SHORT ARTICLES

PSEUDOMONAS THOMASII IN A HOSPITAL DISTILLED-WATER SUPPLY

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IN recent years, faults in the manufacture of intravenous fluids have come to light that in some instances have resulted in the production of contaminated fluids and disease in patients (Felts *et al.*, 1972; *Lancet*, 1972; Phillips, Eykyn and Laker, 1972; Center for Disease Control, 1973). Phillips *et al.* (1972) described an outbreak of infection affecting 40 patients, after the administration of fluids which were later found to be contaminated with *Pseudomonas thomasii*. The source of the outbreak was traced to the pharmacy-purified water that had been used to spray-cool fluids after sterilisation.

During a check on the distilled-water supply-system in the pharmacy at this hospital, *P. aeruginosa* was isolated from the distilled water. This paper records the findings of the subsequent investigation and points again to the need for constant vigilance in the preparation of pharmaceutical products.

MATERIALS AND METHODS

Preparation of distilled water. Mains water supplied to the hospital was stored in two tanks on the roof. From there it was delivered to the pharmacy plant-room, passing through a water softener and a smaller tank before being distilled. Distilled water was collected in a small plastic tank and was then pumped into three large plastic tanks (approx. 400 litres), where it was divided into grades according to the time of distillation. This water was used in the pharmacy for the preparation of intravenous fluids, for the manufacture of non-sterile preparations or to supply the bottle-washing machines. All water that had not been used at the end of the working day was drained from the three tanks.

Collection and treatment of specimens. Water samples were collected from the mains, the hospital tanks, the piping system, the water softener, the still, the pump and the storage tanks, and from the pharmacy water-supply, as indicated in the figure. Samples (20 ml) were collected in sterile 25-ml screw-cap bottles to which 0.1 ml of sodium thiosulphate (3% w/v) had been added. Samples were filtered aseptically through 0.45- μ m Millipore filter units. The filter pads were then incubated on nutrient agar at 37°C for 48 h and at 22°C for 5 days. In addition, 0.1-ml and 1-ml samples were plated out in duplicate on nutrient agar and incubated at 37°C or 22°C. Resulting colonies were counted and identified.

Identification of P. thomasii. Cultures were identified as *P. thomasii* if they were of gram-negative rods that gave the following reactions: production of oxidase; production of catalase; oxidative metabolism in Hugh and Leifson's medium; production of acid from ammonium-salt glucose; growth on Simmons' citrate; growth at 37°C; no growth on three successive sub-cultures at 42°C; nitrate reduction; urease activity (Christensen, 1946); non-motile at 37°C; arginine dihydrolase negative. Cultures that gave the above reactions were subsequently confirmed as *P. thomasii* at the Computer Trials Laboratory, Central Public Health Laboratory.

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FIGURE.—Viable bacterial counts (colonies per ml) in water sampled at indicated points in the production plant.

RESULTS

The figure shows the layout of the distillation plant and the number of contaminating organisms found in the water. Samples collected before distillation contained few organisms and pseudomonads were not found. Water after distillation was, however, contaminated, and although *P. aeruginosa* was not detected, the predominant organisms were identified as *P. thomasi*.

Immediate steps were taken to disinfect the piping system with 1% sodium hypochlorite solution. This proved ineffective, contributory factors probably being the chipped and pitted surfaces of the plastic collecting tanks and the fact that two of the three tanks leaked. No further use was made of the distilled water for the preparation of pharmaceutical products.

DISCUSSION

When the distillation plant was first installed in the pharmacy, bacteriological examination of the distilled water was made at weekly intervals. This routine procedure had lapsed, probably as a result of changes of staff. We were not able retrospectively to discover whether *P. thomasi* from the distilled water had been responsible for clinical infection. It had been found in two patients, but because the date when contamination began is not known the relevance of this finding is uncertain. It is unlikely that sterile fluids were contaminated with it in the way first described by Phillips *et al.* (1972), because the temperature in the cooling tanks used for sterile-water production was kept at 80°C by heating coils.

This incident illustrates some of the difficulties that may be encountered when hospital pharmacies are responsible for production of their own sterile fluids, and raises the question whether these pharmacies should continue production. The implementation of requirements in a recent Health Service Circular (Department of Health and Social Security, 1975)—which asks Regional Health Authorities to introduce arrangements corresponding to the licensing procedure of the Medicines Act 1968, as applied to commercial undertakings—is likely to have widespread implications throughout the health service. One of the most important outcomes is likely to be the restriction of sterile-fluid production—and to a lesser extent, non-sterile production—to institutions that conform to the stringent conditions necessary for the production of sterile fluids as laid down by the Department of Health. It is generally agreed that production of sterile fluids should continue in certain hospitals so that they are not entirely dependent on commercial supplies. This study shows that continuing care and constant surveillance of various practices within the pharmacy are essential whenever this is done.

SUMMARY

The distilled water supply in a pharmacy was found to be contaminated with *Pseudomonas aeruginosa* and *P. thomasi*. Disinfection of the piping system proved impracticable, and use of the water from this supply was discontinued.

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REFERENCES

- CENTER FOR DISEASE CONTROL 1973. National Nosocomial Infections Study Quarterly Report, 2nd quarter, 1972, p. 10.
- CHRISTENSEN, W. B. 1946. Urea decomposition as a means of differentiating proteus and paracolon cultures from each other and from salmonella and shigella types. *J. Bact.*, **52**, 461.
- DEPARTMENT OF HEALTH AND SOCIAL SECURITY 1975. Application of Medicines Act to health authorities. Health Service Circular (Interim Series) no. HSC(IS)128.
- FELTS, S. K., SCHAFFNER, W., MELLY, M. A. AND KOENIG, M. G. 1972. Sepsis caused by contaminated intravenous fluids. Epidemiologic, clinical, and laboratory investigation of an outbreak in one hospital. *Ann. intern. Med.*, **77**, 881.
- LANCET (NOTES AND NEWS) 1972. Dextrose drip feeds. *Lancet*, **1**, 645.
- PHILLIPS, I., EYKYN, S. AND LAKER, M. 1972. Outbreak of hospital infection caused by contaminated autoclaved fluids. *Lancet*, **1**, 1258.