the serum calcium level and the QTc interval (Herndon *et al.*, 1955), but these results can hardly be compared with the changes produced by hypercalcaemia due to hyperparathyroidism because of other concomitant electrolyte changes.

The relative shortening of the Q-T duration in hyperparathyroidism as opposed to other causes of hypercalcaemia has been described by Lepeschin (1951). Other electrocardiographic changes in cases of hypercalcaemia due to hyperparathyroidism include lengthening of the P-R interval, inversion of the T waves in leads 2 and 3, a slurred rSR in V1 and a peculiar broad rounded apex of the T wave rather similar to the appearances described by us (Fig. 1) (Kellogg and Kerr, 1936; Lepeschin, 1951; Goldberger, 1953). The present case showed no changes in the A-V conduction and no broadening of the QRS complex. The latter finding agrees with the observations of Herndon *et al.* (1955), who were unable to affect the QRS duration by raising the serum calcium. The only common factors which shorten the QTc interval are digitalis and its derivatives, hyperpotassaemia, high vagal tone, and anoxia (Lepeschin, 1951), but none of these produce the appearance of the T wave described above.

The prognosis has been discussed in a report by Rienhoff (1950). His follow-up of 25 cases of hyperparathyroidism due to adenomata revealed a mortality of 36% (9 cases) after three to eleven years following discharge from hospital. All the deaths were due to hypertension with or without renal insufficiency. All but one were in their fourth or fifth decade at the time of death. In four of these cases there was evidence of renal complications without bony lesions at the time of operation. The other five had skeletal complications but no renal abnormalities. Yet after removal of the parathyroid adenomata the nine patients appeared well and the blood chemistry returned to normal. Nevertheless there was a continuous degenerating process in the kidneys going on for a number of years that produced their ultimate death. This fact has also been stressed by Hellström (1950), and more recently by Simpson and Wilson (1955).

In our patient there has been a steady improvement in the renal status in the six months since operation, but this does not mean that complete recovery will ensue, as renal function is not yet normal. The outlook must remain uncertain.

It can be concluded that individuals who show least evidence of renal damage before operation have the best outlook for complete recovery. Once complications have developed to any extent, especially in the fourth and fifth decades, the secondary damage to the kidney may not be corrected in spite of successful operation and a complete cure of the hyperparathyroidism.

It must be emphasized that the main goal in treatment should be to make the diagnosis of hyperparathyroidism before obvious and serious complications have occurred (Rienhoff, 1950).

Summary

A case of parathyroid adenoma with parathormone intoxication is presented.

The rarity of acute hyperparathyroidism is stressed.

The electrocardiographic changes in hyperparathyroidism are discussed and their diagnostic value is emphasized.

The pre-operative management and prognosis of such a case are discussed.

The literature is reviewed.

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ANTISEPTICS IN MIDWIFERY

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For more than 20 years chloroxylenol has dominated the field of antiseptics in midwifery (Colebrook and Maxted, 1933), but manufacturers have been developing new antiseptics in this field and have reintroduced already known compounds in fresh formulations.

The possible use of quaternary ammonium compounds* has been considered at intervals, particularly since the paper of Domagk in 1935, and interest in their bactericidal power has recently revived. Direct comparison between the various types of compounds described in the literature is difficult because of the different methods which have been used for testing antiseptics. We felt, therefore, that it would be useful to compare "dettol" (chloroxylenol) with these antiseptics under the same conditions, and a series of experiments were undertaken to enable us to form our own opinion on which was the most suitable antiseptic for midwifery available at the present time. Shortly after the start of this investigation "hibitane" (chlorhexidine), a new British compound, described later by Davies *et al.* (1954), was made available to us and was therefore tested in the same way. The antiseptics which were selected for testing included those used by our clinical colleagues and some suggested by various manufacturers as likely to be of value for this particular field. Tests were carried out on nine substances in all, two of which were discarded after preliminary testing and are not, therefore, included in the results now reported. In the case of one further antiseptic, "milton," the investigation was discontinued after contact tests in the presence of organic matter had been completed. The six antiseptics which were fully tested are given in Table I. Trade names of substances have been used throughout this paper, since the long and cumbersome chemical names would not be so readily understood. In all these experiments the dettol used was the "new" formulation containing 4.8% *p*-chlor-*m*-xylenol.

