infected mother to her infant or from faecally incontinent children with profuse diarrhoea.¹⁸

Outbreaks affecting groups of people have been associated with meals⁵ (often including chicken), unpasteurised milk,¹⁹ and contaminated water supplies.²⁰ The infective dose may be as low as 500 organisms,²¹ but attack rates probably depend on individual susceptibility as well as the dose. Ingestion does not always induce symptoms, perhaps because (as with salmonellae) *C jejuni* is destroyed by gastric acid. Immunity derived from past infection may possibly account for the low incidence of clinical disease among poultry-farm workers and others exposed to the organisms. A few infections are imported: some 3% of cases reported in Britain between 1977 and 1980 were acquired abroad.⁵

For most patients campylobacter enteritis is a self-limiting condition which requires only symptomatic treatment. Nevertheless, as many as one-fifth of those affected have prolonged symptoms, especially abdominal pain. Erythromycin has been recommended as the antibiotic of choice in such cases because of its activity against *C jejuni* in vitro; but how effective is it in practice? A double-blind placebo trial using 250 mg six-hourly (40 mg/kg/day for children) for five days promptly eradicated the organism from the stools of a small group of patients who started treatment four or more days after the onset of symptoms but did not alter the course of infection in uncomplicated cases.²² Present evidence suggests that erythromycin is indicated for patients with severe, prolonged, or relapsing disease, or for those who may be a potential source of infection for others, such as children with diarrhoea living in residential centres and food handlers (though asymptomatic food handlers excreting *C jejuni* seem to constitute little risk). Resistance to erythromycin is uncommon in strains isolated in Britain and North America, though the incidence of resistance has been found to be as high as 9% in Sweden.²³ The susceptibility to antibiotics of laboratory isolates should be monitored; reinfections with strains resistant to erythromycin have been reported in patients whose organisms were initially sensitive.²⁴ Campylobacters are usually susceptible to tetracyclines, furazolidone, gentamicin, and metronidazole,²⁵ but if alternative treatment is required it should be governed by laboratory results.

Information about *C jejuni* infection has accumulated rapidly in recent years, but much remains to be learnt, especially about its epidemiology. Campylobacter enteritis is theoretically preventable: attention to food hygiene both in processing and in the home, appropriate precautions when attending to animals, especially domestic pets with enteritis, and avoidance of untreated milk and water could all contribute to a substantial reduction in the incidence of this common infection.

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Ventilation in operating rooms

Three reasons are usually given for promoting air movement through operating rooms: the comfort of patients and staff, the dissipation of explosive or, more recently, toxic anaesthetic gases, and the removal of airborne micro-organisms.

The first is outside the scope of this article. The second is attracting increasing attention, but toxic gases cannot readily be diluted adequately by pumping air through a room. Some system for scavenging these gases at a point close to their release is gaining ground as a more logical and effective approach.¹

The third function of ventilation is the removal of airborne micro-organisms, mostly shed from the bodies of operating-room staff. This topic has been brought into new prominence by a recent account of a painstaking major survey sponsored by the Medical Research Council.² A record was made of the incidence of postoperative sepsis after just over 8000 operations for the implantation of hip or knee prostheses. These were performed with conventional ventilation or in specific conditions designed to reduce the numbers of airborne micro-organisms. When the operations were done in an ultraclean air environment the incidence of deep periarticular sepsis was cut from 3.4% to 1.6%. When the operating team wore all-

enveloping impermeable exhaust-ventilated suits in addition to working in an ultraclean environment the rate of deep sepsis fell even further, to only 0.9%. With the wisdom of hindsight (and the example of the gases) it is a pity that we do not know how effective exhaust-ventilated suits would have been if used in conventionally ventilated operating rooms.

