the conclusion at which Bernard arrived, that the pancreatic juice dissolves and digests the proteid matters of food, both those which have not been dissolved by the gastric juice and those which, having been thus dissolved, have been reprecipitated by the bile. In fact, before Bernard's memoir, the state of things was this. The action of pancreatic juice on starch was just beginning to be recognised, its action on fats was only just hinted at, and its action on proteids, so to speak, unknown. Bernard clearly proved the existence and pointed out the importance of all these three actions, and thereby restored intestinal digestion to its proper position. I need hardly point out to you how, by the subsequent labours of Corvisart, and especially of Kühne, our knowledge of the proteolytic action of pancreatic juice has made vast strides, and what a flood of light has thereby been thrown not on digestion (and let us hope on indigestion also) only, but on the metabolism of the whole body. The first steps of this inquiry, the ultimate worth of which it is almost impossible to exaggerate, we owe to Claude Bernard.

Far more important, however, than this pancreatic work was the next research, with the results of which Bernard startled the physiological world. I have already spoken of two at least of Bernard's discoveries as being the most important of the mid-century; one of these was his discovery of glycogen and of the glycogenic function of the liver, made known to the world in 1849.*

This discovery naturally starts from the knowledge of the presence of sugar in the blood, which, by a curious coincidence, we owe to Magendie. I need not pass in review before you the details of this great step. Suffice it to say, that the whole credit of it belonged to Bernard. Both the truth and the value of it were of course denied by some, and a long controversy, now happily forgotten, arose about it; but in the end Bernard, supported especially by Lehmann,† came out triumphant. He not only proved the glycogenic function of the liver, but was the first to extract glycogen, though this was independently, at a subsequent date, discovered by Hensen.‡ And to Bernard alone must be attributed the discovery of the diabetic puncture.§ But these matters are household words in all physiological schools; the names Bernard and glycogen are, and always will be, inseparable. You all know, too, how subsequent researches have somewhat modified the views first put forward by Bernard; at the present moment we do not, as he was at least inclined to do, regard proteid matter as the chief, much less as the only, source of glycogen. I should, however, like to spend a few moments in pointing out to you the bearings of this discovery.

Not so very long before Bernard commenced his work, physiologists almost unanimously subscribed to the dogma of Dumas, that "the plant creates, the animal only destroys". This doctrine has been in reality upset by Liebig's proof that fat was actually formed, and not merely accumulated, in the animal body; but it was a doctrine of great tenacity, capable of living in the face of obvious disproof. The discovery of glycogen may be said to have given it its *coup de grâce*. After that it could no longer hold up its head; and to you who, from the beginning of your biological studies, are indoctrinated with the view that the bodies of the complex animal and the complex plant are mere instances of the differentiation along two diverging lines of a common protoplasm, it may perchance seem strange that such a view should ever have been held. It was held though, and that most strongly; and the fact that it now belongs to past history we owe, next to Liebig, to Bernard's discovery of glycogen.

There is, moreover, a second aspect, in which this work of Bernard's acquires even greater importance. There was a time, not so far distant, when the animal body was regarded as merely a bundle, somewhat loosely tied together, of machines called organs, each of which had its special work or function; and the whole work of physiological inquiry was tacitly held to be limited to the finding out what was the function of this or that organ. Hence it came to pass, that when a "function" had been allotted to an organ, there seemed little more to be done. When, for instance, it was stated that the function of the liver was to secrete bile, it was felt that physiological inquiry had done its duty as regards that mass of tissue, and that there was nothing more to be done. Into such a view as this, the discovery of glycogen fell like a bomb-shell. That one organ should have two functions, and those so utterly different, seemed scarcely less than a scandal. And when Bernard went on to show that this same glycogenic "function" was shared by the placenta, by muscular fibres, by epithelial struc-

tures, and indeed might, under appropriate circumstances, be taken on by almost any tissue, the old mechanical theory of organ and function fell to the ground. I do not say that its downfall was not being prepared in many ways by other researches; it received a great shock when Bichat wrote on *The Tissues*; it, while retaining the old phrases, had for some years become more and more unreal; but the final death-blow was dealt by Claude Bernard. It is, I venture to think, not too much to say that if one sign of modern physiology be more hopeful than another, it is the tendency of present inquiries to attack the phenomena of living beings as the co-ordinated results of the concurrent and conflicting properties of variously differentiated living matter, and not as the mechanical outcome of a group of organic machines.

