Section of Medicine.

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Nine Cases of Recovery from Diabetes Mellitus.

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In order that the title of this paper shall convey the same meaning to all, a definition of diabetes mellitus is essential. For the purpose of this paper the definition of diabetes mellitus is: "A disease due to a progressive deterioration of the metabolism, primarily of that of carbohydrate and secondarily of that of protein and fat." This deterioration may progress steadily, sporadically or fulminatingly; it may be arrested or even reversed by medical treatment. The diagnosis of diabetes has been based upon symptoms such as thirst, polyuria, dry tongue, lack of energy, loss of weight accompanied by a hyperglycæmia. I diagnose hyperglycæmic glycosuria in the absence of symptoms as diabetes mellitus only when there is conclusive evidence that the loss of power of storing sugar is progressive.

I regard a patient as having made a complete recovery when he has eaten ordinary food for at least six months and has at no time developed glycosuria. Naturally, during this period he has not received any drug calculated to assist metabolism nor to delay absorption. If the patient happens to have a low renal threshold for dextrose, the fact that the concentration of sugar in his blood has not risen above 0·19% after the principal meals replaced the absence of glycosuria.

Some of the cases have made only a partial recovery. I have assumed that the recovery is partial when the patient has been able to utilize a diet containing more carbohydrate than that which he received when he needed insulin. The diet must contain more than 90 grm. carbohydrate and at least 35 calories per kilogramme body weight per diem. There must have been a period of at least six months freedom from insulin.

About eight years ago Sir Archibald Garrod asked me whether I had ever seen a case of undoubted diabetes mellitus make a recovery; my reply was "never," and at that time I fear I should have received any story of recovery with an air of incredulity. That opinion is no doubt current to-day. If any holding that point of view happen to be present this afternoon, I would ask them to indicate any error in my diagnosis or to amend my conclusions on the question of recovery.

The nine cases I am about to record do not represent all in which hyperglycæmia has ceased to develop after meals, but since I do not admit that hyperglycæmic glycosuria is necessarily diabetes mellitus, only cases satisfying the definition are included. I have used the word "recovery" instead of the word "cure" in order to avoid making the assumption that the treatment has been responsible for the return to health. Since, however, the treatment to which these patients have been submitted is not that advocated by the majority of authorities on diabetes mellitus, a description of it may prove of interest. As more than six years have elapsed since I outlined this treatment, and as I have adhered to it during that time, perhaps you will forgive my repeating my former statements: "We have in insulin a substance which when injected into a diabetic, allows him to burn sugar. The question we have to consider to-day is how to use this substance to the greatest advantage of our patients. In order to answer that question I must remind you of the work done by F. M. Allen ten years ago. His experiments consisted in removing the greater part

of the pancreas and observing the condition which allowed life to be prolonged. The conclusion he arrived at was that overwork of the pancreas led to degeneration of that gland. This was an epoch-making discovery, the importance of which has not been fully appreciated, although it forms the basis of the successful treatment of diabetes mellitus. . . . Therefore if an attempt be made to arrest the disease in a diabetic, insulin must be given in sufficient quantity to prevent at any time a hyperglycæmia which will over-stimulate the β cells of the islands of Langerhans."

The mechanism through which the pancreas is stimulated has not been determined definitely, and this is not the time or the opportunity for me to lay before you the evidence in favour of a peripheral or central apparatus, but there is one thing upon which all are agreed, namely, that the concentration of sugar in the blood is the determining factor. The pancreas is stimulated into activity when the sugar in the blood rises above a certain concentration: in all probability this concentration not only differs in different individuals, but also varies from time to time in the same individual, but since I have not succeeded in discovering a method of determining this concentration in the diabetic subject, I have been arbitrary and have assumed it to be 0·15%. Although the treatment has been directed to keep the concentration of sugar in the blood below the figure in all cases treated, nevertheless in other respects the patients have been studied individually; the diets have not been fixed by reference to any tables which declare that a patient whose height is a certain fraction of a mile whilst his skin-surface is a certain fraction of an acre requires a certain number of calories in his daily food. I hold no brief for those who advocate a diet very poor in carbohydrates, or for those who assert that so long as the quantity of fat is kept low the patient may receive plenty of carbohydrate. In my experience some patients are able to take more carbohydrate than fat, but this is far from the general rule, except amongst the obese. All my patients have received sufficient food to satisfy their appetites and the majority sufficient to allow them to gain or maintain their weight. A few have been obese and their diets have been arranged for them to lose weight. None of the nine patients has received alcohol. The views on the advisability of administering alcohol to diabetic patients have changed from time to time. Fourteen years ago it was given in comparatively large quantities because it was thought to be able to supply energy in a form which could be used. Later, several observers, myself among them, found that on ceasing to give alcohol, the weight of the patient did not fall and that there was no evidence that it served any useful purpose. I think that during the last few years evidence has been accumulating to prove that it retards regeneration of the pancreas and acts as a poison in a way comparable with chloroform and ether, but in a degree less potent.

There has not been any fixed interval between the injections of insulin and the meal; the time has differed in different patients from five to ninety minutes, depending entirely upon the concentration of sugar in the blood before and after meals. The number of meals and the hours have been arranged to suit the individual patient. Frequently it has been found necessary for carbohydrate to be taken at 11 a.m. and 10 p.m. in order to prevent the development of hypoglycæmic attacks towards midday and midnight. In cases in which attempts were made to prevent these attacks by decreasing the dose of insulin, the concentration of sugar in the blood rose to over 0·15% about an hour after the meal. I am not satisfied that a patient under my care is being treated correctly until it has been proved that the concentration of sugar in the blood at all times during the day and the night does not rise above 0·15%; one can be certain of this only by taking samples of blood and estimating the sugar in them. After the correct diet and dose of insulin have been established, further observations become necessary when any reduction is made in the dose of insulin.

