

## **The dietetic treatment of diabetes / by B.D. Basu.**

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# THE DIETETIC TREATMENT OF DIABETES

BY  
B. D. BASU  
MAJOR, I.M.S. (RETIRED)

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FIFTH EDITION  
(*Revised and enlarged*)

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To  
MY BROTHER  
RAI BAHADUR SRIS CHANDRA BASU  
WHO  
STIMULATED MY INTEREST IN THE ANCIENT  
LEARNING OF INDIA  
THIS BOOK  
IS AFFECTIONATELY DEDICATED.





## PREFACE TO THE FIFTH EDITION.

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The present edition of this little book has been revised and enlarged, and it is hoped it will prove as useful to those for whom it is intended as did the previous ones.

ALLAHABAD :

*1st March, 1915.*

B. D. BASU.

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## EXTRACT FROM THE PREFACE TO THE FOURTH EDITION.

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Three editions of this little book have already been sold and it has been out of print for some time. It is seldom that medical books undergo so many editions in such a short time in India. But the subject being an important one, it is a pity, that it has not been so well studied in this country as it deserves to be.

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This book is intended for the medical practitioner as well as the layman. Three previous



editions have proved useful to both classes of people. Hence I leave it as it was in previous editions, with such changes as are now considered necessary, in the light of modern researches on the subject.

ALLAHABAD :

*1st November, 1913.*

B. D. BASU.

## PREFACE TO THE SECOND EDITION.

The fact of the longevity of cases of diabetes in India was brought to prominence in the discussion of the subject at the annual meeting of the British Medical Association last year (1908). I attempted to account for the longevity of Indian diabetics in a paper which I wrote more than ten years ago. Extracts from that paper are given in this work, to which the particular attention of the profession is invited.

ALLAHABAD :

*1st November, 1909.*

B. D. BASU.



## WHAT IS DIABETES ?

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Hindu physicians of yore were perhaps the first in the world to diagnose what is called diabetes. Notwithstanding the researches of physiologists, pathologists and physicians in modern times, it is perhaps not too much to say that the ætiology and pathology of this disease remain as obscure to-day, as they were in the days of Charaka and Suśruta. Very truly has Sir J. F. Goodhart observed :—

“Diabetes shall be my between maid—in part functional, in part, perhaps, otherwise. What morbid anatomy have we not sought in this disease and have not found it? Long, indeed, have many of us hovered over the alterations we had *hoped* to find and have not found them. Changes in the nervous system, in the pancreas, in the liver, in the blood, and so on. “\* \* \* The question has now to be answered, what causes this seemingly inveterate sugar craze on the part of the proteins? This curious reversion, may we call it, to a plant-like metabolism in thus compounding with carbon to the rejection of its natural affinities. Is it nervous in—co-ordination, or toxic disorganisation, or what? Again we seem to be driven back, cancer like, upon a *loquacity of function*, upon some misapplied vital energy behind the scenes with which as yet we cannot grapple.” [Harvein Oration on the passing of morbid anatomy; delivered at the Royal College of Physicians of London on St. Luke's day, 1912.]



Diabetes Mellitus (that is, voiding a large amount of urine containing excessive quantities of sugar and nitrogen), is not a specific disease. Structural lesions of the pancreas, the liver or some portion of the nervous system,—have been known to be associated with this disorder. But how this is brought about is not clearly understood.\*

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\* The following are the recent views regarding the Origin of the Sugar excreted in Pancreatic diabetes.

As an exclusive proteid diet for dogs, codfish was chosen ; when boiled, it is free in winter and spring from glycogen and glucosides, and contains only traces of fat. Dogs without a pancreas so fed create in a month 30 per cent. of their body weight of sugar, or a weight greater than all the proteid of their body. The sugar must originate either from the fat or proteid of the body or of the food. In spite of the food, the body wastes "to a skeleton," only heart and brain remaining unaffected. The liver enlarges enormously to 5 per cent. of the body weight or five times more than in ordinary starvation ; it is normal in composition. In diabetics the liver is always richest in fat. There is no constant proportion between the sugar and nitrogen of the urine, and so the origin of sugar from proteid is doubted. The sugar is believed to originate in the liver cells, which are capable of turning fat as well as glycogen into sugar. The liver overgrows owing to the large amount of work it has to do in relation to proteid ingested ; its sugar-forming function is simultaneously increased. Any stimulus of the liver such as ammonium carbonate or neutral soaps increases the sugar formed.—*Journal, Chemical Society*, 1905, A. II. 469.

#### IRON IN THE DIABETIC URINE.

Neumann and Mayer have described four cases of diabetes in which there was a constant relation between the sugar



Had we known the true pathology of Diabetes Mellitus, we should have been perhaps in a position to treat it more properly than we can at present.

But if we regard diabetes or glycosuria as not a disease by itself, but a manifestation of several pathological or functional changes in the animal organism, we shall be in a position to understand its true significance. Glycosuria like fever or pyrexia should be considered as a symptom, and, as in fever, the aim of the physician is not so much to reduce the high temperature as to cure the disease of which pyrexia is one of the symptoms, so in diabetes the physician should not rest content with merely trying to reduce the quantity of sugar in the urine, but to treat the condition or conditions of which it is a product.

*Conditions leading to the production of Glycosuria.*

In a paper on Experimental Glycosuria read before the 69th Annual Meeting of the British Medical Association held in Cheltenham in July and August, 1901 and afterwards published in the *British Medical Journal* for October 12, 1901, the late Dr. Pavy mentioned the following conditions

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and the iron in the urine. This is important, in view of the possible origin of sugar from nucleic acid. Three cases are, however, now recorded in which the proportion varied from 1·7 to 3·4 mg. iron per 100 grams of sugar.—*J., C. S.* 1905, A II. 469.



as leading artificially to the production of glycosuria :—

Bernard's puncture of the floor of the fourth ventricle ; extirpation of the superior cervical sympathetic ganglion, of the first thoracic ganglion, and division of the thoracic sympathetic chain (Pavy) ; extirpation of the celiac plexus (Klebs and Munck) ; section of the medulla spinalis on a level with the brachial plexus (Pavy) ; stimulation of the central end of the cut vagus (Bernard) ; stimulation of the depressor nerve (Filehne) ; section and stimulation of the sciatic nerve (Schiff).

The administration of phosphoric acid (Pavy) ; lactic acid (Goltz) ; hydrochloric acid (Naunyn) ; uranium salts (Cartier, Chittenden) ; potassium cyanide (Frerichs) ; phosphorus (Araki) ; chloral and chloralamid (Feltz and Ritter, Manchot) ; nitrobenzol and nitrotoluol (Ewald, Magnus-Levy) ; o-nitrophenyl-propionic acid (Hoppe-Seyler) ; phloridzin (v. Mering) ; thyroid extract (Dale-James) ; strychnine (Schiff) ; methyldephinine (Reshop) ; morphine (Bernard) ; caffeine (Jacobi) ; curara (Bernard) ; carbon monoxide (B. W. Richardson) ; nitrous oxide (Lafont) ; amyl nitrite (F. A. Hoffmann) ; respiration of oxygen (Pavy) ; excessive aëration (Pavy) ; chloroform and ether inhalation ; partial mechanical asphyxia (Pavy) ; partial asphyxia by restricted supply of oxygen ; restraint glycosuria of cats (Bohn and Hoffmann) and of frogs (Velich) ; intravenous and subcutaneous injection of sugar (Bernard) ; excessive ingestion of sugar (Pavy, Worm-Muller) ; reabsorption of sugar from mammary gland—lactosuria (Blot) ; excision of the pancreas (di Dominicis, Minkowski) ; ligation and fistula of the thoracic duct (Biedl).

### *Classification of Glycosuria.*

Glycosuria may be classified as regards the conditions leading to its production as follows :—



I. **Simple**, occurring by taking a large quantity of Saccharine or carbohydrate stuff.\*

II. **Alimentary**.—In which some portion of the alimentary system or organs concerned in metabolism is at fault. There is very often some disorder of the stomach.†

Affections of the liver‡, the pancreas and also of the spleen often cause glycosuria.

\* Thus, according to Aage Th. B. Jacobsen of Copenhagen (*Chemical Abstracts*, for March 20, 1914, p. 1144):—

“Ingestion of large amounts of Starch or Sugar can cause an increase to 0·16—0·17% (of Sugar in the urine) in normal persons. The increase is more rapid and likely to be greater after consumption of sugar than after that of starch.”

† “L.-Dietrich has examined the gastric juice of 40 cases of diabetes and found normal conditions only in 25%. There was severe gastric catarrh or achlorhydria in 67·5%. The sugar disappeared completely from urine in 3 out of 9 cases of diabetes in which lavage of the stomach was practised without enforcing an antidiabetic diet. There is much to indicate that more than one organ concerned in the metabolism of carbohydrates must be involved in the causation of diabetes, that the pancreas is not the one to be affected first”.—*Chemical Abstracts*, June 10, 1914, p. 1980.

‡ “Hepatic diabetes supervenes, as a rule, in heavy eaters. It is preceded often by obesity, sometimes by gout or renal lithiasis. It is a mild diabetes without any nitrogenous waste; it is accompanied by the usual manifestations, i.e., hypertrophy of the liver, subicteric complexion, and the presence, in the urine, of excess of biliary pigments, of brownish red pigment, of urobilin, ammonia, and the amino-acids. The nitrogen index is low.”—*Chemical Abstracts*, for June 10, 1914, p. 1980.



Affections of Tonsils and Pharynx also cause glycosuria.\*

III. **Toxæmic.**—Phloridzin, chloroform, epinephrine, dyspnoea and other poisons mentioned above by Dr. Pavy are known to cause glycosuria.

But it is alimentary toxæmia of which we will speak presently which causes glycosuria in very large number of cases.

IV. **Affections of Glycogenic centres.**—Thus tumors of the floor of the fourth ventricle cause glycosuria.

V. **Functional or Emotional.**—Messrs. O. Folin, W. Denis and W. G. Smillie of Boston "found sugar in the urine of 22 insane patients out of a total of 192. Of the 22, the majority suffered from depression, apprehension or excitement. More direct evidence of the existence of emotional glycosuria in man was obtained by testing for sugar in the urine of students before and after

\* *Glycosuria in four cases of acute pharyngotonsillitis*, by C. Farmachidis of Genoa.

"F. observed the appearance of transitory glycosuria in 4 cases of acute pharyngotonsillitis in which acute affection of the tonsils, and not the febrile process, was the immediate cause of glycosuria; experiments with dogs and rabbits showed that simple mechanical irritation of the tonsils (especially in dogs) was sufficient to produce hyperglycemia and distinct glycosuria."—*Chemical Abstracts*, for April 10, 1914, p. 1301.



important examinations. Of 33 students, 6 or 18% had traces of sugar in the urine passed immediately after the examination. It seems reasonably certain from the results obtained that pronounced mental and emotional strain may produce temporary glycosuria in man." (*Chemical Abstracts* for August 10, 1914, p. 2742 from *J. Biol. Chem.*)

#### VI. Influence of Ductless Glands.—

Glycosuria has been known to be produced by the combined action of such ductless glands as pituitary body or thyroid with inner secretions and morphine.

VII. Influence of age and sex.—There is *Diabetes innocens* of younger individuals, in which, as a rule, the excretion of sugar in the urine remains below one per cent., while there exists a pronounced, although not absolute, independence from the diet.

There is often glycosuria present in pregnant women.\*

#### \* Glycosuria in Pregnancy—

It is generally due to hyper-sensitiveness on the part of the kidneys to the sugar in the blood. Nothing is found to indicate any disturbance in the metabolism of sugar, and neither the spontaneous nor the alimentary glycosuria can be accepted as necessarily a sign of pathologic conditions in the kidneys. These statements are based on the metabolic findings in 16 women during and following a pregnancy. In contrast to these are tabulated? the findings of 3 pregnant women



VIII. **Renal.**—"In case of (renal) diabetes there was least glycosuria on a liberal carbohydrate diet. Milk diet, rest or exercise caused no change, and the sugar content of the urine was independent of carbohydrate supply. The proportion of sugar in the blood was subnormal and independent of the food. From this and other cases it appears that the existence of a clinical renal diabetes is established, and it differs from diabetes mellitus in cause, course, and prognosis."—*Chemical Abstracts* for April 20, 1914, p. 1456, from C. D. DeLangen's paper in *Nederlandsch Tijdschrift Voor Geneeskunde*, 2, No. 17, 1443, through *J. A. M. Med. Assoc.* 62, 739-740.

It is, therefore, necessary to examine the blood for sugar, for the sugar content of the urine does not give a true index of the amount in the blood.

Well did Dr. Pavy exclaim :—

"With such a chaotic list before us it is difficult to see upon what ground we stand with respect to the manner in which the several conditions act in producing glycosuria."

I will, however, restrict the term **Diabetes** to that form of glycosuria which is consequent on alimentary toxæmia.

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with mild diabetes. The pregnancy had a seriously aggravating effect on the constitutional disease. The aim in dieting should be to reduce the glycosuria within bounds without acidosis, rather than to try to banish the sugar altogether.—*Chemical Abstracts* for March 10, 1914 ; p, 956.



*Pre-glycosuric stage.*

By studying the history of diabetic patients in India, we are enabled to know that they show certain symptoms before the discovery of sugar in the urine. I call this stage PRE-GLYCO-SURIC.

In some, the symptoms are those of what is vaguely termed Indigestion or Dyspepsia. Constipation is an early symptom. Another symptom is burning sensation of hands and feet. Some suffer from polyuria or nycturia. Dilatation of the stomach may be observed in many. If the mouth is carefully examined, oral sepsis is discovered in not a few. The terminal end of the alimentary canal shows also, not unfrequently, the existence of hæmorrhoids. Hydrocele is also very often present.

Pre-glycosuric stage deserves very careful attention at the hands of Indian practitioners, for much can be done to prevent the occurrence of diabetes if the patient be properly treated at this stage.

Many diabetic patients give the history of their having suffered from malaria and consequently enlarged spleen.

*Glycosuria—a manifestation of alimentary  
toxæmia.*

By the analysis of symptoms and so-called complications of diabetes, we shall not perhaps be wrong in considering it, in most cases, as a



manifestation of alimentary toxæmia. To my mind it explains the occurrence of diabetes much better than any theory so far advanced, of course the nature of toxin like that of enzyme is not yet properly known. One of the earliest symptoms of diabetes is said to be cramps in the calves of legs. In India almost every medical practitioner has seen cases of Asiatic cholera and cramps of the calves of legs associated with them. Their occurrence in both diseases is due to one and the same cause, *viz.*, alimentary toxæmia.

Again, eczema, psoriasis, boils, carbuncles and some other skin diseases, said to be so many complications of diabetes, are manifestations of alimentary toxæmia.

Several diseases are grouped as allied ones with diabetes. These are also manifestations of alimentary toxæmia.

Cataract is said to be a complication of diabetes. But is it not due to alimentary toxæmia?

*How alimentary toxæmia is brought about?*

Alimentary toxæmia is brought about by

- I. Errors in diet.
- II. Disordered conditions of the digestive juices.
- III. The toxins discharged by the bacteria in the alimentary canal.