I must now pass on to Bernard's second great discovery, that which, in reality, forms the basis of our present doctrines of vaso-motor action. It is possible, that when I use the word vaso-motor, some of you may be reminded of that gourmand who grew weary of partridges when served every day for dinner. And, indeed, if we were to mark out the history of physiology into epochs, the present might fairly be called the vaso-motor epoch. You think you hear in this place a great deal of vaso-motor nerves and vaso-motor actions. I can assure you that I, for your sake, have to read a still great deal more. Hardly a number of a physiological journal is laid upon my table which does not contain what might be called a vaso-motor memoir. This being so, am I not right in speaking of that initial observation of Bernard's upon which the whole of the modern vaso-motor doctrines are based as an event of capital importance? It was in 1851 that Bernard first observed that dilation of the blood-vessels of the head and neck followed upon the division of the cervical sympathetic. From that simple observation has sprung all the vaso-motor learning which is now poured so plenteously into your minds.

[To be continued.]

REMARKS

ON

THE RECENT OCCURRENCE OF AGUE IN YOUNG CHILDREN IN LONDON: ILLUSTRATED BY FIVE CASES.

By W. B. CHEADLE, M.D., F.R.C.P.,

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THE heavy rainfall of the last few seasons appears to have revived a disease which had been almost stamped out by the progress of modern improvement. Ague, with all its striking features fully developed in the acute and early stage of the primary disease, is rarely seen in London now-a-days. Every now and then a well marked case is admitted into the Seamen's Hospital at Greenwich; but in the General Hospitals of London proper the primary forms of intermittent fever are extremely infrequent. Relapses and the irregular recurrence of the later stages are indeed met with, but an initial attack rarely. Similarly, in private practice, a genuine unmitigated attack of ague in full blow, at any rate in the regular form of its earlier stages, is, I imagine, hardly ever encountered in London. Children are said to be less liable to the disease than adults. I have met with cases occasionally, at long intervals, in my practice at Great Ormond Street, during the last ten years; but none so severe, or presenting such striking features, as two out of the five which have come under my observation during the last twelve months.

CASE I. *Severe attack of Tertian Ague in a Child aged two years and nine months, developed five months after residence in an Ague District: Appearance of Rash simulating that of Scarlatina: Immediate Cure by Quinine.*—On February 28th last year, I was asked by one of my colleagues to see his child, a little girl two years and nine months old, who was suffering, as was supposed, from scarlatina. The patient was also seen by Dr. Mahomed and Dr. Broadbent, who kindly gave their assistance in the case, and were as much interested in it as myself. When I first saw the child, about four o'clock, it was in a state of high fever, with a pulse of 116 and temperature of 104 deg., and covered with bright red suffusion of the skin, closely resembling the rash of scarlatina. The throat, however, was not congested, and the tongue, although rather white, was not reddened or strawberry-like. The child was teething, and the gum over one of the double teeth was swollen and a little tender, but did not appear to give any pain or distress. I learnt that the illness had commenced two days before, about 9 A.M., with a sharp shivering fit; a hot-bath was given, after which a bright

* *Compt. Rend.*, t. xxvii, p. 514; t. xxxi, p. 572; *Archiv. Gén. de Méd.*, t. 18, p. 413; published in full in *Nouvelle Fonction du Foie*, 1853.

† *Bericht. Leipzig Gesellsch.*, Band iii, p. 130, 1850.

‡ *Verhandl. Würz. Gesellsch.*, Band vii, p. 216, 1860; Virchow's *Archiv*, xi, p. 395.

