are more or less alkaline. The impression generally entertained that sour fruits produce acidosis is a mistake as they are all converted into alkaline salts in the body. The acid-binding (alkaline) elements are potassium, sodium, calcium, and magnesium and the acid-forming elements are phosphorus, sulphur, silicon and chlorine, etc. In selecting food, the acid-binding and acid-forming elements should be taken into consideration. The practical and easy way of testing acidosis, in the case of Indians, is to give internally  $6\frac{1}{2}$  grammes or about 2 drams of soda bicarb with water and to test the urine passed after. In normal persons the urine will be alkaline after taking that quantity of soda bicarb. During fasts, if there is a tendency to acidosis, either soda bicarb or lime juice with water or orange juice should be taken with water.

### VITAMINS AND CATALYSTS.

Vitamins were discovered by Funk in 1913. They are accessory foodstuffs. Till now four vitamins have been isolated and studied. They exert much influence in metabolism and their presence is necessary for the proper growth and functioning of endocrine glands which have been recognised as the chief guiding factors in the evolution and development of the human race. The vitamins are to endocrine glands what the endocrine glands are to the bodily economy as a whole. They are the products of vegetable growth and are found in vegetables only. Those found in animal organisms are supplied to the animals through their vegetable foods. Vitamin A. is required for growth and its absence in food causes Xero-ophthalmia and Rickets. It is contained in large quantity in codliver oil, butter, eggs and green leaves. B. vitamin is required for growth and is found in turnips, tomatoes, yeast, etc. C. vitamin prevents scurvy and is found in lemon juice, potatoes, etc. B. vitamin is said to contain 2 vitamins B and D of which B is required for growth and D is anti-neurotic. The absence of any of these vitamins is said to cause what are called deficiency diseases.

One vitamin cannot replace another and all of them are required for the maintenance of orderly balance between the constructive and destructive cellular processes. Vitamin C is more sensitive to heat or drying than others. Cooking at a low temperature for a long time is more harmful to vitamins than high temperature for a short time. Leaves—particularly green leaves—contain the largest quantity of vitamin A and seeds the smallest quantity, while roots and tubers take the intermediate place. The following substances do not contain any vitamin :—

Lard, olive oil, cocoanut oil, linseed oil, margarine (from vegetable), tea, coffee, cocoa, chocolate, tinned meat, fish (white), cheese (skimmed milk), meat extracts, honey, jam, malt extracts, white wheat flour, white corn flour, polished rice, pea flour, custard powder, tapioca and sago. The white of egg does not contain any vitamin but the yolk contains both A and B. Green leaves contain more of A and C than B. The outer layer and germ of seeds contain a large quantity of B. It is said that in the natural sea-water there is something akin to vitamin but it is not yet isolated. Catalysts are more or less like ferments and are destroyed by cooking. Purin bodies cause certain diseases as gout, etc. They may be produced in the body itself by disturbed metabolism or introduced by foods containing them. 12 such bodies are known to occur in nature, while according to some the number is 146. Mutton, beef, chicken, liver, cocoa, tea, coffee, beans, oatmeal contain them. Connected with the purin bodies are oxalates. They are found in rhubarb, spinach, sorrel, strawberry, figs, potatoes, beetroot, french beans, tomatoes, plums, tea, coffee and cocoa. A table showing the nature and sufficiency or otherwise of the vitamins is given in the Appendix.

### COOKING.

Having ascertained the nature of the foodstuffs and their constituent parts, it is necessary to consider how they should be cooked if all their useful ingredients are to be utilised. Cooking itself comprises within it several processes, as boiling, steaming, frying, roasting, toasting, baking, etc., and all the foodstuffs need not be cooked by one and the same process. Some foodstuffs as fruits, and some vegetables do not require any cooking at all and may be taken raw. The cooking is

being done mostly by illiterate cooks and the head of the household does not think it necessary to bother his head about this, partly out of ignorance and partly out of indifference. The cost of fuel required for cooking is increasing day by day, and there is no chance for it to come down in future. In an ordinary household, as at present managed, the hearth is kept burning from morning to evening causing unnecessary expenditure of fuel and the whole time of the female members of the family is spent in kitchen in smoke and hot air, contributing to illness and leaving them no leisure to rest. Any step taken to minimise the consumption of fuel is indeed a welcome economic reform. While much time and money are spent in making experiments to limit the consumption of fuel for engines and motors, etc., no such attempt is made as regards the consumption of fuel for the kitchen. Rice and some vegetables only require steaming. The Ic Mic or Rukmini Cooker is a good apparatus for steaming. The cellulose envelopes of the starch granules found in the cereals, such as rice and some vegetables, require steaming or soaking to set free the starch from its envelopes. In the germ and aleurone layer of rice vitamin B is found, but it is removed in the process of polishing. It is said that during one of the battles in India, on account of the shortage of provisions, the Indian soldiers preferred to live on conjee, strained in cooking of rice, leaving the solid food to the European soldiers and it was found that the former fared better than the latter. In the conjee all the mineral salts and nutrient matter of rice are found and the other portion contains only unimportant and innutritious things. Out of 19.7 per cent. of chemical elements contained in the wheat, bran contains 17.32 per cent. and the flour 1.75. Anybody having experience of travelling in country boats in Travancore will see how the boatmen do not waste the conjee but drink it, with very good effect, and how strong they are. Parboiled rice (பழுக்கல அரிசி) is better than raw rice, as it is difficult to remove the outer layers in the former. The best way of preparing rice is steaming when the conjee is not strained. In cooking vegetables, in order to remove the green colour, soda is added. This is wrong, as alkali has destructive effect on vitamins. If necessary citric acid may be added to the water used in cooking green vegetables. The practice of straining and throwing away the water used

in cooking is a mistake as it contains all the mineral salts. In using common salt, the ordinary salt taken from the sea water is better than that quarried in rocks and table salts as they do not contain iodine. It is within the experience of parents that their children, when they begin eating rice, relish fresh vegetables, salt-free dhal, better than cooked vegetables and salted dhal and that is only after compulsion, persuasion, etc., they are made to take cooked and salted pickles, etc., and it then becomes a habit.

### THE TIME OF TAKING MEALS.

As morning time is meant not for assimilation no food should be given in the morning. The habit of opening the mouth and putting some food in it, before the eyes are opened, is a bad habit. A large cup of water should be drunk on waking. The heaviest meal of the day should be taken in the evening after the work of the day is over. In countries where the people take their heaviest meal in the day and go to work immediately, diabetes is more prevalent than elsewhere. In India, except the Brahmins, almost all other communities take their dinner, the chief meals, in the evening and the incidence of diabetes is more among Brahmins than in any other communities. Even among Brahmins the women, who after their chief meal in the day take rest, do not suffer as much as men who have to attend to their business immediately after the chief meal for the day. At least five hours' interval is necessary between meals, so that the stomach may have rest and be empty when the next meal is taken. It is better to take water half an hour before each meal and two to three hours after, than during meals. Before going to bed, a cup of water is very beneficial.

### MENU.

Taking all the above facts into consideration it is possible to prepare a menu suitable for officers and businessmen in India.

Morning between 8 and 9 : Hoppers, or wheat chappattis, Eddali (இட்டிலி), or tho'ai (தோசை), or Adai (அடை), butter (the butter should be made from fresh unboiled milk), or gingelly oil, previously exposed to the sun, a chutney with raw vegetables, and a cup of butter-milk.

Luncheon—between 1 and 2. Fruits, nuts, chappatti (wheat) and in hot weather cocoanut water.

Evening meal—7 and 8. Rice or ragi ; oatmeal ; vegetable curry ; milk or butter-milk and butter.

It may even be possible to have the hoppers, etc., required for the morning meal, prepared overnight. This will obviate the necessity of any cooking in the morning. It will be sufficient if cooking is done once a day and that in the evening. The luncheon can be taken in hand when going to office if chappatti is used, otherwise the articles such as fruits and nuts can be purchased near the office or place of business.

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#### IV.

#### FASTING, EXERCISE AND EDUCATION.

WHENEVER animals which are chiefly guided by instinct fall ill, they do not take food but starve. It is only in case of human beings when they become ill and their system, in consequence, is not in a fit state for digestion and assimilation and when they have no appetite for food, they are coddled, cajoled to take concentrated foods as beef extracts, etc., and if they are unable to take them by the mouth they are given by other means. Fasting is dreaded. Even if men, by their reading and observation are convinced of the utility of fasting, their wives and other womenfolk, who believe that they are made to see that their dears are kept in good temper and well nourished, would not allow them to fast. The institution of periodical fasting, observed among the Hindus, is very salutary. Ekadesi is observed by almost all the elderly orthodox Hindus. Among females, particularly widows, institution of vrithams, such as Somavaram (Monday), Chathurthi, etc., when fasting is enjoined is excellent and it is by such periodic fasting that widows live long and are far more healthier than others. According to orthodox medical opinion also, fasting for three days in a quarter is considered to have a very good purifying effect. For the fast to be effective, it must be preceded by a purge, so that the contents of the bowels may be removed, as otherwise, the retained fecal matter might produce toxins and the toxins after absorption cause headache, etc. In addition to the purgative, enema should be given once a day, throughout the fast. The fast should be complete and nothing but water should be taken. If there be any tendency to acidosis, either lemon juice or soda bicarb or lime juice may be taken with water. Confinement to bed is not absolutely necessary during fasting. Ordinary duties, which do not involve much physical work, may be performed. Breaking of the fast is very important. The practice of taking very heavy and substantial meal as is done now on the early morning of Dwadesi, after fasting on Ekadesi day, is not good. The fast should be broken gradually. The first meal should consist of fruits or fruit juice and should be light.

## EXERCISE.

Exercise is as essential to long and healthy life as food. For adults, tennis, badminton, golf, etc., are good. If it is not possible to have them, brisk walking either morning or evening for 3 miles is sufficient and is quite possible. If the weather does not permit even this, every morning, on waking, breathing exercise for half an hour should be taken in front of the open window by inhaling air while raising the hands and exhaling while bringing them down. It is known that when a man gets angry, the adrenal glands which are the glands of fright, fight, and flight, are excited and they throw into the blood a large quantity of their secretion—adrenalin—which mobilises sugar, the source of energy required for flight and fight. If by not resorting to flight, or fight, the extra sugar is not used up by the muscles, it must leave the body with the urine, causing glycosuria. It is usual among uncivilised people, particularly the women, when they become angry, to abuse, gesticulate, fight or run about. As the present-day society does not view with favour any gesticulation or fighting, etc., the angry persons go to bed with their pent up anger and rack their brains, in the night without sleep, to find out means to take legal action against the persons who had caused their anger, and thus tend to increase the amount of sugar which passes away in the urine, increasing the glycosuria. If this happens frequently, diabetes is produced and one of the causes of diabetes, viz., mental worry, finds its explanation in this. So the best thing, if a person gets angry or worried, is to take a long walk to utilise the extra sugar produced and try to forget the event which caused the anger in the night and sleep away.

## EDUCATION.

If public health is to improve at all, the school-going population should be well grounded in that subject. Before imparting instruction to earn livelihood, it is necessary to learn how to live. The present system of education given in schools and colleges is unsound in principle and exhausting in practice, saps the energy of the young, damps the spirit of originality and is productive only of slave mentality. Herbert Spencer wrote half a century ago, that "men who would blush over an imputation of ignorance respecting the fabled labours of a fabled demigod,

show not the slightest shame in confessing that they do not know what the Eustachian tubes are and what is the normal rate of pulsation." If this statement represented the state of affairs in England 50 years ago, it is abundantly true at present in India. To state more correctly it is worse in India now. About a decade ago physiology was a compulsory subject for the F. A. examination. Now specialisation has commenced at the root and the pupils from the IVth Form begin to specialise. Physiology is an optional subject in secondary schools and the teachers who teach the subject have not got even the elementary knowledge of the subject. The wealth and health spent in this education can very well be utilised to better advantage otherwise. The money actually spent and proposed to be spent in future in increasing the number of colleges and universities of the types existing now, cannot be considered to be well spent. With that money primary education can be made compulsory and free and secondary education made useful. It is not to be thought that every girl or boy born should go to a University. It is only meant for the wealthy and for a few gifted intellects among the poor and middle classes. For the last two, scholarships may be provided to continue their education in universities. The medium of instruction should be vernacular in all schools and English, Hindi, and Sanskrit should be made compulsory languages. Hygiene and physiology should be made compulsory subjects and must be taught only by medical graduates who have had special training in psychology in addition to the subjects they teach. It was pointed out in page 6 that among the endocrine glands there is one pair, "Thymus and Pineal," which restrains body growth to give a start to the central nervous system to develop and that after the restraint is withdrawn at puberty, one or more of the other glands might take predominance over others. In the absence of sufficient restraint or over action of any of other glands psychoses, neuroses and other abnormalities might be developed. The backwards, the indifferent and the dunces are more or less the subjects of endocrine glands dysfunction. If that is early diagnosed and properly treated they will turn out to be healthy and good pupils and eventually good citizens. From the Public Health Administration Report of the Madras Corporation for 1924 it is seen that about 59.37 per cent. of boys and

