

OBSERVATIONS AND EXPERIMENTS ON DISH-WASHING*

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SO FAR as we know there has been no investigation on dishwashing as performed in public restaurants. That dishes are possible vehicles for disease transmission is recognized in the laws against common drinking cups and in the practice of sterilizing dishes used by patients suffering from infectious diseases. Although the latter practice is almost universal and although it is well known that sometimes persons in apparently good health discharge infectious material from the mouth, no attempt has been made to determine to what extent such material may be transmitted to patrons of restaurants using common dishes. It was decided, therefore, to inspect a representative number of restaurants in New York City, and to test out experimentally the efficiency of the methods in use.

Restaurants can be grouped on the basis of dishwashing, into two classes: (1) those using the hand method of dishwashing, comprising by far the larger number, and (2) those using mechanical apparatus.

DISHWASHING BY HAND METHOD.

Twenty-two of the establishments visited used the hand method of dishwashing. These included both cheap and highclass restaurants.

Inspections.—The glasses used at

the drinking fountains of the average quick lunch restaurant are not washed at all. Usually, there are a dozen or more glasses on a shelf above the water faucet, which, after use are rinsed off and placed upside down to drain. These glasses are not washed, and are therefore, little better than poorly rinsed common drinking cups.

The practice relative to the cleaning of glasses in confectionery stores is poor. Glasses after use are rinsed off and used again without drying them for serving soda water to a second patron. The spoons are shaken around in water and stood in metal containers from which, although frequently wet, they are served to the next patron.

Although in the restaurants of this group there is considerable variation in the care exercised to produce clean dishes, the process is substantially the same in all places. The dishes are placed in large dish pans containing warm soap water, are rubbed with a dish cloth and then removed to another dish pan containing warm water for the purpose of rinsing off the soap. They are next removed to a draining board and then dried with a towel. In several of the establishments the dishes are not dried with towels, being allowed to dry in the air, the waiter rubbing them with a napkin to remove noticeable spots before

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placing them on the table. The temperature of the dishwater was, in every case, below 45° C. This is unavoidable because the dishwasher must constantly introduce his hand into the water.

Bacterial Data.—Bacterial counts were made from samples of dishwater and from moist sterilized swabs rubbed over cups, spoons, forks, etc. As expected, the counts fluctuated greatly. Naturally, if dishes upon which there had been milk were washed, the dishwater counts would be high; if, on the other hand, the water were changed at the beginning of the inspection, as frequently happened, the counts would be low. Consequently no conclusion on the care exercised in washing dishes can be reached from the bacterial counts obtained either from the dishes or the dishwater. The counts obtained, however, are included below for comparison with those obtained from the water of the mechanical dishwasher to be described later. Although no definite conclusion as to the efficiency of the hand method of dishwashing is advanced as a result of study of the bacterial data, we should like to draw attention to the large number of high counts obtained from dishwater and from swabs of spoons and cups.

BACTERIAL COUNTS—HAND DISHWASHING.

Dishwater—per cc. on agar (24 hrs.).

No. of bacteria.	No. of places.
Between 1-100.....	1
Between 1000-50,000.....	5
Between 50,000-100,000.....	1
Between 100,000-300,000.....	6
Between 300,000-500,000.....	4
Above 500,000.....	1
Not taken.....	4

Swabs from spoons.

Between 1-100.....	8
Between 100-1,000.....	6
Between 1,000-50,000.....	3
Above 50,000.....	3
Not taken.....	2

Swabs from rims of cups.

Between 1-100.....	4
Between 100-1,000.....	5
Between 1,000-5,000.....	11
Over 50,000.....	2

Tests on Manual Dishwashing.—

Since little information can be obtained from direct examination of dishes and dishwater, series of tests were conducted for the purpose of observing the reduction in the bacterial counts of dishes artificially infected and subsequently washed in a restaurant. Sets of dishes were smeared with bacteria suspended in salt solution, in broth, and in egg albumen. These bacterial suspensions were left to dry on the dishes before the latter were washed. The bacterial suspensions were made up from a salt solution suspension of an agar slant of *Bacillus pyocyaneus*. Equal quantities of the suspension of *Bacillus pyocyaneus* were added to tubes containing 10 cc. of salt solution, 10 cc. of broth and 10 cc. of egg albumen. The dishes were smeared with equal quantities of these suspensions so that, in a measure, the reductions due to washing would be comparable. The dishes after being washed in the kitchen of a clean lunch room were returned to the laboratory. The surfaces were carefully rubbed with sterilized moist swabs and the washings plated out in agar.

