

remained in a feeble state, which lasted several days, and which reappeared when the bandages were changed or the patient moved. The left arm is atrophied a little, and there is paresis. June 10th, aspiration with the bulb shows that there is a perforation of the lung. The liquid of the irrigation, when slowly introduced into the pleura, appeared in the mouth with its characteristic taste, and produced cough with suffocation. From the next day, the siphon worked well, showing that the perforation had closed. June 22d, the lung is only seven centimetres from the thoracic wall. The little liquid furnished by the siphon is only limpid serum without membrane. June 24th, auscultation and percussion normal. The siphon is removed. June 30th, the fistula is closed.

The patient left on July 25th. The perimeter measured at the level of the cicatrix 35 centimetres on the right, 37 centimetres on the left. There was consequently an increased amplitude of the thorax on the diseased side. The left arm remained atrophied, its circumference being 18.3 centimetres at the upper end of the forearm (the right limb was 20 centimetres) and 19.5 over the biceps (right 21.5). The following table will serve to show the course of the disease.

PER CENT. OF ALBUMIN.	
April 7	20.
April 10	1.6
April 18	3.50
April 25	1.25
May 7	.40
May 25	.60
June 1	.25
July 23	.00

  

PUS IN TWENTY-FOUR HOURS.	
May 23	315 grammes
May 28	100 "
June 2	50 "
June 7	30 "
June 29	0 "

  

PER CENT. OF HEMOGLOBIN.	
June 1	60
July 23	73
August 24	80
December 20	85

  

PATIENT'S WEIGHT.	
June 10	34,400
June 20	33,100
June 30	35,30
July 15	41,600
July 30	42,200
August 25	43,800
December 25	49,200

*En résumé.* — Here is a case of intense febrile scarlatinal nephritis, which at the end of the fifth week ended in a vast pleural abscess. As one thoracentesis was not sufficient, the siphon was applied one month after its formation. The action of the siphon was hindered by divers complications, pulmonary perforation, and apoplectiform nervous symptoms, rendering the irrigations most difficult, but which were necessary in this case on account of the large quantity of false membranes. Nevertheless, six weeks after the siphon had been in use, cicatrization of the pleural cavity was perfect without any tendency to retraction of the costal arc. The last report of the patient was on May 28, 1892. The cure was still complete, and the general health perfect.

CASE VI. (Dr. Archavski's thesis.) A child was taken on February 14, 1891, with a suppurating pleuro-pneumonia following scarlet fever. On March 10th, he was brought to the hospital. On the same

day the first thoracentesis gave issue to one litre of pus. A second thoracentesis, on March 16th, gave 400 grammes. The third thoracentesis, on the 22d of March, gave 580 grammes. The fourth, performed on April 1st, gave 400 grammes. On April 15th, incision and siphon. April 25th, the pleura was empty, and the lung came to the thoracic wall. The siphon was removed. A few days later an acute nephritis appeared, with a large quantity of albumin and general anasarca. Suppuration recommenced, and the siphon was put back for a few days. On May 13th, the cicatrization was complete, and cure definite. The patient was followed for some time afterwards, and always found in excellent health.

These six cases, which concern either chronic or complicated pleurisies which would have been considered as incurable, all ended in a complete recovery. This is a sufficient conclusion for justifying this memoir, and more eloquent than any commentaries that I could add. Tuberculous pyothorax, although not less interesting in our point of view, is a subject too special to find place here; but I hope at a future date to be able to give some personal experience on this question.

## ACUTE LEUKEMIA.<sup>1</sup>

BY R. C. CABOT, M.D.

THIS paper is an attempt to answer the question whether it is reasonably certain that cases of acute leukemia have occurred.

My attention was first drawn to this question by a remark of Rieder's.<sup>2</sup> "Certainly," he says, "some of the cases reported as acute leukemia, are properly to be considered as cases of inflammatory leucocytosis." In this opinion Rieder is supported by v. Limbeck,<sup>3</sup> who considered the evidence insufficient to establish a separate acute type of leukemia. On the other hand, such text-books as Pepper's (new edition) and Strümpell's speak of the occurrence of acute forms of the disease as an established fact.

