

TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some of the metabolic diseases met with in general practice.

MANAGEMENT OF DIABETES MELLITUS

BY

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PART I

Diabetes mellitus is a disease that can now be treated as efficiently in general practice as in the clinic or hospital. The whole treatment can be summed up in two simple rules: (1) Eliminate and keep entirely absent from the urine every trace of acetone (ketone) bodies. (2) Remove or reduce to the smallest proportion loss of sugar in the urine. These rules are carried out by giving sufficient carbohydrate to prevent the production of acetone bodies and, if necessary, insulin to enable the patient to utilize this carbohydrate. Before proceeding further the tests for acetonuria and glycosuria, by which treatment is controlled, will be outlined.

TESTS FOR ACETONE BODIES

Ferric Chloride Test.—Fill a test tube two-thirds full of urine and add drop by drop a 10 per cent. aqueous solution of ferric chloride. If the test is positive a deep Burgundy-red colour develops. Similar colours are given by various drugs—for example, salicylates—so a positive reaction must always be checked by the nitroprusside test, which gives no reaction with such drugs. The ferric chloride test only detects acetone bodies when they are present in large amounts. Cases in which this test is positive must be regarded as medical emergencies; they are within the danger zone of coma, and therefore will not be discussed in this article.

Nitroprusside Test.—(For this test it is convenient to powder together 100 parts of ammonium sulphate and 1 part of sodium nitroprusside crystals. This mixture keeps well in a tightly stoppered bottle.) Put one inch of the crystalline mixture in the test tube, add one inch of urine, shake well, add one inch of strong (0.88) ammonia, shake, and allow to stand for five minutes.* If the test is positive a *permanganate*

* Many normal urines give with this test a transient pink colour which is not due to acetone, but the colour always fades within five minutes.

Diet 1.—1,500 Calorie Diet

DIET A

DIET B

	Weight in Grams				Weight in Grams		
	Carbohydrates	Proteins	Fats		Carbohydrates	Proteins	Fats
BREAKFAST				BREAKFAST			
Tea	—	—	—	[As for Diet A]	43	11	13½
Milk 2 oz.	3	2	2				
1 egg	—	6	5				
Bread 2½ oz.	43	3	—				
Butter ½ oz.	—	—	6½				
	43	11	13½		43	11	13½
DINNER				LUNCH			
Lean meat 3½ oz.	—	35	10½	Lean meat 2 oz.	—	20	6
Greens 6 oz.	2	1	—	Fat or butter ½ oz.	—	—	6½
Potatoes 4½ oz.	27	3	—	Potatoes 4½ oz. or 3½ oz.	28½	3	—
Custard—				Tomato 2 oz. or root vegetable 5 oz.	—	—	—
½ egg	—	3	2½	Lettuce	—	—	—
Milk 5 oz.	7½	5	5	Custard—			
Orange, apple, pear, or grape-fruit 3 oz.	6	—	—	½ egg, milk 5 oz.	7½	8	7½
				or			
	42½	47	18	Bread ½ oz., cheese 1 oz.	6	—	—
				Orange 3 oz.	—	—	—
					6	—	—
					42	31	20
TEA				TEA			
Tea	—	—	—	[As for Diet A]	18	3	8½
Milk 2 oz.	3	2	2				
Bread 1 oz.	15	1	—				
Butter ¼ oz.	—	—	6½				
	18	3	8½		18	3	8½
SUPPER				DINNER			
Cheese 2 oz. or ham 2½ oz.	—	16	16	Clear soup	—	—	—
Bread 2½ oz.	37½	2½	—	Meat 2½ oz.	—	25	7½
Butter ½ oz.	—	—	12	Fat or butter ½ oz.	—	—	6½
Orange, apple, pear, or grape-fruit 3 oz.	6	—	—	Potatoes 3 oz.	18	1½	—
				Greens 3 oz.	1	—	—
	43½	18½	28	Cereal pudding—			
				Cereal ½ oz., milk 7 oz.			
				or			
				Bread pudding—			
				Bread 1 oz., ½ egg, milk 5 oz., saccharin	23	7	7
				Coffee with milk 1 oz.	1½	1	1
					43½	31½	22
Total Weight in Grams	147	79	68	Total Weight in Grams	146	79	64

