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Experiments on the communion cup

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The work described in this paper was undertaken as the result of a request to the Medical Research Council for information on the danger of disease being transmitted by a common communion cup.

Besides the more direct approach, observations were made on the value of a cloth or purificator for wiping the rim of the cup after each communicant, and of rotation of the cup so that each communicant has a fresh portion of the rim presented to him.

A silver communion cup or chalice was used for these experiments with a bowl 12 cm. in diameter gilded on the inner surface. The cup was not polished in the course of the experiment, but merely washed well in warm running water and dried after each experiment. Sacramental wine was used; it was not diluted, because inquiries concerning this practice showed such diversity in custom in individual churches, some using the wine undiluted, that it seemed preferable to use the neat wine rather than to adopt an arbitrary concentration. Chemical analysis of the wine showed that the alcohol content was approximately 14·5%.

Part 1. Survival of organisms in saliva, wine and Ringer's solution on the chalice surface

Methods

A. *Numbers of organisms recovered from the chalice after drinking*

(i) Volunteers were asked to drink wine from the chalice. On the first occasion after drinking, a small area of the rim, 4 cm. wide by 2 cm. in depth, was swabbed on both the inner and outer surfaces with two calcium alginate swabs (Higgins, 1950). The first swab was moistened in 9 ml. of quarter-strength Ringer's solution, rubbed over the appropriate area and then broken off into the Ringer's solution; the second swab was used to remove excess moisture and broken off into the same Ringer's solution. One ml. of a 10% solution of sodium hexametaphosphate was added and the solution shaken gently for a few minutes to dissolve the swabs; this suspension was used for making plate counts. The experiment was repeated for each person.

On the second occasion the drinking area was wiped gently with a linen cloth after each person in order to imitate the use of the purificator in church. The same area of the chalice was then swabbed as before on both inner and outer surfaces.

Counts were made either from drops of known volume dried on the surface of

blood agar (Miles & Misra, 1938) or, when experience suggested that few bacteria would be present, in pour plates of nutrient agar containing 10% horse serum.

The experiment was repeated with several volunteers and in some instances with the same person on different occasions.

(ii) A similar experiment was carried out with six volunteers who drank from the communion cup in turn at approximately 5 sec. intervals. The cup was half filled with wine at the beginning of the experiment. A few drops of the wine were dropped onto the surface of blood agar as a negative control for the wine; this was repeated on a number of occasions with negative results. The inner and outer surfaces of the chalice were swabbed at the beginning of the experiment to determine the number of bacteria present on the cup initially. The communion cup was passed around the six volunteers four times, each time with a different procedure, and after each round, which took approximately 40 sec., the whole of the inner and outer drinking surfaces were swabbed to a depth of 2 cm. from the edge.

The variations in the procedure were carried out in the following order:

(*a*) All drinking from the same place.

(*b*) Rotating the cup so that each person drank from a different place.

(*c*) Drinking from the same place but wiping gently with a linen cloth after each person.

(*d*) Rotating the cup so that each person drank from a different place which was wiped after each person. This experiment was repeated on six different occasions.

B. *The survival of organisms present in saliva deposited on the surface of the chalice*

Saliva was collected in a sterile test-tube, and by means of a standard size platinum loop a small quantity was deposited on the dry chalice over an area approximately 4 cm. wide by 2 cm. in depth; this area was swabbed, according to the procedure described in section A, after different intervals of time up to 3 min. This was repeated for the inner and outer surfaces of the chalice.

C. *The survival of organisms suspended in wine and in Ringer's solution and deposited on the surfaces of the chalice*

Five cultures were used, two strains of *Staphylococcus aureus* F 6186 (phage type 6/7/42E/47/54/75) and St. 61.17004 (phage type 80/81), *Escherichia coli* type 1 and *Streptococcus pyogenes* (R.61.4139). A suspension of approximately 10^8 organisms per ml. was made from each in saline. One ml. of each suspension was added to 9 ml. of wine and 1 ml. to 9 ml. of Ringer's solution. A loopful of these suspensions was placed on the surface of the chalice as described in the previous experiment and each region was swabbed after different periods of time.

RESULTS

A. *Numbers of organisms recovered from the chalice surface after drinking*

The results are given in Tables 1 and 2. Table 1 shows the variability of the results obtained from one person and also that, although the wiping cloth usually removed a proportion of the organisms, the extent of the removal was variable.

