Infection in Britain Today

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At the beginning of the twentieth century Britain led the world in its efforts to control infectious diseases. Large isolation hospitals, recently constructed, provided accommodation for patients suffering from statutorily notifiable infections, while enlightened city councils grappled with the problems of poor sanitation, inadequate housing and unhygienic water supplies. Florence Nightingale’s experiences in the Crimean War had already awakened interest in the problems of infection in hospital patients, and Lister working in Edinburgh, Glasgow and London had pointed the way towards its control by chemical methods.

By the middle of the twentieth century the decline in classical infectious diseases was accelerated by the introduction of antibiotics and the implementation of childhood immunisation programmes — another British ‘first’ in that Jenner of Gloucestershire was the originator of protection against infection by vaccination. His courageous efforts have been rewarded almost 200 years later by the apparent eradication of smallpox from the world.

Thirty years ago it would have been excusable to predict the virtual demise of infection by 1980, its pre-eminent place in medicine being usurped by new developments such as organ transplantation, sophisticated neurosurgery, prosthetic implant surgery, the treatment of leukaemia and cancer, and the creation of special units for the neonate, burned patients and the critically ill. Advances in medicine and surgery would, correctly, have been expected to increase the life span of the average person.

Although all these predictions have materialised, each and every one has been complicated by a common problem — infection. Further, antibiotics have not proved to be universal panaceas, the bacteria under attack frequently developing resistance, while viral infections are not, for the most part, amenable to chemotherapy. The perverse nature of mankind, through a combination of misinformation or mere apathy, has caused a recent fall in childhood immunisation, while air travel has opened our shores to the importation of exotic diseases. Modern methods of animal husbandry and the introduction of ‘convenience foods’ have added to the problems of infection, while sexual ‘liberation’ and promiscuity have increased the incidence of sexually transmitted diseases.

Decreasing Infections

As a result of childhood immunisation programmes diphtheria and poliomyelitis are, at present, rare diseases in Britain and many young doctors will never have seen a patient suffering from these infections (Table 1). However, adverse publicity, principally directed against pertussis immunisation, has led to a fall in acceptance rates for diphtheria and poliomyelitis vaccine (Table 2). As diphtheria can be contracted from healthy carriers, and poliomyelitis still occurs in many parts of the world visited by UK holiday-makers, it is likely that cases will occur again in this country. Indeed, we have seen three children suffering from diphtheria in Birmingham in 1980. There is also concern about children who have not been immunised against tetanus, which is now, fortunately, a rare disease in this country.

The decrease in measles followed the introduction of an effective vaccine, although acceptance rates in many parts of the country are now unsatisfactory (see Table 2). The fall in notifications of infectious hepatitis and bacillary dysentery, both spread by the faecal/oral route, is principally due to improved hygiene and sanitation coupled with better housing and less over-crowding; families sharing toilets in tenement housing in large cities frequently contracted these infections. The decrease in tuberculosis has been delayed by immigration from Asia and East Africa.

The virtual eradication of brucellosis from cattle in the UK is a major success for the veterinary services. Scotland
was declared a Brucella Attested Area in January 1980. The number of human cases of the disease notified in that country fell from almost 400 in 1970 to under 100 in 1979.

**Increasing Infections**

The increase in food poisoning, sexually transmitted disease, malaria and whooping cough reflects certain aspects of life in the late twentieth century. The increase in hospital-acquired (nosocomial) infections is often the result of complex interactions between increasingly susceptible patients (Table 3) and new techniques of care.

Table 3. Some reasons for increase in hospital-acquired infection.

| Increase in elderly patients | Increase in susceptible patients as a result of: |
|-----------------------------|--------------------------------------------------|
|                            | leukaemia                                         |
|                            | cancer                                            |
|                            | major surgery                                     |
|                            | organ transplantation                              |
|                            | implant surgery                                    |
|                             | Increase in specialised units:                     |
|                            | renal                                             |
|                            | intensive care                                     |
|                            | urology                                           |
|                            | neonatal                                          |
|                             | Use and abuse of antibiotics                      |

Food poisoning caused by Salmonellae is an illustration of the unwanted effects of 'convenience' foods, in this instance the battery-rearing and deep freezing of poultry, while the increase in the popularity of rice-based food in the ubiquitous Chinese restaurants has been associated with *Bacillus cereus* gastroenteritis. Sexually-acquired infections reflect declining moral standards and promiscuity, both hetero- and homo-sexual.

In 1979 over 2,000 cases of malaria were notified in the UK—invariably imported by travellers.

One of the important aspects of infection in Britain today is the perverse interest of the media in exotic infections such as Legionnaires' disease, combined with a lack of appreciation of the importance of preventive medicine. The increase in whooping cough is inversely related to the fall in immunisation rates against the disease as a result of adverse publicity in the media, usually based on inadequate information about the efficacy and safety of the pertussis vaccine.

