epidemics of 1892-3, and by measles epidemics at various times. Not only the absence of systematic revaccination, but the absence even of facilities for carrying it out, afforded by our then existing system of public health administration, made the want of isolation specially conspicuous (although it may be doubted whether revaccination, unless thoroughly systematic or in a sense compulsory, would have been entirely successful). The fact that the adult population suffered largely under the visitation (which as measured by its effect on the death-rates was severely felt, like the influenza epidemic of recent date), together with the horror of the disease and the interference with trade which it involved, greatly added to the panic and the loss of property that followed. The way in which the disease was seen to spread by the sometimes unavoidable and sometimes careless exposure of infected persons and things at public-houses, laundries, provision shops, etc., as well as in the workhouses and common lodging-houses, forced attention to the question of isolation. This had hitherto been kept in the background by the habit of relying wholly on vaccination as the great preventive measure against small-pox. Under the influence of panic small-pox hospitals so-called were erected, but this did not take place anywhere until the disease had got firm hold of the population, and consequently they were of little or no use in preventing epidemic diffusion.

It often happened that with small-pox—that most infectious or contagious of diseases—such accommodation had to be provided on some open space well within the precincts of the town, and which could not be regarded, therefore, as true isolation. Mead's view, so far as it relates to the sufferers being removed a distance of three or four miles out of the town, was perhaps more practicable when the whole population of the country was much less and when towns were very much smaller in size.

The policy, indeed, of dealing with so highly contagious a disease as small-pox by the segregation of large numbers of cases within the precincts of any large town had from the beginning been regarded with distrust and suspicion by eminent and experienced Fellows of this College, some of whom gave their opinions in evidence at a well-known trial in the law courts about five-and-twenty years ago. Later, Dr. Bridges, the Local Government Board adviser on medical Poor-law matters of the metropolis, and others whose experience was of the highest value, gave evidence also before a Select Committee of the House of Commons on the Hampstead Fever and Small-pox Hospital in 1875. How far this distrust and suspicion were found to be justified by subsequent events belongs to the history of the following decade. I will, therefore, conclude this lecture, which deals mainly with the subject of the beginnings of isolation regarded from the modern point of view.

THE PHYSIOLOGY OF THE CARBOHYDRATES.

A REJOINDER TO DR. PATON'S FURTHER CRITICISM.

By F. W. PAVY, M.D., LL.D., F.R.S.,
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(Continued from page 455.)

I HAVE said that Schenck himself acknowledged that his work was unsound. He performed fresh experiments by a process differing from that employed by him before, and obtained results of a nature directly contradictory to those set out in his previous paper. At the suggestion of Professor Pflüger he conducted also some dialysis experiments, and found¹ that the added sugar dialysed from the blood. Finally he sums up in a paragraph, of which the following is a translation:²

It follows from these experiments taken as a whole that the sugar in blood and serum is in free solution. The experiments also tell against my conjecture that the explanation of the loss of sugar in the analyses published previously is to be sought in a combination between the sugar and proteid, and render it probable that after coagulation the retention of sugar in the coagulum is to be accounted for by mechanical circumstances.

It is such work as this which Dr. Paton reproves me for ignoring, saying that "coming as it does from Professor

Pflüger's laboratory in Bonn it must be received with respect, and cannot simply be ignored," and that "it has a most important bearing on all Dr. Pavy's work, and is worthy of his careful study and consideration."

Dr. Paton imputes to me contempt for the work of others. I do not admit the justice of this allegation; but I admit frankly that it has been my principle of action through life never to found conclusions upon statements the accuracy of which I had not tested for myself by personal experiment. Dr. Paton, on the other hand, judging from the course of action he has pursued in his criticism of my work, deems it right to seize upon anything which may seem likely to serve his immediate purpose without stopping to consider the question of its validity. Does not his use of Schenck's earlier paper in the manner which I have here explained afford striking support for the remark made in my *Epicriticism* that "anything seemingly that has come to hand that could be applied to disparagement has been eagerly grasped at"?

