Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota

Preoperative Skin Sterilization

Volume XI | Friday, January 5, 1940 | Number 11

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Volume XI | Friday, January 5, 1940 | Number 11

INDEX

Published for the General Staff Meeting each week during the school year, October to May, inclusive.

Financed by the Citizens Aid Society

William A. O'Brien, M.D.

I. LAST WEEK

Date: December 15, 1939

Place: Recreation Room
Powell Hall

Time: 12:15 to 1:00 p.m.

Program: Movie: "Hockey Champ with Donald Duck"

Extravasation of Urine
B. A. Smith

Discussion
C. P. Creevy
L. H. Fowler
B. A. Smith

Present: 129

- - - -

Date: December 22, 1939 - Vacation

December 29, 1939 - Vacation

Gertrude Gunn
Record Librarian

- - -

II. MOVIE

Title: "Donald's Penguin"

Released by: R-K-O.

- - -

III. ANNOUNCEMENTS

1. BABIES

James Edward McLennan, weight 7 lb. Arrived December 29, 1939 at 11:30 a.m. His father, Charles E. McLennan, and his mother, the former Margaret Thomas, both graduated in medicine at the University of Minnesota. Both were "tops" in their class which should make this baby the top-ranking medic of the year. The entire Department of Obstetrics has quickened its pace and one would imagine they are feeling a certain amount of personal pride in the event. Dr. Robert Meyer has been officially named honorary grandfather while Head Obstetrician, John L. McKelvey, has voluntarily assumed the role of grandfather. The departmental uncles and aunts are sputtering around with the result that the entire west end of the hospital has assumed a gayer air. Congratulations!

2. OPEN HOUSE

Visitors are welcome to come and see the newly built addition to the child psychiatry unit. This is an extension beyond the large reception and play room which equals in size the original office space. The psychiatric chickens have all come home to roost and everyone seems to be breathing easier with all the new space. The decoration for the south wall has not yet been planned, and suggestions will be appreciated. The balance of the surface is covered by various friends of the children including Ferdinand, Snow White, and others.

3. WEDDING

Harry A. Cumming and Elizabeth Backus - married Friday, December 22, 1939. Congratulations!

4. NEW YEAR

There is a great deal in store for us during the coming months. Former professor Herbert A. Reimann, who occupies the chair of medicine at Jefferson, will be the special guest of the Hennepin County Medical Society on Monday, January 8, when he will deliver a lecture on "The Pneumonias" at 8:00 p.m. in the Society Headquarters on the 20th floor of the Medical Arts Building. Dr. Reimann's many friends will be glad to see him and much entertaining is planned during his stay. In addition to the many visitors who will serve on the faculty during the course in Hospital Administration, we are looking forward to the visit of Dr. MacKay who will be here for the course in Dietetics. Dr. MacKay is an old friend of many Minnesotans who have visited him in his clinic and laboratories at the Scripps Metabolic Clinic, La Jolla, Calif. During February we are expecting Dean Albert C. Furstenberg of Michigan, Chevalier Lawrence Jackson (the younger) of Philadelphia, Dean M. Lierle of Iowa, Philip E. Meltzer from Tufts, and George E. Shambaugh, Jr., from Rush. In addition Dr. Edith Potter will be here for the course in Newborn and Premature Care, and Dr. Edward D. Churchill of Boston, for the Surgery course in March.

IV. PREOPERATIVE SKIN STERILIZATION

Milan Novak

During the past 15 years, innumerable articles concerning the use of antiseptics in preoperative sterilization of skin have been published. This work is probably a direct result of the appearance of many new proprietary solutions purposing to kill bacteria on the skin. One can scarcely pick up a medical journal or magazine without seeing various claims for this or that antiseptic. Such literature has served to confuse not only the lay individual but also the physician as to the choice of solution for various germ-killing purposes. Furthermore, the activities of the different pharmaceutical houses in exploiting their products, often with the help of uncritical or disingenuous medical investigators, have confused the subject.

