their supposed importance. It is to be hoped, therefore, that no cases will be accepted as cases of acute general peritonitis without a competent bacteriological examination — not even cases in which the abdominal fluid possesses the usual appearances of pus. As a matter of fact, the only way in which the varying statistics of operations for general peritonitis can be even approximately reconciled is to assume that the majority of successful operations follow infections which are apparent rather than real.

Unfortunately, the evidence obtained from numerous observations made at operations and subsequently at the bedside seems to show that whatever the kind of infection of the peritoneum, however slight or severe its manifestation, and whatever its treatment, the result is still deplorable. Nevertheless, the outlook in view of the increasing number of recoveries in authentic cases after early recognition and operation is distinctly more hopeful.

The report of the pathologist is as follows :

Miss E. J. A.— *Culture from peritoneum*.— Cultures are made on blood serum and in 24° show a pale gray, slightly yellow growth along line of inoculation. Water of condensation slightly turbid, and shows considerable pale yellow deposit. Microscopic growth is found to be a small micrococcus arranged in chains averaging 15 elements in number.

Gelatine stab culture shows at end of 24°, at room temperature, abundant yellowish-gray growth along line of inoculation. Grows as well at bottom as at top of stab. Fine round yellowish colonies on either side of stab. Does not grow as readily on surface of gelatine. Non-liquefying.

Litmus milk shows in 48° considerable change in reaction, but no coagulation.

Potato in 48° in incubator shows no visible growth. In bouillon first culture showed after 48° in incubator a marked sediment with clear supernatant fluid. Sediment is in form of flocculi of considerable size. Later bouillon cultures, however, fail to give this flocculent appearance, but sediment is finely granular.

Agar plates show surface colonies to be pale gray with darker centres and irregular leaf-like contour.

On November 1st a suspension of the organism in bouillon was injected to the amount of 1½ c. c., into a guinea-pig. At end of two weeks animal apparently as healthy as ever. On sixteenth day, however, the pig was found dead in his cage. Autopsy showed microscopically nothing abnormal. Cultures made from spleen and heart's blood. In 48° culture from blood showed one pale lemon-yellow colony which, however, proved on investigation to be not a streptococcus, but the staphylococcus pyogenes citreus. This latter organism was undoubtedly a contamination. The pathogenesis of the organism, therefore, as far as guinea-pigs are concerned, is probably *nil*.

In conclusion :— We have to do here with a streptococcus differing from the ordinary variety in its character as a color producer. Similar organisms have been seen and described, but the exact status of the bacterium is yet to be made out— "*Streptococcus aureus*."

A PUBLIC DINNER FOR PROFESSOR VIRCHOW.— It is proposed, the *Lancet* states, to entertain Professor Virchow on the occasion of his forthcoming visit to England at a public dinner. Lord Lister, we understand, will take the chair and may count upon the support of the leaders of the profession.

A REPORT OF TEN OPERATIONS FOR GENERAL PERITONITIS WITH TWO RECOVERIES.¹

BY F. B. LUND, M.D.,
Assistant Visiting Surgeon, Boston City Hospital.

IN dealing with general peritonitis except in the very early stages the surgeon has to do with patients whose general vitality has been lowered by the absorption of toxins from a serous surface of immense extent and complication and enormous absorbing power. This serous cavity abounds in folds and pockets which increase its absorbing surface, and its inflammation is attended by the paralysis of the musculature of the intestinal canal, by stagnation and putrefaction of its contents, generation of gas, distention, fecal vomiting. The patient's vitality is so quickly reduced by so active and virulent a process in such close relation with the great splanchnic nerve centres, and the attendant paralysis of the digestive and absorbent centres, that whatever measures are taken must be so thorough and effective as to change, and that at once, the condition of the peritoneal cavity from that of an absorbent of toxins to drainer of poison from the system. Operative interference must be thorough enough to accomplish its object at one session, for repeated operation, or continuous meddlesome interference, will prove a fatal tax on the strength of the patient. For this reason a thorough cleansing and disinfection followed by provision for drainage adequate to start a current out of the peritoneum and its lymphatics, instead of into them, must be accomplished at one operation and if possible immediate action of the bowels must be induced to prevent if possible intestinal paralysis, and enable nutriment to be administered to the exhausted system.

If the peritoneum can be disinfected and all its pockets successfully and thoroughly drained, within a very few hours adhesions are found around the drainage tubes or wicks, and prevent further infection of the peritoneal pockets. The patient's condition in cases where this is successfully accomplished changes from one of septic intoxication to one of comparative comfort, and the exhausted system has opportunity to recover.

