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THE COMMON DRINKING CUP

By W. A. MATHENY, Clark University

The history of the movement against the use of the common drinking cup dates back three and one-half centuries. According to some old letters recently found by Martin (9) in the library of the city of Zürich, Zanchiny, a former student of Calvin and at one time Professor of Theology at Strasbourg, insisted on individual communion cups, and especially was this enforced during the Plague of 1564. Among other manuscripts he found interesting documents showing that in 1783, Christian Gottfried and a little later, Johann Daniel Metzger, raised serious objections to the common cup giving as a reason his belief that syphilis may be transmitted by it.

Scientific investigation of the problem did not begin until about ten years ago. Metzger and Mueller (10) made diligent inquiry among one hundred and twelve physicians. Their results showed that the promiscuous use of the public cup offers beyond a question of doubt positive and serious dangers. By inoculating guinea pigs in the usual manner Roepke and Huss (19) were the first to prove definitely that tuberculosis can be transmitted from one mouth to another by means of the drinking glass.

One of the best experimental studies on the survival of infectious germs on glasses and forks was made by von Esmarch (6). Drinking glasses and forks were smeared with saliva mixed with cultures of tubercle bacilli and other microbes. He found that bacteria in a living condition adhere persistently to the dishes even after a careful washing. The edges of drinking glasses and the tines of forks were washed in cold water and wiped with a sterile cloth. They always showed infecting power after this process. Washing in lukewarm water gave no better results. Efficient disinfection can be obtained by allowing the utensils to remain five minutes in water at 50° C. Evidence of the tubercle bacilli even appeared after this method was employed. Washing in boiling water for one minute gave satisfactory results as did also washing in water at 50° to which had been added two per cent. carbonate of soda. Esmarch concluded that the ordinary washing of dishes has little value in getting rid of living organisms.

Cristiani and de Michelis (3) experimented along the same lines using different methods. In place of rubbing the objects with the saliva mixed with the cultures of bacteria as was done by Esmarch, they approached more nearly the natural conditions. A small portion of a culture of *Bacillus prodigiosus* was placed in sterile water and shaken until the bacteria were evenly distributed through it. A drop was then placed on the tongue and allowed to diffuse through the mouth cavity. Many perfectly sterile glasses were then immediately placed to the lips as in the process of drinking. The edges of these glasses were afterwards touched to the surface of plates of nutrient media. In every plate abundant growths of *B. prodigiosus* resulted showing beyond a doubt that the saliva is able by the simple contact which exists in the act of drinking to contaminate the edge of the glass sufficiently so that the germs of one mouth may be carried to another mouth.

Their work on the sterilization of glasses gave somewhat different results from those obtained by Esmarch. They contaminated the glasses with *B. prodigiosus* by the same method that he used. In their process of cleaning they proceeded as follows:

1. A series of three glasses were all simply wiped with a sterile cloth without washing.

2. Another series was rinsed in a basin of cold water and afterwards wiped as one wipes generally in the kitchen, that is, with little energy.

3. A third series was washed as the preceding and rinsed afterwards in pure water then wiped as one wipes in the laboratory, that is, carefully.

The results obtained showed method 1 to be positive; method 2 also positive but the colonies were less abundant. Method 3 showed some positive and some negative.

These experiments were repeated with *Staphylococci*, *Streptococci* and the *Bacillus* of Loeffler. The glasses were contaminated according to Esmarch's method. The results were practically the same as those stated above for *B. prodigiosus*. The writers conclude that careful washing is extremely beneficial.

Saroglau (22) experimented with spoons and drinking vessels using *Bacillus prodigiosus*, *B. subtilis* and *Staphylococci*. Smears of these three forms were placed on the glasses and spoons in three different solutions,—pure water, albuminous water and saliva. The test for the presence of bacteria remaining on these utensils was made by touching them to the surface of the nutrient media. *B. subtilis* was found on the glasses twenty-three days after it was smeared there in the ordinary water solution, and twenty-six days after on the

saliva glasses. The saliva-Staphylococci glasses gave positive results when tested at the end of four days. *B. prodigiosus* on the saliva glasses was also positive at the end of four days.

The same writer made some extensive studies with the common cup used in communion service. He found it to carry bacteria in a living condition, the wine used having absolutely no effect on the organisms.

He further reports cases of syphilitic infection occurring in certain student societies where the common drinking cup was used. He is strongly of the opinion that infection of this kind can occur through the use of the public cup.

By means of guinea pig inoculations Price (18) has proved that table utensils used at Sanatoria are good carriers of tuberculosis. The washings from forks, cups, spoons, etc., used at one meal by consumptives were injected into eight guinea pigs. Forty-one days later six, or seventy-five per cent., of the pigs, were found to have tuberculosis.

In another experiment on similar utensils he found that no tubercle bacilli survived when the articles were thoroughly washed with soap and water as hot as the hands could stand and then rinsed in boiling water.