Diet 2.—1,750 Calorie Diet

DIET A				DIET B			
	Weight in Grams				Weight in Grams		
	Carbohydrates	Proteins	Fats		Carbohydrates	Proteins	Fats
BREAKFAST				BREAKFAST			
Tea	—	—	—	[As for Diet A]	51	11	23½
Milk 2 oz.	3	2	2				
Bacon 1 oz.	—	5	15				
Tomato 4 oz.	3	1	—				
Bread 3 oz.	45	3	—				
Butter ½ oz.	—	—	6½				
	51	11	23½		51	11	23½
DINNER				LUNCH			
Lean meat 3½ oz.	—	35	10½	Lean meat 2 oz.	—	20	6
Butter or fat ½ oz.	—	—	3	Fat or butter 8 oz.	—	—	12½
Potatoes 5 oz.	30	2	—	Potatoes 4½ oz. or 3½ oz.	—	—	—
Greens 3 oz.	1	½	—	Tomato 4 oz. or root vegetable 5 oz.	30	3½	—
Cereal pudding—Rice ½ oz. milk 7 oz.	23	7	7	Lettuce	—	—	—
or Bread pudding—Bread 1 oz.				—	3	2½	
½ egg, milk 5 oz., saccharin	—	—	—	Milk 5 oz.	7½	5	5
				Banana 3 oz.	17	—	—
	54	44½	20½		54½	31½	26
				<i>Or</i>			
				LUNCH B			
				Sandwiches—			
				Bread 3 oz.	45	3	—
				Butter ½ oz.	—	—	12½
				Lean meat 2½ oz.	—	25	7½
				Tomato 4 oz.	3	1	—
				Orange, apple, or pear 3 oz.	6	—	—
	54	29	20		54	29	20
TEA				TEA			
Tea	—	—	—	[As for Diet A]	18	3	8½
Milk 2 oz.	3	2	2				
Bread 1 oz.	15	1	—				
Butter ½ oz.	—	—	6½				
	18	3	8½		18	3	8½
SUPPER				DINNER			
Cheese 2 oz., or ham 2½ oz.	—	16	16	Clear soup	—	—	—
Tomato 4 oz.	3	1	—	Lean meat 2½ oz.	—	25	7½
Bread 3 oz.	45	3	—	Fat ½ oz.	—	—	6½
Butter ½ oz.	—	—	12½	Potatoes 3½ oz.	21	2	—
Orange, apple, pear, or grape-fruit	6	—	—	Greens 3 oz.	1	½	—
3 oz.				—	—	Cereal pudding—	
				Rice ½ oz.	12½	—	—
				Milk 7 oz.	10½	7	7
				Orange, apple, pear, or grape-fruit			
				3 oz.	6	—	—
				Coffee with milk 2 oz.	3	2	2
	54	20	28½		54	36	23
Total Weight in Grams	177	79	81	Total Weight in Grams	177	79	81

colour develops. All brown colours should be disregarded. The amount of acetone present can be roughly estimated by the depth of the colour, which can be denoted as: ++ (a deep purple colour, like ink); + (a strong but transparent colour); "trace" (a weak purple colour). This test is very sensitive; it detects acetone in the concentrations which are encountered during the adjustment of diet and insulin.

TEST FOR SUGAR

Benedict's Test.—Add eight drops of urine to one teaspoonful of Benedict's qualitative solution in a test tube and boil; in the absence of sugar the solution remains blue, but in the presence of increasing amounts of sugar, green, yellow, or red precipitates form. These results are indicated as: O (blue), G (green), Y (yellow), and R (red).

When a diabetic first comes for treatment two questions immediately arise. What diet does the patient require? Does the patient need insulin? It may be said at once that the only occasion on which insulin must be given immediately is when the patient's urine shows a positive ferric chloride reaction, for this indicates that immediate treatment is essential to prevent the development of coma. In other cases the decision whether to give or to withhold insulin is made on the reaction of the case to dietetic treatment.

Diet

Various formulae are still taught for calculating the caloric need, the protein requirements, and the ratio of carbohydrate to fat in the diabetic's diet. Such formulae were rendered obsolete by the discovery of insulin. The patient's caloric requirements can be judged sufficiently exactly from his general appearance. A big, active man will manage with 2,300, a sedentary worker with 2,000, most women with 1,750, and some small individuals with 1,500 calories. The proportions of the different foodstuffs in the diabetic diet is a matter of opinion, but the key diets here given have proved very satisfactory in practice.