The difference between the treatment I have adopted and that advocated by the majority may be summed up in the following words: Most advise the administration

of the minimum dose of insulin which will render the patient free from glycosuria whilst on a fixed diet; I give the maximum dose of insulin which the patient can stand whilst on a fixed diet. It may be alleged that the nine cases of recovery which I produce represent an extremely small percentage of those which have been under my care, and that these cases would have recovered with any alternative treatment. If, however, observers with an equal experience of diabetes mellitus have failed to attain positive results with cases treated in the more orthodox manner, I am forced to the conclusion that the method I have adopted has been instrumental in promoting recovery.

I attribute the small percentage of recoveries to a variety of causes; amongst them are:—

(1) The fact that patients are not treated with insulin immediately upon the development of the disease; the longer the interval between the onset of the disease and the commencement of the above treatment, the more remote the chance of making a complete recovery. Until the world sees a new generation of medical practitioners it will not become the general rule to treat diabetes mellitus with insulin from the onset of the disease. There are few things more dramatic in medicine than the improvement, unfortunately only temporary, which follows upon the restriction of diet, in any patient suffering from diabetes mellitus. Those who have seen this remarkable change in their patients will be persuaded only with difficulty that any better treatment is a practical policy. There is also a prevalent belief that once a patient is started on a course of insulin, he must continue that treatment for the rest of his days. The practitioner therefore postpones the use of insulin until the life of the patient is threatened, which usually is at a point long past the period when complete recovery is possible.

(2) The second factor inimical to recovery is infection. A patient who appears to be making good progress, to such an extent that it has been necessary to reduce his dose of insulin on several occasions, suddenly experiences thirst, polyuria and glycosuria. In other words, he has a second attack of the disease, or has developed some acute infection which may in many ways simulate a second attack. The differential diagnosis between the two conditions must depend upon the discovery of the source of infection. If no source can be discovered it is assumed to be a second attack. At the same time it should be observed that whilst infections are common, second attacks are rare. The return to the condition which prevailed before an infection is often fairly rapid, but after a second attack the progress is tediously slow. A considerable number of budding recoveries have been nipped by infections in a most disheartening manner.

(3) The third factor is the difficulty of adhering to the rule that the concentration of sugar in the blood must never rise above 0·15%.

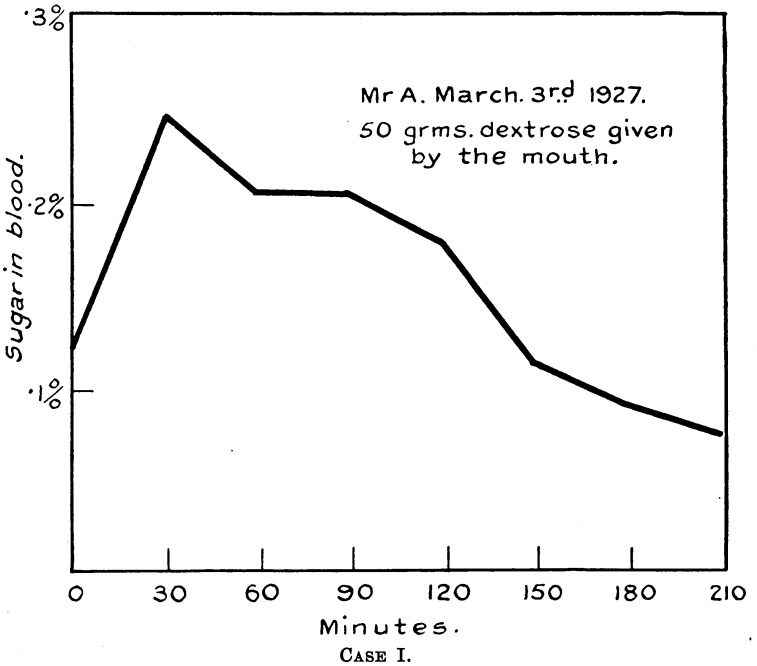
My cases of recovery have been confined (with one exception which is not included in to-day's list) to private patients. It is essential that the patient should be intelligent and scrupulously obedient. Even then there are difficulties. The concentration of sugar in the blood tends to rise during the night, and in some cases is well above the limit by six o'clock in the morning unless a dose of insulin be given about one a.m. This is extremely inconvenient. The promise that a recovery would result from following the prescription for a year would no doubt remove all objections, but only quacks guarantee recoveries; therefore the number of patients willing to have this injection has been comparatively small. By the use of insulin suspended in castor oil injected towards six o'clock in the evening, I believe that this difficulty of the rise of sugar in the blood during the night will be overcome. The absorption of insulin in oil is slow and the action prolonged.

My object in bringing the cases before you is to invite criticism. Should any speaker take the view that these cases are not due to subinsulinism but to hyperpituitarism, I trust that he will favour us with detailed reasons for that conclusion.

Case I.—Mr. A., aged 66. First seen October 16, 1924.

Family History.—None of diabetes mellitus.

Fourteen days previously he had had a cold, and ten days ago his mouth became dry, even shortly after taking fluid. He suffered from intense polyuria, having to pass urine at intervals of less than an hour, and he noticed it was practically colourless. Nine days later he began to feel really ill. I found that his urine contained much sugar and that the concentration of sugar in his blood at 12.50 (four hours after a meal) was 0·31%. He came under treatment immediately, and upon a limited diet containing about 70 grm. of carbohydrate, it needed 10 units of insulin injected twice a day to keep the concentration of sugar in the blood under 0·15%. From time to time samples of blood were taken in order to be certain that this figure was not exceeded. In March, 1925, after a luncheon containing 30 grm. of carbohydrate, the sugar in his blood rose to 0·19%, and therefore he was told that he could not take as much as this at a meal without having insulin previously. He



CASE I.

was quite willing to reduce the diet. Estimation of the concentration of sugar in his blood was made at intervals of a week for some time, and on no occasion was it found to rise above 0·15%.