§ *Compt. Rend.*, t. xxviii, p. 393; t. xxxi, p. 574; *Gaz. Méd.*, 1852, p. 72.

scarlet rash appeared all over the body, accompanied by dry burning skin, and a temperature of 102 deg. and pulse of 110. This condition continued about three hours, when the skin became freely perspiring and the febrile symptoms subsided; the rash also faded away. A dose of castor-oil was given, and the next day the child was playing about as usual, apparently well. On the succeeding day, however—*i. e.*, about seven o'clock in the morning of the day on which I was called in—the same series of symptoms recurred, viz., shivering, followed by high fever, with a temperature of 104 deg. and pulse 116, and the appearance of a bright scarlet rash all over the body. So like was this to the eruption of scarlatina, that the case had been assumed to be certainly one of scarlet fever, and it was proposed to transfer the child at once to the Fever Hospital. The scarlet, punctate, universal rash, without doubt, looked uncommonly like that of scarlet fever; but in view of the absence of sore throat, the condition of the tongue, the anomalous onset, the remissions of the fever, and the eruption, I could not endorse the conclusion as positive, and it was decided to await further developments. Two grains of calomel were given, and the next day the symptoms had subsided. The rash had disappeared, the pulse and temperature were normal, the tongue nearly clean, and, except that the child appeared a little weak and languid, she was herself again. No more medicine was given, and the febrile seizure, although the subject of argument and conjecture, remained to a great extent unexplained.

The improvement in the patient's state was, however, only temporary; for, at 3.30 the following morning, the rigors came on afresh, followed by burning fever and delirium. At nine o'clock, Dr. Broadbent, Dr. Mahomed, and myself saw the child together. We found it with a dry harsh burning skin, a white-coated and extremely dry tongue, a temperature of 106 deg. and pulse 130. There was no distinct rash visible, but perceptible although slight hyperæmia of the skin. The attacks were now seen to be distinctly intermittent, having occurred three times on alternate days, although not with absolute regularity as to the hour, commencing in each succeeding instance a few hours earlier in the morning. The question then arose: Whether the case was one of genuine ague, or a less defined febrile condition dependent on some cause yet obscure? In view of the periodic character of the attacks, half a grain of quinine was ordered to be given every four hours, and two grains at bedtime in addition. The swollen gum was also lanced. The next day, the child was again apparently well, but this was the day of immunity. The quinine was continued; and the following night, on which the seizure would have come in regular course, passed without any other symptom than slight feverishness and restlessness; there was just enough, as the nurse said, to make her feel sure that an attack was coming on. There was, however, no further development, and the slight fever and irritability passed off by morning. On more careful inquiry, we now ascertained that, in the previous August and September, this child and another had been staying in Essex, in a place where ague occurred occasionally from time to time. During their stay there, however, which extended over two months, the children had enjoyed perfect health. These facts, together with the regularly intermittent character of the attacks, and their sudden cessation under quinine, were decisive. The treatment was continued, and the attacks did not recur. A fortnight later, the diagnosis was confirmed by the occurrence of the second case.

CASE II. Tertian Ague in a Child aged one year and nine months, brother of the patient in the preceding case, developed five months after exposure to malarial poison: Cure by Quinine.—This child had been the companion of the preceding patient in the visit to Essex; and, about a fortnight after the elder child was attacked, the second was seized with exactly the same symptoms, viz., a shivering fit, followed by burning fever, ending in profuse sweating, with a temperature of 105 deg. and pulse 120. These attacks recurred regularly every other day, for five times, and were then cured at once by quinine. In this instance, no rash was observed. Two months later, the first child had a relapse: a single fit of ague, exactly similar to those of the first series. Quinine was given as before, and there was no recurrence. The spleen was not found to be enlarged in either case.

In addition to these two typical cases of tertian ague, I have, during the last twelve months, met with three other examples of intermittent fever in children. These were less regular in form and of less pronounced features than the preceding. With regard to two of them, there cannot, however, I think, be much doubt. The third is perhaps of more questionable identity. I give the particulars of them very briefly.

