
THE PUBLIC DRINKING CUP.***Bacteriological Report.**

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It was suggested long ago that the public drinking fountain with its chained cups is decidedly unsanitary but few investigations are on record to prove this point scientifically. In the hope of adding something to the somewhat indefinite knowledge and to find out if possible exactly what objectionable species of bacteria were present, we made a series of ten bacteriological examinations of drinking cups from various fountains. In selecting cups for the examinations those which appeared to be decidedly unsanitary as well as those which appeared cleanly and connected with fountains which were used by the higher strata of society were selected.

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The study of the bacteriology of the drinking cup is in a way closely connected with the study of the bacteriology of the mouth and the body surfaces surrounding the mouth. The bacteria which infest the mouth and proximate surfaces and orifices we would be quite liable to find on the cup which came in contact with that organ and with the surfaces of the body which are in immediate proximity. In comparing the species of bacteria found in our examinations with those reported as having been isolated from the mouth, we find our assumption verified in several cases.

The method of examination was as follows: A sterile cotton swab containing a little moisture was passed over the edge and interior of the drinking cup and this in turn drawn over the surface of sterile agar and Loefflers' blood serum contained in test tubes. The media was 1% acid to phenolphthalein. Cover glasses were also smeared and stained, after drying and fixing, with anilin gentian violet, Loefflers alkaline methylene blue, and by Grams' method. The cultures after being grown for 24 hours at 22° C. and 37° C. were diluted and plated in Petri dishes after which cultures were made according to the ordinary bacteriological technique. The bacteria were differentiated by means of Chester's "Manual of Determinative Bacteriology" and Matzuschita's "Bacteriologische Diagnostik." The pathogenic power of certain species of bacteria was tested on guinea pigs and rabbits. Frequently the cover glass preparations showed bacteria which we were unable to cultivate and consequently were unable to determine the species. Without doubt there were other bacteria present on the cups which were not revealed by cultivation or on cover glass preparation. No attempt was made to cultivate anærobic bacteria except in two cases.

Ex. No. 1. Swab was taken from a cup in connection with an ice tank in the hall of one of the state charity institutions. The cup was used in the main by visitors and employees. The cover glass preparation and cultural experiments showed the following bacteria to be present.

1. *Micrococcus citreus* (Sternberg). Distributed in air normally.

2. *Micrococcus pyogenes albus* (Rosenbach). A pyogenic bacterium. Common. The pathogenesis of this particular organism was not great, guinea pigs dying only after 7 to 8 days. Widely distributed over the body surfaces.

3. *Sarcina lutea* (Flügge). Widely distributed in air and water.

4. *Pseudomonas flourescens*, var. liq. (Flügge). Widely distributed in air, etc.

Ex. No. 2. Swab taken from same cup as No. 1. A child (visitor at the hospital) had become sick and after vomiting was

given a drink from the cup. The swab was taken directly afterward. The cover glass preparation showed some bacteria which we were not able to cultivate. The following bacteria were shown to be present:

1. *Sarcina lutea* (Flügge). (See above).
2. *Micrococcus liquifaciens* (v. Besser). First isolated from nasal mucus.
3. *Micrococcus pyogenes aureus* (Rosenbach) Pathogenic (pyogenic). Common.
4. *Micrococcus pyogenes albus* (Rosenbach). Pathogenic (pyogenic). Common.
5. *Pseudomonas fluorescens* var. liq. (Flügge). (See above.)
6. *Bacillus vulgatus* (Trevisan). Widely distributed.
7. *Bacterium buccalis*. Isolated first from healthy sputum.

Ex. No. 3. Swab was taken from a cup in connection with an improvised water tap and was used by several hundred workmen. The cup remained in the dirt and mud underneath the tap the most of the time. The following bacteria were shown to be present.