Table 1. *Experiments to show the number of organisms deposited by individual persons on the chalice during drinking and showing the effect of wiping on the numbers of organisms recovered*

	Without wiping	With wiping
1A	1260	320
B	400	100
2A	20	None
B	None	None
3A	30	15
B	40	None
4A	2650	15
B	2730	100
5	20	20
6	20	100
7	25	None

Table 2. *Effect of wiping and of rotating the chalice on the numbers of organisms recovered from the drinking surface (six persons)*

	Experiment no.					
	1	2	3	4	5	6
Control swab from chalice	None	20	22	63	10	45
(1) Drinking from same place	485	2700	1700	7820	9200	1670
(2) Drinking from different places	910	3020	3320	7840	42900	5200
(3) Drinking from same place and wiping	215	125	320	790	1730	2300
(4) Drinking from different places and wiping	765	305	465	920	9440	80

Table 3. *Survival of organisms suspended in saliva when deposited on inner and outer surfaces of the dry chalice*

Time (min.)	Experiment 1		Experiment 2		Experiment 3	
	Outside	Inside	Outside	Inside	Outside	Inside
0	122,000	34,000	55,000	220,000	35,000	90,000
½	48,000	34,000	70,000	115,000	29,000	70,000
1	130,000	13,000	60,000	90,000	2,000	40,000
2	70,000	1,000	35,000	115,000	15,000	35,000
3	1,000	12,000	10,000	80,000	40,000	38,000

Table 2 shows the more consistent results obtained when six persons drank from the chalice, with and without wiping. More organisms were recovered from the chalice after rotating the cup to present a fresh surface for each participant

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than when all were drinking from the same place. This may be explained by the assumption that when each person took the wine from the same region some bacteria were removed and some others were deposited, whilst when the cup was rotated all organisms deposited by preceding participants remained, so that each person added a complement to the total. There was considerable variation in results from person to person as would be expected. No organisms were ever isolated from the wine itself, even after six persons had taken four sips each.

B. *Determination of the survival of various organisms present in saliva deposited on the surfaces of the dry chalice*

The results are shown in Table 3. In most instances there was a small reduction in bacterial numbers at the end of the 3 min. test. It appears that short intervals of time cannot be expected to sterilize the surface of the chalice or even to decrease the possibility of contracting disease unless certain organisms are exceptionally sensitive to these conditions. In fact the time elapsing between communicants may be as short as 3 sec.

Table 4. *Survival of* Staphylococcus aureus *suspended in wine and Ringer's solution and deposited on inner and outer surfaces of the chalice*

	F 6186				St. 61.17004			
	Outside		Inside		Outside		Inside	
Time (min.)	Wine	Ringer's solution	Wine	Ringer's solution	Wine	Ringer's solution	Wine	Ringer's solution
0	7830	3600	1020	1670	400	3190	5200	2170
½	4560	1250	330	210	1320	1650	1720	3370
1	4580	1790	850	490	1370	1390	740	3850
2	1180	3860	170	160	270	660	1620	1510
3	2450	1950	220	200	170	220	580	1440

Table 5. *Survival of* Escherichia coli I *suspended in wine and Ringer's solution on inner and outer surfaces of the chalice*

	Inside		Inside		Outside	
Time (min.)	Wine	Ringer's solution	Wine	Ringer's solution	Wine	Ringer's solution
0	530	720	230	2150	2970	7260
½	70	990	130	1400	1620	3820
1	50	780	30	290	1140	3700
2	20	340	20	890	700	2860
3	0	1110	60	780	80	2570

C. *Determination of the survival of various organisms, suspended in wine and in Ringer's solution, on surfaces of the chalice*

The results are shown in Tables 4, 5 and 6. There was always some reduction in the numbers of organisms recovered after 3 min., but it was rarely as great as 90 %.

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Experiments with *Staph. aureus* showed no difference between results obtained with the organisms suspended in wine or in Ringer's solution. However, experiments with *Esch. coli* and *Strep. pyogenes* showed that bacterial survival was greater in Ringer's solution than in wine.