*A full description of the properties and history of the quaternary ammonium compounds is given by Lawrence (1950).

TABLE I.—*Antiseptics Used*

Hibitane ..	1: 6-Di-4 ¹ -chlorophenylodiguanidohexane. (Chlorhexidine.)
Bradosol ..	β -phenoxy-ethyl-dimethyl-dodecyl-ammonium bromide (Domiphen bromide.)
Octaphen ..	β -p-Tert. octyl-phenoxy-ethyl-diethyl-hexyl-ammonium chloride
Dettol ..	p-Chlor-m-xyleneol
Cetavlon ..	Hexadecyltrimethyl ammonium bromide. (Cetrimide, C.T.A.B.)
Roccal ..	Lauryldimethylbenzyl ammonium chloride. (Benzalkonium chloride.)

All the antiseptics were tested against four standard organisms: *Ps. pyocyanea*, *E. coli*, *Staph. pyogenes*, and Group A β -haemolytic streptococcus. Of these bacteria, the staphylococcus was the standard Oxford strain, while the remainder were typical strains isolated in routine cultures from the hospital. They were maintained by regular subculture throughout the course of the experiments, and in order to ensure uniformity of later tests samples of each strain were freeze-dried at the outset.

The bactericidal level for each antiseptic was determined in respect of the four organisms described. Two different methods were used: in the first a constant dose of organisms was exposed to varying dilutions of antiseptic in broth or blood broth for 48 hours at 37° C., and in the second the ability of substances to kill organisms after contact with them for a short time was tested by exposing a standard inoculum to varying concentrations of antiseptic for intervals of 2½, 5, and 30 minutes. On the whole little difference was found in the results from these varying times, and consequently it was decided to report only the results of a standard time of two and a half minutes' contact.

48-hour Bactericidal Tests

Dilutions of antiseptic were made in sterile distilled water and 1 ml. of diluted antiseptic was added to 9 ml. of 1% "lemco" broth to give the final dilution required. These tubes were then inoculated with 1 drop (0.025 ml.) of an overnight culture of the organism standardized to a constant opacity by dilution, where necessary, in order to avoid variations in the numbers of bacteria present. The tubes were incubated at 37° C. and examined for visible growth at 24 and 48 hours; at the end of this time subcultures were made with a 3-mm. loop on to blood-agar plates which were incubated for 24 hours before final examination for growth.

To begin with, subcultures were made into both large and small quantities of different media, the volumes ranging from 5 to 50 ml. of liquid media containing a variety of substances inhibitory for the antiseptics being used. It was found, however, in the 48-hour test, that little advantage was obtained by subculture into these liquid media, and that a subculture direct on to the surface of horse-blood-agar, using a 3-mm. loop, gave the most satisfactory results. The bactericidal level was taken as that dilution in which the organisms failed to grow on subculture.

Contact Tests

The antiseptics were tested for the effect of contact for 2½ minutes with organisms in distilled water, in lemco broth, and also in 25% blood broth (both horse blood and human blood were tried, but no difference in effect was found between the two). For tests in the absence of organic material, dilutions were made in distilled water; on the other hand, for the broth and blood-broth tests the antiseptic was diluted in distilled water to concentrations ten times those finally required, and 1-ml. amounts of these dilutions were added to 9 ml. of the appropriate broths. The inoculum was made with a 0.2-ml. graduated pipette, using an overnight culture; the pipette was lowered to just above the surface of 5 ml. of the diluted antiseptic before expelling the organisms so as to avoid splashing the walls of the universal container in which the test was made. The mixture was then well shaken, and after 2½ minutes one loopful (3 mm. diameter) of the mixture was withdrawn and subcultured into 9 ml. of lemco broth. This was incubated at

37° C. for 48 hours, examined for visible growth, and subcultured on to blood-agar plates, which were examined for visible growth after 24 hours' incubation.

