SURGICAL DRESSINGS.*

BY ELMER H. HESSLER.

Surgical dressings had their birth at the time when Lister gave to the world his discovery of antisepsis. The era of Listerism completely revolutionized the method of treating wounds and the practice of surgery. The pharmacist has always been called upon to furnish the surgeon with the proper material for practicing his profession and, naturally, the pharmacist was also called upon to furnish materials required when this revolution in surgical treatment took place. Since the time of Lister, rapid strides have been made in the practical carrying out of his theory both in the technic and materials employed. Pharmacists, as a rule, have not bothered themselves about the actual preparation of the items used. Perhaps it would have been better for them, both from a professional and a business standpoint, if they had. On account of the failure of pharmacists to prepare these surgical materials and also, perhaps, on account of the inability to manufacture economically in a small way, the manufacture of surgical dressings has been developed almost entirely by the larger manufacturers.

The raw materials employed in the manufacture of surgical dressings are numerous. The most common materials used are cotton, paper, felt, wool, lint, oakum, linen, silk, rubber and paraffin.

There must be certain standards for these items, and there have been numerous attempts made at standardizing raw materials for surgical dressings. The United States Pharmacopoeia, Ninth Decennial Revision, has specified the standard of purity for absorbent cotton. The description of purified cotton in the U. S. P. is as follows:—"X X occurs as white, soft fine filaments, appearing under the microscope as hollow, flattened and twisted bands, spirally striate, with slightly thickened edges, inodorous and almost tasteless, insoluble in ordinary solvents but soluble in an ammonia solution of cupric oxide." A limit of 0.2% of ash is established, as well as a limit for alkali or acid, fatty matter, resins and soap. In other words, the Pharmacopoeial standard describes pure cellulose fiber derived from the *Gossypium* genus. This is the ideal requirement for surgical purposes, and cotton that does not meet these requirements is not satisfactory for all purposes. There are cases, however, when non-absorbent cotton is used for certain purposes but in such cases this variety is definitely specified. Cotton is the basis of a large number of surgical dressings; among these are surgical gauze, the facing for plasters, tampons, towels, bandages, sanitary napkins, etc.

Surgical gauze is woven in practically the same manner as any other cotton cloth, only that specially selected yarns are used in the process, and that in the process of finishing, the cloth is purified by acid and alkali treatment, bleaching and final extraction of all foreign matter so as to leave the finished product in very much the same chemical condition as absorbent cotton. A number of standards have been suggested taking advantage of both the physical and chemical properties of the gauze. The physical properties which serve as a basis for standardization are the microscopical appearance, the weight per square foot, the number of threads per square inch, the number of times its own weight of water it

* Read before Section on Practical Pharmacy and Dispensing, A. Ph. A., City of Washington meeting, 1920.

will absorb and the length of time necessary to absorb a given weight of water. Color and general appearance are also considered. The chemical properties which serve as a basis of standardization are the limit of ash, the composition of the ash, and the composition of extractive obtained by various solvents. All surgical gauze should be free from any sizing or filler such as are used in ordinary textiles. Surgical gauze may be impregnated with certain medications and sold as such in convenient packages. The popular medications are phenol, corrosive sublimate, boric acid, picric acid, thymol iodide, double cyanide and chloramin T. The medications are made by saturating the gauze with a solution of the medicament in a proper solvent. The strength of the solution is so calculated as to leave the gauze impregnated with the desired percentage of medication. A complete description of the manufacture of gauze would be simply the story of manufacturing textiles of any kind and, in this paper, is not deemed necessary. The various grades of surgical gauze base their classification on the number of threads per square inch. The grades vary from 48 threads per inch lengthwise and 44 threads per inch crosswise to 20 threads per inch lengthwise to 12 threads per inch crosswise.

The most popular grades are:

48 x 44 threads to inch.
44 x 40 threads to inch.
32 x 28 threads to inch.
28 x 24 threads to inch.
24 x 20 threads to inch.
20 x 16 threads to inch.
20 x 12 threads to inch.

The higher grades of gauze are used largely in the manufacture of bandages and handkerchiefs, while those of more open mesh are used for surgical purposes. Recently, lace mesh made of cotton fiber has been impregnated with paraffin and used as a surgical dressing which is non-absorbent and non-adherent. This variety of surgical dressing has a distinct advantage, in acting as a drainage medium, and also permits the redressing of a wound without causing bleeding. Bandages are usually made from surgical gauze of the 48 x 44 or 44 x 40 threads to an inch. There are a number of styles of bandages, such as gauze bandages, muslin bandages, canton flannel bandages, black muslin bandages and triangular bandages. Gauze bandages have the widest application, but the other styles have a limited application for special work.

Paper which has been purified to an extreme degree has recently been introduced as a substitute for cotton, for absorbent purposes and also as a substitute for bandages. The substitution of this paper for cotton has been very successful where absorption alone is desired. The substitution of paper bandages for gauze bandages has not met with as much success on account of the inability to use them with moist dressings.

Felt is employed as a surgical dressing, in a very limited amount, for pads used in alleviating pressure.

Wool of a high degree of purity, usually lamb's wool, is used in making tampons, because it possesses the advantage of absorbing medications intended for local use.

Lint is a variety of cotton cloth, used to apply ointments or similar preparations to open wounds or irritated surfaces.

Linen is employed in the better grades of surgeons' towels and is an ideal material for this purpose.

