tain from one to two and a half per cent. Transudates do not coagulate spontaneously; in exudates a coagulum is frequently observed after standing for twenty-four hours.

Microscopically the transudate shows only a few isolated leucocytes and endothelial cells derived from serous surfaces and undergoing fatty degeneration. Exudates contain many more formed elements and may be serous, sero-fibrinous, sero-purulent, purulent, putrid, hemorrhagic, chylous, or chyloid.

Following the administration of potassium iodide it is possible to obtain the iodine reaction in ascitic fluids.

Etiology.—Atrophic cirrhosis of the liver is the most common cause of ascites. It is less commonly found in the hypertrophic form. The frequency of ascites in diseases of the heart and kidneys is illustrated by the statistics of 300 cases of general dropsy, as revealed after death, taken consecutively from the post-mortem books of St. George's Hospital, London, from 1888 to 1897. One hundred and sixty-three of these were due to affections of the heart or aorta. As regards ascites, 1 in 2.5 of the cardiac cases and 1 in 2.2 of the renal (not lardaceous) cases presented this condition. Any of the organic heart lesions when incompensated may be followed by ascites. It is most frequently associated with mitral stenosis. The pleuræ and peritoneum are especially liable to dropsical invasion with the large white kidney of nephritis and the advanced granular kidney in which secondary cardiac changes have been added to the renal. Diseases of the lungs, such as emphysema and fibroid changes, may cause ascites by obliterating pulmonary vessels. This results in an increase of pressure in the right heart, and secondarily in the veins and capillaries, with transudation.

Diagnosis.—*Inspection.*—In ascites of moderate degree with the patient lying down, the abdomen is full at the sides and flat on top; in the upright position it projects below the navel. If the ascites is enormous there is a uniform distention and no change of shape with change of position. The superficial abdominal veins become enlarged in cases of long standing. In cirrhosis of the liver the veins surrounding the umbilicus may become very prominent and form the caput medusæ. When the amount of fluid is excessive there is a marked hernial protrusion of the navel.

Palpation.—Fluctuation is obtained by placing one hand flat upon one side of the abdomen, and tapping gently on the opposite side with the other, as in direct percussion. A similar sensation may be felt, however, if the abdomen be very fat or tympanitic. In order to exclude this pseudo-fluctuation, an assistant presses the edge of his hand along the linea alba; this manœuvre does not interfere with the transmission of the wave in ascites, but effectually interrupts it in the other conditions mentioned.

Percussion.—In the horizontal position there is dulness at the sides, and tympany over the upper and middle portions of the abdomen. The fluid seeks the dependent parts and the intestines float to the top so far as the mesentery will permit. The area of dulness changes with the position of the patient. On assuming the side position, dulness is obtained over the lower side and tympany over the upper. If the ascites is enormous, the intestines and stomach do not reach the surface, consequently there is dulness over the entire abdomen. The amount of fluid necessary for demonstration varies with the size and sex of the patient.

Toma's sign has been employed to distinguish between an exudate and a transudate, or inflammatory and non-inflammatory conditions. In inflammatory conditions of the peritoneum the mesentery contracts, drawing the intestines over to the right side. As a result, the patient assuming a horizontal position, tympany is elicited over the right side and dulness over the left.

Exploratory puncture is the crucial test, and should always be employed before operation.