On March 3, 1927, after 50 grm. of dextrose by the mouth, the sugar in his blood rose to 0·25%; it fell again to 0·107% within 120 minutes. His diet was gradually increased.

On February 13, 1929, at 5 p.m., the concentration of sugar in his blood was 0·14%. On being asked whether he had now returned to a perfectly normal diet he replied, "I do not take sugar with apple tart." In January, 1930, he reported "all well," and sugar in blood was 0·14%.

Analysing this case, there seems to be little doubt that the patient had true diabetes mellitus, for he had thirst, polyuria, glycosuria and hyperglycæmia even

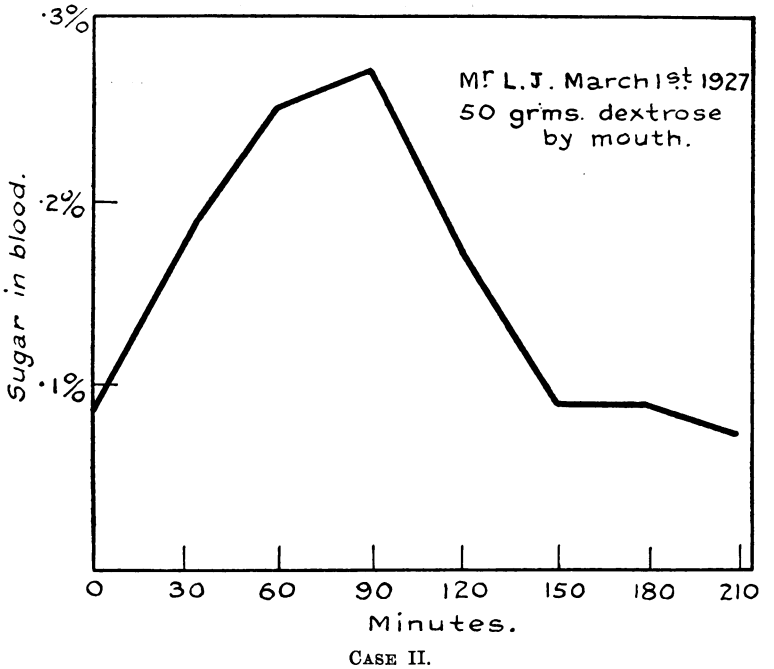
four hours after a meal. There can be little doubt about his recovery. In February, 1929, whilst he was on a perfectly ordinary diet including bread, potatoes and puddings, the sugar in his blood was 0·14%, and he described his health as perfect.

Case II.—Mr. L. J., aged 49. First seen March 1, 1926.

Family History.—None of diabetes mellitus.

Whilst in Torquay on holiday he suddenly developed severe thirst, and on consulting a doctor was told that he had sugar in his urine and should seek advice in London without delay. At 12.10 p.m. the sugar in his blood was 0·30%. He was placed in a nursing home and given a restricted diet containing 70 grm. of carbohydrate. On March 3 the sugar in his blood was: at 7.45 a.m., 0·23%; 9 a.m., 0·33%; 2 p.m., 0·20%; 6.30 p.m., 0·23%; 10·30 p.m., 0·27%.

The dose of insulin was gradually increased to 20 units twice a day, and on March 11 the sugar in his blood was: at 7.30 a.m., 0·13%; 9 a.m., 0·13%; 12.30 p.m., 0·11%; 6.35 p.m., 0·11%; 8.15 p.m., 0·11%.



Case II.

On April 12, at 11.40, the sugar in his blood was 0·10%, and the insulin was reduced to 15 units twice a day. On May 17 the dose of insulin was reduced to 12½ units and 10 units because the patient had been suffering from hypoglycæmic symptoms. The sugar in his blood at mid-day was 0·07%. On July 1 the sugar in his blood towards mid-day was 0·115%, the insulin having been reduced to 10 and 8 units because he had had severe attacks of hypoglycæmia. On August 6 a further reduction to 7 and 6 units, the blood taken at 4.30 containing 0·12%.

The blood taken in September, October and December was all within the limits of normal, and the dose of insulin was reduced to 10 units once a day. On this dose he continued until March 1, 1927, when an hour after breakfast the sugar in his blood was 0·09%. He was then submitted to a tolerance test, 50 grm. of dextrose

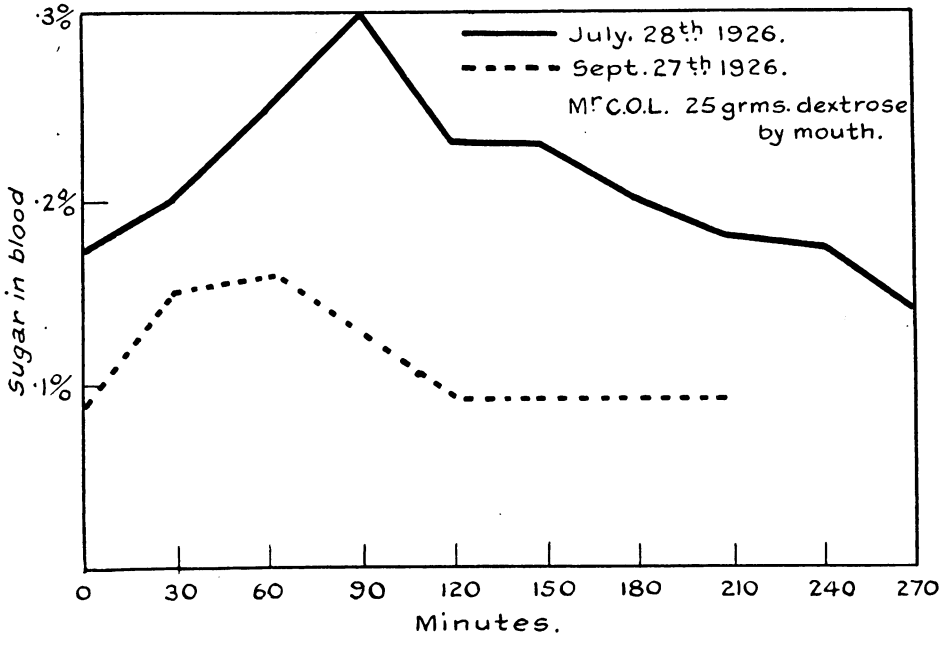
being given; he was able to store carbohydrate at the rate of 33 grm. per hour, which is roughly about half the average efficiency. He ceased taking insulin.