Historical

The importance of skin sterilization previous to surgical operation was first clearly realized by Lister, the English Quaker surgeon who became professor of surgery in the University of Glasgow in 1860. His attention was directed to the fact that compound fractures always suppurated, whereas simple fractures never became involved. During this time Pasteur was beginning his work to show that microscopic living organisms are the cause of fermentation and decay; from these facts Lister gained the impression that living tissue could likewise undergo similar degeneration. Lister attempted to kill microorganisms on tissue, on surgical instruments and on surgeons' hands by the use of carbolic acid which was known to be a caustic substance, and thus he gave birth to the idea of antiseptic surgery. However, the dangers in the use of carbolic acid were soon realized when it became known that it would in itself destroy tissue and cause gangrene in the concentration in which it was used. And so the idea of antisepsis gave rise to aseptic technique, whereby bacteria were prevented from entering wounds in the first place by the sterilization of instruments and other objects. It was learned that a thorough cleansing of the operative site and the surgeon's hands with soap and water would decrease the incidence of infection appreciably. With the advent of the basic principles of bacteriology, many chemicals came to be used for destroying germs. The first to become popular was mercuric chloride, shown by Koch to be a good germicide by his silk thread and garnet method. In 1908, tincture of iodine was introduced as a skin antiseptic, and the publicity afforded to this method served to establish it firmly for years to come. Tincture of iodine, however, as originally introduced and widely used, was too strong so that iodine burns were common, and this fact was seized upon by various pharmaceutical drug concerns who soon began introducing other substances which were less irritating. The first one of this series was mercurochrome, introduced in 1925. Since then many preparations have appeared, and exorbitant prices at present prevail for these new proprietary substances, some of which are relatively inefficient. One naturally wonders whether the high cost of these preparations is justified when they are considered from the point of view of an ideal antiseptic.

Bacterial Flora of Normal Skin

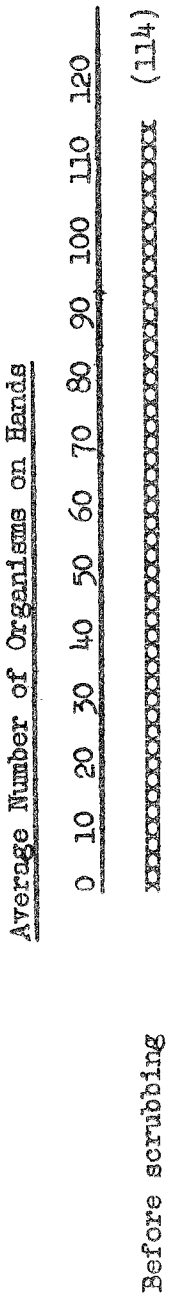
The body surface collects many kinds of saprophytic bacteria which vary in number and kind depending on the personal hygiene and environment of the individual. However, there are a few species of bacteria that are found constantly on the skin and in the sebaceous glands. The most common is Staphylococcus albus. Occasionally Staphylococcus aureus is found, which is considerably more pathogenic. Diphtheroids are the next most common organisms. They are usually saprophytes and are not pathogenic. Both staphylococci and diphtheroids are frequent contaminants in cultures from wounds or in blood cultures. We have found, on the average, 12 staphylococci and diphtheroids per square centimeter of normal skin. A few other types of bacteria may be found, but rather infrequently. These include

the spore-forming rods and the coliform group. Proteus is occasionally found and may be the cause of infections of the genito-urinary tract if introduced by means of instruments or catheters which have been contaminated from the skin. The skin seems to possess some self-sterilizing ability but this action is manifested only against certain organisms and is not effective against staphylococci and diphtheroids normally found on the body surface. It is against this latter group that the efforts exerted in effecting preoperative sterilization are most important in the prevention of postoperative infection.

Preoperative Debacterialization of Hands

The number and kinds of bacteria on the exposed surfaces of the body and especially on the hands vary a great deal in different individuals and in the same individual from time to time. There is little variation in the permanent flora but a great deal of variation in the "transient" flora. Transients may be present in enormous numbers, but as a rule relatively few are present on clean hands or on clean unexposed skin, and they are comparatively easy to remove or kill, which is not true of the basic flora. Hence the futility of germicidal tests which utilize test bacteria placed on the skin previous to the application of an antiseptic.

Using the agar impression method, the number of bacteria on surgeon's hands before scrubbing, after scrubbing, and after wearing rubber gloves for an hour or more was determined on hands of the various personnel of the main operating rooms at this hospital. As a rule the hands of staff doctors and internes were cleaner before washing than were those of the clerks, but regardless of the initial number of bacteria on the hands, the scrubbing procedure reduced the number to practically a constant value. The average number of bacteria on the 20 square centimeter area tested was 114 before scrubbing, 3 after scrubbing, and 2.7 after wearing gloves for at least an hour. These results do not confirm those recently published by Price, who claims that there is a tremendous increase in the number of bacteria on the hands during the period the gloves are worn. In numerous trials using our impression plate technique, we have never noted an increase of organisms on the hands during the time the surgeon was operating. The fact is of importance in the event of accidental tearing of the glove during the operation or in changing gloves between operations.