These facts, the necessity for procuring a condition of rest for the patient, and the securing of adhesions preventing reinfection of peritoneal pockets, seem to me to militate against the exhausting procedures involved in the plans of continuous or repeated irrigation of the peritoneal cavity which have been proposed and tried.

During the past ten months I have been called to operate upon ten cases of acute general septic peritonitis at the Boston City Hospital. Eight of the cases resulted from perforating appendicitis, and two were of tubal origin. These occurred in the services of Dr. W. P. Bolles and Dr. George H. Monks, by whose courtesy I report them. All were operated upon as soon as seen, and in all the condition when first seen was extremely grave. Only one case, not included in the cases reported, was seen which was not operated upon owing to the moribund condition of the patient. This patient died six hours after he was admitted.

In the presence of fatal prognosis without operation it has seemed imperative to disinfect and drain

¹ Read before the Boston Society for Medical Improvement, April 18, 1898. The paper as read was a report of seven cases with two recoveries, but the writer has added three cases operated upon since the date of the writing, two of which recovered.

the peritoneum, wherever there was the slightest hope of the patient's withstanding the shock of the operation.

CASE I was operated upon November 13, 1897; a boy of seven years, whose first symptoms had begun about sixty hours before with pain, continual vomiting, and prostration. On entrance there was general abdominal tenderness without marked distention. No tumor in region of appendix. Short incision over appendix, which was found perforated. No adhesions whatever about appendix. Pus free among intestines and in pelvis, a few delicate flakes of lymph on lower portion of ileum. Redness and loss of lustre of entire small intestine. The incision was extended to five inches. The lower half of ileum was removed from the abdomen, and washed and sponged free of lymph, the abdomen washed out with several quarts of hot salt solution, and wiped dry. The pelvis was drained by a glass tube and the subhepatic space and left lumbar region by gauze wicks. Time of operation thirty minutes. No vomiting followed the operation, the tube was removed the second day, on which day calomel in one-tenth-of-a-grain doses followed by a high enema produced free movement of bowels. No vomiting after operation. Discharged well on December 15th. Cultures from peritoneal cavity showed free growth of bacillus coli communis.

CASE II. M. M., a girl of twelve years, operated upon January 27, 1898. Pain for three days before entrance and vomiting for two days. Diarrhea since a cathartic was given at onset of trouble. For past twelve hours delirium. Has vomited but once. On entrance mental dulness and delirium. Abdomen generally tender and rigid, but especially in epigastric and right iliac region. No tumor felt anywhere. Pulse 140, fairly good strength, eyes bright and glassy, abdominal pains marked.

Incision over appendix showed general peritonitis with pus throughout abdomen and flakes of fibrin, covering the entire small and large intestine. The incision was extended in the semilunar line to six inches. Evisceration, removal of fibrin, which was only lightly adherent, by sponging and washing, irrigation of entire cavity with salt solution. Pelvis drained by glass tube and gauze, but abdomen left full of salt solution. Suture of upper part of wound. But slight shock from operation, which lasted thirty-five minutes.

The following day marked improvement ensued, the patient was conscious, and her general appearance was much better, pulse 100 and of good strength. No vomiting. Efforts to move the bowels by Epsom salts by mouth and high enemata were unsuccessful during this day and the following, and the patient steadily grew worse and died the morning of the fourth day after operation.

CASE III. J. J. McQ., a boy of twelve years, operated on March 2, 1898. Had had pain in right iliac fossa and constipation for four days, but bowels had moved after an enema twenty-four hours before. Vomiting more or less continuous for four days. On entrance, pulse 104, abdominal facies. Abdomen generally tender but especially so in right iliac fossa, where a tumor is to be felt. Universal rigidity of abdominal muscles, slight distention. Incision five inches long in right semilunar line; immediate escape of thick pus from abdominal cavity, perforated appendix removed.

The ileum, which was covered with fibrin flakes, was removed from the abdomen, and the flakes as far as possible sponged off. The upper part of the small intestine appeared healthy, the abdominal cavity was thoroughly irrigated with salt solution, a considerable amount of pus was washed out of the subhepatic space and the pelvis. One ounce of a saturated solution of Epsom salts was injected through a hollow needle into the ileum, and the puncture closed by a fine silk suture. The pelvis was drained by a glass tube and gauze in the lower angle of the incision, the subhepatic space by a rubber tube and gauze, and the left lumbar region by a gauze wick. The abdomen was left full of salt solution. Time of operation, thirty-five minutes, no vomiting followed the operation, and on the following morning there was a free movement of the bowels followed during the day by several other movements and the passage of much gas. The patient's condition from the day of operation was extremely comfortable, his convalescence being only interrupted by an accumulation of pus in the pelvis, which resulted perhaps from a too early removal of the drainage. This was evacuated by dilating the lower end of the wound by the finger; convalescence has since been uneventful, the boy is well and fat, and left the hospital early in April.

