

Nuffield Trust Series No. 7

The Contribution of Global
Health Policy to the Control of
Emerging Infectious Diseases

Implications
for the UK

Professor S R Palmer¹
Dr R L Salmon¹
Dr D Rh Thomas¹
Dr M Morgan³
Dr R M M Smith¹
Professor C L R Bartlett²

Foreword by
John Wyn Owen

Public Health Laboratory Service, Communicable Disease
Surveillance Centre (Wales), Abton House,
Wedal Road, Cardiff CF4 3QX.
(Phone +44-1222-521997, fax +44-1222-521987,
email palmers@cardiff.ac.uk)

¹Public Health Laboratory Service,
Communicable Disease Surveillance Centre,
London NW9 5HT.

²Public Health Laboratory Service (Wales),
Abton House, Wedal Road,
Cardiff CF4 3QX.

Correspondence to Professor Palmer



The Nuffield Trust
FOR RESEARCH AND POLICY
STUDIES IN HEALTH SERVICES

Published by The Nuffield Trust
59 New Cavendish Street
London W1M 7RD

ISBN 1 902089 15 4

© Nuffield Trust 1999

Publications Committee

Professor John Ledingham DM,FRCP

Mr John Wyn Owen, CB

CONTENTS

Foreword	4
Emergence of Infection: Historical Perspectives on a continuing problem	9
Factors in Emergence	13
The host	13
Physical and natural environment	13
Built environment	18
Social environment 1, (politics, economics and trade)	19
Social environment 2, (demographic and life style trends)	23
The therapeutic environment	30
Articulating a Global Response	37
Prognosis	44
References	45
Proceedings of the EHF/Health Industry Council World Health Forum on Emerging Plagues and Resurrected Pestilence	50

FOREWORD

Last year's World Health Day focussed on emerging infectious diseases, challenges and solutions. The recent outbreaks of ebola, meningitis and plague illustrate the challenges in making both a global alert and a global response a reality. The challenges relate to early detection of epidemics in a poor public health environment. An unusual disease often may not be detected until it has become a major threat to the population and cannot be contained with national resources. In many parts of the world public health laboratories, even if they exist, are poorly equipped or are unable to diagnose uncommon diseases or assess their impact on the community.

Often the international community reacts with panic to outbreaks. Extraordinary and inappropriate measures have been instituted and barriers set up against travel and trade, including quarantine at airports. These measures cause heavy losses in tourism and export without providing much real protection against the potential import of the disease. Quarantine is a poor protection against the import of disease. Travel time is short and an infected person can board an aircraft in apparent good health and arrive at a new destination days or weeks before symptoms appear. Very crucially we have seen the crumbling of international infrastructures as public health priorities changed in the 1970s and 1980s as resources for communicable diseases became scarce and the necessary infrastructure weakened.

The Nuffield Trust, in contributing to informing debate on how to protect and improve the health and health care of the people of the United Kingdom, has been examining the impact of global health and globalisation. Moran and Wood provide a useful operational definition:

A process through which the authority and autonomy of the nation state is challenged or supplanted by

structures, processes or policy developments which cut across national boundaries¹

but they conclude that the case for globalisation in health care policy is as yet not proven. Issues of global health however are perceived by WHO ² to be a priority as outlined in last year's Annual Report, where Dr Paul Kleehouse, a WHO director said

there is a dramatic trend for the globalisation of western lifestyle and a parallel globalisation of the associated diseases. We had expected this but we are nevertheless surprised at the pace at which this is happening. Cancer rates are soaring in countries which hardly knew the disease a few years ago.

Further, we see evidence of emerging and re-emerging infections. The Nuffield Trust's interest in this area is shared with the Institute of Medicine in the United States, which as part of its concern to protect the American people, produced a report, 'America's Vital Interest in Global Health'³ which recognises that American citizens' health is directly linked to global health changes.

International trade along with deepening poverty, political instability and environmental degradation have increased the movement of people across national borders to some two million per day. As a result people face new threats, including infections, particularly by drug-resistant microbes, exposure to dangerous substances such as contaminated foodstuffs, banned substances and violence, including bioterrorism.

All countries need strong international health organisations to provide leadership and standards. The bodies currently engaged in

FOREWORD

international health, for example the UN, are seen to be inadequate to face the new challenges. The new WHO Director offers great opportunities, so also does the emerging role of the European Union in public health: the forthcoming Treaty of Amsterdam states that:

Community action, which shall complement national policies, shall be directed towards improving public health, preventing human illness and diseases, and obviating sources of danger to human health. Such action shall cover the fight against the major health scourges, by promoting research into their causes, their transmission and their prevention, as well as health information and education.

The Community shall complement the Member States' action in reducing drugs related health damage, including information and prevention.⁴

This Nuffield Trust paper provides an introduction to the Trust's interest in global health and the background paper prepared for the Secretary's participation at a meeting in February 1998 of the World Health Forum in Atlanta and its preliminary analysis for the Trilateral on Globalisation of Health Care, which was held in Washington DC in October 1998. The conclusions of the World Health Forum were

- Nations continue to operate independently despite the need to build an international infectious disease management strategy.
- The appointment of a new Director General of the World Health Organisation (WHO) presents an opportunity to revitalise and refocus the goals of WHO on the issue of new and re-emerging infectious diseases.