Our results indicate that the 10 minute period of scrubbing, followed by rinsing with 75% alcohol, as carried out at the University Hospitals, is an adequate method for preoperative debacterialization of hands.

Preoperative Cleansing of the Operative Site

The use of soap and water in the preoperative cleansing of skin dates back to the very beginning of aseptic surgery. There are some hospitals at the present time that resort to scrubbing with soap and water as the only protection afforded the patient against postoperative infection. The procedure is not without deleterious effects. In the first place, a long period of vigorous scrubbing is necessary to remove the majority of bacteria. As recently shown by Price, a 10-minute period is far from sufficient. The method is therefore time-consuming and messy, since the removal of bacteria is greatly dependent on repeated rinsing during the scrubbing process. Again this long period of scrubbing may actually injure the tissue, thus robbing it of its natural resistance to bacterial invasion. The same objection is raised against shaving the skin immediately before an operation. There is no doubt that such procedures produce a more favorable condition for the invasion of pathogenic bacteria, and if carried out at all, it should be done the day before the operation. In numerous trials, we have found skin that had been shaved, scrubbed with tincture of green soap and finally with alcohol and ether, to have just as many bacteria per square centimeter after 18 hours as normal untreated skin, even though the treated skin was protected with sterile bandages during the 18-hour period. It would seem then, that this procedure is of value only in removing hair, organic matter and dirt, and has relatively small importance as far as debacterialization of the skin is concerned.

Preoperative Use of Fat Solvents on the Skin

The common use of fat solvents following the soap and water treatment is justified, since they render the cutaneous flora more liable to contact with the germicide to be applied. However, the common use of benzine and ether is not logical, since they may cause burns on sensitive individuals, a fact which is not generally appreciated. Furthermore, they are relatively expensive and dangerous due to their inflammability. The substitution of acetone in this routine is definitely indicated, since it does not tend to burn the skin, is cheaper than either benzine or ether, is not inflammable, and eliminates the necessity of using two different substances, thus simplifying the procedure.

Choice of the Preoperative Antiseptic

Having thus prepared the cutaneous surface, one is confronted with the choice of an antiseptic solution to complete the "prep." Since there has been no standard reliable quantitative method for testing the efficiency of preoperative skin antisepsis, a large variety of germicidal substances and concentrations have been used. The decision as to which of these shall be used must be based on a consideration of several points. They may be listed as follows:

1. Bactericidal power
2. Harmlessness to skin
3. Rapidity of action
4. Damage to linen
5. Convenience in use
6. Irritation to operating room personnel
7. Ability to outline field
8. Sustained action
9. Cost

Bactericidal Power

Since it is generally conceded that the phenol coefficient is not a reliable method for determining the ability of an antiseptic to act in the presence of living tissue, a great deal of investigation on the efficiency of various antiseptics in sterilizing the skin has been carried out. The methods used in the past are open to criticism since they have not been quantitative and interpretations have been made erroneously. In

most instances after application of the antiseptic to the skin, an area was scraped with a scalpel and the scrapings, or a skin biopsy, were inoculated into broth. A wide variation in the number of sterile cultures resulted with obvious difficulty in interpretation. A short time ago, an investigation prompted by Dean Diehl and Dr. Wangensteen was undertaken to determine if possible the relative efficiency of various cutaneous antiseptics. For this purpose a method was evolved which is not only simple to carry out but which gives quantitative results. It consists briefly in the taking of skin impressions on agar. After treating the skin with a given antiseptic, the excess antiseptic is removed and a watch crystal filled level full with solidified blood agar is inverted and placed into immediate contact with the treated skin. The plates are removed after a brief interval and incubated. Colonies which develop are from bacteria not killed by the antiseptic, and the number of colonies thus obtained is compared with those developing on impression plates made of normal untreated skin areas.

A summary of the results obtained on several solutions tried are tabulated in the following chart:

Antiseptic	Bacteria Killed
Merthiolate (tincture)*	98.18%
Mercresin "	99.82%
Metaphen "	99.56%
Iodine, 1% "	99.65%
Cresol, 2% "	99.57%
Iodine 1%, Cresol 3/4% (tincture)	99.54%
$HgCl_2$, 0.1% "	99.21%
Harrington's Solution "	98.42%
Alcohol, 50%, Acetone 10%	96.94%
Tincture of green soap	53.64%
Merphenyl nitrate	99.48%
Cresol, 0.5%, $HgCl_2$ 0.07% "	99.62%

*The tincture in each case consisted of 50% alcohol, 10% acetone.

