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THE
Kenya Medical Journal

Vol. II. No. 5.

AUGUST, 1925.

NATIVE DIETS.

A meeting of the Kenya Branch of the British Medical Association was held in Nairobi on June 10th when Dr. C. J. Wilson opened a discussion on the subject of Native Diets; full notes of the proceeding are given below:—

DR. BURKITT (*Chairman*): I have very great pleasure and very great interest in calling on Dr. Wilson to open the discussion on Native Diets.

DR. WILSON: My business is to open a discussion on Native Diets; it is not to read a paper. That must be understood from the very outset. I dare not presume to lecture on a subject of which I know so little. I can only put forward certain bits of information which I have been able to collect from various sources, and make a few suggestions which may or may not be sound; and in order to avoid the usual fate of the speaker at this meeting—the bombardment of searching questions which shatters him the moment he sits down—I propose to ask so many questions myself that you will be kept too busy answering them to worry me.

As I understand it, the subject of our discussion is the Diet of the African Native of Kenya. If the diet of natives of other countries is mentioned, that is merely incidental. The objects of our discussion are, I take it, first to get some idea of what Kenya natives actually eat; secondly, what they ought to eat. If we can suggest how they can effect a change, if any is needed, from what they actually eat, to what they ought to eat, so much the better.

It is unfortunately a very difficult proposition to attempt to answer correctly either of the principal questions—What do natives eat? What ought they to eat? Hence the need for discussion.

I have collected such information as I could under the first head: I fear it is very scanty. Take first that most elusive and little known individual—the Native in the Reserve. It is comparatively easy to work out, in exact figures of proteid, carbohydrate, fat and caloric equivalent, the average daily diet of the British working man or his family, and still easier, I suppose, to measure what a typical German household consumes. But the native in the Reserve does not measure his food by weight, and the estimate of his meal is too often so vague as to be useless.

In 1917 there was sent out from the office of the Principal Medical Officer a circular letter addressed to Administrative Officers, Medical Officers and Missionaries asking for information on a great number of points in connection with native customs—including food. I tried to abstract from the replies a summary of what was recorded as being the food of the different tribes. The outstanding feature of these reports is the number of articles of food mentioned as being part of the normal diet of the native, whatever his tribe.

Dr. Callanan, when stationed at Chuka, was asked if he could give any idea of the nature and quantity of the food eaten by the natives of that district, and he supplied a mass of information on that subject.

The only conclusion one can reach is that the native in the Reserves enjoys a very varied diet: varied in quantity as well as quality, for failure of a crop may at any time bring him to the borderline of starvation. The usual diet certainly contains a preponderance of carbohydrates, but meat in some form is at any rate an occasional part. At the best it is probably enough to keep him going, for the life which he is accustomed to lead. That life may not be the life of complete idleness which the European Settler is so fond of picturing; neither is it, on the other hand, the life of hustle and hard work which is the lot of most civilised people.

The meagreness of the diet lays him open to two dangers. Near the point of absolute food deficiency, he is on that account more susceptible to disease than the fully nourished individual. Secondly, on such a diet he is unable to put forth the extra energy required when he is faced with hard manual labour, without breaking down under the strain. It may fairly confidently be stated that the average native in his Reserve is on the borderline of food deficiency.

In that excellent book by Pearson and Mouchet, "Practical Hygiene of Native Compounds in Tropical Africa," it is stated that the natives recruited for the Katanga Mines are usually in a prescorbutic condition, and unless precautions are taken will often develop signs of scurvy when put to work. That, I think, seems a reasonable assumption as regards the natives of this country. Certainly in times of famine they are dangerously near the condition of scurvy.

So much for the native in the Reserve.

Now consider the native when he comes in contact with the European. When the white man first came to this country, in the old caravan days, the only possible ration for porters was one which could easily be carried. The average porter was given

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so much mealie meal or so much rice, helped out with whatever game meat the leader of the caravan could shoot.

That tradition, I think, has persisted until to-day. There is an idea that the African ought to get practically only rice or maize as his food. There is this to be remembered, that maize is not indigenous to this country: it is an importation from the other side of the world, and it cannot be said that any African native was ever accustomed to live on maize alone.

So we come to the question of what is the best diet for a working African.

In 1912, shortly after I first came to this country, I was told to draw up a suitable scale of rations for the Askaris of the King's African Rifles. I thought it rather extraordinary that a man new to the country should be asked to do what I imagined should have been done years before by someone who knew all about Africans and their feeding; yet now, thirteen years later, one is still up against the same question—what is the right diet for the African?

In that year, 1912, two companies of the K.A.R. at Serenli in Jubaland, had been completely knocked out by beri-beri. The actual mortality I have forgotten, but two of the best companies in the battalion practically ceased to exist, as the result of faulty rations.

The improved scale of rations which was suggested was turned down, with the comment that maize had always been the food of the African and therefore an elaborated ration was unnecessary. That idea still seems to hold amongst the uneducated part of the population of Kenya. One hears the opinion expressed that the native labour in this Colony is so poor in quality that it does not deserve good food. It does not occur to these people that if the labour were better fed it might improve in quality.

Let us now consider some of the actual ration scales which have been adopted on various occasions in the history of Kenya.

