those of duodenal obstruction. The fact of this obstruction being so high up was probably a factor in the excellent recovery made, as there was little chance of any septic absorption occurring.

2. *The Character of the Obstruction*.—This was also unusual, as there was no volvulus or twist, band or adhesion, but merely a flattened piece of intestine, which was not inflamed or kinked.

3. *The Cause of the Obstruction*.—As to this we can give no opinion, and it would be interesting to know from gynaecologists whether the uterus could be a factor in producing the obstruction.

TREATMENT OF APPENDICITIS IN CHILDREN.

BY
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FROM time to time one sees letters in your columns on appendicitis, and the various opinions expressed show how divided the profession is as to the line of treatment in acute cases—I mean especially as to the time to operate and how much should be done. I wish it were possible to get an expression of opinion from general practitioners on the question; the surgeons are practically all agreed that operation at once is necessary as soon as the diagnosis is certain, and the appendix must be removed if possible.

With regard to adults this may be the correct course, but in children (under 7 years of age, for example) I feel most strongly this is wrong, and have lately come across two cases that confirm my opinion—namely, that the less done in abscess cases the better. Children, especially of the better class, with excessive sensibility of the nervous centres, will not stand a long abdominal operation; even swabbing out an appendicular abscess is harmful, and removing a difficult appendix will be sufficient to turn the scale from life to death in many cases at this early age. Opening and simply draining an abscess cavity can often be done in ten minutes, while if a difficult appendectomy is done at the same time the operation is often prolonged to fifty minutes or so, with, I am sure, in the majority of cases, a fatal result. Surgeons may say that the case ought not to have been left to form an abscess, that it ought to have been operated on in the first twenty-four hours, but the fact is the majority of cases are not seen till after twenty-four hours have elapsed since the initial symptoms, and then it is best to wait till an abscess forms and simply drain. We hear a great deal about the necessity of removing the appendix in abscess cases, for fear of getting a recurrence, such recurrence being estimated at about 10 per cent.; but what is the danger of recurrence when compared with the danger of an immediately fatal result following the longer operation? Simple drainage of the abscess cavity is all that is required to relieve the little patient, and the appendix, in the great majority of cases destroyed by the inflammatory process, never gives any further trouble. This, I am sure, would be found to be the experience of the vast majority of general practitioners, who would be in the best position to know the after-history of their cases over a long course of years.

I think we are all agreed as to the treatment of these cases by starvation, avoidance of purgatives, and keeping the patient absolutely at rest in the recumbent position, using the rectal tube or glycerine suppository to help the expulsion of flatus, but in most cases avoiding enemata. Personally I generally allow small doses of laudanum to be given when the pain is bad, but not in big enough doses to mask symptoms. One correspondent who wrote a short time ago stated that in children appendicitis generally subsided with simple medical means; but my experience is that, given the same degree of acuteness of onset, in a child the case is more likely to go on to form an abscess than in the adult.

I believe Mr. Moynihan is quite right in his statement that in all these cases in which the appendix perforates and abscess results in children there will be found to be a history of a purgative having been given. To illustrate my point as to the treatment of these cases I will give notes of the last case seen.

A boy of 4½ years complained of pains in the stomach, but got about and took his food; in the evening he was given a purgative; he had rather a restless night, and the next day the pains were worse, and he was sick, but was still able to be up for a few hours. Later in the day he returned to bed, and was seen for the first time the same evening. He was then crying with pain, the temperature was 101° F., and the pulse 130; the abdomen was distended and tender everywhere, especially on the right side, and there was some rigidity of the right rectus muscle. He was put on the regimen stated above. He had a restless night, dropping off to sleep, but waking up with pains every half-hour or so. Next morning (third day of the attack) the temperature had come down to 99° F., and the pulse to 100, and he had had no more sickness; the abdomen was still distended, but he was able to pass some flatus and he micturated naturally. On the fourth day the pulse was still 100, and the temperature varied between 98.0° and 99°, tenderness was now present only in right iliac region, extending across to the left side of the middle line. On the fifth day there was no change; on the sixth day there was some dullness in the right iliac region and rigidity there was more marked; the temperature kept very near the normal. On the seventh day the temperature in the morning was still normal, but a definite lump was to be felt in the right iliac region, the size of half a cricket ball, very tender and dull to percussion.