In every case wide-range tests were first carried out, using tenfold dilutions of antiseptic in each medium. Subsequently, dilutions of closer range were made in order to find a more exact end-point. Ultimately, after repeated testing, it was shown that it was unsatisfactory and unrealistic to attempt to arrive at an exact end-point, since there was some variation in the results if too close a range of dilutions was made. This was particularly true of some of the newer antiseptics and some of the quaternary ammoniums which can be diluted so very greatly and still retain their bactericidal power. For example, it was found impracticable to make a dilution range any closer than, say, 1 in 2,000, 4,000, 6,000, 8,000, and 10,000. Reports on closer ranges may appear satisfactory if they are based on a single series of tests, but if many close-range tests are done repeatedly, then the end-point will often show considerable variation. Where the dilutions are close enough the survival of organisms in any one tube near the end-point appears to depend more upon chance than upon the particular concentration of the antiseptic. It must therefore be realized that the results which are reported here are in this sense approximate end-points, but it will be seen that the differences are sufficiently great for adequate comparison to be made between the different compounds.

Anaerobic Tests

The more promising antiseptics were also tested by different techniques against several strains of *Cl. welchii* and *Cl. tetani*. All cultures of these two organisms except those in Robertson's meat broth were incubated anaerobically at 37° C. in McIntosh and Fildes jars.

Cl. welchii.—48-hour tests: Cultures of *Cl. welchii* were grown for 48 hours in glucose broth, and 0.025 ml. was inoculated into 10 ml. of antiseptic dilutions made in 0.5% glucose broth. The tubes were then incubated for 48 hours, examined for visible growth, and subcultured—one loopful into 0.5% glucose broth (9 ml.); these were incubated for 24 hours and examined for visible growth. Subcultures were then made on to blood-agar plates, which were in turn incubated for 24 hours and examined for visible growth. 2½-minute contact: 0.2 ml. of a 24-hour Robertson's meat broth culture of *Cl. welchii* was added to 5 ml. of the diluted antiseptic. After 2½ minutes a loopful (3 mm.) was subcultured into 10 ml. of Robertson's meat broth. Cultures were incubated for 24 hours and subcultured on to blood-agar plates, which were examined after 24 hours' incubation.

Cl. tetani.—48-hour tests: The culture used for the inoculum was a Robertson's cooked meat broth which was known to contain many spores (cultures were incubated for at least a week). Dilutions of antiseptic were made in lemco broth and inoculated with 0.025 ml. of the culture; these tubes were incubated for 48 hours, examined for visible growth, and subcultured (one loopful) into Robertson's broth (10 ml.) and one loopful into the water of condensation at the bottom of a Fildes agar slope. The subcultures were then incubated for 48 hours and each Fildes agar was examined for signs of growth at the top of the slope. Gram-stained films were made from all tubes. No delay was allowed to occur during subculturing of *Cl. tetani*, and tubes were returned to anaerobic conditions as soon as possible. 2½-minute contact: 0.2 ml. of a 48-hour Robertson's meat broth culture of *Cl. tetani* was added to 5 ml. of antiseptic dilution. After 2½ minutes a loopful was transferred into Robertson's meat broth, which was incubated for 48 hours and subcultured into a Fildes agar slope as above.