I will first take the record of the Carrier Corps, during the War. That was the biggest experiment in native labour ever made in this country, or indeed in Africa. The number of native carriers in the field at any one time ran up to over 110,000. Colonel Watkins, who is fortunately here as our guest this afternoon, will be able to correct me if I go wrong. He has kindly lent me his Report on the Carrier Corps, and from that Report I have noted the following facts.

At the very commencement the diet was simply 2 lbs. of mealie meal daily, and nothing more. In October, 1914, a

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Routine Order laid down the daily ration as:—

- 1½ lbs. mealie meal or beans.
- ½ lb. of meat.
- ½ oz. salt.

I do not think it likely that any native would eat 1½ lbs. of beans at a sitting: 5 ozs. daily is said to be the most that can be usefully consumed.

In December, 1914, the Carrier ration was altered again to:—

- 1½ lbs. mealie meal.
- ¼ lb. beans.
- ¼ lb. meat.
- ¼ oz. salt.

In 1915 an issue of beans was allowed instead of meat if meat was not available. In October, 1916, an addition was made to the ration of 2 ozs. potatoes, bananas, or sweet potatoes, with 2 ozs. jaggery (raw sugar) and 2 ozs. sim sim oil. Finally, on October the 17th, 1917, a satisfactory ration was at last adopted, viz.:—

- 8 ozs. Meat (or in lieu 2 ozs. Beans, 1 oz. (Ghee, and 2 ozs. Jaggery if (Meat was unobtainable).

- 10 ozs. Mealie Meal.
- 10 ozs. Rice.
- 4 ozs. Beans.
- 2 ozs. Jaggery.
- 2 ozs. Ghee.
- 6 ozs. Vegetables.

May I quote this passage, from the Report on the Carrier Corps, which refers to the evolution of an adequate ration:—

“ The period during which we were working up to the improved ration was costly in lives from gastric diseases. The stages are therefore given in hope that future expeditions will start where we left off, without repeating our experiments.”

I have here graphs showing the mortality and sick rate in the Carrier Corps. I do not know whether this directly bears on the question of diet. Such factors as over-fatigue from forced marches, exposure to weather and lack of medical attention and hospital facilities have to be taken into account, so that one could not say that this terrible mortality was actually due to poor diet.

In this connection it must be remembered that the Carrier in the field did not necessarily receive even as much as the ration laid down. Frequently Troops and Carriers were on half

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rations and "half rations" meant considerably less than half the authorised ration, as I know from painful experience. It meant half the usual quantity of whatever items of the standard ration happened to be available at the moment.

The highest mortality recorded was in July, 1917, when, with a total force of 110,000, there were 900 deaths weekly. That works out at something over 400 per 1,000 per annum. I pass round these graphs as a possible example of the result of an insufficient diet in the case of Africans performing hard work; but the direct relation of mortality to diet is, of course, open to question.

Another experiment in the feeding of Africans has been made in the Prisons. Three years ago the Prison diet for Short-Term Prisoners was:—

1½ lbs. Mealie Meal	}	On 4 days in the
¼ lb. Beans.		week.
3 lbs. Potatoes.	}	On the other 3
¾ lb. Beans.		days of the week.

The Long Term Prisoners received in addition:—

1 oz. Ghee.	On 4 days of the week.	
1 lb. Potatoes.	}	On the other 3
2 ozs. Ghee.		days of the week.

These diets were adversely criticised by the Prisons Commission of 1922, and the Commission recommended the adoption of a diet which had been elaborated by a Committee on Native Dieting in 1920. This diet consisted of:—

Maize 18 ozs.
 Meat or Beans 6 ozs., or Nuts 3 ozs.
 Ghee, 2/3 ozs., or Nuts 2 ozs.
 Potatoes, Bananas, etc., 8 ozs., and
 2 Lemons weekly.

That diet was never put into force; in the meantime we tried an experiment. About June, 1923, two new diets were introduced; the diet for the Long Term Prisoners was so devised as to contain the principal food factors in the quantities generally accepted as a reasonable minima. It was:—

Maize, 18 ozs.
 Meat, 8 ozs. (with bone—say 6 ozs. lean meat).
 Beans, 6 ozs.
 Potatoes, 8 ozs.
 Ghee, ¼ oz.
 Lemons, 2 per week, or 2 lbs. green vegetables or germinated beans.

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The second diet, to be issued to the Short Term Prisoners, contained an excess of carbohydrate and comparatively little protein, being composed of:—

Maize, 2 lbs. daily.
Beans, 2 lbs. weekly.
Ghee, 4 ozs. weekly.
2 Lemons weekly.

We hoped that the use of two such different diets might give us some indication of what a suitable native diet should contain. But the practical difficulties of the experiment were very great. First of all there was difficulty in making certain that the weekly records of prisoners' weights were correct. Then came the question, is the weekly weighing a fair test of health? Mr. Wazir Chand, the Sub-Assistant Surgeon in charge of the Nairobi Prison, helped me in plotting hundreds of curves of individual weekly weights; the most noticeable feature was an extraordinary irregularity. There seems to be little doubt that an African's weight will alter most surprisingly from week to week.

To assume that progressive loss of weight denotes falling off in physical fitness is very likely to lead one astray. For instance, from a series of weekly weights I selected one case which showed a steady loss in weight each week, the last entry showing a total loss of nearly 20 lbs. since the prisoner's admission to gaol: I examined the boy and found him in the pink of condition. He admitted that he was very fat before going to prison and I am sure that he had improved rather than suffered by losing weight. What one wants to determine is the general standard of health and degree of resistance to disease, with different diets, and variation in body weight is a very untrustworthy indication of these.