80 per cent. of girls examined in elementary schools were defective. Before the defects are found out and removed, instruction imparted to them is only a waste of time and money and energy. The importance of medical inspection of pupils in schools having been recognised, if for every school a medical graduate is appointed to teach hygiene and physiology, he may be entrusted with advantage and economy the medical inspection of the pupils. The hours of attendance should be so regulated as to give to the pupils sufficient time for recreation in the open air. The schools should be equipped with all necessary apparatus required and also provided with botanical gardens where nature study including biology may be taught. Excursions should be arranged periodically for visiting the zoo, aquarium, etc. Whatever is taught should be demonstrated. The evil practice of imagining everything without opportunities for verification by experiments, the outstanding feature in the educational system in India, damps all initiative and instinct of curiosity and causes, according to some authority, neurasthenia as more energy is required to imagine a thing and remember it than is required in remembering it after seeing it once. An English youth is more practical and knows something about everything than even an Indian graduate. Among Indian graduates, there are many who do not know how to make simple repairs to the electric lighting installed in their houses. For secondary schools, in teaching physiology, reproductive system should not be excluded, as instances are common where boys and girls, on account of the mischievous literature concerning sexual matters, which are printed and circulated largely in these days, become subject to psychoses, dementia and other mental diseases. In the education of girls cooking, spinning and weaving should be taught. The subject of hostels requires some consideration here. Most of the present-day hostels are nothing better than ordinary hotels in the matter of preparation of meals. The method of cooking, the time when meals should be taken and the selection of food-stuffs should be a special feature of the hostels. The warden of the hostel may well be the school medical officer, instead of any other, as he will be better able to supervise cooking, etc. It is better that every school should have an hostel attached to it and that every pupil be made to live in it. This is quite possible in case of secondary schools where the pupils are pretty

grown up. It may be necessary for the pupils to have 4 meals a day instead of 3 as for adults as pointed out in page 14. In the morning at 8 they may be given either rice or oatmeal congee, and at 12, hoppers, chappatti with butter, buttermilk, and a chutney of raw vegetable. Again at 3, fruits and nuts and cocoanut water during summer and lastly at 7, rice, ragi, vegetables, etc.

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## V.

### PUBLIC HEALTH ADMINISTRATION—GENERAL.

Everybody knows the old proverb that prevention is better than cure. This is applicable more to medicine than to anything else. The goal of medicine, according to the late Sir William Osler, is prevention of diseases. The present-day combative and suppressive treatment of diseases must give place to preventive treatment. As most of the diseases are self-limited and symptoms produced by them represent nature's effort to cure the disease, any interference to mask those symptoms by giving medicines, as obtaining at present, is to a large extent unnatural and should be considered as quackery. The enormous amount of money spent in the treatment of diseases, the vitality and the energy, and therefore the earning capacity, lost by patients is a great loss to the nation. It is therefore the duty of physicians in future to prevent diseases. The preventive medicine is otherwise called Public Health.

Public Health may be said to consist of two parts: (1) personal hygiene, and (2) hygiene of the environment, and for the first the people themselves are said to be chiefly responsible, while for the second the responsibility rests with the Government. But as personal hygiene has to be taught in schools, and as education is more or less under the control of State, it comes to mean that the State is directly or indirectly responsible for the public health of the country. On page 17 it is pointed out that the instruction imparted in ordinary schools and colleges is defective and one-sided. If that is so, the instruction given in medical schools and colleges is not much better. Dietetics, dealing with the chief mainstay of life, is not taught while the medical man has to prescribe medicine and diet. Psychology is not included in the curriculum of studies while cases of abnormal psychology as insanity, etc., have to be treated and are being treated. The endocrine glands are so intimately connected with the economy of human organism that the evolution of human race is found to depend on them. It is said that for the development of psychic faculty

and to increase the perceptive powers of man, the proper functioning of the pituitary and pineal glands is necessary. There is nothing unbelievable about this statement, as it is well known that the existing three principal races of mankind show marked difference in the development and functioning of the different endocrine glands. The superman, who is in the process of being evolved, will have the maximum development and functioning of the pituitary and pineal glands. The subject of endocrinology, so important as pointed above, and which has made marked progress in Europe and America, has not been adequately recognised here. While such is the case with the training, the administration of public health needs considerable improvement and change of line of action. Sir Ray Lankaster says that "while departments of Government in which scientific knowledge, is the one thing needful, are carried on by Ministers, Secretaries and Assistant Secretaries, etc., who are wholly ignorant of science and naturally dislike it, since it cannot be used by them and is in many instances the condemnation of their official employment." And as a remedy he suggests that "probably an enquiry into and the discussion of the neglect of science and the questionable treatment of scientific men by the Administrative Departments of Government might with advantage be undertaken by a committee appointed by our great scientific societies for the purpose." The above observation was made several years ago with regard to the conditions that obtained in England then. It is to-day as true in India as it was in England in the past when the observations were made. More than this there is a vast difference between the Ministers and Secretaries in England and those in India. The officers there have all-round education and are in a position to understand scientific subjects. Here, as most of the officers are the products of the Indian schools and colleges, their education is one-sided and in the majority of instances they are not adequately conversant with scientific knowledge. In the reviews of vital statistics nothing noteworthy is observed beyond expressing sorrow with every fall and joy with every rise, commending upon the work of the officer in charge in the year in which there is rise and condemning the officer in charge in the year in which there is fall, though the officers themselves may be quite innocent of an

action taken or failure to take and when, according to the present experience, periodicity of epidemics has been recognised. The best thing to do\* under the present conditions will be, to have a committee of officials and non-officials with knowledge in Public Health. The Surgeon-General and the Director of Public Health may be itenary Secretary and Under-Secretary to the Committee and the Minister, the President. Before any steps are taken in connection with Public Health, arrangements must be made for collection and registration of facts and figures on all factors contributing to public health, to determine the nature of the steps to be taken and to gauge their effects after they were in operation. Measures taken simply because, they were adopted in other countries where the conditions may be quite different, are sure to involve loss of money and waste of energy.

#### INFANT MORTALITY AND CHILD WELFARE.

Some time back the South Indian Health and Welfare Association was started with much flourish of trumpets and after two or three years nobody heard anything about it. Now for the last 5 or 6 years Child Welfare schemes and Health and Baby Weeks are much before the Public and were started in the belief that the infant mortality was very high in India. It is to be seen whether the infant mortality is really proportionately higher than the general mortality as to demand special and exclusive action and whether the action taken is the right one and what are the results of the action taken during the last 7 years, the organisation has been under operation. The birth rate, the general death rate and infant mortality rate, in Madras for the year 1924 were in round numbers, 35, 25, 180. In England where the Public Health is said to be very satisfactory the rates were a few years ago, 25, 15, 110 respectively. The infant mortality bears a definite relation to the birth and the general death rates; and any increase in the latter is sure to affect the former, though no formula of variations has been worked out. It does not appear from the above figures that the infant mortality is out of proportion to the general mortality and birth rate and what now required are steps to bring down the general mortality and if possible of general birth rate; and if proper steps are taken,



the infant mortality will surely fall. No steps taken separately and exclusively for the lowering of infant mortality will be crowned with success. The Health and Baby Week which has been in operation for more than five years has not in any way improved either the general death rate or mortality of babies. It is merely an anniversary, a formal routine function as anniversaries of birth and death of other institutions and persons are. The child welfare, so much talked of in Madras, was instituted to diminish infant mortality by providing for attendance during confinement of poor women by the municipal nurses and giving them clinics and otherwise assisting them to rightly bring up the babies born. The effect, therefore, will have to be seen in the statistics of mortality of infants under one month, who are expected to be under the special care and attention of the Municipal Child Welfare staff. According to the Administration Reports of the Madras Municipal Corporation for 1924 and 1925, the percentage of mortality of infants below one month, to the total infant mortality and the total infantile mortality during the last 7 years were as follows :—

Year.	Deaths of infants under one month.	Total deaths of infants.	Percentage of deaths of infants under one month to total infant deaths.
1919 ..	2,237	6,231	35.9
1920 ..	2,381	7,113	39.8
1921 ..	2,178	5,475	40.3
1922 ..	2,865	6,678	42.9
1923 ..	2,590	5,837	44.4
1924 ..	2,598	6,148	42.3
1925 ..	2,570	6,431	40.0

If any inference is to be drawn from these figures it is that the Child Welfare Scheme has not been beneficial to infants, particularly to those under one month, and the energy and amount of money spent in that direction might have been advantageously utilised otherwise. In connection with the infant mortality in India, the following factors contributing towards it should be taken into consideration. It is well known that

children born to immature mothers are ill-developed weaklings and are therefore not expected to live long. The ignorance of mothers has a great deal to do with the life of infants ; and the overcrowding and insanitation and poverty go a great way in increasing the mortality of infants. And lastly, the greater the number of births the higher will be their death rate. All these are in full operation in India. Before making comparison of vital statistics of infant mortality of one country with those of another, all the above factors should be taken into consideration as otherwise the comparison will lead to fallacious inferences. Taking the first factor, it is known that a woman attains her full growth and bodily development at about 20 years and till then she must be considered to be immature. In England out of 1,000 females in the age period 15-20, 112 are married, while in India as a whole it is 771 and in Madras it is 685. According to Dr. Newsholme, out of the total number of children born to a woman, about 45 per cent. are born before the 19th year. Thus a large majority of infants born in India must have been born to immature mothers, contributing to the high level of the birth rate. The overcrowding, insanitation and poverty are the privileges of the Indians particularly those that live in towns. About ignorance of Indian women, no figures are necessary to prove it, as it is too well known and if necessary a reference to the census report will reveal the appalling fact that out of 1,000 women only 18 are literate in India and 21 in Madras. And another factor also should be considered here, viz., that the order of birth of children has also something to do with their mortality. Thus the mortality per 1,000 births of the 1st and 2nd born is 138.3, 3rd and 4th born—143.2, 5th and 6th born—177.0, 7th and 8th born—181.5 and 9th and above 201.0.

When the Indian females begin to give birth from the 15th year, unlike in England where they bring in the 19th and 20th years, the number of children born to them must be more than in England. When all these factors are taken into consideration, the wonder is that the infant mortality is not higher than what it is. It arouses suspicion whether the registration is correctly done. Special attention has to be paid to girl mothers and their surroundings and not to infants alone and instead,

of the annual function being called 'Health and Baby Week, Health and Girl-mothers' Week will be a more appropriate name. The following remarks made by the Hon'ble Dr. Hoops, the President of the Far Eastern Association of Tropical Medicine, are true and appropriate : " Our large eastern cities need pre natal clinics, maternity hospitals, training centres for midwives, post-natal clinics, child welfare activities, dispensaries and sanatoria for tuberculosis, venereal clinics, school and dental clinics. But what will these avail unless we remove the sources of evil—overcrowding and bad feeding ? " And nearer home the late Dr. H. M. Crake, the Health Officer of the Calcutta Corporation in the administration report for 1924, had stated as follows : " The high rate of infant mortality is due to ante-natal conditions and cannot be remedied by baby clinics, Milk Depots, etc. With so many sickly, poorly nourished mothers living under insanitary conditions, puny weakly babies are inevitable. Whilst poverty is the direct cause of so many expectant women being ill-nourished and badly housed, ignorance, child marriage, the purdah system, and diseases all combine to undermine their health. It is obvious, therefore, that there is little hope of these causes of infant mortality being removed without a radical change in the social and economic condition of the women in Calcutta." However, in Madras, about 2 lakhs of rupees were spent in the celebration of the Health and Child Welfare in 1925. If that money had been spent in improving the economic conditions of a few poor families, or in the improvement of the sanitation of the most crowded and ill-ventilated narrow streets which abound in towns, it would have been better utilised than in the mere celebration of Health and Child Welfare festivities where the babies and children are given buns and biscuits which are productive only of indigestion, if not anything worse, to them and anxiety and expense to their parents.

### VITAL STATISTICS.

The subject of statistics in general and that of vital statistics in particular are very important and complex and for any correct inference to be drawn from vital statistics figures, it must be

made certain that the figures are complete and collected for an adequate period of time and deal with a sufficiently large population. In making comparison of the statistics of one place with those of another, not only the length of time and strength of population on which the statistics are taken but also, its composition, viz., the age, sex and civil condition, must be taken into consideration. In places where infant marriage is in vogue and where the proportion of married people is large, the birth, death, and infant mortality rates will be high. We shall take up the subject of infant mortality which serves as the index of the sanitary condition of a place and which is being talked about much at present. In order to appraise correctly the value of the figures, it is necessary that provision should be made in the birth register, to record the age of the mother and the order of birth and in the death register, in case of an infant's death, the order of birth of the deceased infant, the age of the mother when the deceased infant was born. On the death of an infant being reported, the registrar must go to the place and ascertain the financial condition of its parents and the sanitation of the house and the street in which it lived and died. In the periodical returns the age of mothers may be shown under the age—periods of below 14, 15 to 19, 20 to 24, 25 to 29, 30 to 34, and 35 and over. The financial condition of the family may be shown as "good" when the average monthly income of each member of the family works at the rate of Rs. 15 or more, "fair" between Rs. 10 and 15, "bad" between Rs. 5 and 10 and "poor" below Rs. 5. And in the matter of the sanitary condition of the house, the extent of superficial area available for each member and whether there is provision for sufficient light and ventilation may be noted. Are such statistics being taken now? None so far as I know. Notwithstanding the absence of correct statistics and in spite of the fact that the infant mortality figures showed an increase in the rate, in parts of the city where the Child Welfare Scheme was working, the scheme was extended to other parts of the city and as pointed out above the results are not satisfactory.