The rates noted so far were achieved without prophylactic perioperative antibiotics. The use of prophylactic antibiotics was not controlled during the experiment, but a retrospective examination of the data showed that when they were used during operations done in conventional operating rooms the deep sepsis rate was 0.8%. In ultraclean conditions there was a further but insignificant improvement to 0.7%, and when exhaust-ventilated suits were worn as well deep sepsis was reduced to a near-perfect 0.06% (one in 1584 operations). This dramatic effect has been confirmed by an independent study in which use of antibiotics was fully controlled.³

If ultraclean air more than halves the rate of sepsis in prosthetic orthopaedic surgery, why not perform all such operations in these conditions? The implications of an affirmative answer need careful consideration. The available data suggest that prophylactic antibiotics are at least as effective as ultraclean air and exhaust-ventilated suits in reducing deep sepsis. Close attention to the choice of prophylactic agents—and the timing of their administration—might possibly improve their effectiveness still further.

When all three measures are used simultaneously the final improvement is less than 1%. So the cost of equipping large numbers of orthopaedic operating rooms with ultraclean air delivery and exhaust-ventilated suits could be justified only if deep sepsis rates after prosthetic surgery in conventionally ventilated operating rooms had already been reduced to the minimum possible; the further improvement of a fraction of 1% might then be thought worth while. In the mean time attention directed to general measures and more efficient use of antibiotics seem likely to produce greater benefit at a fraction of the cost of providing ultraclean air delivery and exhaust-ventilated suits.

Should these results be extended to the rest of surgery? Could infection rates of 5% or 10% be better than halved by operating in ultraclean air conditions? The strongest reason for doubting the validity of this extrapolation is that the infection rates under discussion are of deep sepsis, the kind which threatens the integrity of an implanted joint. "Ordinary" wound sepsis has been excluded from the figures available at present from the MRC trial, and we shall have to wait for details to be published before a proper judgment can be made. The idea cannot, however, be dismissed out of hand. Further information is provided by a double-blind study of the effects of ultraviolet irradiation in operating rooms in 14 854 operations performed over two years in five American hospitals.⁴ Like ultraclean air, ultraviolet irradiation achieved an impressive reduction in the number of airborne bacteria, but the overall rates of infection were 7.4% in irradiated rooms compared with 7.5% in unirradiated. Only in operations classed as "refined clean" did irradiation show any advantage, and that was comparatively small—a reduction of infection from 3.8% to 2.9%. These results, like those of the MRC study, show that the total contribution of airborne micro-organisms to postoperative sepsis is very small, and their removal, or killing, can be important only when the more important causes of sepsis have been eliminated or considerably reduced. It follows that in classes of surgery with higher infection rates any benefit from the provision of ultraclean air is likely to be small.

The message seems to be clear. The presence of micro-organisms in the air of operating rooms is relevant to the production of deep postoperative sepsis in the special circumstances of prosthetic orthopaedic surgery. The observation might cautiously be extended to other types of surgery where very low rates of infection have already been achieved, but more data are needed to establish this. These findings are overshadowed by the deduction that prophylactic antibiotics have an effect at least as dramatic as clean air in the circumstances under review. A rational appraisal suggests that the benefit to be derived from this very much cheaper alternative should be exhausted before any of the substantially more expensive provisions are considered.

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Skin replacement after burn injury

Burnt servicemen—quite rightly—attract public sympathy and attention. Their injuries are not, however, necessarily more severe than burns resulting from injuries in civilian life. In reality, losses amounting to hectares of full-thickness and partial-thickness skin occur daily throughout the world. The improved management of hypovolaemic shock by early intravenous infusion has led to more injured patients surviving the injury itself. This still leaves the patient and the clinician to cope with the problems of immunoincompetence, the prevention and treatment of infection, and the management and repair of the extensive wounds.

Large full-thickness burns rarely heal spontaneously but almost invariably need covering with new skin from another source. The surgeon treating an extensive burn has to prepare the surface of the wound to accept the new cover and find a source of the new skin itself. The only possible source of new permanent skin cover remains the patient's own skin, usually applied as a sheet of split-thickness skin which is harvested from an unburnt area and applied to the wound as soon as the wound bed is ready to accept the graft. In extensively burnt patients the same donor area may have to be used several times.

The management and surgical techniques used to achieve skin cover for burns vary from centre to centre. Some surgeons advocate early excision of the wound with immediate grafting of the excised wound bed, but others equally strongly advocate conservative treatment, waiting for spontaneous separation of the eschar before proceeding to immediate or delayed grafting. Both approaches are likely to benefit from some exciting recent developments in preparing the wound bed and the supply of new skin.