On November 16, 1927, the sugar in his blood at mid-day was 0·12%, at 2.45 0·11%. On January 1, 1928, at 5 p.m. it was 0·13%. In April, 1929, he had rather severe bronchitis, but the sugar in his blood shortly after mid-day was 0·08%. The patient found that his diet, which was only slightly restricted, satisfied him completely, and he was not willing to add to it in any respect.

Analysis.—The sudden onset of the disease with intense thirst and hyperglycæmia left no reasonable doubt that it was one of true diabetes mellitus. The evidence of the hyperglycæmia did not rest upon a single observation but upon a series of observations. That the recovery was fairly complete is proved by the fact that he was able to store or burn 33 grm. carbohydrate per hour; that it was permanent was shown by the observation that in April, 1929, the sugar in his blood was normal whilst he had not received insulin since March 1, 1927.

Case III.—Mr. C. O. L. First seen July 27, 1926, aged 47.

Family History.—Mother diabetic, two brothers refused life insurance due to glycosuria.



CASE III.

Came home from holiday in France because he had developed breathlessness and intense thirst along with some changes in his vision. These changes in refraction were stated by Mr. Flemming to be typical of diabetes mellitus. When he came to see me he had been on a carbohydrate-free diet, and at 3.40 p.m. the concentration of sugar in his blood was 0·16%, so that obviously he had reacted well to the restricted diet. With the history he gave me it seemed unwise to advise him to go on with an ordinary diet before submitting him to a carbohydrate metabolism efficiency test. He was told to present himself the following morning having had only a cup

of tea for breakfast. The sugar in his blood was 0·17%, and therefore he was given a small dose of only 25 grm. of dextrose by the mouth dissolved in 200 c.c. of water to which a little acid had been added. The concentration of sugar in his blood rose to 0·3% and had not fallen to 0·17% after 160 minutes. The patient was placed upon a restricted diet and 10 units of insulin twice a day.

On September 24 he decided to come under close observation, but the sugar in his blood was found to be as low as 0·06%. On September 27 he was submitted to a similar test to that which had been carried out at the end of July, and then the sugar in his blood rose to 0·16% and took only eighty minutes to fall to 0·09%. On September 29 he was given 50 grm. of carbohydrate and the sugar in his blood rose to 0·21%. He was advised to keep on a limited diet, and until November 19 took only 23 calories per kilogram of body weight per diem. Since he lost weight his diet was then raised to 30 calories per kilogram bodyweight.

On January 14, 1927, he was given 50 grm. of dextrose. It was then found that sugar in his blood did not rise above 0·12% and fell to 0·08%, and that therefore his power of utilizing sugar was up to the normal, and he was advised that he could eat and drink whatever he liked. In April, 1927, the concentration of sugar in his blood was satisfactory, and therefore I suggested that for a short time he should do himself very well indeed in order that we might find out whether his metabolism could stand up against a big strain. On May 13, 1927, the concentration of sugar in his blood after lunch rose to 0·22%, which led to the advice that it would be wise for him to eat only as much as was necessary to satisfy his hunger. Since that time he has presented himself at intervals, and I have failed to find any hyperglycæmia on any occasion.

Analysis.—The diagnosis in this case was based upon intense thirst, glycosuria, and changes in the refraction of the eyes. I gathered that the doctor in France was of the opinion that the breathlessness was air hunger, but of course of this I have no evidence. The sugar in his blood, following a comparatively small dose of dextrose, rose to 0·3% and took a long time to fall, and therefore I think one is justified in concluding that this is a case of diabetes mellitus. About his return to health there can be no doubt.

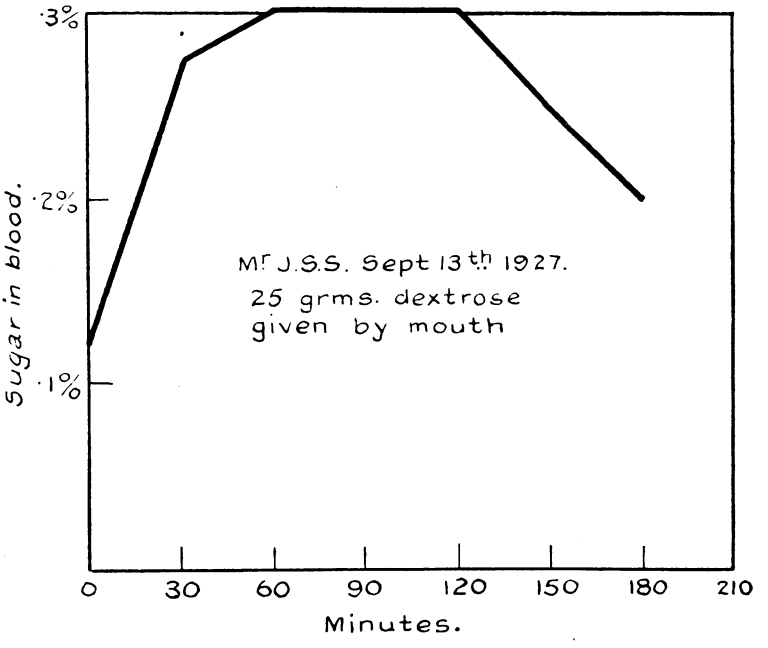
Case IV.—Mr. J. S. S., first seen September 12, 1927, aged 54.