#### MEDICAL RELIEF.

In the matter of medical relief also it does not appear that any definite policy has been followed, nor there appears to be

any clear vision of the requirements of the presidency. In all civilised countries of the world, the private medical practitioners form the backbone of the medical profession. Most of the hospitals in civilised countries are maintained from private funds. The State only undertakes the opening and maintenance of hospitals for the army, navy, police and infectious diseases and there are out of 6,896 hospitals in the United States of America, only 299 maintained by State funds and they are for the army, navy, and infectious diseases, etc. The maintenance of hospitals, except those required for the police, military and infectious diseases and for clinical purposes, from the general public funds, is not only doing injustice to the general tax-payers but goes against the proper development of medical science itself. It is not possible to maintain the number of medical men required to meet the needs of the population from general or local funds as the number is very large. To maintain some medical men and leave others to look after themselves is not fair as it produces unequal competition. The medical men who get handsome salaries during service and decent pension after retirement need not exert themselves to maintain their knowledge up-to-date but still with the convenience of appliances, instruments and medicines available in hospitals or dispensaries in their charge, they may and can monopolise private practice to the disadvantage of private medical practitioners. Thus medical science does not develop and the backwardness of the medical science as now obtaining in India is to a great extent due to this cause. The increase of pay given to medical officers after the advent of the Reform Scheme is neither beneficial to medical science nor to the medical profession in general. It only increased the price of Government-paid medical men. They are dumped into Municipal Councils mostly in face of their unwillingness and inability, to go in for such costly stuff, and the Government come to their aid by contributing a major portion of the pay of these officers. Surely this is a step which certainly damps all incentive for medical men to take up independent practice. As long as in towns there are sufficient number of qualified private medical practitioners to meet their needs, the correct and economical procedure is for the Government to stop the manufacturing of such costly and unsaleable commodities and cease

to make any contribution and for the municipalities to withdraw from the maintenance of hospitals other than those required for the isolation and treatment of infectious diseases and hand over the former to private or public charities. The money thus saved may be utilised in increasing the number of medical schools and colleges. Before any steps are taken to organise or develop medical relief, the number required to meet the requirements of the population served must be ascertained. Has it ever been done? The present organization with the recent development made does not indicate the existence of any such idea. In European countries it is found that there are on an average 6 medical practitioners in rural areas and 12 in towns for every 10,000 population. In Germany there were in 1925, 6.77 for rural and 13.2 for urban areas for every 10,000 people. In the United States of America according to the latest report there are 13 on an average for every 10,000 of the whole population, while in Japan there are 6 in rural and 12 in urban areas. For the Madras Presidency there should be at least 5 for rural and 10 for urban areas. Taking the population as per 1921 census, it works out that 18,745 for rural and 5,305 for urban areas totalling 24,050 are required for the presidency as a whole. At present there are 2,272 or, in other words, less than 1/10 of the actual requirement. Taking the city of Madras, there should be about 500 practitioners but there are only about 250 just one-half the number needed. Even this small number is not able to maintain itself because the State-paid medical men who are included in the number monopolise almost the whole practice as the competition between them and the private medical practitioners is on very unequal and unfair terms. The need in India for qualified midwives must be borne in mind. In Japan there are on an average 6 qualified midwives for every 10,000 population and taking the number that are available in this presidency, it would not come to more than one-hundredth of the number actually required.

#### MEDICAL SCHOOLS AND COLLEGES, HOSPITALS AND LABORATORIES.

Taking now that about 24,050 practitioners are actually needed and 1/10 of the number required as the reserve to

replace those that may fall ill or otherwise engaged, the total strength comes to about 26,000. On account of the nature of their work, exposing them to infection and permitting no rest in night time, the mortality rate of medical men is higher than that of others. So in order to maintain these 26,000 practitioners always, an yearly recruitment of about 1,500 men is required. Considering that 75 per cent. of the men admitted into medical schools and colleges come out successful, the number of admissions per year must be about 2,000. The existing medical colleges and schools are utterly inadequate to meet this demand. At least there should be one medical school for each district and three medical colleges for the presidency. In the United States of America in 1925 there were 67 medical colleges and the number of medical practitioners given licenses for practice was 7,294. For giving clinical instruction to the large number of students, there should be one Government Hospital for each district as it is now, provided with all the latest appliances for diagnosis and treatment. Besides to each district hospital should be attached a clinical and bacteriological laboratory. There are in the United States of America 3,821 clinical laboratories for a population of 113 millions, *i.e.*, thrice the population of the Madras Presidency and most of them are privately owned and maintained and at that rate there should be 1,200 for this presidency. If the Government provide one for each district and about half a dozen for the city of Madras, the private medical practitioners in course of time will open their own laboratories. A physiological and pharmaceutical laboratory and chemical laboratory to analyse foodstuffs and indigenous medicines and standardise the latter should be attached to each medical college. In each college centre, in addition to a general hospital, separate special hospitals as ophthalmic, maternity, etc., should be opened while to each district hospital should be attached separate wards for special diseases.

#### MINISTRY OF PUBLIC HEALTH.

Having turned out the required number of students from the medical schools and colleges it is the duty of the Government to see that they are given necessary practical training and experience in hospitals before they are sent out to practise

independently. As only a few of the men trained could be entertained permanently by Government or Local Boards, the rest must be appointed as paid apprentices (house surgeons or physicians) in the district and presidency hospitals. The apprenticeship may be extended to 5 years, of which one year should be devoted to a maternity hospital and one year to an ophthalmic hospital and the rest spent in a general hospital. They may be paid monthly during the apprenticeship at the rate of Rs. 200 each for graduates and Rs. 100 each for Sub-Assistant Surgeons and after the close of their apprenticeship they may be given a gratuity of Rs. 2,000 for each of the former and 1,500 for each of the latter to enable them to start private practice. Only the medical officers required for colleges and schools and all officers of the Public Health Department may be made permanent and given pension on retirement. The college and school staffs should be *ex-officio* medical officers in charge of presidency and district hospitals and they should not be allowed private practice except as consultants. Now as the Government have recognised the importance of medical inspection of schools and made the inspection compulsory, it is both economical and advantageous to appoint one or two medical men for each school as teachers to teach hygiene and physiology and also to conduct medical inspection of the students. They may, as suggested in page 19, be appointed as wardens of the hostels attached to schools. The appointments may be, as far as Government schools are concerned, permanent and pensionable. The selection of medical officers for medical schools and colleges may be made by competitive examination to which the private practitioners may appear. For special subjects competent men may be got from other countries if necessary. In course of time private practitioners may be appointed as honorary surgeons and physicians for the presidency and district hospitals. There is no necessity for having a head for the Medical and another for the Public Health Departments. The Minister of Public Health may have one Medical Officer of Health to assist him and one or two assistants to the latter, if necessary, to help him in inspection. The District Health Officers who are all qualified can very well look after vital statistics, vaccination, fairs and festivals in their own districts. There are now local fund district board engineers.



and assistant engineers but there is no Chief Engineer for District Boards. Similarly there is no need for a separate Director of Public Health for the Sanitary Departments, and a Surgeon-General for the Civil Medical Department. The head of the Civil Medical Department must eventually disappear and the Director of Public Health must be in charge of both and occupy the position of the Medical Officer of Health in the Ministry of Health or as suggested before, the Surgeon General and the Director of Public Health be appointed as itenary Secretary and Under-Secretary to the Public Health Committee. No educational qualification is fixed for executive council members or ministers and it is not unusual to find ministers or members possessing no university qualification. But the appointment of medical men holding university qualifications both in special subjects and in arts as ministers and members is practically unknown. Perhaps it is considered that either the special qualification is a drawback for membership or ministership or that it annuls or depreciates the value of the other university qualification, the doctor may possess in addition. This is indeed unfortunate. In highly civilised and newly formed countries which have no prejudices, it is only scientifically-trained men that are appointed for high offices. The following quotation from the proceedings of the Eastern Association of Tropical Medicine may be interesting in this connection :—

“A few advanced and intelligent countries such as Czecho-Slovakia are beginning to discover that the medical men make the best statesmen because their knowledge of life is very real and their mental outlook a genuinely wide one. The world, long centuries ago, escaped from the peril when Public Health was under the domination of priesthood with vested interests. To-day it seems to be passing through the transitory phase when administrative and executive power is concentrated in the hands of the legal profession and is under the control of men with quite intelligent minds but with no outlook upon life wider than that of precedent and antiquity. To-morrow it may discover that the real role of the doctor is to prevent disease rather than to cure it, and may reluctantly surrender administrative and legal control of preventible diseases to the medical fraternity. Ultimately it may discover that a true philosophy is the secret of life.”

## INDIGENOUS SYSTEM OF MEDICINE.

Medical science is changing rapidly and to think that the allopathic system of medicine is the only true system worthy of support of Government is not correct. There can be no State medicine as no religion can be a State one. The Madras Government has recognised the indigenous medicine and has opened a school to train students in that system. Physiology and Anatomy are taught there by teachers trained in allopathic system and only Materia Medica, Therapeutics and Medicine are taught as per the indigenous system. If the Government had really been impressed with the usefulness and soundness of the indigenous system, the training should not have been shunted to a side line and a special school opened to teach the system, separated from the allopathic schools and colleges. As Anatomy, Physiology, Midwifery, Ophthalmology, etc., are common to both, special classes should have been provided in the allopathic schools and colleges for teaching indigenous Materia Medica, Therapeutics and Medicine, etc., and special wards opened in the allopathic hospitals for treating patients under that system. Besides the indigenous system, there are homeopathic, naturopathic, osteopathic, hydropathic and several other systems and they are all doing some service to the public. As time passes, there will be agitation by the public to provide training in each of these systems. Are the Government going to open separate schools or establish special chairs in the allopathic schools and colleges and open separate wards in allopathic hospitals for these systems? Nobody can deny the enormous progress made in the allopathic system in the matter of diagnosis of diseases, and in the selection, preparation and standardisation of medicines with utmost precision. All these should be utilised in the treatment by systems other than allopathic, as the circumstances and condition of patients may require, so that in future, there will be only one system, that is the system which assists nature in curing and preventing diseases.

## RURAL DISPENSARIES.

In G. O. No. 1522 P. H. dated 22-10-1924 the Government stated that 719 dispensaries and hospitals maintained by them or Local Boards were insufficient to meet the needs of the

population and organised the scheme of affording medical relief to villages by opening 228 rural dispensaries. Out of 128 Local Boards, thirty consented to open 30 more such dispensaries. It is just one year since the scheme has been in force but according to para. 3 of the G. O. No. 833 P. H. the scheme is said to have become so popular as to necessitate the opening of 85 more of such dispensaries for this year. Certainly the time is too short to find out whether the scheme, in its practical working, has met the purpose for which it was intended. In the newspapers one sees almost every day, notices inviting candidates for the appointments either not filled up or have fallen vacant. And instances are not wanting where medical men who had been appointed have returned quite disgusted with the work and its administration. If any inference is to be drawn from these facts, it would go to prove that the scheme is not popular but has failed. In principle it is wrong and it will be impracticable in its working. Already the Indian Medical Association has passed a resolution to reserve some of the appointments to the Ayurvedic physicians and in course of time similar requisitions may be made by Unani medical men and by Homeopaths, Naturopaths, etc. As long as these systems are doing some good to and appreciated by the public and as the Ayurvedic and Unani systems are recognised by Government and a school opened to teach them, to deny the practitioners following these systems of medicine a percentage of the appointments, will not be fair, and to give appointments to the followers of all systems of medicines now existing and those that may come up in future, is not practicable. The money spent by the State on this scheme may be utilised in increasing the number of medical schools and colleges where special courses for the several systems of medicines recognised by Government may be given. The extension of the scheme of the rural dispensaries appears to be on a par with that of the child welfare scheme, throughout the City of Madras as pointed above.

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## VI.

### MEDICAL PROFESSION IN MADRAS.

#### NECESSITY FOR THE REMOVAL OF ABUSES.

In the inaugural address delivered by Major M. A. Kureishi, I.M.S., before the South Indian Medical Union, Madras, in June 1925, he pointed out certain drawbacks in the profession. Though several, including the writer, were present at the meeting, they were not able to follow the address closely and in consequence there was no discussion then. Now that Major Kureishi has got his address printed and copies have been circulated among the members of the Union, it is possible to offer some remarks on the address.