- A new WHO administration can begin to address the need to develop a sustainable source of funding to support EID management initiatives, explore innovative strategies for building public and private partnerships, and consider alternative mechanisms to pool public and private voluntary and commercial funds.

The issues in this background paper are in line with the recently produced House of Lords Report which says 'This enquiry has been an alarming experience, which leaves us convinced that resistance to antibiotics and other anti-infective agents constitutes a major threat to public health and ought to be recognised as such more widely than it is at present.'⁵

Further, in the European Commission communication *Putting health at the forefront of EU action*, Pdraig Flynn, the Commissioner, said 'it is disturbing that there is no real EU mechanism to deal with communicable diseases. If, tomorrow, there were to be an outbreak of a new and dangerous epidemic, we are poorly equipped to respond'.⁶

The future challenge is that the United Kingdom's health industries, research communities, universities and government must work with its partners in the European Union and WHO to build an effective surveillance network for monitoring infectious diseases. Biomedical infrastructures must be strengthened and the full benefits of telecommunications must be realised to make the intervention of medicine possible. Further we should be able to pursue Bradley's recommendations that ' . . . there is a great need for new antimalarial drugs . . . however, the pharmaceutical industry . . . is not strongly motivated to produce more medicines for impoverished people.'⁷

FOREWORD

This paper points out that 'if policymakers wish to contain and, ultimately, reverse the resurgence of infectious disease they need to readopt, sustain and develop these evidence-based effective interventions at a national and an international level. They also need to develop the discipline of systematically assessing policy more broadly in terms of its impact on health and infectious diseases'. This emphasises the need for a UK strategy towards global health to protect the people and incorporated into the appropriate UK public health law, European regulations for public health and UK support for a revitalised World Health Organisation. This in turn should secure our economy and sustain British interests abroad.

John Wyn Owen

November 1998

References

1. Moran and Wood. 'Globalisation of Health Care Policy' in *Globalisation and Public Policy*. Phillip Gummert (Ed). Edward Elgar. 1996.
2. *World Health Report*. WHO. 1997.
3. *America's Vital Interest in Global Health*. Institute of Medicine. National Academy Press, Washington, DC. 1997
4. Draft Treaty of Amsterdam from Conference of the Representatives of the Governments of the Member States, Brussels, 19 June 1997. CONF/4001/97.
5. 'Resistance to Antibiotics and Other Antimicrobial Agents'. 7th Report of the House of Lords Select Committee on Science and Technology. HMSO. 1998.
6. IP/98/354. 15th April 1998. Brussels.
7. Op. cit. page 57.

EMERGENCE OF INFECTION: HISTORICAL PERSPECTIVES ON A CONTINUING PROBLEM

In 1347 the Mongols of the Golden Horde swept westwards from Central Asia and laid siege to Kaffa in the Crimea, a trading post established by the Genoese. Plague broke out among the Mongols investing the city¹. It is believed this was as a result of the Mongols' practice of killing marmots, among which *Yersinia pestis*, the plague bacillus, is endemic, for their furs. Contemporary accounts have them also throwing the corpses of plague victims over the walls of the invested city. Mongols ranged across a huge area of Asia and Europe. Plague subsequently spread along the trade routes to Europe. The resultant Black Death killed 20-25% of Western Europe's 80 million population in four years.

This story, apart from illustrating that the emergence of infectious disease is not a new phenomenon, also indicates a number of the categories of factors that are repeatedly seen to contribute. It shows the critical roles played by movements of peoples, in this case the Mongols, and patterns of trade, particularly of fur and silk. It shows the role of transportation whether medieval ships or Tartar horsemen. It also indicates the ever present threat of biological warfare.

Plague epidemics emphasise the role played by several aspects of human behaviour (migrations, trade, transportation, war) in the process whereby infectious disease problems emerge. Other historical examples show other themes which are important in disease emergence. Influenza illustrates the dramatic role of biological changes in an infectious agent which may enhance infectivity. Some eleven pandemics have been recorded since 1720. The influenza pandemic of 1918/19, called 'Spanish 'Flu' everywhere except Spain, is the largest infectious disease event in human history and resulted in 20 million deaths, frequently in young adults, more than the Great War that preceded it. Such influenza pandemics result from

EMERGENCE OF INFECTION: HISTORICAL PERSPECTIVES ON A CONTINUING
PROBLEM

reassortment of genetic material from human and avian influenza viruses in pigs, or, possibly, other domestic animals, to produce new strains to which humans have no immunity and which may be transmitted among humans². Even this 'antigenic shift' may, however, be promoted by human activity such as when humans, their domestic animals and poultry live in close proximity, conditions that occur in rural China which has led to the term 'influenza epicentre' being given to that country. The world wide interest which has followed the infection of human influenza in Hong Kong in 1997/1998 with what turned out, on genetic analysis at least, to be avian H5N1, was prompted by concern that a new pandemic strain might be emerging. Between periods of shift, in order to survive, the influenza virus continuously undergoes some degree of genetic mutation ('antigenic drift') as a result of the selective pressure on the virus of a large population of partially immune people, and this results in regular epidemics of influenza of five to eight weeks duration on a regional scale. These are of sufficient magnitude to produce measurable changes in the overall mortality rate of the population³.