These results show that all antiseptic solutions used failed to give complete sterilization of the skin. Our results do not agree with those of Tinker and Sutton who state that normal skin areas are frequently sterile since we found an average of 12 organisms per square centimeter of normal skin. Neither do they agree with previous reports on the inefficiency of iodine (Tinker and Prince, Robb, Bonney and Browning, Decker, Turner and Catto, Bovee, Scott and Hill, Tinker and Sutton). Their results, however, since they were not quantitative, do not permit accurate interpretation. The use of iodine encounters several disadvantages which will be mentioned later in this discussion. The poor showing of tincture of green soap can be attributed to the fact that it is mainly a detergent and if not used in conjunction with profuse rinsing with sterile water, the organisms remain on the skin. A surprising result is the fact that the solvent used (50% alcohol, 10% acetone, erroneously called a tincture) is itself highly germicidal, since it destroys almost 97% of the cutaneous flora. The addition of any antiseptic substance to this solvent therefore serves only to dispose of an additional 2% to 3% of the bacteria on the skin. It is only logical, then, to conclude that the most efficient and economical solution could be attained by the use of the least expensive of these germicidal substances in combination with the solvent. By trial such a combination proved to be a 0.5% cresol, 0.07% mercuric chloride in 50% alcohol and 10% acetone. This solution regularly kills 100% of the diphtheroids and 99.6% of the staphylococci on the skin. The cost of the cresol and mercuric chloride contained in a liter of this solution is about one cent.

Harmlessness to the Skin

Perhaps the greatest factor in the use of tincture of iodine as a skin antiseptic has been the constant danger of burns following its use. This fact alone has been the greatest talking point of the producers of patented mercurial antiseptics for the introduction of these preparations for preoperative skin sterilization. Although direct data on the relative power of various antiseptics to produce irritation of the skin is lacking, no commonly used skin antiseptic, with the exception of iodine, is possessed

of this danger. While a weaker tincture of iodine might be efficient as a skin antiseptic, the danger of burns is not completely eliminated and likewise since the iodine fumes occasionally cause irritation of mucous membranes of the operating room personnel, it will perhaps never again enjoy its original popularity.

Recently tissue culture methods have been used to determine the relative toxicity of antiseptics to tissues and to bacteria. Using living embryonic chick heart tissue Salle and co-workers have conducted a long series of investigations and have arrived at some definite conclusions. They determined in all cases a "toxicity index" defined by them as the ratio of the highest dilution of germicide required to prevent the growth of tissue in 48 hours to the highest dilution required to kill the test organism in 10 minutes. The same substrate was used in both cases. By this method, the smaller the toxicity index, the more perfect the antiseptic and an index of less than one means that the germicide is more toxic to bacteria than to embryonic tissue, while the reverse is true for values greater than one. Their results indicate that the halogens and phenolic compounds (iodine, azochloramid, and hexylresorcinal) are superior to other compounds. Of the newer organic compounds, Azochloramid and Metaphen appear to be the best, although the latter has the disadvantage of being highly bacteriostatic. Mercurochrome was unreliable and merthiolate was the worst of the lot, since they could not prepare a solution of the substance concentrated enough to kill Staphylococcus aureus (all solutions used were aqueous).

While tissue culture methods for determining the relative efficiency of antiseptic action may be of importance in the selection of a skin antiseptic, they obviously are of greater usefulness in the selection of a solution for use on open wounds and for irrigations since the outer cutaneous surfaces are not so sensitive to the adverse action of an antiseptic.

Rapidity of Action

Aqueous solutions of antiseptics have been frequently proposed. However, their use is not convenient since bactericidal action is much slower as compared to tinctures. Likewise evaporation from the skin is greatly prolonged and puddles of the antiseptic form in skin depressions. The use of 50% alcohol and 10% acetone as a solvent has become well established following the extensive work of Vaichulis and Arnold on various solvents. In this combination, they found the maximum antiseptic action in the test tube and defatting action on skin surfaces. The solvent also dries readily, yet not too rapidly to prevent adequate antiseptic action. It penetrates better into superficial fissures of the normal skin surface although penetration of antiseptics in appreciable amounts does not occur in normal tissue. Most of the patented skin antiseptics now on the market use this solvent.