CASE III. Quotidian Ague, in a Child aged four years; Enlargement of the Spleen; Cure by Quinine.—Louise S., aged four years, living in Gray's Inn Road, was admitted into the Hospital in Great Ormond Street, on April 27th, 1877. The family had lived at Sheerness for two years, and only came to London one month ago. A year ago,

while at Sheerness, the father had ague; and, seven days after their arrival in London, this child became fretful, languid, and feverish, followed by a well marked attack of shivering a few days later. The fit recurred daily, lasting from half an hour to an hour and a half, and was followed by a hot stage of some thirty minutes' duration, which ended in sweating. The attacks were ushered in and succeeded by frontal headache; they came on at first about ten o'clock in the morning, but had been gradually getting later, and now occurred about two o'clock in the afternoon. The child had taken quinine from the outset, the mother giving it "a pennyworth" a day. Another child had similar attacks, but every other day only. On examination, the spleen was found enlarged, hard, extending three fingers' breadths below the ribs. The tongue was slightly coated with white fur. The urine was free from albumen. The temperature was subnormal, 96 deg. Two days after admission, the temperature rose to 100 deg., and there was frontal headache, but no rigors or hot stage. The headache recurred once or twice, but the temperature did not again rise. No drugs were given. No further symptoms of ague were developed, and the patient was discharged on May 18th. The spleen had then returned to its normal dimensions.

CASE IV.—Intermittent Attacks of Shivering and Fever in a Child aged eight years: History of ague: Enlargement of the spleen: Cessation of the attacks without medicinal treatment.—Minnie P., aged 8, was admitted under my care at the Hospital for Sick Children November 9th, 1877. She was said to suffer from attacks of shivering and sense of extreme chilliness; this cold stage being ushered in by headache, and lasting two or three hours; it was followed by burning heat, ending in perspiration. The last stage was often accompanied by vomiting, and the attack altogether was usually of four or five hours' duration, the febrile stage preceding the perspiration generally lasting about an hour. The attacks have become less frequent and less severe than formerly, and now occur about once a month only. The exact frequency of recurrence at an earlier period could not be ascertained. In June, the child received a blow on the elbow, followed by five abscesses up the arm, which had only just got better at the time of her admission. While the abscesses were forming, the abdomen was said to have swelled to twice its natural size, accompanied by diarrhoea, which lasted three or four months, and indeed still exists intermittently.

On examination, the child was seen to be fairly well nourished, of an unusually mottled bronzed complexion, more than consonant with the darkness of her hair. The tongue was clean, pulse and temperature normal, appetite good, urine free from albumen. The abdomen was full, but resonant; it measured 23½ inches at the umbilicus. The spleen was decidedly enlarged, being felt nearly three inches below the margin of the ribs. Her mother stated that she and her family had lived at Hendon for the last twelve years and a half; that she first contracted ague, when living in a damp locality there, in a house built on the earth without excavation beneath, some ten years ago. Her first child contracted it at the same time, and the second, with which she was then pregnant, had it when born. The present patient is her fourth child; it was born at seven months, the mother suffering from ague-fits while carrying it; and she affirms that the child shook in the womb, and had ague directly it was born, from which it nearly died. She further affirms that there have been many cases of ague in the neighbourhood. Two of the other children and the mother were examined, but no enlargement of the spleen could be found.

The patient was kept without medicine for a week; no symptoms of ague appeared. Two grains of quinine were then given three times a day, and the child continuing free, she was sent to Highgate, the spleen being still as large as on admission. The circumstantial history of a succession of attacks of ague in other members of the family, the prevalence of the disease in the district, together with the intermittent character of the seizures and the existence of enlargement of the spleen, seemed to be conclusive evidence as to the nature of the affection in this case. Further inquiry into the statements of the mother, with regard to the prevalence of ague in the neighbourhood, has not led to their confirmation. My friend Dr. Andrew of Hendon informs me that he has met with no instance of the kind during the last five years; and that, although he attended this child for some ailment last year, he had never heard that she or any of the family had had ague previous to my inquiry. The mother, however, adheres to the account she gave me, and the enlargement of the spleen is, of course, strongly corroborative evidence.