The history of cholera illustrates how the organised efforts of society to achieve health can be catalysed by an infectious disease catastrophe, and address it successfully⁴. There have been seven cholera pandemics caused by *Vibrio cholerae* O1, believed formerly to be the only subgroup of *V.cholerae* capable of causing epidemics, and an eighth, due to the unexpected emergence of *Vibrio cholerae* O139 as an epidemic strain which commenced in 1991. It was the second pandemic, which commenced in Bengal in 1826 and spread to Europe via Astrakhan, Moscow and Saint Petersburg, arriving in Northern England in 1831, which gave rise to sanitary reform and a recognisably modern structure for the administration of public

health¹. Whilst the disease was still in Russia the British Privy Council established a Central Board of Health, the forerunner of the General Board of Health, which was set up to oversee the 1848 Public Health Act. The Act laid the administrative responsibility on local health boards, a function subsequently subsumed into local authorities where, legally at least, it remains in the United Kingdom to this day⁵.

International collaboration also resulted. The first international conference on health was in 1851⁴. Less reassuringly the recent history of cholera's re-emergence shows what happens if policies change and these organised efforts are not made or not sustained. In August 1970 cholera re-emerged in Africa from which it had been absent for over 70 years⁶, and in Peru, South America, in January 1991, where the rapidity of its spread testified to the quite extraordinary mobility of modern populations. Discharge of sewage and/or bilge water from ships has been suggested as the means of importation to Peru, and, once imported, spread has been facilitated by poor maintenance of municipal water systems, absent or ineffective chlorination, irrigation of fruit with wastewater, and shellfish beds and fishing next to sewage discharges⁷. By contrast cholera has not re-emerged in countries where the sanitary infrastructure has been maintained despite shipping and occasional imported cases.

Finally, Group A streptococcal infections, notably Scarlet Fever, illustrate how for some organisms we simply do not understand why they may emerge or disappear. In 1863 the death rate in Britain from Scarlet Fever was 4/1,000 in children under 15 years of age¹. The Archbishop of Canterbury, Dr Tait, lost five of his seven children within a month⁸. Despite well publicised clusters of cases both sides of the Atlantic^{9,10} and the public alarm generated by coverage of

EMERGENCE OF INFECTION: HISTORICAL PERSPECTIVES ON A CONTINUING PROBLEM

tabloid newspapers of the severe streptococcal infection known as necrotising fasciitis (which led to the organism being popularly styled the 'the flesh eating superbug'), surveillance in England and Wales suggests that invasive group A streptococcal infection, whilst present, is uncommon, with 679 laboratory reports of isolates from blood in 1997¹¹. This example illustrates the importance both of national surveillance to accurately and speedily characterise the scale of the problem, and also the value of an epidemiological and microbiological field investigation capability able to respond quickly to a crisis.

FACTORS IN EMERGENCE

The examples given above illustrate that the emergence of infectious diseases is the result of complex interactions between the environment, the host and the agent. An ecological approach to understanding emergence and developing appropriate policy therefore is essential. Underlying the factors identified in the following sections are two fundamental forces; the innate variability of microorganisms which allows emergence of new strains able to exploit new niches, and the tremendous increase in human population which contributes to the problems of immigration, social disruption, urbanisation and deprivation.

The host

The expansion of the world population is well known but its scale is not always appreciated. A world population in the immediate post war years of 2.5 billion had doubled to 5 billion by 1985, the 4 billion mark being passed just nine years before in 1976. A population of 11 billion has been forecast by the year 2030. Further, the enlarging population masks important demographic differences. In developing countries the age structure will be pyramidal, with a large base of infants and children, age groups traditionally subject to high rates of infectious diseases, particularly acute diarrhoeal diseases and acute respiratory infections. Conversely developed countries will have increasing proportions of elderly persons, susceptible to infection as a result of declining immunity, and frequently requiring care in institutions which themselves can facilitate the spread of infection.

Physical and natural environment

The quality of man's physical and natural environment is a major determinant of human health¹². Any future changes to the World's biophysical systems have the potential to affect human health¹³, not least by influencing the extent and distribution of communicable diseases^{14-15,16}.

FACTORS IN EMERGENCE

Climate

One of the major environmental determinants of communicable disease is climate. With the Intergovernmental Panel on Climate Change predicting an increase in the average world temperature of between 1 and 3.5°C in the next century¹⁷, and world governments showing little commitment to limiting the process of global warming through the reduction of greenhouse gas emissions, changes in the epidemiology of many communicable diseases may be anticipated.

Concerns about the public health impact of climate change are diverse. Direct effects may include: (i) increased mortality and morbidity due to extreme climate events (eg floods, storms), (ii) changes in the rates of temperature related illness (eg respiratory disease) and (iii) increased incidence of skin cancer and cataracts through exposure to solar radiation. Indirect health effects are less predictable but potentially just as serious. These will include (i) health effects of geographical shifts in food production and changes in water availability^{20,21} (ii) effects of population displacement and changing patterns in migration of peoples both short and long term, and, (iii) changes in the abundance and geographical distribution of disease vectors. The epidemiology of communicable diseases may be linked to a combination of these factors. For example, the effect of flooding caused by *El Nino* may be an increase in Rift Valley Fever in Kenya and in Somalia²² where unprecedented dry-season rains and floods have increased mosquito populations and transmission of this virus from sheep and other animals to humans.