While the cleansing of the dishes was, no doubt, unusually thorough, since the object of the experiment was

known by the dishwasher, the reduction effected by the hand washing was even much greater than we expected. The counts were as follows:

Controls.		
Non-infected (sterilized) plates (6) Count, between 0-2	Infected plates washed (6) Total count 500,000 to 700,000 B. pyoc.	not washed
After Washing.		
Dishes infected from salt sol. B. pyoc. (12) Total count, between 50-80	Dishes infected from broth—B. pyoc. (12) Total count, between 100-150	Dishes infected from egg albumen—B. pyoc. (12) Total count, between 100-180

Tests were made on the possible bacteriocidal effect of the soap powder used, by suspending bacillus pyocyanous in solutions of the powder prepared similarly to those used in the restaurant. No material reduction in the bacterial counts was effected. The soap, however, had a high detergent value in removing bacteria previously dried on Petri dishes.

The experiment above indicates that careful washing of dishes by the hand method, especially if soap is used, is highly efficient, even though the bacteria had been dried on from the suspensions of salt solution broth, or egg albumen. It should be remembered, however, that the washing of these dishes was far more carefully carried out than is usually the case. Although the above experiment would tend to foster confidence in manual dishwashing, our inspections convinced us that this method is highly

unsatisfactory. The dishwater is not changed frequently enough, the dishes are insufficiently rinsed, and soiled towels are used for drying. Flies were observed in contact with the empty dishes even after they had been washed; flies were observed also in contact with the dish towels. During the busy lunch hour, in large restaurants, where several hundred persons are served, dishes must be cleaned rapidly for immediate use. Cleanliness is too frequently sacrificed for speed. If hand washing were carefully performed, we believe it possible to obtain satisfactory results. On the other hand, we think it very difficult to enforce care in the washing of dishes by hand.

MECHANICAL WASHERS.

Inspections. — Six establishments using mechanical apparatus for dishwashing were inspected. The apparatus for this purpose varies somewhat, but substantially the following description will answer for all. The dishes are packed in wire crates of proper size to be lowered into a vessel containing boiling soap water. At the bottom of the vessel containing the boiling soap water is a fan attached to an electric motor; when the fan revolves, the water is violently agitated and the dishes thereby thoroughly washed. After exposure to the boiling water for about one minute, the crate is transferred to another vessel containing clean boiling running water. Here the dishes are raised and lowered several times and then transferred to a drying board, where they are stood on edge to dry in the air. The dishes

are so hot that hand drying is not necessary and thus considerable manual labor is saved. Furthermore, this operation is very rapid, one man being able to accomplish the work of several, and at the same time getting much better results. The appearance of the dishes is far better after this process than after the hand washing process; there are no grease marks on the dishes, which now have a clean shiny appearance.

Bacterial Data.—The temperature of water in the dishwater in all cases but one (where it was 70° C.) was at or slightly under 100° C. By referring back it will be seen that the temperature of the water in the hand washing process never exceeded 45° C. and was indeed usually under 40° C. The bacterial counts of the water from the mechanical washer were consistently low, never exceeding 10 per cc. The counts obtained from the spoons and the rims of cups ranged below 50. In one case only did the count exceed 500. These figures offer a striking contrast to those obtained from hand washing tests.

Tests on Mechanical Washer.—Series of plates similar to those prepared for testing hand washing, were passed through a mechanical washer. The results can be briefly stated: The test organism (*B. pyocyaneus*) could not be recovered from any of the dishes. When bottles were used in place of dishes, however, the organisms could be obtained from the bottom of the bottles in greatly diminished numbers in only three cases out of twenty. No doubt, the bacteria were protected from the water by air pockets.