Family History.—Some diabetes.

Recently developed severe thirst; sugar in blood at mid-day was 0·33%. After fourteen hours' fast the sugar in his blood on September 13 was 0·12%. 25 grm. of dextrose was given by the mouth, and the sugar in his blood was found to be at 10.5 a.m. 0·27%, 10.35 a.m. 0·30%, 11.5 a.m. 0·30%, 11.35 am. 0·30%, 12.5 p.m. 0·25%, 12.35 p.m. 0·20%. During this time 274 c.c. of urine was passed containing 4·6% sugar and 1·6% urea.

He was placed upon diet and increasing doses of insulin. On September 27 when receiving 15 units twice a day the sugar in his blood was at 9.35 a.m. 0·11%, 1 p.m. 0·10%, 2.15 p.m. 10%, 4.45 p.m. 0·143%. He kept to his diet and insulin, and from time to time the sugar in his blood was estimated. On November 29, 1927, the sugar in his blood was: at 9.30 a.m. 0·107%, 12.5 p.m. 0·10%, 1.15 p.m. 0·14%, 5 p.m. 0·10%. He said he had not felt better in his life. No hypoglycæmic symptoms.

On February 8, 1928, hypoglycæmic symptoms began to appear, and in order to appease them he added some carbohydrate to his diet. In April, 1928, the sugar in his blood at 5 p.m. was 0·09%, and the insulin was reduced to 12½ units twice a day. On November 30, 1928, the symptoms of hypoglycæmia led to the reduction of insulin to 7½ units twice a day and later to 5 units twice a day. In March, 1929, on 5 units twice a day, the sugar in the blood was: at 9.30 a.m. 0·107%, 2 p.m. 0·125%, 5 p.m., 0·09%. The carbohydrate in the diet had been added to, to a small extent.



CASE IV.

On March 20, after insulin had been omitted in the morning for a week, the sugar in his blood was: at 9.30 a.m., 0·15%; 2 p.m., 0·14%; 5 p.m., 0·10%. Insulin was stopped, and after four days the sugar in the blood was found to be: at 9.30 a.m., 0·14%; 2 p.m., 0·14%; 4.50 p.m., 0·10%.

November, 1929.—Patient reported progress. Felt quite well. Concentration of sugar in blood at 2.5 p.m., 0·09%.

Case V.—Major E., aged 40. First observed, September, 1927.

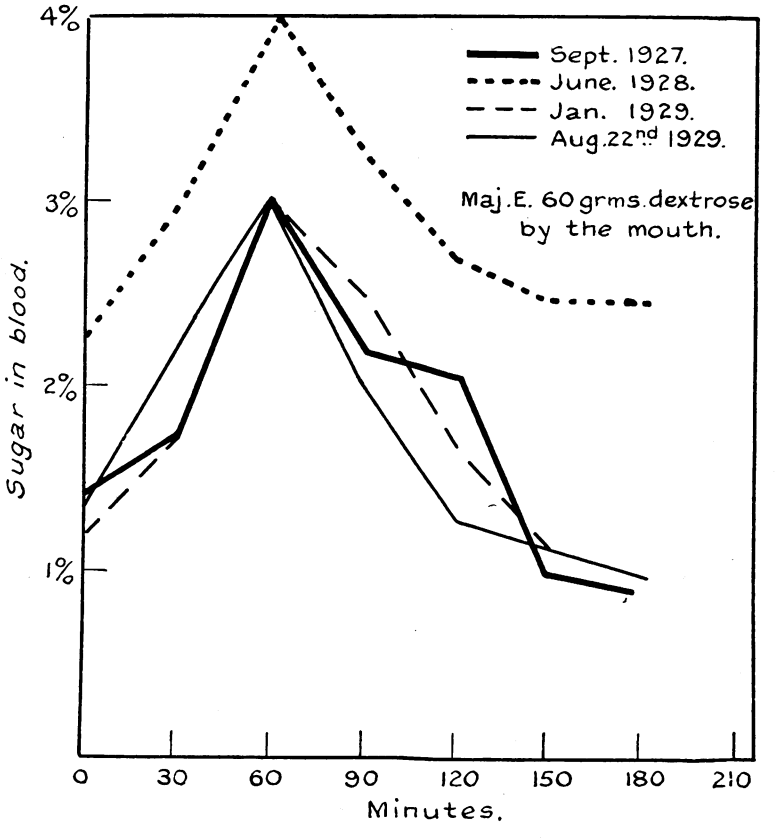
Family History.—None of diabetes mellitus.

This patient sought advice because he had been rejected for life insurance and upon making inquiries had learnt that his urine contained sugar. Some weeks previously he had been operated upon for hæmorrhoids. He had been taking an ordinary diet fairly rich in carbohydrate, and on September 19, 1927, after fourteen hours' fast the sugar in his blood was 0·14%. He was given 60 grm. of dextrose and his blood was examined at half-hourly intervals and found as follows: 0·175%, 0·30%, 0·22%, 0·21%, 0·10%, 0·09%. All the specimens of urine passed at these various times contained either a considerable quantity or a trace of sugar, so that there seemed to be evidence that the renal threshold was below the average. Since the patient had been subjected to an operation and an anæsthetic comparatively recently, I thought that this curve did not necessarily indicate diabetes mellitus, and I advised him to take a holiday for six weeks and then be submitted to a similar test. The patient had no symptoms of diabetes mellitus and not very long previously had passed a full Army test. His weight had remained constant during the previous four years.