Results

All the antiseptics were first submitted to the 48-hour bactericidal test, and the results shown in Table II represent dilutions of antiseptic in broth and blood broth which achieved a complete kill and from which subcultures remained sterile. It was striking that in many cases the

newer antiseptics showed inhibition of growth at far greater dilutions than those necessary for a complete kill. These tests show the very small amounts of modern antiseptics necessary to produce a bactericidal effect. For example, hibitane could be diluted to a 1 in 10 million concentration and still kill β -haemolytic streptococci in 48 hours. The presence of 25% blood greatly reduces the bactericidal level, though it will be seen from Table II that the activity of most of the compounds was still very considerable under the conditions of this type of test.

Table III shows the results of the 2½-minute contact tests where the effective dilutions were, of course, much lower, though modern antiseptics could still be diluted very considerably and yet retain a useful level of activity. Tests in water showed that electrolytic hypochlorite (milton) is highly effective against the four strains used; on the other hand, when tested in the presence of organic material such as broth, its efficiency was so much impaired that tests in the presence of blood are not reported. The table also shows clearly the effect of blood on the efficiency of all antiseptics, and the influence of this upon the best concentration for practical use is discussed later.

In Table IV the 48-hour and 2½-minute tests are shown for *Cl. welchii* and *Cl. tetani*. The results obtained on a number of tests with *Cl. tetani* suggest that the element of chance in determining the correct end-point is more widespread than with the other organisms tested. However, dettol appears unable to kill *Cl. tetani* at 1 in 10 (about 1/200 final dilution of chloroxylenol), whereas most of the quaternary ammoniums and hibitane are usually effective over 48 hours at usable levels. The results here reported show the average effective concentrations, but the wide scatter of end-points obtained in different experiments suggests that an occasional tetanus spore can survive the action of all the antiseptics tested at relatively low dilutions. On the whole, bradosol and cetavlon gave the best results against *Cl. tetani*, and dettol was clearly without effect.

Although the 48-hour tests show that prolonged contact with most of the antiseptics was usually capable of killing *Cl. tetani*, it is clear from Table IV that the tetanus spores will survive 2½ minutes' contact in broth with the highest concentrations tested. This means that none of the antiseptics would in practice be able to kill tetanus spores in 2½ minutes if used at the dilutions recommended for obstetrics. This inability of all antiseptics to deal rapidly with *Cl. tetani* emphasizes the necessity of autoclaving all pads, dressings, or other material likely to come in contact

with lacerated and bruised tissues. Nevertheless, contamination with *Cl. tetani* is most unlikely to occur during the course of delivery or the puerperium, and proper autoclaving (20 lb. for 20 minutes) before dressings are issued for use should guard against this infection. Once autoclaved, dressings are extremely unlikely to become contaminated with tetanus.

With *Cl. welchii* the 48-hour tests gave results very similar to those obtained with *Staph. aureus*. It would appear that all the antiseptics tested were effective. On the other hand, no antiseptic was capable of killing *Cl. welchii* in 2½ minutes. *Cl. welchii* is pathogenic only under favourable conditions, and, being non-motile, it must be introduced directly into dead or decaying tissues before it can cause infection. While viable organisms can be recovered in contact tests with all the antiseptics used, their undoubted bactericidal power shown in the 48-hour experiments would effectively and substantially reduce the number of organisms reaching such a site in obstetric practice.

These findings would indicate that no antiseptic, however efficient, is a substitute for careful obstetric and operative technique.

Effect of Soap on Antiseptic Activity.—On investigating the action of the antiseptics in the presence of soap, we found that 0.1% soft soap greatly reduced the activity of the quaternary ammoniums and hibitane but that lower concentrations had much less effect. When the amount of soap was reduced as far as 0.001% the effect on the antiseptics was very slight. Unlike the other antiseptics, dettol appeared to have its activity increased by the presence of soap, and against *Staph. pyogenes* the effect was one of true synergism. The haemolytic streptococcus was so much more

TABLE IV.—48-Hour Tests and the 2½-Minute Contact Tests in Broth

	48-Hour Tests		2½-Minute Contact Tests in Broth	
	<i>Cl. tetani</i>	<i>Cl. welchii</i>	<i>Cl. tetani</i>	<i>Cl. welchii</i>
Hibitane ..	10,000	2,000,000	<1,000	<1,000
Bradosol ..	>2,000,000	4,000,000	<200	<200
Octaphen ..	200,000	600,000	<200	<200
Dettol (4.8% chloroxylenol)	<208	20,800	—	<208
Cetavlon ..	1,000,000	700,000	<1,000	<1,000
Roccal ..	1,000	700,000	<1,000	<1,000

The figures represent the average final dilution in terms of active ingredient required for complete kill.