I. Errors in diet. When the quality of food-stuffs consumed is not good, it is known to produce toxic symptoms. Wheat and rice form the staple articles of food of the population of India.

As regards wheat, we have the high authority of Sir William Crookes, who in his Presidential Address at the British Association for the Advancement of Science, in 1898, said that no other grain can take the place of wheat in the preparation of bread—the staff of life for man.\* But with the export of wheat, the people of India, for the most part, have to depend on inferior food-grains for their bread. Regarding Indian wheat, Messrs. McDougall Brothers, at the request of the Government of India, in 1880, prepared a report from which the following passages are taken :—

“Glancing at all the facts here elaborated, it is evident that these wheats afford a larger margin of profit, both to the miller and baker than any other.

“We venture to record a conviction that we have long held, strongly emphasized by the results of these experimental workings, of the measureless importance of the great

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\* Sir William Crookes said :—

“We are born wheat-eaters. Other races, vastly superior to us in numbers, but differing widely in material and intellectual progress, are eaters of Indian corn, rice, millet, and other grains ; but none of these grains have the food value, the concentrated health-sustaining power of wheat, and it is on this account that the accumulated experience of civilized mankind has set wheat apart as the fit and proper food for the development of muscle and brains.”



resources of the Indian Empire being developed to the utmost in producing wheat for this country. Farmers here are finding that to live they must produce beef and mutton rather than grain, hence the greater need of resources of supply under our own control ;\* \* there is, no doubt, an outlet in this country and the Continent for unlimited quantities [of Indian wheats]".

Accordingly, Indian wheats are being exported in large and larger quantities year after year. As a consequence, the Indian population, for the most part, have to live on inferior food-grains. Sir George Watt, the compiler of the Dictionary of Economic Products of India, does not try to traverse this statement, but thinks that he has proved his case by writing in the following strain :—

" Indian wheat has for some years continued to undersell the produce of the old and established supplies, and is gradually assuming a recognised position in the grain markets of Europe. The outcry has, accordingly, in certain quarters, been raised against the objections to this new traffic. Philanthropy, that much abused ally of a weak cause, has been called to the rescue. The natural food and surplus stocks of the people, we have been told, were being drained away from them. For greed of the means to satisfy exotic desires of modern civilization, the people were being induced to part with their ordinary food, and were, in consequence, taking to the use of inferior and unwholesome grains."

The fact that, due to the export of wheat, people have to maintain themselves on inferior and unwholesome food-grains cannot be disproved by sophisticated arguments. Steps should, therefore,



be taken to reduce, if not actually to stop, the export of wheat.\*

Rice forms the staple article of diet—if not of the majority—at least of a very large population of India. In over-polished rice, the vitamine is got rid of, and thus its consumers do not get that nutriment which they would otherwise derive from it.

Moreover, the Bengali mode of preparation of rice is open to the objection that salts are removed by throwing away the water in which rice is cooked.

Pure milk and *ghee*, which enter so largely into

\* Sir William Crookes gave the following as an appendix to the address above referred to :—

“So long ago as April 16, 1891, the following statement by a leading Indian economist appeared in the ‘Daily Englishman’ of Calcutta :—

‘People do not realise the fact that all the wheat India produces is required for home consumption, and that this fact is not likely to be realised until a serious disaster occurs, and that even now less than 9 per cent is exported. It is a self-evident fact that a slight expansion of consumption, or a partial failure of crops of other food grains, will be sufficient to absorb the small proportion now exported. Besides, we have a steady increase of consumption, in consequence of the natural growth of the population, as well as in the gradual improvement of the condition of a considerable part of the people in the cities. I believe that, comparatively speaking, India will in a few years cease to export wheat, and soon thereafter become an importing country.’

Even after the lapse of nearly a quarter of a century, the above still holds true, and it shows the inexpediency of exporting wheat from India.



the Indian dietary, cannot be had in large towns in India, in sufficient quantities to meet the requirements of the people. There is, moreover, no article of diet which is not more or less adulterated.

Tea drinking which has been introduced in recent years in India, is a very fertile cause of dyspepsia leading to alimentary toxæmia.

It is the belief of many that diabetes has been prevalent in this country since the introduction of the potato. There may be some justification for this belief, if we remember the fact that the potato contains the poisonous alkaloid and glucoside known as *solanin*. Consumption of potato in large quantities disturbs the digestive system and thus gives rise to alimentary toxæmia.\*

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\* Regarding potatoes, the golden maxim to be observed, is *Non-Exposure to Light*. It is stated in a well-known work on gardening :

“ If the weather is cloudy so much the better, for the tubers should be exposed to light as little as possible, and more especially not to bright sunshine. It is well-known that all the green parts of the Potato are more or less poisonous, and so the finest white floury Potatoes become, by exposure to light. Potatoes may be white, black, or purple, externally, and their flesh, notwithstanding, be white and good when cooked ; but expose them to the light for a longer or shorter period, according to its intensity, and the flesh of all will become green and unwholesome. Some persons dig up their Potatoes and leave them exposed to the sun's rays to dry previous to storing ; but this is a bad practice, for three days of bright autumn sun will green newly-taken-up Potatoes to



In some provinces of India, Cayenne pepper is used to such an extent, that its influence on digestion is detrimental to its consumers. So also the use of other spices which, though they stimulate the motor functions of the stomach, impair the secretory functions and thus inhibit the production of hydrochloric acid. The inordinate use of Cayenne pepper and spices, therefore, causes dyspepsia and disordered digestion in the people of this country.

II. Disordered conditions of the digestive juices producing alimentary toxæmia.

The digestive juices are disordered from many causes, *e.g.*, worries, anxieties, nervous disturbances, irregularities of diet, unmasticated foods, etc.

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a very injurious extent; and this being the case, the tubers should not be exposed to the sunshine even for a single day.

"It should therefore always be borne in mind that from the time Potatoes are taken out of the ground till they are to be cooked, they should be exposed to light as little as possible. If, after having been dug up, they must lie on the ground in heaps for but one day, or even less, they should be protected from light till they are pitted. If stored in a shed, loft, cellar, or any other place, light should be entirely excluded; if in a building, to the interior of which light must be admitted, it should nevertheless be prevented from reaching the tubers by some close covering. Thompson's "Gardeners Assistant," edited by William Watson. Part VI, pp. 4967.

As cultivators of the potato in India observe the maxim of *Non-exposure to Light* more in its breach than otherwise, it is easy to understand how unwholesome that article becomes by the action of the tropical sun.



The nervous strain connected with modern life is a well-known cause of disordered digestion. India is a country where from time immemorial, people were accustomed to take their principal meal in the middle of the day after which they used to spend an hour or so in *siesta*, which allowed for the proper digestion of food. But under the altered conditions of their existence, they do not even find time to properly chew and masticate their food which they are obliged to bolt down as soon as they can, to attend to their studies or business in the middle of the day. By proper mastication alimentary toxæmia is reduced to a minimum. In an account of some experiments initiated by Mr. Horace Fletcher which Dr. Ernest Van Someren in 1901 submitted to the British Medical Association, and afterwards to the Congress of Physiologists at Turin, it is stated that :—

“One fact, fully confirmed by the Cambridge observations, consists in the effect of the special habits described upon the waste products of the bowel. These are greatly reduced in amount, as might be expected; but they are also markedly changed in character, becoming odourless and inoffensive, and assuming a condition which suggests that the intestine is in a healthier and more aseptic condition than is the case under ordinary circumstances.”

Every one should be taught to properly masticate and insalivate the food—it is one of the most necessary conditions of good health.



Worries and anxieties are an important factor in the causation of toxæmia and hence of diabetes. It is the Jews who are said to be victims of diabetes more frequently than any other community in Europe. There must be some common factor in the case of the Jews and educated Indians to account for the prevalence of this disease amongst them. Perhaps from their peculiar political situations, both the Jews and educated Indians are subject to worries and anxieties of many sorts.

That this is an important ætiological factor of the disease, may be gathered from its large prevalence in Germany of late. It is noticed in the *Lancet* for February 1st, 1913, p. 351 :—

“The statistical records of Prussia show that the death-rate from diabetes has been increasing of late years. \*\* It is suggested that the increase is partly caused by the growth of luxury and the greater consumption of rich food, and also by the nervous strain connected with modern life. \*\*\* With respect to individual trades and professions it has been found that persons engaged in the preparation and sale of food and spirituous liquors, soldiers and men belonging to the civil and ecclesiastical services had a higher death-rate from diabetes than other classes of the population.”

III. The most important factor in the production of alimentary toxæmia is the discharge of toxins by the bacteria in the alimentary canal. Constipation from any cause and intestinal stasis—by not allowing free evacuation of the contents



of the intestines—bring about toxæmia. Of late years, principally due to the writings of Sir Arbuthnot Lane, the pernicious effects of intestinal stasis are being recognised by the medical profession all over the world.

One of the most important causes of alimentary toxæmia in India is undoubtedly the condition of the latrines generally all over the country. The civilization of a land is to be judged from the condition of its latrines. In rural tracts, no latrines are attached to dwelling houses, as their inhabitants go to fields to attend to the calls of nature. This has its obvious advantages. But in towns the latrines generally are not what they should be. They are ill-ventilated, filthy and not provided in sufficient numbers to meet the requirements of the members of a large household. Their condition is such that it is disgusting to many to visit them to answer the calls of nature. Latrines should be improved. If half of the time devoted to toilet, were spent in water closets, it would greatly relieve alimentary toxæmia of persons calling themselves civilized.

Various, then, are the causes which give rise to alimentary toxæmia. Oral sepsis, piles, errors in diet, malaria, worries, anxieties, &c., are principally responsible for the occurrence of alimentary toxæmia amongst educated Indians.



Adulteration of food-stuffs in large towns, the difficulty of procuring good *ghee* and milk which enter so largely in Indian dietary, over-polished rice, exportation of wheat and consequently the subsistence of a large population of India on inferior food-grains, are mainly the different factors in the causation of Indian diseases and especially of alimentary toxæmia.

The wide prevalence of Malaria in different provinces of India also explains the occurrence of alimentary toxæmia. Malarial patients suffer from enlarged spleen which seriously interferes with pancreatic digestion. There are many who associate diabetes with the organic or functional disorder of the pancreas. If that be so, the enlargement of the spleen accounts for the occurrence of the pancreatic disturbance. According to Herzen, the spleen furnishes an internal secretion which causes in the pancreas the transformation of its inert trypsinogen into trypsin.

The influence of the nervous system in the production of alimentary toxæmia is so well-known that it needs only a passing allusion.

Again, if pathological changes of the Pancreas be the real ætiological factor in the causation of diabetes, we know that pancreatitis is very often set up by oral sepsis.

By not assigning due importance to alimentary



toxæmia as the ætiological factor in the production of diabetes, it has been attributed to many different causes. It has been said that it is due to sexual excesses on the part of Indians. As a rule, they, and especially the educated portion amongst them, are not given to so much sexual excesses as inhabitants of the Western countries. It is the educated Indians who suffer more than uneducated ones from this disease. It passes one's comprehension why they should be more vicious than their uneducated brethren as far as sexual morality goes.

Then again, it has been said that Indians, being very fond of Saccharine food-stuffs, fall easy victims to diabetes. Consumption of a large quantity of carbohydrates, and of sweets, no doubt, very often produces glycosuria and alimentary toxæmia, resulting in diabetes. But when we remember that Hindu priests generally, and the Choubeyas of Muttra especially, indulge largely in sweetmeats without their suffering from diabetes, we should not be justified in considering the disease as resulting from an excessive indulgence in sweet stuffs alone.

### *Is Sugar a Poison ?*

The question naturally arises whether sugar present in the blood of diabetics acts as a poison



on the system and accounts for the complications and other symptoms of the disease. Is sugar in itself a poison? No evidence of this exists. It is a normal constituent of the blood. It is not known to act deleteriously on animal or vegetable tissues. From the fact that it is a powerful antiseptic and used as a preservative of foods, its importance can be judged as a very useful substance in domestic economy.

That in animal economy also it is useful to destroy toxicity of intestinal flora, is to be inferred from Metchnikoff's experiments in introducing bacilli in the intestines to produce sugar.

If we introduce sugar in the blood of healthy animals by injection or infusion for any length of time, the symptoms and complications of diabetes will not be set up by this. The following sheds curious sidelight on the treatment of diabetes by rectal injection of sugar. Before the German Congress of Internal Medicine, held at Wiesbaden, from April 15th to 18th, 1913,

"Professor Luthje (Kiel) reported that in cases of Diabetes Mellitus he had introduced solutions of sugar into the rectum by enema. In this way from 50 to 100 grammes of sugar daily were administered without pain and without increasing the sugar in the urine. The quantity of sugar in the blood, however, became greater, showing that the sugar was absorbed from the intestine." [*The Lancet* for May 31, 1913, p. 1561].

If sugar is not a poison, what is its significance



in diabetes as opposed to Simple glycosuria? Nature always tries to set wrong right. Hence the proverb that every disease creates its own remedy. May it not be that sugar is produced in the system to get rid of the deleterious effects of alimentary toxæmia and to serve the purpose of an antitoxin? \*

There are many practitioners who look upon high temperatures in fevers as necessary to kill the germs of those diseases. So perhaps may be the sugar in diabetes.

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\* *Treatment of Wounds with Sugar—*

“George Magnus Marburg of Munich examined a large number of commercial beet sugars for pathogenic bacteria, and in no case were they found; 89% of the sugars examined were sterile sugar (beet) solutions up to 30% concentrated, and in 20 cc amounts injected subcutaneously, introperitoneally and intra-articularly into rabbits were tolerated well, produced no necrosis and were absorbed by the following day. A 5. g. piece of sugar placed below the skin was completely dissolved in 35 minutes, and produced a transient œdema which had nearly completely disappeared in 60 minutes, the next day no necrosis was found at the site. Virulent streptococcus pus was sterilized by said sugar solutions. Sugar placed in a wound produces a marked secretion, is marked by deodorizing and favors healing. M. treated 100 cases (acute septic wounds, chronic osteomyelitis, and tuberculous processes, etc.,) with favorable results.” [*Chemical Abstracts* for May 20th, 1913, p. 1736.]

Such being the antiseptic properties of sugar, it is not difficult to understand the important rôle it plays in diabetes, in protecting the system from the deleterious effects of alimentary toxæmia.



*Sugar a local irritant.*

But if sugar is not a poison, it acts as a local irritant which accounts for some of the cutaneous and other troubles such as Herpes preputialis, cystitis, &c., often observed in the course of diabetes.

*Treatment of Diabetes.*

Almost every important drug of our *Materia Medica* has been credited some time or other as a remedy for diabetes. That such drugs might have proved beneficial in some instances may be easily believed, if we consider diabetes as a manifestation of alimentary toxæmia. Anything which relieves the latter, will prove beneficial in diabetes. This view alone can satisfactorily account for the large number of medicines said to have been successfully used in its treatment. Every individual case should be treated on its own merits, and attempts should be made to discover the cause or causes of alimentary toxæmia.

Spring waters containing Sulphur, probably in a colloidal condition and in a form not otherwise available in medicine, by their action upon alimentary toxæmia, are beneficial in Diabetes. In India, there are several springs containing Sulphuretted waters such as of Guhya Pani—near Dehra Dun—which are useful in Diabetes.