If one were to take the sick rate as a test, then you must remember that in a prison like the Nairobi Prison you will find minor infectious diseases such as chicken-pox and measles practically the whole time; that a man should contract chicken-pox is not necessarily a sign of poor bodily health, yet a few cases of chicken-pox, each involving about three weeks in hospital, will seriously affect the recorded sick rate. So the sick rate cannot be accepted as being a fair test of the general health of the prison population.

Though it had seemed such an excellent opportunity to put this question of diet to the test, by giving one group of prisoners a diet mostly carbohydrate, and the other group a diet containing a fair proportion of protein, yet I regret to say no

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conclusion has been reached in regard to that experiment; the net result is *nil*.

There is one scale of rations which has been put to a practical test with satisfactory results, and that is the ration issued by the Magadi Soda Company to native labour, which is as follows:—

- 2 lbs. Mealie Meal daily.
- 2 lbs. Chiroko Beans weekly.
- 2 lbs. Meat weekly.
- 1 Lemon weekly.

The Native Affairs Department approved of that diet and wished it to be more generally adopted. It is said to be very satisfactory; the experience at Magadi is that the boys put on weight, and improve in condition.

The question of native diet cropped up again in connection with the Thika-Nyeri Railway. When the construction of that Railway was begun the diet proposed was:—

- Maize, 2 lbs. daily.
- Meat, $\frac{1}{2}$ lb. daily.
- Beans, $\frac{1}{4}$ lb. daily.
- Nuts, 1 oz., or Ghee, $\frac{1}{2}$ oz. daily.
- Vegetables, 1 lb. weekly.

Owing to the difficulty of supplying meat daily the following scale of diet was eventually adopted:—

- 2 lbs. Maize daily.
- 2 lbs. Beans weekly.
- $\frac{1}{2}$ lb. Nuts weekly.
- 1 lb. Potatoes or Vegetables weekly.
- or $1\frac{1}{2}$ lbs. Meat instead of Beans.

Another diet which was worked out carefully in detail, on physiological principles, was that recommended for Askaris of the King's African Rifles in the Northern Frontier District, where there is difficulty in obtaining food locally. The diet recommended was:—

- Mealie Meal, 20 ozs.
- Meat, 8 ozs.
- Beans, 4 to 5 ozs.
- Dates, 2 ozs.
- Sugar, 1 oz.

These are all diets I have picked out, as recommended or issued in this country; but I should like to mention here the diet in use in the Katanga Mines, in the Belgian Congo:—

- Maize, 24 ozs.
- Rice, 5 ozs.
- Beans, $2\frac{1}{2}$ ozs.

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Nuts, 2½ ozs.
Cassava, 5 ozs.
Meat, 7½ ozs.
Cooking Oil, 2 ozs.

You will notice how liberal this ration is in comparison with any of ours. I am sorry Dr. Kauntze is not here to give us the latest information from South Africa, but I believe the diets there are on a far more liberal scale than any suggested in this country.

So much for the diets that have been attempted in practice. Now I should like to consider the theoretical basis of these diets.

I have here a memorandum which I think was drawn up by Mr. Kirkham, when he was Director of Chemical Research. He assumes, as a standard, that a daily diet should contain:—

Protein, 100 grammes.
Fat, 60 grammes.
Carbohydrates, 450 grammes.
Calories, 2,800 grammes.

I do not know from where he gets these figures. Koenig's minimum, as usually quoted, is:—

Protein, 118 grammes.
Fat, 56 grammes.
Carbohydrates, 500 grammes.
Calories, 3,000 grammes.

In these scales "protein" is taken as being protein of biological value. Here I am completely out of my depth, as I am not a biological chemist. The essential point is that it is not every protein present in food that can be used for building up body protein, and the difficulty is to find for each article of food what proportion of the contained proteins is available for building up. The value of the proteins in maize, of which zein is the principal, is certainly low in the scale, but how low I am unable to discover. The figure accepted as correct in calculations made in this country is, I think, derived from the researches of Thomas, who states that the biological value of maize protein compared with milk protein is in the proportion of 30 to 100; that is to say the protein in maize is less than one-third of the value of the protein in milk. But according to Ellis and McLeod this figure is open to question; another table by McCollum gives the value of maize protein to milk protein as 50 to 100.

Now as regards the minimum amount of protein of biological value required in the daily diet. In the memorandum

on the subject stated that:—

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on the subject of the Northern Frontier District ration I find it stated that:—

“The native of this country does not appear to require Koenig's minimum of protein (4.2 ozs.) to keep healthy, but the amount given should not be less than 2.5 ozs.”

I do not know why the figure of 2.5 ozs. is chosen. If it is accepted that 118 grammes are necessary for the European I do not see why it is said that an African can do with 70 grammes. However, I take it there was some foundation for that statement, and we will take 70 grammes as our standard and not 118, as the minimum protein required in a native's diet. The minimum for fat, we will take as 50 grammes, and for carbohydrates 500 grammes.

With these figures for our standard diet, let us see what happens when we try to compose an adequate daily ration from the common foodstuffs available for natives of this country.