Instead of returning after six weeks the patient presented himself on June 11, 1928, and then stated that, with the exception of occasional cramp in the legs, he was enjoying perfect health. He had no thirst and no polyuria. After fourteen hours' fast the sugar in his blood was 0·23% and at half-hourly intervals following the administration of 60 grm. of dextrose was: 0·3%, 0·40%, 0·33%, 0·27%, 0·25%,

0·25%, whilst the urine passed during this time contained 3% of sugar. This test seemed to be good evidence that the patient had developed diabetes mellitus.

The next step taken was to see whether he reacted to insulin. On June 19, whilst on diet, the sugar in his blood at 10 a.m. was found to be 0·17%, at 12.30 0·26%, and at 2.30 0·23%. This confirmed the earlier readings following the administration of dextrose. On a diet of 78 grm. of carbohydrate and 10 units of insulin twice daily the sugar in his blood was kept below 0·15% at all times, and he continued this dose until September 3, when it was found that the dose of insulin could be reduced to 5 units twice a day.



CASE V.

In January, 1929, he was subjected once more to a test with 60 grm. of dextrose by the mouth after he had rested from insulin for one week. The sugar in the blood recorded was: 0·125%, 0·18%, 0·30%, 0·25%, 0·17%, 0·12%, 0·10%, showing that he had returned to the state that he was in when he first came in September, 1927. Insulin was then resumed because, obviously, complete recovery had not occurred.

In August, 1929, he passed through the test of 60 grm. of dextrose for the third time, and during that test the sugar in the urine was only 0·5%, whilst the sugar in the blood rose to 0·30% but fell more rapidly than on the previous occasion. He was

advised to continue a restricted diet until the beginning of November and then to eat and drink what he liked. On November 11, 1929, the sugar in his blood an hour after breakfast was 0·15%; an hour after lunch 0·16%, and an hour after tea 0·107%. I conclude, therefore, that this patient's condition has ameliorated greatly.

It is too early to state whether it is a complete recovery, because it is only after a patient has thrown work upon his pancreas for many months without the pancreas showing any signs of degeneration that one may conclude that recovery has occurred.

Case VI.—Captain R. H. P. First seen November 6, 1927, aged 34.

Family History.—None of diabetes mellitus.

Gave a history that in March, 1927, whilst on a shooting trip in Khartoum suffered from malaria. Felt ill in July and developed severe thirst along with dryness of mouth in August. Noticed that he was losing weight in September, and by November 26 he had lost 3 st. Along with the usual symptoms of diabetes mellitus he had constipation and cramp in his leg. At mid-day on November 26, 1927, the sugar in his blood was 0·30%. He was placed in a nursing home, given a fixed diet and an increasing dose of insulin. On 25 units twice a day the sugar in his blood on December 13 was: at 9.40 a.m. 0·12%, 12 noon 0·06%, 2.30 p.m. 0·13%, 5.20 p.m. 0·09%, 8.30 p.m. 0·08%.

In December, 1927, he went to Switzerland and took sun baths, and whilst in Switzerland he began to have hypoglycæmic attacks and reduced his insulin. On January 30, 1928, the insulin was reduced to 13 units and 10 units, and upon this the sugar in his blood was: at 11 a.m. 0·17%, 2.40 p.m. 0·107%, 5.20 p.m. 0·12%. On January 31 the test was repeated, and at 11 a.m. the sugar in his blood was found to be 0·19%, and therefore insulin was raised to 15 units twice a day. On March 5 the sugar in his blood was: at 10 a.m. 0·11%, 12.43 p.m. 0·125%, 2.45 p.m. 0·16%, 4.45 p.m. 0·13%. He confessed to having taken half a roll at his lunch, which accounted for the sugar in his blood being 0·16% at 2.45 p.m. The insulin was reduced to 10 units twice a day. On April 11 the sugar in his blood was: at 9.45 a.m. 0·13%, 12.40 p.m. 0·107%, 2.45 p.m. 0·13%, 5.20 p.m. 0·13%. I advised a reduction to 8 units twice a day. In May severe tonsillitis developed; he was removed to a nursing home, the fat in his diet was cut down, and it was found necessary to increase the dose of insulin to 25 units twice a day to reduce the sugar in his blood to normal limits. On June 18, 1928, the insulin was reduced to 12½ units twice a day because he had had a severe hypoglycæmic attack. The sugar in the blood was at 10 a.m. 0·1%, 12.20 p.m. 0·08%, 2.35 p.m. 0·15%, 5 p.m. 0·12%. A week later observations were made to see whether this reduction in insulin was justifiable, and the sugar in the blood was: at 10 a.m. 0·09%, 12.20 p.m. 0·09%, 2.30 p.m. 0·08%, 5 p.m. 0·09%. The insulin was then reduced to 10 units twice a day. On August 22 the sugar in the blood was: at 10 a.m. 0·11%, 1 p.m. 0·11%, 2.35 p.m. 0·125%, 5 p.m. 0·12%, and the insulin was reduced to 6 units twice a day. On September 18 the sugar in the blood was at 10 a.m. 0·09%, 1 p.m. 0·09%, 2.35 p.m. 0·14%, 5 p.m. 0·13%. The insulin was reduced to 5 units twice a day, and he was advised to cease taking insulin fourteen days before the next visit. On November 30, 1928, the sugar in the blood after ceasing insulin for fourteen days was: At 10 a.m. 0·09%, 12.30 p.m. 0·09%, 2.40 p.m. 0·075%, 4.45 p.m. 0·11%. In January the sugar in the blood was found to be normal. During that month the patient had influenza, but it did not affect the sugar in his blood. He was advised to increase his diet to 25 grm. of carbohydrate at each of the three meals. On August 29, 1929, he was submitted to a sugar tolerance test, but he had a boil in his ear at that time and it was found that the sugar in his blood after fourteen hours' fast was 0·20%. It rose to 0·60% and fell to 0·37% three hours after the administration of the dextrose. His urine contained 2·5% of sugar. He was advised to go back on to insulin until the boil in his ear had healed. On September 19, after having ceased to take insulin for a fortnight, the sugar in his blood at 2.45 p.m. was 0·12% and at

