TABLE 1—Number and type of colonies cultured from 44 auriscope earpieces

Micro-organisms cultured	No of colonies per earpiece)					
	0	After enrichment	1-10	11-20	21-30	>31
<i>Staphylococcus aureus</i> *	32		7	1		4
Other staphylococcus spp	9	2	18	2	3	10
<i>Aspergillus</i> *	42		2			
<i>Pseudomonas</i> (not <i>P. aeruginosa</i>)	43	1				
<i>Micrococcus</i>	42		2			
<i>Bacillus</i> spp	36		7			1
Diphtheroids	27		7			10
<i>Penicillium</i> spp	42		2			
<i>Clostridium perfringens</i>	42	2				
Haemolytic streptococci (not <i>S. pneumoniae</i>)	42		2			

*Potential pathogens

TABLE II—Methods of cleaning auriscope earpieces declared by general practitioners

Method	No (%) of GPs (n=85)
Alcohol swab	31 (36)
Soap and water	24 (28)
Antiseptic lotion	16 (19)
Cotton wool or tissue	5 (6)
Practice nurse's task	5 (6)
Other	1 (1)
No response	3 (4)

Cues that change general practitioners' behaviour include peer influence, literature reports, and financial inducements¹²—none of these factors currently prompt general practitioners to consider cleaning their earpieces more assiduously. Once a cue has been received, an appraisal is made of the threats and benefits involved and of the advantages and disadvantages to be gained or lost. The threat of using uncleaned earpieces seemed slight, and improving hygiene was not perceived as carrying great benefit. Although some advantages were perceived from using clean earpieces (reducing infection, complying with patients' expectations of cleanliness), the perceived disadvantages were important ones (lack of time and the inconvenience, especially on home visits and at weekends). The health belief model thus suggests that there is little motivation for general practitioners to improve their auriscope cleaning behaviour.

Conclusion

A study directly assessing the risk of cross infection from using contaminated auriscope earpieces would be unlikely to gain ethical approval. However, this study may raise awareness that auriscope earpieces can harbour organisms that are potentially pathogenic. General practitioners may be alerted to change their behaviour by cleaning their earpieces more assiduously or using disposable ones.

Most general practitioners in the study used alcohol swabs to clean their earpieces, but this may not be

an effective technique. Ayliffe recommends three methods: boiling earpieces in water for five to 10 minutes, five minutes' immersion in 70% alcohol, or autoclaving.¹ One manufacturer recommends that non-disposable earpieces should be boiled in distilled water for five minutes or autoclaved at 134-138°C for three minutes. Immersion in some cold disinfectant solutions may also be appropriate (see manufacturers' instructions), but phenolic and carbolic solutions should not be used, as these will damage the earpieces.¹³ Disposable earpieces cost from 7p to 16p each, depending on the manufacturer and the quantity purchased.¹⁴

Ensuring clean earpieces for each patient will mean increases in workload, equipment, and expense. Clarification of the most appropriate and cost effective cleaning technique for auriscope earpieces in general practice is required.

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Stethoscopes as possible vectors of infection by staphylococci

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Hand carriage of staphylococci by hospital staff is thought to be one of the main modes of spread between patients,¹ and frequent handwashing to prevent such spread is emphasised in infection control measures.² Stethoscopes, an almost universal tool of the medical profession, are an additional possible vector of infection as they touch many patients. Twenty years ago stethoscopes were shown to harbour staphylococci,³ yet standard sources on infection control still give no advice on cleaning these instruments.^{4,5}

We surveyed current practices of stethoscope hygiene among junior doctors in our hospital and assessed the degree of carriage of staphylococci by stethoscopes and the effect of cleaning on this.

Methods and results

Twenty nine doctors were questioned, and their stethoscopes were examined by moistening sterile

swabs in saline, rubbing them over the diaphragm, and inoculating them on to blood agar, which was incubated aerobically overnight. Staphylococci were identified by standard methods.

We examined the effect of cleaning on 13 additional stethoscopes. One half of the diaphragm was swabbed and cultured; the diaphragm was then cleaned with a commercial saturated with alcohol swab (Sterets, Seton Prebbles Ltd) and allowed to dry; the other half of the diaphragm was then swabbed and cultured. Total colony counts before and after cleaning were noted.

Of the 29 doctors spoken to, only three had ever cleaned their stethoscopes, two intermittently and the other only once. None of the doctors could recall ever being advised in this matter.

Twenty six of the 29 instruments yielded staphylococci and the remainder were sterile. Most of the staphylococci were coagulase negative, but of the 29 stethoscopes five yielded *S. aureus*. The mean

A breeding ground for staphylococci?

bacterial count was 69 (range 0-500) colony forming units per stethoscope.

Cleaning with an alcohol soaked swab was strikingly effective: six of the 13 stethoscopes had a bacterial

count >20 colony forming units before cleaning (range 23-400); in these the mean reduction in the bacterial count after cleaning was 97% (range 87%-100%).

Comment

These results confirm that doctors' stethoscopes are often contaminated with staphylococci and as such are a potential vector of infection. This contamination is greatly reduced by simple cleaning. Stethoscopes should be cleaned frequently as an adjunct to hand-washing, especially in units where there are outbreaks of methicillin resistant *S aureus* or where there are patients with increased susceptibility to staphylococcal infections.

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O little wolves of Leeuwenhoek

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At the end of the seventeenth century, when the medical establishment ascribed all disease to an imbalance of the four humours, a brilliant mind proposed that one particular condition could be caused by "little wolves" so small that they could be seen only through his newly invented microscope. This brilliant mind did not belong to Robert Koch but to a Dutch amateur naturalist and lens maker, Anthony Leeuwenhoek. Most of us know Leeuwenhoek as the inventor of a microscope, but that was mere gadgetry; he deserves far more credit for one of the greatest eureka's in medical history.

Leeuwenhoek made his observations in 1692, while studying corn dust. He published his initial reports of "little wolves" in Dutch, without any press conference,

and only the perspicacity of Bernadino Ramazzini brought his work to the attention of the rest of Europe. Ramazzini was also interested in corn dust, believing it to be the cause of premature dropsy and death among sifters and measurers of grain. After discovering Leeuwenhoek's work, Ramazzini commented:

I have often wondered how so noxious a dust can come from grain as wholesome as wheat, and I began to suspect that in that dust there must lurk minute worms imperceptible to our senses and that they are set in motion by the sifting and measuring of the grain and broadcast by the air. . . . The great Anthony Leeuwenhoek records that with his microscope he observed in corn certain minute worms which he appropriately calls "wolves" [a term drawn from the science of alchemy, used to describe aggressive substances]. So we may well believe that it is a breed of worms that so grievously afflicts these workers.¹

Ramazzini completed his work on occupational diseases in 1713; a Latin edition of Leeuwenhoek's work describing the "wolves" had been published a few years before.

We do not agree, at present, that extrinsic allergic alveolitis is caused by little wolves—or, as once thought, paramoecium. This, however, should not detract from our appreciation of the inspiration that forged the first link between inhaled small organic particles and human disease. It has the flavour of a true bite from the muse: a leap towards a new truth without logical stepping stones. Later scientists like Jack Pepys made a chain that could bear the weight of sceptics, and they deserve full credit for this. An increasing number of agents derived from cereals and their flora and fauna has been shown to cause disease. But we should also remember Leeuwenhoek, in justice, and so that we bear in mind the possibility that great medical insights may come from non-medical people.

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Paramoecium—is this what Leeuwenhoek saw?