In these days of trained dietitians one cannot hope to construct menus to rival their skilful productions, and I advise every practitioner to provide himself with four key diets, devised by a specialist in dietetics. He need then have no fear that his diets are deficient in protein, vitamins, or minerals, nor that the fat and carbohydrate contents are not in a correct ratio. The diets here given are so constructed that a patient taking them will not excrete acetone bodies in the urine without first showing glycosuria. With these as a basis it is easy, with the help of tables giving food values, to substitute dishes of

Diet 3.—2,000 Calorie Diet

DIET A

DIET B

	Weight in Grams				Weight in Grams		
	Carbohydrates	Proteins	Fats		Carbohydrates	Proteins	Fats
BREAKFAST				BREAKFAST			
Tea or coffee	—	—	—	[As in Diet A]	63	17	28½
Milk 2 oz.	3	2	2				
1 egg	—	6	5				
Bacon 1 oz.	—	5	15				
Bread 4 oz.	60	4	—				
Butter ½ oz.	—	—	6½				
	63	17	28½		63	17	28½
DINNER				LUNCH			
Lean meat 3 oz.	—	30	9	Lean meat 2 oz.	—	20	6
Fat or butter ½ oz.	—	—	12½	Fat ½ oz.	—	—	9½
Potatoes 5½ oz.	33	3	—	Tomato 4 oz.; lettuce; potatoes } 6 oz. or } Carrots 5 oz.; potatoes 5 oz. ... }	39½	4½	—
Greens 6 oz.	2	1	—	Butter ½ oz.	—	—	6½
Cereal pudding— Cereal ½ oz., milk 7 oz. ... } Or } Bread pudding— Bread 1 oz., ½ egg, milk 5 oz., } saccharin } Orange, apple, pear or grape-fruit 3 oz.	23	7	7	Custard— ½ egg	—	3	2½
	6	—	—	Milk 5 oz.	7½	5	5
				Banana 3 oz.	17	—	—
				Or	64	32	29½
				PICNIC LUNCH			
				Sandwiches— Bread 3 oz.	45	3	—
				Butter ½ oz.	—	—	12½
				Lean meat 2 oz.	—	20	6
				Tomato 4 oz.	3	1	—
				2 cream crackers	10	—	—
				Butter ½ oz.	—	—	3½
				Cheese 1 oz.	—	8	8
				Orange, apple or pear 3 oz.	6	—	—
	64	41	28½		64	32	30
TEA				TEA			
Tea	—	—	—	[As for Diet A]	18	3	8½
Milk 2 oz.	3	2	2				
Bread 1 oz.	15	1	—				
Butter ½ oz.	—	—	6½				
	18	3	8½				
SUPPER				DINNER			
Cheese 2 oz. or ham 2½ oz.	—	16	16	Clear soup	—	—	6
Tomato 4 oz.	3	1	—	Lean meat 2 oz.	—	20	6
Bread 3½ oz.	52½	3½	—	Fat or butter ½ oz.	—	—	6½
Butter ½ oz.	—	—	12½	Potatoes 3½ oz.	21	2	—
Orange, apple, pear or grape-fruit 3 oz.	6	—	—	Greens 3 oz.	1	—	—
				Bread ½ oz.	7½	½	—
				Butter ½ oz.	—	—	6½
				Cereal pudding— Cereal ½ oz.	12½	—	—
				Milk 7 oz.	10½	7	7
				Orange 3 oz.	6	—	—
				Coffee with milk 2 oz.	3	2	2
	61½	20½	28½		61½	31	28
Total Weight in Grams	206	81	94	Total Weight in Grams	206	83	95

similar composition and so adjust the diet to the varying tastes of patients.

The patient should be instructed to weigh out his diet every day for the first week, every other day for the next fortnight, twice a week for the next month, and thereafter once a week. In this way the patient's visual judgement of amounts is trained and kept in practice. Insist upon his weighing all his food on a definite day—say, Sunday—each week.