Differential Diagnosis.—The ascites of heart disease is associated with a dusky skin, while that of Bright's disease is associated with a pale skin. Diseases of the heart, lungs, kidneys, and blood should be excluded by careful examination. A satisfactory examination of the abdomen by palpation can be made only after the withdrawal of the fluid. Palpation is then very easy on account of the relaxed abdominal muscles. An enlarged liver or spleen, growths on the liver or in the neighborhood of the portal vein can then be easily felt. At times the nodules of tuberculous or carcinomatous peritonitis can be made out. If primary cancer or tuberculosis is found in other parts, the problem is simplified. The great value of microscopical examination of the fluid, as a material aid in differential diagnosis, should be strongly emphasized. The fluid should be centrifugated, the sediment spread on cover slips, dried in the air, fixed in absolute alcohol and ether, then stained with hæmatoxylin. Quincke, Rieder, Dock, and Warthin have found in exudates cells which seem peculiar to cancer and sarcoma of serous membranes. Rieder found cells undergoing division, their nuclei presenting numerous karyokinetic figures, especially asymmetrical division forms, which are found to a slight degree or not at all in endothelial cells. Dock found in cancerous effusions more cells showing mitoses than in simple or tuberculous inflammations. Warthin concludes from his investigations that the presence of numerous cell-division forms in the cells of the sediment of serous exudates may be taken as strong, perhaps conclusive, evidence that the effusion is due to the presence of a new growth, inasmuch as mitoses are but rarely found in cells of purely inflammatory exudates. Quincke claims that carcinoma probably exists if a marked glycogen reaction can be obtained in the endothelial cells. Endothelial cells are sometimes mistaken for the so-called cancer cells. Quincke states that the diagnosis should be made only when large epithelial cells of variable form, measuring at times 120 μ in diameter, are found in large numbers, especially when arranged in groups, unless indeed cancerous nodules presenting the characteristic alveolar structure are found. Hemorrhagic exudates are as a rule tuberculous or cancerous. The fluid should be centrifugated, spreads made and stained for tubercle bacilli; though these are rarely found even in undoubted cases of tuberculosis of the peritoneum. A guinea-pig should be inoculated with the sediment, since even when the bacilli are not found the pig often develops tuberculosis. The diazo reaction is occasionally present in the urine of tuberculous and cancerous peritonitis, but does not help in differentiating one from the other, as it has been found in both.

The quantity of fluid varies greatly with the disease, but is usually largest in atrophic cirrhosis of the liver and in perihepatitis chronica. W. Hale White reports the case of a patient with perihepatitis who was tapped thirty-five times; the total amount of fluid withdrawn was seven hundred and ninety pints; the largest quantity taken out at one time was thirty-one and a half pints. Pütz's case of atrophic cirrhosis of the liver was tapped forty-seven times, with the removal of twelve hundred litres of fluid, during a sickness of four years' duration.

Prognosis.—The majority of the patients die within two years. Some cases associated with incompensated heart lesions recover under cardiac treatment and live for many years. Occasionally a case of cirrhosis of the liver recovers, if a sufficient collateral circulation is established. Numerous recoveries have been reported in cases of tuberculous peritonitis with ascites, treated by laparotomy. Many theories have been advanced to explain the cause of recovery in these cases. There are tuberculous diseases of the peritoneum which heal spontaneously. Hildebrandt believes that laparotomy only increases the natural healing factors. This author believes that the venous hyperæmia which ensues is the important factor in the healing of tuberculous peritonitis. Following operation he has observed an involution of the tuberculous process, and in isolated cases a complete healing with disappearance of the tubercles which he had seen in the first laparotomy (*Münchener med. Wochenschrift*, 1898, Nos. 51 and 52).

Treatment.—The ascites, if troublesome, should be relieved immediately, and treatment directed to the causative disease instituted if advisable. The first is most successfully accomplished by the simple surgical procedure of tapping. This operation is strikingly free from the danger of infecting the peritoneum. Flint refers to a patient who frequently tapped himself with a jack-knife and used a clay pipe stem for a cannula.

Aspiration, or the introduction of Southey's tubes, may be resorted to.

If the diagnosis of tuberculous peritonitis seems probable, then laparotomy should be performed. The fluid may collect so rapidly that it is necessary to tap every fortnight or oftener, but frequent tappings do no harm. In ascites due to heart disease and anæmia, treatment appropriate to these diseases should be given. The use of diuretics and hydragogue cathartics is usually unsatisfactory. The value of the dehydrating effect of dry diet should be emphasized. Care should be taken in selecting appropriate cases, since it is well borne in cardiac dropsy and poorly borne in renal dropsy.