Table 6. *Survival of* Streptococcus pyogenes *suspended in wine and Ringer's solution and deposited on inner and outer surfaces of the chalice*

	Inside		Outside	
Time (min.)	Wine	Ringer's solution	Wine	Ringer's solution
0	20	270	0	1330
½	0	225	45	1200
1	0	115	5	495
2	0	60	0	80
3	0	0	5	10

Part 2. Effect of wine and silver on various organisms

A series of fifteen experiments was carried out to investigate the effect of the wine and the silver and a combination of both factors on *Esch. coli* (026), *Staph. aureus* F 6186, *Serratia marcescens* NCTC 9940 and *Strep. pyogenes* (R.61.4139).

Initial inocula were approximately 100,000–200,000 organisms/ml. in 10 ml. wine held in sterile Universal containers with or without a lining of thin sheet silver. Similar receptacles with suspensions of the same organisms in 10 ml. quarter-strength Ringer's solution were used as controls for each experiment.

Exposure times varied from 15 sec. (the initial count) to 60 min. with sampling intervals of 1, 2 or 4 min. in different experiments.

The effect of exposure was observed either by noting growth or sterility in Todd Hewitt broth inoculated with a loopful of the experimental suspensions, or more exactly by pour plate counts.

In four experiments *Esch. coli* in wine was killed in 12 but not 10 min. (two experiments) and 14 but not 12 min. (two experiments); and, in two experiments out of three, silver reduced the killing time by approximately 1 min. in one experiment and 4 min. in the other. In the same four experiments *Staph. aureus* in wine was killed in 20 but not 18 min., in 12 but not 8 min., and in 18 but not 16 min. (two experiments). The effect of silver was to reduce the killing time by 10 min. in one experiment, by 4 min. in two experiments, and not at all in one experiment.

In two experiments *Serratia marcescens* in wine was killed in 16 but not 14 min., when silver had no effect, and in 12 but not 10 min. when silver reduced the time by 2 min.

In three experiments with *Strep. pyogenes* in wine, the organism was killed in 4 but not 2 min. in one experiment, when the time was reduced to 2 but not 1 min. by silver, and in 1½ but not 1 min. with no reduction by silver in two experiments. Examples of counts obtained in some of these experiments are given in Table 7.

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In a series of three experiments wine was reinoculated at intervals with the test organisms in an effort to simulate the continuous use of the common chalice. The same cup of wine could be used for a varying number of people depending on the size of the cup. It would take approximately 50 sec. to serve 10 persons, and perhaps 10 sec. would be used to return to the beginning of the row of people. It is likely that as many as seventy people could thus partake of the same wine in approximately 7–10 min. and during this time fresh organisms would be added to the wine. Refilling of the cup would dilute the residual wine and organisms, but with 200 communicants, for example, there could be a continuous inoculation process for 20 min. or so. This presupposes the carriage of similar organisms by a number of people which would perhaps occur only at epidemic times. These experiments will now be described.

Table 7. *Effect of wine and wine and silver together on various organisms*

	Count per ml. (2 days at 37° C.)							
	Esch. coli		*Staph. aureus*		*S. marcescens*		*Strep. pyogenes*	
Time	Wine	Wine and silver	Wine	Wine and silver	Wine	Wine and silver	Wine	Wine and silver
15 sec.	90,000	61,000	67,000	76,000	180,000	190,000	3,700	21,000
30 sec.	—	—	—	—	—	—	1,800	1,700
45 sec.	—	—	—	—	—	—	120	850
1 min.	—	—	—	—	—	—	90	120
1½ min.	—	—	—	—	—	—	< 5	< 5
2 min.	—	—	—	—	—	—	< 5	< 5
2½ min.	—	—	—	—	—	—	< 5	< 5
4 min.	7,900	6,800	14,000	3,800	160,000	1,200	—	—
6 min.	2,400	1,300	620	110	25,000	—	—	—
8 min.	580	70	80	70	8,900	120	—	—
10 min.	20	< 5	10	50	700	< 5	—	—
12 min.	10	< 5	< 5	5	< 5	< 5	—	—
14 min.	< 5	< 5	15	< 5	< 5	< 5	—	—
16 min.	—	—	5	< 5	< 5	< 5	—	—
18 min.	—	—	< 5	< 5	—	—	—	—

In two experiments suspensions of *Esch. coli* and of *Staph. aureus* in 10 ml. quantities of wine held in silver-lined universal containers were continually reinoculated with the same quantity of a suspension of the relevant organism in wine; the additions were made at 1, 3, 5 and 7 min. Samples were removed for counts at 2 min. intervals from 2–24 min. The original count taken at 15 sec. was 30,000/ml. for *Esch. coli* and 45,000/ml. for *Staph. aureus*, and the survival times reckoned from the first addition of the wine suspension to the universal containers were 14 but not 16 min. for *Esch. coli* and 18 but not 20 min. for *Staph. aureus*.