Operation was decided on. The lump was cut down on, and an abscess opened directly under the abdominal wall, and in contact with it; it was well shut off; it contained thick, stinking pus. The abscess cavity was swabbed out and the appendix searched for, and after some difficulty found to the outer side behind the caecum; it was freed from adhesions, ligatured and cut off, and, with further difficulty, the peritoneum sutured over the stump. A large drainage tube was inserted into the cavity and some gauze plugs; afterwards a stitch or two was passed through the abdominal parietes. Before the operation the pulse was 103, and the temperature 100° F. After the operation, which took fifty minutes, the pulse was 130 to the minute, and he was very restless. Six hours later the pulse became very feeble, and in spite of transfusion, strychnine, brandy, infundibular extract, etc., it went from bad to worse, and the patient died three hours later, that is, nine hours after the operation, bringing up "coffee ground" vomit at the last.

I say that this result is alarmingly frequent, and I feel sure might be avoided in many cases if simple drainage of the abscess was alone employed, thus shortening the operation to the least possible time, and doing away with all shock. The practitioner, in charge of a case like this, can manage to get his wishes carried out in the matter by advising the parent beforehand to give his consent to the operation being performed on condition that the abscess is only opened and drained, and that nothing further in the way of an appendectomy shall be done.

PYOCYANEUS INFECTION IN DOGS AND ITS SIMILARITY TO RABIES.

BY
MAJOR W. F. HARVEY, I.M.S.

AND
CAPTAINS R. MARKHAM CARTER, I.M.S., and
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SEVERAL variations from typical rabies have been described both in animals and in man. These have received such names as "chronic rabies," "abortive rabies," and so on. The question of the possible spontaneous cure of rabies has also received attention. Some authors in discussing these conditions have suggested the possibility of incorrect diagnosis and the idea of a bacterial causation. We do not directly deal with any one of the conditions mentioned above, but our own experience leads us to believe that the bacterial causation hypothesis is worthy of attention. In this paper we consider that we make out something of a case for the existence of a *B. pyocyaneus* infection occurring naturally in dogs, and that such infection may, both as regards symptoms produced and tests applied, lead to confusion with rabies. Of course, we are aware that *B. pyocyaneus* is a very ubiquitous organism, and we must therefore leave to our readers the judgement as to whether contamination has or has not been excluded in the case which we present to them. The diagnosis of rabies by animal experiment is often the only test at our disposal, and may be summed up as depending on the subdural inoculation in a rabbit of an emulsion of the brain of the suspected animal with subsequent onset of paralysis and death within a given period. Only exceptionally do

we add to this a bacteriological examination. The result of such an examination in rabies should, of course, be negative. We think we are right in saying that if the cultivation from brain substance showed sterility in forty-eight or seventy-two hours, it would be assumed that the tissue was sterile, and that the experiment went to confirm the diagnosis. We shall see that some of our cultivations from brain substance did not develop growths of *B. pyocyaneus* for more than seventy-two hours after inoculation. The point is an important one. Further, if subpassages are made by subdural inoculation, and the same train of paralytic symptoms leading to death appears as in the original experiment, the diagnosis of rabies would be considered as completely established. But we show that the brains of animals which have succumbed to subdural inoculation, and which have yielded pure cultures of *B. pyocyaneus*, are capable of giving rise to the same symptoms as in the original when reinoculated after the manner for rabies diagnosis. We have carried this experiment to as many as eleven subpassages in one case. It must be remembered that, as part of the evidence leading to a diagnosis of rabies, we must include the suspicion attaching to the condition of the animal or brain of the animal which was brought or sent to the institute on account of the fear that the animal was rabid.

The disease produced in rabbits and guinea-pigs by *B. pyocyaneus* is well known, and has been described. As far as we know, it has not been specially described as a disease naturally occurring in dogs. The points of differentiation from rabies of the disease are:

1. Absence of Negri bodies from the hippocampus major of the animal suspected of rabies, if a microscopical examination is available. The absence of Negri bodies from the brain of the animal inoculated is not absolutely to be relied upon. We have been able to show scanty Negri body formation in the brains of guinea-pigs inoculated with pure cultures of *B. pyocyaneus*.¹