TABLE II.—48-hour Tests

	<i>Ps. pyocyanea</i>		<i>E. coli</i>		<i>Staph. pyogenes</i>		β -Haem. Streptococcus Group A	
	Lemco Broth	25% Blood Broth	Lemco Broth	25% Blood Broth	Lemco Broth	25% Blood Broth	Lemco Broth	25% Blood Broth
Hibitane ..	200,000	5,000	800,000	80,000	1,000,000	80,000	10,000,000	800,000
Bradosol ..	20,000	800	160,000	8,000	400,000	16,000	2,000,000	80,000
Octaphen ..	8,000	400	20,000	3,200	400,000	20,000	600,000	80,000
Dettol (New formulation)	416	104	8,320	2,080	16,600	4,160	83,200	8,320
Cetavlon ..	4,000	500	40,000	2,000	500,000	8,000	1,000,000	40,000
Roccal ..	9,000	1,000	100,000	2,000	800,000	20,000	2,000,000	100,000
Milton ..	3,000		5,000		4,000		6,000	

The figures show, in terms of active ingredient, the dilution of antiseptic at which all organisms were killed and failed to grow on subculture.

TABLE III.—2½-minute Contact Tests of Antiseptics with Bacteria in Water, Broth, and 25% Blood Broth

	<i>Ps. pyocyanea</i>			<i>E. coli</i>			<i>Staph. pyogenes</i>			β -Haem. Streptococcus Group A		
	Water	Broth	25% Blood	Water	Broth	25% Blood	Water	Broth	25% Blood	Water	Broth	25% Blood
Hibitane ..	80,000	20,000	2,000	120,000	30,000	5,000	60,000	30,000	2,500	320,000	40,000	10,000
Bradosol ..	48,000	2,000	400	40,000	15,000	2,000	20,000	20,000	2,000	160,000	60,000	3,000
Octaphen ..	10,000	400	100	6,000	6,000	2,000	12,000	12,000	2,000	100,000	30,000	3,000
Dettol (New formulation)	3,330	312	104	6,240	6,240	2,080	4,160	4,160	1,040	8,320	8,320	1,040
Cetavlon ..	8,000	1,000	400	10,000	10,000	1,000	40,000	10,000	2,000	100,000	20,000	2,000
Roccal ..	32,000	1,500	500	20,000	15,000	2,500	20,000	20,000	2,500	120,000	40,000	2,500
Milton ..	10,000	200		10,000	200		10,000	200		20,000	500	

The figures show the final dilution of antiseptic in terms of the active ingredient.

sensitive to soap than the other organisms that it could not be used for these tests, and in fact its growth was inhibited by the least concentration of soap necessary to affect the antiseptics concerned. On the whole our findings would suggest that the deleterious effect of soap on antiseptics under conditions of practical use has been somewhat exaggerated.

Clinical Use.—On the basis of the experimental results given above both octaphen and hibitane were given a period of clinical trial in the hospital. The former compound, chosen in preference to bradosol because of its cost, was withdrawn from use immediately it became apparent that the aqueous solution was capable of causing intense irritation of the vagina in sensitive cases. Hibitane, however, has remained in use in the hospital for over two and a half years, and during this period no cases of irritation or individual idiosyncrasy have occurred amongst the 10,000 patients delivered or the nursing and medical staff. This antiseptic has been used as a liquid solution at 1/2,000, as an obstetric cream at 1/100, and as a hand cream also at 1/100. For instrument storage and skin preparation a 1/200 solution containing 70% industrial spirit has been used. While 1% creams are entirely bland to the vaginal mucosae, an aqueous solution of this strength produced some irritation of the nasal mucosa and conjunctiva. We would therefore not recommend solutions stronger than 1/1,000 for use on delicate mucous membranes.

