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CLINICAL THERMOMETERS AND CROSS-INFECTION IN HOSPITALS*

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Cross-infection in hospitals, particularly in childrens' wards is always a serious hazard. The main sources of infection are patients, attendants and visitors.[4] Infection may also be spread by non-human agencies such as thermometers, and instruments commonly used in examinations such as spatulas, stethoscopes and auriscopes.

In studying the clinical thermometer as a possible source of cross-infection, several workers have investigated the antiseptic fluid in which the thermometer is kept. Rubenstein and Foley[6] found that bacterial counts made on one of the thermometer fluids (1 in 10,000 bichloride of mercury solution) revealed a bacterial population of 7 million viable organisms per c.c., the majority of which were *Escherichia coli.* Similarly, Green and Penfold[3] found thermometer fluids (chiefly Glyc. thymol. co.) grossly contaminated with various pathogenic and non-pathogenic organisms. Both investigations were carried out in wards in which 'communal' thermometers were used, i.e. wards in which a few thermometers were shared by a group of patients.

In the present investigations, attention was paid to the *thermometer itself* as a possible cause of infection, since culture of the thermometer ends which go into the patient's mouth or rectum should give a better estimate of bacterial contamination than culture of the antiseptic fluids.

PRESENT INVESTIGATION

The work was carried out in a general hospital. In the paediatric wards each child has his own thermometer, but 'communal' thermometers are still in use in other wards. The antiseptic used is 1 in 1,000 biniodide of mercury, supplied by the dispensary. There is considerable variation in the frequency with which the antiseptic is changed; it is usually 2 or 3 times a week.

A number of serum-culture tubes were supplied by the bacteriology department. Visits were made to the wards without any notice being given, usually before the 10 a.m. temperature round, so that the thermometer had been immersed in the antiseptic for approximately 4 hours. In the examination of a thermometer, the bung of a tube was removed and the thermometer taken out of its jar and dipped for about half its length into the tube. The bung was at once replaced and the thermometer put back into its jar. The serum tubes were then taken to the bacteriology department for culture.

The total number of thermometers tested was 109, of which 63 were found to be contaminated. The results obtained from examination of oral and rectal thermometers were as follows:

Oral		*Rectal*	
Number investigated	51	Number investigated	58
Number contaminated	28	Number contaminated	35

The organisms grown from oral and rectal thermometers were as follows:

	Rectal	*Oral*	*Total*
Coagulase-positive *M. pyogenes aureus**	7	—	7
Coagulase-negative *M. albus*	8	4	12
Enterococci	15	—	15
Viridans streptococci	—	15	15
Haemolytic streptococci	1	—	1
Diphtheroids	—	7	7
Pseudomonas aeruginosa	1	—	1
Escherichia coli	1	—	1
Aerococcus	—	1	1
B. rotans	—	1	1
Sarcinae	2	—	2
	35	28	63

Mixed infections occurred in 12 instances.

* A paper presented at the South African Medical Congress, Pretoria, October 1955.

* 'Hospital staph.', sentitive to chloramphenicol and erythomycin, but not to penicillin, streptomycin, oxytetracycline or sulphatriad.

These results seem to show that even after several hours' immersion in antiseptic (1 in 1,000 biniodide solution) over half the thermometers investigated were contaminated with pathogenic and non-pathogenic organisms. This applies to both oral and rectal thermometers.

It is likely the contamination would be even higher if tests were taken during a temperature round since, under the 'communal' thermometer system, very little time is allowed for the thermometer to remain in the fluid before use.

DISCUSSION

In order to reduce the possibility of cross-infection from contaminated clinical thermometers, two steps would have to be taken. In the first place, the 'communal' thermometer would have to be abolished and replaced by a system in which each patient would have his own thermometer. Secondly, the fluid used for sterilizing the thermometer would have to be effectively germicidal and suitable for clinical use. Biniodide of mercury is still largely used for this purpose, but mercurial compounds fall far short of being ideal germicides, though the belief persists that they are highly effective germicides.[2]

It is not proposed to discuss the question of a suitable antiseptic in detail, except to mention that tests are being made with 2 cationic detergents, viz. Cetrimide (Cetavlon), and Benzalkonium chloride (Zephiran). They reduce surface tension and have bactericidal properties. In the dilutions normally used, both are non-irritating and non-toxic to raw surfaces.[1] Preliminary observations have shown a marked reduction in the number of contaminated thermometers where these detergents were used as thermometer fluids.

In ideal circumstances, each patient should have his own thermometer, but there are certain objections to the keeping of a thermometer at the patient's bedside. Nurses of experience maintain that breakages would be frequent, patients or visitors might tamper with the fluid, and nervous patients might be constantly taking their own temperatures. In a large ward it is not easy to keep thermometers free from dust, and after a patient has been discharged, the nurse may easily forget to change the fluid for the next patient. Some of these objections apply even more with children, particularly older children. It is very difficult to keep anything out of the reach of an active convalescing child.

In order to overcome certain of the difficulties mentioned, the author has suggested the use of a portable stand, based on the principle that each patient has his own thermometer.[5] All the thermometers are immersed in tubes on the stand, which can be kept in a cupboard out of reach of the patient. It is easy to keep everything clean, and changing the solution is an easy process which can be done quickly and efficiently at one time. To simplify the taking of termperatures in large wards, each tube and its thermometer are clearly numbered, corresponding with the bed or cot. The nurse in charge can thus be readily guided while she is taking temperatures in a ward; e.g., the patient in bed No. 1 receives thermometer No. 1 which, after use, goes into tube No. 1.

CONCLUSIONS AND SUMMARY

1. Cultures of oral and rectal thermometers in a general hospital showed that more than half were contaminated with pathogenic and non-pathogenic organisms. The thermometer fluid currently in use is 1 in 1,000 biniodide of mercury, and 'communal' thermometers are still used in some wards.

2. Suggestions are made regarding the prevention of cross-infection by clinical thermometers. Each patient should have his own thermometer and beds should be numbered to prevent confusion. The use of a portable stand for ward use is described.

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