Indirect effects of floods, droughts and long-term changes in agriculture may also lead to malnutrition, increasing susceptibility to gastrointestinal disease and helminth worms.

Changes in climate will affect all human infectious disease agents that reproduce outside their host (eg. salmonella food poisoning) or have an infective environmental stage of their life history (eg. helminths). In addition organisms that have animal reservoirs (zoonoses) will be affected by any changes that occur in the species range and distribution of their animal hosts (eg. plague, yellow fever).

Some of the diseases most sensitive to climatic change are those which are vector-borne. The epidemiology of vector-borne diseases will be influenced by increases in temperature by:

(i) *extending their current altitude and latitude limits.* Recent empirical data from a study in Rwanda²³ indicate that future temperature increases would cause malaria to move to higher altitudes. Dengue, a viral mosquito-borne disease, has also been reported at higher altitudes in Mexico²⁴. It is important to note that even a small increase in the altitude range of an infectious disease may translate as many hundreds of miles in latitude. Examples of climate-related changes in the latitude range of infectious diseases are Mediterranean Spotted Fever occurring in Spain, Hantavirus Pulmonary Syndrome in the Southwestern United States²⁵ and Ross River virus in Australia.

(ii) *extending their current seasonal range* and so increasing their burden of illness in endemic areas. Increased temperatures would also affect the incidence of vector-borne disease in areas where the disease already exists. Temperature influences the development of the life history of ticks from larval to nymph to adult stages¹⁶. Rates of transmission of tick-borne infections such as Lyme disease and human granulocytic ehrlichiosis may therefore be increased. The frequency of blood meals in mosquitoes is similarly related to

Implications
for the UK
FACTORS IN EMERGENCE

temperature. Thus higher temperatures facilitate transmission of mosquito-borne disease. An increase in dengue and malaria recently observed in Argentina has been attributed to climate change. However the existence of malaria-free states such as Trinidad would indicate that control is possible, despite climatic conditions favourable to the vector and parasite. Once again, epidemiological surveillance of both the disease and the insect vectors together with rapidly implemented control programmes are essential to identify and contain imported infection.

Animal health

Many human diseases are zoonoses (that is transmitted to man from animals). It follows that the health of man's domestic and companion animals will influence rates of transmission of these diseases.

The increase in the incidence of food poisoning due to *Salmonella enteritidis* PT4 seen in the United Kingdom (UK) during the 1980s was the result of infection entering the elite breeding stock at the top of the egg production pyramid²⁶. Reduced resistance in highly selected genetic stock may have contributed to its emergence. This is something which the recently developed techniques of cloning domestic animals could in theory make more problematic if this approach is used in the future for the wholesale re-stocking of flocks and herds. The international spread resulted from the fact that the elite breeders for the egg laying industry in Western Europe were in the hands of only two commercial companies. Nations varied in their ability or willingness to recognise this outbreak and only relatively recently has the full scale of the epidemic been documented.

The emergence of new variant Creutzfeldt-Jakob Disease (CJD) in the United Kingdom is thought to be related to consumption of BSE infected meat in the 1980s. The emergence of BSE in cattle may, in

turn, be related to a change in the rendering process which allowed the infectious agent to be transmitted via ruminant derived protein feed which was fed back to cattle, setting up a cycle of amplification of infectivity.

Laboratory animals may harbour zoonotic infection such as hantavirus and Marburg disease. In the latter example, importation of infected monkeys caused outbreaks and widespread alarm.

The agricultural practice of feeding animals large quantities of antibiotics as growth promoters has been identified as a possible cause of the rapid and widespread development of multiple antibiotic resistant strains of salmonellas, potentially important in human disease.

Wildlife

Conservation efforts are directed generally toward increasing the abundance and diversity of wildlife. However such changes in the abundance of wildlife which act as reservoirs of infection may increase prevalence of human disease. In the United States of America (USA) changes in farming practices led to reforestation of large tracts of the Eastern States and a large increase in the population of deer which are the main host for the ixodes tick, the vector of Lyme disease. At the same time expansion of residential suburbs into wooded areas has contributed to the emergence of Lyme disease as a major tick borne infection.

The growing numbers of badgers have been implicated in the breakthrough of bovine tuberculosis in the UK. Urbanisation of foxes poses a threat of spread of rabies in Europe. The increasing number of stray dogs in some countries has been the cause of a resurgence in hydatid disease. An increase in the number of deer mice, brought

FACTORS IN EMERGENCE

about by climatic extremes and bumper crops of pinion nuts, has been implicated in the emergence of hantavirus pulmonary syndrome in the American Southwest²⁵.

Disruption of the ecology and loss of biodiversity

The building of the Aswan dam was predicted to increase the mosquito population and thereby potentially initiate epidemics of Rift Valley Fever. In the event this has occurred²⁷.

Deforestation may facilitate the emergence of communicable diseases that were previously only present in limited epizootic or endemic foci. Ebola virus and AIDS may both have emerged from small foci in tropical Africa. However, probably the greatest impact of the mass clearing of tropical rainforest for farming will be the loss of genetic diversity with loss of potentially medicinal products.