2. The paralysis induced in the inoculated rabbit is somewhat different in character, although not necessarily in incubation period, from that of rabies. The description of the disease in rabbits as given by E. Macé² will bring out both the points of resemblance to conditions which have been called rabic and also the points of difference. Pyocyaneus disease, he says, takes different forms, according to the character and the quantity of the virus introduced into the organism and also according to the state of the animal. The affection may manifest itself very acutely in less than twenty-four hours, less acutely in three to four days, or it may develop in chronic fashion and last even for several months. In the rapid forms the chief symptoms are readiness to stumble, loss of appetite, somnolence, and often at the end convulsions. There are, besides, fever, diarrhoea, albuminuria. The animal emaciates and falls into a cachectic state. Finally there appears in certain cases motor paralysis of a type which is quite characteristic. These paralyzes do not supervene immediately after inoculation. There is a rather long period of incubation—twenty days to two months. The hinder extremities are the first attacked, either simultaneously or successively or singly. At the autopsy no lesions, either of muscles, nerves, or nerve centres, are to be found. The diagnosis is easily made clinically or bacteriologically. The above description refers to animals inoculated either subcutaneously, intraperitoneally or intravenously. Our cases were those of dogs which apparently had developed the disease naturally, or rabbits which, having been inoculated subdurally in the test for rabies, developed the chronic cachectic form (otherwise described as consumptive rabies), or were animals subdurally inoculated with brain material containing *B. pyocyaneus*, and which developed the acuter form of the malady. The symptoms in the animal observed by us corresponded accurately with those described by Macé. The paralysis in particular is very typical, and may easily be distinguished from that due to rabies when attention is drawn to it. Diarrhoea was not a prominent symptom in our animals. The paralysis in its final stages could not be distinguished from that of rabies.

3. Cultures from heart's blood or liver or brain give a pure growth of *B. pyocyaneus*. This we were able to obtain in all our cases.

Other dogs than those mentioned were examined—animals to which no suspicion of rabies attached—and no

growth of *B. pyocyaneus* occurred. Nor did cultivations made from heart's blood, liver, or brain of test animals dying from undoubted rabies ever show growth of *B. pyocyaneus*.

In many of the cases, in order to exclude the possibility of agonal infection, the animals were not allowed to live until death, but were chloroformed in the later stages of the disease. The *B. pyocyaneus*, we found, can, when contained in tissue, resist the action of pure glycerine for a time. It can thereafter give rise to "pyocyaneus disease" in rabbits subdurally inoculated, although with a long incubation period and more manifest wasting than when unglycerinated cerebral tissue is used.

The case which led up to the search for and experimentation with *B. pyocyaneus* is instructive in its details. It was as follows: A patient came to the institute for treatment, after having been licked on abrasions by his own dog. The dog died under suspicion of rabies. (Some time before the development of the disease this dog had pups which were about 6 weeks old.) During our patient's stay under treatment one of these pups developed a sickness and was brought to us for inspection. The animal was very weak and could not stand, and was detained under observation. Before death it exhibited spasmodic movements of the limbs. The symptoms were not exactly characteristic of rabies, but did not exclude the possibility, and, when taken in conjunction with the history, were at least suggestive of that disease. The brain of the pup was removed, and was used in a series of dilutions (subdural inoculation) in an experiment designed to determine the connexion between length of incubation and degree of dilution. That is to say, we assumed that the disease was rabies, and had no suspicion of any other. The actual experiment was instituted because it is comparatively seldom that at this institute fresh brains can be obtained, and we did not wish to lose the opportunity thus afforded us. Six rabbits were inoculated subdurally with varying dilutions. All six developed paralysis and died. It was the nature of the paralysis which raised our suspicion that the disease was not rabies, and which led to the making of cultures from brain and from heart's blood. The heart's blood culture gave a growth of *B. pyocyaneus*, but the culture made from the brain did not do so at all. This last fact indicated that the bacilli were at least very sparse in the cerebral tissue. That they were there, however, was shown by the subpassage experiments which followed. The following are the details of our case:

CASE I.

Puppy belonging to Captain L., a patient. Mother of pup died of suspected rabies. Puppy fell sick, could not stand, and died twenty-four hours later with convulsions. Six rabbits inoculated with emulsion of fresh puppy's brain. All six developed in the course of sixteen to twenty days paresis of the hinder extremities and died a few days later.

Rabbit 2 (passage), inoculated subdurally from one of the six rabbits, developed the same disease. The heart's blood gave a culture of *B. pyocyaneus*, whilst the culture from brain was sterile.

Rabbit 3, inoculated from Rabbit 2 October 16th, 1909, showed tremor October 30th; paralysis in hind quarters October 31st, and died November 2nd. Heart's blood gave growth of *B. pyocyaneus*. Brain showed sterile.

Rabbit 4, inoculated from Rabbit 3 November 2nd, 1909, showed paralysis November 23rd, and died November 25th. Heart's blood showed *B. pyocyaneus*. Brain sterile.