To demonstrate the problem I have prepared this board, in which, as you see, are coloured pegs, representing units of protein, carbohydrate and fat. Here we have our standard, consisting of 5 red pegs to represent 500 grammes of carbohydrate, 3 black pegs to represent 70 grammes of protein, and 5 green pegs to represent 50 grammes of fat. On the other side of the board I have shown the constituents of various quantities of different foodstuffs: for instance we have 1 lb. of maize, represented by 3 red pegs (333 grammes of carbohydrate), 2 green pegs (20 grammes of fat) and either 1 or 2 black pegs for protein, according as we estimate the biological value of the protein in 1 lb. of maize as 12 or 20 grammes.

And similarly for these other articles, meat, beans, chiroko beans, ground nuts, potatoes, and ghee.

Now, let us see how we can build up to our standard diet by a selection from these foodstuffs. Suppose we take $1\frac{1}{2}$ lbs. of maize; that gives us 500 grammes of carbohydrate (represented by these 5 red pegs), 30 grammes of fat (these 3 green pegs), and, taking the maximum figure for maize protein, 30 grammes of biological protein (these 3 black pegs). Add $\frac{1}{2}$ lb. of lean meat, and we have an additional 43 grammes of protein (these other 4 black pegs) and 10 grammes of fat (1 more green peg). We are now just up to our standard for carbohydrate and protein but 10 grammes short in fat. Perhaps the protein figure for maize may have been calculated too high; if we accept the lower valuation we must take away one protein unit. Moreover if our half-pound of meat should contain a proportion of bone or fat we must reduce the protein figure further on that account.

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To make good this deficiency we can add $\frac{1}{4}$ lb. of chiroko beans, which will give us 19 grammes (so it is said) of biological protein. The deficiency in fat can be met by 2 ozs. of ground nuts, or 1 oz. of ghee, or we may reckon on a larger amount of fat contained in the meat. So we arrive at our standard ration.

My object in making this somewhat elementary demonstration is to illustrate how difficult it is to reach the standard in protein, without including meat in the diet: unless one takes excessive quantities of other foodstuffs.

If for instance one takes 2 lbs. of maize, you are immediately in excess with carbohydrate, but even taking the maximum figure for the biological value of maize protein, and accepting the very low figure of 70 grammes as the maximum requirement of protein, the ration contains only a little more than half the necessary protein. Yet that ration of 2 lbs. is actually suggested, by some people, as sufficient for an African.

To bring up the protein content of the diet to the standard, without including meat, one would have to add $\frac{1}{4}$ lb. of chiroko beans, which is fairly heavy on top of 2 lbs. of maize, or $\frac{3}{4}$ lb. of ordinary beans, which is worse, or $\frac{1}{4}$ lb. of ground nuts, or 4 lbs. of potatoes.

I will conclude by asking a few questions.

- (1) Can 70 grammes of protein of biological value be taken as sufficient for an African?
- (2) Is maize protein of greater biological value to an African than to a European?
- (3) Given free choice, would an African select, as the most suitable diet, one mostly carbohydrate, or is it force of circumstances that has made him choose it?
- (4) Is an African physiologically adapted to periodical surfeits of food—either carbohydrate or meat? Is such a practice not injurious?
- (5) Is the supposed endurance of an African to protracted exertion due to his carbohydrate diet? Has he this endurance?

There is an idea that the African is more capable of prolonged exertion than the white man, although the white man can beat the African when it comes to sudden effort. Is this idea true? I believe that the weight carried by a British Soldier in full marching order compares with an African porter's load, in fact I am told that a Sapper carries 90 lbs.; if this is so there is nothing remarkable in an African carrying a 60 lb. load. The power of endurance would then seem to depend on training more than diet.

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- (6) Is the African more susceptible than the European to disease? Is such susceptibility due to protein deficiency?

The argument is that protein in diet is necessary not so much for developing energy as for building up the tissues and maintaining the resistance to disease. One has the idea that the African is more susceptible to disease, and that this may be the result of protein deficiency. On the other hand the African is much more often exposed to mass infection than the European: when he does meet infection he usually meets it in concentrated form. I suppose it is reasonable to believe that the African would show as great resistance as the European if his conditions of living were the same, though under present conditions his resistance appears to be less.

- (7) What is the experience of other races, for example Chinese, Indians, Zulus, as regards the effects of carbohydrate diet?

I have confined myself entirely to Kenya. I have been told that certain sections of the Zulus grow up and thrive entirely on a maize diet. I know nothing of the natives of India, but I understand that the diet of many is mostly carbohydrates. The Chinese are supposed to subsist mostly on carbohydrate, and I should like to be informed of their powers of exertion and endurance and of their resistance to disease.

- (8) By evolution should not an African be more a meat eater than a European?

I am perfectly certain that primitive man did not live on nuts; he must have consumed quantities of meat when he could get it. The African, being presumably of a more primitive type than the European, should therefore be adapted for meat eating.

- (9) Is the difference in physique between such tribes as the Kavirondo, Kikuyu and Masai due to diet, or is it a racial characteristic?

The diet of the Kikuyu is undoubtedly mostly carbohydrate. I am not prepared to say whether the Kavirondo habitually eats much meat or not. He is supposed to eat more than the Kikuyu and has the reputation of being a harder worker. Is that cause and effect? The Masai lives mostly on meat, milk and blood: he is credited with immense powers of endurance. I do not know his susceptibility to disease under normal conditions; the Masai we had in the Nairobi Prison seemed particularly susceptible.