In a third experiment the same procedure of reinoculation was followed using *Strep. pyogenes*. Starting with a count of 4700/ml. at 15 sec. and reinoculating at 1, 1½, 2 and 2½ min. the streptococci survived for 3 but not 3½ min.

In a further experiment with *Strep. pyogenes* it was observed that, with an inoculum of approximately 670,000/ml., streptococci suspended *in neat wine*

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were destroyed in 3 min., but in wine diluted 1/2 to 1/256 with quarter-strength Ringer's solution the destruction time was lengthened but the actual time beyond 3 min. was not ascertained. In practice the dilution of wine with water varies according to the practice of the incumbent but it is likely that a few drops only of water will be added to any volume of wine.

The inhibitory effect of silver ions was demonstrated directly with *Esch. coli* but not with *Staph. aureus*. Two methods were used:

(*a*) 1 cm.^{2} portions of silver foil and glass (control) were introduced into an inoculated pour plate and incubated for 48 hr. at 37° C. Colonies of both organisms growing beneath both silver and glass were reduced in size but there was a noticeable reduction in numbers of colonies of *Esch. coli* only beneath the silver; the effect was most apparent in pour plates with small inocula.

(*b*) Nutrient agar plates were inoculated by flooding the surface with suspensions of *Esch. coli* or *Staph. aureus*; pieces of silver foil and glass were placed on the surface. On the *Esch. coli* plates the silver strips but not the glass were surrounded by a zone of incomplete inhibition about 0·5 mm. wide; also the growth under the silver strips was more scanty than that beneath the glass strips.

An experiment in which silver and glass strips were directly contaminated with drops of wine containing *Esch. coli* and *Staph. aureus*, and were inoculated into Todd Hewitt broth after various exposure times, was unsatisfactory. The results were irregular, with survival times for *Esch. coli* up to 20 min. on silver and 24 min. on glass and for *Staph. aureus* up to 24 min. on silver and 30 min. on glass.

The results of these experiments confirmed the findings described in Part I, namely that, with the organisms tested, the effect of the wine in destroying bacterial cells deposited on a chalice would not be fast enough, even for *Strep. pyogenes*, to take place during the rapid passage of the chalice from person to person. They show too that, although silver may enhance the destruction of bacteria by wine, the effect is too small to be of value.

DISCUSSION

The possible spread of infectious disease by the common communion cup has been under discussion for many years. Attention was concentrated on the subject in the United States of America by the observations of Forbes in 1894 and Anders in 1897.

According to Anders (1897), Forbes reported to the Rochester Pathologic Society 'in the dregs of the ordinary cup, contamination from both the mouth and clothing; from the former, epithelial cells, mucus, and various bacteria and spores; from the latter, fibrous material. Control experiments showed the unused wine to be practically sterile.' Without much more information than is given it would be difficult to assess the significance of these findings. The origin of the epithelial cells could have been the skin, and the sporing bacilli and fibrous material could have come from dust in the air.

Anders (1897) himself records very briefly the results of observations he made in 1894 with the assistance of Dr Furbush. Without giving any technical details

he states that he found tubercle bacilli in two out of five specimens of dregs from the communion cup, besides pus cells, oral epithelial cells and 'pus staphylococci'. Here again, it is difficult to assess the significance of the results. Acid-fast bacilli are common in dust and in water from metal taps and could not be distinguished microscopically from tubercle bacilli. It is improbable that the bacilli were cultured, and therefore the statement that tubercle bacilli were found must be accepted with the greatest reserve. No mention is made of how the 'pus staphylococci' were disinguished from ordinary staphylococci and micrococci that are common on the skin and in the mouth, nor how the epithelial cells were shown to be of oral origin.

The combined effect of the observations, and still more the pleading, of Forbes and Anders was to promote a lively interest in the use of individual cups for communion. Anders presses strongly for their adoption. He doubts whether at the Last Supper only one cup was used and whether it was, in fact, passed round. There is no explicit statement in the Gospels to this effect, and among Jews at the time of Christ individual cups are said to have been the rule.