**Infections of Recently Recognised Importance**

These infections are principally the result of improved laboratory diagnostic techniques which have led to the discovery of hitherto unrecognised pathogens (Table 4). The identification of rotaviruses has explained the common occurrence of 'culture-negative' gastroenteritis of childhood, and the recent discovery that Campylobacter species are frequent causes of food poisoning in humans has added to our knowledge of the pathogenesis of intestinal infections. Improved techniques in virus hepatitis serology, with the detection of hepatitis A specific IgM, have allowed recognition of non-A, non-B hepatitis. The pre-eminence of anaerobic colonic organisms, notably *Bacteroides fragilis*, in the aetiology of intra-abdominal sepsis, has now been established, allowing a more rational approach to the therapy of these conditions. One of the most important antibiotics used to treat anaerobic infections, clindamycin, has recently been incriminated in the aetiology of pseudomembranous colitis which, in turn, is due to the toxin produced by an anaerobe, *Clostridium difficile*.

The viral haemorrhagic fevers, Lassa fever, Marburg virus disease and Ebola virus disease have been given excessive publicity. Although they are potentially lethal infections, their communicability is low and epidemics of infection should not develop in Europe where the vector, *Mastomys natalensis*, the multi-mammate rat, is not indigenous.

Opportunistic infections develop in patients with decreased resistance to infection and are usually caused by pathogens of relatively low virulence. These include bacteria (e.g. *Pseudomonas aeruginosa*), viruses (e.g. cytomegalovirus), fungi (e.g. *Candida albicans*) and helminths (e.g. *Strongyloides stercoralis*). The latter organism is of special interest in that it has recently been recognised as a cause of serious infection in immuno-suppressed patients who have lived in tropical countries.

**Bacterial Pathogenesis**

Until recently, surprisingly little was known about the specific actions of bacteria on human cells. Information on the mode of action of bacterial toxins and on bacterial adherence to, and invasion of, human cells, is now emerging. The attachment of bacteria to host cells has been shown to be of great importance in the pathogenesis of certain infections such as endocarditis, pylonephritis and gonorrhoea.

The role of iron in infection and the relationship between micro-organisms and cancer is also being studied.

**Diagnosis of Infection**

The diagnosis of infection has recently been improved by the introduction of new laboratory techniques. These include countercurrent immunoelectrophoresis (CIE), enzyme-linked immunoassay methods (ELISA), gas
liquid chromatography (GLC) and radioimmunoassay (RIA). CIE techniques have been employed for the rapid detection of bacterial antigens in CSF and sputum, GLC for the demonstration of anaerobic bacteria in specimens of pus, and RIA for serum antibody studies, as in the diagnosis of virus hepatitis.

**Treatment of Infection**

There are now almost one hundred antibacterial agents and treatment is available for infections caused by all known bacteria. However, increasing bacterial resistance and new information about potential adverse reactions associated with their use frequently restricts the clinician's choice to two or three antibiotics for the treatment of certain infections. It is also salutary that the mortality from two important infections, bacterial endocarditis and pneumococcal meningitis, has remained unchanged at around 30 per cent since penicillin first became available almost forty years ago.

Viral chemotherapy still remains relatively primitive. Indeed, it has been stated that viral chemotherapy is at the same stage today as bacterial chemotherapy was fifty years ago.

**Prevention of Infection**

The use of chemoprophylaxis in the prevention of infections has been clarified over the past decade and it is paradoxical that one of the original indications for antibiotic prophylaxis, namely the prevention of bacterial endocarditis, remains a matter of controversy.

The eradication of smallpox is principally due to the effective use of the vaccine, especially the freeze-dried preparation. Research in immunisation continues and recently introduced vaccines include the human diploid cell rabies vaccine and a pneumococcal vaccine. There is also a new meningococcal vaccine, which, unfortunately, is not effective against Group B meningococci, the commonest type causing disease in Europe. A Pseudomonas vaccine is under clinical trial for use in burned patients and a hepatitis B vaccine is also being tested.

**Conclusion**

The changing pattern of infectious disease is a complex and fascinating process. It depends on many factors. These include the susceptibility to infection of individuals and populations, human behaviour, current medical and public opinion, the prevalence of certain microorganisms, the availability of techniques for their detection and of drugs to destroy them.

Alterations in the environment, especially of hospital patients, political decisions and international incidents such as wars or civil disturbance can all contribute to the ever-changing pattern of infection, which necessitates a constant vigilance on the part of the medical profession.

The diagnosis and management of infection requires close co-operation between many different specialties. The subject is too complex to be left to one discipline or individual. The recent establishment of a national Communicable Disease Surveillance Centre is an important development. Hospitals should be encouraged to appoint general physicians with experience in infection to complement the laboratory-based microbiologist, who should have training in clinical infectious diseases.

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