CASE V.—Intermittent Attacks of Shivering and Fever in a Child aged five years, ushered in by a rash simulating that of Scarlet Fever: No enlargement of the spleen: Cessation of the fits under treatment by quinine.—Mary Ann S., aged 5, living in Drury Lane, was admitted into the Hospital for Sick Children, Great Ormond Street, November 16th, 1877. The mother stated that the child had always enjoyed good

health until two years ago, when she complained of a feeling of heaviness and pain over the left eyebrow. This was followed by ptosis and external strabismus of that eye, which persisted for some months. About six months ago, she was seized with intense pain in the right heel and ankle, accompanied by numbness of the thigh and in the toes. Ten weeks ago, she had what was supposed to be scarlet fever, the attack commencing with a shivering-fit, which lasted from half-an-hour to an hour; this was followed by a burning heat and red rash all over, and terminated in a fit of profuse sweating. There was also severe pain across the loins, high-coloured urine, and great thirst afterwards. Similar attacks recurred about once a week, latterly only once a fortnight; the last was five days ago. There was no history or sign of congenital syphilis. No similar attacks had occurred in any others of the family, or amongst the people in the neighbourhood.

On examination, the child was seen to be anæmic, and appeared feeble, depressed, and fretful. The tongue was much furred, and rather dry. There was no albumen in the urine; the temperature was normal. Physical examination of the chest and abdomen disclosed nothing abnormal. The spleen could only just be felt on deep inspiration. On the day of admission, the child had a shivering-fit, and the nurse who saw it described her as looking cold, and that her legs trembled; the attack lasted about ten minutes. Two grains of quinine were given with ten minims of liquid extract of bark three times a day, and, there being no return of the seizures, she was discharged at the end of three weeks convalescent.

REMARKS.—The first notable point in these cases is the occurrence of the scarlet rash observed in the first and in the fifth. In the first, the eruption was so distinct, and apparently so typical, that it was at once assumed without question to be the eruption of scarlatina; and undoubtedly the occurrence of this rash, together with high fever, greatly obscured the diagnosis at the outset. In the fifth case, the original attack was set down as scarlatinal, and its possible malarial character only transpired on cross-examination afterwards. So far as I can ascertain, although there is often some flushing of the face, such general scarlet eruption does not occur in adults. I have never previously observed it in the intermittent fevers of children, nor can I discover any instance of its occurrence on record. Its development is, however, entirely consistent with what we see in children in analogous conditions. In them, the sharp pyrexia of various acute disorders is frequently attended at the outset with a cutaneous hyperæmia so well marked and so general as to be often mistaken even by experienced practitioners for the eruption of scarlatina. I have seen it in empyema; it is not uncommon in the traumatic fever which follows operations or injuries; and it is met with in various other febrile disorders. This pyrexial erythema is usually partial—not, indeed, in well-defined patches; but it is only distinct on certain parts of the body, such as the neck, chest, and abdomen, for example; and fades away insensibly into the surrounding skin. I have never seen it so bright and deep in colour, nor so uniform, as in this instance; and the pathological conditions in ague would appear to be favourable to the abnormal development of cutaneous hyperæmia. There is marked vascular disturbance, and the contraction of the cutaneous vessels during the cold fit is followed by excessive relaxation during the hot stage which succeeds it. Hyperæmia of the superficial vessels so extreme as to constitute a distinct scarlet rash appears, however, to be the exception. It was observed only in the first case, which was the most severe; and in the fifth.

Another point of much interest is the long period of latency which intervened between the exposure to the malarious poison and the first manifestation of the disease. Such lengthened incubation is by no means unknown. Attacks of remittent fever contracted in a tropical climate sometimes make their first appearance after the return of the patient to England; and similarly ague occasionally appears for the first time in a person resident in some dry healthy locality, but who visited a marshy district months before, where the disease was undoubtedly contracted. Yet this long term of quiescence of the poison after its reception, and the apparent extreme variability of its duration, are most remarkable, for they are far beyond the limits met with in any other disorder dependent upon the entry of a material poison into the body, except only that most fearful and strange disease of all—hydrophobia. In it, not months merely, but years even, may elapse between the primary infection and the development of symptoms. Ague stands in this respect between it and the contagious fevers.