I have always laid stress on the exclusion of



meat from the dietary of the diabetic and the substitution of the vegetarian diet, in the treatment of this disorder.

It is very gratifying to me to find that such has been the experience of many medical men in the West also. Because vegetarian diet is better calculated to relieve alimentary toxæmia, therefore it should be the dietary of the diabetic.

### *Fasting.*

It is noticed that diabetic patients are improved by fasting. Of late, some physicians have been treating diseases by fasting. This fasting cure of course relieves alimentary toxæmia, and so proves beneficial in diabetes. Hence the importance of starvation and purgation in diabetes. There should be no over-indulgence in food.

### *Physical exercise for diabetics.*

Diabetics are benefited by physical exercise. This is also accounted for on the disease being considered a manifestation of alimentary toxæmia. Regarding the antitoxic action of exercise, Sir Thomas Lauder Brunton said in his Harveian Oration of 1894:—

“We are able to influence the circulation in muscles both by voluntary exertion and by massage, and we should expect that both of these measures would influence the constituents of the blood generally. Such, indeed, appears to be the case, for J. K. Mitchell [*A. J. of Medical Science*, May 1894] has



found that after massage the number of blood corpuscles in the circulation is very considerably increased. We can thus understand why exercise either of the body or its parts may increase its power to resist infective diseases."

### *Gastric lavage and douche.*

The cases of diabetes reported to have been benefited or cured by gastric lavage and rectal douches can only be explained on the theory of its being due to alimentary toxæmia. To my mind, no other theory so satisfactorily accounts for the symptoms and complications of this disease as this one.

Since Metchnikoff pointed out the part which intestinal flora play in the production of alimentary toxæmia, the alimentary canal has been mercilessly subjected to the knife of the surgeon. But the surgeon's knife is not essentially necessary to relieve the disorder.

### *The Importance of Yoga.*

The holy sages of India found out for themselves the curability of alimentary toxæmia by means which we may adopt even now, with great advantage. They evolved the system of *yoga*, the practitioners of which were said not only to attain longevity, but immortality. In recent years my brother, Rai Bahadur Sris Chandra Basu, who is well-known for his Sanskrit scholarship in almost every country of the civilised world, has kindled the interest of the public in the study of this system of Hindu



philosophy by his various writings on the subject. From the Introduction to his translation of the *Gheraṇḍa Samhitâ*, written more than twenty years ago, the extracts given below will show the importance of relieving alimentary toxæmia by methods practised by the votaries of *yoga*.

“Although it is not possible within the short space at my command, to give the rationale of *all* these practices, and to justify them to a doubting public, I shall briefly illustrate the advantages of some of them. Thus to begin with *Vâtasâra*. It is the process of filling the stomach with air, and expelling the wind through the posterior passage. The greatest duct or canal in the human body is the alimentary canal beginning with the œsophagus (throat) and ending with the rectum. It is some twenty-six feet in length. This great drain contains all the rubbish of the body. Nature periodically cleanses it. *Yoga* practice makes that cleansing thorough and voluntary. If the cleansing is incomplete, then the foetid matters putrify in the stomach and intestines, and generate noxious and deleterious gases which cause diseases. Now वातसार (*Vâtasâra*); by passing a current of air through the canal, causes the oxidation of the foetid products of the body; and thus conduces to health, and increases digestion. In fact, it gives a tone to the whole system. Similarly, वारिसार (*Vârisâra*) is flushing the canal with water, instead of air. It thoroughly purges the whole canal, and does the same work as an aperient or a purgative, but with ten times more efficacy and without the injurious effects of these drugs.”

The *Gheraṇḍa Samhitâ* describes the internal washing under the term of *Antar-dhauti*, as follows:—

“*Antar-dhauti* is again sub-divided into four parts :—*Vâtasâra* (wind purification), *Vârisâra* (water purification), *Vahnisâra* (fire purification), and *Bahiskrita*.”



It is not necessary here to quote any further from the Gheraṇḍa Saṃhitâ for the performance of the different processes mentioned above. Suffice it to say for our purposes that the sages of India thoroughly understood the dangers of alimentary toxæmia and devised means to efficiently combat the evil results of the same.

The aim of yoga is *samâdhi* or suspended animation. To attain to this stage, the body should be cleansed of all its impurities. The various processes described in works of *yoga* are meant to lead to this end. Thus the various *âsanas* or postures, mentioned in treatises of *yoga*, are calculated to prevent chronic intestinal stasis, by the occurrence of ptosis. The abdominal organs depend mainly for the maintenance of their positions on the support of the abdominal muscles. The different *âsanas* are so many exercises which develop the abdominal muscles, and thus reduce the possibility of the occurrence of ptosis to a minimum.



## DIETETIC TREATMENT OF DIABETES MELLITUS.

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It is with the present-day physicians customary to divide cases of Diabetes Mellitus into (1) the mild and (2) the severe forms.

Mild and severe forms of Diabetes Mellitus.

By chemical examination of the urine, as suggested by Gerhardt,\* and test diet such as that of Von Noorden,† attempts have been made to

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\* Gerhardt's test consists in the testing of the suspected urine with a solution of perchloride of iron ; if diacetic acid is present, then a claret coloration is produced, the intensity of which depends on the severity of the case. This reaction is also produced when salicylates, aspirin or antipyrin are voided by the urine. So these drugs should be discontinued before examining the urine to determine the form of diabetes.

† This is meant for the recognition and estimation of the assimilative capacity for carbo-hydrates. Von Noorden says :—

“Of all the foodstuffs, carbo-hydrates exert the greatest influence upon the glycosuria. It is essential in every case to determine the precise amount of carbo-hydrates which the patient can tolerate. We call this the *tolerating power* of the individual, \*\*\*

“I divide the foods into two groups :—

1. Principal articles of diet. These include substances which are practically free from carbo-hydrates. Foods and



distinguish the mild from the severe forms of the disease. The dietetic treatment is made to differ in these two classes. In the severe form it is said that a rigid anti-diabetic diet is not necessary. For my own part, I do not consider rigid diet necessary even for mild cases of diabetes. It is

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drinks of this group form the basis of the three meals a day.

2. Accessory articles of diet. These include substances which contain carbo-hydrates.

\* \* For the purpose of the test diet I always at first choose white bread, and of this I commence with 100 grammes per day, 50 grammes for breakfast and 50 grammes for lunch.

*Von Noorden's standard test diet.*

*Breakfast.*—200 grammes coffee or tea with one to two table-spoonfuls of thick cream.

100 grammes of hot or cold meat (weighed after cooking).  
Butter.—

Two eggs, with bacon.

50 grammes of white bread.

*Lunch.*—Two eggs, cooked as desired, but without flour; or any other *hors d'œuvre* free from flour.

Meat (boiled or roasted), fish, venison, or fowl, according to taste, about 200-250 grammes altogether (weighed when cooked).

Vegetables, such as spinach, cabbage, cauliflower, or asparagus; prepared with broth, butter or other fat, eggs or thick sour cream, but without any flour.

20 to 25 grammes creamy cheese; plenty of butter.

Two glasses of light wine or red wine, if desired.

One small cup of coffee, with one to two table-spoonfuls of thick cream.

50 grammes of white bread.



this craze for rigid diet which is responsible for much harm in this disease, since the withdrawal of carbo-hydrates from foods produces acid auto-intoxication. This leads to acetonuria, which is due to the removal of carbo-hydrates from the food.

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*Dinner.*—Clear meat soup, with egg or green vegetable in it.

One to two meat dishes, as at lunch.

Vegetable dishes, as at lunch.

Salad of lettuce, cucumber or tomatoes.

Wine.

No bread.

Drinks during the day (exclusive of wine), one to two bottles of ærated water.

“ The total urine excreted during the twenty-four hours is collected, that of the day and of the night separately, and is examined quantitatively for sugar. Both the percentage contents, and more especially the whole quantity of sugar excreted in the twenty-four hours, is noted.

“ Further investigations as to the quantity of acetone, oxybutyric acid, ammonia nitrogen, follow as a matter of course. If on this fare, the only carbo-hydrate contents of which are the 100 grammes of bread, no sugar is excreted, the quantity of bread is then gradually increased until sugar does appear in the urine. If, on the other hand, sugar is excreted with this test diet, the patient is at first kept on the same fare until the daily quantity of sugar excreted has become nearly constant. Then the quantity of bread is gradually diminished. \* \*

“ When the urine becomes free from sugar whilst there is yet bread in the daily fare, it is with a case of the so-called *slight form of glycosuria* that we have to do, and the testing has taught us at the same time how high the tolerating power of the patient is. \* \* The greatest differences occur in this respect, and it is only an exact knowledge of them which



The presence of acetone in the blood is mainly responsible for the occurrence of diabetic coma.

Recent years have seen something like a revolution in the dietetic management of diabetic patients. Not very many years ago, medical men, as a matter of routine practice, used to deprive their diabetic patients of all carbo-hydrate foods. This can be gathered from the long lists of articles of food which were allowed, and of those which were forbidden, to diabetics, by such eminent medical men as Dr. Pavy, Sir William Roberts and others. As specimens, the lists prepared by the two above-named physicians are reproduced below :—

PAVY'S.\*

<i>Sanctioned.</i>	<i>Forbidden.</i>
Butcher's meat of all kinds except liver.	Sugar in any form.
Ham, bacon, and other pre- served meats.	Wheaten bread and ordinary biscuits of all kinds.
	Rice, arrowroot.

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enables us to properly prescribe the diet regulations necessary for each individual.

"When it appears from these test examinations that the urine only becomes free from sugar when bread is totally excluded from the dietary, we have then to do with the *severe form of glycosuria*" (pp. 174-177).

The object of the test diet is to show if the sugar comes from albumins. There is no need to subject Indian diabetics to this test diet, for not only many of them are born vegetarians and teetotalers, and so will not partake the foods prescribed above, but acute cases of diabetes being rare in this country, most of them possess toleration for carbo-hydrates.

\* "Food and Dietetics," 2nd edition, 1876.



*Sanctioned.*

Poultry and game.  
 Fish of all kinds, fresh and  
   cured, including the crus-  
   tacea.  
 Animal soups, beef-tea, and  
   broth (not thickened).  
 Eggs, cheese, cream cheese,  
   cream butter.  
*Almond, bran or gluten sub-*  
*stitutes for ordinary bread.*  
 Greens, spinach.  
 Turnip-tops, watercress.  
 Mushroom, mustard and cress.  
 Cucumber, lettuce, endive.  
 Radishes, celery.  
*And the following only, in mo-*  
*derate quantity, after boiling*  
*in much water :*  
 Turnips, French beans.  
 Brussels sprouts, cabbage.  
 Cauliflower, broccoli, seakale.  
 Asparagus, vegetable-marrow.  
 Pickles, olives, vinegar, oil.  
 Jelly, flavoured, but not sweet-  
   ened.  
 Savoury jelly.  
 Blance-mange, made with  
   cream and not milk.  
 Custard, made without  
   sugar.  
 Nuts of all kinds, except  
   chestnuts.

*Forbidden.*

Sago, tapioca.  
 Macaroni, vermicelli.  
 Potatoes, carrots.  
 Parsnips.  
 Beet-root.  
 Peas.  
 Spanish onions.  
*Pastry and puddings of all*  
*kinds.*  
 Fruits of all kinds, fresh and  
   preserved.

*Beverages.*

Tea, coffee, cocoa from nibs.

Milk, except sparingly.



*Sanctioned.*

Dry sherry, claret, hock.  
 Dry Sauterne, Chablis, Burgundy.  
 Brandy and spirits, unsweetened.  
 Soda-water.  
 Burton bitter ale, in moderate quantity.

*Forbidden.*

Sweet ales, mild and old porter and stout, cider.  
 All sweet and sparkling wines.  
 Port wine, unless sparingly.  
 Liqueurs.

## SIR WILLIAM ROBERTS'.

Butcher's meat.  
 Poultry and game.  
 Fish.  
 Cheese.  
 Eggs.  
 Butter, fat and oil.  
 Broths, soups, and jellies made without meal or sugar.  
 Cabbage, endive, spinach.  
 Broccoli, Brussels sprouts.  
 Lettuce, spring onions.  
 Watercress, mustard-and-cress.  
 Celery.

*Substitutes for bread.*

Bran-cake, gluten bread (and meal), almond meal, rusks and biscuits.  
 "Torried" or charred bread.

All saccharine and farinaceous food.  
 Bread, potatoes.  
 Rice, tapioca, sago, arrow-root, macaroni, etc.  
 Turnips, carrots, S I S  
 beans and peas.  
 Liver (contains much sugar-forming substances), and therefore  
 Oysters } Containing  
 Cockles } enormous  
 Mussles } livers.  
 The "pudding" of crabs and lobsters.

All sweet fruits as apples, pears, plums, gooseberries, currants, grapes, oranges, etc.

*Beverages.*

Dry sherry, claret, bitter ale.      Port and all sweet wines.



*Sanctioned.*

Brandy and whisky (in small quantities).  
Tea, coffee (no sugar), chocolate (made with gluten meal), soda-water, bi-tartrate of potash water.

*Forbidden.*

Sweet ales and porter.  
Rum and sweetened gin.

Rice and potato which were altogether banned from the dietary of the diabetic, are now made by several practitioners the bases of their treatment of this disease. The argument for the withdrawal of carbo-hydrates from the diet was a very simple one. As the urine contains sugar, so, it was thought, the exclusion of those articles from diet which are converted into sugar in the system, would lead to the cure of the disease. Preponderance of proteids—specially animal flesh—entered into the dietary of diabetics. But this did not cure those cases.\* Extended experience has proved the

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\* Thus Sir Thomas Lauder Brunton says that he has found raw meat of great use in the *Treatment of Diabetes*, but has never succeeded in curing a case with it. He writes :—

“It seemed probable that the glycosuria in many cases of diabetes might depend upon the non-conversion of glucose into lactic acid, and it occurred to me that possibly, either by giving raw meat or a glycerine extract of it, I might be able to cure the disease. In a paper published in the *British Medical Journal* of February 21, 1874, I mentioned the result of this treatment in some cases in which I tried it at St. Bartholomew’s Hospital. In none of them was a cure effected, but in some of them there was temporary benefit. These cases were,



harmfulness of the reckless administration of flesh foods to diabetics.

Diabetics, as a rule, suffer from sub-normal temperature, and when they have fever, then their urine is generally free from, or contains a very small amount of, sugar. Fats and oils have been proposed as substitutes for carbo-hydrates in feeding the diabetic.

The food which a healthy person takes in the course of 24 hours represents between 2,500 and

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I believe, the first in which portions of a solid organ were administered for the purpose of supplying a ferment which would alter tissue change. Before that time only ferments obtained from the digestive canal had been used in medicine. " \* \* Encouraged by the success which attends this method of treatment by thyroid or other glands, I have again been trying raw meat in diabetes. The results which I have obtained are much the same as before. I find distinct amelioration of the symptoms, but I cannot say that I have yet succeeded in curing a case."—Brunton's *Disorders of Assimilation*, pp. 9, 10.