1. *Sarcina aurantica* (Flügge). Widely distributed in air and water.
2. *Micrococcus roseus* (Bumm). Widely distributed in air.
3. *Micrococcus pyogenes albus* (Rosenbach). (See above.)
4. *Streptococcus pyogenes aureus* (Rosenbach) *St. erysipelatis* (Fehleisen). A virulent pyogenic bacterium which may cause a variety of disease conditions.
5. *Pseudomonas janthina* (Zopf). Distributed in water.
6. *Spirillum rubrum* (v. Esmarch). Distributed in water.

An effort was made to trace any cases of streptococcus infection which might have resulted from this cup but owing to the difficulty of getting at the workmen this could not be done. It should be noted in this case that there are no soil bacteria present notwithstanding the fact that the cup was frequently contaminated. No anaerobes could be demonstrated in this case.

Ex. No. 4. Swab was taken from a cup in connection with a public drinking fountain in Chicago. The following bacteria were shown to be present:

1. *Sarcina lutea* (Flügge). (See above.)
2. *Sarcina aurantica* (Flügge). (See above.)
3. *Micrococcus pyogenes albus* (Rosenbach). (See above.)
4. *Bacillus formosus* (Ravenel). Distributed in water.
5. *Pseudomonas fluorescens*, var. liq. (Flügge). (See above.)
6. *Bacterium mycoides* (Flügge). Distributed in soil and water.

The primary cover glass preparation showed a leptothrix which could not be cultivated. This bacterium was in all probability *Leptothrix buccalis maxima*, (Miller).

Ex. No. 5. Swab was taken from a cup at a pump at a well on a country road along which there was a great amount of travel. The well was about 30 feet deep and covered with a board platform. The following bacteria were shown to be present:

1. *Sarcina lutea* (Flügge). (See above).
2. *Sarcina aurantica* (Flügge). (See above).
3. *Sarcina tetragena* (Koch). Slightly pathogenic and frequently associated with tubercular processes in the body.
4. *Bacillus coli* (Escherich). The normal habitat is the intestinal tract of man and animals. It has been isolated from the mouths of healthy persons.
5. *Bacillus subtilis* (Ehrenberg). Widely distributed. Common "hay bacillus."

It was extremely dusty in the vicinity of this well. There was an outhouse about 30 feet from the well but on the side of the hill below. It does not seem probable that the well was infected from this source. No cases of typhoid fever or other disease were reported in the vicinity.

Ex. No. 6. Swab was taken from a cup in Chicago. The following bacteria were shown to be present:

1. *Micrococcus aureus* (Flügge). Distributed in air, etc.
2. *Micrococcus pyogenes aureus* (Rosenbach). (See above.)
3. *Sarcina aurantica* (Flügge). (See above.)
4. *Sarcina lutea* (Flügge). (See above.)
5. *Bacillus amylobacter* (v. Tieghem). Widely distributed.
6. *Bacillus coli* (Escherich). (See above.)

The water coming to the fountain where this cup was found came from four miles out in Lake Michigan.

Ex. No. 7. Swab was taken from a cup in connection with a fountain in a city of 40,000 in Wisconsin. The following bacteria were shown to be present:

1. *Spirillum rubrum* (v. Esmarch). (See above.)
2. *Sarcina lutea* (Flügge). (See above.)
3. *Micrococcus pyogenes aureus* (Rosenbach). (See above.)
4. *Micrococcus radiatus* (Flügge). Widely distributed.
5. *Bacterium pneumoniae* (Zopf). (Penumococcus). Found frequently in normal mouths.
6. *Bacillus prodigiosus* (Ehrenberg). Widely distributed. ("Bloody bread bacillus.")

Ex. No. 8. Swab was taken from cup in a railway station in Chicago at six o'clock in the evening when the station was crowded with people returning from the city. The following bacteria were shown to be present:

1. *Sarcina tetragena* (Koch). (See above).
2. *Sarcina aurantica* (Flügge). (See above.)
3. *Sarcina lutea* (Flügge). (See above.)
4. *Micrococcus roseus* (Bumm). (See above.)

