look set to remove further health and safety protection from many vulnerable workers in such enterprises. There is little evidence that voluntary action by employers protects the health of workers in deregulated workplaces or activities.

Information collected before the passage of the 1974 Health and Safety at Work etc Act showed the abysmal failure of self regulation and voluntarism to protect employees' health and safety in the workplace. In 1983 the House of Lords Select Committee on Occupational and Hygiene Services documented their failure specifically to affect occupational ill-health. Without regulations, no progress has been made on implementing the committee's specific recommendations for improving health services in the workplace.¹⁷

Market forces have a sad and unsuccessful history in maintaining health and safety in the workplace: Adam Smith believed that hazardous work would be done only by workers who, in the marketplace, would expect high wages for dangerous tasks. The wage costs for hazardous industries would be so high that companies would devise ways of reducing the hazards and hence lower wages could be introduced without health and safety regulations adversely affecting the companies. But in Britain (as elsewhere) many hazardous industries employ mainly low paid and vulnerable workers.

The European Union has stimulated considerable activity in health and safety with a series of important directives. These may be unevenly implemented throughout the union, but many people in Britain have welcomed them because they provide clear and in some instances new approaches and standards on neglected hazards. It now seems that the government wants to push health and safety back to basics and restore Victorian values and Victorian accident rates and rates of ill health with its proposals. This could create more conflict with the European Union, which has already begun

proceedings against Britain this year for failing to implement some of last year's health and safety directives.¹⁰

We should oppose sweatshop thinking on occupational health and call for the maintenance of existing occupational health controls at the very least. What is needed is the retention of effective health and safety laws, restoration of the Health and Safety Commission's budget, expansion of the field inspectorate of the Health and Safety Executive, more information on health and safety in the workplace, and support for small and medium sized businesses. The very opposite of this has happened or is about to happen.

Dr Watterson has worked as a paid consultant for government departments and as an unpaid consultant for trade unions on health and safety issues.

ANDREW WATTERSON
Head

Centre for Occupational Safety and Health,
Nottingham Trent University,
Nottingham NG1 4BU

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Acanthamoeba keratitis

A problem for contact lens users that is here to stay

Keratitis due to *acanthamoeba* infection has now been recognised in Europe, Asia, Australia, the Americas, and parts of Africa. The cause is a free living protozoan found not only in soil and pond water but also in mains water supplies. It survives in adverse conditions by forming resistant cysts, which may contain legionellas and other bacteria. These cysts are impervious to inorganic chlorine at up to 50 ppm. The trophozoites are sensitive to chlorine at 2 ppm, but even this concentration is well in excess of that in public water supplies (<1 ppm). A strength of between 3 and 8 ppm is found, however, in chlorine generating disinfecting solutions for contact lenses.¹

The cysts, so difficult to destroy, may be incorporated in the biofilm within water pipes and on contact lenses and may be cultured from both sites. Enhancement techniques may be required—especially when cultures are made from corneal scrapings or biopsy specimens—because earlier drug treatment may have induced temperature sensitivity and a shift into a "dormant" cyst stage.

Infection of the cornea with *acanthamoeba* without a contact lens as a vector is now well recognised in India^{2,3} but was first identified in the United States and Britain only 20 years ago.⁴ The cause may be trauma followed by application of contaminated water⁵ or contamination of the eye by mud,

especially if the eye has been compromised by earlier infection with herpes virus or trachoma or other diseases causing breaks in the protective mucus and the integrity of the surface epithelium.

Acanthamoeba keratitis is increasingly being recognised among people who wear contact lenses, especially those who wear soft lenses. The chain of events is thought to begin with contamination of the contact lens storage case with *acanthamoeba* in household or mains water supplies. If bacterial contamination is also present (and it is found in up to 40% of storage cases) then these amoebas can multiply, ingesting the bacteria as a food source. If the contact lens is then immersed in the storage case and inadequately disinfected—as often occurs—*acanthamoeba* can adhere to it and so to the corneal epithelium. As many as 7% of storage cases are contaminated with *acanthamoeba*,⁶ but only one in 250 000 wearers develops an active, invasive infection. The explanation for this disparity is not clear. Infection may develop in immunocompetent hosts by invasion through epithelial gaps, though there is debate whether motile trophozoites can penetrate between healthy intact epithelial cells, because of their size, unless they cause proteolysis.⁷ Penetration through such gaps would explain the increased microbial infection rates with extended wear of contact

lenses: the corneal oedema that occurs with extended wear causes separation of epithelial bridges and disruption of mucus.