The next series of observations appears to have been in 1925 by Page in the United States. According to Burrows & Hemmens (1943), Page took cultures from the rim of the chalice after use, and dropped the purificator (the cloth used for wiping the cup) into broth. Mice and guinea-pigs were inoculated with the cultures. Numerous organisms were isolated, mainly sporing and non-sporing bacilli, staphylococci, yellow cocci, white cocci and other cocci. Of the 18 mice inoculated 5 died, and of the 19 guinea-pigs inoculated 8 died. As Burrows & Hemmens point out, there is little evidence to show that these organisms were of salivary origin; it is more probable that they came mainly from dust.

Burrows & Hemmens themselves performed a number of experiments on both the communion cup and the purificator. There is no need to describe them in detail. Their main findings were that *Strep. pyogenes*, when suspended in filtered saliva, died off rapidly in contact with the silver chalice, a high proportion being dead within 2 min.; that 80–90 % of organisms were removed by the purificator; that under the most favourable conditions for transference only about 0·001 % of organisms were transmitted from the saliva of one person to the mouth of another; and that when conditions approximated to those in actual practice no transmission could be detected. Their general conclusions are that the communion cup cannot be regarded as an important vector of disease.

Rather different results were obtained by Gregory, Carpenter & Bending (1963) in Canada. They found that contact with the silver chalice had no apparent effect on cells of *Strep. pyogenes* suspended in saliva within 60 min., though when unprotected by saliva they died in the wine itself within 2–3 min. The difference between these results and those of Burrows & Hemmens was probably due to the use by Burrows & Hemmens of filtered saliva, which contained far less protective protein than raw saliva. Gregory, Carpenter & Bending studied the rate of passage of the chalice during communion services, and found that the average time between successive communicants was about 5 sec. From the test cup after a simulated communion service they isolated species of *Bacillus*, *Micro-*

coccus, *Neisseria*, *Staphylococcus* and *Streptococcus*. They point out that 5 sec. is far too short a time to effect destruction of these organisms and therefore conclude that the common communion cup and its contents could serve as vehicles for the rapid transmission of micro-organisms.

The results of our own experiments lie rather between those of Burrows & Hemmens and those of Gregory *et al.* They showed that the organisms in saliva, when in contact with the inner surface of the chalice, decreased in numbers within 3 min., and that *Strep. pyogenes*, when suspended in wine, perished on the inside of the chalice in between 2 and 3 min. Like Burrows & Hemmens, we found that the purificator removed about 90 % of the organisms on the rim of the cup. Rotation of the cup had less effect than was expected, probably because the time of complete rotation is too short to allow destruction of the organisms deposited on the rim, and partly because each person deposits traces of saliva of his own which replace those of the communicant before him. Rotation, in fact, benefits only the communicants in the first round of the cup. The rest are exposed to much the same degree of contamination as when the cup is not rotated.

On technical grounds it must be admitted that during an ordinary communion service the rim of the chalice inevitably becomes contaminated with the saliva of the participants; that the organisms present in the saliva of one person are transmitted to the next one in turn; that the combined effect of the wine and the silver of the chalice is insufficiently rapid to ensure the destruction of these organisms in the short interval between successive communicants; and that therefore the common communion cup must serve as a vehicle for the transmission of infective organisms.

After such an admission we must ask ourselves what is the risk of contracting infectious disease in this way. There are two main reasons for assuming that it is not great.

In the first place the number of bacteria on the lips, though varying greatly with different persons, tends to be small and the chance of pathogenic bacteria being among them may be very low indeed. When pathogens are present, the numbers are probably so small that the risk of ingesting them may be negligible. The body can deal with very small numbers of most pathogenic organisms, so that even if a few were ingested they would be unlikely to give rise to disease.