- (10) Will not training and enabling the African to adopt a better balanced diet, containing a fair proportion

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of meat, almost certainly lead to a better-built, more disease-resisting individual than the present native of Kenya?

I suggest that these questions are of the greatest importance. A good deal of attention is being devoted at present to the sanitary housing of Africans. I suggest that their correct feeding is even more important.

DR. BURKITT: This is, I suppose, the most important question in the light of present politics and of present economics in this country. I think it is the most important discussion we can go into and I hope everybody will give their ideas and what they know so as to help matters.

DR. ALLEN: Certain information is required before the proper composition of diets can be established, and unfortunately this information is not available. We do not know the food requirements of the native as regards protein, carbohydrate or fat, nor do we know anything about native metabolism. He may or may not require the same food as an European, and the present tendency is to make his diet conform to European standards.

With regard to food in this country nothing is known of its biological protein or vitamine contents. In the recent report on vitamins published by the Medical Research Council it was stated that tomatoes grown and examined in South Africa contained approximately half the amount of vitamine C. of the English tomato. Meat in this country as a rule contains very little fat, what is its content of vitamine A? This is of great importance in the prophylaxis of dysentery and other diseases. The vitamine content of milk depends largely on the feeding of the cattle. In this country cattle are fed only on grass which is often dried up by the sun. Does this affect the vitamine content of the milk?

These are only a few points on which information is required, and which can only be decided by biochemical investigation. Until this is done I do not think we can make any definite statements about the diets required by the natives of Kenya.

DR. JOHNSTONE: I should like the meeting to consider the subject from the economic point of view, as I think the problem is intimately connected with the labour supply of the Colony, not only in the Native Reserves, but particularly on European farms.

In the Colony at the present time there is a serious shortage of labour and this shortage is increasing from year to year. Some time ago I considered housing to be the most

pressing problem. Since then I have modified my views and, although I still believe that proper housing is essential, I think that a lot of attention should be paid to dieting as well.

In the course of inspections I have come to the conclusion that on many European farms, (although conditions are rapidly improving) in regard to housing and dieting, the native is worse off than in his own reserve. This state of affairs causes a good deal of unrest. The native feels that something is wrong, but does not know quite what, and is apt to express himself by asking for an increase of wages or a disinclination to work for Europeans.

By paying more attention to dieting and housing, conditions on farms could be made more attractive and native labour would tend to settle down. I think it is essential that the Medical Department should give a lead in this matter, more particularly in regard to research work on the problems of housing and dieting. We should solicit the co-operation of the Native Affairs Department and every other Department concerned as I think it is one of the most important problems in the Colony. At present we have got various ideas on the subject and have carried out certain experiments, but when all is said and done we have not yet collected any scientific information.

In conducting this research work in the future we should make certain that our experiments are carried out with accuracy, that they are not subjected to interruptions and that adequate staff is available. It is an extremely important subject and one in which investigations should be carried out immediately.

DR. CLARKE: It seems to me in dealing with the native the first thing to consider is what his diet is under natural conditions and what work he is wanted for in particular, such as the Carrier Corps, rather than supplying him with extra protein, and he should as nearly as possible retain the diet that he would have under his native conditions.

Let us consider different parts of the world—take India to which some reference has been made. In Southern India the native lives entirely on rice, or rice is the chief article of diet, yet in Northern India he resembles in physique and energy the European, but hardly eats any rice.

I remember once being on duty in a famine district and we had packed train loads of wheat to feed the natives with. They preferred to starve. All we could do was to feed goats on the wheat and feed the infants on the goats' milk.

Take the Chinese diet. I remember the Chinese Regiment which was disbanded—a very uneconomical decision, as it was the cheapest and one of the most efficient regiments

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in the Army. These men can carry 30 days' supply of food on their backs and could have marched through China. They ate compressed cooked rice, and took a few grains of opium; the latter has not the effect on the Asiatic that it has on the European.

Take the Eskimo. He can consume any amount of fat and can thrive on it and it seems to me in working out a diet for the African one must consider the surroundings in which he works. It is a well known fact that Indians and negroes when they get below a certain climatic temperature will collapse. I remember a little Frontier show in India. At a height of 12,000 feet, the Southern Indians collapsed to a man, whereas the Gurkhas, who are hill men, and the northern Indians, marched and did well on the rations supplied to them.

The lecturer made no reference to the mortality or admissions to hospital from beri beri or scurvy. I think these figures would be interesting, but I beg to support Dr. Johnstone in his suggestion that this diet question must remain an open one until we have more definite facts to go on with regard to the native diet and its proved value.

Another point which was not mentioned is the amount of fuel issued per day per man to cook his food. If you issue him with food which is rich in proteins and carbohydrates and no fuel, it is not worth much to the man. In peace time, in the Army I think 3 lbs. of coal per man, and in India 7 lbs. of wood, is issued as fuel. Supposing you issue a thousand calories value in rations, and no fuel, the food is no good to the man. If Dr. Wilson can give us the figures I have referred to it would be rather interesting.