Damage to Linen

The relative disadvatnage of various antiseptic dyes such as crystal violet, acriflavine, brilliant green, is obvious since they stain linen badly. Picric acid and mercurochrome likewise have this disadvantage and have not become popular in spite of extensive ballyhoo. Most of the commercial preparations now in use are reasonably free of this undesired characteristic.

Convenience in Use

Aqueous solutions, because of the difficulty involved in securing a uniform spreading of the solution, together with their delayed evaporation from the skin, have been unpopular. Lee and Hoxworth, in a recent publication, pointed out that although isotonic aqueous iodine solution was perfectly satisfactory from the standpoint of wound healing and efficiency as a skin antiseptic, it was uni-

versally rejected and a commercial antiseptic containing alcohol-acetone as a solvent was preferred by all surgeons who used the two solutions.

Irritation to Operating Room Personnel

Most of the antiseptics in common use with the exception of iodine are non-irritating to mucous membranes. Iodine, whether it is in aqueous, alcoholic, or in alcohol-acetone solution causes lacrimation and discomfort to operating room personnel. This proved to be the chief disadvantage to us in the experimental use of various amounts of iodine in the alcohol-acetone solvent. The combination, though efficient in killing bacteria on skin, is highly impractical. This disadvantage is not noticeable in any of the other commonly used antiseptics.

Ability to Outline the Field

The addition of dyes to colorless antiseptic solutions is not only of esthetic value but serves to outline the field treated. Ideally the chemical used to prepare the field should produce a definite, easily visible stain, which fades out within a few hours or else washes off readily with water or alcohol. At the same time it should not permanently discolor linen or other supplies near the operative field. Eosin and related dyes are commonly used in commercial solutions since they are easily removed with soap and water and are in themselves somewhat bactericidal. The disadvantages of certain other bactericidal dyes have already been discussed. Iodine is fairly satisfactory in this respect as it fades spontaneously when exposed to air or is easily removed with Richardson's solution.

Sustained Action

The application of a skin antiseptic to the skin surface presumably kills about 99% of the bacteria present regardless of the preparation used. However, the deeply situated organisms in the skin depressions and in the sweat glands may not be destroyed. Consequently when vasodilation occurs during anesthesia these organisms are brought to the surface. It is therefore desirable to use an antiseptic that can be applied preoperatively and allowed to remain on the skin during the operative procedure. The disadvantage of tincture of iodine which must be removed to prevent burns before surgery is begun is obvious. Bacteria brought to the surface with perspiration remain viable and the wound is thus liable to post-operative infection.

Cost

Following is a list of common antiseptics, with approximate cost per gallon:

Tincture	Metaphen	$18.00
"	Merthiolate	10.00
"	Mercresin	9.25
"	Mercurochrome (Scott's Solution)	6.25
"	Merphenyl nitrate	5.00
"	Iodine, 7%	1.75
"	Iodine, 3½%	1.10
*Tincture colored cresol-mercuric chloride solution		.35

From the above approximate figures, one sees at a glance that the proprietary solutions are outstandingly expensive. For example, the cost of preparing a field with Tincture of Metaphen is 50 times as great as if colored cresol-mercuric chloride tincture is used. Granted the use of some simple arithmetic, the yearly consumption of 150 gallons of skin antiseptic (average yearly amount used at University of Minnesota Hospitals), would entail an outlay as follows for different agents:

Tincture	Metaphen	$2700.00
"	Merthiolate	1500.00
"	Mercresin	1385.00
"	Colored Cresol Mercuric Chloride Solution*	52.00

*Formula for Tincture Colored Cresol Mercuric Chloride Solution (Novak)

Alcohol 95%	525. cc.
Acetone	100. cc.
Cresol U.S.P.	5. cc.
Mercuric Chloride	0.7 grams.
Eosin Y	0.6 "
Acid fuchsin	0.08 "
Water q.s.a.d.	1000. cc.

Summary

1. Normal cutaneous surfaces vary in the number and kind of bacteria present. Organisms present may be roughly divided into the basic flora and the transient flora.

2. Of the basic flora, Staphylococci and diphtheroids are the most common skin inhabitants.

3. The procedure for preoperative debacterialization of hands by scrubbing for 10 minutes and rinsing in 75% alcohol is adequate.