In the *Journal of the American Medical Association* for July 23, 1898, Drs. Reginald, H. Fritz and Elliot, P. Joslin, published an account of the treatment of diabetes during the past seventy-four years, based on 172 cases treated in the Massachusetts Hospital. According to them, the dietary ordered to diabetics during the period of high mortality, that is, from 1840 to 1855, was as follows:—

"Lean meat, with a small quantity of stale, dry or roasted bread, avoiding all fatty, farinaceous and saccharine articles. For drink, cold water and weak tea."

This clearly proves the harmfulness of meat in diabetes.



3,000 calories ; but the diabetic requires more, since he voids large quantities of urine containing sugar. One gramme of sugar representing about 4 calories, a loss of 300 grammes a day means that 1,200 calories have to be replaced. It is calculated that one gramme of proteid represents about 4 calories, whereas the same amount of fat about 9. So the diabetic losing 300 grammes of sugar a day by his urine has to take extra 300 grammes of proteid or 135 grammes of fat to cover his loss. Fatty foods should, therefore, be given by preference.

When the liver is affected, that is, when diabetes is due to liver disorder, food which does not undergo secondary digestion in that organ should be given. Fats, therefore, are very useful in diabetes, since the liver is not unduly taxed for their digestion.

Fats are, no doubt, our "sheet-anchor" in the dietetic treatment of cases of diabetes, for the production of sugar from fat has not been demonstrated. But fats cannot be given in very large quantities, or rather in isodynamic quantities as substitutes for carbo-hydrates.\* Moreover, it has been

**Acetonuria,**  
how produced.

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\* Dr. E. P. Cathcart of Glasgow University in a paper on "the role of carbohydrate in nutrition" in the *British Medical Journal* for September 19, 1914 writes :—

"When we consider carbohydrate we find, in man at least, that still less of the carbohydrate in a diet can be replaced



found that ingestion of certain kinds of fats often leads to acetonuria.

"Gelymuden was the first to call attention to this relation, for he demonstrated that the ingestion of butter led to an increased excretion of acetone. This author assumed that the acetonuria in this instance was due to the effect of free fatty acids, and Waldvogel, Hagenburg, Schwarz, Mohr and Lob and others could also determine that the ingestion of free fatty acids, as for instance, butyric acid, led to an increased elimination of acetone in the urine and in the expired air. The same effect, however, is also exercised by the neutral fats, although not to such a degree."\*

How the deprivation of carbo-hydrates produces acetonuria is not as yet fully understood, although the above-named authors have attempted the following explanation, when they say :—

"The phenomenon of acetonuria, with its many modifications.

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by fat. The organism demands that there be a constant supply of carbohydrate circulating in the body fluids; even in advanced starvation, the glucose content of the blood varies but little from the normal."

As a result of certain experiments, he states that :

"The definite psychical effect of the taking of carbohydrate after the prolonged use of a fat diet was particularly well marked; the subject, within an hour or two, was bright and cheery, whereas previously he was dull and heavy, at the same time the feeling of physical debility and tiredness disappeared."

"Now, carbohydrate may be regarded as the currency which is readily available, and fat the security, but a security which cannot apparently be so fully liquidated as to take its place as a universal currency."

\* 'Acid Auto-intoxication,' by Prof. S. Carl Von Noorden and S. Mohr (1903), pp. 25 and 26.



becomes quite comprehensible if we assume that acetone is a synthetic product derived from certain bodies that contain few carbon atoms and that may be derived from different sources.

"Normally, the fragments of the proteid and fat molecules that contain few carbon atoms undergo further oxidation, but only, as has been repeatedly emphasized, if a sufficient quantity of carbo-hydrates is present. This is probably due to the fact that the carbo-hydrates contain so much oxygen. A portion of this oxygen is presumably liberated when the carbo-hydrates undergo metabolism and is used for the oxidation processes. That the effect of the oxygen must be of a peculiar kind, is demonstrated by the fact that there is no lack of respiratory oxygen in diabetes. One might imagine that the influence of the carbo-hydrates is a constant effect, exercised by the oxygen *in statu nascendi* that is liberated within the cell."\*

The same authors write :--

"Some authors recommend adding carbo-hydrates or substances that are similar to carbo-hydrates to the diet, for in this way, it is argued, the acetonuria is decreased, while at the same time glycosuria is not greatly increased. A substance answering this purpose would seem to be levulose. Unfortunately, however, as Von Noorden has repeatedly shown, this sugar is useful only in mild cases, for, in the more severe cases, levulose seems to increase the glycosuria as much as other carbo-hydrates (amylum, etc.) In severe cases, on the other hand, levulose presumably exercises the same effect on the glycosuria as starch, and the latter substance is more useful, because it offers more variety to the patient and is more agreeable to take than levulose. For these reasons, we employ levulose in those cases in which we desire a very rapid result, and in cases in which—as for instance in incipient coma—only a liquid diet can be given. Under these circumstances, levulose frequently exercises a very excellent effect and aids in warding off impending danger."

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\* Locum Cit., pp. 71-72.



In recent years, vegetarian diet (especially, carbo-hydrates) has found favour with a very large number of medical men. Flesh foods are not considered so absolutely necessary in feeding the diabetic, as they were formerly.

**Vegetarian diet for diabetics.**

It is a fact that diabetic patients who are vegetarians live longer than those who are meat-eaters.\*

**Harmfulness of flesh foods in diabetes.**

In a paper on "Diabetes in India," written several years ago, I attempted to account for this by the fact that the kidneys are not so often disorganised amongst vegetarians as they are amongst meat-eaters.† Extracts from this paper are given below :—

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\* Diabetics require more potassium Salts than healthy persons. Therefore, they should be given vegetables rich in such salts.

"Robin (*Bull. de L'Acadde Med.* ; No. 23 of 1895) recommends the food to be well salted on account of the loss of inorganic salts in diabetes ; to supply potassium salts he advises green vegetables, especially cabbage and endive, and also a weak solution of potassium tartarate to dilute the wine taken at meals : and, to counteract the loss of phosphates of magnesium and calcium, he prescribes glycestro-phosphates of lime and magnesia. He also recommends bouillon on account of the inorganic salts which it contains." (*B. M. J. Epitome*, 10-8-1895, p. 23.)

† When I wrote this paper in 1898, I did not fully understand the rôle which alimentary toxæmia plays in the causation of the disease. Of course kidney troubles are not so common amongst the residents of India as they are in cold countries and amongst meat-eaters.



## DIABETES IN INDIA.

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“Almost every practitioner in India comes across cases of Diabetes Mellitus lasting for ten, fifteen, and, in some instances, even twenty years.

“Whether we regard diabetes as a manifestation of some morbid condition of the liver, the pancreas, or of some portion of the nervous system, it cannot be denied that the kidneys also share greatly in pathological changes in the course of this disease. Death in diabetes, if not brought about by some complications, such as pneumonia or phthisis, is almost always due to the kidneys not discharging their functions properly. The closing scenes in diabetes always point to the mischief in the renal apparatus.\*

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\* Some of my critics did not look with favour on this statement of mine. But the medical profession of late is coming round to share this view, expressed by me as far back as 1898. Thus Mr. C. B. Lockwood in a lecture on “amputation for diabetic gangrene,” reported in the *Lancet* for February 10, 1912, says:—“When the urine has renal casts in it the kidneys are gravelly and permanently diseased and may not continue to function. Some who are supposed to die from diabetic coma, may have died with uraemic poisoning.”



“ If we bear this fact in mind, we shall be able to understand the longevity of diabetic cases in India, and also to rationally treat the disease.

“ In the first place, kidneys have not to perform so much work in India as in Europe and other cold countries. The chief function of kidneys is to remove impurities from the blood. In India, the skin largely shares in discharging this function, and so the whole strain is not put on the kidneys.

“ In the next place, kidney disease is not so common amongst Indians as amongst Europeans. This is due to Indians being accustomed to the vegetarian diet, which is non-stimulating, and also to their eschewing alcoholic beverages. Alcohol-consumers have to pay the penalty in diseased kidneys.

“ The marvellous residual kidney power of the natives of India is the key-note of the longevity of cases of diabetes amongst them. They retain their kidney power unimpaired, from their vegetarian diet and non-alcoholic drinks and also the fact that they keep the pores of their skin open by frequent baths.

“ Not losing sight of the fact that in diabetics, kidneys are sooner or later diseased, our course of treatment should be such as not to throw undue strain on them. In the treatment of diabetes, the

Residual kidney power of Indians.

Kidneys should not be unduly taxed.



regulation of diet plays the most important part. With many practitioners, the administration of animal food is the chief treatment of diabetes. They believe that such food is not converted into sugar and that thus the cure of diabetes is to be hoped for. The reckless prescription of animal food has been often followed by serious consequences. The writer has known practitioners giving animal food to diabetics who had never tasted flesh before. The patients, instead of improving, sank rapidly and died. It has not been proved that animal food checks the course of the disease. Such being the fact, its use should not be insisted upon in the case of those who are not accustomed to it. Moreover, meat diet is not the proper thing for patients suffering from any renal disease. This diet throws undue strain on the kidneys, hence it should be very cautiously given to diabetics.

“From vegetable diet, on the other hand, much good is to be expected. It is non-stimulating, and does not throw unnecessary strain on the kidneys. Of course, such vegetables as are rich in starch and sugar should be excluded.\* In India,

Why vegetable diet is beneficial in diabetes.

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\* We cannot, however, pass over the unique experience of Professor Pietro Lupo of Naples, who has reported, in the *Canadian Practitioner*, for February 1898, cases of diabetes completely cured by exclusively vegetable diet. In the vegetable dietary he excluded nothing—all edible soups,



where the people are chiefly vegetarians, diabetic patients should be prescribed vegetarian diet.”\*

In diabetes, there are skin affections, as boils and carbuncles, brought about by the blood wanting in proper alkalinity. To make it properly alkaline, vegetable diet is of paramount importance. Vegetable salts keep the blood alkaline.

Residents of Europe and America who are mostly meat-eaters, suffer from constipation and other ailments which are due to it. It is a well-known fact that the thirst of the diabetic is increased by constipation. Vegetarian diet not only keeps the bowels regular and thus relieves constipation, but by its containing a large amount of water does not make one feel so thirsty as meat diet does. For the relief of the thirst and constipation of the diabetic, vegetarian diet is indicated.

peas, beans, saccharine fruits, including the grape. He says that, after two months of the vegetable diet, the urine showed a complete absence of sugar. However, it is a safe rule in practice not to allow such vegetables to diabetics as are rich in sugar or sugar-forming elements, because large consumptions of them produce fermentation, thus resulting in alimentary toxæmia.

\*As said before, diabetes is a manifestation of alimentary toxæmia. Kidney diseases are set up in the course of the latter. Anything which will relieve toxæmia will prevent renal mischief. Hence the importance of vegetarian diet in the treatment of Diabetes.



All the above show the necessity and value of vegetables in the dietary of the diabetic.\*

Formerly all kinds of meat (except sweetbread and liver), fish, poultry, game and eggs were considered good for diabetics. But shell-fish, containing a large amount of carbo-hydrates, were forbidden. Animal food, for reasons stated above, should be, as far as possible, withheld from the dietary of diabetics.† However, those who are accustomed to it, may be allowed to partake of it in moderation. For them, fish especially will be found very useful. Bread made from fish roe may also be given with advantage. This is made from the roe of fresh water fish, being dried and ground and then cooked in the usual fashion.

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\* Dr. Arany writes :—

*Vegetables* should be diabetic's principal article of food, (1) on account of their proteids being better tolerated by the patient than those of animal food ; (2) because they are very good carriers of fat ; and (3) owing to their filling the patient's stomach up, whereby the diabetic's stomach hunger gets more satisfaction than if an amount of meat, corresponding with the calories of the vegetables, were ingested by him." [*The Lancet* for March 29, 1913, p 886.]

† Professor Chittenden's experiments have shown the harmfulness of giving, even in health, large quantities of albuminous food-stuffs. In a disease like diabetes where the general tone of the system is below par, the reckless administration of proteids—especially animal foods—cannot prove beneficial.



According to Von Noorden, "feeding with casein is associated with the most marked degree of glycosuria, then follow that resulting from the proteids of the leguminosae (peas, lentils, beans). Egg albumin and the albmin of cereals (wheat, rye, rice, oats) have the least power of producing glycosuria. In severe cases of diabetes one must bear this experience in mind, and absolutely forbid casein and also limit the quantity of meat that may be eaten." ('Diabetes,' p. 75).

Milk is very useful in diabetes; so much so that there is the system known as Milk in diabetes. milk cure of diabetes. In this system, which was much practised by Dr. Scott Donkin, the food is limited to *skimmed* milk. At first the patient takes four to six pints in 24 hours, gradually increasing it to 12 pints. Part of this milk is converted into curds and whey, and taken as such. According to Dr. Donkin, by placing a patient on milk diet, sugar entirely disappeared from the urine, at the end of a fortnight.\*

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#### \* THE SKIM-MILK TREATMENT OF DIABETES.

"The skin-milk treatment of diabetes and Bright's disease was suggested by the late Dr. Arthur Scott Donkin in a book under this title published by Longmans Green & Co. in 1871. He considered it suitable for all but the very worst cases. He administered it in the following manner: On the first day of treatment half a tea-cupful of skim-milk every two or three hours; on the second day, double the quantity at the same



But this exclusive milk diet has not found favour with the medical profession generally.\*

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intervals ; on the third day, half a pint at intervals of three or four hours ; on the fourth day, four pints may be given : on the fifth or sixth, five pints and, if borne well, the quantity may be raised to six, seven, or even, in patients of large frame and keen appetites, to nine pints. In some cases he gave curds in addition. The milk may be given cold or warm : every other article of food must be strictly prohibited, although occasionally tea or coffee was allowed. The general experience of other authorities has not been favourable to this plan of treatment. The late Sir William Roberts said : " Three chronic cases I know of, in which the treatment was obstinately persevered in, died from exhaustion." Dr. W. H. Dickinson writes : " Of two diabetic women thus treated in St. George's, one died on the second day, possibly partly from the effects of the journey to the hospital ; the other slowly sank under the process, and owed her death in all probability to it ; with these experiences I have myself forborne the practice." The late Professor Frerichs condemned it, and Dr. Ralfe spoke of it as only suited to the gouty type. Professor Saundby, in the first edition of his *Lectures on Diabetes*, printed a table to show that this diet is one on which patients may lose weight while the amount of sugar is not reduced. Finally, it is not in accordance with the modern principles upon which the treatment of diabetes is based ; these recognise that each diabetic patient has an individual capacity for the assimilation of carbo-hydrate food, and that the problem which the physician has to solve is to determine this quantity for him and to construct a diet containing only as much carbo-hydrate as he can utilize.—*The British Medical Journal* for 12th November, 1904.

\* " I consider milk to be counter-indicated at all periods of the disease and, like Frerichs have always seen the sugar



Milk contains four per cent. of sugar and a very large amount of water—which, it is said, makes the condition of the diabetic worse. But, on the other hand, it contains a large quantity of fat and albumen which cannot but benefit diabetics. So cream may be given with great advantage to them. It contains less milk-sugar, and a large amount of fat.\*

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in the urine greatly augmented under its influence. (Germain See's *Du Regime Alimentaire*, p. 522.)

Milk is not easily digested by many. It produces flatulence which is a very common cause of alimentary toxæmia. It is advisable, therefore, not to prescribe it indiscriminately in all cases of diabetes.