Discussion

An antiseptic which is intended for practical use in a general hospital must obviously be bacteriologically efficient but will clearly not be acceptable if its cost is out of relation to that of existing compounds. An important aspect of the factors which determine the cost of hospital antiseptics is the dilution at which they are used; with modern antiseptics this dilution is not a compromise between toxicity for the host and organism as hitherto, but between optimum strength and reasonable economy. Ideally, an antiseptic should not be toxic for human tissues but have bactericidal powers of a very high order. Practically, therefore, antiseptics should be used at the highest possible strength compatible with toxicity to the body. The usable concentrations of such compounds as dettol are effectively limited by the increased tendency towards reaction in sensitive individuals with stronger solutions. Many of the modern antiseptics on the other hand, are expensive to produce, and their manufacturers must be tempted to recommend the lowest concentrations consistent with efficiency. Use at such marginal levels is fraught with danger, and the principal advantage of better antiseptics should be that they can safely be used at more effective concentrations.

The tests described in this paper are concerned only with complete kill of bacteria. It is true that the inhibitory effect of many modern antiseptics extends far beyond their killing power, and indeed this inhibitory effect may well have a considerable bearing on clinical use. A great deal has been written concerning the necessity of using subculture media containing antagonists for the antiseptics being tested. Nevertheless, in our experience during tests designed to detect a total kill it was not necessary to use added inhibitors for the antiseptic in the subculture media, the protein content of which is itself strongly inhibitory. Our observations are in keeping with those of Baker and her colleagues (1941), who showed that lipids such as lecithin, cephalin, and sphingomyeline were ineffective antagonists unless they were added to a suspension of organisms before or at the same time as the quaternary ammonium salts. They concluded that these lipids were unsuitable for use as neutralizing agents once the organisms had been exposed to the antiseptic. Our experience also agrees with that of Rahn (1947), who discouraged the use of antagonists in standard methods of antiseptic testing. It may well be that in other types of test it is necessary to add materials to the subculture media which will inactivate any antiseptic carried over.

In considering the bacteriological evaluation of antiseptics it is necessary to decide whether they should be judged by their effectiveness in water or in the presence of organic matter and whether their ability to kill organisms quickly or just to inhibit their growth is the more important. For obstetrical purposes we felt that rapidity of action in the presence of protein material and blood is more significant than the ability to inhibit bacterial growth at very high dilutions in water. For other purposes, such as water sterilization, inhibition of growth may well be more important than a quick kill.

The types of organism used in these tests were chosen to provide a fair sample of bacteria which can cause infection in a maternity unit, and the greater part of the work was done with one strain each of *Ps. pyocyanea*, *E. coli*, *Staph. pyogenes*, and Group A β -haemolytic streptococcus, although comparisons were also made with *Cl. welchii* and *Cl. tetani*. Both sporing and non-sporing strains of *Cl. welchii* were used and, surprisingly, no difference was found in the capacity to survive, whether the particular strain was capable of sporing readily or not. After numerous tests it was found, contrary to expectation, that rapidly growing cultures which had been repeatedly subcultured were most resistant to the antiseptics. For example, if the vegetative forms of a sporing strain of *Cl. welchii* were killed by heating at 80° C. for 10 minutes the remaining spores were much more easily killed than a whole fresh culture containing many more vegetative forms.

