GUPTA, D. M., and GHOSH, S. C. (1952). Chloroquine in the treatment of amœbic hepatitis and amœbic liver abscess. *Calcutta Med. J.*, p. 468.

JELLIFFEE, D. B. (1951). Amœbic Hepatitis treated with chloroquine. *J. Trop. Med. and Hyg.*, **54**, 114.

HAMILTON, H. E., and ZAWALA, D. C. (1952). *J. Iowa Med. Soc.*, **42**, 1.

LANE, R. (1951) .. The treatment of hepatic amœbiasis with chloroquine. *J. Trop. Med. and Hyg.*, **54**, 198.

LWOFF, M. (1951) .. In : Biochemistry and Physiology of Protozoa, p. 235. (Academ. Press.)

MANSON BAHR, PH. (1949). The treatment of amœbic liver abscess with chloroquine. *J. Trop. Med. and Hyg.*, **52**, 91.

MARITON, Y. (1938) .. *J. Orient. Med.* (Abst. Sec.), **28**, 37.

MEYER, R., CHAFFEE, E., HOBBY, G. L., and DAWSON, M. H. (1949). Hyaluronidases of bacterial and animal origin. *J. Exp. Med.*, **73**, 309.

MOHR, W. (1953) .. Therapie der amœbeuruhr mit. Resotren. *Deutsche Medizinische*, **36**, 1157.

PALMER, R. B. (1938) .. Changes in the liver in amœbic dysentery. *Arch. Pathol.*, **25**, 327.

PATEL, J. C. (1953) .. Chloroquine in the treatment of amœbic liver abscess. *Brit. Med. J.*, p. 811.

ROGERS, L. (1922) .. Lettsomian Lectures on amœbic liver abscess. *Lancet, i*, 463.

SAWITZ, W. G., and FAUST, E. C. (1942). The Probability of detecting intestinal protozoa by successive stool examinations. *Amer. J. Trop. Med.*, **22**, 131.

SAWITZ, W. G., and HAMMERSTRON, R. J. (1943). Statistical significance of negative stool examinations in diagnosis of amœbiasis. *Amer. J. Hyg.*, **38**, 1.

SODEMAN, W. G. (1950). Clinical picture of hepatic amœbiasis. *Amer. J. Trop. Med.*, **30**, 141.

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THE PRESENT STATUS OF DISH WASHING PROCEDURES ADOPTED IN COFFEE HOUSES AND RESTAURANTS—A BACTERIOLOGICAL ASSAY

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THE Government of Madras constituted a committee in October 1950 to consider the question of cleanliness and sanitation in coffee houses, canteens and other catering establishments in the State and to make recommendations for the removal of defects and deficiencies, with a view to securing adequate standards of cleanliness, sanitation and quality of the edibles sold in such premises. In the course of the preliminary discussions, the committee felt the need for a bacteriological study of the present methods adopted for cleaning and handling of glassware, dishes and other utensils used in establishments serving food, drinks and beverages in the city. This was the genesis of the present investigation and the main purpose of the survey carried out was to determine how far the present dish washing methods were satisfactory from the hygienic point of view and to suggest practicable and feasible methods for the improvement of the procedures in vogue.

Persons who have observed conditions in coffee houses and restaurants will agree that there is urgent need for radical improvement in the methods adopted for washing utensils, cups, etc. The arrangements in vogue in some of the small coffee houses and restaurants for washing and cleaning of the utensils are somewhat primitive. During the peak rush hours in coffee houses and restaurants there is generally a bypassing of the washing, cleaning and rinsing operations, due to the increased demand for cleaned utensils and the insufficient stock of these available at the establishment. It is likely that persons suffering from streptococcal sore throat, tuberculosis, or other communicable diseases may visit places of public refreshment and prove a source of potential danger to the community, as the cups, plates, spoons, etc. used by them may act as vehicles of infection

if the methods for cleaning these are inadequate (Cummings and Lynch 1919, 1920, Malmann and Devereuxe 1935, Lyons and Mallman 1936).