\* "I reject milk entirely from the dietary of the diabetics. I have always seen in diabetics who have drunk milk the amount of sugar in their urine increased by it." (Dujardin—Beaumetz's *L'Hygiene Alimentaire*, p. 178.)

On the other hand, Dr. Haig writes of the case of a diabetic patient that "by increasing the milk I appeared to be able to ward off the coma. It has also been pointed out by Maurel (*Bull Gen de Therapeutique*, 1897) that milk diet wards off both "the gangrene and coma of diabetes." [*Uric Acid*, 6th Edition (1903), p. 678.]

Ettinger (*Sem. Med.* March 26th, 1897) treated patients with chronic myocardities, albuminuria, generalised gout, dyspepsia, etc., with milk diet, with great success, and concludes that milk is not so injurious as is supposed. It is far from certain that lactose generates glycosuria in all cases of diabetes, though it has been shown to do so in coma. Bouchard has shown that all generators of glycogen do not have an equal action. There are carbo-hydrates that seem to have little influence on glycosuria, such as levulose, inulin and



Curds of milk, in which sugar has been partly converted into lactic acid, are useful in diabetes. *Koumiss*, *kefir*, *laben* and those preparations of milk in which the sugar is got rid of by fermentation may be prescribed with advantage to diabetics.\*

It is also said that lactic acid ferment destroys sugar.

Whey is useful in diabetes, because it relieves alimentary toxæmia. It is on that account that Metchnikoff attributes the longevity of Bulgarian peasants who consume large quantities of this food.

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mannite, which have often been used without ill-effect. It is, however, certain that the same carbo-hydrates produce different effects in different persons. Certainly the rule is that the groups of sugar which deviate polarised light to the left are less injurious than those that deviate it to the right. Ettinger has shown that milk may be invaluable in some cases of diabetes, and that its prescription should depend, not on a general theory, but entirely on the individual case.

\* *Koumiss substitute.*

To prepare a substitute for Koumiss from cows' milk, the *Ap. Zeitung* gives the following directions: Dissolve 15 gram. ( $\frac{1}{2}$  oz) of grape sugar in 120 cubic centimeters (3 fl. oz) of water. Mix 1·2 grain. (18 grain) of well-washed and pressed bear yeast with 60 cubic centimeters (2 fl. oz.) of cows' milk. Mix the two liquids in a champagne bottle, fill with milk, stopper securely, and keep for three to four days at a temperature not exceeding 10°C. (50°F.) shaking frequently. The preparation does not keep longer than four or five days.—  
[*Scientific American Cyclopedia of Receipts.*]



In Europe, the importance of whey as an article in sick dietary has been recognised only in recent years ; but Hindu physicians knew its usefulness so well, that they compared it to nectar or water of immortality.\*

\* In one of the medical works of the Hindus, it is stated :

न तक्रसेवी व्यथते कदाचन । न तक्रदग्धाः प्रभवन्ति रोगाः ॥  
यथा सुराणाममृतं सुखाय । तथा नराणां भुवि तक्रमाहुः ॥  
निशान्ते च यत् पिवेत्तोयं तत्तोयं नेत्रवर्धनम् ।  
भोजनान्ते यत् पिवेत् तक्रं तत् तक्रममृतोपमम् ॥

*Utilisation of Whey for Dietetic Purposes.*

Whey is allowed to stand in a suitable vessel for from 2 to 6 days at the ordinary temperature, until it has attained the desired degree of acidity, as is ascertained by testing portions of the liquid from time to time ; and the clear liquid is then drawn off and heated to a temperature of 170° F. The dissolved proteins are thus coagulated and are separated ; after being washed, the coagulum may be dried, powdered, and used as a food. The clarified whey is then bottled, while it is in a hot and sterile condition. If desired, the whey, after bottling, may be inoculated with a quantity of a culture of lactic acid bacilli, in order to increase the acidity ; this result is aided by the addition of a small quantity of dextrose, and the bottles may be closed before the fermentation is completed, so that an ærated beverage is produced. An alternative method consists in treating the fresh whey with a sufficient quantity of hydrochloric acid to precipitate the proteins when the mixture is heated to 170° F. The coagulated proteins are then removed, and the solution is inoculated with lactic acid bacilli [*Eng. Pat.* 23, 127, October, 11, 1909, *J. Ch.* I. 30-11-1910, p. 1327].

The acid may be concentrated under atmospheric or reduced pressure, so as to form a syrupy liquid or a solid mass. The



Artificial milk, from which sugar has been removed, has been suggested for diabetics.\*

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solid product may be ground and the powder pressed into the form of tablets. Or, the whey may be sprayed into a current of air having a temperature of about 300° F., and the finely divided dry powder thus obtained pressed into tablets.

*A New Method of Preparing Whey.*

Treat 300 CC., cold milk with 6 CC. 50 % tartaric acid. Stir well. Coagulation is instant. Let stand 2 minutes and filter in graduated cylinder, pouring back the first portions until a clear filtrate is obtained. Determine sp. gr. at 15° of the first 60 CC., filtrate by means of a Quevenue lactometer. Tables for correction to be made when sp. gr. is taken at other temperature are given. 20-25 minutes only are required for making this test. 90 % of adulteration with 5 % water can be easily detected. The sp. gr. of the whey lies between 1028 and 1030. *Chemical Abstracts*, for May 10, 1914 ; p. 1625.

\* There are several methods of preparing artificial milk. According to Dr. R. T. Williamson :—

“Four table-spoonfuls of cream are added to a pint of water, and well-mixed. The mixture is allowed to stand in a cool place. At the end of 12 hours the fat of the cream, which will have floated to the surface, can be skimmed off with a tea-spoon. On examination, this will be found to be practically free from milk-sugar which will remain dissolved in the pint of water. The cream fat is skimmed off the surface of the water in the first vessel and then placed in another vessel, and to it are added water, the white of an egg, a little salt, and a trace of saccharin (if desired). A palatable artificial milk can thus be prepared. This milk may be allowed freely in all forms of diabetes. (The egg albumen may be omitted, according to the patients' taste.)—*The Practitioner* for April, 1906, pp. 494-495.



Fats, as said before, are our sheet-anchor in the dietetic management of diabetes. These may be derived from the animal or the vegetable kingdom. Butter, cream, cheese, yolk of eggs, bone-marrow, vegetable oils,

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*The Journal of the Society of Chemical Industry* for 15th September, 1905, gives an account of English Patent 17,318 of August 16, 1904, for the production of *Milk free from sugar*. The cream is separated from the milk by centrifugal action and washed, the casein is precipitated by acetic acid, filtered off, washed and redissolved in a dilute alkaline solution; this casein solution is recombined with the separated cream and the necessary salts are added. These salts consist of a soluble calcium salt, such as calcium chloride, sodium chloride, and a soluble phosphate, such as sodium phosphate; the desired sweetness is imparted by the addition of "crystallose," the sodium salt of methyl-saccharin. This sugar-free milk can be sterilised at 100°C. without coagulation.

A German Patent 202,468, dated January 1st, 1908, taken by I. Bonma and S. B. Selhorst, for the preparation of milk free from sugar is described in the *Journal of the Society of Chemical Industry* for December 15th, 1908, page 1172.

"Milk is freed from fat by treatment in a centrifugal machine, the cream is washed with water till free from milk-sugar, and again treated in the centrifugal machine till of the same water content as at first. The skim-milk is treated with carbon dioxide under a pressure of 25-30 atmospheres to precipitate the casein which is separated, washed, and dissolved in dilute sodium hydroxide solution. To the solution a saturated solution of monosodium phosphate is added until the mixture has an amphoteric reaction, and then, after addition of some sodium chloride and "crystallose" the liquid is mixed with the separated cream."



nuts and other oleaginous seeds may be very usefully given to diabetics. But it is necessary to remember that fats without the addition of carbohydrates may produce acetonuria. Regarding butter, the authors of the monograph on "the Acid Auto-intoxication" say :—

Butter gives the highest values for acetone excretion of all the fats that we eat. Von Noorden has called attention to the fact that this deleterious influence that large quantities of butter exercise can be reduced if the butter is first thoroughly washed with cold water ; for in this way the lower fatty acids are removed and they exercise the greatest influence on the acetonuria. If the butter is thoroughly washed, quantities as large as 180 or even 200 grm. can be given without causing any appreciable increase in the acetone excretion, and we will hardly ever be tempted to give more fat than this.\*

Clarified butter, known as *ghee*, can be given with more safety than butter.

In his monograph on Diabetes Mellitus, Noorden says :—

"The question as to whether fats also play a part in the formation of the sugar is a much more difficult one to answer. For the one component of fat—the *glycerin*—the question may be at once answered in the affirmative. \* \* \* Glycerin increases glycosuria, both in severe cases of diabetes in man and in dogs after extirpation of the pancreas. *Lecithin*, which contains a fair amount of glycerin, behaves in the same way." (p. 75).

As said before, the importance of carbohydrates is now recognised, and they are not withdrawn from the dietary

Use of carbo-hy-  
drates in diabe-  
tes.

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\* L. C., pp. 73-74.



of diabetics, as it was customary to do not very many years ago.\* Several methods of diabetic cure by means of different carbo-hydrates are now practised. But, before describing these different cures, it is necessary to allude to the fact of there being a larger excretion of sugar in the morning hours than at any other time of the day. There is, at present, no satisfactory explanation of this phenomenon. Dr. Naunyer's explanation is "that in the empty intestines the introduced Carbo-hydrates more quickly digest and absorb, and so the diabetic organism is supplied with more sugar at once than it can assimilate." But Dr. Haig contends against this, and says that sugar follows the uric acid, rising when it rises, and falling when it falls, and so there is a larger excretion of sugar in the morning hours when the

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\* Falkenstein (*Wien Med. Presse*, 1905) draws a parallel between gout and diabetes. According to him, in gout there is deficient secretion of gastric juice, so in diabetes pancreatic secretion is defective or absent. The cell in gout is unable to oxidize completely nitrogenous material ; in diabetes carbo-hydrate metabolism is at fault, the intermediate product of oxidation being not uric acid, but sugar. If this is true abstention from carbo-hydrate food, though it may lower the percentage of sugar in the urine, withdraws? from the body useful food, without influencing the disease. Treatment should be directed in diabetes, not to the withdrawal of all possible forms of sugar in the food, but to sources remedying the deficient pancreatic digestion and stimulating the metabolism of the cell.



excretion of uric acid is large. Be the explanation what it may, this phenomenon has an important bearing in regulating the diet, in reference to time of day. Carbo-hydrates may be withheld, if possible, or given in very small quantities to diabetics during the morning hours.

In recent years, some articles of food, rich in carbo-hydrates, have been recommended by different medical men as specific cures for diabetes. These are known as (1) Oatmeal cure ; (2) Potato cure and (3) Rice cure. These seem to be based on the principle enunciated by Von Noorden's school that " the most efficient means for combating acidosis in diabetes is the abundant administration of carbo-hydrates."\*

Oatmeal cure. (1) The author of this is Von Noorden. It is carried out as follows :—

" The patient for one or two weeks eats nothing but oatmeal gruel daily, 250 grm. of oat flour, 250 to 300 grm. of butter, 100 grm. of Roborat or of some other vegetable albumen ; this mixture is prepared as a soup and given at intervals of two hours. It is a remarkable fact that on this diet the excretion of sugar, almost without exception, falls below the quantity that was excreted on a mixed diet free from carbo-hydrates." (*Ibid*, pp. 74-75.)

Dr. S. Strouse has recently reviewed in *The Interstate Medical Journal* of April, 1912, the literature on the Subject for oatmeal cure. According to

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\* *The Acid Auto-intoxication*, p. 74.



him, it is not advisable to employ it in mild cases. This treatment diminishes the acidosis, and is thus beneficial in severe cases of diabetes.\*

I have not tried the oatmeal cure. In this country, at least in the Upper Provinces, oatmeal is not generally used as a food by the people, but is given to horses for fattening purposes. There is prejudice against using it and living on it for days together—which is the method advised by those who advocate its use.

(2) Potatoes were, and still are, forbidden by many to the diabetic. Yet it is a remarkable fact that its use has been recommended by many in diabetes.†

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\* But it has been suggested by Drs. O. J. Williams and P. Mildred Powell, in a paper on Diabetes Mellitus which they read before the Liverpool Medical Institution on 7th March, 1912, "that there may be some part of the potato, of oats, and of rice which has a specific action on metabolism, and which, if it can be isolated from the cereals or from the preparations of diastase, may prove to have specific action in the treatment of diabetes." [*The Lancet*, March 16, 1912, p. 728].

† Sir Thomas Brunton writes :—

"In my opinion it is not advisable to remove carbo-hydrates entirely from the diet. If you do this, you find the patients, as a rule, suffer very much, and that they practically get such a craving for carbo-hydrates that they will have them in spite of your prohibitions, whereas, if you allow them a limited form you may get your patients to stick to the diet as you restrict it, and it is much better that they should take the diet which you have laid down for themselves. Diabetics, as a rule,



An editorial in the *British Medical Journal* for January 18, 1902, p. 160, states that the value of potatoes, as a substitute for bread, was recommended in small quantities by several authors, such as Dujardin, Beaumetz, Kuelz, Saundby, and others. But M. Mosse, in his communications to the French

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complain very bitterly of their diet, and say that it becomes so distasteful to them. You may allow a little potato, if it be given in the form of potato chips. A single potato cooked in this form may be made to fill almost a whole dish. It must be cooked, however, in one particular way, and this is the way. You must have a large deep pan, not a frying pan, but a pan six inches deep, and this should be nearly full of oil or grease; dripping is as good as any other kind of fat. You put this on the fire, and it comes as you think to the boil, but this boiling is quite delusive. You let it go on boiling, and all the water that is mixed with the dripping boils away, and, finally, in place of the apparently boiling liquid, you get liquid with a perfectly smooth still surface, which is not boiling at all, and then is the time you are able to cook your potatoes. They should be cut in very thin shavings indeed, and should be then thrown into this practically boiling fat. When I say boiling, I mean this very hot fat which does not appear to boil. They are then quickly taken out, and under the influence of the great heat they become firm and crisp upon the surface, and the fluid that they contain is boiled within these crisp surfaces by the heat, so that they are blown out, and each little shaving of potato, which was originally as thick as a bit of cardboard, is now about three-quarters of an inch thick. These potato chips may be used in cases of diabetes, and you will find that the patients are very fond of them as a rule, and they are enabled to get down a quantity of food that they could not otherwise take.—”

[Brunton's *Disorders of Assimilation*, &c., pp. 54-55.]



Academy of Medicine, goes still further in the use of potatoes in considerable quantity, as much as three pounds being allowed daily. He describes a number of cases which were placed on this diet to show that, as compared with the equivalent quantity of bread, their use was followed by a decrease in the amount of the glycosuria, polyuria, and thirst; also marked improvement in general health. In only one case were the results unfavourable. It has been shown that diabetics can take 3,000 grains daily in the form of potatoes, without eliminating more than 500 or 600 grains of glucose in the urine. Mosse ascribes the benefit of the potato diet to the alkaline salts, especially potassium, contained in the potato.