DR. GILKS: I think that in discussing this question of diet we have got to remember two or three significant experiments which have been carried out in this country by employers of labour. The Magadi people I know would not go back and take off their ration of meat, because they think the boys work better with it. The Sisal Planters and people who put their boys on piece work would, I am perfectly certain, decline to discontinue the meat rations.

There is, I think, a very significant fact with regard to the Kikuyu that all the food customs, semi-religious ones, are connected invariably with the killing and eating of goats. That possibly indicates some physiological need for protein of higher value than can be obtained from maize.

The question as to the incidence of scurvy and beri-beri has been raised. I believe that the large majority of natives in the Reserves are on the border of food deficiency diseases.

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They have comparatively little resistance to disease. We get a certain number of cases—all, I think, definite food deficiency—cropping up from time to time both in the railway and civil hospitals.

I think everyone will agree there is something wrong with the majority of natives in the reserves, especially the Kikuyu. I am told the Kikuyu male (Colonel Watkins will correct me if I am wrong) after his circumcision does not eat green vegetables. That possibly indicates that he is suffering a good deal from a deficiency of vitamin C.

We are all working at the present time on facts that have been worked out with regard to Europeans. What we do not know is as to whether the needs of an African are different to those of an European: how we are to get on any further without proper investigations I do not know.

It has been suggested that the needs of carnivorous animals with regard to vitamin supply are different to non-carnivorous animals. Or perhaps it might be put the other way round that the vitamins of meat are more potent with carnivorous than with non-carnivorous animals.

Possibly the vitamin and food requirements of an African, at any rate a vegetable eating African, are totally different to an European. We have got to take into consideration the fact that the very large majority of natives in this country are all suffering from intestinal parasites.

Our conclusions as to native feeding are liable to be vitiated by extraneous factors. I have been looking up to see if I could find what the ordinary tape-worm and other inhabitants of the native intestines live on, but I cannot find anything definite. I do not know whether they live on part of the food which is required by the human host or whether they live on waste material or whether they merely live on juice which they extract from the mucuous membrane.

Why does a native as a habit eat and likes to eat those enormous amounts of mealie meal in a day? I do not know how many of you have seen the mass of stuff that 1½ lbs. of mealie meal makes when it is cooked. A native gets through it regularly and more besides. Does he take that amount merely because he likes the feeling of repletion or does he take it because the physiological protein value of maize flour is so little, or does he take it because he is entertaining at the same time a large variety of intestinal parasites and he has to feed these as well?

As regards maize a very interesting point arises. In testing the effect of protein deficiency on malignant growths the Cancer Research Commission fed their rats on maize. It makes

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one wonder when one reads of a thing like that whether the great majority of boys living on maize are being fed or starved.

The subject of vitamins was not alluded to by the opener of the discussion—I think he rather funked it. Briefly I would like to allude to the Masai cases; Dr. Wilson mentioned that they had little resistance when in jail. These people developed strange swellings on their legs which were very painful and were something like the description that a gentleman called Lind gave in 1760 or thereabouts, of his cases of scurvy.

I do not know whether these were cases of deficiency disease; one has seen them crop up on railway construction and something very similar coming in from the fuel camps down the line. It is all very nice to say definitely that they were cases of food deficiency disease but there are a great many other things which enter into the picture. There is the question of the overcrowding in gaol, of how they live normally, and the difference between the conditions to which these particular people were subject and their fellow prisoners. I think personally they were food deficiency diseases. It is only an opinion and I cannot prove it. They were fed on the physiologically correct diet which was instituted in the Prison. They were all Masai. Do the Masai correspond to the carnivores with regard to the theory which is being developed that the vitamins of meat are more potent in their case than to the non-carnivorous animal and therefore the diet which was physiologically sufficient to keep the ordinary prisoner in health was not sufficient for the Masai?

We have to consider as to whether the food requirements of the African are entirely different to the European and as to whether the forest and hunting tribes are different from the others in this respect.

I believe that all tribes need meat if they be kept fit to do hard work.

COLONEL WATKINS: I would like first of all to thank you for giving me the opportunity of hearing this interesting paper on a subject I have been studying for a great many years. I should like to say first of all I regard this question of dieting as the most important, with all due deference to Dr. Johnstone, that we can possibly have in this country and comes before housing because until you can get your natives fed better they are not going to build houses. You have got to get the fit and sound man before you can get changes going in the Reserves.

Medical work in the Reserves is the most important of all, but you must have a certain amount of education and other things as well to make medical work effective.

In 1914 we began with several thousand carriers and gave them only 2 lbs. of mealie meal per day, as was the custom of the country for safari porters. From 1915 onwards we were making constant experiments in feeding under medical advice and finally reached a ration which gave eminently satisfactory results and was adopted for the fighting units.

One thing I have not heard touched upon at all, and that is the cooking. Cooking is of immense importance. It is of no use pouring pounds of anything into a native if it is not going to nourish him and I think one of the reasons why the native is able to put such a large amount of food into himself is because it is not cooked. We found natives eating vast quantities of food and yet were suffering from food deficiency.

The grinding of the flour is important. Again during the war we found it impossible to get flour that was up to the standard we wanted. We were told that the parings of the outer husks scratched the inside of the man and gave him stomach troubles. We had to place our orders for mealie meal in South Africa where I understand they have a very thorough system of testing and grading flour. They insist on the winnowing away of the husk so that there is only a small percentage left in the flour. I merely suggest it for a possible line for enquiry.