The earliest sign of infection is at the epithelial level, with patchy oedema. This causes an irregular dendritiform ulceration, which is often misdiagnosed as keratitis due to Herpes simplex virus. There is, however, less branching and a wider base. The clue to the correct diagnosis is that the patient is young and wears contact lenses; herpetic ulceration is rare in this group. Superficial infiltrates then appear in the underlying stroma. The epithelium may heal but appears oedematous and is easily debrided. At the same time linear infiltrates may be observed along one or more corneal nerves, and this is believed to be the cause of severe pain—out of proportion to the signs. If left untreated the amoebas penetrate the full depth of the cornea, forming a ring abscess, which may eventually lead to perforation. Most patients have antibodies to acanthamoeba, but the immune system alone seems unable to halt progressive corneal infection.

Successful medical treatment, with propamidine and neomycin, was first described 10 years ago,⁸ but for treatment to be effective early diagnosis is required. Resistance, associated with temperature sensitivity,⁹ and failure of treatment may both occur. Recent work has shown acanthamoebas to be sensitive to the biguanide antiseptic chlorhexidine and to polyhexamethylene biguanide, which is sold as a disinfectant for swimming pools.¹⁰ Both biguanides have been combined with propamidine and used successfully to treat acanthamoeba keratitis.^{4,11} This combination gives a more rapid therapeutic response than neomycin (to which cysts are usually resistant). While polyhexamethylene biguanide has been applied topically in an artificial tear complex, chlorhexidine has been applied in physiological saline; neither is ideal for topical ocular treatment, and more research is needed.

Preventing acanthamoeba keratitis occurring because of infection from natural sources remains impossible,² but early recognition and treatment with 0.02% chlorhexidine (ideally with propamidine as well) should prevent blindness. Preventing infections associated with contact lenses is theoretically possible but will be difficult to achieve. It depends on the use

of an effective amoebicidal disinfectant. Among the many marketed only two cold chemical disinfectants (hydrogen peroxide and chlorhexidine) are effective against acanthamoeba cysts and most bacteria found in storage cases.¹² Both should be used as sterile solutions and not dissolved in tap water. While also effective, thiomersal is not recommended because it can induce hypersensitivity. Storage cases should be washed daily with boiled-cooled water (at 70°C) and kept dry when not in use to prevent amoebic and bacterial multiplication. This procedure needs to be explained to both the people who fit contact lenses and their patients. Finally, compliance is required by those who wear contact lenses—but is often lacking in young people, who buy “disposable lenses” and then wear them for 14 days. The future development of sterile contact lenses that are disposed of properly each day may be expected to reduce the occurrence of this infection. In addition, extended wear of any contact lens overnight should be avoided.

D V SEAL

Consultant medical microbiologist

Department of Microbiology,
Royal Infirmary,
Glasgow G4 0SF

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Towards investing in health gain

The finest strategies must be backed up with the best science

The main task of NHS purchasers should be to reshape services to achieve the greatest possible improvements in their population's health. The obstacles to that endeavour are many. They include the scientific problems of measuring the effectiveness of, and hence need for, clinical interventions¹⁻³ and the political problems of bringing about changes in the teeth of fiercely held interests. As relatively small organisations, purchasers need all the help they can get with the sheer complexity of altering so many interlocking aspects of provision of the health services while meeting the many other demands of their new role.

Coming to their rescue is the Welsh Health Planning Forum's recently completed series of protocols for investment in health gain,⁴⁻¹⁷ which summarises the science and mobilises the political will. The series highlights both the advantages and the pitfalls of such an initiative being taken centrally in the NHS. The advantages are obvious: the initiative has led to a lucid set of syntheses that identify many points where

change is needed and to a Welsh health service deeply imbued with the proclaimed values of “health gain” (a much used term attributed to this group), “people centredness,” and “resource effectiveness”—the three pillars on which the whole Welsh enterprise was built. But the pitfalls are also evident: a plethora of targets only partially supported by the available evidence. Moreover, the series might reinforce the impression that informed consensus can substitute for scientific proof and that slim, polished documents can by themselves solve the complex problems facing purchasers. Nevertheless, the protocols are a splendid way of stimulating the service to consider the actions that might be needed.

It all began in 1989 with the Welsh Office's *Strategic Intent and Direction*,¹⁸ which, together with *Local Strategies for Health*,¹⁹ stated what was generally required and explained how to set about achieving it. These rousing statements helped to set the framework—amid much razzmatazz—for “taking the people of Wales into the 21st century with a level