It may be objected that this scheme of dietetic treatment is unnecessarily stringent for application to all cases of diabetes mellitus. It is true that many mild cases will do perfectly well on simple qualitative restriction of food; but it is also true that it is impossible to judge at first sight which cases will be mild and which will be moderately severe. This decision can only be made on the reaction to treatment. It is far better to institute a stringent regime at the outset, when the patient is amenable, and then to slacken the restrictions

if the case improves, than to begin with light restrictions and then to have to increase their stringency piecemeal.

Technique of Balancing

Whenever possible "balance" the patient while he is living his usual life. For the purpose of illustration it will be assumed that our patient will ultimately require a diet of 2,000 calories (Diet 3). Start by giving him a diet of 1,500 calories (Diet 1). Instruct him to collect separately specimens of urine passed half an hour before and two hours after each of the three main meals—breakfast, midday meal, and supper—and to begin this collection the day after starting the diet. The patient is seen again forty-eight hours after starting the diet, and the urine specimens are each tested for sugar and acetone. Treatment proceeds in accordance with the "urine picture" thus disclosed. If acetone is present in all the specimens insulin must be started immediately (Table I). Delay is both dangerous and useless. If

Diet 4.—2,250 Calorie Diet

	DIET A			DIET B		
	Weight in Grams			Weight in Grams		
	Carbohydrates	Proteins	Fats	Carbohydrates	Proteins	Fats
BREAKFAST						
Tea	—	—	—			
Milk 2 oz.	3	2	2			
1 egg	—	6	5			
Bacon 1 oz.	—	5	15			
Butter ½ oz.	—	—	19			
Tomato 4 oz. and bread 4½ oz. ...	70½	5½	—	73½	18½	41
or Bread 4½ oz.						
	73½	18½	41	73½	18½	41
DINNER						
Lean meat 2 oz.	—	20	6½		20	6
Fat meat or butter ½ oz.	—	—	6½		—	12½
Potatoes 7 oz.	42	4	—	45	4	—
Greens 3 oz.	1	½	—	—	—	—
Cereal pudding—						
Cereal ½ oz.	12½	—	—	10	—	—
Milk 7 oz.	10½	7	7	—	4	4
or Bread pudding—bread 1 oz., ½ egg, milk 5 oz., saccharin	—	—	—	—	—	6½
Orange, apple, pear, or grape-fruit 3 oz.	6	—	—	17	—	—
	72	31½	19	72	28	29
LUNCH						
Lean meat 2 oz.	—	—	—	—	20	6
Fat or butter or olive oil ½ oz. ...	—	—	—	—	—	12½
Potatoes 7 oz.; tomato 7½ oz.; or root vegetable 4 oz.	45	4	—	45	4	—
Lettuce	—	—	—	—	—	—
2 cream crackers	10	—	—	10	—	—
Cheese ½ oz.	—	—	—	—	4	4
Butter ½ oz.	—	—	—	—	—	6½
Banana 3 oz.; or prunes 4 oz.; or grapes 6 oz.	—	—	—	17	—	—
	72	28	29	72	28	29
TEA						
Tea with milk 3 oz.	4½	3	3			
Bread 1 oz.	15	1	—			
Butter ½ oz.	—	—	6½			
	19½	4	9½	19½	4	9½
TEA						
[Tea as for Diet A]	19½	4	9½	19½	4	9½
SUPPER						
Cheese 2 oz.	—	16	16			
Bread 4 oz.	60	4	—		20	6
Butter ½ oz.	—	—	12½		—	12½
Mustard—						
½ egg	—	3	2½		—	—
Milk 5 oz.	7½	5	5		3	—
Orange, apple, pear, or grape-fruit 3 oz.	6	—	—		—	—
	73½	28	36½	73	33	27½
DINNER						
Clear soup	—	—	—	—	—	—
Lean meat 2 oz.	—	—	—	—	20	6
Fat or butter ½ oz.	—	—	—	—	—	12½
or Fish 4 oz. and butter ½ oz.	—	—	—	—	—	—
Potatoes 5½ oz.	33	1	—	33	3	—
Greens 3 oz.	1	½	—	1	½	—
Bread ½ oz.	7½	—	—	7½	—	—
Cereal pudding—						
Rice ½ oz.	12½	—	—	12½	—	—
Milk 7 oz.	10½	7	7	10½	7	7
Orange, apple, or pear 3 oz.	6	—	—	6	—	—
Coffee with milk 2 oz.	3	2	—	3	2	—
	73	33	27½	73	33	27½
Total Weight in Grams	238	82	106	238	83	107

* Sandwiches can be made by using 2½ oz. bread in place of potato 7 oz.

acetone is not present in all the specimens the patient should be instructed to continue with the same diet for a further five days, and then the six urine specimens of the last day should be collected and examined again.