At the outset it must be stated that the address is very clear and frank without any camouflage. He said that the medical profession, particularly the private medical section, had been reduced to the status of a low class shop-keeping, that the practitioner was indistinguishable from a chemist or a compounder, and that a medical man who merged his advice and his own prescription into a bottle at so much per ounce was not worthy of being called a medical man. It appears such practices are rare in other countries and that in London there are only one or two such, run by medical men who have, in their struggle for existence, reached their lowest ebb. The second point he brings forward is about the tendency evinced by medical practitioners to run after any new remedy advertised and the injection method largely resorted to by several of them. Lastly, he comes to Government medical officers and says that if they could be satisfied with having consulting practice only and that through the medium of the practitioners, they will not only be raising their own status but will hope to grow that spirit of independent fraternity which is the distinguishing feature of most civilized countries and which is so essential for our general welfare. That he has stated the truth and nothing but truth there is no gainsaying. It is necessary, therefore, to find out the causes that have led to this state of affairs and suggest remedies for improvement.

If in London, Major Kureishi had seen one or two medical men, who had descended to the position of doctor-chemists

because in the struggle for existence they had reached their lowest ebb, in Madras a large number of private medical practitioners have reached that stage and are living hand-to-mouth existence. Their position is difficult and they have to struggle on one side with indigenous medical practitioners with their advertisements in newspapers of their magic cures, on the other side with Naturopaths, on the third side with Homeopaths and on the fourth with the highly paid Government medical officers. There are four classes of compounder-doctor-chemists, now in Madras : (1) Private medical practitioners having dispensaries of their own in which the medicines required only for their patients are compounded ; (2) private medical practitioners who have opened chemists' shops either in their own names or in those of their dependents but owned and managed by them and where not only their prescriptions but those of others are compounded ; (3) Government medical officers adopting the practice of No. 1 ; and (4) Government medical officers following the practice of No. 2. The condition of the country and the tradition of medical practitioners in olden days permit No. 1 class. In rural areas, it is known that separate medical shops do not exist and the combination of compounder-doctor-chemist is necessary in those places. Further it is known that in municipal towns, on payment annually of a nominal subscription to the municipal hospital, a subscriber and his family are entitled to have a free supply of medicines throughout the year. The Government medical officers in charge of hospitals and similar institutions have better facilities to treat private patients, with the conveniences obtaining in those hospitals or institutions, such as the examination of urine, blood, sputum, the preparation of vaccines, and medicines, etc., than the private medical practitioners who have to spend money and time in procuring those conveniences. Between the practice of merging his advice in the medicine and bottle charged for, adopted by half-starving medical practitioners to keep the wolf out of their doors, and the practice of giving medicine and other conveniences more or less free, and charging fees, high enough to cover a portion of the cost of medicines and other appliances for which no payment need be made, adopted by plethoric Government-paid medical men, certainly the former is to be preferred. The second class is

bad in two ways, firstly, on principle and secondly, on the existence of chances of going through other practitioners' prescriptions and commenting on them. The third class is certainly bad, and there is no ground in support of it. The last is most reprehensible and cannot be condemned too strongly. Both the Government and the Medical Council should take steps to find out such cases and deal with them properly.

The second point raised that the medical profession in Madras has a tendency to resort to injections for any and every trouble, is too true and of late it has been so much in vogue, that common patients demand injections and think that the doctor is not up to date, if he demurs to resorting to it, as injection appeals more to the imagination of the common folk, than mere taking of medicine by the mouth.

Coming to the last point raised in the address, *viz.*, that Government-paid medical men should only resort to consulting practice, it will not only bring credit to such officers but also help the profession and the private medical practitioners. The actual state of affairs even in Madras, where there are a fairly large number of private medical practitioners to attend to the needs of the city, is quite otherwise. A few of the Government medical officers are omnivorous and undertake in private practice, the whole treatment of cases, including dressing and application of poultices themselves. If such officers do not themselves realise their position not only in their profession but in society, certainly it is the look-out of the Government to see that their officers maintain their dignity and do not violate decency. The Government have framed travelling allowance rules, prescribing the classes in railway in which certain grade of officers should travel, in order that their dignity as representatives of Government should be maintained. The Surgeon-General is not allowed private practice except as a consultant. A similar rule to the effect that medical officers of the grade of Civil Surgeon should not take up private cases independently for treatment should be passed. In the cases of specialists and in those in which the patients are sent from other places, there may be exception but even then the help and co-operation of private practitioners should not be discarded.

## VII.

### MEDICAL INSPECTION IN SCHOOLS.

The subject of medical inspection of school-going population has been rather long in the minds of the public and the Government of Madras have at last passed orders for inspection of pupils in secondary schools. It is something to be grateful for ; at least there must be the satisfaction that the principle of medical inspection in schools is recognised. Taking the large number of children that attend Primary Schools, considering the fact that Primary Education has been made compulsory in certain areas in the Presidency and recognising that diseases occurring among children, if detected and treated early, have better chances of being cured, than those among older persons, where they have the likelihood of taking deeper roots than among young children, it would have been better if provision had been made for the inspection in Primary Schools also. From the orders passed, it does not seem that the objects of the medical inspection are secured in full. According to the order as published in newspapers, only the physical condition of the pupils has to be ascertained and noted, and if any actual disease is found in a pupil its parents should be informed of it. Disease detection and its treatment were the chief functions of the old school of medical men. At present owing to the rapid advancement made in medical science both in the matter of diagnosis and treatment and the enlargement of its scope, the duty of a physician is not only to treat diseases that have actually made their appearance but to prevent them. The pupils may not be ailing from actual diseases at the time of inspection but there may be predisposition to them. It is now found that the secretions and hormones from ductless glands have largely to do with the development of the several organs of the body and their upkeep. Even the evolution of human race, the peculiarities of different races of mankind, and the causation of sex also, are said to be connected with the Endocrine System. Dysfunction of any of the glands, though not be productive of actual diseases, may impair the integrity of the organs and make

them liable to be attacked by pathogenic micro-organisms or their toxins. It is possible by careful medical examination and appropriate diagnostic measures to detect such dysfunction and remedy it. It is not the physical condition alone that needs inspection. The mental condition requires equal attention to be paid to it, if not more. The backward children in schools are found to be due to the absence or dysfunction of certain ductless glands. The body requires careful measurements and morphological index (Brevilinear, Mediolinear and Longilinear) and Pignet's index should be found out. From these it may be possible to know the predisposition to certain diseases and steps may be taken to ward them off. The mental capacity may be gauged and arranged under the Binet-Simon Scale. It may be possible from this to find out the capacities for several vocations and they may be recommended with advantage, instead of passing all the pupils through one and the same mill. Lastly, psychoses, including obsession, phobia, stammering, tics, etc., can be detected and before they take firm roots, remedied. For these purposes, the examination of each pupil should be long and thorough and diagnostic appliances have to be used and in some cases the pupils should be kept under observation. It is not possible for any Government medical officer attached to medical institution or any general medical practitioner to devote sufficient time for a school with, say, 500 pupils. Medical inspection at the rate of 10 to 20 pupils per hour, as is now done in certain places and which consists merely in the examination of the heart, lungs, mouth and eyes, etc., is of very little use and for the money spent in this direction, the return would be inadequate and the inspection itself will become a useless and lifeless routine formality without any practical benefit. In connection with the subject of medical inspection in schools, the subject of making Hygiene and Physiology compulsory in schools needs consideration. The teaching must precede the inspection. It is more essential for a boy or a girl to know the route food takes after it is put into the mouth and passed as stools at the other end of the alimentary canal, and the nature of the juices that act on it during digestion, than to know the ports which a coasting steamer touches when voyaging from one place to another and the exports and imports of Labrador. It is within the personal know-



ledge of the writer that even some of the graduates in Arts at present are ignorant of elementary physiology and anatomy. Now physiology is said to be taught in the IV or V Form in Secondary Schools by teachers who have no special knowledge and training in the subject. As the number of medical graduates now turned out by universities are increasing every year, there is no reason why medical graduates should not be appointed as teachers to teach Hygiene and Physiology in schools. They may be required to conduct medical inspection of the pupils also in the schools in which they are employed. Only they can devote adequate time in the matter of inspection and keep under observation such of the pupils as require such action, and also treat them if necessary. To make the inspection complete, it may be necessary to have a consulting physician of experience and learning to visit schools occasionally and advise the medical teachers and have their doubts cleared. This arrangement will be more economical, than the proposal of paying annas 12 for each pupil examined by medical officers in charge of Government institutions, or private medical practitioners, in addition to their own duties. During the course of my long experience of over 20 years as Sanitary Commissioner of Travancore, which necessitated the inspection of schools in connection with vaccination, the urgency of medical inspection of school children had been impressed in my mind. In the Report of 1921 Census of Travancore, I have given some facts and figures in the chapter on Infirmities on this subject. The Government of Travancore have already taken steps for the inspection of school children.

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## VIII.

### MR. C. R. DAS' DEATH AND ITS LESSON.

Now that the condolence meetings, obituary notices, and appreciative sketches of the late Mr. Das' life are over, it is time to consider the lesson his death teaches us. That he was a great person, and that his loss is a national one, there can be no doubt. He died at the age of 55, and other great men like him, as the late Mr. Gokhale, and Mr. V. Krishnaswami Iyer, and others died at an early age. It is only after fifty, bodily passions subside, worldly experiences become ripe, and thinking and knowledge clarify. That lives of great men, who are to be the leaders of the nation, should be taken away at such a time, is indeed a misfortune to the nation. It is therefore the chief concern of the public to direct their attention to this matter. Along with their energies in other directions, as political, commercial, industrial, etc., the matter of Public Health and Personal Hygiene, should also be included in the programme of their work, as otherwise any advancement achieved, will be one-sided and unstable. For this unhappy state of public health, not only the medical men, but the public, the educationalist and even Government are responsible. It is considered even now by medical men, that their duty consists in only treating diseases and it is within the observation of the informed public, that the branch of the medical service, *viz.*, the Sanitary Service, was not much in favour with the medical service. Of course, the antagonism is now disappearing and the medical men are brought to realise that the goal of medical science, according to the late Sir William Osler, is the prevention of diseases. On account of the advancement made in the matter of early diagnosis of diseases, and in the treatment of them, it is possible now to detect the predisposition to diseases and its onset, sufficiently early before they develop into actual diseases, and adopt measures to remedy them. As long as the generality of the people call in doctors only after the actual onset of diseases and after they had made sufficient advancement, the system of the provision of family doctors must be brought into existence.

In olden days, for every village in India there used to be one or two vydians, who were paid in kind every year, by the inhabitants of the village and they might be expected to know the condition of their clients very well. If they had been given opportunities now afforded by the advancement in the diagnosis of diseases and knowledge of medicine, they would have been able to detect any predisposition and abnormalities and remedy them immediately before they develop into actual diseases. After the opening of Hospitals and Dispensaries and the frequent transfers made of officers in charge, the system disappeared altogether, though in big cities where there are a number of independent private medical practitioners it is found to exist though in an unsatisfactory state. Taking for instance diabetes, the chief disease which collects its toll largely from among the most intelligent people, it is such an insidious one, that its presence is only detected in most cases accidentally when the urine is examined for other purposes. If the family doctor knows the family in which the disease is common, he may by periodical examination of urine and by adopting sugar tolerance test, detect latent diabetes among its members and take immediate steps to prevent its onset. In America, it is said that the urine of suspected persons is examined yearly on the birthday of the persons suspected. There are several other such diseases as Tuberculosis, Gout, Myxedema, etc., requiring similar action. The public including the Public Press is also responsible partly for this state of affairs. They have not yet sufficiently appreciated the importance of the subject. Though in the daily lay papers weekly supplements on matters connected with Commerce, Engineering, and Education are published, no paper has yet thought fit to include Public Health in its weekly supplement. Even after the writer has drawn the attention of a few papers to this matter, no action has yet been taken. The education now given in schools and colleges are one-sided and mostly literary. And with the quarterly, half-yearly and yearly examinations, it saps dry the energy and vitality of the pupils, leaving no energy for any original study and before one comes out of the college, with his money and energy exhausted, he has nothing before him except the addition of one or more letters of alphabet after his name and a wife and children to look after. He has little now to look up for,

except diabetes or tuberculosis and early death. Before persons learn how to earn money, they must be taught how to live and in the curriculum of studies in schools and colleges, no provision, for instruction in this vital matter, is made. The Government's duty does not end with the opening of hospitals and dispensaries. At first it may be necessary to open and maintain them before sufficient number of qualified medical men are turned out from colleges. For each Province, Physiological and Research Laboratories should be opened, and all the foodstuffs should be analysed and their composition found out. It is necessary, for proper dieting, the ingredients of the diet are known. Such laboratories require a lot of money and the Government alone will be competent, for a long time to come, to open and maintain them. The hospitals and dispensaries except those required for clinical teaching, should in course of time, be handed over to private and public charities. The social side of the public also requires earnest consideration. Even in the matter of the time of taking meals, some changes are necessary at present. In olden times, it is not possible to say, in the absence of correct statistics, the incidence of and mortality from diabetes, tuberculosis and other diseases. Even now, except perhaps in municipal towns, the vital statistics registration cannot be expected to be correct. Whatever it may be, it is well known that among vegetarian Hindus, the women are less affected with diabetes than men. This may be partly due to the habit of the women taking rest after their chief midday meal. In India except in the case of priestly class which had not to work to earn their livelihood, the chief meal of the rest of the Indian people was in the olden times, in the night. Now, the times have changed after the advent of the British. The businessmen and officers have to attend to their duties immediately after their chief meal taken in the day time and this is one of the reasons for the increased incidence of diabetes among men. That even in other countries, the taking of chief meal in the day and doing work immediately without giving sufficient rest may have contributed to the increase in the incidence of diabetes, is evidenced by the fact, that of all the places given in the following table showing the rate of mortality from diabetes, Berlin where the Germans are more in the habit of taking the chief

meal in the day than others, tops the list with the highest mortality.