4.30 p.m. was 0·15%. On November 21, 1929, the sugar in his blood was at 10.20 a.m. 0·16%, 12.35 p.m. 0·17%, 2.40 p.m. 0·14%, 5.20 p.m 0·19%.

Analysis.—The evidence that the patient was suffering from diabetes mellitus is quite unquestionable. One cannot consider that the recovery is complete because his metabolism still remains very sensitive to bacterial toxins, but it seems probable that as time passes his pancreas will become more and more efficient.

Case VII.—C. B., male, aged 5, December 21, 1927. Family history of diabetes mellitus. Elder brother died from that disease. When first seen the patient was very drowsy, had a raised temperature, sugar in the urine and complained of pain in the upper part of the abdomen. The concentration of sugar in the blood was 0·25% several hours after food. Patient was placed upon a diet: carbohydrate 80 grm., protein 85 grm., fat 85 grm., and needed 7½ units insulin twice a day to keep the sugar in his blood below 0·15%. As time passed hypoglycæmic symptoms developed, and in the following March insulin was stopped. The diet was increased to C. 95, P. 85, F. 85. May 24, 1928.—Following a rat bite the temperature rose and glycosuria reappeared and the patient needed 3 units of insulin twice daily to control the sugar in the blood. During the following month the patient developed a common cold and gradually the dose of insulin had to be increased, until in October he was receiving 15 units daily. In January, 1929, owing to another cold, the insulin had to be increased to 17 units daily. Further infections needed further increases in the doses of insulin, and by February 8 the patient was receiving 18 units of insulin twice a day, i.e., 36 units daily. Recovery from the cold was rapid and was accompanied by the development of hypoglycæmic symptoms.

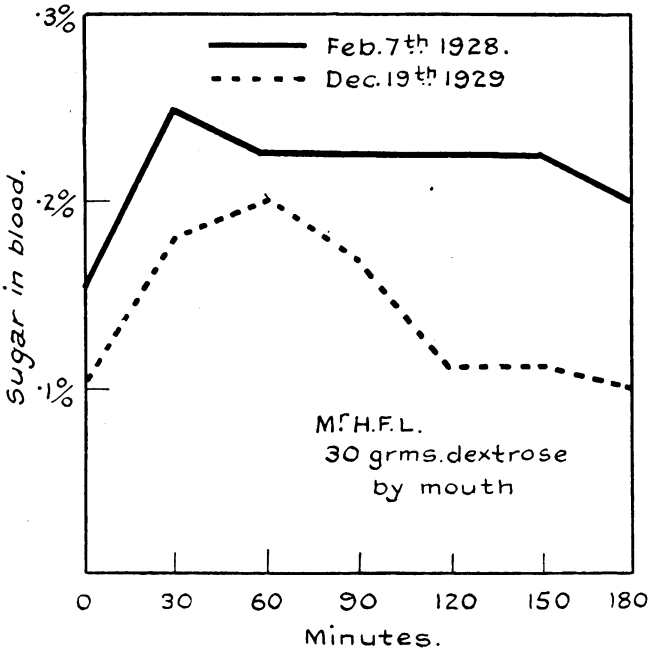
February 12.—The dose of insulin was reduced to 10 units twice a day. By February 17 the dose had come down to 6 units twice daily. On that day however only the morning dose was given because hypoglycæmic symptoms developed after the mid-day meal. The patient then went through a period of persistent hypoglycæmia which called for vigorous treatment with carbohydrate at two-hourly intervals for a time, and for weeks the patient was awakened during the night in order that he might be given sugar. March 24, 1929.—The diet had been increased to C. 155 grm.; P. 67 grm.; F. 77 grm. The concentration of sugar in the blood was at 8 a.m., 0·05%; 10.30 a.m., 0·08%; 1.15 p.m., 0·08%; 2.30 p.m., 0·17%; 4 p.m., 0·10%; 7 p.m., 0·14%. March 25, 1929.—1 a.m., 0·10%; 5 a.m., 0·11%. April 28, 1928.—Diet: C. 165, P. 62, F. 74: 10.45 a.m., 0·075%; 1 p.m., 0·10%; 3 p.m., 0·12%; 5 p.m., 0·17%; 6 p.m., 0·13%; 7 p.m., 0·12%; 9.0 p.m., 0·14%; 10.45 p.m., 0·20%. April 29.—3 a.m., 0·10%; 7 a.m., 0·08%. Since the sugar in the blood rose above 0·15% for a period, the diet was reduced somewhat. Observations have been continued up to December 12, 1929. Since the patient was very susceptible to the common cold it was thought advisable to give him a vaccine. It was found that the bacterial poison drove up the concentration of sugar in the blood to 0·20%, but it did not remain there for long. This hyperglycæmia following the introduction of bacterial poison is the reverse to what happens in a normal individual and seems to indicate that there is some disease of the metabolism. In this case the disease must be very mild indeed. The patient keeps a concentration of sugar in the blood within the limits of normal whilst on a diet containing over 50 calories per kilogramme body weight per diem and more than 90 grm. of carbohydrate, nine months after he has ceased to receive insulin.