CASE IV. On March 2d, the same day as the previous case, laparotomy was performed upon W. H. G., a boy of twelve who had had general abdominal pain for four days, and vomiting for three, together with absolute constipation. On admission he was found to have general abdominal tenderness, distention and tympany, pulse 140 and weak, temperature 102°. Abdominal pains, immediate operation by median incision below umbilicus, which was extended upward a distance of six inches. Escape of large amounts of very offensive pus from abdominal cavity, which was converted into a series of pus pockets separated by adhesions. Entire small and large intestine covered with very adherent flakes of fibrin. Numerous ecchymotic spots along free border of small intestine. Appendix gangrenous, and sloughed off, feces escaping from stump into abdomen. It was ligatured and removed. Evisceration was performed, but efforts to remove fibrin by sponging were only partially successful, owing to adhesion. Thorough irrigation of abdomen with salt solution. Operation, which lasted forty minutes, owing perhaps to too vigorous and prolonged efforts to remove adherent fibrin, was attended by marked shock, and the final steps had to be taken very hurriedly. An ounce of saturated solution of Epsom salts was injected into the bowel, the pelvis drained by a glass tube and gauze, and the subhepatic space by rubber tubes and gauze. Salt solution left in abdominal cavity, free stimulation with brandy, strychnia and digitalis and the subcutaneous injection of salt solution, one and one-half pints, seemed to strengthen the pulse somewhat, but the improvement was not maintained, and the patient died of shock five hours after the operation.

CASE V. March 13, 1898. E. M. W., a girl of nine years, was operated upon. Four days before she was seized with abdominal pain. Vomiting for three days, with distention of abdomen. Bowels moved on second day of attack by cathartics. On entrance the pulse was 130 and weak. Temperature 99.5°. General abdominal distention, tympanites and tenderness. An incision four inches long in right semilunar

line. Pus escaped from general cavity. No adhesions. Appendix was found perforated, and removed. Intestines covered with fibrin and presented ecchymotic spots. Evisceration, removal of fibrin by sponging. Irrigation of abdominal cavity, which contained numerous pus pockets, with salt solution. Injection of two ounces of saturated solution of Epsom salts into intestine. The cecum which was much distended was incised, and a rubber tube tied in and brought out of upper end of wound. A glass tube drained the pelvis, and gauze wicks the general cavity. The operation was attended with shock, but the patient rallied under free stimulation and rested quietly for six hours. She then woke suddenly, and pulled out the rubber tube before the nurse could restrain her. After that she failed rapidly and died about twenty hours after the operation.

CASE VI. A. W., female, five years old. Operation March 25, 1898. Sudden severe general abdominal pain five days ago. Vomiting for four days. On entrance, general tenderness and rigidity of abdomen. Pulse 150. Temperature 102°. Abdominal pain. Median incision six inches long. Intestines distended and congested, showing ecchymotic spots. Appendix gangrenous, distended to the size of an adult thumb, lying beneath the liver. Large amount of pus beneath liver, in pelvis and general abdominal cavity. Appendix removed. Evisceration, sponging of fibrin from intestine. The intestines had to be punctured in three places to allow escape of gas so that they could be returned to abdomen. Thorough irrigation with salt solution and injection of one ounce saturated solution of Epsom salts into bowel. Drainage of pelvis and subhepatic space with tubes and gauze.

Considerable shock ensued but patient rallied under free stimulation. The following day vomiting began and persisted; pulse grew rapid and weak and death ensued twenty-four hours after operation.

CASE VII. D. H., female, thirty-two years of age. Two days before operation sudden sharp general abdominal pain and distention. On examination, temperature 100°, pulse 101, of fairly good strength. Abdomen tender but not rigid. Tenderness slightly greater on right. During four hours pulse rose to 128 and temperature to 103°. Incision in right semilunar line allowed escape of pus from abdomen. Appendix found congested and adherent to right ovary, which was soft and friable. Right tube congested. Several ounces of pus in pelvis. Small intestine universally congested, and its lower portion covered with flakes of fibrin. Partial removal of small intestine from abdomen, removal of fibrin by sponging, and thorough irrigation of abdomen after excision of right tube and ovary. Drainage of pelvis with tube and gauze.