4. There is no increase in bacterial population on the hands during the period that rubber gloves are worn.

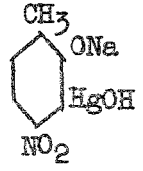
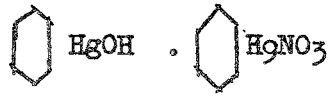
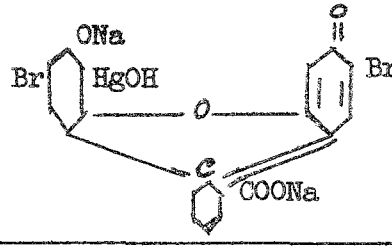
5. Preoperative cleansing of the operative site is of use mainly for removing hair, organic matter and dirt, and is of little value for destroying bacteria.

6. Fat solvents applied to the skin previous to the antiseptic are of value. It would seem that the routine use of benzine followed by ether could be replaced by a single application of acetone.

7. The various desirable qualities of skin antiseptics are discussed. Experimental data indicate that all commonly used antiseptics are satisfactory except for one feature- their cost.

8. An inexpensive antiseptic (formula published) has been found to be efficient for all types of skin antisepsis. It has been used at the University of Minnesota Hospitals for about 18 months.

9. There is no logical reason for the use of the relatively expensive proprietary skin antiseptics.

Name	Manufacturer	Chemical Name	Hg. Content	Structural Formula	Empirical Formula
Merthiolate	Eli Lilly & Co.	Sodium salt of ethyl mercuri-thiosalicylic acid	49%		$C_9H_9O_2S\ HgNa$
Metaphen	Abbott Laboratories	Anhydride of 4, nitro-5, hydroxy-mercuri ortho cresol	56%		$C_7H_5O_4HgN$
Merphenyl Nitrate	Hamilton Laboratories	Phenyl-Mercuric Nitrate (basic)	63%		C_6H_5HgOH $C_6H_5HgNO_3$
Mercresin	Upjohn Company	Not a chemical entity but a mixture of mercarbolide and five isomeric amyl ortho cresols.			
Mercuro-chrome	Hynson Westcott and Dunning	Sodium salt of di brom hydroxy mercuri fluores-cein	25%		$C_{10}H_8O_5Br_2HgNa_2$

Commonly Used Proprietary Antiseptics for use on the Skin

References

1. Beck, Wm. C.
Preparation of the operative field - a report of a survey of 17 surgical teaching clinics.
Arch. Surg. 33: 876, 1936.

2. Brewer, J. H.
The Antibacterial Effects of Organic Mercurial Compounds.
J.A.M.A., 112: 2009-2018, May 20, 1939

3. Bonney, Victor, and Browning, C. H.
Sterilization of the skin and other surfaces by a mixture of crystal violet and brilliant green.
Brit. Med. Jr., 1:562, 1918.

4. Bovee, J. Wesley
Complete sterilization of the skin by iodine.
Am. Jr. Obst. & Gynec., 7: 1, 1914.

5. Cornbleet, T. and Montgomery, B. E.
Self sterilization powers of normal skin.
Arch. Dermat. & Syph. 23: 908, 1931.

6. Decker, C.
Experimental contributions to the question of disinfection with tincture of iodine.
Deutsche Med. Wchnschr. 37:1078, 1911.

7. Grossich, Antonio.
A new method for preoperative skin sterilization.
Zentralbl. f. Chir. 44: 1289, 1908.

8. Grossich, Antonio.
A new method for sterilization of skin previous to surgical operation.
Berlin. Klin. Wchnschr. 46: 1934, 1909.

9. Hill, J. and White, E. C.
Action of normal skin on bacteria.
Arch. Surg., 26: 901, 1933.

10. Hirschfelder, A. D. and Novak, M.
An experimental investigation of the penetration of antiseptics through tissues.
Jour. Pharm. & Exp. Thera., 63: 15-16, 1938.

11. Hirschfelder, A. D. and Novak, M.
An experimental investigation of the penetration of antiseptics through tissues.
Jr. Clin. Investigation, 17: 521-22, 1938.

12. Lee, Marshall, and Hoxworth, Paul.
Isotonic aqueous iodine solution as a skin antiseptic.
Surgery, 6: 762-769, Nov. 1939.

13. Meleny, F. L.
Infection in clean operative wounds; a 9-year study.
Surg., Gynec. & Obst., 60: 269, 1935.

14. Novak, M. and Hall, H.
A method for determining the efficiency of preoperative skin sterilization.
Surgery, 5: 560-566, 1939.