Built environment

The expansion of the world's population has critically altered the balance between rural and urban dwellers. The latter are now in the majority and by the next century there will be many mega-cities with populations in excess of 10 million. Such unprecedented congregations of humans offer novel opportunities for the spread of infectious diseases. Crowding increases human contact, and with it, opportunities for transmission of disease. The United Nations' Intergovernmental panel on Climate Change (IPCC) predicted that greenhouse-induced global warming would have particular impact on cities.

It is likely that in the future much of the predicted urbanisation will be largely unplanned, and consequently accompanied by a lack of basic infrastructure. The growth of the mega-cities is far outstripping the ability to create adequate water supplies and sewerage, and

much of the expansion is in the form of shanty towns and *favellas*. Sanitation, or the lack of it, continues to have a considerable impact on human health. In developing countries over 8 million children die annually from diarrhoeal diseases. In large older cities the failure to modernise sewerage systems may allow previously controlled diseases to re-emerge, as in the case of cholera in South America (above). Poor sanitation also promotes expansion of the rat population which may in turn lead to epidemics of plague, leptospirosis and hantavirus infection.

Industrialisation is also frequently accompanied by air pollution increasing both chronic respiratory disease and susceptibility to acute disease.

Social environment 1, (politics, economics and trade)

Globalization

The world of nation states is such a ubiquitous feature of our intellectual horizons that it is hard to acknowledge that, in their familiar pervasive form, nation states are relatively recent creations dating from the new monarchies of early modern Europe such as Spain, France and England. The influence of the nation state however is waning. Technical advances in transport and communication permit commerce and industry to be organised effectively on a global basis, without particular reference to any single national government. Political developments have reinforced this trend. The European Union (EU) in 1986 signed an accord, the Single European Act, to establish a single market in goods, persons, services and capital by 1992^{28,29}. North America has similarly seen Canada, the United States and Mexico join in a single free trade block, and all belong to the World Trade Organisation (WTO), successor to the General Agreement on Tariffs and Trade (GATT). For the fortunate, the

FACTORS IN EMERGENCE

15% of the world's population who live in high income countries and have an annual per capita income of \$21,000 compared with the \$1,000 of the remainder³⁰, this has given rise to a worldwide consumer society where the fortunes of countries, industries and companies are more dependent on global trends than domestic concerns. It has also made free market philosophy the dominant political ideology as the millenium approaches.

There is a vigorous debate on the relationship of free trade to health and to environmental protection^{30,31}. Certainly globalisation has resulted in some well documented international outbreaks of acute communicable disease³².

Shigella: In May of 1994, investigators in Sweden noted an increase in domestic cases of *Shigella sonnei* infection. Strains were either phage type (PT)2 or PT 65 and were fully sensitive to antibiotics. The Swedish investigators suspected that imported iceberg lettuce was the source and informed collaborators in a European wide surveillance scheme (The 'Salm-Net' Scheme). Meanwhile in England, doctors were reporting local increases in cases of *S.sonnei* infection in adult women over the same period. There were family outbreaks, larger outbreaks following meals in restaurants and hotels and sporadic cases. Numbers of laboratory reports of *S.sonnei* infection in adults without a history of travel abroad also increased. Several similar outbreaks were reported in turn from Norway and Scotland. The Swedish observation that illness was associated with the consumption of iceberg lettuce was tested by means of an epidemiological investigation in England and Wales which showed a significant association between illness and the consumption of iceberg lettuce. Food chain investigations in several countries implicated iceberg lettuce imported from Spain³³.

Cyclosporiasis: A nationwide outbreak of gastro-enteritis caused by the parasite, *Cyclospora cayatensis*, in the US in 1996 was associated with imported raspberries. Raspberries were only introduced into Guatemala in 1987 and first exported in 1988 but represented 9% of all raspberries shipped between April and July 1996 within the US³⁴, a country which, seasonally, may import up to 70% of selected fruit and vegetables³⁵.

Salmonella: Infected chocolate gave rise to many hundreds of cases of *Salmonella napoli* in two countries³⁶ and at least 1,000 cases of *Salmonella enteritidis* infection resulted when contaminated aspic was served on the intercontinental flights of a major airline³⁷. When salami sticks contaminated with a common salmonella serotype were distributed internationally, the problem was recognised through routine salmonella phage typing in the United Kingdom (UK); the full extent of the outbreak remains unknown, but many thousands of salami sticks from the same source were consumed in other countries³⁸. Bean sprouts grown from mung beans have been identified as a cause of human salmonellosis in several countries³⁹. Many countries are now having to cope with *Salmonella enteritidis* infection associated with poultry and eggs²⁶ reflecting the international nature of the industry and the small number of elite layer-breeder flocks (above).

Legionellosis: Outbreaks of legionellosis also illustrate the relationship between international trade and emerging infections⁴⁰. Developments in public health surveillance and microbiology now allow outbreaks caused in one country to be detected in another. For example in May 1993 four members of a party from England and Wales developed Legionnaires' disease following a tour to the Spanish cities of Madrid, Toledo, Cordoba and Granada and one died. Via a European surveillance scheme it was learned that a

FACTORS IN EMERGENCE

French tourist had become ill after staying in the same hotel in Cordoba. Indistinguishable isolates of *L.pneumophila* serogroup 1 were obtained from one of the English patients and the French patient. Water samples were obtained from all four hotels and legionellas were detected in samples from the hotels in Toledo and Cordoba.