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ASCLEPIADACEÆ.—(*Milkweed Family.*) This immense family, of more than two hundred genera and fifteen hundred species, is an exceedingly difficult one for botanists. There is probably no other family the relations of whose members are so poorly known, so that any present system of classification must be regarded as very arbitrary. Nevertheless, the composition and properties of its members are singularly uniform. Its plants, with few exceptions, abound in a milky juice which possesses acrid, narcotic, and nauseating properties, so that a great many of them have been used as nauseating expectorants, alteratives, and mild counterirritants. The glucoside *asclepiadin* occurs frequently in this juice, as do many other glucosides. The only plants which have been much used in professional medicine are several species of *Asclepias* (see *Pleurisy Root*) and *Condurango*. Many are, however, used in native and domestic practice. In India especially, a large number of species have been used, the principal of which are described by Dymock and Hooper in the "Pharmacographia Indica" as follows: *Cryptostegia grandiflora* Br., which is poisonous and yields a rubber. *Calotropis gigantea* R. Br. and *C. procera* R. Br., which are irritant purgatives; *Tylophora asthmatica* W., and A. which is a nauseating expectorant; *Demia extensa* Br.; *Dregea volubilis* Benth.; *Hemidesmus Indicus* Br., the root of which is a much-used and powerful diuretic; *Cosmostigma racemosum* Wight.; *Gymnema sylvestre* Br. and many others less well known.

H. H. Rusby.

ASEPSIS, SURGICAL.—That wound infection and suppuration are the result of the presence of vegetable micro-organisms is no longer a theory but a fact proven by experimental research and clinical experience. While no one will deny that wounds may, under certain conditions, heal kindly without the use of any precautions to prevent the entrance of minute living organisms, such result obtains with great rarity, and not in consequence of a lack of these precautions but despite such negligence. The almost complete disappearance of hospital gangrene, the greatly diminished frequency of other forms of wound infection, the very low mortality rate, the safety with which the abdominal and cranial cavities are invaded at the present time, render unassailable evidence of the value of surgical asepsis. The term asepsis now indicates an absence of germs in a wound. Unfortunately, we are as yet unable to obtain a condition of absolute asepsis. There is perhaps in every wound some form of organism present, but by proper application of the means now at hand, aided by the resistance in the tissues, we are enabled, in a large percentage of wounds, to obtain healing without inflammation or suppuration. In the development of our present methods of asepsis, Lister stands out as the pioneer, and although his idea that air infection was very dangerous has been proven fallacious and the spray has fallen into disuse, the present technique is the direct outcome of his teaching. Other investigators have added to our knowledge during the time that has elapsed since his writings, and the present technique is the result. The object in wound treatment is to prevent anything coming into contact with the wound surface which can convey infection, and to limit the number and the virulence of bacteria whose entrance cannot be prevented. To accomplish this end requires unremitting care and attention to detail as well as a thorough appreciation of the dangers resulting from the slightest oversight. The more cleanly a surgeon is in his daily life, the more easily can he form habits of surgical cleanliness. Many surgeons obtain poor results because of an imperfect technique and fail to perceive such imperfection. Only by a careful investigation of poor results can the evil be remedied. The young surgeon educated to-day under the influence of the present teaching more readily learns and practises aseptic surgery than one who was taught and practised under the old régime. The infectious agents are bacteria of different forms which exist in the air, the soil, and the clothing, upon the skin and mucous membranes of the healthy body, in the beard and hair, and especially under the nails. The number of bacteria in the air is inconsiderable compared to the number found in the other places mentioned. The infection occurs as a rule by contact with a broken surface. If the chances of contact infection are excluded, air infection becomes of little moment. This can be almost entirely eliminated by care to prevent dust being raised in a room. No sweeping, brushing, taking down of curtains, opening windows or doors on opposite sides of a room should be allowed just before an operation. A moist cloth can remove dust and dirt with the least possible disturbance. Bacteria can scarcely leave a moist surface and pass into the air.

There is some tendency at the present time again to attribute greater importance to air infection, as certain investigators have obtained virulent cultures of the pyogenic bacteria from the air of hospitals. The methods of handling dressings and wound discharges will determine, to a large extent, the number of bacteria which reach the air. It is important, therefore, to destroy all wound dressings and not allow them to lie about in a dry condition. That flies and other insects can be the medium of transportation is well established, and while perhaps not a frequent means of infection yet it is well to exclude them from hospitals, for this reason as well as for the comfort of the patients, by the use of screens. The most frequent source of wound infection is the hands of the surgeon and his assistants. This can be readily appreciated when we consider the great fre-

quency with which the surgeons and their helpers are called upon to handle cases in which bacteria are present in countless numbers, all possessing some degree of virulence. In the language of Keith, "It is the willing and tender though unclean hand" which conveys the infection. Therefore the fewer and better trained the assistants, the better the results obtained. If the chain of careful technique is broken by any of these, the result will be infection with its consequent inflammation, suppuration, and sepsis.