15. Nye, Robert N.
The relative in vitro activity of certain antiseptics in aqueous solution.
J.A.M.A., 108: 280-287, Jan. 23, 1937.

16. Pijoan, M. and Wheeler, S.
Use of extravasating dye as a measure of skin permeability to bacterial invasion.
Arch. Surg., 34: 591, 1937.

17. Price, Philip B.
New studies in surgical bacteriology and surgical technique.
J.A.M.A., 111: 1993, 1938.

18. Robb, Hunter.
Iodine in sterilization of the skin.
Surg., Gynec. & Obst., 17: 324, 1913.

19. Salle, A. J., McOmie, W. A., Shechmeister, I. L., and Foord, D. C.
The evaluation of a group of germicides by the tissue culture technique.
Jour. Bact., 37: 639-646, 1939.

20. Scott, W. W., and Hill, J. H.
Presentation of a preoperative skin disinfectant - an alcohol-acetone-aqueous solution of mercurochrome.
J. Urol., 14: 135, 1925.

21. Tinker, Martin B., and Prince, Howard L.
Common fallacies regarding skin disinfection with special reference to the iodine methods.
Surg., Gynec. & Obst., 12: 530, 1911.

22. Tinker, Martin B., and Sutton, Henry B.
The efficiency and inefficiency of certain skin antiseptics.
Ann. Surg., 82: 640, 1925.

23. Tinker, Martin B. and Sutton, Henry B.
Efficiency of most of the commonly used skin antiseptics.
J.A.M.A. 87: 1347, 1926.

24. Turner, Philip, and Catto, H. D.
The iodine method of sterilizing the skin.
Lancet, 180: 733, 1911.

25. Vaichulis, J. A. and Arnold, L.
A compound colored alcholic solution of mercuric chloride for skin disinfection.
Surg., Gynec. & Obst., 61: 333, 1935.

V. GOSSIP

During the Christmas Holidays the General Alumni Association decided to have a meeting at Winnipeg for local residents who were members of the Association. It has been the right of every visiting Englishman to give his impressions of America no matter how short his visit; if they assume that prerogative, so do I. It is Wednesday evening and the train is preparing to leave for Winnipeg. I find my place, as I go to address the local Canadians on the wonders of the University of Minnesota. The Pullman conductor, as soon as he found I was bound for Canada, gave me a formidable document to complete. In it, I revealed the past and the present to such an extent that the future seemed in doubt. I soon learned, however, that the border authorities are very patient and considerate. In spite of this, my feeling of guilt never left me. The inquisitors seemed to assume an innocent air, at the same time staring intently at the person they are questioning. In the morning we passed over the border. The day was cold and cloudy, and everything was covered with hoar-frost. As far as one could see, there was vacant wheat ground, occasional straw piles (from oats and other grains) and nondescript settlements, some of them with very high-sounding names. At breakfast a fellow traveller had positive ideas in regard to his food. He appeared to be Scotch, and evidently with the idea of sparing his teeth, mixed his food before eating. Orange juice was poured over cereal; baked apple was smeared on toast, but he failed to dip his bacon in the tea, which was a disappointment. The customs man was very much interested in him when he said he had brought in a little tobacco. He had to complete a document, too. Canada at the present time is in the midst of heavy taxes on tobacco. Ordinary American cigarettes are quoted at 45¢ and 55¢. The Canadian version of Chesterfields was 30¢. Most of the cigarettes sold were packaged in gay cartons which immediately aroused one's suspicion that they were designed primarily for women's bridge clubs. P.S. Most of them had cork tips. In the station in Winnipeg, one notes the absence of Ethiopian red caps and finds in their place Orientals. Outside the station I found the first representative of what I thought was from the Northwest Mounted Police. He was an imposing creature with a tall fur piece on his head. He had on a uniform which did not include a red tunic. I am already speaking like a Canadian who uses unexpected terms for ordinary articles. I saw so many people during the day with tall fur pieces on their heads and various kinds of uniforms that I doubt now that I ever saw any members of the Northwest force. I should have remembered that they were probably up in the back country chasing murderers instead of providing a spectacle for an ordinary visiting American. In my hotel room the management had posted an unusual sign. They begged the occupant, no matter who he might be, to report any inattention or neglect in service. We, who occupied this room, were also gravely informed that such complaints would be investigated if such investigations were thought advisable. We were told that many complaints were not to be considered seriously because the person at fault might not be doing wrong. Just because the bell boy didn't come when you called for him did not prove that he was lazy; he might be busy doing something else. One would feel very diffident about presenting his case before such a just tribunal, and I wondered if anyone has ever reported inattention. The telephone book was next. In it I read about barristers, apartment blocks in which the number of one's suite was given, phonograms which appeared to be messages which the telephone company would transmit at a certain rate, and many other interesting innovations. I thought I would take a stroll and soon discovered that seeing downtown Winnipeg consisted chiefly of walking by a series of banks. One would imagine that a Scotchman would find great delight carrying his money from one bank to another (except for wear and tear). As I passed Eaton's, Canada's famous department store and mailorder house, I heaved a sigh of relief, as I thought of all the dishes I would not have to bring back, because I was not to be in Canada the required 48 hours. Soon I was in front of the Hudson Bay Store, a magnificent stone building which has all the appearance of a government building or a bank, but which proves to be a department