Operation was fairly well borne, but vomiting began on coming out of ether and continued until death ensued, sixty hours after operation.

CASE VIII. H. G. P., age twenty-two, single, entered the Boston City Hospital on May 18, 1897. Three days ago, during menstruation, was seized with sudden severe abdominal pain. No vomiting. Two days ago distention began to appear. Pain and tenderness not localized.

Examination showed general abdominal tenderness and marked distention. Temperature 101°. Pulse 132 and weak. Abdominal facies. Operation was advised and immediately performed.

A median incision below the pubes allowed escape of a little sero-purulent fluid. The small intestine was generally injected, and the coils in the lower abdomen were covered with delicate flakes of fibrin. Both tubes and ovaries were acutely inflamed and the pelvis contained a moderate amount of pus, which was not walled off by adhesions. The pelvis was sponged out with peroxide, and the lower abdomen thoroughly washed out with salt solution, the patient being lowered to the horizontal position.

The pelvis was thoroughly packed with sterile gauze, seven wicks being used, and the lower part of the incision being left wide open, the upper portion was closed with silkworm-gut sutures. Considerable shock followed the operation but the patient rallied. The bowels moved under small doses of calomel on the second day. On the fourth day the wicks were removed under chloroform anesthesia.

Recovery uneventful. Discharged well on June 18th. A culture was taken by a swab from this case, but no growth resulted.

The swab was, however, taken hurriedly, touched merely to the upper surface of the omentum in the upper part of the wound, so that I do not think it is evidence that no organisms were present in the pelvis, which was certainly the seat of an acute inflammation, with pus and fibrin, extending up into the general cavity and not walled off by adhesions.

CASE IX. G. F. R., age thirteen, mulatto, entered May 27, 1898. Sudden severe abdominal pain one week ago, with diarrhea. Some improvement, followed by relapse the day before entrance, attended with abdominal distention and constipation. Rapid prostration.

Examination: Tongue coated. Abdomen generally distended and very tender. Respiration rapid and shallow. Pulse so weak that it cannot be felt at wrist, 180 to 200. Extremities cold, and body covered with perspiration. Although the patient seemed moribund it was thought best not to deprive him of any possible chance which might be held out by draining the abdomen. His condition contraindicating ether, the usual oblique incision three to four inches in length was made in the right inguinal region under cocaine, one-tenth per cent. An enormous quantity of thin purulent fluid escaped, and more was washed out by thorough irrigation with hot salt solution. Glass tubes were inserted into pelvis and subhepatic space. The patient's condition precluded any further measures than washing of the abdomen, and was apparently made no worse by the operation. After it he rallied slightly under active stimulation but soon sank and died about eighteen hours after entrance.

CASE X. N. W., domestic, age twenty-two, single, entered the hospital on August 31, 1898; she had been treated on the medical side at the same institution for pleurisy in October, 1897. She had a slight cough at entrance but otherwise her general health was good. Twenty-four hours before entrance she had been seized with sharp pain in the right iliac fossa, attended by vomiting and prostration. On examination she was seen to be well nourished, fair complexion with clear transparent skin, temperature 104°, pulse 130. Marked tenderness and muscular spasm on pressure in right iliac region. Tenderness over pubis and slight in left iliac region. Lips bluish in color, tongue dry with a thin, white coat.

Immediate operation, by incision in the right iliac

fossa, disclosed pus free in the abdominal cavity. No adhesions. The appendix was found perforated at the base, and was removed. Numerous small, hard tubercles were found on the pelvic walls, broad ligament and mesentery of the small intestine. The whole abdominal cavity was washed out with salt solution, a large amount of pus escaping from the pelvis and from the right hepatic region. Drainage of subhepatic space by gauze strip, and of pelvis by gauze and glass tube.

The pulse and temperature fell rapidly, reaching the normal line on the third day. There was no vomiting after the operation, and the patient is now, one week after the operation, considered out of danger.

The culture of the pus examined by Dr. R. M. Pierce showed numerous micro-organisms, the streptococcus and bacillus coli communis being prominent.

The case is of interest both on account of the virulence of the micro-organisms present, in particular the streptococcus, and on account of the supervention of an acute attack of appendicitis, with general infection of the peritoneal cavity, upon a previous, but not far advanced, tubercular peritonitis.