Another question I should like to touch on and that is adaptability to climate. We found during the war that the tribes who worked best in all varieties of climates were those who most nearly approximated to our own methods of feeding. The Swahili seemed to work anywhere. Next to him was the Mwanyamwasi. He did very well in practically any climate. Next to him I should put the Kavirondo, and at the tail of the lot came the Kikuyu and I think more particularly the Embu and Meru branches of that people. We found when we were able to keep these people in our Depots at Nairobi before sending them out, they did very much better when we moved them than if we had put them out in the field at once. I remember in one experiment we lost about 25% of them in hospital and we repatriated the rest in a very bad condition.

I think that the question of adaptability is a very important one because as somebody said the greatest thing of all in this Colony is largely the development of the Colony by the increase of labour supply, and if our labour is only going to work in its own district we are not going to get very much further. We have two ways of increasing the labour supply. One is increasing quantity; and the other is increasing quality. We must get the work of three men out of two and gradually increase

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that again, I am sure we can, but it is to the Medical Department that the Colony must largely look to bring that about.

Things are gradually changing and I was pleased in a talk with a leading settler the other day to be told that he was coming round to the conclusion that meat was an essential to the native and he was going to support the killing of meat which he hoped would be easily obtained from the native reserves and help to do something to settle this problem of overstocking from which they are suffering at present.

There is one question on which I should like to have heard a few remarks and that is the use of sugar. I believe in sugar as a diet and I do not know if the experiment has been tried. It had very good effects with us, its introduction out here being due to direct instructions from the War Office. We grow it and prepare it in this country and I believe we can increase the amount if only we can stop it being used for drink.

I would like to touch on the subject of physical characteristics and how far they are affected by diet. I do think stamina and fitness are due to diet; but the size and amount of bone in a man are racial characteristics.

I went down the Nile in 1913, and I was very much struck there by the way the neighbouring tribes gradually differentiated as one went on, neighbours resembling each other but with a wide difference at each end of the line, the marsh dwellers in particular seem to develop very long legs. I do think that type is largely due to environment—it is not due to meat eating because in my experience the few spear hunting tribes I have come across, are small boned and are rather meagre people.

I met some years ago a tribe called the Wasanya who were very small, but lived entirely on meat and honey. I happened to march right into one of their encampments when I had lost my way. I found the same characteristics to a lesser extent among the Wanderobo. I certainly think the physical characteristics of the tribes here are largely due to their local environment.

DR. FISHER: I was sorry to hear Dr. Allen's remarks about this matter but his point of view is rather that of a man who looks at test tubes. If you see people you get certain definite impressions. There are certain things we have got to remember when we are working things out on a board. We are talking about *the native*. What does he eat? You may visit any tribe in any place and you will find each is different, and I do not think there is any such thing as *the native*. I have had certain porters who refused to eat Zebra meat but would eat Kongoni.

There is the question of training. A good contractor never works his people for the first month. We had a lot of deaths in

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camps on the Uasin Gishu Railway and diseases which spread from camp to camp. One contractor was getting a heavy mortality—he had 1,400 men in three camps and you could pick out the men who had worked longest by looking at them, simply because they were fitter and in better condition. These people had their meat and mealie meal as they liked. They are fitter and work better if they are fed properly from the beginning.

The Ukamba's hands are softer than a woman's. They cannot do manual work to begin with. I could not get porters to carry my loads for over 6 miles, yet their physique is essentially the same as the white man, and those trained as Dressers who get from 40 to 100 shillings a month send in to buy their meat, tobacco, etc., they live as we do. They have about three meals a day and they seldom get ill. We had 100 Dressers on the Uasin Gishu Railway and only one man out of the lot was in hospital—nothing serious—a man named Robert Wordsworth. The general health of these men differed remarkably from the others.

The amount of fuel the men got was sufficient but as far as one could see the people will only cook their food in the way they are accustomed to at home. The Prison authorities give their people properly cooked maize. These Ukamba people heat the water and sprinkle the maize on the top until they have put enough in and then they eat it. If they get coarser ground maize they do not cook it a bit longer than the finer ground maize.

One more point. The feeling of repletion seems to obtain just as well on a meat diet. A safari of 25 porters ate a large Kongoni in 24 hours. Another point, is that each class of work should have a different diet. I think there should be a difference between the diet of people who do heavy manual labour and that of the ordinary office boy. When suggestions were made for the dietary of the Thika Railway a certain diet was prescribed for the district, the settlers there asked why a man who only picked three tins of coffee should have meat three times a week.

DR. GILKS: There is one thing Dr. Fisher has not made clear and that is whether the effect of the better diet that the natives got on the Railway Construction had anything to do with the improvement in health and capacity for work.

DR. FISHER: Every contractor gave his boys meat because it cheered them up. It certainly has got a great moral effect and they improved on whatever diet they got there and a man in

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his third month worked better than in his first or second month. They got regular meat. 1½ lbs. was the minimum.

DR. MACKINNON: I know nothing about native diets, but I cannot help comparing the intentions in this country of raising the standard of diet among Natives to approach that of Europeans, and the equal enthusiasm at home of European races reducing the standard of their diet to a more primitive type.