TABLE V.—Ratio between Dilution Required for Complete Kill and Recommended User Strength. 48-hour Tests

	Recommended Dilution for Midwifery Lotion	Broth				25% Blood Broth			
		<i>Ps. pyocyanea</i>	<i>E. coli</i>	<i>Staph. pyogenes</i>	β -Haem. Strep.	<i>Ps. pyocyanea</i>	<i>E. coli</i>	<i>Staph. pyogenes</i>	β -Haem. Strep.
Hibitane 2%	1/40	100	400	500	5,000	2.5	40	40	400
Bradosol 5%	1/100	10	80	200	1,000	0.4	4	8	40
Dettol (4.8% chloroxylenol)	1/25	0.8	16	32	160	0.2	4	8	16
Cetavlon 1%	1/10	4	40	500	1,000	0.5	2	8	40
Roccal 1%	1/10-1/20	9-4.5	100-50	400-200	2-1,000	1-0.5	2-1	20-10	100-50
Milton 1% sodium hypochlorite	1/80	1.5	2.5	2	3				

TABLE VI.—Ratio between Dilution Required for Complete Kill and Recommended User Strength. 2½-minute Contact

	Recommended Dilution for Midwifery Lotion	Broth				25% Blood			
		<i>Ps. pyocyanea</i>	<i>E. coli</i>	<i>Staph. pyogenes</i>	β -Haem. Strep.	<i>Ps. pyocyanea</i>	<i>E. coli</i>	<i>Staph. pyogenes</i>	β -Haem. Strep.
Hibitane 2%	1/40	10	15	15	20	1	2.5	2	5
Bradosol 5%	1/100	1	15	10	30	0.2	1	1.75	1.5
Dettol (4.8% chloroxylenol)	1/25	0.6	12	8	16	0.2	4	2	2
Cetavlon 1%	1/10	1	10	10	20	0.4	1	2	2
Roccal 1%	1/10-1/20	1.5-0.75	15-7.5	20-10	40-20	0.4-0.2	1.0-0.5	2-1	2-1
Milton 1% sodium hypochlorite	1/20	0.025	0.025	0.025	0.0625				

The common practice of mixing soap solution with an antiseptic is not satisfactory in the case of the quaternary ammoniums and hibitane, but various detergents can be mixed with these compounds, if required, although most quaternary ammoniums are themselves surface-active. On the other hand, the use of soap for washing hands or the toilet of patients would have no effect on the subsequent effectiveness of these antiseptics, because it is unlikely that the amount of soap remaining on the skin after these procedures would be enough to inhibit either the quaternary ammoniums or hibitane. A very satisfactory mixture is one of hibitane and cetavlon, the latter conferring a detergent activity upon the preparation.

Because of the difficulty of defining a satisfactory strength at which the new antiseptics can be compared with the old, we have prepared Tables V and VI, showing the relationship between bactericidal power and manufacturers' recommended strengths for midwifery. The most exacting tests which we made, and also in our view the most relevant to practical obstetrics, were the 2½-minute contact tests between organism and antiseptic in the presence of fresh blood. By this standard none of the antiseptics tested showed a wide margin of safety, and, with the exception of hibitane, the ratio fell below 1. It is noteworthy that bradosol, cetavlon, and roccal fell below dettol and hibitane by this standard. However, in the case of dettol, the usable concentration cannot be increased without risk of irritation, whereas bradosol, cetavlon, and roccal could probably be used at higher concentrations were it not for their cost.

Hibitane achieves a reasonable balance by giving a ratio of 1 or over for all organisms and a substantial margin of safety for the most dangerous *β*-haemolytic streptococcus.

One inexplicable but repeatedly confirmed result appearing in Table VI was the action of dettol on *E. coli* in blood for 2½ minutes. This excellent result was out of keeping with those obtained with other organisms. We must reiterate that none of these antiseptics would kill *Cl. tetani* under conditions of contact for 2½ minutes, and we must emphasize again that, while hibitane, bradosol, cetavlon, and roccal can be used safely at concentrations greater than those recommended by the manufacturers, dettol cannot. Milton is, as previously stated, relatively inactive in the presence of organic material.