Case VIII.—Mr. H. F. L. First seen February 6, 1928. Aged 54.

Family History.—Mother diabetic, brother diabetic, two other brothers refused life insurance owing to glycosuria.

This individual had previously insured his life at a normal rate. He found that he was losing weight and felt ill, and upon consulting his doctor sugar was found in his urine. His gums were severely infected. At 5 p.m. the concentration of sugar

in his blood was 0·21%. On February 7, in the morning, after fourteen hours' fast, the sugar in his blood was 0·15%. He was given 30 grm. of dextrose, which led to the sugar in his blood rising to 0·25% and taking three hours for it to fall to 0·15%. He was given 10 units of insulin along with a limited diet, and this was found to keep the sugar in his blood below 0·15%. Insulin was stopped on May 19, and on May 21 the sugar in his blood was found to be normal. On June 5 he was given



CASE VIII.

40 grm. of dextrose, that is 33% more than at his original test in February, and the sugar concentration in his blood rose to 0·16%. He was advised to keep the carbohydrate in each meal under 30 grm., otherwise the diet was not restricted.

Case IX.—Miss M. J., aged 65. August 16, 1928. Severe thirst for three months, which had become still more accentuated during the last few weeks. She complained of pains in the legs and loss of energy. Four hours after food, at 12.30 p.m., the concentration of sugar in her blood was 0·31%. The weight of the patient was close upon 17 st., and therefore she was put upon a diet which contained only a little fat, 70 grm. carbohydrate and 100 grm. of protein. It was found that 15 units of insulin twice a day kept the sugar in her blood below 0·15%. August 24, 1928, the sugar in the blood at 9.40 a.m. was 0·13%, 12 mid-day 0·08%, 9.30 p.m. 0·07%. November 8, 1928: Weight had fallen to 16 st. The patient had been suffering from mild hypoglycæmic attacks. The concentration of sugar in her blood at 12.50 p.m. was 0·09%. The dose of insulin was reduced to 10 units twice a day. February 7, 1929: Weight had fallen to 15 st. 7½ lb. A history of further hypoglycæmic attacks led to the reduction of dose of insulin to 8 units twice a day. March 18, 1929: Concentration of sugar in the blood: at 11 a.m. 0·13%, 12.30 p.m. 0·10%, 2.30 p.m. 0·14%, 4.30 p.m. 0·125%. Insulin dose reduced to 5 units twice a day. May 7, 1929: Concentration of sugar in the blood: 10.45 a.m. 0·14% (biscuit eaten

at 11.0 a.m.), 12.30 p.m. 0·14%, 2.30 p.m. 0·12%. Advice was given to cease taking insulin. December 10, 1929: Concentration of sugar in the blood: 11 a.m. 0·125%, 12.40 p.m. 0·09%, 2.20 p.m. 0·115%, 4.30 p.m. 0·107%. This case seems to conform to the usual onset of diabetes mellitus. The recovery in December was only partial; the sugar in the blood of the patient was low, whilst insulin had been stopped more than six months before the observations were made. The diet of this patient has been increased.

Dr. Leyton's paper was criticized at some length by Dr. Cammidge, Dr. George Graham, and Dr. R. D. Lawrence, who joined in disputing the justice of the term "recovery" as used by Dr. Leyton, and regarded the state of improvement recorded as by no means so uncommon as Dr. Leyton had assumed, Dr. Poulton also discussed the paper and Dr. Leyton replied.

Psittacosis: A Further Account of Cases of Human Infection,

By A. P. Thomson, M.C., M.D.

With Bacteriological Reports

By W. T. Hillier, M.R.C.S., L.R.C.P.

In a recent communication [1] I published a brief review of psittacosis and described four cases of human infection that had come to my notice. My reason for returning so soon to the subject is that I have since met with no less than thirteen further cases, which are recorded fully below.

One of them (Case 11) I did not myself see, but the clinical details leave no doubt of the diagnosis; of the remaining twelve, two instances (Cases 6 and 7) were not sufficiently clear cut to warrant a final opinion, but I regard them as probable instances of mild infection.

The fact that so many cases, in so short a time, have come to the notice of one physician seems to justify the tentative opinion that I expressed previously that sickness of this type is by no means rare. It is true that in Cases 5, 6 and 7, I was consulted as a result of the publicity given to my first communication by a daily newspaper, but most of the others occurred in the ordinary course of practice, and I saw them as unsolved problems of obscure pyrexia: in several instances a fairly confident diagnosis was made on purely clinical grounds, for the history of contact with sick birds was only elicited later, and although one (Case 8) occurred in a doctor's household, the possible significance of this point had not previously been suspected.

Cases 5, 6 and 7.—For information and help in preparing the record of the following cases I am indebted to Dr. W. Geoffrey Shaw, of Weaverham, Cheshire, who had charge of them, and to Dr. W. H. Grace, Pathologist to the Royal Infirmary, Chester, who saw them in consultation.

On June 27, 1929, Mrs. A. bought a young parrot from a dealer in London. The day after its arrival in her home the bird appeared to have a "cold": a little later the feathers became ruffled and were shed freely, and there was a frothy discharge from the nose; diarrhœa set in on July 20, and on the 22nd the parrot died. The bird had been much petted by Mr. A., who trained it to walk up his arm and take a lump of sugar from between his lips, and his little son had often played with it. Mrs. A. cared for it during the later stages of its illness. On the day that the parrot died, Mr. A. (Case 5), who had appeared unwell for two days previously,