It is well known during the war that the CS population were studied and it was found the physique of the CS population was really due to the cooking pot at home. They proved the deficiency of the physique of the middle and lower class to the overcooking of food and the excess of meat eating. One eminent physician at home—I will not mention his name, he is a Harley Street man—recommended and carried it out very thoroughly himself, that we should eat no meat at all and should starve for three days once every three months and that we should be better living on fruit and vegetables; he is thoroughly convinced himself that the cause of the deficiency in the physique of the European races is the over specialization in diets and holds that the diet should be reduced to the primitive type where they practically never use the cooking pot at all and depend on foods such as fruit and vegetables. One cannot help comparing the physique of the Masai which is good to that of the Kikuyu which is poor. I think this is due to the diet which the Masai have, i.e., milk and in many cases milk and blood. Milk contains everything the body needs and the physique of the Masai must be due to the absence of the cooking pot and their never using food that is over-cooked and depending solely on the milk and blood of animals.

I think that if the diet were reduced to a simpler form of diet than the one at present they would probably be healthier and it is rather peculiar that we in this country should be endeavouring to raise the standard of the native by giving him food approaching that of the European.

DR. PATERSON: The last speaker has raised an important point. He said that if the diet of the European was changed back to the primitive form the death rate would not be so high. During the last few centuries in spite of that the death rate in England has gone steadily down till now it is lower than it has ever been before and is a quarter of the death rate in this country. I understand that it is hardly possible for the average man to get into a suit of armour which was worn by the average man in England in the days when the people of my country had porridge, yet we seem to be getting on remarkably well.

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DR. ALLEN: I did not make myself quite clear the last time I spoke. I did not wish to imply that increasing the diet of the native did not produce good effects. I have ample evidence of that.

Certain numbers of the Carrier Corps were admitted to hospital suffering from dysentery and they all improved enormously in hospital where they were well fed; it was obvious that increasing the food and making it more varied was excellent.

But it is practically impossible to decide what is the best diet for the natives because we do not know either what the native requires, what foods will supply these requirements, or the parts of the country where these foods should be grown to the best advantage, and until we know these things we cannot lay down the standard of diet.

DR. WILSON: Dr. Gilks said that I funked vitamins. I kept clear of vitamins because had I once started on that subject I should be talking still. Vitamins are so much to the fore just now that there is no danger of their being overlooked, but I do think there is a danger of overlooking the protein content of diet, and that was the particular point I wished to bring out in opening this discussion. If you get a properly balanced diet the vitamins will not be wanting.

On the subject of vitamin deficiency: in this country one does not get rickets developing, but may I call your attention to this photograph, from the *British Medical Journal*, of a rickety European child with a protuberant abdomen. Dr. G. M. Ross has pointed out that it is very like the picture of an average Kavirondo child. It may be that vitamin deficiency plays a part in producing the familiar pot belly of the African child.

Dr. Clarke seemed to take the view that the diet a native is used to is the best diet for him. But to my mind the essential point was brought out by Colonel Watkins: that our object should be to train the native to a better diet: to accustom him to a balanced diet, and so make him adaptable to changes of diet and climate, and resistant to disease.

DR. BURKITT: Gentlemen. It is the business I believe of a Chairman to sum up as far as he can what has been said. In that respect my business is extremely easy. I listened with great interest to the introducer and to each speaker. Every speaker said exactly the same thing only in different words and that is, that this country is lamentably deficient in research workers and until research workers come (that does not necessarily mean medical men), or until such persons are brought here by Government we shall not get any further.

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Every speaker emphasised the fact that so far as we have been only working on theory. Theory is of very limited value. May I make one remark, I think it will help certain speakers. I remember—this is rough and is not the exact percentage—that at the Nairobi Carrier Corps Hospital in 1916 as compared to 1917 the result of an improved diet lowered the death rate from 33% to 3%.

I was extremely glad to see Dr. Fisher get up towards the end because he summed up things in a very practical way and I think we all agree with him that there is no real difference, as a work-machine, between the native and the European.

It is a well known thing that the races of the world who eat most meat do the most work.

I am exceedingly glad that Colonel Watkins, Acting Chief Native Commissioner, is here to convey to Government in the most emphatic way what this meeting has said, emphasising the absolute necessity, the growing necessity, of having research workers and biological chemists. We have neither, and never had.

May I now convey to the introducer of this subject the greatest possible thanks of the meeting for his address, over which he must have expended considerable time and trouble.

THE TREATMENT BY AUTOGENOUS VACCINES OF INFECTION WITH COLIFORM BACILLI.

The Journal of Hygiene for April, 1925 (Vol. 23, No. 4) contains a paper entitled "Infection with Coliform Bacilli as a Cause of Rheumatoid Arthritis and Chronic Rheumatism: Its Diagnosis and Its Treatment by Autogenous Vaccines," by W. H. Kauntze.

The introductory section describes how the first patient treated by the author's method

was sent to the Medical Research Laboratory, Nairobi, by Dr. Gilks, now Principal Medical Officer of the Colony, but at that time Resident Surgical Officer at Nairobi Hospital, with a view to determining whether vaccine treatment was possible or advisable for the rheumatoid arthritis from which the patient was suffering. The usual sites of septic absorption were examined and eliminated one by one, until only the intestines remained. It was then that the idea of recovering a number of organisms from the faeces and testing their agglutinability by the patient's serum, suggested itself.

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