My very recent observation of a case first diagnosed as acute leukemia, where only a differential count with Ehrlich's triple stain showed the true diagnosis to be leucocytosis due to new growth,<sup>4</sup> has further awakened my suspicion as to the value of diagnosis made without the assistance of some such method. Accordingly, it has seemed worth while to go over all the literature upon which the belief in the existence of acute leukemia is based, and scrutinize carefully the methods of diagnosis used in each case.

It is necessary to consider at the outset just what evidence should be held sufficient to establish a diagnosis of acute leukemia.

First, we note the element of time. The duration of the cases published as acute leukemia (34 in all) varies between three days and nine weeks, the latter being the longest case on record under this title. Now, without attempting to lay down any precise number of days or weeks as a limit beyond which no case may last and still be considered acute, it may be stated that, considering the average duration of ordinary chronic leukemia (with which these cases are contrasted), any case which runs its entire course

<sup>1</sup> Read before the Clinical Section of the Suffolk District Medical Society, October 17, 1894.

<sup>2</sup> Grundriss einer klin. Path. d. Blutes, Jena, 1892, p. 162.

<sup>3</sup> Beiträge z. Kenntniss der Leucocytose, Leipzig, 1892, p. 34.

<sup>4</sup> Boston Medical and Surgical Journal, March, 1894.

within nine weeks may fairly be classed as acute. So that all the published cases of acute leukemia may, I think, be considered established as far as their *stated* duration is concerned.

I say their *stated* duration; but we have next to consider by what evidence we can settle the dates of start and finish in any case. Now, as all the published cases ended in death, it is very easy to settle the boundary on that side; but the date of the beginning of the disease is much harder to settle, and for the following reasons:

(1) In the first place, the sudden onset of severe symptoms in a person previously considered well, is of no importance whatever as evidence of the beginning of a case of leukemia. Cases which show evidence of having existed for a considerable period are sometimes first discovered by an oculist, or the patient may consult a physician for some slight gastric or respiratory disorder, and in the course of routine physical examination the discovery of an enlargement of the spleen or lymph-glands leads to a blood examination, and so to the diagnosis—the patient's general condition being and remaining excellent.

As an example of this, I will cite the case of Winnie S., twenty-two years old, who came to the Massachusetts General Hospital in December, 1892, for shortness of breath. Routine physical examination leading to the diagnosis of leukemia, the patient was after some difficulty persuaded to stay a few weeks in the hospital, in spite of the slowness of her symptoms. The blood current showed: red corpuscles, 2,921,600; white corpuscles, 492,000; a proportion of one to six. A differential count showed a large percentage of myelocytes. The spleen reached nearly to the navel; yet she felt so well that after a day or two it was difficult to keep her in the hospital. Eighteen months later she came to the hospital again to report that she felt entirely well, and had been so since leaving the hospital. She was married, had a healthy child, did her own housework, and was by no means an invalid. The blood and spleen were practically as before.

Another case of very marked leukemia which I kept track of after her discharge from the hospital was able to be about and do some work until about three weeks before her death, when there was a sudden onset of symptoms resembling those reported in cases of acute leukemia (so called). Any one seeing her for the first time in this attack, and following the case to the time of her death, three weeks after, might have supposed it to be an acute case.

Dr. Hubbard, of Taunton, was kind enough to write to me not long ago about a case of leukemia who was under observation at the Massachusetts General Hospital in July, 1892, and who has since been under his care. He tells me that she had been at work a good deal of the time since leaving the hospital, and of late has safely passed through a severe attack of lobar pneumonia. The blood is still leukemic.

Such cases as these show how largely latent a case of marked leukemia may be, and how easy it would be for any one seeing the case for the first time during the last weeks to suppose it an acute case.

In order to fix with any certainty the time of the beginning of a case of leukemia, one must have examined the blood before the date supposed to mark the beginning of the disease, and be able to state that no changes characteristic of leukemia were present

before that date. Now, it is obvious that a physician would rarely have opportunity for such examination previous to the beginning of the disease. Clearly, therefore, it must always be difficult to be sure of a diagnosis of acute leukemia. That acute, severe symptoms occurred with a leukemic condition of the blood, and that death followed within a few weeks, is only what occurs in cases of leukemia known to have existed for a considerable time.

(3) But now, supposing that we settled that it is really an *acute* case of some kind, what further evidence is needed to show that this acute disease is really acute leukemia.