Name of City.	Rate of Mortality from Diabetes per 100,000 population.
Berlin (Germany)	.. 17.9
Copenhagen (Denmark)	.. 17.1
Amsterdam (Holland)	.. 15.9
Paris (France)	.. 15.5
Barcelona (Spain)	.. 14.9
Florence (Italy)	.. 14.1
St. John (New Brunswick)	.. 13.4
Christiania (Norway)	... 13.2
San Salvador (Salvador)	.. 13.0
Colombo (Ceylon)	.. 12.5
Victoria (British Columbia)	.. 11.5
Basel (Switzerland)	.. 11.4
Montreal (Canada)	.. 11.2
Toronto (Canada)	.. 11.1
Montivideo (Uruguay)	.. 10.6
Edinburgh (Scotland)	.. 10.4
London (England)	.. 10.3
Belfast (Ireland)	.. 9.0
Glasgow (Scotland)	.. 8.8
Madrid (Spain)	.. 8.8
Turin (Italy)	.. 7.2
Milan (Italy)	.. 6.3
Mexico	.. 5.4
Manila (P. I.)	.. 4.5
Singapore	.. 4.3
Tokio (Japan)	.. 4.1

If under the existing circumstances in India, it is not possible to change the office and business hours, the best thing would be to change the time of the chief meal to night for those who are now taking it in the day. The cooking of meals also is a matter for attention. The removal of the nutritious portion in the preparation of food, or the evil practice of straining and throwing

away the congee from the rice-food, is well known. The bad selection of the articles of diet and their incorrect preparation might not affect the health all on a sudden, to attract attention, but act insidiously, through several generations. It is known that the last child of a large number of children born to a woman is a Mongolian idiot. It is said that the Mongolian facies is not due to accident but is the outcome of taking unhealthy and unbalanced diet for generations. The diet of poor people among the Chinese does not contain fresh fruits and vegetables, but only rice from which the pericarp is removed. Besides the diet and the time of taking and preparation of it, the infant marriage obtaining among the Indians may be touched a little here, as it also contributes to shorten life. The General Public and even statisticians attribute high infant mortality solely to unhealthy surroundings, and institute comparison of infantile mortality rate obtaining in India with that in other countries without taking into consideration the chief factors contributing to it. It is known that children born of immature mothers cannot be expected to be healthy and live long. Taking the reproductive age of females as 15 to 40 and also bearing in mind that according to Dr. Newshome, 45 per cent. of the children born to a woman is born before the 19th year, it is but natural to expect that these children cannot be expected to be quite healthy, as the females attain full development about that year. The number of married females out of 1,000 females between the age of 15-20 in England is 112 (according to 1911 census), in India 771 and in Travancore 499 (according to 1921 census), and the mortality of infants born to such undeveloped mothers must be proportionate to the number of such married girls is evident from the fact that while the infant mortality in England is 110, in India it is 178 and in Travancore 150. That the rise in the age of marriage of girls has a diminishing effect on the infant mortality is clear even in India, as would be seen in the case of Travancore, where the number of married women is lower than that in the other parts of India, and the rate of infant mortality is less than that in the rest of India. It is not only the higher age of marriage but also literacy among mothers, influence favourably the infant death-rate. It is worthy of note that in Travancore the percentage of literacy among females is 173 per 1,000 while in the rest of India it is 20. In con-

clusion while in collecting Statistics of infant mortality it is very desirable that arrangements must be made to note the order of birth, age of mother in the vital statistics registers and in case of deaths of infant reported, enquiry must also be instituted to find out the healthiness or otherwise of the house in which the death took place and the financial condition of its parents. I wonder whether in any of the Municipal towns in India, such arrangements are made. I may say for the information of the readers that in Travancore in places where Vital Statistics collection and registration is compulsory, provision is made in the Vital Statistics Registers to note, the order of birth and the age of mother. The influence of the rise in the age of marriage of girls and in literacy, in the rate of child birth, the sex of children and mortality of infants, is discussed in the report of the 1921 Census of Travancore and a perusal of chapters on sex, civil condition and age in the report is worth the trouble.

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## IX.

### RURAL SANITATION.

#### RECONSTRUCTION OF VILLAGES.

Throughout the world, "Back to Village" is the popular cry and in India the same cry is heard although towns are few and a vast majority of people live in villages. It will be seen from the report of 1921 census of India, that about 90 per cent. of the population live in villages in India as a whole and that in the Presidency of Madras, with which we are intimately concerned about 12 per cent. live in towns. The physical, social and economic conditions of India are such that urbanisation is not possible to any appreciable extent. Neither is it necessary nor desirable. It is only in countries which are industrial, commercial, and wealthy, urbanisation is much in evidence, as for instance in England, where about 79 per cent. of the population are urban, while in France, which is not so very wealthy, or industrial, only 44 per cent. of the population live in towns. Rural life connotes healthy life in European countries and America. Whatever it might have been, in ancient times, at present in India it means anything but healthy life. The mention of villages brings to the mind rubbish and dung heaps, dilapidated houses and filthy tanks, etc. Perhaps it might be said by statisticians that the mortality figures are low and that therefore the health is satisfactory. But it is known that vital statistics registration is so very backward in villages and that no reliance can be placed on it. What now required is not so much "Back to Village", as "Reconstruction of Villages".

#### THE DEFECTS OF PRESENT VILLAGES AND THEIR CAUSES.

Before reconstruction is undertaken, it is necessary to know the present defects and the causes that have led to them, as no reconstruction is possible without removing the defects. The first cause is illiteracy. In India the extent of illiteracy is appalling. Out of 1000 persons of over 5 years of age, only 82 are literate; in other words, more than 91 per cent. are illiterate,



and in Madras the illiterates are more than 90 per cent. While the figures stand as above for the country as a whole, in the urban areas the literacy is much higher than that in the rural areas. Taking India as a whole there are 256 literates per 1000 living in cities against 82 in both rural and urban population, while in Madras the number of literates in towns is 350 against 92 in the Province. The second cause is the nature of the instruction imparted in schools. It is of the most literary kind, unfitting the recipients of such education, to follow their traditional occupations in villages and fitting them up only to serve as clerks, petition writers, etc., and attracting them to towns, where they have some scope for their acquirements. Thirdly, the want of schools and medical aid. In olden days there used to be pial schools and vydians in every village, and the teachers and the vydians were usually paid in kind. Now the schools have to conform to certain rules and in consequence the pial schools disappeared and after the extinction of the village vydians, there is none to replace them. Fourthly, the fear of thieves. Well-to-do persons who usually adorn their women with costly jewels are afraid to live in villages on account of fear of thieves; so they go and live in towns. And lastly, the absence of good and cartable roads and other means of communication. There are several villages, which are cut off from other villages, on account of the absence of roads and unless the persons living there are prepared to walk and carry their luggage on their heads, there is no chance of their visiting other places. The following statement taken from the 1921 census report of Travancore gives the particulars of the length of roads in the chief provinces in India :—

Province or State.	Area.	No. of miles of roads.	Area in sq. miles served by 1 mile of road.
Travancore	7,625	4,475	1·7
Bengal	78,669	34,795	2·3
United Provinces	1,07,267	34,115	3·1
Punjab	99,779	27,969	4·0
Behar and Orissa.	83,161	9,016	4·4
Bombay	1,23,059	27,520	4·5

Province or State.	Area.	No. of miles of roads.	Area in sq. miles served by 1 mile of road.
Madras	1,42,330	26,946	5.3
Assam	53,015	8,989	5.9
Central Provinces	99,876	7,993	12.5
Burma	2,30,436	12,541	18.4

Thus it will be seen that in Madras there is only one mile of road for every 5.3 sq. miles. With good roads and quick conveyances, it may be possible to live in villages and go to adjoining towns for work and return home.

#### FAVOURABLE TIME FOR RECONSTRUCTION.

The time is now favourable for rural reconstruction. The public are very keen about it and the Government are not slow in showing interest in the matter and the publication of "Rural India," a monthly magazine under the auspices and support of Government, is ample evidence of the interest they take. On account of the large number of students that come out of the schools and colleges and the existence of only a limited scope for their employment in public service, they cannot leave their villages now as they did before. The advent of the present Viceroy who takes much interest in agriculture and the appointment of a Royal Commission on Agriculture, which is expected to arrive in India shortly, are certainly good omens for the reconstruction of villages.

#### SANITATION.

The chief item to be taken in the reconstruction of villages is sanitation ; but sanitation itself is inseparably connected with education. Even in towns, the sanitation is not satisfactory as a large proportion of the population is illiterate. The very slight improvement observed is due to the existence of sanitary laws and their enforcement by legally constituted authorities and not due to the intelligent co-operation of the people. Education (Primary) must be made compulsory for both boys and girls and Hygiene must be made a compulsory subject, so that its principles may well be grounded in the impressionable young brains. A minimum, tolerably high,

must be fixed for this subject. Scientific cooking must be taught particularly in girls' schools. Agriculture, carpentry, weaving and other arts suitable to villages must be taught. A qualified medical man must be appointed as a teacher in each school to teach Hygiene. He may be permitted to practise medicine in the village. He should make periodical medical inspection of the students and maintain a record of the inspection. Any pre-disposition to disease noticed in a pupil should be brought to the notice of its parents and remedied then and there. He should supervise sanitation of the village and maintain correct Vital Statistics Registers. The supervision of scientific cooking must be entrusted to him. Such combination of duties will give him sufficient income to maintain himself and also give him a status in the village. In the villages of European countries, pastors and other clergymen are looked upon as important persons and in olden days they combined medicine with religion. In India where there are several religious faiths, a medical man will be the proper person to lead in the village. Besides a medical man, a village needs the services of a qualified mid-wife. One should be appointed as a teacher in each girls' school and she may be entrusted with the teaching of cooking. She may be allowed to practise midwifery in the village and be an assistant to the medical man. Villages should be connected with one another and with towns by good roads. For each village one or more wells completely protected against contamination should be provided and set apart as sources of drinking water. If there is no river, separate tanks must be set apart for bathing purposes and for cattle. If there is a river, separate portions must be reserved for bathing, washing and for cattle. As difficulty is experienced in getting sweepers and scavengers in villages, every house should have a receptacle in a corner of the compound, into which the rubbish swept may be deposited and removed to fields periodically. It is better that it is covered. For the purpose of latrine, a small plot of ground far away from wells should be selected in the garden attached to the house and should be fenced round. About half a dozen holes six inches deep should be dug in it every day and night soil passed into them, after which they should be covered with mud. After some time another plot of ground must be selected and used similarly, the used plot being ploughed

and cultivated. After cultivation, the plot may be used again for latrine purpose. This is an old system and is called the Jewish system of conservancy. For the disposal of drainage water from houses, each house should provide itself with a bacterial filter trench at the end of the drain. It is very cheap and easily done. A pit  $2' \times 2' \times 2'$  should be dug up and filled from the bottom, with one foot of blue metal, six inches of gravel and three inches of sand; or a big bucket with the bottom knocked out filled with blue metal, gravel, and sand as above, and kept in the pit. The drainage water after passing through this filter will be pure and can be used for watering gardens or let out in the street drain. The pit or bucket should be covered. At the end of a week, the blue metal, gravel and sand may be removed and the blue metal washed and dried, and used again with fresh gravel and sand. The houses in the village are ill constructed and ill ventilated. On account of fear of thieves, few windows are provided and these few are closed during nights. The chief attraction for thieves are the jewels worn by the females. In olden days on account of fear of robbers and dacoits, property was not safe. In order that the valuable property may be compact, so that it might be carried, when the house owners leave their villages on the advent of robbers and dacoits, it was converted into jewels and women consented to wear them and sleep in dark and ill-ventilated rooms during nights. Though there is not so much fear of thieves, in these days, the habit of making and wearing large quantity of jewels has not left the women. It is the unending complaint of economists that gold coins intended for circulation are melted down and converted into jewels. To do away with this habit, the education of women is absolutely necessary. Any one visiting Travancore or Malabar will be surprised to see the womenfolk there with very little jewels on them. They live in detached houses with big compounds as there is no fear of and attraction for thieves.

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# APPENDIX.