The final decision on which antiseptic to recommend for use in a hospital has to rest upon a balance of safety from infection, protection of patients from irritation and discomfort, acceptance by nursing staff, and reasonable economy. On the whole we feel that, after more than two and a half years' use, hibitane is the most satisfactory one available at present.

Treatment of Hands Before Putting on Operating Gloves.—Although certain units and individual surgeons may vary somewhat in their technique for "scrubbing up," there is a general measure of agreement that prolonged and careful washing and scrubbing with soap and water reduces the bacterial flora of the hands, although it has been suggested that it is possible to overdo the scrubbing and so displace deeply seated organisms. In many units after "scrubbing up" it is the practice to immerse the hands in a weakly antiseptic solution of spirit. To help render the hands aseptic we considered the possibility of glove powder containing 1% hibitane hydrochloride. After repeated tests in three individuals we were unable to convince ourselves that the addition of even such a powerful antiseptic in the dry state to glove powder was any advantage. On the other hand, we did find a considerable decrease in the number of bacteria recovered from the interior of surgical gloves if the hands had been rubbed with approximately 2 g. of antiseptic cream (hibitane 1%) after "scrubbing up" and before the application of formalized starch glove powder.

Summary

Consideration of antiseptics which can be used for midwifery lead to the choice of nine for test under the same conditions. Two main types of test were used:

prolonged (48 hours) and short (2½ minutes) contact in water and in the presence of protein and blood. The technical methods are described, and the results, using seven of the antiseptics on *Ps. pyocyanea*, *E. coli*, *Staph. pyogenes*, *β*-haemolytic streptococcus group A, *Cl. welchii*, and *Cl. tetani*, are reported. Clinical trials of those selected on this basis were made. The relation of these experiments to practical midwifery is discussed. Of the two antiseptics selected for clinical trial, "Hibitane," a new British compound, tried for two and a half years, was found satisfactory, and recommendations are made for its use in watery solutions, obstetric cream, hand cream, and as an alcoholic solution suitable for instrument storage and skin preparation.

The clinical trials described in this paper were only possible with the help and interest of our obstetric colleagues and the nursing and labour ward staff. We would like to thank Miss Mason, chief pharmacist, for her patience in compounding and distributing the different preparations tried. To the laboratory staff, and in particular Miss J. Gratwick, we wish to express our thanks for technical assistance. We thank the directors of Bayer Products for advice on quaternary ammonium compounds and for supplies of roccal for testing. Our thanks are also due to I.C.I. Pharmaceuticals for their willing co-operation in arriving at satisfactory preparations of hibitane and for generous supplies not only for laboratory testing but also for such prolonged clinical trial throughout the hospital.

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DIAGNOSIS OF CANCER OF LUNG AND STOMACH

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This paper is an account of two recent inquiries undertaken by the General Register Office—the first on cancer of the lung and bronchus, the second on cancer of the stomach.

Cancer of the Lung and Bronchus

During the past thirty years the deaths assigned to carcinoma of the lung and bronchus in this country have increased year by year until in 1954 they numbered 16,331, whereas between 1916 and 1920 they averaged only 428 per annum. What proportion of this recorded increase is real and what may be attributed to improved methods of diagnosis is a question impossible to answer in retrospect. It is, however, important to know if there is any likelihood that cancer of the lung is being over-reported and whether any great number of secondary growths due to an unknown or unreported primary focus have been included. A knowledge of the degree to which the more elaborate methods of diagnosis are employed and the proportion of cases in which the diagnosis is confirmed by such procedures is of considerable interest and should help to resolve this question.

To assemble the necessary data, a covering letter explaining the reason for the inquiry, with a questionnaire (see below), was sent from the General Register Office to the certifying medical practitioner in respect of every second death ascribed to cancer of the lung or bronchus in January, 1955. The response showed the great