In this country objection was first raised to the common cup by VanDerwerken (23) in 1892. In 1898 Anders (1) found tubercle bacilli and Staphylococci in the dregs of a communion cup used in a Philadelphia church. Five years later Kinyoun (7) isolated pneumococci and the Klebs-Loeffler bacilli from a public drinking cup taken from a railway coach.

The results obtained by Davidson (4) in 1908 gave the movement a great impetus. He made extended studies of various public drinking vessels. On cups taken from a school room he found both tubercle bacilli and pneumococci. That there could be no doubt of the identity of these organisms he isolated them, grew them in pure culture and inoculated guinea pigs. His evidence is convincing in every particular. In other experiments he isolated from school cups Streptococci apparently the same as those occurring in sore throats and tonsillitis. The pus germ *Staphylococcus aureus* was present also.

In another study Davison (5) reports securing a cup from a well on a college campus where it had been used for weeks by workmen and by students. By inoculating a guinea pig with the washings of this cup he proved that it bore living and virulent tubercle bacilli. A cup taken from a railway station when examined in a like manner showed tubercle bacilli. He summarizes his experiments by saying that "Thirty-seven and one-half per cent. of the public drinking cups examined for the presence of pathogenic germs, bore tubercle bacilli." He

further states that "These revelations, the reader will note' harmonize with the well-known fact that half of the individuals of the human race in civilized countries are infected with the tubercle bacillus before the twentieth year."

In this connection the germ content of the mouth becomes of considerable interest and importance. That many people apparently in good health may carry pathogenic organisms in their mouths has been demonstrated by a large number of investigators. This condition is especially true among convalescents. We have already cited indisputable evidence that a part of the germ content of the mouth is deposited on anything touched by the lips, especially is this true with glasses, cups, forks, spoons, etc. Davison (5) says: "An examination of a hundred glass slips touched by the lips of different persons showed the number of germs deposited on each to vary from a few hundred to more than a hundred thousand. Three clean, sterile glasses filled with sterile water and each used once by a child presented rich infection under the microscope. All bore bits of dead skin. Number 1 had on its brim approximately 13,000 bacteria; number 2, 20,000; and number 3, had 28,000."

An experiment similar in nature was performed in our laboratory. A hundred glass slips were touched by the lips of different people and then subjected to microscopic examination. The results in no way differ from those obtained by Davison.

Of intense interest is a recent experiment performed by the Department of Health of the City of New York. The information was sent the writer by letter from the Sanitary Superintendent, Dr. Walter BenseL. There seems to be no published account of this work so the entire letter is quoted.

NEW YORK, Sept. 12, 1910.

W. A. MATHENY,
Clark College, Worcester, Mass.

Dear Sir: In response to your letter of September 5, requesting information concerning the tests made by the Department of Health with common drinking cups, I beg to submit the following:

In making the tests twenty-two patients of the Willard Parker Hospital of this department were used. Nine of the patients had diphtheritic membranes and diphtheria bacilli were present in the throat of every patient. Each patient drank water from a sterile glass, the place where the patient's lips touched the glass was marked for identification. The glasses were allowed to dry after which a culture was taken from the portion of the glass touched by the lips of the patient. The results are shown below:

In addition to showing the presence of diphtheria bacilli, all of the cultures with the exception of two showed the presence of streptococci.

Respectfully, WALTER BENSEL, M. D.
Sanitary Superintendent.

Number of Patients	Period elapsing between the time the glass was touched by the patient and the time the culture was taken.	Results of cultures from glasses (diphtheria bacilli present.)	Per cent.
8	10 minutes	3	37.5
5	1 hour	2	40.
4	4 hours	1	25.
5	18 hours	2	40.

Slack, Arms, Wade and Blanchard (21) in their examination of 8,531 Boston school children conclude that, "At least 1 per cent. of all healthy school children are carriers of morphologically typical diphtheria bacilli (Wesbrook's A, C and D types)."

Pennington (17), of the Philadelphia Health Bureau, has made investigations among well school children. In twenty-five schools taken at random she found 9.3 per cent. of the children infected with diphtheria-like organisms. About one-eighth of these organisms were highly virulent to guinea pigs.

Von Sholly (20) examined the throats of one thousand tenement-house children who came to the hospitals and dispensaries of New York City. Children suffering from anything suggesting a "sore throat," nasal discharge, or laryngitis, were not included in the experiment. Of this number eighteen or 1.8 per cent. showed virulent Klebs-Löffler bacilli.

From the experiments cited and from the works of Neumann (14), Park and Beebe (15), Kober (8), Müller (13), and many other investigators we may conclude that at least a half-million people in the United States carry in their mouths or throats typical diphtheria bacilli. More than a fifth of these are virulent and ready to do deadly work on reaching a susceptible person.