Sir James Sawyer, in his article on "Improvements in dietetics of diabetics" in the *British Medical Journal* for March 5, 1904, p. 537, states that the permission of potatoes in the food of diabetics is one of the greatest dietetic advances of our times. Cooked in any of the ordinary ways, they are a grateful food, but they should be cooked by steaming with the skin on. He proposes that the bread difficulty in diabetics be met by using the "flour" of properly cooked potatoes instead of the flour of grain.

He writes:—"I find that excellent and delicious baked cakes can be made from paste composed of a



kind of flour prepared by rubbing down potatoes cooked with their coats on by steaming, blended with cream and butter." Then he gives the following details for the making of these new biscuits and bread for diabetics:—

"*Bran and Potato Bread.*—Take half a pound of flour of steamed potatoes, quarter of a pound of bran, half an ounce of German yeast, half an ounce of butter, one egg. Twenty-four hours before making the dough, cook the potatoes by steaming them in their "jackets," then peel and break up into flour with the fingers. Mix all ingredients together, and let the paste stand near the fire for an hour to "rise." Bake in greased tins for an hour and a half."

According to Fitcher (*Maryland Med. Journal* for October 1904) potato starch improves such other symptoms of diabetes as thirst, neuralgia, etc., and that it not uncommonly produces tolerance for carbo-hydrates. He recommends that potatoes should be given baked.

I have tried potato cure in some cases of diabetes. But if it did not do any harm, it did not appear to do much good to those who were subjected to this treatment. As stated before, there are many people who attribute the prevalence of diabetes to the introduction of potatoes in this country. For reasons stated there,



potatoes should be withdrawn from the dietary of the diabetic.\*

Rice cure. (3) Rice cure has also been recommended by Duering.

The Hindu physicians of Bengal use a preparation of rice with *ghee* and milk which they give to diabetics. This preparation is called in Bengali *choru*. I have seen and known cases of diabetes benefited by this food.

The beneficial effects of rice cure are very easily accounted for; of all the cereals, it is the one which taxes the kidney least and because its consumption in moderation does not produce alimentary toxæmia. Some time ago, the *Herald of Health* summarized the facts on which the claims

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\* It is necessary to mention here that oatmeal and potato cures have not found favour with the majority of English physicians. Thus Dr. J. Rose Bradford, writing on Diet in Diabetes in "*A system of Diet and Diabetics*," edited by Dr. G. A. Sutherland, says:—"Potatoes and oatmeal are very suitable kinds of carbo-hydrates to give in certain forms of diabetes, inasmuch as it is so usual to take them with large quantities of fat, either in the form of butter with potatoes, or cream with porridge. \* \* there is no reason for thinking that either potatoes or oatmeal contain carbo-hydrates that are less prejudicial to the diabetic than bread and other carbo-hydrate foods." (p. 450).

For my own part, I strongly urge the exclusion of the potato from the dietary of the diabetic in India, because the precaution of *non-exposure to light* is not taken by potato cultivators in this country.



of rice to be the world's greatest food are based, as follows :—

“1. Rice is the staff of life for nearly two-thirds of the world's inhabitants.

“2. Rice is the most easily digestible of all foods ; it digests in less time than any other food.

“3. Rice is the most easily utilized of all foods, taxing the body least, in both digestion and elimination. Food such as corn and other cereals contain five to twenty-five times as much as does rice of the irritating potash salts of which rice, of all foods, contains the least. (Bunge.)

“4. Rice is the best food for sore and feeble stomachs. (Bunge.)

“5. Rice should be the chief food of persons suffering from Bright's disease. (Bunge.)

“6. Rice is the most antitoxic of all cereal foods, and hence the proper food for persons suffering from “biliousness” and other forms of intestinal auto-intoxication.

“The sturdy Japanese rice-eater, whether piloting a warship on the Pacific, digging a canal at Panama, fighting the Russians among the snows of Manchuria, or tilling his fields at home, is far better fed than the beef and potato eating Englishman or American. We may well learn a lesson from the Orient in the matter of diet.”—*Herald of Health*.



But then rice should not be over-polished,\* and there should be proper methods in its cooking. Only so much water is to be put in the rice to be boiled as will suffice to cook it. To strain off the thickened rice water, after cooking, is not the Japanese practice nor of the sturdy cultivators of Upper India.

Bread being also a carbo-hydrate was (and is) under the ban of many medical men; and so, many substitutes for ordinary bread were recommended for diabetic patients. Dr. R. T. Williamson has classified the most useful of these bread substitutes as follows:—

“1. Prepared from vegetable albumens:

Roborat bread. Aleuronat cakes. Gluten bread.

2. Prepared from nuts:

Almond cakes. Cocoa-nut cakes.

3. Prepared from milk albumens:

Plasmon powder and biscuits. Protene bread and biscuits. Casoid bread and biscuits. (Kalari and pro-lacto biscuits.)”

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\* Dr. J. Walter Leather, Imperial Agricultural Chemist, writes:—

“The meals and broken rice are, chemically, the best foods, and the polished rice contains less oil, proteids, and phosphorus. Consequently one is apt to condemn the polishing process. But the consumer holds that one cannot cook unpolished rice, which concludes the argument! It follows that rice should be consumed in conjunction with other grain, particularly pulses, which indeed is very commonly the case.”

[Annual Report of the Board of Scientific Advice for India, for the year 1913-14, p. 13].



Gluten bread was formerly very extensively used in the dietary of the diabetic. But it has fallen into disuse, because it is unpalatable, expensive, and by no means free from starch. Bread made of almond flour, cocoa-nut flour, *besan* or flour of several varieties of *dâls*, which are not only palatable and inexpensive, but contain less amount of carbo-hydrate than gluten, could be very advantageously used as substitutes for ordinary wheaten bread, if so desired.

Speaking of bread, it is necessary to remember what Dr. William Prout said in his work on 'The Nature and Treatment of Stomach and Renal Diseases,' regarding the use of bread in diabetes. The present classification of food-stuffs originated with Dr. Prout, and in his time he was considered a great authority on all questions relating to Food and Diet in health and disease. He wrote:—

"Bread, therefore, made with undressed flour, or even with an extra quantity of bran, is the best form in which farinaceous and excremental matters can be usually taken in most of the varieties of dyspepsia, accompanied by obstinate constipation. This is a remedy, the efficacy of which has been long known and admitted; yet, strange to say, the generality of mankind choose to consult their taste rather than their reason; and by officiously separating what nature has beneficently combined, entail upon themselves much discomfort and misery."\*

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\* "For some time past, I have recommended as a substitute for bread in diabetes, a compound of bran, eggs and milk,



But it is not always necessary to make use of bread substitutes for diabetics. Most of them can

which, if properly prepared, is not unpalatable. The late Rev. J. Rigg, to whom this *bran-bread* was recommended, took much pains to perfect the process, and the following, with some slight variations, is the method he finally adopted :—

“The bran in the first place is to be reground, or the coarser portions separated by sifting. It is then to be diffused through cold water, and permitted to stand for a short time so as to allow all the heavier portions, and particularly the silicious matter derived from the mill stones, to subside to the bottom. The bran suspended and diffused through the water, is now to be poured into a bag made of cloth, of such a texture as to allow the farinaceous matter, but not the bran, to escape through it; and the bag with its contents are to be repeatedly washed in cold water till the water is no longer rendered milky; in other words, till the whole of the farinaceous matter is removed. The bran is then to be removed from the bag, dried before the fire or in the sun, and after being well beaten and separated, again sifted; when it will be fit for use.

“Seven eggs, one-sixth of a pound of butter, the same quantity of suet (previously melted together), and a pint of milk are then to be well incorporated and mixed with as much of the prepared bran as will make a soft dough, which is to be well kneaded in the ordinary way. The quantity of dough thus prepared will make four or five small loaves or cakes, which may be baked in saucers in a quick oven.

“According to Mr. R., “This bread kept well and remained very palatable for a few days, and having it,” he observed, “I really did not feel the want of any other kind of bread.” He sent me a specimen, which arrived in good condition, and corresponded with his account. The addition of a few carraway seeds may, by some, be deemed an improvement. I regard this bran-bread as much superior to the *gluten-bread* recommended in Diabetes; all the specimens of which I have seen have been



and do tolerate ordinary wheaten bread better than its substitutes.\*

difficult of mastication, in short, almost as much so as caoutchouc. It is probable that a superior bread may be made by a due admixture of bran, prepared as above, with gluten ; and that the lightness may be increased by employing the carbonate of soda and muriatic acid, as in the preparation of unfermented bread. In this case, the milk may be omitted, and the bread made to resemble more nearly common bread."—Dr. Prout's *Nature and Treatment of Stomach and Renal Diseases*, 5th Edition, 1847, pp. 43-44.

\* Although bran contains a large percentage of nutritive ingredients, it is for the most part indigestible and irritating to the alimentary canal. So attempts have been made to produce a digestible flour from it. In the *Journal of the Society of Chemical Industry* for Oct. 15, 1908, p. 994, there is a description of a process of which the author is T. Schluter, Jun., Foerderstedt, Germany. It has been patented in the United States, America ; the patent bearing No. 897, 854 and being dated September 1st, 1908.

" Bran is mixed with boiling water to a thin pulp, then heated quickly to a temperature of 100°C, dried at a temperature of about 70°C., and the solid mass obtained ground to a flour."

Bread made of bran-flour prepared as above, is very nutritious, and may be given to diabetics with advantage.

To recover the mineral constituents from bran for admixture with ordinary flour, &c., the bran is treated with water to extract soluble salts, and the residue then treated with an acid solvent (*e. g.*, hydrochloric acid) and water, and subsequently with an alkaline (sodium hydroxide) solution of sufficient strength to extract gluten, &c., but not to dissolve cellulose. The acid and alkali in the second and third extracts are neutralised, and the whole of the extracts are united and evaporated to dryness, preferably *in vacuo*, and the residue reduced to a powder. [*J. Ch.* I. Aug. 31, 1909. Eng. Pat. 15, 474, July 21, 1908, by J. H. Quine, Rochester, New York.]



As substitutes for rice and wheat, different kinds of millets have been used in the dietary of diabetics. These are used in the form of porridge and of *chapatis*. There is a larger percentage of oil in millet than in wheat or rice. This perhaps accounts for its usefulness in diabetes.

The use of millet  
in diabetes.

Von Noorden says:—

“Whether it is the rice-cure of Duering, the milk cure, the oat cure or the potato cure, on which we fix our attention, we find that, underlying them all, there is a common principle—namely, the limitation of carbo-hydrate to one particular kind, excluding all others, and at the same time the exclusion or the maximal reduction of meat. \* \* \* \* \* It is of tremendous importance to possess, as in the oat-cure, a means of mastering large quantities of acetone-bodies within a few days. Even though we may not be able to permanently maintain this favorable state of affairs, it is still of the greatest advantage to the whole organism to be given a period, of about a week or a fortnight, in which the issues are practically free from acetone.”

Carbo-hydrates are essential to human life, and therefore these should not be withdrawn from the dietary of the diabetic. Truly has Dr. M. C. Ridwill of Melbourne University, in his paper on “Rye bread in Diabetes,” observed:—

“I would like to say here that we must not be carried away by the analysis of food stuffs given in books. The chemical means of analysis are not the digestive means, so that when we



see a food marked as containing 70 per cent. of starch, we must not consider that the body ferments can extract the equivalent in glucose of 70 per cent. of starch."

According to Schultzen and other recent investigators, sugar is eliminated unchanged in diabetes, because the ferment is lacking which normally splits sugar into lactic acid and glyceric aldehyde. The withdrawal of carbo-hydrates and the administration of flesh-foods will not generate the sugar-splitting ferment in the system.

The importance of carbo-hydrates being recognised, the question has arisen, which other carbo-hydrates, besides the above, could be given to the diabetic? Gautier answers this as follows:—

"We say: Suppression of the saccharose or cane sugar and of glucose, but not of levulose, a special sugar which is not sensibly eliminated; reduction of starchy foods, but not of those which Kütz has pronounced harmless and which are rich in ordinary starch, but in inulin and inosit, special starchy saccharine substances which are unfitted to be changed directly into glucose. Such are Jerusalem artichokes, viper's grass, scorzonera, salsify, French beans, chicory, lettuce, cardoons, onions, leeks, many mushrooms, etc.

"As to asparagus, radish, cress, long radishes, turnips, horse-radish and especially the vegetables properly so called: spinach, sorrel, cucumber, cole, cabbage, cauliflower, sauerkraut, salads of every kind, these may be also taken, as they contain *but very few carbo-hydrates*. Moreover, cooking carries off from these vegetables a large proportion of their sugar and partly dissolves their starches, which disappears with the water."



“Fruits,\* properly so-called, particularly those of the Rosacæ (peaches, apples, apricots, pears, straw berries, raspberries) containing as a rule only 5 to 6 parts of sugar and 1 to 7 of starch per 100, may in case of necessity be tolerated, *provided they are not taken in excess*, as 100 to 150 grms. per day do not introduce more sugar than 10 to 15 grms. of bread do. Moreover, half of this sugar is in the form of levulose, which rapidly disappears from the blood. The same may be said of the orange, lemon, pomegranate, etc.”

“With still more reason may those fruits, which contain scarcely any sugar or starch, be sanctioned: almonds, nuts, olives. On the other hand, it is necessary to avoid those which are rich in sugar or starch: bananas, chestnuts, cherries, grapes, etc.”

In India, besides the above, such fruits as *jambul*, *khirni*, *phâlsa*, *lasora*, *papaya*, *Bael* (*Ægle marmelos*); *Kath bael* (*Feronia Elephantum*); *Zizuphus vulgaris* and *jujuba*; *Averrhoa Carambola*; *Anacardium Occidentale*; and *Semecarpus anacardium* may be given to the diabaetic with advantage.

\* Fruits and acidosis.—

According to N. R. Blatherwick of Yale University (*Arch. Intern. Med.* for 1914), oranges, raisins, apples, bananas, cantaloupes and potatoes, particularly the last two, are very effective in reducing the formation and excretion of acid. Tomatoes are less valuable. The cereals increase the formation of acids. Plums, prunes and cranberries, in spite of their alkaline ash, increase the excretion of acid, owing to the BZOH they contain. Meat produces a large increase in the acidity of the Urine. All acid urines are super-saturated with uric acid; all alkaline urines may dissolve more.—*Chemical Abstracts* for Novr. 20, 1914, p. 3672.



The prune also is very beneficial to the diabetic, for it not only acts as a thirst quencher, but, when properly dried and treated, contains more nourishment, volume for volume, than any other food.

While there is difference of opinion regarding the prescription of starches to diabetics, most of the authorities are agreed that sugars—saccharose and glucose especially—should not be given to them. Diabetics crave for something to sweeten their foods and drinks with. Saccharin has been proposed to satisfy their craving. This is a coal-tar product and said to be 300 times sweeter than cane-sugar. But at the same time it is a poison. It may be used as a medicine, but not as a food.

Sucrol, a paraphenctol-carbamide, has been also proposed as a substitute for sugar, but this also cannot be given in large quantities, as it gives rise to unpleasant symptoms.

Glycerine has been proposed as a substitute for sugar. But its administration also is known to increase glycosuria.