It has been supposed until within a few years that leukemia was one of the easiest of diseases to diagnose; and although no one would now consider it a very hard one, it requires something more than a glance at the blood and the detection of an enormous number of white cells in the field to make the diagnosis. Yet upon no greater evidence than this, several of the writers whose reported cases I have studied, rest their diagnosis. In a single field of an immersion lens (one-twelfth) with a No. 4 eye-piece, which of course is very small, I counted 65 leucocytes in the blood of a case of cancer of the kidney a few weeks ago. The field was simply crowded with them, yet from other evidence it was clear that the case was not leukemia. I shall speak more in detail of this case later on. It is mentioned here only to show how fallacious conclusions based on the appearance of an unstained blood slide may be.

But further than this, even a careful count of the red and white corpuscles and the detection of an enormous increase in the latter by *actual count*, is not sufficient without further data to prove that the blood is leukemic.

It would seem unnecessary to repeat at this time a fact so widely known and so firmly established as this; but that it still needs to be repeated is shown by the fact that such a Journal as *Sajous' Annual*,<sup>5</sup> on which I suppose many of us have to base our ideas, quoted last year as established 19 cases of leukemia, in most of which the diagnosis was based on a simple increase in the count of white cells and in some of which no count at all was made. In fact, some of these cases were guessed at from the appearance of the blood-slides, and in a few, no blood examination of any kind was made.

Now, in fact, leukemia not only does not depend on a simple increase of the white cells, but in rare cases may exist without *any* notable increase of the white cells<sup>6</sup> at all. And in the lymphatic form it is not uncommon to find a ratio of white and red no greater than that found in a variety of other conditions, such as cancer and the anemias of children. On the other hand, an enormous increase of white cells is occasionally found in cases demonstrably not leukemic.

Reinert<sup>7</sup> quoted a case where a patient with abscess of one hand and multiple abscesses about the ankle showed a leucocytosis of 1 to 16, and a case of cancer of the stomach with a ratio of 1 to 12. Welsh, in "Pepper's System of Medicine," speaks of a cancer of the stomach with a blood count of 1 to 25. In the case of C. W., which I have previously reported,<sup>8</sup>

<sup>5</sup> 1893, vol. i, p. L 14.

<sup>6</sup> See case of Mrs. S., quoted in Boston Med. and Surg. Jour., March, 1894.

<sup>7</sup> Die Zählung der Blutkörperchen, etc. Leipzig, 191, p. 165.

<sup>8</sup> Boston Med. and Surg. Journal, loc. cit.

the proportion was 1 to 24, and in a case of cancer of the kidney Maggie B., who entered the Massachusetts General Hospital the 7th of last July, under the service of Dr. W. L. Richardson, who has kindly permitted me to mention it, the proportion was 1 to 21. Dr. T. M. Rotch permits me to mention two blood-counts made for him by Dr. A. Wentworth in leukemic children, in which the ratio was 1 to 10 and 1 to 20 respectively.

Cases could easily be multiplied; but those mentioned seem to me sufficient to show that an increase in the count of leucocytosis, even very large, is not sufficient to show leukemia. In all the cases above mentioned the increase of white was due wholly to a multiplication of the polymorphonuclear cells and none of the characteristic myelocytes were present.

We need to know not only the number but the kind of white cells with which we are dealing, before we can be sure of our diagnosis. It is very striking to note how much the clinical picture of certain cases of malignant disease resemble those of a case of leukemia in every respect except in the one all-important detail of the kind of leucocytes to which the increase in white is due. I have seen in two cases of cancer with anemia, an enormous increase in the white cells and a large tumor in the splenic region. In both of these cases the subsequent growth of the tumor gave it a shape and a feel very different from that of an enlarged spleen, but for a time the resemblance was striking.

(4) Lastly, even the findings of the autopsy, which generally clear up questions of diagnosis in difficult cases, and which are appealed to in several of the cases published as acute leukemia, do not always give us any help in leukemia.

A diagnosis of leukemia cannot be made from post-mortem appearances alone. Certainly, Hodgkins's disease, and possibly other conditions, may give rise to appearances identical with those of true leukemia; and as a marked increase of the polynuclear neutrophilic leucocytes may occur towards the end of a case of Hodgkins's disease, the observer who had made sure of an enlarged spleen and lymph-glands — possibly tender long bones, with a marked increase in the white cells, and finally with post-mortem appearances of leukemia — would probably reject with indignation the suggestion that his case may not have been leukemia after all. Yet such a doubt is inevitable.