Park and Williams (16) have isolated typical pneumococci from about one-half of all mouths of well persons examined.

Miller (11, 12) was able to discover typhoid bacilli in the sputum of the mouths of apparently healthy persons. Bulkley (2) in his book, "Syphilis in the Innocent," details many cases, and even epidemics, of syphilis transmitted by means of spoons, knives, forks, glasses, jugs, tobacco, pipes, etc. It is now known to science that the specific organisms of all the common diseases of this country except five are found in the mouths of different persons.

The evidence cited certainly more than justifies the action that had been taken against the use of the public drinking cup. It is now, Feb. 1911, abolished by law in seven states. Kansas, in March, 1909, was the first state to take this action. Similar action has since been taken in Oklahoma, Michigan, Wisconsin, Massachusetts, New Hampshire and Mississippi. Thirty additional State Boards of Health have condemned the public cup and expect to abolish it in the near future. In six states such legislation is now pending.

At a recent meeting of the national Federation of Women's Clubs held at Cincinnati a movement was started among its million members to abolish the common cup in every state in the Union.

More than forty railroads throughout the country have substituted the individual paper cups for the old time rusty cup familiar to every one. The movement is rapidly gathering momentum and threatens to abolish in every state "this symbol of equality and good fellowship," as it was explained to the writer by a physician "not yet convinced." In theatres, department stores and public buildings of all kinds the old cup that has served for ages is seen no more.

The public schools throughout the country are rapidly awakening to the problem. In a very large per cent. of our cities some form of bubbling fountain or the individual cup is now used. It is evident that the former is more hygienic and should be used wherever it is possible to have it.

Of all the fountains now in use the style which is run by foot-power seems to give the best results. A slight pressure with the foot on a pedal at the base of the fountain starts the water flowing in a uniform stream. When the stream is not flowing a dust-proof cap protects from contamination the orifice through which water is delivered to the consumer. It is economical in the amount of water used, the flow being discontinued at the will of the drinker. The continuous flow bubble fountain is not desirable on account of its great waste of water. One model of the former fountain can be set up in any sink, and is adjustable to any height. Another model is made in different heights thus rendering it suitable for any grade of pupils. An important consideration in favor of this fountain is the fact that there is no way of tampering with the apparatus to regulate the size of the flowing stream. This removes a factor which has caused other fountains to be used as "playthings" by the pupils. Considered from every point of view this style of fountain is, in the opinion of the writer, the most satisfactory one now on the market.

There are a great many different varieties of individual cups now in use. In practice the glasses give better results than

the paraffin cups. The latter are soon soiled and as they are unwashable their sanitary nature is soon lost.

If individual cups must be used then there should be more attention paid by those in charge to the conditions under which the cups are kept when not in use. It is common practice for the pupils to keep their cups in their desks, a method which is both inconvenient and unhygienic. A better plan is the one now used in several states. The cups are numbered and hung on numbered pegs in a dust-proof case which is usually kept in one corner of the schoolroom. This allows of a better inspection of their cleanliness on the part of the teacher and makes it convenient for all concerned. The school should own these cups and should assume the responsibility of keeping them sanitary.

In making inquiry among the teachers of this city where the individual cup is in use, we have found that some of the teachers insist that the cups be washed regularly, while others give the matter little or no attention. Each child is supposed to supply its own cup and keep it in its desk when not in use. The great majority of pupils do this; although there are some who do not. The latter class borrow from the former class or do without drinking. Practice shows that it is not possible to control the borrowing and lending of cups among the pupils.

That the borrowed individual cup may offer serious dangers to the user is well established. Six individual glasses were obtained from some of the schools of this city and examined by the usual laboratory method. Two were pronouncedly filthy while the remaining four were found to be far from sterile. On staining these glasses they were found to bear *Staphylococci* *Streptococci*, and *Bacilli* in great numbers.

Another disadvantage of the individual cup is found in the attitude assumed towards it by the larger pupils,—namely that it is childish for them to carry a drinking glass about with them. The principals and teachers of this city are united in the opinion that the bubbling fountain is from every point of view more desirable than the individual cups.

SUMMARY AND CONCLUSIONS

I. Science offers clear and positive evidence that living virulent pathogenic organisms are transmitted from mouth to mouth by means of the common drinking cup.

II. Sentiment against the use of the public cup is spreading rapidly. Laws abolishing it have been passed in at least seven states.

III. The bubbling fountain and the individual cups are being used in place of the common cup. In schools the former

gives better results and should be maintained where it is possible to have it.

IV. This movement is neither a "frill" nor a "fad" in education. It is a fight for the protection of public health and is of public interest. There was a time when an epidemic of diphtheria was looked upon as "the wrath of Providence." To-day we charge it to ignorance and hasten to find the source. When the public cup is abolished far and near a deadly blow will be given to this and many other spreaders of disease which are now rooted in the ignorance of the people. The common drinking cup has had its day.

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