The second reason is an even stronger one. It is that the organisms which infect by the mouth, such as the typhoid and the dysentery bacilli, are not likely to be found on the lips. They are excreted in the faeces or urine and contaminate the fingers but not the lips. On the other hand it is thought that the pathogenic organisms that may be found on the lips are unlikely to infect by the mouth. Micro-organisms including viruses which are mainly responsible for respiratory disease gain access to the body through the nose, and possibly the conjunctiva, but do not as a rule, unless present in large numbers, give rise to infection by the mouth, although this may happen. It is hoped that persons with acute infection, particularly of the throat, will not communicate. But salivary carriage of *Strep. pyogenes* may occur in patients with or recovering from acute throat infection but fit enough to go to church, and the streptococcal count in the saliva may be quite

high (Hamburger, 1944). An additional point may be made, namely that many of the more easily transmissible diseases are diseases of childhood, and that in the Church of England few young children are communicants, and they are becoming fewer.

It is conceivable, of course, that a patient suffering from a syphilitic sore on the lip or in the mouth might contaminate the rim of the chalice and pass on infection in this way. The chances of this occurring are remote, but if such a person wished to partake of Holy Communion it is unlikely that the officiating priest would recognize the lesion.

Disease from tubercle bacilli follows the inhalation of infected particles. It may occur by mouth but for an infective dose the organisms must be present in large numbers and ingested over a long period of time.

It is difficult to assess the significance of the common communion cup in the transmission of infectious disease. The difficulty of obtaining definite proof, one way or the other, is almost insuperable. There are in any gathering, such as that in a church, other commoner and probably far more effective ways in which respiratory and alimentary infections can be spread. Unless quite unusual circumstances prevailed, it would be almost impossible to incriminate the communion cup.

What risk there is of transmission could be greatly diminished by the use of a purificator in between each communicant, or by the use of individual cups as practiced by many Protestant denominations; though we realize that not all officiating priests would agree to these practices. The risk could be removed also by substituting the method of intinction in which the bread is dipped within the wine so that both elements in the sacrament are given simultaneously. Clergy visiting the sick administer the elements in this way but there might be practical difficulties in adapting the method for large numbers of people. No objection was raised to the method of intinction at the Lambeth Conference of 1945 which, under Resolution 118, recommended that any part of the Anglican Communion should by provincial regulation have liberty to sanction administration by intinction as an optional alternative to the traditional method. However, the recent Liturgical Commission considering the new communion service emphasized very strongly that consecrated bread from one loaf and consecrated wine from one chalice should be delivered to the people (Liturgical Commission, 1965).

SUMMARY

Experiments were made to find out whether the common communion cup is likely to serve as a vehicle for the transmission of infection.

A silver chalice and sacramental wine containing 14·5% of alcohol were used.

Observations with volunteers showed that the number of organisms deposited on the rim of the chalice varied from person to person, but was usually quite small—less than 100.

Rotation of the cup was of no benefit except to those partaking during the first round, since the saliva deposited on the rim by each person in turn remained

to contaminate the cup during the second round, and the combined effect of the alcohol and the silver of the chalice was not rapid enough to destroy the contaminating organisms before rotation of the cup was completed.

On the other hand the use of a linen cloth or purificator led to a diminution of about 90 % in the bacterial count of the cup.

Organisms in saliva deposited on the interior of the dry chalice suffered some diminution in numbers within 8 min., presumably as the result of the disinfectant action of the silver, but the effect was too small to be of significance.

When suspended in wine and deposited on the internal surface of the chalice *Escherichia coli* suffered a substantial reduction within 3 min., *Streptococcus pyogenes* was destroyed completely; but *Staphylococcus aureus* was affected to a much less extent.

Various experiments designed to measure the disinfectant action of wine, and of silver and wine together, showed that the augmenting effect of silver on the disinfectant action of the alcohol was quite small. *Strep. pyogenes* proved to be far more sensitive to alcohol than *Esch. coli*, *Staph. aureus* and *Serratia marcescens*. Under the conditions of the experiment these last three organisms were not destroyed for 10–12 min., whereas *Strep. pyogenes* perished within $1\frac{1}{2}$ min.

The results of our work are in general agreement with those of previous workers, and show that the organisms deposited on the rim of the communion cup are not destroyed within the short time—5 sec. as an average—elapsing between the partaking of the sacrament by each successive communicant.

It must therefore be admitted that the common communion cup may serve as a means of transmitting infection. Reasons are given, however, for believing that the risk of transmission is very small, and probably much smaller than that of contracting infection by other methods in any gathering of people.

Such risk as there is could be greatly diminished by the use of a purificator for wiping the cup between each communicant, and could be abolished completely by substituting individual cups or by the practice of intinction.

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