I mentioned at the outset that ague had been unusually rife from the autumn of 1876 until the present time. In addition to the four cases here recorded, there has been, I believe, one other in the Children's Hospital under the care of one of my colleagues. For several years previously, I have not met with a single instance. Dr. Ralfe, Physician to the *Dreadnought* Hospital at Greenwich, informs me that it has been

exceptionally prevalent amongst seamen and the boatmen of the Lower Thames. He states, moreover, that not only have intermittent fevers of irregular character, and relapses of ague caught elsewhere, been much more numerous than common, but that cases of primary ague contracted on the Thames, which were formerly rarely seen, have of late become of comparatively common occurrence. Thus the total number of cases of ague admitted into the *Dreadnought* Hospital during the year ending October 1876 was thirty-nine; while during the succeeding twelve months ending October 1877 the number admitted under Dr. Ralfe's care alone was thirty-seven. There would probably be an equal number under the other physician, Dr. Leach; so that the total cases of ague have probably nearly doubled during the last year. Amongst the thirty-seven cases under the care of Dr. Ralfe, there were five of primary attack contracted on the Thames. The explanation of this reappearance of ague seems to lie in the excessive rainfall. The marshy lands artificially drained were deprived of their power of producing the paludial poison; the constant rains of the last two autumns have restored the lands to their former marshy condition, and malaria has temporarily developed again as in the old præ-drainage era.

THYROTOMY FOR THE REMOVAL OF GROWTHS IN THE LARYNX.

By W. PUGIN THORNTON,

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I SHOULD be glad to have an opportunity of making some remarks on the paper relating to a case of thyrotomy for the removal of growths in the larynx, which was brought forward by Professor Lister and Dr. Burney Yeo at the meeting of the Clinical Society on February 22nd, and was reported in the *BRITISH MEDICAL JOURNAL* of the following week.

There was a point of considerable surgical interest in the treatment of Mr. Lister's case, on which no discussion took place. I refer to the method of drawing together the split halves of the thyroid cartilage by passing a silver wire not only into their substance, but completely through their walls. It was on the second or third day after the operation, on seeing the man in King's College Hospital, that I first learnt the value of such a measure, Mr. Lister very kindly explaining the case to me at the bedside of the patient, and subsequently ordering him to show how good a voice he had. I confess it was with horror that I witnessed the man's attempts to speak; for it has always been my custom, in cases of thyrotomy, to close the thyroid cartilage by passing the sutures only into the substance, taking special care that the wire should not enter the cavity of the larynx. In the twenty-seventh volume of the *Transactions* of the Pathological Society, I have related the appearance of the larynx taken from a boy three years and a quarter after thyrotomy. With this patient, aged 2½ years, owing to his constant fits of passionate crying, the divided portions of the cartilage could not be kept closely together, although the sutures were on one occasion reapplied; and, after the child's death (of general marasmus following whooping-cough, which had attacked other members of the family), they were found united by fibrous tissue, so that there was free movement between them. Doubtless, had I used a suture in Mr. Lister's manner, I should have obtained a cartilaginous union.

Mr. Lennox Browne, speaking in favour of thyrotomy, mentioned three accidents which might occur in attempts to remove laryngeal growths through the mouth, and which he had, he said, personally observed. They were as follows: 1. Spasm of the larynx, resulting from the introduction of instruments, and requiring immediate tracheotomy; 2. Removal of normal tissue, leading to ulceration; 3. Injury to the laryngeal cartilages, especially the arytenoid, resulting in paralysis, caries, and death of the patient. Mr. Browne might have added a fourth consequence which will occur in the removal of growths by forceps, if a portion of the growth is left behind—namely, acute inflammation in the larynx—and especially if the residue is large and happens to become bruised by the instrument. This *contretemps* may necessitate tracheotomy very shortly after the operation.

The three accidents doubtless may occur in the practice of any one who uses the laryngoscope; but I feel confident that the greater the skill of the operator the less likelihood there is of their occurring, and therefore the value of the operation should be estimated by the degree of excellence and consequent ratio of result which we know may be attained. I can but remember the high degree of dexterity which I was accustomed to see displayed in the removal of laryngeal growths by forceps, and which was but rarely, in my recollection, followed by any serious conditions—certainly not in a degree sufficient to warrant