In our country, no work has been done to assess the hygiene and the health problems relating to the food catering industry. Various procedures, including bacteriological standards, have been suggested for determining the efficiency of the dish washing methods adopted in restaurants in other countries. In the United States and other advanced countries, provision is generally made for machine washing equipment for the cleaning and the sterilisation of coffee house and restaurant utensils. While such equipment may prove suitable for larger establishments in India, some cheap and simpler method will have to be thought of in the case of the smaller restaurants. Manual washing methods have necessarily to be adopted in such cases, and these if carried out properly and with diligence, should prove equally effective.

Washing and Cleaning of used Utensils— Methods in Vogue

The usual type of washing equipment met with in coffee houses and restaurants consists of a sink, containing water in which the used utensils are given a preliminary cleaning. In many cases, the water supply is derived from polluted shallow wells or tube wells. In some coffee houses and restaurants, facilities exist for running water from taps but the quantity available is strictly limited with the result that the preliminary washing itself is generally unsatisfactory. The wash water is not frequently changed with the result that a huge amount of organic food residue from the plates, cups etc., accumulates in the sink, where the preliminary washing takes place.

After the preliminary washing in the sink, the utensils are rinsed in " clean " water before being re-used. The use of detergents has not come into general vogue. In some larger establishments, soap, soda or soapnut powder is used for the purpose of deflocculation and the removal of the dirt and the food residues adherent to the vessels after the preliminary wash. Some hotels and restaurant possess equipment for the supply of hot water for the final rinsing before the utensils are put into recirculation. This is seldom used. When put to use, the temperature of the hot water is invariably not adequate to ensure bacterial destruction and the sterilisation of the washed cups, etc. As a result of the work of various authors (Mallman *et al.* 1947, Dahlbergs reported by Mallman, 1947) a rinse period of 10 seconds at 170°F is considered essential for the destruction of all vegetative bacterial flora normally met with in unwashed utensils.

Chemical sterilisation by surface active germicidal detergents such as Q.A.C has come into prominence in recent years and may prove suitable for practical application in the place of the time-honoured methods of using soap, soda, etc. This new type of germicidal detergents when used for washing has yielded results which are extremely satisfactory from the bacteriological point of view. Besides being bactericidal they leave no residual films, odour or taste in the cleaned utensils. They are also non-corrosive and non-toxic in the dilutions used. The germicidal property of these compounds is however known to be appreciably reduced when hard waters are used as the diluent. These compounds do not have much effect on spores but the sporicidal activity of the Q.A. compound showed an appreciable increase with increasing temperature and pH (Curran and Evans 1950). Proper adjustment of concentration with reference to quality of the diluting water, temperature, etc., are necessary Rideneour and Armbruster 1948) to yield satisfactory results.

Samples and Sampling Methods

For the purpose of collection of samples for bacteriological examination, surprise visits were paid to a few selected coffee houses and restaurants in the city of Madras, including both the large size and the small scale establishments so that the samples collected for examination might be considered to be representative of the normal working conditions prevalent in the city coffee houses and restaurants. Samples of " washing up water " in actual use were taken for bacteriological examination. In addition, samples of rinse water were collected for bacteriological examination from utensils like cups, brass and stainless steel, tumblers, glasses, plates, spoons, etc., which had been washed and kept ready for re-use.

In the case of plates and spoons, the swab rinse method patterned after the technique recommended as official procedure by the United

States Public Health Association (1948) and the method adopted by Knox and Walker in their report to the British Medical Research Council (1947) was followed. Slight modifications necessitated by local conditions had to be made in the methods above mentioned. Wet swabs were used in preference to damp ones (France *et al.* 1943) and non absorbant cotton was used for the swabs as this was reported to be very satisfactory (Buckbinder, 1947). Quarter strength sterile Ringer's solution was used as the suspending fluid; 10-20 cc. of the Ringer's solution were used, depending upon the type of container sampled.