The operation of evisceration, sponging the bowels free of fibrin, thorough irrigation and sponging when necessary of the abdominal cavity, which must often be supplemented by incision of the intestines in order to allow escape of feces and flatus in order to permit their return, sounds like a formidable one, especially for patients weakened by a general peritonitis. Yet when we are confronted by the fact that without a thorough primary disinfection and drainage we cannot hope for recovery, it seems worth while to perform it even at the risk of shock. With moderate practice, the operation can be done in thirty minutes or a little more. The one step of the operation which is attended with most shock seems to be the attempts to remove adherent fibrin from the bowel. When the fibrin is firmly adherent it seems best, in the light of present experience, not to make too prolonged attempts to remove it. In one of these seven cases that died directly of shock within five hours of the operation the operation was I think unduly prolonged by attempts to sponge fibrin from the bowels. When it is only lightly adherent, it may be easily and quickly removed. Where there is purulent or sero-purulent fluid in the abdominal cavity, but no fibrin adherent to the intestines, it is not necessary to eviscerate.

The other fatal cases lived respectively, twenty, twenty-four and sixty hours, four days and eighteen hours.

In Case II, the girl who died four days after the operation, marked improvement immediately followed the operation. Death ensued upon paralysis of the bowel, and I shall always regret that a saturated solution of Epsom salts was not injected into the intestine.

This procedure, introduced by McCosh, of injection of saturated solution of Epsom salts into the bowel, was tried in four cases, and one recovered. The convalescence of this boy was most excellent, and seemed to me to be favorably influenced by the early movement of the bowels which ensued.

A brief consideration emphasizes the necessity of early recognition of the cases. Case I, which recovered, had general peritonitis for forty-eight hours after the first attack of pain. Three of the four cases which recovered presented in some respects the least advanced picture of the disease, the fourth was certainly

an advanced case. Several of the fatal cases showed most severe extensive and intractable processes four and five days after the first attack of pain. The fact that seven out of these ten cases occurred in children is of interest. It is possible that the early diagnosis of general peritonitis is made less often in children than in adults.

In these cases, and other operations for general peritonitis which have come under the writer's observation, those in which ecchymotic spots were noted on the intestine, the hemorrhagic cases, have been uniformly fatal. An occasional success in this otherwise uniformly fatal disease is sufficient indication for operation in all except absolutely moribund cases.

The complication of a fresh acute general peritonitis, in which the streptococcus was found, with an old tubercular peritonitis in Case X is of interest.

A CASE OF GENERAL PERITONITIS; OPERATION, RECOVERY.

BY WILLIAM T. SMITH, M.D., HANOVER, N. H.

CASES of recovery after operation for perforating appendicitis when general peritonitis has already set in are well attested. But they are rare. My own experience with such cases has been so discouraging that when the symptoms of general peritonitis are distinct I have come to expect a fatal result, though I always advise operation to give the patient what chance there may be. I have had recently such a case in a farmhouse in which the patient recovered and I wish to record it.

A farmer, forty-five years of age, in good health and with no history of previous attacks was taken with appendicitis on Wednesday afternoon. After a night of severe pain he sent for the doctor Thursday morning. The usual symptoms existed, pain, at first diffused, later locating itself at McBurney's point; temperature 99° to 100°; pulse 80 to 90 and obstinate constipation. No vomiting. No tympanites on Thursday. Thursday night pain was intense. Friday morning when I was called it had ceased. The belly was tense and tympanitic up to the ensiform cartilage. Temperature 101°. Pulse 134 to 144. Countenance drawn and anxious. I advised immediate operation but gave no encouragement to the friends. On opening the abdomen a sero-purulent fluid oozed out. I found the appendix curled up and adherent at the margin of the pelvis. The adhesions were recent and I separated them freely as there was no indication of any walling in of the locality, and removed a swollen and angry appendix; its lumen obstructed near the base by concretions and an ugly gangrenous perforation beyond. Puncturing the colon in two places to let out the gas, I drew out several feet of small intestine which was inflamed and had many patches of membranous exudate on it. With a one-half of one-per-cent solution of formalin I washed the gut and rubbed off the patches of exudate with a sponge. The gut was then returned, the puncture in the colon being closed by fine silk through the serous coat. Lacking a proper irrigator the blind end of an eight-inch test-tube was broken off and the other end inserted in the abdomen and through this tube irrigation was done with a one-half of one-per-cent solution of formalin. An iodoform gauze wick was carried down to the stump of appendix. A single stitch of silkworm-gut through the whole thickness of