Let me proceed a step further and invite attention to the nature of the proposition which is made. It is nothing less than that glucose, on being simply added to blood, straightway enters into combination with the albumins present. The words employed in the passage quoted by Dr. Paton from Schenck are: "It is highly probable from this that the glucose is combined with the albumins of the blood." That such a proposition should be brought forward without the slightest pains being taken to examine into its soundness must surely impress everyone as an extraordinary method of procedure. Relying as he has done for his criticism upon published literature, and so well versed as he appears to be in it, is it not surprising that he should be unacquainted with Schenck's own contradiction published in the succeeding volume of *Pflüger's Archiv*; of Röhmann's and of Seegen's attacks upon the first article in the *Centralblatt für Physiologie*, vol. iv, 1890; and of Dr. Vaughan Harley's experimental and critical article in the *Journal of Physiology*, 1891?

But Schenck's earlier paper is made to do still further duty by Dr. Paton in his observations on the glucoside constitution of proteid matter. In his original criticism³ Dr. Paton, in referring to the osazone which I had obtained from the sugar derived from proteid matter, remarked: "It is only when an elementary analysis of the compound is made that it can be definitely concluded that a carbohydrate is a constituent part.....but Dr. Pavy does not give such analyses, and without them we are not justified in accepting his conclusion that the substance is a carbohydrate."

In my *Epicriticism* (p. 25 *et seq.*) I supplied an elementary analysis showing that the body was beyond doubt a sugar osazone. Dr. Paton now renews his attack upon another line, which, be it remarked, is suggested by—if, indeed, it may not be said to rest entirely on—Schenck's work, the unsoundness of which I have fully exposed. Dr. Paton writes:

But the question still remains: Was the albumin from which osazones were prepared by Dr. Pavy free of carbohydrate bodies in mere mechanical union or loose chemical connection, or was the carbohydrate an integral part of the molecule? Schenck's results, already considered, show that mixtures of carbohydrates with albuminous substances are formed, which may account for Dr. Pavy's results. But Dr. Pavy refuses to consider these observations.

As I said before, I do not deny that a carbohydrate may be yielded by the splitting of the proteid—the albuminous—molecule; but I did say, and still maintain, that all Dr. Pavy has yet proved is that, in the solution of proteids by caustic potash or sulphuric acid, a carbohydrate substance convertible into sugar is set free, which was either loosely combined with the proteid or formed an integral part of its molecule. Until the work of Schenck has been satisfactorily dealt with, with an open mind must be kept on the subject. Undoubtedly the fact that an increased amount of reducing substance is obtained by the use of stronger solution of potash favours his view.

Looking at the position in which Schenck's work, relied upon here by Dr. Paton, has been shown to stand, what need be said in reply to this criticism? "Until," says Dr. Paton, "the work of Schenck has been satisfactorily dealt with, an open mind must be kept on the subject." It is alleged that the carbo-hydrate may have come from carbohydrate incidentally, as it were, present. "Schenck's results, already considered, show that mixtures of carbohydrates and albuminous substances are formed, which may account for Dr. Pavy's results. But Dr. Pavy refuses to consider these observations." I do not know whether Dr. Paton will still

¹ *Pflüg. Arch.*, xlvii.

² *Loc. cit.*, p. 627.

³ *Edin. Med. Journ.*, December, 1894.

hold to the opinion he has expressed. Fortunately science rests upon other grounds besides those upon which he has based his attack on my work.

Naturally the question that has been raised, namely, the question of the pre-existence, as such, of the carbohydrate obtained by the treatment of proteid matter with potash, had to be considered in my original inquiry upon the subject. I had been labouring under the idea that the carbohydrate obtained in the potash method of analysis came from free glycogen simply existing in contact with the proteid, and it was only in the course of work that results presented themselves which led me to question this idea, and to have ground before me suggesting that the carbohydrate found was derived from the proteid operated upon.

I learnt that the amount of carbohydrate obtainable was influenced both by the length of time during which the potash was in contact with the proteid substance and by the strength of the potash solution used. Now if the carbohydrate had existed in a free form the act of solution ought alone to have placed it in a position for the whole of it at once to be recognisable. What, it has to be said, is actually observable is that more carbohydrate is obtainable under lengthened exposure to the action of potash, and by boiling with a strong solution of potash, than when the period of contact is shorter, and when a weak solution is employed. The only conclusion legitimately to be drawn from these facts is that the carbohydrate has its origin in the breaking down of the proteid matter. Sugar, of course, does not enter into the question as a source of the carbohydrate. In the first place, the carbohydrate obtained by the agency of potash is an amylose carbohydrate; and, in the second place, sugar would be destroyed in the process employed.