In the case of plates, one-third of the surface area of the "eating side" was swabbed five times and the swab rinsed well afterwards with 10 cc. Ringer's solution stocked in screw-capped bottles. The stick was broken and the cotton portion of the swab was also left inside the bottle. With a fresh swab, the above procedure was repeated, the surface of the plate being swabbed in the reverse direction so that the selected portion of the plate was swabbed ten times on the whole.

In the case of spoons, the entire surface of both sides of the bowl was swabbed five times and the swab, rinsed in sterile Ringer's solution (10 cc.) as in the case of plates.

In the case of tumblers, glasses, cups etc., the required quantity of the Ringer's solution (10 cc. or 20 cc.) was poured into the containers and the whole of the inside surface of the utensil including the rim was swabbed well with a cotton swab and the entire rinse was transferred into screw capped bottles. The cotton portion of the swab was also left inside the bottle. Care was taken in applying the swab to cover all areas likely to have been heavily contaminated.

The samples for examination were packed in ice immediately and brought to the laboratory. They were kept under refrigerated condition (below 10°C) till they were taken up for actual testing. Ordinarily, the time taken between the collection and the inoculation of the samples did not exceed four hours. Buckbinder *et al.* (1947) have recorded that "if the samples of rinse waters are kept at 40°F or less without freezing, plating for bacterial count at any time within 24 hours after sampling, proves satisfactory."

Bacteriological Tests

The following tests were carried out:

(1) The total bacterial colony count on standard nutrient agar at 37°C after 48 hours incubation. From the figures obtained with suitable dilutions of the rinses made in Ringer's solution, the total colony count was calculated for the entire utensil surface.

(2) The number of coliform organisms per utensil surface. ("Indicated number" method described in the American Public Health Association, Standard methods, IXth Edition Water Analysis). MacConkey bile salt broth was used for cultivating the organisms.

(3) Qualitative observations on the type of bacterial flora present in the samples examined and growing on nutrient agar plates.

Bacteriology of Wash Tub Water

Samples of water from the tubs or the basins used for the preliminary washing of the used utensils were collected from 8 coffee houses and restaurants in the city. The counts obtained in the individual samples are given in Table I.

TABLE I

Bacteriological examination of "Wash Tub" water from coffee houses and restaurants in the city

Name of Coffee houses and restaurants		Total colony count on Nutrient agar at 37°C per c.c.	Coliform organisms present in	Remarks
(1)	M.C.	38800	0.1 c.c.	..
(2)	M.C.	20200	0.1 c.c	..
(3)	C.L.	4150*	0.1 c.c.	The water was freshly drawn.
(4)	T.L.	87700	0.01 c.c.	..
(5)	R.L.H.	237000	0.0001 c.c.	..
(6)	B.C.	6800*	0.1 c.c.	*The water was freshly filled.
(7)	U.K.V.	51000	0.1 c.c.	..
(8)	D.R.	3720000	0.0001 c.c.	..

The colony counts on nutrient agar as 37°C are generally very high, the lowest figure being 20,200, while the highest figure was 3720000 organisms per cc. In two cases, fairly low figures of table I of 4150 and 6800 were obtained. In both these cases, it was observed that the wash tubs had been filled with fresh water a very short time before the sample was drawn and so, they had not received their usual full load of contamination. As stated already, these tubs are not emptied and refilled with fresh water periodically at short intervals. It has also to be noted that the water for cleaning is taken from shallow polluted wells in certain cases, which already carries heavy bacterial pollution.