The very greatest care cannot prevent the occurrence of an occasional contamination of the wound surface. But in direct proportion to the care exercised will the danger of infection be lessened. Every surgeon should assume the right to inspect the hands and nails of his assistants and accept or reject them, for he alone is responsible for the outcome of the case. No mere washing for one minute in this and for one minute in the other solution will render the hands sterile. Rubber gloves or finger cots sterilized for each case will prove very useful in handling septic cases with the least chance for contamination. Those working in the deadhouse or in putrefying materials should not perform or assist at surgical operations.

All who handle wounds should keep the idea of asepsis always before them and should carefully avoid needless contamination of their hands. In dressing wounds which are suppurating or are infected contact should be avoided as much as possible. From fifteen to thirty minutes' careful scrubbing with soap, water, and freshly sterilized brush are necessary for the mechanical cleansing of the hands. The water either should be running or should be changed frequently during this process. The soap should be carefully selected and germ free. Ordinary green soap is very frequently used for this purpose. A cheap brush of vegetable fibre can be obtained which has the advantage of not being injured by boiling. Each person engaged in the operation should have an individual brush for his final scrubbing. The nails should be kept short and all visible dirt should be removed by a sterilized scraper after a primary washing and before the final scrubbing which should extend above the elbows. Such mechanical cleansing is the first step in all plans of sterilization of the hands. In hospitals the final cleansing of the hands is preceded by a complete change of the clothing, the operator and assistants removing the outer clothing and donning a white sterilized suit and cap. Some operators go so far as to change the shoes as well. In private practice such a change is not often possible, therefore the coat, vest, collar, and tie are removed and a large sterilized apron is used to cover the clothing to within a few inches of the feet. In such way the object desired can be accomplished. If the apron and clothing beneath become saturated with water, care must be used to prevent such spot coming into contact with the wound, hands of surgeon, or anything which will touch the wound.

A number of investigators have made bacteriological tests of the efficiency of different methods for the preparations of the hands. In 1885 Kümmel made a number of experiments to determine the value of different antiseptic solutions, such as boric acid, thymol, carbolic acid, and corrosive sublimate. After rinsing the hands in soap and water, and immersing in one of the above solutions, he drew his finger tips over the surface of a sterile nutrient gelatin. He found the colonies least abundant when five per cent. carbolic or 1 to 1,000 bichloride of mercury was used. He concluded that primary importance should be attached to the mechanical cleansing, while chemical agents were of secondary importance. Förster about the same time obtained the same results. Fürbringer in 1888 showed that a sterile culture resulting after such a test by no means indicated that the fingers were sterile, for scrapings from beneath the nails of such fingers would, when thrown on gelatin, produce an excessive growth of bacteria. This result was obtained even after the utmost care in cleansing and scraping this part prior to the disinfection. He was led to believe that the grease adherent to the skin protected the germs from the action of the chemicals. Acting on this idea he used a strong solution of alkali, which proving inadequate he abandoned for ether. This was not satisfactory owing to its rapid evaporation. Alcohol was found to have the solvent property of ether without the rapid evaporation. His method was as follows:

1. Thorough cleansing of subungual space.
2. Scrubbing the hands for one minute with water and soap.
3. Scrubbing hands with sterile brush in eighty or ninety-five per cent. alcohol for one minute.
4. Rinsing in three per cent. carbolic or three-tenths of one per cent. of bichloride solution.

He did not claim germicidal action for the alcohol. The more recent investigations show that the tests with alcohol give as good results without the fourth step as when the germicides are used. The great objection to bichloride of mercury is the cracking of the hands which follows its use. Some operators, notably Kelly and others, use the solution of potassium permanganate and oxalic acid (Schatz' method) in addition to the mechanical cleansing mentioned before; others use turpentine, and still others use sterilized ground mustard in their technique. Less depends upon plans used than upon the thoroughness with which the preparation is accomplished. The method most in vogue is some modification of Fürbringer's with the use of a longer time for the preparation than his instructions would indicate. First scrub the hands and arms to elbows with soap and water, after cleansing nails thoroughly until no dirt is visible. Then scrub thoroughly the hands, arms, and crevices about the nails in a basin of alcohol for at least five minutes. This, with or without the use of bichloride of mercury, will give the best results and has the advantage of being very simple and easy of application. After this preparation has been completed, the greatest care should be exercised to keep from touching anything which is not sterile. That almost irresistible desire to scratch the nose or to adjust spectacles must be controlled.