TABLE I.

Proteins Composition per cent. of Amino-Acids isolated from various Proteins (Taken from A. P. Mathews' Physiological Chemistry and published in Vitamines by Benjamin Harrow).

Amino-Acid.	Glutadin-Rye.	Glutadin-Wheat.	Hordein-Barley.	Zein-Maize.	Legumin-Vetch.	Legumin-cowpea.	Salmin-Salmon.	Edestin-Hemp.	Excelsin-Brazil nut.	Keratin-Sheep's horn.	Squash seed-Globulin.
Glycocoll	0.13	0.02	0.00	0.00	0.39	0.38	0.00	3.80	0.60	0.45	0.57
Alanine	1.33	2.00	0.43	9.79	1.15	2.08	0.00	3.60	2.33	1.6	1.92
Valine	?	0.21	0.13	1.88	1.36	?	4.3	6.20	1.51	4.5	0.26
Leucine	6.30	5.61	5.67	19.55	8.80	8.00	0.00	14.50	8.70	15.3	7.32
Proline	9.82	7.06	13.73	9.04	4.04	3.22	11.0	4.10	3.65	3.7	2.82
Phenylalanine	2.70	2.35	5.03	6.55	2.87	3.75	0.00	3.09	3.35	1.9	3.32
Aspartic acid	0.25	0.58	Nil.	1.71	3.21	5.30	0.00	4.50	3.85	2.5	3.30
Glutamic acid	37.8	42.98	43.19	26.17	18.30	16.97	0.00	18.84	12.94	17.2	12.35
Serine	0.06	0.13	?	1.02	?	0.53	7.8	0.33	0.0	1.1	?
Cystine	?	0.45	?	?	Undet	Undet	0.00	1.00	?	7.5	0.23
Tyrosine	1.19	1.20	1.67	3.55	2.42	1.55	0.00	2.13	3.03	3.6	3.07
Arginine	2.22	3.16	2.16	1.55	11.06	11.71	87.4	14.17	14.14	2.7	14.44
Histidine	0.39	0.61	1.28	0.43	2.94	1.69	0.00	2.19	1.47	?	2.63
Lysine	0.00	0.00	0.00	0.00	3.99	4.98	0.00	1.65	1.64	0.2	1.99
Ammonia	5.11	5.11	4.87	3.64	2.12	2.05	?	2.28	1.80	?	1.55
Tryptophane	Pres.	Pres.	Pres.	0.00	Pres.	Pres.	0.00	Pres.	Pres.	..	Pres.
Total	68.31	71.46	78.16	85.27	62.65	62.22	110.5	82.38	60.21	..	55.77

TABLE I.

Amino-Acid.	Almond.	Ovalbumin-Cryst.	Vitellin-Hens Eggs.	Muscle-Scallops.	Cocoon Eccecticus Palensis.	Indian Tussock silk.	Italian Silk Cocoons.	Japanese Silk Cocoons.	Globin-Horse Haemoglobin	Gelatin.	Casein-cow.	Elastin.	Histone-Thymus.
Glycocoll	0.31	0.00	0.00	0.00	27.19	1.5	33.59	35.00	0.00	16.5	0.00	25.75	0.5
Alanine	1.40	2.12	0.75	..	18.8	9.8	20.00	22.6	4.2	0.8	1.5	6.58	3.46
Valine	0.16	2.50	1.87	..	..	..	..	..	..	1.0	7.2	1.4	..
Leucine	4.45	10.71	9.87	8.78	0.75	4.8	0.75	0.7	..	2.1	9.4	21.38	11.80
Proline	2.44	3.56	4.18	2.28	3.2	3.0	0.8	0.7	2.3	5.2	6.7	1.74	1.46
Phenylalanine	2.53	5.07	2.54	4.90	1.8	0.3	1.2	1.3	4.2	0.4	3.2	3.89	2.20
Aspartic acid	5.42	2.20	2.13	3.47	0.25	2.8	1.0	1.3	4.4	0.56	1.4	..	..
Glutamic acid	23.14	9.10	12.95	14.88	2.35	1.8	2.25	0.07	1.7	1.88	15.55	0.76	3.63
Serine	?	?	?	..	..	5.4	1.9	..	0.6	0.4	0.5	..	..
Cystine	?	?	?	..	..	..	..	..	0.3	0.0	0.07	?	..
Tyrosine	1.12	1.77	3.37	1.95	0.00	1.0	9.0	9.7	1.3	0.00	4.5	..	5.2
Arginine	11.85	4.91	7.46	7.38	..	..	..	..	5.4	7.62	4.84	0.3	15.5
Histidine	1.38	1.71	1.90	2.02	..	..	..	..	11.0	0.4	2.59	..	1.5
Lysine	0.70	3.76	4.81	5.77	..	..	..	..	4.3	2.75	5.95	..	6.9
Ammonia	3.70	1.34	1.25	1.08	..	..	..	..	..	..	1.61	..	..
Tryptophane..	Pres.	..	..	Pres.	..	..	..	..	Pres.	0.0	1.5	..	..
Total..	59.00	50.08	54.02	52.51	..	..	..	..	..	..	..	..	..

TABLE II.

Analyses of food products showing the amount of the different organic Salts in 1,000 parts of water-free substance (Taken from Rational Diet by Otto Carque)

	Average Chemical Composition. Per cent.							Composition of Mineral matter in 1,000 parts of Water-free Substance.											
	Water.	Protein.	Fat.	Carbohydrate.	Mineral matter.	Total.	Potassium. K <sub>2</sub> O	Sodium. Na <sub>2</sub> O	Calcium. CaO	Magnesium. MgO	Iron. Fe <sub>2</sub> O <sub>3</sub>	Acid binding Elements.				Acid forming Elements.			
												Phosphorus. P <sub>2</sub> O <sub>5</sub>	Sulphur. SO <sub>3</sub>	Silicon. SiO <sub>2</sub>	Chlorine.				
<i>Berries and Deciduous Fruits.</i>																			
Apples	84.80	0.40	0.50	13.00	0.50	33.00	11.78	8.61	1.35	2.89	0.46	4.52	2.01	1.42	..				
Apricots	84.70	1.42	..	13.34	0.54	33.60	19.68	3.76	1.08	1.12	0.26	3.76	0.92	2.80	0.20				
Black berries	86.30	1.30	1.00	10.90	0.45	40.15	17.90	0.60	7.95	4.75	0.05	6.20	0.90	..	1.80				
Cherries, average	79.80	1.00	0.80	16.70	0.70	34.60	17.94	0.76	2.60	1.90	0.70	5.54	1.76	3.11	0.48				
Cran berries	88.90	0.40	0.63	8.40	0.40	36.00	9.00	0.31	10.15	0.90	0.04	1.60	14.20	..	0.03				
Currants black	76.80	1.00	..	18.70	0.51	22.30	13.70	0.13	0.60	0.75	0.04	2.27	4.73	..	0.08				
Gooseberries	85.70	0.50	..	8.40	0.40	29.00	11.22	2.87	3.54	1.70	1.32	5.71	1.71	0.75	0.22				
Grapes, average	78.20	1.30	1.25	18.60	0.65	30.00	18.75	0.40	2.70	1.25	0.45	4.00	1.50	0.60	0.35				
Huckle berries	78.40	0.80	0.60	16.60	1.00	46.30	26.44	3.00	3.70	2.82	0.50	8.05	1.44	0.42	..				





TABLE II—*contd.*

	Composition of Mineral matter in 1,000 parts of Water-free Substance														
	Average Chemical Composition. Per cent.					Acid binding Elements.					Acid forming Elements.				
	Water.	Protein	Fat.	Carbohydrate.	Mineral matter.	Total	Potassium, K <sub>2</sub> O	Sodium, Na <sub>2</sub> O	Calcium, CaO	Magnesium, MgO	Iron, Fe <sub>2</sub> O <sub>3</sub>	Phosphorus, P <sub>2</sub> O <sub>5</sub>	Sulphur, SO <sub>3</sub>	Silicon, SiO <sub>2</sub>	Chlorine.
<i>Tropical and Sub-tropical Fruits.—(Contd.)</i>															
Lemons	89.30	1.00	0.70	8.50	0.50	46.70	22.54	0.84	12.75	2.09	0.20	5.25	1.25	0.31	0.18
Limes	85.15	0.83	..	0.58	0.98	66.00	28.38	..	5.17	1.56	..	5.70	2.24	..	2.65
Litchi, fresh	79.03	1.15	0.20	15.30	0.54	..	..	..	..	..	..	..	..	..	..
Do, dried	16.04	2.90	0.08	78.00	1.90	..	..	..	..	..	..	..	..	..	..
Mango	87.40	0.60	0.40	9.90	0.50	40.00	18.95	..	2.55	0.64	..	2.60	1.47	..	1.55
Olives, dried	30.07	5.24	1.90	10.45	2.34	33.40	27.02	2.52	2.50	0.06	0.30	0.46	0.36	0.22	0.06
Oranges, average	86.90	0.80	0.20	11.60	0.50	38.15	18.62	0.95	8.65	2.03	0.38	4.70	2.00	0.25	0.29
Papaya	87.80	0.50	0.05	10.30	0.56	..	..	..	..	..	..	..	..	..	..
Pineapple	89.30	0.40	0.30	9.70	0.30	28.60	12.55	2.20	3.10	2.10	0.40	1.40	4.15	..	2.70
Pomegranate	76.80	1.50	1.60	16.80	0.60	25.90	8.00	12.25	1.65	0.90	0.06	2.50	0.20	..	0.34
Sapodilla	75.00	0.87	0.55	20.00	1.00	..	..	..	..	..	..	..	..	..	..
Siar apple	88.50	2.35	1.38	4.40	0.40	..	..	..	..	..	..	..	..	..	..
Tamarind	47.50	1.36	..	31.43	1.56	..	..	..	..	..	..	..	..	..	..

*Nuts.*

Acorns, dried	4.10	8.10	37.40	48.00	2.40	25.00	16.30	0.15	1.80	1.30	0.25	3.70	1.05	..	0.45
Almonds	4.90	21.45	54.40	16.80	2.50	26.30	5.23	0.38	3.04	3.95	0.23	10.10	0.06	0.04	0.05
Beechnuts	9.09	21.70	42.50	19.20	3.86	42.00	7.20	2.18	7.73	5.94	0.42	12.81	1.01	1.13	1.03
Brazilnuts	4.70	17.40	65.00	5.70	3.30	34.60	6.65	0.37	6.10	2.90	0.10	13.30	4.33	..	0.85
Butternuts	4.50	27.90	61.20	3.40	3.00	..	..	..	..	..	..	..	..	..	..
Candlenuts	5.90	21.40	61.70	4.90	3.30	..	..	..	..	..	..	..	..	..	..
Chestnuts, dried	5.90	10.70	7.00	74.20	2.20	23.40	11.40	0.28	1.07	1.87	0.14	5.50	3.00	0.04	0.01
Chufa (Earth Almond)	2.20	3.50	31.50	60.70	2.00	..	..	..	..	..	..	..	..	..	..
Cocoa nut	14.10	5.70	50.50	27.90	1.70	22.80	9.75	1.30	1.10	1.30	0.40	4.80	0.85	..	3.20
Do. desiccated	3.50	6.30	57.40	31.50	1.30	..	..	..	..	..	..	..	..	..	..
Do. Milk	92.70	0.40	1.50	4.60	0.80	..	..	..	..	..	..	..	..	..	..
Filberts	5.40	16.50	54.00	11.70	2.40	25.25	6.65	0.20	3.60	1.98	0.46	7.30	4.46	..	0.60
Hickory nuts	3.70	15.40	67.40	11.40	2.10	..	..	..	..	..	..	..	..	..	..
Paradise nuts	2.30	22.20	62.60	10.20	2.70	..	..	..	..	..	..	..	..	..	..
Pecans	3.40	12.10	70.70	8.50	1.60	16.60	5.80	0.36	1.33	2.20	0.23	6.75	..	..	..
Pinons	3.40	14.60	61.90	17.30	2.90	30.00	5.70	0.75	2.62	4.20	0.60	13.15	..	..	..
Pignolias, Italian	6.20	33.90	48.20	7.90	3.80	..	..	..	..	..	..	..	..	..	..
Pistachios	4.20	22.60	54.50	15.60	3.10	..	..	..	..	..	..	..	..	..	..
Walnuts, black	2.50	27.60	56.30	11.70	1.90	..	..	..	..	..	..	..	..	..	..
Do. English	2.50	18.40	64.40	13.00	1.70	17.40	2.20	0.17	0.97	2.88	0.61	10.10	0.22	0.12	0.12
Water chestnuts	12.30	4.00	1.20	50.00	1.77	20.02	12.30	trace	0.90	1.15	trace	5.10	0.45	..	0.15
Peanuts	7.40	29.80	43.50	14.70	2.25	24.30	9.27	0.21	0.95	2.29	0.27	10.60	0.45	0.05	0.23
Peanut Butter	2.10	29.30	46.50	17.10	2.20	..	..	..	..	..	..	..	..	..	..
Almond Butter	2.20	21.70	61.50	11.60	3.00	..	..	..	..	..	..	..	..	..	..