As regards the carbohydrate obtained, it may be said with absolute certainty that it is not glycogen. Glycogen is precipitable by alcohol of moderate strength; 60 per cent. secures its complete precipitation. The body obtained from proteid is, on the other hand, only precipitable by spirit of much greater strength. Glycogen is readily convertible into sugar by boiling with sulphuric acid of 2 per cent. strength. Not so, however, with the cleavage carbohydrate; this requires prolonged boiling with sulphuric acid of 10 per cent. strength to obtain any marked amount of conversion.

(To be continued.)

VAGINAL HYSTERECTOMY FOR MYOMA OF THE UTERUS.¹

By ARCHIBALD DONALD, M.D., C.M.,

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VAGINAL hysterectomy for fibroid tumours has been practised extensively in France and in Germany for several years, but as yet the operation has made little advance in England. So far as I am able to ascertain, the only case recorded by an English gynaecologist is one reported by Dr. Heywood Smith in the *British Gynaecological Journal* of February, 1894.

I wish here to record four cases in which I have removed the uterus by the vagina on account of fibromyoma, and to add a few remarks on the indications, advantages and limits of the operation.

CASE I.—S. S., single, aged 37, admitted to St. Mary's Hospital, Manchester, June 8th, 1892. For two and a-half years has suffered from menorrhagia and metrorrhagia. During the last six months has had several attacks of serious flooding. There is a copious watery intermenstrual discharge. Patient is very anæmic, with hæmic murmurs and blanched face. On abdominal palpation a large smooth rounded mass was felt rising 3 inches above the pubes, very firm and hard. The cervix was small and nulliparous, but through the anterior fornix the rounded tumour was felt, and was recognised as the enlarged body of the uterus. On bimanual examination the tumour was estimated to be about the size of a four-months' pregnant uterus. Sound passed 6 inches. Owing to the weak condition of the patient I hesitated to perform abdominal section; but, knowing how well such patients bear vaginal operations, I determined to try to remove the tumour by vaginal hysterectomy.

Operation, July 8th, 1892.—Preliminary ligature of vaginal mucous membrane above line of incision. Then bladder was separated from uterus, pouch of Douglas opened, broad ligaments tied and divided alternately until uterus was quite freed from attachments. Owing to its bulk it would not pass through aperture in vaginal vault. The cervix was pulled well down with volsella forceps, the anterior uterine wall slit right up

with scissors, and the tumour cut into and diminished by knife and scissors. The uterus was then drawn through as an elongated sausage-shaped mass. The anterior and posterior peritoneal margins of the gap in the pelvic floor were then united in the middle by a fine silk suture and the raw edges of the anterior and posterior vaginal walls were treated in the same way. The gaps at each side, through which the ligatures tying the broad ligaments passed, were loosely filled with iodoform gauze.

The patient made a rapid and uninterrupted recovery. Temperature ranged from 99° to 102° during first week, but after that gradually came down to normal. Patient was able to take nourishment from the first, had no pain, and slept well. Wound was dressed daily (gauze renewed and vagina douched). Ligatures removed on the tenth day. Patient discharged August 11th. Wound in vaginal vault firmly healed.

After-History.—Patient presented herself at hospital two months after discharge. Her appearance was so much improved that it was difficult to recognise her. She is now perfectly well and strong.

CASE II.—S. A. D., aged 27, married, no children, sent by Dr. Laslett, Farnworth, to St. Mary's Hospital, Manchester, and admitted October 5th, 1892. For nine or ten years has suffered from severe dysmenorrhœa, a constant pelvic aching, bearing down, and occasionally pains shooting down right leg. For two or three days each month patient is quite incapacitated. At times she suffers from difficulty in passing water. No menorrhagia or metrorrhagia. On vaginal examination the cervix was found to be long and conical, os small, and the body of the uterus was felt (retroverted) through the posterior fornix. On its left was a small hard nodule about the size of a walnut, and on the right, bulging into the lateral fornix, was a large, irregular, very hard body, closely attached to the wall of the uterus.