All the samples examined show the presence of coliform organisms in volumes ranging from 0.1 cc. to 0.0001 cc. The main types of organisms isolated from these samples consist of Streptococcus, Staphylococcus, Aerobic spores, coliform organisms, both intestinal and soil types and a variety of chromogenic bacteria. Yeasts and moulds were frequently present. The cleaning of utensils in waters so heavily polluted will naturally be unsatisfactory and there is also a grave potential risk of infection with pathogenic organisms from this source. As the average bacterial content of sewage effluents approximates roughly to 100,000 organisms per cc., it is seen that in some coffee houses and restaurants, the dishes are being washed in water bacteriologically inferior to only a sewage effluent. In any system of dish washing, the first preliminary step must be the removal and the disposal of the scrapings and the gross food residues from plates, cups etc., before these are rinsed and washed thoroughly in clean running water. It is observed that provision for running water is absent in many of the small establishments. Provision is not made for the frequent change of the wash water stored in tubs, with the result that after about 1 to 2 hours' use during the peak hours, the liquid in the tub looks more like an emulsion, with huge amounts of solid matter accumulated at the bottom.

Experimental Method used for Sanitizing Utensils

In evolving a suitable method for the washing, cleaning and sterilisation of the utensils, the main considerations should be its simplicity and economy.

After the utensils were well scrubbed and washed in running water or water stored in a basin of adequate capacity, they were immersed in a dilute, slightly warm solution of a germicidal detergent in another basin for a period of about one minute. The vessels were then dipped for one minute in hot water maintained at a temperature of about 170°F in a clean basin. (A Fahrenheit thermometer enclosed in a metal casing was used to determine the temperature of the water. The thermometer was left dipped in the water in the basin in which it was heated. A centigrade thermometer may also be used for the purpose, in which case, the temperature may be adjusted to the corresponding temperature in the Fahrenheit.)

This method of treatment carried out under proper supervision was expected to yield satisfactory bacterial purification and thorough cleaning of the used utensils. The glasses and cups were immersed in the final hot water bath, in such a way as to prevent the formation of air pockets, which might prevent the hot water penetrating and reaching the entire surface of the vessels. Containers like cups, glasses, tumblers etc., were placed on their sides and the stacking of plates one over the other, was also avoided. For the final hot water treatment, metallic wire baskets with long handles, extending well over the level of the water in the sink, were found useful for holding the utensils.

The procedure outlined above was adopted in the case of samples examined under the experimentally controlled conditions of cleaning. The particular type of germicidal detergent used was a Quaternary Ammonium Compound sold under a proprietory trade name. This was used in a dilution of 1 in 5000. Any other germicidal detergent may prove equally satisfactory, but as this product was readily available in the laboratory, it was used in our experiments.

Table II gives the results of the bacteriological examination of plates used in the coffee houses and restaurants *before* and *after cleaning*. Similar examinations were done on tumblers, *davaras* and spoons, etc. and the results which are almost of a similar nature are not included in this paper. The colony counts and coliform counts however were lower in the case of unwashed cups and tumblers which are generally used for serving hot coffee or tea in some places.

These are generally served hot and this factor might account for the low counts obtained from them. The results are discussed in the review of results.

The following three sets of samples were collected for bacteriological examination at the time of each visit, the swab-rinse method already described being used in all cases.

(1) Samples from used utensils before being washed.

(2) Samples from utensils washed by coffee house and restaurant authorities in the manner usually followed in the premises.

(3) Samples from utensils washed under the experimentally controlled conditions of cleaning described above.

TABLE II

Bacteriological examination of plates before and after controlled conditions of cleaning

Review of the Results

Name of coffe house or restaurant	48 hrs. total colony count on standard nutrient agar at 37°C			Number of coliform organisms calculated per utensil		
	Before washing	as washed by the establishment	controlled conditions of cleaning (vide text)	Before washing	as washed by the establishment	controlled conditions of cleaning (vide text)
(1) T. L.						
No. of samples	3	4	5	6	4	4
Average	2,640,000	1,771,000	457	..	..	..
Maximum	3,000,000	3,705,000	690	30,000	3,000	Nil
Minimum	2,280,000	8,88,000	135	300	300	Nil
(2) R. L. H.						
No. of Samples	4	4	4	4	5	5
Average	4,230,000	42,825	164	..	..	..
Maximum	6,900,000	68,100	460	3,00,000	300	Nil
Minimum	6,60,000	21,600	40	300	Nil	Nil
(3) B. C.						
No. of Samples		1	1		1	1
Average		1,50,000	120	..	30,000	Nil
Average for all samples examined.	3,245,000	8,23,000	276	95,000	4,100	Nil