store. Our meeting was to be held in this building, so more of that later. I decided to walk down the other side of the street and found that buildings I had suspected might not be banks were really banks when you got up close. There was an occasional homey touch such as a Five and Dime Store and a Cut-Rate Drug Store. About this time I noticed a puffy, ponderous, blue-nosed creature, who carried a bundle of papers under his arm apparently for the purpose of sale. When anyone drew near him, he politely looked the other way and started to hum a tune. Several times during the day I met him and the result was always the same. He apparently made no sales and seemed to enjoy looking the other way and singing. As I returned to my hotel, I found another quaint reminder of the Canadian's happy faculty of saying it in a natural way. Instead of the usual American sign "No Parking Here," I was informed instead that there was to be "No Standing Here at Any Time." One is impressed with the uniform politeness of the people. As an example, small boys in preparation for a career in hockey were busy everywhere practicing in the streets. Cars would slow down to allow them to complete a shot. One was using the sidewalk behind me for a little practice. Gradually the puck was propelled closer and closer to my heels. I am sure that nothing about my appearance resembled a cage but, whatever it was, the back of me had a fatal fascination for this future hero of the rinks. He scored a goal in the middle of my back. This seemed to disturb him a great deal as he protested his deep sorrow, and all the way down the street I could hear him singing out, "Sorry, Sir, Sorry Sir!." The Winnipeg General Hospital and the Medical School of the University of Manitoba were my next points of interest. Dean Mathers and Hospital Director Stephenson appeared to be glad to get news from south of the border. The Medical School and hospital are together and seemed to be well-equipped. The dean was in conference when I arrived. He was trying to allot research funds. He assured me he was in no hurry, as it would be impossible to settle it that day. The money exchange difference both the dean and hospital director felt would make some difference in the attendance of Canadians at our courses. In a special edition of the Winnipeg Free Press, one read of the health work which they are doing in Manitoba. The typical Winnipeg home pays about $100 a year in taxes of which sum $39 goes for education and $47 for general municipal purposes. This includes a health item of $6.60. They have broken down their individual items under sanitation to show the people that for 11¢ a week th city operates its garbage and sewage system. One of the brightest features of the tax statement is the alarming statement that most local improvements have now been paid for which will mean that taxes will be reduced. The carefulness with which these people approach their problems is evident on every hand. Instead of proudly announcing that horse-drawn milk wagons will be a thing of the past in a very short time they are pleased to state that within the next five years the service may be mechanized. Their infant death rate in 1938 was 111 (total) as compared with 625 (total) in 1920. They report that in 1939 the babies born in inadequate homes was 50%. The University of Manitoba is rather widely scattered over the city so that one does not get a comprehensive picture of it. In the evening, loyal Minnesotans gathered in the dining rooms of the Hudson Bay Store for a delicious meal. An American might have called it something else. Empty cups at the sides of our plates were finally filled late in the meal with a fluid said to be coffee. It is best to order tea. There was good-natured bantering at the dinner, much talk of loyalty to Minnesota, the football pictures, and certain discussions of the problems of people who are in the middle or late part of life. Harmon Pierce, son of E.B., and William Gibson, editor of the Alumni Weekly also took part in the program. Dr. Bert Oja, former football player, engineered the meeting. One leaves Canada with regret. They are in the middle of war but do not discuss it. They have difficulties which they quietly attempt to solve. They tolerate conditions which Americans might find intolerable. They are loyal to the Crown, democratic in spirit and ideals, friendly to us, quiet and peaceable.- in all, an ideal people to have as good neighbors. Of course there are exceptions to this.

Adios.