From what has been said it may seem that I am maintaining that the diagnosis of any leukemia, acute or chronic, is a matter of great difficulty; but this is not my meaning. The diagnosis of ordinary chronic leukemia is very simple, provided the observer makes a differential count of the leucocytes in addition to the ordinary blood count. It is not the diagnosis of leukemia in general that it is hard to establish, but of *acute* leukemia; for here, for reasons given above, it is rare for the physician to have access to the facts necessary to settle even roughly the date at which the disease began.

Putting together the conclusions arrived at so far, it appears that in order to make a diagnosis of acute leukemia, we need to establish:

- (1) The previously normal condition of the blood.
- (2) The presence in the blood of such numbers *and varieties* of white cells as occur, so far as is known, only in leukemia.
- (3) A reasonably short course to the symptoms.

The negative results arrived at are:

(1) Increase in the white cells (even very large), does not constitute the disease leukemia, even when accompanied by enlargement of the spleen and lymph-glands.

(2) The acute onset of severe general symptoms is of no value as an indication of the beginning of a case of leukemia, for such is often seen in course of a case of chronic leukemia.

(3) There are no post-mortem appearances, and no physical signs (exclusive of the blood examination) peculiar to leukemia, acute or chronic.

In the light of these principles let us now examine the literature of acute leukemia with special attention, first, to the nature of the evidence submitted for their being acute; and second, of their being leukemic.

A glance at the accompanying table will show that out of the 34 cases reported, only three comply with the requirements. These are No. 27 (Senator's) and Nos. 31 and 32 (Obrastow's two remarkable cases). Every one of the others lack one or more of the proofs necessary to establish a diagnosis of acute leukemia. Most of the cases we may suppose to have been leukemia, and possibly acute leukemia; but there is nothing in the histories as given to prove that the disease had not been latent for some time before the onset of severe symptoms. In only six cases was any examination of the blood made previous to the stated beginning of the disease, and in three of these there was no differential count, nor any description of the individual characteristics of the leucocytes.

We are reduced then to three cases, as material from which to form our ideas of the type of acute leukemia. These three cases present some points of interest, and seem worth quoting in more detail.

Senator's case, published in 1890, was in a woman of forty-nine. She had had amenorrhea for a year, and had felt weak and feverish for three months. Such symptoms make us suspect that the disease may have been latent for some time, but an examination of the blood pronounced negative by such an observer as Senator must, I suppose, be accepted as correct, even though no actual count was made. His statement is that on June 2, 1890, he examined the woman's blood, and found "no increase of white cells — only seven or eight in a field of a No. 7 Hartnack lens." If the number of red corpuscles had been low, this number of white cells would, I think, have represented a considerable leucocytosis. But the author makes no statements on this point; and we have to be satisfied with his assertion that the blood was negative, even though he made no actual count of red and white, and no differential count. At any rate, eight days later he did make a count, and found *six white to every two red corpuscles*. As to the characteristics of the individual leucocytes, he merely observes that they consisted mostly of the "small forms," and that he could not make out the nuclei. Presumably, it was a case of lymphatic leukemia with large increase of lymphocytes. During these eight days the spleen had become much enlarged and the patient had lost strength very rapidly. She died June 11th, nine days after the first (negative) examination of the blood. At the autopsy there was found ulcerative endocarditis, besides the large spleen and hyperemic bone marrow. This case, then, although defective in several particulars, seems to me to belong under the category of acute leukemia.

Obrastow's two cases are much more satisfactory,

and present several extraordinary features. They were reported in 1892.

CASE I. The patient was a boy of seventeen, previously healthy, who for two weeks had been partially disabled from work by weakness and had been troubled by frequent nose-bleeds and cutaneous ecchymoses for the same period. He entered the hospital March 1st, with high fever and a pulse of 126. Physical examination showed that the liver and spleen were enlarged and projected six fingers' breadth below the ribs. The blood was examined, and found to be negative, both as to number and varieties of white cells. On this account a diagnosis of Werhofs disease was made. The patient continued to run a high fever and grew rapidly weaker. After four days in the hospital the spleen projected three fingers' breadth,

and after a week a whole hand's breadth below the ribs; the liver, two fingers' breadth. The lymphatic glands were everywhere enlarged. March 10th, nine days after entrance, the spleen reached the navel. This day the blood was again examined, and a ratio of one white to every seven red was found, with a large percentage of myelocytes — in short, the typical blood of spleno-myelogenous leukemia. Two days later the spleen reached an inch beyond the navel, the liver was a hand's breadth below the ribs, and the inguinal and axillary glands were of the size of hazelnuts. The blood-count showed 3,044,000 red, 434,000 white, myelocytes as before. The fever continued between 100° and 104° F. throughout the disease, which lasted just sixteen days from the time of his entering the hospital. Two days before his death the