Since infected material from the mouth of one person would hardly be transferred to the mouth of another from the bottom of deep receptacles (*e. g.* cups), we believe the occasional recovery of a small percentage of the organisms from the bottom of deep receptacles to be no objection to the general application of mechanical apparatus for dishwashing. The knives, forks and spoons tested, were either sterile or gave very low counts.

The time of exposure and the temperature of the water were sufficient to kill all non-spore-bearing organisms.

SUMMARY.

HAND WASHING. Inspection.—1. The glasses in restaurants and confectionery stores are merely rinsed off and therefore not properly cleansed. Paper cups should be used unless the glasses can be washed with soap in hot water. The spoons should be similarly treated or scalded.

2. The amount of care exercised to obtain clean dishes fluctuates greatly; dirty dishwater and towels are used in many places, and soiled and greasy dishes served to patrons. Flies were observed on the empty dishes even after the dishes had been washed. Flies were also seen in contact with the dish-towels.

Bacterial Data.—1. The temperature of the dishwater was not sufficiently high to effect bacterial reduction, the cleansing of dishes resulting largely from the detergent action of soap.

2. Dishes and dishwater frequently gave high bacterial counts.

3. Artificially infected dishes,

washed in a restaurant were cleansed, largely as a result of the detergent action of soap combined with the vigorous rubbing with a dishcloth. The bacterial reduction exceeded 99 per cent.

The hand washing of dishes, while capable of producing excellent results, is too often carelessly performed.

MECHANICAL WASHING. *Inspection.*—1. Dishes washed in mechanical apparatus have a clean, glistening appearance.

2. No hand drying is necessary.

3. It is a labor-saving device.

Bacterial Data.—1. Except when bacteria are in the bottom of bottles or deep containers, and protected from the boiling water by air pockets, the dishes are nearly always sterilized.

2. Test on dishwater and counts from swab washings from dishes indicated that the temperature of the water, and the time of exposure were suffi-

cient to produce nearly sterilized dishes.

CONCLUSION.*

In view of the carelessness in washing eating utensils in many of the poorer class of restaurants and confectionery stores and in view of the possible transmission of disease from this source, and furthermore, because of the desirability of producing clean and glistening dishes, we recommend an ordinance requiring the subjecting of all eating utensils in public places to a temperature exceeding 80° C. for one minute before permitting the serving of such utensils to a second person.

*Since writing this paper a similar conclusion has been reached by Dr. H. N. Cole (*Jour. A. M. A.* Vol. XLVII, No. 25, p. 1805) as a result of a study of the etiology of a number of cases of extra genital chancres. Doctor Cole writes: "There should be stringent laws enforced by careful inspection, requiring the placing of all dishes, glassware and silverware in boiling water for the space of five minutes, even if the microscopic dust be not removed. This would effectively kill all organisms and fully protect us."



The Physician and the Food Supply.—An editorial in the June, 1917, issue of the *Southern Medical Journal* discusses the physician's rôle in handling this important war problem:

The principal danger lies in the meat shortage. The Department of Agriculture announces that there is available at this time 100,000,000 pounds less meat than a year ago. The wheat, corn, and sugar crops, to a less extent, are predicted to yield much less than last year.

We are informed that the average man would be more efficient and that he would live longer if he ate less of meat, flour bread and sweets.

It is believed that the medical profession should be organized in a campaign of education that would give every person in the nation accurate information as to just how much he should eat

of the different kinds of foods. The people of the United States should be taught that it is not only their patriotic duty to eat less, but that they will be healthier and more efficient if they will restrict their diet. Obviously this does not apply to persons who are under-nourished, but such an educational campaign would at the same time tend to correct this condition by instructing the people in the proper amounts of proteins, carbohydrates and fats that should be eaten.

The article concludes that by such action the physicians will have a wonderful part in conserving the present food supply; and in the years to come we may expect to see a reduction in the mortality from nephritis, heart and arterial diseases that have been so rapidly increasing during the last thirty years.