Mikulicz advised the use of sterile cotton gloves to protect against infection from the hands. As might be expected, this was not successful owing to the facility with which fluids passed to and from the hands carrying microbes through the gloves. More recently thin rubber gloves and fingers cots have been introduced to provide a sterile finger and hand. These are not injured by boiling or by steam, therefore can be made perfectly sterile, and will undoubtedly have a large field of usefulness. The chief objection that can be offered to rubber gloves is that they interfere to a greater or less extent with the manipulations. Some surgeons, however, become quite expert in their use and claim that the tactile sense is not perceptibly lessened. The finger cots allow greater freedom to the hands but do not cover them sufficiently and if not snug may be left in the wound. This might prove troublesome in operations in the abdomen and other cavities. Sterile glycerin or sterile talc will aid in putting the gloves on the hand. The cleansing process must be just as thorough as when operating without the gloves. Dr. A. C. Wiener, of Chicago, has suggested the use of celluloid dissolved in acetone as a substitute for collodion. Enough celluloid is dissolved in the proper amount of acetone to produce a thin syrupy liquid. For holding small dressings in place, sealing wounds and abrasions of the hands before operation, and like purposes, it appears to be superior to collodion, as it adheres much more tenaciously.

Dr. James B. Bullitt, of Louisville, Ky, has proposed the possibility of eliminating the finger nail and crevice as a factor in wound infection by sealing up the nails by means of this preparation. He has found that if a thin solution be first applied to the nail and the contiguous skin and then, after this has dried, in a few minutes a further coat, or coats, of a thicker solution of the consistence of cream be applied, that the nails can be completely sealed. If a half-hour's time be then given for drying and hardening it will be found that the hands can be thoroughly washed, scrubbed with a brush, and subjected to all of the usual preparations for a surgical operation without the celluloid loosening its hold. In using this material for such purpose, it is recommended that the hands and nails be thoroughly washed and prepared just as is usual for operation, and that the celluloid be then applied, after which it is desirable to permit a half-hour to elapse before the hands are again placed in water. Sealing the nails in this way leaves the tactile sense of the fingers unimpaired, an objection offered by many operators to the use of gloves, whether of rubber or of cotton fabric. Bacteriological investigation upon this point will be of interest, and if the method achieves the object desired it will prove quite an adjuvant to our present technique.

The Patient.—It is undoubtedly a fact that the condition of the patient is often responsible for a wound infection. It has been proven that bacteria can and do exist in the blood of apparently healthy individuals, only becoming localized after a trauma, and in other cases the resistance of the tissues is below par; therefore, when time is allowed, the patient should be placed on tonics and nutritious food. The kidneys, skin, and intestines should be rendered active. In this way the bacteria present are eliminated and the resistance of the tissues to infections is increased. A number of warm or Turkish baths should, whenever practicable, be given prior to operation. One warm bath should be insisted upon in all cases in which it does not endanger the patient. A bichloride of mercury bath will render the bacteria on the surface less active, but is irritating to sensitive skins. On the afternoon before an operation is to be performed the field should be shaved and thoroughly cleansed with soap, water, and brush. This should extend some distance away from the point of incision. The scrubbing should be done gently when over a suppurating lesion in the abdomen, to prevent rupture. After rinsing with plain sterilized water a bichloride scrubbing should be added, then the part should be covered with a thin layer of green soap, and over this a thick fold of gauze, or in lieu of this a gauze compress saturated with bichloride of mercury solution, 1 to 2,000, should be laid.