A critical examination of the bacteriological findings indicates that:—

(1) The colony count on agar at 37°C is very high in the case of unwashed plates, the average number of organisms ranging from 2 to 4 millions per plate. The used spoons also generally carry a heavier load of pollution than the cups and tumblers.

(2) The methods adopted at present for washing the used utensils do not reduce the bacterial flora in them to any appreciable degree. *On the other hand, an appreciable increase in the counts was obtained from the so-called 'cleaned' utensils examined from certain coffee houses and restaurants.* Evidently this is attributable to the poor bacterial quality of the water in the wash tub, lack of hot water facilities for rinsing etc. The high counts indicate faulty technique of dish washing.

(3) When the utensils are washed in the manner suggested and used for the experimental work *i.e.* a preliminary thorough rinse in clean water after scrubbing off the solid residues, followed by immersion in a germicidal detergent solution for a minute and a final hot water treatment for a minute at a temperature of about 170°F, the improvement effected in the hygienic and bacterial quality of the washed utensils, as judged by the colony count on agar at 37°C is impressive. The counts for plates, cups and spoons range from 20 to 690; nearly 84 per cent of the samples gave a count lower than 500. The *majority of the organisms on plates washed under the experimental conditions referred to above consisted only of spores, which* had survived the Q.A.C. and the hot water treatment.

(4) The results obtained are still more satisfactory when the coliform counts are taken into consideration. While the unwashed utensils and those washed under the now prevalent conditions invariably contain coliform organisms in varying amounts, the utensils washed under controlled conditions always showed the absence of coliform organisms, indicating that the cleaning had been particularly effective. The absence of coliform organisms could safely be taken as an indication of the absence of the common intestinal and other pathogens also in the utensils washed in this manner.

(5) The United States Public Health Code prescribes a total colony count of 100 organisms per cleaned utensil. Although this was attained in some cases in our series, the counts were higher than the 'standard' figure in many cases. An upper limit of 500 organisms per utensil may reasonably be permitted and is capable of easy achievement by the method now recommended. In 32 out of 34 samples tested, the total count was less than 500 colonies per utensil.

(6) The *total* absence of coliform organisms in washed utensils kept ready for service *should be insisted upon,* as the majority of the dishes are now being washed in water containing coliforms to the extent normally present in samples of heavily polluted water. The coliform group of organisms was absent in 100 per cent of the samples collected and examined from utensils washed in the manner suggested.

(7) The recommended method of treatment may not be helpful in getting rid of spore forming and heat resistant organisms entirely. These, when present, do not have the same degree of sanitary significance as the presence of the susceptible groups referred to above. *A low colony count and the absence of coliform organisms* in the cleaned utensils will generally ensure the desired degree of safety from pathogens.

Summary

(a) A survey of the hygienic conditions prevalent in the city coffee houses and restaurants with special reference to the methods adopted by them for dish washing is described.

(b) The results of the bacteriological examination of a few samples of the "washing up" water and unwashed and washed containers and of utensils washed under controlled conditions of cleaning are furnished.

(c) The report indicates that the present method of dish washing and sanitization of utensils used in restaurants calls for radical improvement.

(d) A simple and economical method for washing and cleaning of coffee house and restaurant utensils, employing cheap equipment and suited to local conditions, is suggested for adoption in all hotel establishments and restaurants. The method described ensures satisfactory cleaning of the vessels and an appreciable reduction in their bacterial content.

(e) The absence of coliform organisms and a total bacterial count on agar not exceeding 500 organisms per washed and cleaned utensil may be insisted upon under conditions obtaining in this country.