Vaginal Hysterectomy performed November 9th, 1892.—The steps of the operation were similar to those described in the previous case, except that as the tumour was not so large the uterus was removed entire. There were two intramural fibroids, the larger of which was the size of an orange, and had grown between the folds of the right broad ligament. The patient made a rapid recovery; highest temperature 101.4°. Ligatures removed on November 23rd. Patient discharged December 3rd, wound being soundly healed. After-progress was quite satisfactory; there was immediate and complete relief from her symptoms. Patient is now in excellent health.

CASE III.—A. B., a widow, aged 45, admitted into St. Mary's Hospital, Manchester, May 27th, 1893, suffered for the last four years from excessive uterine hæmorrhage, which of late has been so profuse as to render her a complete invalid. In the intervals between the attacks of hæmorrhage there is continuous watery discharge. On examination the body of the uterus was found to be very hard and almost symmetrically enlarged; the upper border was felt about 3 inches above the pubes and over the right Poupert's ligament. The size of the enlarged uterus was estimated on careful bimanual examination to be rather bigger than a foetal head at term. The cervix was not expanded by the tumour—the cervical canal being narrow and long.

Operation, June 14th, 1893.—The uterus was removed *per vaginam* exactly as in Case I. Its removal was impossible until the anterior uterine wall had been incised and the greater portion of the tumour—which grew on the posterior wall—had been removed piecemeal with scissors.

The patient made an excellent recovery; the temperature only once touched 100°, and the pulse never ran above 100. She went home on July 8th, twenty-four days after operation.

After-history has been completely satisfactory; she is now in very good health and able to work in the mill.

CASE IV.—Mrs. P., married, aged 38, nulliparous, consulted me on June 28th, 1893, on account of pain in the left iliac region and bearing down. She also suffered from menorrhagia—periods lasting ten days—and dysmenorrhœa. Duration of symptoms two years. On examination under chloroform the uterus was found antverted and of normal size. Two tumours were felt *per vaginam*—one behind the uterus in the pouch of Douglas; the other, which was fluctuant and much the larger, in the left postero-lateral quarter of the pelvis.

Abdominal Section, July 15th, 1893.—On opening the abdomen the swelling on the left was found to be a dilated Fallopian tube, elongated, tortuous, much distended at the distal extremity, and containing about six ounces of pus. It was removed along with its ovary. The other tumour, lower down in the pouch of Douglas, was found to be a fibroid, the size of a walnut, growing from the posterior wall of the uterus.

Patient improved rapidly after operation—gained weight and strength; but periods still continued to be rather profuse, and dysmenorrhœa persisted. On June 13th, 1894, she was sent to me by Dr. Dochard, of Whitefield, on account of the menorrhagia, which had again become very troublesome. The tumour in the pouch of Douglas was now found to be much increased in size; it was about as large as a cricket ball, and was incarcerated in the pelvis. Patient had much pain in the back and occasionally suffered from urinary difficulties. She was very anæmic.

Vaginal Hysterectomy, June 28th, 1894.—After tying the greater portion of the broad ligaments the tumour was diminished in size with scissors and the uterus was removed.

Patient made an uninterrupted recovery, and is now in very good health.

SUMMARY OF CASES.

The indications for the operation in Cases I and III were the prolonged and excessive hæmorrhage and continual leucorrhœa. The patients had been drained of blood, and had all the symptoms of extreme anæmia. In Case II the operation was undertaken on account of pressure symptoms and dysmenorrhœa caused by an intramural fibroid, which had developed in the folds of the broad ligament. In Case IV the rapidity of the growth of the tumour—which could be very definitely determined owing to the previous abdominal section—in addition to menorrhagia and pressure symptoms gave ample reason for operating.

As regards the size of the tumour this varied in the different

¹ Read in the Section of Obstetrics and Gynaecology at the Annual Meeting of the British Medical Association, held in London, July-August, 1895.