No.	Author.	Date.	Sex.	Age.	Stated Duration.	Blood-count previous to onset of disease.	Differential Count.	Remarks.
1	Friedreich	1857	F	46	6 weeks	....	....	Gangrenous stomatitis.
2	Isambert	1869	M	54	5 weeks	Yes. Normal	....	One to fifty at death, and never higher ratio. No autopsy.
3	Paterson	1870	F	20	11 days	....	....	Following confinement. Symptoms like septicemia with inflammatory leucocytosis.
4	Paterson	1870	F	?	14 days	....	....	Like No. 3 in all respects.
5	Immerman	1874	F	17	6 weeks	....	....	Large abscess of lower jaw.
6	Kelsch	1875	M	26	7 weeks	....	....	Leukemic retinitis. Lymphoid tumors in various organs at autopsy.
7	Lauenstein	1876	M	59	3 weeks	....	....	
8	Küssner	1876	F	46	2½ weeks	....	....	Severe stomatitis.
9	Ponfick	1876	M	19	5 weeks	....	....	
10	Litten	1877	F	24	5 weeks	Yes. "Minimal leucocytosis"	....	Following "pernicious anemia." Autopsy showed "malignant osteomyelitis."
11	English	1877	M	24	12 days	....	....	Meningitis, endocarditis and pericarditis.
12	Zumpe	1878	M	15	7 weeks	....	....	
13	Fränkel	1881	M	18	20 days	....	Most leucocytes smaller than the red	
14	Gaucher	1881	M	38	9 weeks	....	....	Severe stomatitis.
15	Leube et al.	1881	F	30	7 weeks	....	....	Leukemic retinitis.
16	Waldstein	1883	M	44	44 days	....	....	
17	Wadham	1884	?	5	8 weeks	....	....	
18	Masius et al.	1885	M	22	9 weeks	....	....	
19	Gläser	1887	M	37	?	....	....	
20	Mu ser	1887	M	11	5 weeks	....	....	Ratio rapidly increased from 1 to 40 up to 1 to 18.
21	Ebstein	1887	M	23	6 weeks	....	....	
22	Hinterberger	1889	F	30	5 weeks	....	Yes	Leucocytes mostly polynuclear. Pus cocci found in glands and liver.
23	Westphal	1889	M	16	6 weeks	....	Yes	Blood is that of pernicious anemia with lymphocytosis. Red cells, 816,000; white, 24,000.
24	Fränkel	1890	F	14	9 weeks	No count. Moderate increase in white.	Relatively few polynuclear cells	No blood-count. Diagnosis based on a "considerable increase in the white cells a few days before death."
25	Guttmann	1890	M	10	3½ weeks	....	Relatively few polynuclear cells	
26	Senator	1890	F	49	3 weeks	Yes. Previously normal	Small forms of leucocytes predominate	No actual count before the beginning of symptoms. Saw "only 7 to 9 leucocytes in the field of a No. 7 Hartnack lens."
27	Greiwe	1892	M	28	2 weeks	....	Yes. 35% of polynuclear cells	Had had cutaneous hemorrhages for several months.
28	Eichhorst	1892	M	8	2 weeks	....	Leucocytes 88,000, mostly polynuclear	Leucocytes only 7 to 8 u in diameter.
29	Litten	1892	?	?	1 week	....	Yes	Followed "grippe."
30	Obrastow	1892	M	17	4 weeks	Yes	Yes	Diagnosis satisfactorily established.
31	Obrastow	1892	M	32	2 weeks	Yes	Yes	Diagnosis satisfactorily established. Apparently caught by contagion from No. 30.
32	Nobel	1892	M	40	10 days	No	?	Gangrenous stomatitis. Blood 1 to 10.
33	Dansac	1892	M	17	5 days	....	....	No blood-count at all.
34	Nobel	1893	F	30	3 weeks	....	?	Stomatitis. Blood 1 to 50.

glands and spleen grew very soft — so soft that it was difficult to feel the edges of the spleen at all. At autopsy there was found, besides the enormously enlarged liver and spleen with the ordinary diffuse lymphoid infiltration, a diphtheritic ulceration of the soft palate and a diphtheritic colitis, and pus cocci were found in the swollen lymphatic glands.