This series was continued. The broth tubes inoculated from the brain might have given a growth had this been kept long enough. The subpassages gave quite clear evidence that the brain tissue was also infected, as later cultivations showed, with *B. pyocyaneus*. In the later subpassages *B. pyocyaneus* was recovered also from the brain. Rabbit 11—the last of the series, inoculated February 17th, 1910—showed paralysis on March 3rd, and was killed with chloroform on that date. The heart's blood on culture gave a green scum on the surface of the broth in twenty-four hours, whilst the culture from the brain gave the same in forty-eight hours. Coloration of the broth itself followed.

A portion of the brain of Rabbit 11 was placed in pure glycerine, and kept there for three days at room temperature.

Rabbit 12, inoculated with glycerinated brain of Rabbit 11, March 7th, 1910, did not show any paresis until May 11th. The animal had undergone considerable emaciation. Paralysis

nearly complete May 13th; killed May 16th. Heart's blood gave a greenish-brown scum on the broth culture on May 17th, which by May 18th was a thick green growth. Brain culture showed a definite green tinge of the fluid and growth on May 19th. Thus *B. pyocyaneus* lying in cerebral tissue can withstand the sterilizing action of pure glycerine for three days and give rise after that period to symptoms and death resembling those of what has been called consumptive rabies.

CASE II.

Dog of Lieut. S., brought to Institute on December 24th, 1909. The dog presented an appearance which might have been that of the last stage of rabies. It lay on its side quite unable to move and saliva was dribbling from its mouth. The dog was chloroformed. The hippocampus major showed no Negri bodies.

Rabbit 1, inoculated subdurally from dog's brain, showed total paralysis and death on the third day. Heart's blood gave culture of *B. pyocyaneus* in twenty-four hours; brain in forty-eight hours.

Rabbit 2, subinoculated from Rabbit 1, January 29th, 1910, showed marked paresis on February 7th, and was killed with chloroform on February 8th. The paresis in this case came on earlier than in the previous cases. Heart's blood gave culture of *B. pyocyaneus* in forty-eight hours; brain in ninety-six hours.

Rabbit 3, done from Rabbit 2, February 8th, 1910, showed paresis, February 15th, complete paralysis, February 16th, on which date it was killed. Cultural results the same as in Rabbit 2. In this series we find a very distinct shortening of the incubation period.

Rabbit 4, subinoculated, February 16th, 1910; paresis, February 23rd; marked, February 24th; killed, February 26th. Cultures from both heart's blood and brain gave green scum in forty-eight hours. The brain of Rabbit 4 was kept in glycerine at room temperature three days, and Rabbit 5, inoculated with this glycerinated material, developed symptoms of wasting and paralysis, and died seventy-two days after inoculation.

CASE III.

A dog was sent to the Institute from a near station. On arrival the dog was in a distressed condition, and rosy saliva was hanging from its mouth. The dog was not aggressive, and did not look altogether like a case of rabies. It died the same night (January 25th, 1910), and the body was placed on ice.

Guinea-pig 1, inoculated with emulsion of dog's brain, January 26th, 1910; paresis, February 15th; death, February 16th. Cultures from heart's blood and brain gave growth of *B. pyocyaneus*.

Guinea-pig 2, from Guinea-pig 1, February 16th, 1910; was observed to be unwell, February 27th; showed no definite paresis, but died emaciated, March 9th. Heart's blood gave culture of *B. pyocyaneus* in twenty-four hours; brain in forty-eight hours.

CASE IV.

A dog had bitten unprovoked three persons. The persons came to the Institute for treatment, bringing the dog with them. The dog was kept under observation. It did not show any special signs of rabies. Any symptoms shown were rather those of viciousness. It did, however, on one occasion dart at a stick passed in between the bars of its cage. As the dog remained alive for over ten days the persons bitten were not treated. This dog was kept some time. It became emaciated and developed diarrhoea, and was chloroformed. A heart's blood culture, taken this time from the dog's heart itself, gave a marked *pyocyaneus* culture in forty-eight hours. The case is important in connexion with histories of unprovoked attacks and the value attached to this in the diagnosis of rabies.

These cases all agree most remarkably in the finding of *B. pyocyaneus* in the heart's blood and brain. Some of the animals were not allowed to die, but were chloroformed before death. An agonal infection is thus excluded. Nevertheless, *B. pyocyaneus* is a widely distributed organism in nature. But the invariability of the finding in the cases of animals under suspicion of rabies, and the absence of the particular organism in cases where rabies either was not in question or was quite definite, suggested that here we were dealing with a disease occurring naturally in dogs, and which may simulate, say, either rabies or distemper. We decided, however, not to publish the above four cases, or to raise the question of diseases liable to be confounded with rabies until we should confirm our findings with another such case. This we have in Case v. As the case is an important one from the point of view of decisions as to the necessity or non-necessity of treatment we give it somewhat fully.