Levulose, erythrite and inosit may be used as substitutes for sugar. But these are very expensive stuffs. It must be admitted, therefore, that at present there is no cheap article which can be used by the diabetic as an efficient substitute for ordinary sugar.



Since diabetics can assimilate inuline—a form of starch found in tubers of several species of *Inula*, such as that of *Inula racemosa*, which grows in the Western Himâlayas, on the borders of fields, &c., Kashmir, and Piti, it has been recommended to be given in the form of biscuits.\*

The use of Inulin Biscuits.

Kulz gives the following recipe for making these :—

“ Fifty grammes of inulin are to be put in a large porcelain basin, and while standing over a water bath to be rubbed up with 30 cubic centimeters of milk, and as much hot water as may be necessary, into a uniform dough, with which the yolks of four eggs and a little salt are to be mixed. To this the whites of the four eggs are to be added, having first been beaten to a foam and carefully worked in. The dough is finally to be baked in tin moulds, previously smeared with butter. The taste of the biscuits may be improved by the addition of vanilla or other spices.” (“Dietary of the Sick; Von Ziemssen’s Handbook of General Therapeutics.”)

Dr. Hale White suggests that the tubers may be cooked and eaten as a vegetable.

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\* The root of *kâsni* (*Cichorium intybus*) contains 36 per cent. inulin, and may be made into biscuits.

“Inulin administered to phlorhizinized dogs does not give rise to glucose. The feeding of levulose to the same animals results in the elimination of large amounts of glucose. It is concluded that inulin is not, to any appreciable extent, converted into levulose or any other substance capable of forming glucose in the diabetic organism.”—*Chemical Abstracts* for June 10, 1914, p. 1979.



Some of the edible gums may be given with advantage to diabetics. Acacia Gums in Diabetes. gum, known in Hindi as *Katirâ gond*, fried in *ghee*, has proved of use to sufferers from diabetes. It is very palatable and is useful, for it is not converted into sugar.†

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† *The Housewives' League Magazine* of New York for 1914 published an article entitled "The Story of Chewing Gum."

It is stated there that—"Gum-chewing is admitted to be a habit of American origin, and is attributed generally to American nervousness; but there is another and quite rational reason for its use. Spanish explorers reported that they found the Indians five hundred years ago using the gum of the Sapodillo to relieve exhaustion and quench thirst. The Indians probably did not chew the gum, as their descendants to-day do not chew it. They only hold it in the mouth, which has the effect of provoking a flow of Saliva and thus keeping the throat moist in the absence of water. \* \* \* \* In Greece it is said to be dispensed as a regular ration to the army. \* \* \* Who shall say how much this humble confection had to do with the fall of the Turks." (*Literary Digest* for October 17, 1914, p. 797)

The beneficial effects of gums in diabetes are probably due to the enzymes they contain. According to F. Reinitzer (*J Ch. I.*, 15th October, 1909), there are at least three enzymes, viz., an oxydase, a peroxydase, and a diastase present in gum, though, in some gums, all three enzymes may not be present.

Again, a gum solution is very rich in colloids, and it has been shown by the above-named author that, on passing such a solution through the filter, a large proportion of the colloids is retained, and that the saccharifying part of the amylase may either be completely or almost completely retained, whilst the liquefying part passes through.



There are on the market many proprietary foods meant for diabetics. These Diabetic Patent Foods. are advertised as being free from starch and sugar. Thus Messrs. Callard and Co. of 74, Regent Street, London, say, regarding their preparation of "Casoid Diabetic Flour," as follows:—

This flour consists mostly of vegetable proteids, and is therefore a very highly concentrated nourishing food. It can be made into loaves by following the directions printed on every packet; 3 ozs. only are required to make a good loaf. It is also useful for making puddings, pastry, cakes, etc., according to the directions.

*Analysis of Casoid Flour.*

Water 10·80 ; Fat 1·40 ; Mineral Matter 2·50 ; Proteids 84·56 ; Cellular Fibre, etc., 0·74 ; Total 100·00.

Diabetics require more fat than proteids. So most of these preparations are not suited to them. Besides, they become stale after some time, and, as these are not manufactured in India, they cannot be used when fresh. For my own part, I do not recommend any of the advertised proprietary foods to Indian diabetics. Moreover, both Hindus and Muhammadans have religious scruples against their use.

*The Cocoa-nut Cure.*

The cocoa-nut tree is the most useful plant that nature has bestowed upon mankind.\* There are

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\* Regarding Copra margarine and the rise in the price of



at least a hundred uses to which the different products of this tree can be put. But, without referring to its other economic uses, it is necessary to say that the fruit has not attracted that attention in the treatment of diabetes which its importance

*cocoa-nut oil*, the 'Times' for October 20th, 1913, wrote an article, the summary of which is given below:—

The comparative scarcity of copra, in view of the increasing demand for margarine, has caused a great rise in the price. In every quarter where copra is bought and sold, and even in Japan, despite the popularity of the Soya bean, plant for the manufacture of cocoa-nut oil is being rapidly erected. To extract the oil the copra is milled, the resultant meal steamed and formed into cakes and the oil squeezed out by hydraulic pressure. This is done, not upon the spot, but by a limited number of refiners in Europe and America.

Cocoanut oil has long been used in the manufacture of freely lathering soaps, called "washers" in the trade, as well as for what is termed "cold process" and "marine" soaps. It also plays a part in the manufacture of candles and night lights. On the other hand, it was never used for edible purposes in civilised countries owing to its insinuating cocoanut taste and its capacity for quickly turning rancid. All this has now been eliminated by chemical means, and cocoanut oil finds its way to the table in many forms. Cocoanut lard is now manufactured on a very large scale, and the oil has taken the place of animal fats in the manufacture of margarine.

In its most highly refined form, blended with milk, it appears on the Continent as actual butter. Before the discovery of the above mentioned methods of purification, £12 was considered a good price for copra, whereas now it costs £48 a ton, without likelihood of any fall. The kernels are the staple food of most of the people where the nuts grow, and their



demands. The fruit is a perfect food and drink combined. The objections which can be raised against cures by oatmeal, potato, rice or some other carbo-hydrates cannot be urged against the cocoanut. It contains all the ingredients necessary to

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needs must be satisfied before there is any margin for export. Thus there can be never over-production.—*J. Ch. I.*, November 15th 1913, page 1020.

“The matter which at the moment of writing engages our attention is the copious issue of books on the subject of the cultivation of the Cocoanut. As happened in the earlier days of the Rubber and other industries which have rapidly assumed exceptional importance, a number of books and pamphlets are being published upon the subject of Cocoanuts, and many articles are now appearing thereon in the public press—all of which are “signs on the times,” and are the usual forerunners and customary indicators of great activity.\* \* \*

“The cocoanut production of the world (may be put) at something in the neighbourhood of 6,500,000,000 nuts per annum.

“Now, if we reckon 5,000 nuts to go to a ton of Copra, this represents 1,300,000 tons of Copra, which at £30 per ton are worth £39,000,000. In addition to the Copra, there are, however, to be reckoned the Cocoanut Fibre—a valuable item—and also Cattle food cake and other important by-products. If the value of these is added to that of the Copra, the world's Cocoanut production may be reasonably estimated at perhaps £50,000,000 per annum.

“Whilst the world's population continues to increase, and whilst communities continue to advance towards what we have termed a “higher plane of living,” the demand for and consumption of the Cocoanut in the form of edible and industrial fats, fibres, yarns, and many other articles, must continue to increase. There can be no limitation—the Cocoanut is a necessity and not a luxury.”—“*Tropical Mail.*” (1913).



maintain man in health and comfort. In diabetes also it can be given with safety. The cocoa-nut water is a very pleasant beverage, beneficial to the diabetic as it assuages thirst, since it is about twenty-five degrees cooler than the atmosphere. In describing the liquid possibilities of the cocoa-nut tree, Sir Samuel W. Baker writes:—

“As the stream issued from the rock in the wilderness, so the cocoa-nut tree yields a pure draught from dry and barren land; cup of water to the temperate and thirsty traveller; cream from the pressed kernel; refreshing and sparkling toddy to the early riser: arrack to the hardened spirit-drinker; and a cup of oil, by the light of which I now extol its merits—five separate and distinct liquids from the same tree.”

Cocoa-nut water and cocoa-nut oil are very useful in the treatment of diabetes.

The possibilities of cocoa-nut oil are also great. In these days, when it is becoming very difficult to obtain pure and unadulterated *ghee*, refined cocoa-nut oil should be largely used in every household. It is so very nourishing that some have even proposed it as a substitute for cod liver oil in the treatment of tuberculosis. The importance of cocoa-nut oil will be recognised if we bear in mind that fats constitute our sheet-anchor in the treatment of diabetes.

Cocoanut oil destroys bugs, lice and other insect pests. Bengalis used to rub their bodies with the oil—a process which acted beneficially by protecting their system from the bites of injurious



insects. How far the discontinuance of oil rubbing is responsible for some of the diseases to which the young generation of the Bengalis is subject, requires investigation at the hands of the medical profession of that province.

Cocoanut also enters largely into the confectionary of the Bengalis. But I understand the present generation of educated Bengalis is not so fond of sweets prepared with cocoanut as were their forefathers.

The cocoa-nut meal may be given in a variety of ways to the diabetic. I have tried *chapatis*, cakes and several other preparations of cocoa-nut. Cocoa-nut, finely powdered with the addition of a little *besan* and butter, will make fine *chapatis*, which will keep also for some time.

I urge on the medical profession of this country, where cocoa-nut can be had in abundance and where unfortunately diabetes causes a large mortality every year, to try the cocoanut cure.

### *Leguminous Alimentation in Diabetes.*

Bovet\* has shown the usefulness of leguminous food in many diseases of nutrition, and he considers it also suitable and valuable in diabetes. Leguminous seeds are rich in nitrogen, and hence useful to give tone to the system.

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\* *Presse Med.*, May 11th, 1895, and also *B. M. J. Epitome* for 10th August 1895, p. 24.



The Japanese use very extensively *Soya hispida* or soya-bean as an article of diet. **Soya-bean in diabetes.** A meal of this, as it contains a small amount of carbo-hydrates, is used in the form of bread for diabetics. Although soya-bean is also indigeneous, it is not largely used as an article of food in India as it is in Japan.\*

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\* Soya beans as Food for diabetics—

“Soya beans are treated with boiling water and 0·5 per cent. of sodium bicarbonate, until the carbo-hydrates and other water-soluble substances are removed. The residue, after being dried and pulverised, is a yellow powder containing the nutritive fatty and albuminoid constituents of the beans.”

[U. S. Pat. 980, 292, Jan. 3, 1911 taken by E. Lampe, Frankfurt-on-Maine, Assignor to Farbenfabr. Vorm. F. Bayer and Co., Elberfeld, Germany.]

Soya beans and their utilisation (*J. Ch. I.* for Jan. 16, 1911.)

“Harz classified the varieties of Soya into two groups, one containing those of strongly compressed form and of olive green to brownish black colour, and the other swollen varieties, more or less sickle-shaped, and yellowish-brown to deep brown colour.

An analysis of the inorganic constituents of the beans by Schwackhöfer gave the following results:—Potassium oxide, 44·56 ; sodium oxide, 0·98 ; lime, 5·32 ; magnesia, 8·92 ; iron oxide, trace ; silica, trace ; phosphoric acid, 36·89 ; Sulphuric acid, 2·70 ; and chlorine, 0·27 per cent.

Both in China and Japan the black varieties are boiled and roasted and eaten with rice, whilst the white varieties are ground to meal and baked into cakes, etc.

The soya sauce is prepared from wheat and a small light yellow variety of the bean, with the addition of salt and water, the prepared mass being fermented in open vessels at as low



Ground nut is extensively cultivated in many parts of India. But it is not so largely used as an article of diet as it deserves to be. This may be put to the same use as the Japanese soya-bean in the dietary of diabetics. Dr. J. Walter Leather gives the following chemical composition of its kernels :—

Moisture	...	...	...	4.70	p. c.
Oil	...	...	...	94.25	,,
Albuminoids	...	...	...	29.09	,,
Soluble carbo-hydrates	...	...	...	13.21	,,
Woody fibre	...	...	...	1.65	,,
Soluble mineral matter	...	...	...	2.15	,,
Sand and Silica	...	...	...	.05	,,
Total Nitrogen	...	...	...	4.65	,,

a temperature as possible for a period of 8 months to 5 years, and the sauce then separated from the residue.

The finished *shoyu* has the following composition. (Kellner):—Sp. gr. 1.182 to 1.193; total solids, 287.5 to 319.2; organic constituents, 136.3 to 164.7; free acid (as acetic acid) 5.03 to 6.5; and nitrogen, 7.2 to 14.5 grms. per litre.

The nitrogen is present entirely in the form of decomposition products of proteins (lencine, tyrosine, etc.), and soya sauce is comparable with meat extract in its stimulative properties.

Another product made from the beans in Japan, and used in the preparation of soups and flavours for cooking, is known as *miso*. It is made from a mixture of the crushed beans, with rice or barley *koji*, salt, and water. Five samples examined by Kellner had the following composition :—Water, 48.45 to 59.27; protein, 10.18 to 14.34; fibre, 1.79 to 2.68; ether extract, 5.10 to 7.87; ash, 7.78 to 15.62; sodium chloride, 5.99 to 12.91; dextrose,



From the large percentage of oil that it contains, ground nut forms an useful article of diet for diabetics. Its meal may be made into cakes or *chapatis* and given to diabetics.\*

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4.38 to 11.63 ; soluble in cold water, 22.13 to 34.25 ; and alcohol, 0.95 to 1.92 per cent.

Bean-cheese (*tofu*), and a similar product from which the bulk of the water has been removed (*kori-tofu*), are prepared from Soya beans in Japan."

\* "The peanut, although a very useful article of diet, is rather difficult of assimilation by the system, until it has been digested. To aid in this process, the peanut is first cooked, then digested by a chemical process similar to, but slower and more thorough than, that which goes on in the stomach of the human or other animal.

"The next step is to segregate the digestible from the non-digestible portions. The digestive agents employed are peptinzyne, pancreatin, diastase, hydrochloric acid and others. The excess of hydrochloric acid is removed by the use of Sodium carbonate, which tends to saponify the indigestible fats and forms, with hydrochloric acid, common salt, which goes to the bottom, while the soapy substance, which is insoluble, rises to the top and easily skimmed, and may be removed by means of a centrifugal machine.

"Now, we have the goober juice ready for incorporation into the elixir. This juice of itself is very sweet, like a syrup, and, in order to be rendered palatable, requires only to be combined with tasty, palatable aromatics.

"Aside from the juice obtained by the digestive process above described, there is also obtained (in this latter case from the roasted peanut) an extract of high medicinal value. Together with these extracts from the peanut, and the flavours mentioned, is incorporated animal nuclein. This latter agent



Peanut butter, made by grinding the nut very fine and reducing the mass to a pasty substance and adding salt for flavouring, is an useful article of diet.

Several varieties of leguminous seeds, known as *dâls*, are used as staple articles of food by Indians.

The use of *dâls*.

The meal of gram and several other kinds of *dâls* may be put with advantage to the same use in the treatment of diabetics as is done with the meal of soya-bean in Japan. The meal, known as *besan* in the bazaars of Northern India, may be used in a large variety of ways in the treatment of diabetics. *Chapatis* or bread made of *besan* is well relished by, and is beneficial to, the diabetic patients.