5. *Micrococcus pyogenes albus* (Rosenbach). (See above).
6. *Micrococcus pyogenes aureus* (Rosenbach). (See above.)
7. *Bacillus prodigiosus* (Ehrenberg). (See above.)
8. *Bacillus amylobacter* (v. Tieghem). (See above).
9. *Saccharomyces cerevisiæ*. (Yeast). Frequently found in the mouth.

Ex. No. 9. Swab was taken from a cup at a drinking fountain in a small town of 4,000. The water was running in a swift stream on the cups in the bowl beneath and consequently a great many bacteria were washed off. The following bacteria were shown to be present:

1. *Spirillum rubrum* (v. Esmarch). (See above).
2. *Sarcina aurantica* (Flügge). (See above.)
3. *Bacillus sporogenes* (Klein). A pathogenic bacterium which killed a guinea pig in 48 hours when inoculated subcutaneously. This species is very similar if not identical with *Bacillus areogenes capsulatus* (Welch). Anærobic.

Ex. No. 10. Swab was taken from a cup found in connection with a water tap in a large steel works. The cup was used by a large number of foreign workmen. The following bacteria were shown to be present:

1. *Micrococcus citreus* (Sternberg). (See above.)
2. *Micrococcus lutea* (Cohn). Distributed in water and air.
3. *Micrococcus pyogenes aureus* (Rosenbach). (See above).
4. *Sarcina aurantica* (Flügge). (See above.)
5. *Bacterium pneumoniae* (Zopf). (See above.)
6. *Bacterium rugosum*—An organism found normally in milk and cheese.

There were no bacilli demonstrated, *i. e.*, no motile forms.

SUMMARY.

The main facts to be noted as shown by these examinations are: (1) The comparatively few species of bacteria which are represented in the ten examinations; only 26 in all. (2) The presence in eight out of the ten examinations of the pyogenic or pus producing bacteria, *viz.*: *M. pyogenes aureus* and *albus*, etc. (3) The presence of the *Streptococcus pyogenes aureus* in one case and the *Bacterium pneumoniae* in two cases. These bacteria have been repeatedly isolated from normal and diseased mouths and throats and according to some investigators are closely related if not the same organism. Reudiger* found the streptococcus in 30 out of 51 times in normal throats. (4) The absence of the mouth bacteria proper. Miller† describes 30 species of bacteria infesting the oral cavity. (5) The Colon bacilli reported may have been present in the water coming in contact with the

* Reudiger—Journal of American Medical Ass'n, Vol. 47. Oct. 13, '06

† Miller—Micro-organisms of the Human Mouth.

cup, it having been contaminated by sewage, or the bacteria might have come from the mouth of some person using the cup. In all probability the bacteria came from sewage contamination of some kind. It is interesting to note, however, that *Bacillus coli* has been shown repeatedly to be present in the mouth of normal as well as diseased individuals. (6) The presence of other pathogenic bacteria, viz.: *Sarcina tetragena* and *Bacillus sporogenes*, should be noted. (7) The presence of certain water and air bacteria in nearly every case (*sarcina*, etc.) is undoubtedly explained by their wide distribution. The lack of the *Saccharomyces* groups (yeasts), with one exception, should be noted. These groups are almost always present in the mouth.

From these few examinations it is evident that the public drinking cup may serve as a carrier of infection, particularly pyogenic infections. There is no reason why other infections may not be carried in the same way. Cases have been reported where the *Bacterium tuberculosis* has been found in communion cups and cases are also on record where syphilis has been transmitted by contact with drinking cups. The general public is beginning to recognize the importance of the hygienic drinking fountains and fountains without cups from which the water flows in a slow stream which can easily be taken into the mouth without contamination, are beginning to be installed. In certain localities individual cups and paper drinking cups which can be used but once are quite popular. The sooner we recognize the importance of all these details in hygiene the sooner will we be able to control and prevent infectious diseases among us.