The globalisation of markets means that incidents such as those described above can affect not only the health of those who are unfortunate enough to contract the infection but the health and wellbeing of others who are little to do with the acute incident. Thus following an outbreak of legionellosis in Benidorm, Spain, in 1980 bookings in this popular resort fell by 10% with profound effects on the local economy, an experience replicated following a similar incident in Kusadesi, Turkey, in 1996. The apparent emergence of plague in Surat, India, in 1996 lead to a plummet in the number of tourists to that country and, perhaps more significantly, a ban on Indian textiles and carpets in a number of countries, notably in the Middle East; enough to trigger a stock market crash. Merely postulating a link between New Variant CJD and Bovine Spongiform Encephalopathy (BSE) was enough to trigger a world wide ban on the export of beef from the UK. Currently cholera in East Africa has resulted in an EU ban on importation of soya beans into Europe.

War

War and civil unrest remain major causes of epidemic disease. In recent times war has led to the breakdown of malaria control in India and Pakistan, to the emergence of drug resistant sexually transmitted diseases in Vietnam, to the re-emergence of polio amongst the Kurds and in Chechnya, to typhoid in Bosnia and to cholera and bacillary dysentery in Rwanda.

Social environment 2, (demographic and life style trends)

Within a given physical and social environment, human behaviour is a major determinant of the risk of acquiring infectious diseases, and changes in patterns of behaviour in a society are important influences in emergence and re-emergence.

Sexual Behaviour

Changes in sexual patterns in recent times include reduction in age of first sexual activity, an increase in the number of sexual partners and a link between substance abuse and sexual activity. Key factors in the global epidemiology of sexually transmitted diseases (STDs) are:

- lack of adequate medical services for diagnosis and treatment in developing countries.
- poverty leading to prostitution.
- urbanisation and migration leading to a high density of sexually active young people, free from traditional cultural restraints.
- migration of predominately male workers leading to casual sex encounters.
- war and social upheaval leading to break up of families, concentrations of sexually active men and commercial sex workers.
- low educational levels in women making them vulnerable to exploitation.
- sex tourism.

FACTORS IN EMERGENCE

a) Population migration

The massive movement of rural peoples to cities in Africa has created in many countries huge congregations of unemployed sexually active young people. Probably Human Immunodeficiency Virus (HIV) infection was originally spread by this route from rural to urban centres where it is spread rapidly. Factors for spread include a large number of unemployed women who, separated from families, without opportunity of other employment have resorted to prostitution to survive. Prostitution has been a factor in the regional geographical spread of HIV, with, for example, prostitutes following movement of the military during the civil war in Uganda and neighbouring countries. Concomitantly, the increase in international immigration and business and tourist travel has enabled spread to take place globally.

b) Women's Health

STDs affect women as well as men but strategies for prevention and control have tended to overlook women's social position. Emphasis on reducing numbers of partners and use of condoms are more directed at men's behaviour and do not address the situation of women infected by men returning home from cities where they seek work. They do not address the economic pressures on women to resort to prostitution in the new megacities of Africa and South East Asia. Neglect of education for girls means that women will not have the opportunities to seek other employment. The common practice of female circumcision as well as childbirth related injuries may lead to lesions which increase susceptibility to STD. Availability of appropriate examination and treatment of STDs in women is also a neglected area.

c) Sex Industry

This has promoted the spread of all STDs. For example, in South East Asia, HIV was introduced relatively late in the global spread. In 1985 a survey of intravenous drug users in Thailand showed

infection rates of 1%. By 1988 it was 40%. This was followed by spread through prostitution, often resorted to in order to fund drug habit. The spread has been rapid through the Thai sex industry, including international spread through sex tourism. Many sex workers are young girls from poor rural areas who send money back to their families. 'Temporary affiliation with commercial sex trade has gained legitimacy in poor regions as a means of addressing indebtedness of rural families.' Similarly rapid spread is being seen in other countries in the region, notably in India.

d) Other Sexually Transmitted Diseases

It is now well documented that a major risk factor of HIV spread is co-existing other sexually transmitted diseases. HIV control therefore has to be linked to STD control more widely, including provision of treatment facilities.

Intravenous Drug Use

The epidemic of intravenous drug use has led to an epidemic of blood borne diseases including hepatitis B, hepatitis D, hepatitis E, hepatitis C and HIV infection. The global trade in drugs has exploited the youth culture and poor urban populations. Police and public health policies for controlling this trade has had an effect on spread. Within Europe marked differences in the proportion of HIV infection attributable to intravenous drug abuse exist with higher proportions particularly in Mediterranean countries. Willingness to allow anonymous exchange of intravenous needles and syringes at designated centres in the UK may have had a profound effect in preventing an epidemic in intravenous drug users in low endemic areas such as Wales. By contrast a policy of confiscation of needles and syringes in one area of the UK, Lothian in Scotland, may have, paradoxically, encouraged needle sharing and promoted spread.

FACTORS IN EMERGENCE

The role of intravenous drug abuse is central to the HIV epidemic in South East Asia, IV drug abuse has been a characteristic feature of AIDS in Southern Europe. It has been argued that growth in heroin injection followed a ban on smoking opium in 1958 in China.