TABLE I.—Urine Specimens at the End of the First Forty-eight Hours on Diet

Time of Taking Specimen	Urine Tests	
	Sugar	Acetone
½ hour before breakfast	R	++
2 hours after "	R	++
½ hour before midday meal	R	+
2 hours after " "	Y	—
½ hour before supper	R	++
2 hours after "	R	Trace

A "urine picture" such as this would indicate the immediate necessity for starting insulin.

In the majority of cases the decision whether or not to begin insulin treatment can now be made. Put concisely, the rule is: if acetone is present in more than a trace in any one of these six specimens commence

insulin therapy. Thus in Table II the patients showing the urine pictures of columns 3 and 4 would receive insulin; those showing the picture of columns 1 and 2 would not. In the case of a patient with the urine

TABLE II.—Urine Specimens after Seven Days on Diet

Time of Taking Specimen	Urine Tests							
	Insulin NOT Required				Insulin Indicated			
	1		2		3		4	
	Sugar	Acetone	Sugar	Acetone	Sugar	Acetone	Sugar	Acetone
½ hour before breakfast...	0	0	0	0	0	+	G	++
2 hours after "	0	0	Y	0	R	Trace	R	+
½ hour before midday meal	0	0	G	0	G	0	Y	0
2 hours after " "	0	0	0	0	Y	0	R	+
½ hour before supper	0	0	0	0	0	Trace	Y	0
2 hours after "	0	0	0	0	G	0	Y	+

It should be noted that there are no ketones present in the specimens of columns 1 and 2.

picture of columns 1 or 2 the diet next higher in the scale is given—in the illustrative case 1,750 calories (Diet 2). At the end of a week on the new diet the patient is seen again, and if the urine picture is satisfactory the next higher diet is given—in our case the final diet of 2,000 calories (Diet 3). If now at the end of a further week the urine pictures are still those of columns 1 or 2 the patient can be considered balanced, and passes into the stage of "routine care." At any stage, however, should the urine picture at the end of the week on the increased diet show more sugar and possibly acetone the patient is put back to the previous diet, and the specimens are examined again in four days' time. If now only sugar is present in the specimens the patient is told to continue with the diet and return in a further ten days, but if acetone is also found it is wiser to start insulin. In the former case, if at the end of ten days sugar is found only in moderate amounts (green and yellow precipitates by Benedict's reaction) the policy of waiting for a spontaneous diminution of glycosuria can be pursued, but if it is found in large amounts insulin should be given. The indefinite continuance of anything other than moderate glycosuria should not be countenanced save in the special cases to which we shall refer later.

Insulin

Let us now consider the patient whose urine picture at any stage during balancing indicates the necessity for insulin treatment. Start by ordering 5 units of insulin half an hour before breakfast and 5 units half an hour before supper. Examine the urine specimens four days later, and if there is no improvement in the urine picture increase each dose of insulin to 10 units. Continue to examine the urine picture at intervals of four days and to increase each dose of insulin by 5 units so long as acetone continues to be present. When acetone has disappeared completely and only sugar remains, wait one week before ordering any further change in treatment, as spontaneous improvement may occur. The object of treatment now is to produce the urine picture shown in column 2 of Table II. The patient is seen at weekly intervals, and first one dose and next week the other dose of insulin is increased by 5 units until this object is realized. The diet next higher in the scale of calories is then given, and a week later the specimens are again tested. If the tests are satisfactory the next higher diet is given, and so on until the patient is receiving his full complement of calories. If the tests show an increase of glycosuria the appropriate dose of insulin is raised and the increase of insulin continued at weekly intervals until a satisfactory urine picture has again been obtained. The diet can then be further increased.