In the Panjab, *chapatis* of *besan* mixed with a certain amount of wheaten flour are prepared and largely used by the people. These are called *mis-sirotis*. These may be used with advantage by diabetics.

Unfortunately, *besan* is not very largely used in Bengal, where more cases of diabetes are to be met with than in any other province of India.

In the cookery of vegetarian Indians, *besan* serves the same purpose as the yolk of an egg does

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is a most important addition to the compound, as it assists in digestion, and is an active builder of tissue, the great work of maintaining life."—(*Scientific American Supplement*, No. 1431 of 6th June, 1903).



in European cookery. It is mixed with water and made into a paste, and is used to form a sort of coating upon many fruits, tubers and green vegetables which protects them from too much singeing or getting overbrowned.

Very wholesome and palatable cakes are also made of *besan*. It is well-beaten, and, after being a little fermented, small balls of it are made, of the size of filberts. The more the paste is beaten and allowed to be fermented, the lighter and more porous becomes the ball, which is used after being fried in *ghee* or oil.

Drawbacks to the use of *Dâls*. Dr. Pavy writes :—

“As a drawback to their high nutritive value, the leguminous seeds must be ranked as difficult of digestion. They require prolonged boiling to render them tender and digestible. They are apt, besides being heavy on the stomach, to occasion flatulence and colic, and the flatus is charged with a considerable quantity of sulphuretted hydrogen, arising from the sulphur which the legumine contains.

Pulses are the staple articles of diet of many races and communities inhabiting India, and so these know how to counteract their drawbacks. They cook *dâls* with *Pâpad-khâr* (an impure carbonate of soda) which greatly aids in the process of digestion. In a paper on “The proper cooking of *dâls*” which I contributed to the *Indian Medical Gazette* for December 1896, I tried to show how the addition of *Pâpad-khâr* proves useful in the cooking of *dâls*.



*The use of Oleaginous Seeds in Diabetes.*

Besides nuts, several oleaginous seeds are useful in diabetes. In this disease, as the skin is often dry and harsh, so the administration of seeds which are rich in oil proves beneficial;—on the same principle on which oil-seed cakes are given to cattle and horses to improve the gloss of their skin. Oleaginous seeds are less expensive and more easily digestible than nuts.

Seeds of *Sesamum Indicum*, known as sesame, or in vernacular *Til*, are very extensively used in a variety of ways, by natives of India, as an article of food. Dr. J. W. Leather gives its chemical composition as follows:—

Local description.	Source.	Moisture.	Oil.	Albuminoids.	Soluble Carbo-hydrates.	Woody fibre.	Soluble Mineral matter.	Sand and Silica.	Total Nitrogen.	Albuminoid Nitrogen.
"Red"	Poona	4.18	49.12	20.37	14.16	2.93	6.65	2.59	3.34	3.26
"Black"	"	4.13	47.60	18.12	18.56	4.14	6.86	.59	3.11	2.90
"White"	"	4.21	51.96	18.06	14.62	4.49	6.28	.38	2.99	2.89
"	Nagar	4.87	48.13	22.50	14.05	4.49	5.59	.37	3.60	..
"Black"	Nadiad	5.42	46.50	25.81	9.06	6.51	6.03	.66	4.13	..
"Red"	Nagar	5.37	46.20	21.03	15.87	4.18	6.00	1.35	3.37	...



The grain is very rich in oil, and may be used in combination with *besan* or pulses of other kinds.

*Til*, used either baked or parched, is a very wholesome food. Husked *til* is parched and ground and made into cakes with *besan*, cheese, cream, a little camphor and cardamoms. The delicate aroma of *til* pervades the cakes, which are wholesome and nutritious.

Ground *til* may be also used by being mixed with cocoa-nut water and *dahi* (curd), to which a little *ghee* is added. This makes a pleasant drink.

Linseed may be used as a bread or a porridge, with milk. It makes a lighter bread than pure white flour. The oil may also be applied externally to the skin.

*Chironji*, the seed of the berry known as *pial* in Bengal, is very palatable and nutritious, and is very rich in oil. It is used as a substitute for almond and is eaten roasted with milk.

Regarding the fruit of *Buchania latifolia*, Dr. G. Watt writes :—

“The fruit is eaten by the hill tribes of Central India. Having first pounded them, along with the contained kernels, they dry them in the sun. As required, this is baked into a sort of bread and eaten.”—(*Dictionary of Economic Products of India*, Vol. I, page 545.)

*Chironji* bread, as prepared above, may be given with advantage to the diabetic, as a substitute for ordinary bread.



Poppy seeds form a valuable article of food of the natives of India. They are largely employed by confectioners and also in the preparation of curry powders. Parched poppy seed is very wholesome. The seeds are rich in oil, very nutritious, and hence useful in diabetes.

Some of the practitioners of the Greco-Arabic School of medicine prescribe cotton-seed as a food to the diabetic. Dr. J. W. Leather, in his analysis of Foodgrains and Fodders (Agricultural Ledger No. 10 of 1901), gives the following analysis of the seed-grain :—

Local description.	Source.	Moisture.	Oil.	Albuminoids.	Soluble Carbo-hydrates.*	Woody Fibre.	Soluble Mineral matter.	Sand and Silica.	Total Nitrogen.	Albuminoid Nitrogen.
...	Poona.	8.52	18.33	11.74	38.78	17.53	3.92	1.22	2.57	1.87
...	„ ...	6.93	14.57	11.34	35.96	25.05	4.47	1.68	2.49	1.81
...	Surat.	6.83	16.51	12.54	32.54	27.11	4.23	.24	2.86	2.00
Egyptian seed.	...	6.75	28.40	22.63	21.06	16.71	4.19	.26	3.78	3.63

\* Regarding soluble carbo-hydrates, Dr. Leather writes :—  
“ This term is applied in England to those component parts of food stuffs which are not separately determined.

“ In cereals and pulses it includes principally starch, but in



From the above analysis it will be noticed that the Egyptian seed is the one best suited for the diabetic, since it contains a larger percentage of oil and albuminoids and less amount of soluble carbohydrates than the Indian one.

Cotton-seed may be given in a variety of ways, such as fried, parched, roasted, or ground into flour and made into bread. Professor Connell of America considers cotton seed to be the richest of all food-stuffs and breadstuffs. The cotton-seed meal contains three times as much digestible protein as the highest grade of wheat flour. Being over-rich in protein, pure cotton-seed meal bread would closely resemble cheese; a combination, however, of cotton-seed meal with other recognised bread-stuffs will prove useful.\*

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other cases, such as some of the oil seeds, there is but little starch; its place being taken by such substances as pectin or mucilage."

\* The value of cotton-seed flour in diabetes—

"Cotton-seed flour contains more than twice as much protein as meat, but little 'kneading principle.' It must be mixed with two parts of wheat flour when intended for baking."—*Chemical Abstracts* for May 20, 1914; pp. 1837-1838.

Utilization of the proteins of cotton-seed by man—

Experimental results indicate that the utilization values of the proteins of cotton-seed products are about 78·6% as against 96·6% with meat, on the same men. The cotton-seed proteins are utilized by men equally as well as those of legumes 9/10 as well as those of cereals, and 8/10 as well as those of meat.—*Ibid*, p. 1838.



It is because the green vegetables contain a large quantity of salts that their use is recommended in diabetes. These not only ward off scurvy, but relieve constipation, which is one of the most distressing symptoms in this disorder.\*

Green vegetables in Diabetes.

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*Cotton-seed meal as human food—*

The flour should be from hulls, and have a bright yellow color, a pleasant odor, and a sweetish taste. It contains protein 48 p. c., fat 12 p. c., sugar (mostly raffinose) 23 p. c., fibre 4 p. c., ash 5.5 p. c. It is richer in protein than meat and resembles meat more closely in composition than it does the cereals; accordingly, it might be tried experimentally as a meat substitute or to reinforce a diet deficient in protein. It is advisable to mix one part of meal with four parts of flour. Experiments with animals show that the protein of cotton-seed meal is as digestible as that of cereals. Mouldy or damaged or dark colored meal should be avoided.

(G. S. Fraps, Texas Agric. Expt. Stations, Bull. No. 128, 1910. 15 pages, abstract in *J. Ch.* I., for Aug. 15, 1910, p. 972.)

\* Dr. Prout in his work on *The Nature and Treatment of Stomach and Renal Diseases* (5th Edition, 1848) wrote:—"The green matter of plants is in general little acted on by the stomachs of the higher animals; and hence may, in most cases, safely form a portion of the food of diabetic individuals, as first, I believe, recommended by Dr. B. G. Babington; though on very different principles."

Then in a footnote Dr. Prout added:—"From a careful attention to these points for sometime past, I am persuaded that green vegetables, not only exert a beneficial action in diabetes and other forms of dyspepsia; but that they can be taken with impunity in almost all cases, provided the patient abstains from drinking while taking them. It is the fluid that is taken with them that, more than anything else, causes acidity and flatulence."



Vegetable and mineral salts are necessary for diabetics. Decoctions of cereals, namely, wheat, barley, gram and bran, are very useful to them.

Vegetable and mineral salts in diabetes.

Calcium salts have benefited diabetics. This may be given in the form of powdered egg-shells, which I have often tried with advantage.

Fresh lime or lemon juice is very useful in diabetes—not only by its relieving thirst, but also because it diminishes the break-down of the fats of the body.

Citric acid in Diabetes.

Pickles prepared in European method with vinegar, harden vegetable tissues, and thus render them difficult of digestion and therefore harmful in diabetes. On the other hand, the Indian method of preparing pickles with oil, by softening vegetable tissues is not injurious to digestion. But then there is one drawback in the extensive use of Indian pickles. These contain large quantities of spices, and so cannot be good for digestion. Indian pickles without spices may be given with great advantage to diabetics. I have found lime and lemon pickles very useful in diabetes.

Pickles in diabetes.

Not long ago, not a little sensation was caused by a certain Doctor—not of Medicine—but of Science—giving out as his opinion—not founded on fact or actual observation, but on mere theoretical consideration—that diabetes

Pân-chewing in diabetes.



in Indians was caused by their habit of chewing the *pân* (*Piper Betle*, Lin). When we take into consideration, the millions of men and women in India, who are addicted to *pân* chewing—a habit which is prevalent in this country since time immemorial—and the number of diabetics bearing no appreciable ratio to the population, we do not find adequate reason to accept the view that the habit of chewing the *pân* plays any part in the causation of this disease. From the *pân* acting as a stimulus to the flow of saliva and thus helping in the digestion of carbo-hydrate food-stuffs, the habit of chewing it is decidedly beneficial in diabetes.

The diabetic is very thirsty, and so no restriction should be placed in letting him have his drink of pure water. Tea, coffee, cocoa, may be allowed in moderation, although it would be better if he could do without them, for these substances not only contain purin bodies but often give rise to dyspepsia, nervousness, &c., and thus do harm to diabetics.\*

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\* *Lemonade for diabetics.*

The following is said to be useful for assuaging the thirst of diabetics :—

Citric acid	...	...	...	1 gramme.
Glycerine	...	...	...	50 grammes.
Cognac	...	...	...	40 grammes.
Distilled water	...	...	...	500 grammes.

(*Medical Times*, quoted in the *Scientific American Supplement*, No. 1376 of 17th May, 1902.)



Some are in favour of alcoholic beverages in moderation, while others condemn them *in toto*. Gautier writes :—

Alcoholic beverages in diabetes.

“Generous wines and even cognac bring a valuable element of calorification. Alcohol facilitates the digestion of the fats, and in certain cases diminishes the glycosuria and azoturia. But beer ought only to be allowed very occasionally to diabetics by reason of its dextrin.”

Recently, alcohol has been recommended in minute amounts as a food to diabetics.\*

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\*“*American Medicine*” (1906) believes that alcohol in diabetes is intimately bound up with the food question. Plant physiologists have about concluded that vegetable cells cannot utilize sugar delivered to them in the sap until they have first changed it into alcohol, and there is some evidence that this is also the first step in the oxidation of sugar by animal cells. Should this be true, it would be rational to feed alcohol to diabetics during the period that starches and sugars are withheld, indeed some therapeutists advise it on empiric grounds, or for the symptomatic treatment of the exhaustion. It is unfortunately given in large doses which have narcotic effects, whereas it should be given in minute doses, highly diluted, and very frequently to imitate nature’s method of delivering it to the cells in minute amounts all the time. This method has been tried with apparent benefit, and might tide the organism over the period during which it is building up its nervous control over the metabolism of the sugar. It is possibly the only disease in which alcohol can rationally be given as food, now that there is such a reaction against giving it in conditions formerly considered essentially in need of alcohol. It is one way at least of saving the oxidation of proteids at a time when they are needed so badly and likely to be burned up.”



Alcohol is said to aid the digestion of fat and, therefore, recommended as a beverage.

In diabetic coma also, according to Dr. Hutchison,

“the combustion of alcohol in the tissues appears to lessen the destruction of proteids which are the source of the acid poisons that produce the coma.” \*

But if alcohol is to be given at all, it should be done with great caution. It should be given rather as a medicine than either as a beverage or a food ; and for this purpose it may be prescribed in the form of a medicated wine, such as the one containing cocaine which has been found useful in diabetes.

A dietary, somewhat on the following lines, will be found useful for diabetics in India :

I. *Breakfast*.—As mentioned before (page 53), there is a larger excretion of sugar in the morning hours than at any other time of the day. So, for breakfast, carbo-hydrates should be given in moderation, if not totally withheld.

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\* So also Benedict and Torok (Zeits. f. Kl. Med.), as a result of clinical experiments, conclude that in many severe cases of diabetes alcohol, is of great value, lessening the proteid combustion and diminishing the amounts of “acetone bodies” produced. They recommend its careful prescribing in amounts ranging from one to three ounces daily, noting carefully the effects and controlling the amount used. As contra-indications, they mention albuminuria, neuritis, arterioscleroses, also the diabetes of children. (J. T. H.)



Milk, cocoa-nut cakes and preparations of *besan* may be given for breakfast. Those who live in provinces where cocoa-nut can be had in abundance, should take for breakfast cocoa-nut and its preparations without sugar. Thus, for beverage, they should drink cocoa-nut water, and eat cocoa-nut meal, either raw, fried, or roasted. Ground-nut meal made into *chapatis* or cakes is also very beneficial. So are also almond, pistachio-nut, *akhrot* and oleaginous seeds.

II. The principal meal of the day, which should be at about 2 or 3 P.M., to consist of rice, *chapatis*, *dâl* and vegetable curries. Such fruits as have been mentioned above are to be given to diabetics with their principal meal of the day.

III. For *supper*—milk and cocoa-nut preparations.

As I look upon diabetes as a manifestation of alimentary toxæmia, I should treat every individual case on its own merits. It is not necessary to enforce a too rigid diet, which, by producing disgust for food, might make a patient worse. Anything which relieves alimentary toxæmia is bound to be beneficial to the diabetic. Hence the importance of vegetarian dietary and fruits in the treatment of the disease and the restriction, if not the total withdrawal, of meat, alcohol, tea, coffee, and cocoa.

Conclusion.