In the early 1980s a new form of cocaine, 'crack', which is short acting, highly addictive and smokeable was developed in the USA. Crack produces an intense but short-lived high followed by a crash. Unlike intravenous heroin crack does not depress the nervous system and is claimed to enhance sexual activity. Because of its rapid addictiveness many casual users rapidly become steady customers, and resort to sex in exchange for the next dose of crack. The phenomenon of multiple crack highs may lead to multiple sex exchanges. Trading sex for drugs has become a prominent feature of the crack cocaine trade in the USA.

Food and Catering Trends

Many emerging diseases are primarily or frequently foodborne in their mode of spread. These include disease due to salmonella, Campylobacter, listeria, yersinia, small round structured viruses (SRSV) and *Escherichia coli* 0157. The explanation for their emergence is multifaceted, but changes in the public's preferences for foods, tastes, decline in domestic science knowledge, international trade and commercial trends probably have all contributed.

Salmonella: The pandemic of *Salmonella enteritidis* infection in the late 1980s was caused by infection in the elite egg laying industry as well as in broiler production as has already been described. Eggs were contaminated with salmonella within the oviduct following bloodborne spread. Outbreaks have been associated with fashions

for using raw eggs in catering. Despite official advice from Department of Health to the public, recipes continue to be promoted on television which use raw eggs.

The incidence of salmonellosis increased steadily during the 1970s and 1980s even before the egg epidemic. This has been attributed to the growing importance of inexpensive poultry as a main protein source in the diet. Commercial pressure to reduce costs has led to mass production of poultry and mass processing during which cross contamination of carcasses is frequent. Consequently, about 50% of carcasses in the UK are contaminated with salmonellas.

Listeria: Though relatively uncommon listeriosis outbreaks have caused great public alarm since they affect pregnant women and newborn babies and the immunosuppressed, with a high case fatality rate. Outbreaks have been caused by soft cheeses, often imported for the delicatessen market.

Small Round Structured Virus (SRSV): A cause of gastrointestinal disease increasingly recognised as sometimes foodborne. Outbreaks have occurred from shellfish, particularly oysters harvested from waters which are contaminated by human sewage. The policy of discharging sewage into coastal waters makes all shellfish beds vulnerable to contamination.

Escherichia coli 0157: This new and serious infection (about 5% of cases suffer from renal failure) was recognised first in USA in association with beef burgers served at one fast food chain. The upward trend continues and outbreaks have since occurred in many countries in part from the increasing number of fast food outlets.

FACTORS IN EMERGENCE

Breast Feeding and Child Care Practices

In industrialised countries the popularity of breast feeding declined steadily through the century until the 1970s. This trend has been used to explain a lowering in the prevalence of cytomegalovirus (CMV) which can be transmitted from mother to baby in breast milk. This has produced an increasing proportion of younger mothers (50% in USA) who are susceptible to infection during pregnancy when CMV can cause severe disease in the fetus⁴¹. Coupled with this trend has been an increasing use of day nurseries for very young children. Infection of CMV spreads rapidly in such settings including to adult workers and parents, a high proportion of whom are susceptible. Particularly at risk are pregnant women in whom primary infection may lead to congenital infection of the baby in 10-20% of cases.

In many developing countries commercial pressures to buy baby milk, promoting western life styles, and increasing proportions of working mothers in cities, has led to a decline in breast feeding rates. Breast feeding is one of the most important preventive measures in childhood diarrhoea, itself a major cause of childhood mortality worldwide.

International Travel

Accompanying the globalization of markets has been the growth of international travel and tourism. Importation of exotic infections with the threat that they may become epidemic has been taken seriously by governments. The threat of Lassa fever spreading by the airborne route led to the institution of high containment facilities and the development of public health guidelines. Inadvertent importation of infected mosquitoes in tyres has been identified as the cause of the spread of dengue.

Contaminated lasagne manufactured in one country caused an outbreak of staphylococcal food poisoning in another, and salad eaten at a holiday resort in Greece was the vehicle of infection for 59 cases of typhoid fever distributed across 8 European countries⁴².

The growth in international travel has had a profound effect on the global spread of disease and in stimulating government responses to potential problems. The global spread of HIV within only a few years of its emergence in USA and Europe is directly attributable to business and tourist travel. A number of the early AIDS cases were in air stewards working for international air lines.

The rising incidence of malaria in travellers is due both to the increase in travel to exotic locations, and the increased resistance of malaria parasites to commonly used prophylactic drugs. Spread of malaria to become endemic in new areas has followed the exploration for minerals in Guyana forests by workers who take back infection to urban areas. Travellers' diarrhoea is experienced by some quarter of UK package holidaymakers, a figure which rises to almost a half for some destinations.

Recreation

Trends in recreation overlap with issues to do with travel, especially with travel to rural tropical areas where vector-borne infection is common. Certain infections are increasingly related to changes in the use of leisure time. Leptospirosis, traditionally considered an occupational disease of sewage workers, is increasingly a disease of enthusiasts for such watersports as windsurfing and canoeing.