CASE II. Forty days after the death of this patient, the ward-tender who had taken care of him was taken sick with exactly the same symptoms — epistaxis, purpura, fever; and in three days his spleen was one finger's breadth below the ribs. The blood, as before, was negative at this stage of the case, but a week later showed a ratio of one to nine with a large percentage of myelocytes — typical leukemic blood. The spleen during this week had been growing fast, and now reached the navel, with the liver two fingers' breadth below the ribs. The lymphatic glands were also enlarged in the groins and under the jaws. A few days before his death, which occurred eleven days after his giving up his work, he developed a bloody and gangrenous stomatitis, and the spleen, as in the other case, grew so soft that it was very difficult to feel its edge. Now this man had, as above mentioned, been ward-tender in the ward where the first case was sick. He had taken the temperature, looked after the feces and urine, and helped in the examination of the blood and in the plugging of the nares (which had had to be done on account of the persistent nose-bleeds). The exact similarity of the two cases, and the likeness to an acute infectious disease, is certainly very striking. The cases are, so far as I know, unique, but the suggestion of contagion is certainly plausible.

I will not take up your time with any further details of these cases, except to call attention to the occurrence of severe stomatitis in both the last two cases and colitis in one, as particular attention has been called to these symptoms by Hinterberger<sup>9</sup> in the cases published as acute leukemia. In three-quarters of all the cases published up to the time of Hinterberger's paper (1891) severe ulceration, either of the mouth or of the large intestine, had been noted. Nobel<sup>10</sup> states that stomatitis is present in 70 per cent. of all acute cases.

In conclusion, it need only be said that if what I have been maintaining is true, namely, that there are only two or three satisfactory cases of acute leukemia in literature, it is very important that any one who has seen such cases should report them at once, so that the foundations on which our ideas of the disease are built may be strengthened. I leave it to you to decide how far our confidence in the existence of the disease can reasonably extend on the basis of at most three complete and genuine cases. I do not know how many swallows *do* make a summer, nor how many cases constitute a disease.

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<sup>10</sup> Nobel: Deut. Med. Zeit., p. 1176, 1892.

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#### THE BACILLUS COLI COMMUNIS.

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(Concluded from No. 20, p. 422.)

#### PATHOGENESIS.

ESCHERICH found that the bacillus coli communis from normal feces was fatal to rabbits and guinea-pigs. According to Macaigne<sup>17</sup> and Lesage,<sup>18</sup> however, a dose of 1 to 2 c. c. of a bouillon culture is rarely fatal to these animals, and hence the bacillus under normal circumstances ought not to be considered virulent. When large amounts (4–5 c. c.) of a bouillon culture are inoculated intravenously the animals become drowsy and stupid and show diarrheal symptoms. After a day or two they become paralyzed, comatose, and finally die. Post-mortem appearances vary. When death is quick from septicemia, the subcutaneous cellular tissue is edematous, the lymphatic glands are enlarged and the pleural and peritoneal cavities often contain a fluid or fibrinous exudation. The intestinal walls are usually injected but no macroscopic changes are to be made out. The solid viscera are hyperemic and contain the bacilli in large numbers.

Gilbert and Lion<sup>19</sup> observed that sometimes inoculation of rabbits with bacillus coli communis is followed by a slow progressive paralysis, resulting fatally in from twelve to forty-nine days. On post-mortem examination of these cases numerous microscopic changes are found in the spinal cord, especially in the lumbar region. Numerous cells of the gray matter are granular and stain very feebly with the ordinary dyes, the nuclei being atrophied or invisible. Other cells are wholly atrophied and their prolongations shrunken. In other words, a real poliomyelitis is found.

When the bacillus coli communis is isolated in pathological conditions of the intestine it is more virulent than when taken from normal feces, a dose of 1 c. c. of a bouillon culture producing a septicemia