Silk is employed for isinglass plasters, and also as a material for oiled silk. Oiled muslin is a cheap substitute for oiled silk. Oiled paper has also been recommended as a substitute for oiled silk although it is not as desirable a substitute as oiled muslin.

A description of surgical dressings would not be complete without calling attention to ligatures, splints and the various special dressings. Ligatures are made from a number of different materials—foremost being catgut, kangaroo tendons, horsehair, silk and silkwormgut. Allied with ligatures, although not strictly identical, would come umbilical tape, which is usually made of mercerized cloth of great tensile strength. Splints are usually made of wood, wire, or pressed metal. They do not strictly come under the head of surgical dressings, and should be classed with surgical instruments. Among the special dressings are—Umbilical Dressings, Burn Dressings, Finger Dressings, Packing Strips, Sanitary Napkins, Emergency Dressings, Bed Pads, Gauze Mops, Gauze Sponges, Gauze Pads, Gauze Handkerchiefs. All of these special dressings are made of surgical gauze—medicated or plain—combined with absorbent cotton and similar substances, and designed to meet the particular need for which the dressings are designated.

All the surgical dressings mentioned would be absolutely worthless, and it would be criminal to sell them, if they were not rendered sterile; chemical and physical standards would have little value if the dressings were not subjected to some form of sterilization. It is with the sterilization of the dressings that the surgeon is much more interested than in the chemical and physical standards. Sterilization may be carried on in a number of different ways, but the method mostly employed is sterilization for an extended period with superheated steam. The United States Pharmacopoeia, Ninth Decennial Revision, under the topic of sterilization, has the following note concerning surgical dressings.

"Cotton, bandages, gauze, ligatures, etc., may be rendered sterile by treatment with steam in a pressure apparatus (autoclave) at 115° C. for 15 minutes, or by exposure to dry heat in an ordinary air bath or sterilizer at the temperature of 160° to 170° C. for 2 hours. It should be remembered that all surgical materials are not amenable to such thorough treatment without more or less deterioration taking place. Bandages must be folded or packed in such a manner as to permit penetration of steam or dry heat during the process and should be so arranged that after the sterilization is complete all subsequent contamination with the bacteria will be prevented. This is usually accomplished by immediately enclosing them in glass containers or wrapping them in a number of thicknesses of previously sterilized parchment paper."

This is the usual procedure in sterilizing surgical dressings and all modifications are simply to take care of the chemical properties of the various chemical substances entering into the dressings. Such chemical substances as do not permit sterilization at the temperature designated may be sterilized by the application of moist air laden with the fumes of formaldehyde. Sterilizing in an autoclave is usually done by creating a partial vacuum and then admitting the superheated steam or the formaldehyde-laden moist air. This enables the sterilizing medium to penetrate to the very pores of the surgical dressing and render the sterilization thorough.

THE MCNEIL LABORATORIES, PHILADELPHIA.

ABSTRACT OF DISCUSSION.

Lyman F. Kebler referred to some investigations, not yet completed, on surgical dressings. D. F. Jones suggested the use of the Denver Steam Cooker as a sterilizer for small quantities of dressings, and J. Leon Lascoff stated that it was a very serviceable part of the drug store equipment.

DISINFECTION SOLUTION (SPECIAL APPLICATION).*

BY L. E. SAYRE AND F. A. PATTY.

During the fearful period of the influenza epidemic the almost terror-stricken inhabitants of nearly every community were asking the authorities connected with boards of health for protection from every possible source of infection. It is needless to say that these authorities, while doing their utmost, were groping in the dark to locate the source or sources of contagion. They centered their efforts upon processes of purification and disinfection in every imaginable place where a possibility of a spread of the disease was suspected. One of the places under suspicion was the soda fountain. It was reported that in not a few places there was carelessness displayed in washing soda water glasses. In Kansas, a ruling was made that glasses should be washed in water at or near the boiling point. Many of the enterprising pharmacists installed sterilization schemes such as running hot water; others used live steam; and still others installed expensive apparatus for complete sterilization. Of course, such methods could not be used in the majority of small places where soda trade did not warrant the expenditure. The result was that in many of the small towns, stores discontinued their fountain business.

Dr. S. J. Crumbine, secretary of the Board of Health, and F. E. Rowland, assistant chief of inspection, asked for the preparation of a solution, if possible, that would be a harmless but reliable disinfectant for washing soda glasses—a solution that would stand a fairly severe test and one that any ordinary druggist could make himself. The off-hand remark to these officials was that a sodium hypochlorite solution would most likely meet the requirements they had in mind, but they urged that they would be glad to have any statement verified and substituted by experimental data.

Laboratory experiments to cover the situation were accordingly designed and carried out. This was accomplished by first procuring cultures of three organisms, one a culture of *micrococcus aureus*, an organism which produces boils and abscesses and is found abundantly in the mouth and throat. It is relatively easy to kill. Another, a culture of typhoid bacillus, the bacteria causing typhoid fever; and last, a culture of *streptococcus pyogenes*, which causes sore throat and various skin eruptions. This organism is very resistant and difficult to kill with ordinary disinfectants.

Broth cultures of these organisms were prepared and incubated 24 hours at body heat to obtain a luxuriant growth, then poured into glasses, previously sterilized in an autoclave. The glasses were drained, one at a time, dipped into a disinfectant bath and removed immediately. Each glass was next rinsed with sterile broth and a portion of the broth streaked on agar and incubated at body

* Scientific Section, A. Ph. A., City of Washington meeting, 1920.