*Vegetables.*

Artichokes	79.24	1.80	0.14	16.70	1.10	53.00	25.32	5.38	1.75	1.55	2.00	7.40	2.60	5.30	2.06
Asparagus	93.75	1.80	0.25	2.60	0.54	86.40	20.94	14.77	9.13	3.72	2.94	16.07	5.36	9.30	5.10
Beets	87.50	1.60	0.10	9.70	1.10	88.00	38.70	9.00	5.45	2.73	0.26	8.27	6.15	7.90	9.00
Do. Red	88.00	1.20	0.20	10.10	0.50	41.65	8.45	21.60	2.50	0.10	1.00	2.55	0.50	2.00	2.95

TABLE II—contd.

Average Chemical Composition. Per cent.		Composition of Mineral matter in 1,000 parts of Water-free Substance.													
		Acid binding Elements.						Acid forming Elements.							
Water.	Protein.	Fat.	Carbohydrate.	Mineral matter.	Total.	Potassium, K <sub>2</sub> O	Sodium, Na <sub>2</sub> O	Calcium, CaO	Magnesium, MgO	Iron, Fe <sub>2</sub> O <sub>3</sub>	Phosphorus, P <sub>2</sub> O <sub>5</sub>	Sulphur, SO <sub>3</sub>	Silicon, SiO <sub>2</sub>	Chlorine.	
Vegetables—(Contd.)															
Brussels Sprouts	85.60	3.50	0.30	6.80	1.37	95.40	31.40	0.35	2.40	2.35	0.60	20.25	35.30	..	2.75
Cabbage	90.00	1.90	0.20	4.80	1.23	123.00	45.38	11.68	21.65	4.90	0.86	11.07	17.10	1.10	10.45
Do, Red	90.06	1.83	0.20	5.86	0.77	77.00	17.00	9.33	21.48	3.41	0.08	3.00	9.58	0.38	10.51
Do, Savoy	87.10	3.30	0.70	6.00	1.64	127.00	34.80	12.95	27.17	8.13	2.16	18.63	10.41	6.07	10.03
Carrots	87.05	1.00	0.20	9.40	0.90	69.00	25.46	14.63	7.80	3.04	0.70	8.83	4.45	1.66	3.18
Cauliflower	90.90	2.50	0.30	4.55	0.83	91.20	40.46	5.38	5.10	3.37	0.91	18.42	11.86	3.37	3.10
Celery	94.50	1.10	0.10	3.30	1.00	180.00	48.60	65.25	14.70	6.75	1.60	14.50	6.50	4.30	17.80
Do, Root	84.10	1.50	0.40	11.80	0.84	52.80	22.70	trace	6.90	3.05	0.75	6.75	2.95	2.10	8.45
Chicory Do.	78.80	0.80	0.20	18.30	0.73	32.85	13.20	5.05	2.40	1.60	0.85	4.30	2.70	..	2.75
Chives	82.00	2.80	0.50	10.00	0.95	53.00	18.05	2.28	11.27	2.90	0.80	8.12	6.66	..	2.32
Collards	87.10	4.50	0.60	6.30	1.50	..	..	..	..	..	..	..	..	..	..
Cucumbers	95.60	1.20	0.10	2.30	0.44	100.00	41.20	10.00	7.30	4.15	1.40	20.20	6.90	8.00	6.60
Dandelion	85.50	2.80	0.70	7.45	1.90	131.00	50.95	13.63	26.20	11.00	1.10	10.22	2.88	9.17	3.47
Dill	83.80	3.50	0.90	7.30	2.40	142.00	28.70	12.65	31.95	11.55	1.00	20.30	20.05	2.40	14.75

Egg-plant	.. 92.90	1.20	0.30	5.10	0.50	70.00	39.05	2.80	3.05	4.20	0.25	9.50	4.45	..	6.70
Garlic	.. 64.70	6.80	0.10	27.90	1.50	..	..	..	..	..	..	..	..	..	..
Horseradish	.. 76.70	2.70	0.35	16.00	1.50	64.40	19.81	2.57	5.28	1.87	1.25	4.96	19.84	8.18	8.18
Jerusalem artichoke	.. 79.10	1.50	0.10	17.00	1.05	50.00	26.20	5.80	1.80	1.60	2.15	7.65	2.70	..	2.10
Kale	.. 85.80	1.90	0.10	3.00	1.58	25.50	81.50	5.35	28.10	7.30	1.30	35.50	8.00	..	10.50
Kohlrabi	.. 93.00	4.90	0.20	8.20	1.17	83.00	29.30	5.40	9.15	5.65	2.50	1.70	7.35	2.05	4.10
Leek bulbs	.. 87.60	2.60	0.30	6.50	1.24	100.00	30.70	14.15	10.40	2.90	7.60	16.70	7.40	7.40	3.10
Do. Leaves	.. 90.80	1.50	0.30	5.10	0.69	75.70	33.25	5.55	17.70	3.60	0.50	6.25	3.35	..	5.50
Lettuce	.. 94.30	1.40	0.30	2.20	1.03	180.70	67.94	13.55	26.56	11.20	9.40	16.62	6.87	14.64	13.82
Do. Romaine	.. 92.50	1.54	0.43	4.20	1.33	177.00	44.90	62.70	21.10	7.60	2.30	19.40	6.90	5.30	7.40
Do. Lamb's	.. 93.40	2.70	0.40	2.70	0.79	120.00	53.00	11.20	7.20	2.60	0.45	10.20	5.80	24.00	5.70
Okra	.. 90.20	1.60	0.20	7.40	0.60	61.35	8.80	12.00	21.00	3.30	trace	9.00	7.10	..	..
Onions	.. 87.60	1.60	0.30	9.90	0.60	48.40	12.10	1.55	10.65	2.55	2.20	7.2	2.65	8.10	1.35
Parsley	.. 85.05	3.70	0.70	7.45	1.70	..	..	..	..	..	..	..	..	..	..
Parsnips	.. 83.00	1.60	0.50	13.50	1.40	80.20	33.80	0.32	4.80	2.50	0.25	10.25	8.00	9.60	10.40
Pepper, green	.. 92.00	1.10	0.10	4.60	1.00	..	..	..	..	..	..	..	..	..	..
Potatoes	.. 75.00	2.08	0.15	21.00	1.10	44.20	26.56	1.33	1.15	2.18	0.48	7.47	2.89	0.88	1.55
Do. Sweet	.. 69.00	1.80	0.70	27.40	1.10	35.50	18.60	2.20	3.10	0.85	0.50	2.20	1.05	1.40	5.50
Pumpkins	.. 90.30	1.10	0.13	6.50	0.70	72.15	13.85	15.22	5.55	2.45	1.88	23.80	1.73	5.27	0.30
Radish, large	.. 86.90	1.90	0.10	7.40	1.07	82.30	18.00	3.05	6.60	2.85	1.00	33.70	6.35	6.75	4.00
Do. small	.. 93.30	1.20	0.15	3.80	0.74	110.50	35.10	23.15	16.30	3.35	3.00	12.00	7.15	1.00	10.00
Rhubarb	.. 94.40	0.60	0.70	3.60	0.70	125.00	74.50	6.45	12.55	..	1.84	18.41	2.34	3.46	6.81
Rutabagas	.. 88.90	1.30	0.20	8.50	1.10	100.00	46.30	13.60	8.80	5.20	1.70	18.10	5.30	..	1.00
Salsify	.. 85.40	4.30	0.30	6.80	1.20	..	..	..	..	..	..	..	..	..	..
Do. black	.. 0.40	1.00	0.50	17.10	1.00	48.80	15.30	6.40	3.40	2.07	1.48	12.95	5.60	..	..
Sorrel	.. 92.20	1.70	0.30	3.90	0.98	125.80	56.05	0.85	7.00	8.70	9.85	21.35	13.30	..	1.60
Spinach	.. 88.50	3.50	0.60	4.44	2.10	182.60	29.90	63.90	21.50	11.50	6.05	18.05	12.45	8.10	8.70
Sugarbeets	.. 81.30	1.00	0.10	15.80	0.70	37.40	20.15	3.35	2.30	3.00	0.45	4.60	1.60	..	1.85
Do. leaves	.. 88.75	1.91	0.03	8.64	0.70	63.60	23.40	11.00	15.60	7.35	0.40	3.25	2.60	..	..
Swiss chard	.. 92.50	1.54	0.43	4.20	1.33	177.60	44.90	62.70	21.70	7.60	2.30	19.40	6.90	5.30	7.40
Tomatoes	.. 94.00	0.90	0.20	3.75	1.05	175.00	82.50	32.90	11.35	13.55	1.00	10.75	5.00	1.75	18.00
Turnips	.. 89.90	3.50	0.10	11.30	1.28	126.00	59.10	7.10	14.24	4.66	0.75	18.27	12.10	1.40	8.30

TABLE II—contd.

[illegible]

Millet	11.50	9.00	3.80	70.25	1.95	22.00	4.46	0.71	0.28	3.26	0.42	13.00	..	1.60	..
Oats, whole	12.40	10.40	5.20	57.80	3.02	34.50	10.40	1.35	2.25	4.25	0.40	14.30	0.80	0.40	0.35
Oatmeal	7.30	16.05	7.20	67.50	1.95	20.00	5.50	1.00	1.10	1.75	0.05	8.10	1.40	0.20	1.10
Do. Rolled	7.70	16.70	7.30	66.20	1.90	22.60	6.50	1.30	1.50	2.10	0.60	7.15	1.45	0.20	0.60
Rice, whole	13.10	7.85	0.88	76.50	2.00	16.00	3.60	0.67	0.59	1.78	0.22	8.60	0.10	0.40	0.02
Do. Polished	12.55	7.90	0.52	77.80	0.35	4.00	0.87	0.22	0.13	0.45	0.05	2.15	0.03	0.11	0.01
Do. Bran	12.90	11.10	7.85	62.10	4.55	52.30	6.00	..	1.35	9.15	4.02	22.85	0.12	8.85	..
Rye, whole	15.06	11.50	1.80	67.80	1.81	21.30	7.45	0.55	0.90	2.10	0.30	7.80	1.50	0.30	0.40
Do. flour, bolted	12.90	6.80	0.90	78.70	0.70	8.00	2.75	0.15	0.15	0.60	0.15	7.35	0.60	..	0.30
Do. Bran	10.90	17.40	3.70	69.06	5.00	56.10	15.75	0.75	1.95	8.80	1.40	26.70	..	1.15	..
Sorghum	12.80	9.10	3.60	69.80	2.10	24.00	6.00	0.90	0.35	5.20	0.58	10.60	0.12	..	0.25
Wheat, whole, average	13.40	13.60	1.90	69.10	2.00	23.10	7.20	0.50	0.75	2.80	0.30	10.90	0.09	0.46	0.07
Do. white, flour	12.60	10.20	0.90	74.70	0.50	5.70	1.82	0.08	0.43	0.44	0.03	2.80	..	..	..
Do. Middlings	11.73	15.22	4.77	60.55	2.85	..	..	..	..	..	..	..	..	..	..
Do. Bran	12.40	16.60	3.50	62.10	4.85	55.00	15.15	0.33	1.65	9.35	0.38	27.80	0.13	0.50	..
Do. Germ	12.50	35.70	13.10	31.20	5.70	..	..	..	..	..	..	..	..	..	..
Bread, whole wheat	35.70	8.90	1.80	52.10	1.50	23.30	4.15	4.10	1.55	1.05	0.30	4.75	0.60	..	6.80
Do. white	35.30	9.20	1.30	53.10	1.10	17.00	1.50	4.90	0.40	0.48	0.03	3.20	1.80	..	4.70
Pumpnickel	42.20	4.20	0.70	43.30	1.35	23.30	2.35	6.40	1.50	2.35	0.45	4.50	0.85	..	4.80
Swedish Rye crisp	8.10	8.00	0.60	70.10	1.95	21.20	5.60	2.70	1.00	1.20	0.08	5.85	2.90	..	1.90
Sago	12.20	9.00	0.40	78.10	0.30	..	..	..	..	..	..	..	..	..	..
Tapioca	11.40	0.80	0.10	88.00	0.10	..	..	..	..	..	..	..	..	..	..
Caraway seed	13.15	19.84	18.73	7.65	5.85	67.35	17.75	4.40	12.05	5.55	2.35	16.25	3.60	3.30	2.05
Mustard Do.	7.18	27.59	29.66	20.83	4.47	18.15	7.80	2.90	8.75	5.05	0.50	19.25	2.40	1.20	0.25
Poppy Do.	7.50	19.40	38.40	12.80	4.27	46.10	6.27	0.46	16.30	4.50	0.18	14.48	0.74	1.52	2.12
Sunflower Do.	7.50	14.20	32.30	14.50	3.50	37.80	6.12	2.80	2.87	4.65	0.60	13.38	0.87	5.54	0.90
Flax Do.	9.20	22.60	33.70	26.89	4.30	..	..	..	..	..	..	..	..	..	..
Hemp Do	8.90	18.20	32.60	21.10	4.20	..	..	..	..	..	..	..	..	..	..
Sesame	5.30	35.99	24.62	22.83	7.42	..	..	..	..	..	..	..	..	..	..
Sweet Cassava	66.00	1.10	0.20	30.20	0.70	..	..	..	..	..	..	..	..	..	..
Taro	70.90	1.80	0.20	23.20	1.20	..	..	..	..	..	..	..	..	..	..
Yams	72.90	1.80	0.20	23.30	0.90	..	..	..	..	..	..	..	..	..	..