CASE V.

The dog in question had licked two people and bitten two. The two who were bitten received their injuries in the course of an attempt to administer medicine. All four persons came to the Institute—a distance of some 300 or 400 miles—for treatment. Only the two bitten were treated. The circumstances of the case were these:

A change was noticed in the quality of the bark. The animal showed some perversion of appetite—ate earth. It was able to drink milk, and showed no particular irritability. The dog was sent to a veterinary subordinate, and as it showed weakness of the extremities also, it was shot as rabid.

The brain arrived in glycerine, and was changed into fresh 50 per cent. glycerine September 14th, 1910. An emulsion of glycerinated brain was inoculated subdurally into a rabbit on September 15th. The animal remained well till October 15th, when it showed a certain amount of wasting. The hind limbs were noticed to be slightly paralysed on October 20th, and it died on October 26th, with both hind limbs paralysed.

Post-mortem Examination.—Brain somewhat injected, liver engorged, spleen normal, bladder distended. The hippocampus major showed no Negri bodies. Culture from brain sterile. A portion of the brain of this rabbit was placed in glycerine for twenty-four hours and inoculated subdurally into a second rabbit, October 27th, 1910. Wasting showed itself on November 10th, and paralysis of the hind legs on October 12th. The animal when fully paralysed was chloroformed. *Post-mortem:* Engorged liver; slight congestion of vessels of pia, arachnoid; distended bladder. Subcultures were made from heart's blood, liver, and brain.

The culture from the liver alone showed a growth, and that again was *B. pyocyaneus*.

The brain was kept for twenty-four hours in glycerine, and a third subpassage carried out on November 15th, 1910. Paralysis of the hind legs appeared on November 26th, and the animal died on December 1st. *B. pyocyaneus* was recovered from the brain, heart blood, and liver. The subpassage was done up to the seventh, and every time the *B. pyocyaneus* was recovered from the heart blood.

REMARKS.

1. *B. pyocyaneus*, although a common and widely-distributed organism, is not such a common contamination or such a common agonal infection as to account for the facts here set forth. Agonal infection is negated by the fact that many of the animals were not allowed to die naturally, but were put out of existence by chloroform.

2. Other observers have mentioned the possibility of the occurrence of microbial diseases simulating rabies, but have not, so far as we know, incriminated *B. pyocyaneus*.

3. One author (Beck³) has been able to reproduce a disease by subdural inoculation in a case of distemper, but was not successful in carrying the subpassages further. Other observers have been able to make several subpassages with distemper virus.

4. The confirmation of the facts here set forth, and their bearing on cases of reputed cure of rabies and such conditions as chronic rabies, abortive rabies, and consumptive rabies, must be left to further investigation.

REFERENCES.

- ¹ Captain Acton and Major Harvey, *On the Specificity of Negri Bodies*.
² *Traité pratique de bactériologie*. ³ *Archiv f. wissenschaft. u. praktische Thierheilkunde*. 1902, Bd. 28, Heft 5, p. 505.

A CASE OF BLACKWATER FEVER IN ENGLAND.

By JAMES ROTH, M.R.C.S., L.R.C.P.,
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It is so rarely that a general practitioner in England has the chance of treating a case of blackwater fever that the following seems to me worthy of record:

A young man, R. W., aged 26, came to me on a visit from Burma. He was in the best of health and spirits, and the day following his arrival we went by train to see some friends in the country. As we alighted at our destination, he remarked that he had a touch of fever coming on, and he began to shiver. We got to our friend's house, and I administered 6 grains of quinine, and he lay down. Two and a half hours later he rang for me, and drew my attention to the chamber; he had passed quite a pint of black urine, the colour of stout. He suggested blackwater fever, but I thought it might be merely malarial hæmaturia. During the afternoon he vomited frequently a yellow bile, and passed more urine of the same colour. I managed with some difficulty to get him back to Brighton, and took him straight to a nursing home.

His temperature that evening rose to 105°; he vomited occasionally, and still passed black urine. My experience of malaria was confined to a few mild cases in Kimberley Hospital, so I asked Major Rattray, of the R.A.M.C., to see him, which he very kindly did. Acting on his advice, as we knew the patient had neglected taking quinine lately, I gave him an injection of 2 grains of the hydrobromide of quinine (acid) into the muscles of the buttock. The temperature was kept down by sponging to about 102°. Calomel 5 grains was given. Next morning the temperature was 102°; vomiting continued at frequent intervals,