Sensitive skins are sometimes blistered if either of these applications is left on too long. Especial attention must be given to the axilla, the umbilicus, the pubes, and also the scalp. The preparation of mucous surfaces will of necessity be more or less imperfect. The object is to promote the highest degree of asepsis possible with the least injury to the mucous membrane, for the intact membrane will resist infections much better than one which has been damaged. The eye cannot be scrubbed and cannot stand any strong germicides to promote asepsis. Moreover, the normal secretions in this part seem to have some antiseptic action. The integumentary surfaces of the lids and brows should receive a thorough scrubbing with soap and water. The conjunctival sac should be irrigated thoroughly with a saturated solution of boric acid or Thiersch's solution. If the conjunctiva or the tear sac is infected, no operations upon the eye should be undertaken except those of emergency. The results will certainly justify waiting until the process subsides under proper treatment. The nose can be cleansed only by the use of the spray or douche and some of the simpler antiseptic solutions, of which an ordinary saline is one of the best. Dobell's solution is also very popular. Prior to operations about the mouth it is advisable to have a dentist care for the teeth in order that the chance of infection will be diminished. Before an operation the teeth should be thoroughly scrubbed with brush and tooth wash or powder. The mouth should then be washed out with tincture of myrrh, peroxide of hydrogen, or bichloride of mercury solution, and subsequently rinsed with plain sterilized water. The anus and rectum can be cleansed by means of two or more scrubbings of external parts followed by plain enemata prior to the operation. And when the patient is anæsthetized, the bowel can be thoroughly scrubbed with soap and water and flushed with a weak solution of corrosive sublimate followed by one of plain boiled water. The same plan can be followed with the vagina, using a small nail brush, a jeweller's brush (Gerster), or a small piece of gauze on forceps to reach the upper part. About five days prior to a trachelorrhaphy, after cleansing the vagina, the cavity of the uterus should be curetted and cleansed by flushing with carbolic or bichloride solution and plain water. Many operators advise the same step before a hysterectomy, but it is not generally considered necessary. The *room* should be light and well ventilated, devoid of curtains or superfluous furniture. The temperature should be about 75° F. It should be so arranged that cleaning can be easily accomplished by means of a mop and wet cloths without impregnating the air with dust. When operating in private houses the furniture, carpets, and curtains must not be disturbed at the time of the operation. The utensils should be glass, porcelain-lined, or granite ware which can readily be rendered clean and sterile by hot water. Hard rubber makes the best portable trays, owing to its light weight. The tables and other furniture for the operating room should be of the simplest kind, and those made of iron and enamelled, with or without glass tops, are the best. Where these cannot be obtained a plain table made of hard wood will answer every purpose. They must be kept scrupulously clean. All basins, pitchers, etc., which will be used should be well scoured and boiled or scalded just prior to use. Sheets and blankets should be sterilized and the patient should be well covered except at the site of operation. The towels must be sterilized and kept tightly wrapped until ready for use. These materials may be sterilized in the same way that gauze and dressings are prepared.

Sponges.—The best silk sponges are expensive so that resterilization would be necessary, and this is more or less unreliable. Boiling unfortunately hardens the sponges and destroys their usefulness. This has rendered their thorough sterilization somewhat difficult. Very good sponges can be obtained for about two dollars and a half per pound, and these can be thrown away after an operation. Many methods of preparing sea sponges have been proposed. The following (Schimmelbusch) is useful and very simple: The sponges are beaten, washed, and kneaded repeatedly in cold and warm water until the dirt, shells, and other foreign matter are entirely removed. They are then pressed together, surrounded by gauze, and put into a one-per-cent. solution of soda, just removed, while boiling, from the fire. They are kept in this solution for half an hour. The soda is then washed away with boiled water and the sponges are stored in a tight jar and covered with a solution of bichloride of mercury (1 to 2,000).

Still another method of sterilizing sea sponges is the following: After the usual beating and rinsing to free from dirt and lime, they should be immersed in a solution of muriatic acid, ʒ ij. to O i, for twenty-four hours. They should next be soaked in a saturated solution of permanganate of potassium, and then decolorized in a hot saturated solution of oxalic acid. The latter is removed by passing the sponges through lime water. When washed in plain sterilized water they are placed in a solution of bichloride of mercury (1 to 1,000) for twenty-four hours and are kept in three-per-cent. solution of carbolic acid until needed. In the latter steps of preparation the sponges should be handled by means of sterilized rubber gloves and sterile forceps. The difficulty of sterilization and the cost are objections to sea sponges, and while the advantages of a good sponge are apparent, its place is being largely taken by pads of absorbent gauze and mops or wipers made of cotton covered by gauze (Tupfers). These can easily be made by squares of gauze with diagonal corners tied together and enclosing a small pledget of cotton. When desired they can be made of very small size for use in cavities. They are easily sterilized by steam and are very convenient