REFERENCES

CUMMINGS, J. G., and LYNCH CHARLES (1919).	*Amer. J. Pub. Health,* **9,** 25.
CUMMINGS, J. G. (1919).	*Ibid.,* **9,** 849.
Idem (1920).	*Ibid.,* **10,** 576.
CURRAN, H. R., and EVANS, F. R. (1950).	*Jour. of Dairy Science,* **33,** No. 1, 1.
KNOX, R., and WALKER, J. (1947).	A report to the Medical Research Council.
BUCKBINDER, L., BUCK, T. C., PELPHS, P. M., STONE, R. V., and TICDEMAN, W. D. (1947).	*Amer. J. Pub. Health,* **37,** 373.
LYONS, D. C. (1936) ..	*J. Bact.,* **31,** 523.
MALLMANN, W. L., and DEVERAUX, E. D. (1935).	*Amer. J. Pub. Health,* **25,** 1007.
MALLMANN, W. L., DEKONING, P., and LALKOWSKI, L. (1947).	*Ibid.,* **37,** 390.
FRANCE, R. L., FULLER, J. E., and CASSIDY, U. G. (1943).	*Ibid.,* **33,** 1054.
REPORT (1948) ..	Food utensil Sanitation proposed as official Association procedure : Technic for the bacteriological examination of Food utensils. *Ibid.,* Year Book, **48,** 68.
RIDENOUR, G. M., and ARMBRUSTER, E. M. (1948).	*Amer. J. Pub. Health,* **38,** 504.

PRIMARY CARCINOMA OF THE LIVER

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PRIMARY Carcinoma of the Liver is a rare and obscure disease. The condition is hardly diagnosed during life. There are no pathognomonic symptoms or physical signs special to the diseased condition. Neither the laboratory investigations nor the x-ray examinations are of any substantial help for the diagnosis in the living state. Biopsy of hepatic tissues offers the best chance of diagnosis, but most of the patients are in such a poor general condition that this procedure is of considerable risk. Though the needle biopsies are now less risky yet they have their limitations. Usually the disease is diagnosed by histological examinations of the materials obtained from autopsies.

According to Tull (1932) Primary Carcinoma of the Liver was first introduced in the literature as early as 1849 by Rokitansky. It is a disease usually of older age group and males are more affected than females (Strong and Pitts, 1930). Tull while analysing Eggle's review of 163 cases (1901), showed that 60.3 per cent of cases occur between 41 and 70 years, the average age being 58.5 years in males and 48.9 years in females. He also mentions that the disease occured even in new born babies in Noeggerath & Steiner's series. Tull himself reported a case in a girl aged five years. Berman (1941) in reporting 23 cases stated that the occurrence to be commoner amongst the pigmented and oriental races. Khanolker (1945) in describing the incidence of cancer, stated that this type is rare amongst Europeans. It is commoner in Goldmine workers of Bantu. It is the commonest type of cancer in Malay, Chinese of Batavia and Singapore, Philipinoes in Manila and the inhabitants of Sumatra. In India Viswanath and Grewal (1935) in their survey of 1,234 postmortem examinations performed in King George's Medical College, Lucknow, during te period of 1914-33, King Edward Medical College, Lahore, during 1921-34 and Prince of Wales Medical College, Patna, during 1926-33, reported only 9 cases of liver carcinomas. Gharpure (1927) in reviewing the statistics of 6000 and odd autopsies confirmed only 9 cases of Liver carcinomas. Subsequently in 1948 he reported 8 cases of primary carcinoma of the liver out of 4000 and odd autopsies during the period of 1926 to 1946, thus showing that it is a rare disease in India. Basu and Vasudeva (1929) reported the condition to be relatively commoner among the South Indians (Madras). They reported 29 cases. The total number of autopsies and the period during which these cases were collected is not mentioned in their paper.

During the period 1951 to April 1953, we have been able to collect 4 cases of primary carcinoma of the liver. The number of autop-