

partly possible to legislate about the latter. It would be interesting to know whether more outbreaks of food poisoning begin in homes than in public eating-places. Where home hygiene is poor, the family has often a high resistance, but where homes are clean, immunity is probably acquired late, or not at all. This means, in effect, that a rising standard of hygiene in homes makes the public eating-place proportionately more dangerous.

Other points which have not been mentioned include the whole problem of washing up; those already listed are not new, but they are the kind which still have to be stressed to the majority of food handlers. There are, certainly, food factories, canteens, shops and homes where good food hygiene is practised, but they are in the minority. Unfortunately, clean-food campaigns do not achieve spectacular results, but they may encourage the housewife, who is difficult to reach, to carry over, to her own handling of food in the home, her new awareness of clean food handling.

Canteen manageresses are usually trained people, but a little propaganda now and then, will help them to keep alive their enthusiasm.

And so, the majority of food handlers still require regular, well-directed, educational propaganda to persuade them to handle food with care.

### Hygiene in restaurants and public houses

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Two investigations were carried out in Glasgow over a period of 2 years, 1954–6. The first was concerned with the standards of hygiene in restaurant kitchens and the second, with similar standards, in licensed establishments.

#### *Restaurant hygiene*

The first survey covered fifty kitchens, arbitrarily divided into ten kitchens of high-class restaurants, thirty of restaurants of good every-day type, and ten belonging to works or office canteens. Visits were made towards the end of the lunch-hour break and without previous warning. Kitchen activity was then at its highest. The methods of investigation adopted were bacteriological examination of swabs of the utensils used, and of wash water and dish-drying cloths. Usually seven items were thus sampled in each kitchen. Cups were swabbed round the rim and over  $\frac{1}{2}$  in. in depth on the inner and outer surfaces. Both sides of the prongs of forks were swabbed, both sides of the bowls of spoons and the central area of plates, omitting the rim.

Fourteen of the kitchens were underground, three being in first-class restaurants, ten in the good every-day type of restaurant, and one in the works and offices' canteen group. In several of the underground kitchens the temperature was much too high and the ventilation was proved to be insufficient. In some places the general

standard of hygiene was considered to be poor on account of cramped, ill-ventilated, poorly lit quarters, and a general lack of cleanliness. In twenty-seven kitchens, the washing water was far from being hot enough. A temperature of 150°F and above was considered to be satisfactory. A double-sink method of washing up was in use in twenty-three kitchens and in ten, dish-washing machines as well. Fourteen used the single-sink method and thirteen used washing machines.

Bacteriological results showed that only 27 of 260 washed utensils examined attained the U.S.A. Public Health Standard (Tiedeman, Fuchs, Gunderson, Hucker & Mallmann, 1944) of not more than 100 organisms per utensil for the area swabbed. Only two out of forty-two drying cloths yielded bacterial counts of fewer than 500 organisms/sq. in. Only seven of forty-two wash and rinse waters yielded a count of less than 500 organisms/ml. Seventy-four % of the kitchens examined yielded faecal *Escherichia coli* from one or more items, but no recognized types of food-poisoning pathogens were isolated, apart from *Staphylococcus aureus* (coagulase-positive) which was obtained from eight washing cloths, two samples of washing water, one plate, one spoon, and two forks. In addition, *Clostridium welchii* was isolated from several of the articles tested.

The arrangements in many kitchens left much to be desired but the paramount need throughout was for more hot water at a suitable temperature (180°F.). This survey resulted in improvements being carried out in some kitchens.

#### *Public-house hygiene*

The second survey was made during the period June 1955 to June 1956, and in all fifty public houses were investigated. The premises were visited at busy evening times with no advance warning being given to the publican. Many unsatisfactory conditions were found. There were no facilities for hand washing for male customers in thirty-one houses, and in twenty-six houses the facilities for the staff to wash their hands were poor. Only cold water was available for bar washing-up in twenty-six houses and in twenty-two establishments no soaps or detergents were used. Liquid soap was used in the bar sink in two establishments. Twelve used detergents, including two places where a hypochlorite solution was also added to the wash water. Six publicans used a quaternary ammonium compound in the glass-washing water. In the remaining eight public houses the publican used either soap or detergent or washing soda in a thorough cleansing of glasses once a week.

Only fourteen out of twenty-seven drying cloths investigated gave counts of no more than 500/sq. in. In four cloths the bacterial counts were over 10,000, including one of 2 million. *Staph. aureus* (coagulase-positive) was isolated from 5 cloths, *Streptococcus viridans* from three, and faecal *Esch. coli* from only one. Only fourteen of forty-five samples of wash-water conformed to the hygienic standard laid down by the U.S.A. Public Health Service and only 18 out of the 142 supposedly 'clean' beer glasses. Faecal *Esch. coli* was rarely found, but coliforms and mouth-cocci were frequently isolated from 'clean' glasses. The record count for a 'clean' beer glass was 10 million. No Group A haemolytic streptococci were demonstrated

on 'clean' glasses. Whisky and wine glasses were found to be less contaminated. Beer and overflow beer were also examined with results which were not entirely satisfactory. Undiluted overspill beer languishing in its tray until it can be dealt with may contain washings off the bar tenders' fingers and will not improve any fresh beer with which it is eventually mixed. Coliforms were isolated from six samples of overflow beer in numbers up to 100/ml. *Staph. aureus* was isolated from two samples and *Strep. viridans* from four. Non-haemolytic streptococci were found in three samples. There is, however, no evidence in the literature that anyone ever contracted infectious disease by drinking beer out of glass or pewter in a public house.

There was far too little hot water available in public houses and when available the temperature of use was too low. Though glass-washing machines with hot and cold jets are very good when economically suitable, it is felt that a foolproof method such as the regular dispensing of a quaternary ammonium germicide into the washing water with, when there is room, a second rinsing sink properly maintained, furnishes a generally suitable and easily worked way of securing a clean glass. In all methods sensible application is essential. The survey showed that in the houses visited sanitary arrangements for the public, especially for females, could be much improved.

As in the investigation of restaurant kitchens, the survey resulted in improvements being carried out in some houses.

#### REFERENCE

- Tiedeman, W. D., Fuchs, A. W., Gunderson, N. O., Hucker, G. J. & Mallmann, W. L. (1944). *Amer. J. publ. Hlth*, **34**, 255.

### **The effect of spoilage and handling on the bacterial flora of fish**

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For a number of years, investigations have been proceeding at the Torry Research Station, Aberdeen, on the bacterial flora of newly caught fish and the effect thereon of spoilage in ice and of handling on board ship or on shore. However, it is only within the past 5-6 years that anything like the necessary resources and techniques have been available to tackle these problems adequately. As a result, we now have for the first time a fairly comprehensive picture of the flora of four species of newly caught fish (haddock, cod, lemon sole and skate) from the North Sea, and we have also begun to accumulate data on the effects of spoilage and handling.

The flesh of newly caught fish is sterile, but bacteria are always present on the skin and gills, and in enormous numbers in the gut of 'feedy' fish. The loads on the skin and gills generally vary between 100 and 1 million/sq. cm of skin or per g of gill