If the total daily dose of insulin is 15 units or less an attempt should be made to give it as one dose before breakfast. If the daily dose is 70 units or more it should be split into three portions—for example, 25, 20, and 25. A diabetic is considered balanced when he is receiving his full complement of calories and not more than two of the six urine specimens contain sugar.

(To be continued)

The third Congress of French-speaking Electroradiologists will be held in the physics lecture room of the Paris Faculty of Medicine from October 8th to 10th, under the presidency of Dr. Rechou, when papers will be read on the radiology of so-called rheumatic osteo-articular affections, high-tension radiotherapy, and electrotherapy in metritis. Further information can be obtained from the general secretary, Dr. Dariaeux, 9 bis Boulevard Rochcouart, Paris, 9e.

Nova et Vetera

HENRY LILLEY SMITH, M.R.C.S.—FOUNDER OF SELF-SUPPORTING DISPENSARIES

Henry Lilley Smith was born at Southam, Warwickshire, in 1787 or 1788. He became assistant surgeon to the 45th Regiment, and apparently served under Sir John Moore during the retreat to Corunna. He obtained the diploma of M.R.C.S. in 1810, and then practised at Southam, where he was appointed parish surgeon. He was one of the original members of the Provincial Medical and Surgical (now the British Medical) Association, and served on the Council. He died at Southam, where he was buried, on April 12th, 1859.

His greatest ambition was to improve the condition of the working classes, not by indiscriminate charity, but by helping them to help themselves. His principal achievement was to establish a self-supporting dispensary at Southam, the first in England, but he promoted several other interesting philanthropic schemes.

His first venture was to open, in April, 1818, a small hospital at Southam for the treatment of diseases of the eye and ear. He was greatly assisted by Sir Grey Skipwith, who represented South Warwickshire in the first reformed Parliament. The hospital, built on land belonging to Dr. Smith and adjoining his house, contained about fourteen beds; it was supported by voluntary subscriptions and donations. Dr. Smith periodically visited Warwick, Rugby, Banbury, and Northampton to select suitable cases. About 100 in-patients and 250 out-patients were treated annually. In-patients received free professional attendance, medicine, and lodging, but had to pay for their food, the charge for which was 10d. a day for a man, 8d. for a woman, and 6d. for a child. During the first forty years of the "Eye and Ear Infirmary's" existence, 12,220 patients were treated, and two-thirds were discharged cured.

The Dispensary at Southam

Dr. Smith's experience as parish surgeon made him extremely dissatisfied with the system—or lack of system—of giving medical assistance to the poor, and led him, in 1823, to establish a self-supporting dispensary at Southam under the presidency of Sir Grey Skipwith, assisted by a committee.

The premises consisted of a two-storied thatched cottage, which, to judge from pictures of it, seems to have contained six rooms; it stood close to the Eye and Ear Infirmary. Membership was confined to persons who lived in or near Southam, and could neither afford to pay for medical attendance at the usual rates nor support themselves without manual labour. An income limit was thus fixed only indirectly. Intending members, if servants, had to be recommended by their masters or mistresses; if not servants, by the clergyman of their parish or by two respectable inhabitants. The annual subscription, payable quarterly or in a lump sum, was 3s. 6d. for adults, 2s. for children. Visits to patients in Southam were free; 2s. 6d. was charged for a visit if within three miles, and a further fee of 1s. was charged for each additional mile. Midwifery was not included in the benefits. Dr. Smith's consulting hours at the dispensary were 7 to 10 a.m. on Sundays, and 7 to 12 noon on Mondays and Thursdays; an assistant surgeon and a dispenser were always in attendance. In a difficult case a physician could be called in consultation without charge to the patient if a member of the committee gave his consent. Donations for the outfit were thankfully received, but subscriptions, except from members, were not invited. The dispensary soon became entirely self-supporting. In 1825 it had 336 members; their subscriptions amounted to £44 11s. 11d., additional payments for visits to £26 0s. 6d., the credit balance, after deducting all expenses, to £7 5s. 7½d. The subscriptions usually exceeded the expenses, but during the cholera epidemic in 1832 they failed to do so, and then each family was asked to pay an additional sixpence a week. In one respect the dispensary failed to realize Dr. Smith's hopes. He strongly upheld the principle of "free choice of doctor," and hoped that his colleagues in the neighbour-