N. B.—The large amount of Sodium and Chlorine in Bread is caused by the addition of Common Salt.



## Legumes and Animal Foods.

Beafs, dried	14.76	24.30	1.60	49.00	3.26	38.20	15.85	0.42	1.91	2.73	0.19	14.86	1.30	0.25	0.69
Beans, blackeye	8.48	21.43	1.28	61.28	4.78	..	..	..	..	..	..	..	..	..	4.78
Chick, Peas	14.80	13.00	1.60	51.50	3.76	44.25	8.10	0.40	1.45	18.35	0.80	13.10	1.10	..	0.95
Cow Peas, dried	13.00	21.40	1.40	60.80	3.40	39.10	21.00	2.40	1.50	3.15	..	6.85	3.60	..	0.60
Horse beans	14.00	18.00	0.50	50.50	2.75	32.00	15.25	0.40	0.15	0.30	0.10	14.30	1.15	..	0.60
Kidney beans, dried	13.60	23.12	2.28	53.63	3.53	40.85	18.00	0.58	2.60	3.00	0.13	14.30	1.65	0.23	0.34
Do. green	8.40	3.90	0.20	8.30	0.70	44.00	23.30	1.70	2.75	1.65	0.05	5.65	7.00	..	1.90
Lentils	12.35	25.70	1.90	53.30	3.04	34.70	11.60	4.60	2.10	0.90	0.60	12.20	1.20	..	1.50
Lima beans, dried	10.40	18.10	1.50	65.90	4.10	45.00	27.60	4.10	1.25	3.10	0.01	6.10	2.60	..	0.04
Do. green	68.50	7.10	0.70	22.00	1.70	54.00	33.90	4.75	1.40	3.60	0.14	6.60	3.10	..	0.50
Peas, dried	15.00	22.85	1.80	52.40	2.58	30.03	13.06	0.30	1.45	2.42	0.24	10.87	1.03	1.27	0.53
Do. green	74.60	7.00	0.50	16.90	1.00	39.50	15.40	1.10	1.60	2.80	0.04	11.20	6.00	..	1.40
St. John's bread	17.30	5.70	1.10	67.00	2.50	..	..	..	..	..	..	..	..	..	..
Soy beans	10.75	34.00	16.80	33.70	4.75	53.22	24.65	0.60	3.45	3.45	0.28	17.50	2.65	0.27	0.40
String beans	84.10	3.90	0.20	8.30	1.20	75.00	32.00	1.75	7.50	6.25	0.05	6.50	12.75	..	7.10
Human milk	87.75	1.60	3.95	6.25	0.45	34.70	11.73	3.16	5.80	0.75	0.07	7.84	0.33	0.07	6.38
Cow's milk	87.30	3.55	3.70	4.88	0.71	55.50	13.70	5.34	12.24	1.69	0.30	15.79	0.17	0.02	8.04
Sheep's milk	80.50	6.50	6.90	4.90	0.90	47.40	5.03	4.65	11.70	2.15	0.17	17.70	0.20	0.10	5.70
Goat's milk	85.70	4.30	4.50	4.40	0.80	70.00	15.60	3.45	13.90	2.30	0.60	21.05	0.30	0.20	13.50
Buffalo's milk	82.20	4.40	7.10	4.70	0.85	48.00	6.60	2.88	15.95	1.50	0.08	16.15	1.37	..	3.47
Cow butter	11.00	1.00	85.00	..	3.00	33.70	1.75	12.10	0.90	0.18	0.05	0.12	6.85	..	11.75
Butter milk	90.00	3.00	0.50	4.80	0.70	77.00	18.10	8.50	14.40	2.60	0.60	21.80	1.30	..	9.70
Cream	74.00	2.50	18.50	4.50	0.50	19.20	5.15	1.55	4.25	0.60	0.50	3.90	0.45	..	2.00
Skim milk	90.50	3.40	0.30	5.10	0.70	73.70	22.60	7.10	15.20	2.20	0.60	13.40	2.40	..	10.20
Whey	93.80	0.00	0.07	5.10	0.44	71.00	21.85	9.75	13.65	0.25	0.40	12.00	1.90	..	11.20
Condensed milk	68.20	9.60	9.30	11.20	1.70	..	..	..	..	..	..	..	..	..	..
Cottage cheese	72.50	20.90	1.00	4.30	1.25	45.00	5.40	0.90	14.35	1.00	0.30	15.35	0.60	..	7.10
Cheese, average	38.80	21.75	30.00	1.50	4.50	73.50	2.70	17.90	27.60	1.10	0.04	20.20	7.76	..	26.20
Eggs, whole	73.70	12.55	12.10	0.55	1.10	41.80	6.27	9.56	4.56	0.46	0.17	15.72	0.13	0.13	3.72
White of eggs	85.75	12.70	0.25	0.70	0.60	42.10	13.21	13.30	1.18	1.18	0.25	1.85	0.88	0.45	12.08



TABLE II—contd.

[illegible]

TABLE III.

Distribution of Vitamins A, B, and C in the Common Food Stuffs. Taken mostly from the Report on the Present State of Knowledge of Vitamins, by the British Medical Research Council, 1924.

O indicates that the Vitamin has not been detected; + that the material contains the Vitamin; ++ that it is a good source of it; +++ that it is a rich source; ? means doubtful. An empty space indicates that the material has not been investigated.

N. B.—The difference that may be observed between the particulars found in this table and those given in the body of the book is due to the estimates determined by different authorities.

	Vitm. A.	Vitm. B.	Vitm. C.		Vitm. A.	Vitm. B.	Vitm. C.
<i>Fats and Oils.</i>							
Almond oil	..			Horse fat	++		
Arachis oil	..			Linseed oil	++		
Beef fat	..	o	o	Do. (reduced)	o		
Beef fat oil (oleo oil)	..			Maize oil	++		
Butter fat	..	o	o	Margarine (animal)	++		
Cocoa butter	..			Do. (vegetable)	o		
Coco-nut oil	..	o	o	Mutton fat	+	variable	
Cod liver or other fish liver oils	..	++		Nut butter	++		
Cod oil	..	++		Olive oil	++	o	
Cotton seed oil (reduced)	..	o		Orange peel oil	++		
Cream	..	++	+	Palm kernel oil	++		
Ghee (Indian butter fat)	..	++		Pea nut oil	++		
Ghee (remelted)	..	o	o	Pig kidney fat	++		
Hardened fats, as lard	..			Rape oil	++		
Herring oil	..	+		Salmon oil	++		

TABLE III—contd.

	Vitm. A.	Vitm. B.	Vitm. C.		Vitm. A.	Vitm. B.	Vitm. C.
<i>Fats and Oils—concl'd.</i>				<i>Cereals and their products—concl'd.</i>			
Sesame oil	°	°	°	Maize white	°	++	++
Soyabean oil	°	°	°	Do. yellow	°	++	++
Vegetable oils	°	°	°	Do. young cobs (green mealies)	°	++	++
Wheat oil	°	°	°	Malt green	°	++	++
<i>Cereals and their products.</i>				Do. kilned	°	++	++
Barley, unhusked	°	°	°	Do. extract (commercial)	°	++	°
Do. husked	°	°	°	Do. soup	°	++	°
Do. sprouted	°	°	°	"Millet	°	++	°
Do. do. juice	°	°	°	Oats	°	++	°
Bread, wheaten, white flour	°	°	°	Do. sprouted	°	++	°
Do. do. do. milk	°	°	°	Oat meal	°	++	°
Do. do. whole-meal	°	°	°	Rice, whole grain	°	++	°
Do. do. do. milk	°	°	°	Do. embryo	°	++	°
Custard powders and Egg substitutes	°	°	°	Do. polished	°	++	°
Flour, wheaten, white	°	°	°	Do. embryo and bran (rice polishings)	°	++	°
Kafir corn (sorghum vulgare)	°	°	°	Do. steamed	°	++	°
Do. do. germinated	°	°	°	Rye, whole	°	++	°
Kaoliang, red	°	°	°	Wheat, whole grain	°	++	°
Do. white	°	°	°	Do. bran	°	++	°
Maize-embryo	°	°	°	Do. endosperm	°	++	°
Do. endosperm	°	°	°	Do. embryo	°	++	°
Do. meal	°	°	°	Do. middlings	°	++	°
Do. gluten	°	°	°				



TABLE III—*contd.*

	Vitm. A.	Vitm. B.	Vitm. C.		Vitm. A.	Vitm. B.	Vitm. C.
<i>Nuts—concl'd.</i>				<i>Vegetables and Vegetable Products—Contd.</i>			
Coconut press cake	..	+	+	Cabbage cooked 1 hour at 100° C.	..	+	+
Filberts	..	+	+	Carrots raw and young	..	+	+
Hickory nuts	..	+	+	Do. Do. old	..	+	+
Pea nuts	..	very low.	+	Do. dried & young	..	+	+
Pecan	..	+	+	Do. sundried	..	+	+
Pinenut	..	+	+	Do. cooked young	..	+	+
Walnut black	..	+	+	Do. do. old	..	+	very low.
Walnut English.	..	very low.	+	Carrot juice	..	+	+
<i>Vegetables and Vegetable Products.</i>				Do. ether extract	..	+	+
Artichokes	..	+	+	Cauliflower boiled	..	+	+
Asparagus	..	+	+	Celery	..	+	+
Bamboo shoots	..	+	+	Chard	..	+	+
Banana flowerbud	..	+	+	Clover	..	+	+
Beet	..	+	+	Clover, ether extract	..	+	+
Do. leaves and stem	..	low.	+	Coconut milk	..	+	+
Do. juice	..	low.	+	Cress	..	+	+
Cabbage fresh green leaves	..	+	+	Cucumber	..	+	+
Do. do. white leaves	..	+	+	Dandelion	..	+	+
Do. dried	..	+	+	Dasheen	..	+	+
Do. do. stored	..	+	+	Duhat	..	+	+
Do. sundried	..	+	+	Egg-plant	..	+	+
Do. cooked	..	+	+	Do. sundried	..	+	+



TABLE III—*contd.*

	Vitm. A.	Vitm. B.	Vitm. C.		Vitm. A.	Vitm. B.	Vitm. C.
<i>Fruits.</i>				<i>Fruits—contd.</i>			
Alligator pear (Avocado)	..	++	+	Lime juice fresh	?	+	++
Apple fresh	..	+	very	Do. do. concentrated			++
Do. dried	..		low	Do. do. preserved			++
Do. concentrated juice	..		+	Mango dried			+
Banana	..		+	Orange cake (dried minced orange)			very low.
Cloud berries	..	?	+	Orange juice fresh	+	+	+
Do. preserved	..		+	Do. do. old			++
Cocum dried	..		+	Do. do. heated			+
Cranberry juice	..		very low.	Do. do. autoclaved			++
Currants, dried	..		do.	Do. do. dried			+
Dates, dried	..	o		Do. navel juice	+	+	++
Grape	..	?		Do. Tangerine			++
	..	+	very low.	Do. marmalade			++
Grape juice concentrated	..		o	Do. peel			very low.
Do. do. dried	..	+	o	Pawpaw (carica-papaya)	++	+	++
Do. fruit juice	..	++	++	Peach juice			++
Do. do. dried	..	++	++	Do. dried			++
Lemon juice fresh	..	+	++	Pear			+
Do. do. preserved	..	+	++	Persimmon Chinese		+	+
Do. do. freed from citric acid and concentrated	..		++	Pine-apple		o	++
Do. do. dried	..	+	++	Prickly pear			++
Do. do. tablets	..		++	Prunes		+	o





TABLE III—concl'd.

	Vitm. A.	Vitm. B.	Vitm. C.		Vitm. A.	Vitm. B.	Vitm. C.
<i>Miscellaneous.</i>				<i>Miscellaneous—concl'd.</i>			
Beer Pale Ale	..	+	+	Starch	o	o	o
Do. Kafr	..	+	+	Sugar	o	o	o
Diatoms Marine	..	+	+	Tea decoction		o	
Eggs, whole	..	+	+	Yeast brewers'		+	
Do. yolk	..	+	+	Do. dried	o	+	o
Do. white	..	o	o	Do. extract commercial	o	+	o
Do. dried	..	+	+	Do. autolysed	o	+	o
Glucose	..	+	+	Do. heated		+	
Sea weed (ulva cladophra)	..	+	+	Do. autoclaved		+	
Do. polysiphonia	..	+	+	Wine (red and white)		+	
Spruce infusion	..	+	+			+	