Crime and the Penal System

Policies in the criminal justice system have implications for emerging infections. Over-crowded prisons were demonstrated to be an

FACTORS IN EMERGENCE

important source for the spread of meningococcal disease into the community in Los Angeles. High carriage rates occurred in inmates who then took infection out in the wider community on their release. Also in the USA development of multi-resistant tuberculosis arose particularly in over-crowded prisons with inadequate medical care. In the former Soviet Union tuberculosis in prisons is also a re-emerging problem. Intravenous needle sharing is common in prisons and this has had an amplifying effect on the hepatitis B, C and HIV epidemics in many countries.

The Therapeutic Environment

Technological advances this century in the medical field have produced spectacular successes, leading to prolonged survival and improved quality of life for millions of people. Many previously fatal diseases can now be prevented and/or controlled by the use of vaccines and drugs and by improvements in intensive care, surgical techniques, cancer therapy and therapy for a variety of chronic diseases⁴³. These developments have also had both advantageous and disadvantageous effects on the emergence of infectious diseases, associated with improved diagnostic techniques and as a side-effect of the use of new therapeutic agents.

Diagnosis

Improved technology for diagnosis has meant improved identification of infectious agents, which may have been around for a long time or may have recently emerged. Over the last century, advances in microscopy, and techniques for isolating, culturing and staining have aided identification in bacteriology and virology⁴⁴. More recently, the application of molecular biology to microbiology has led to a surge of new information about most infectious microorganisms⁴⁵. Molecular techniques have allowed more efficient typing of all pathogens, and have permitted discrimination between

strains of organisms that were previously phenotypically identical or uncharacterisable⁴⁶.

A good example of the role of new diagnostic techniques in emerging infectious diseases is that of hepatitis C. The hepatitis C virus causes a significant public health problem, which has important clinical and financial consequences⁴⁷, particularly as a result of outbreaks in nosocomial settings, such as dialysis units and haematology wards⁴⁸. The hepatitis C virus was not discovered until 1989⁴⁹. Previously, blood for transfusion could be screened for hepatitis B surface antigen, which resulted in a 90% decrease in the incidence of post-blood transfusion hepatitis, a significant problem since the 1940s. The remaining 10% of transfusion hepatitis was attributed to non-A non-B viral agents. The identification of hepatitis C, by the isolation of a cDNA reactive clone from infected chimpanzee RNA⁵⁰, established it to be the causative agent of more than 90% of non-A non-B post-transfusion hepatitis⁴⁹. Further developments in molecular techniques have allowed blood donations to be screened and to diagnose and confirm hepatitis C infection.

Therapy

Therapies administered for the treatment of already existing disease can be a significant factor in the emergence of new infectious diseases.

i. Antimicrobial Therapy

Antimicrobial agents are widely prescribed; they are given to 20-40% of patients in hospitals and account for about 25% of total drug expenditure. There has been an awareness of their overuse and misuse for a long time and studies have estimated that almost 50% of prescriptions for antimicrobial agents are unnecessary or inappropriate, due to the wrong drug, dose or duration of therapy being

FACTORS IN EMERGENCE

prescribed^{51,52}. Antimicrobial use or misuse may result in the emergence of two categories of infectious disease: those that arise as a result of changes in the human body through the administration of antibiotic therapy, and those that arise as a result of the promotion of changes in the bacteria from the use of antimicrobial therapy.

Increasing use of antibiotics^{53,54} has meant that the frequency of diseases associated with antimicrobial use is increasing. Cases of hospital-acquired diarrhoea caused by *Clostridium difficile*, a spore-forming anaerobe, have increased exponentially over the last 10 years⁵⁵. It is now the commonest cause of hospital-acquired diarrhoea⁵⁵ and is frequently associated with hospital outbreaks⁵⁰. The ability of *C. difficile* to induce disease is dependent on it being introduced into an individual and being able to establish in the colonic flora⁵⁶. Introduction of the bacterium may be via patient to patient spread, or indirect by healthcare workers or the environment. Establishment usually occurs because the normal gut flora is disturbed and the most common reason for this is antibiotics prescribed to treat another condition or given prophylactically. The third generation cephalosporins are frequently implicated in *C. difficile* infections⁵⁶.

Extensive use of antimicrobial agents has also led to the development and success of resistant strains or species of infectious organisms. Genes conferring resistance to antibiotics were found in bacteria before the introduction of antibiotics, but there is abundant evidence to suggest that it is the use of antibiotics that causes the selection and propagation of these mutant forms and suppresses the sensitive strains⁵⁷. Antibiotic resistance has existed since the 1940s, but there are now increasing levels of antimicrobial resistance

combined with an increased spectrum of organisms exhibiting resistance⁴⁸. The rapid rise in antibiotic resistance is linked not only to the use of antibiotics in medicine, but also to the use of antibiotics in animal husbandry and crop propagation, producing a reservoir of resistant bacteria that can cross animal species to humans⁵⁸. International travel has resulted in rapid worldwide spread.

Previously the effect of antibiotic resistance has been small, since there has always been a steady supply of new, effective agents to combat a resistant organism. The development of new agents has slowed⁵⁹, however, which may have serious consequences for patient care in the future.

This scenario is clearly demonstrated by the development of resistant strains of *Staphylococcus aureus*. *S. aureus* is a bacterium carried harmlessly by about a third of the population, but under suitable circumstances it can cause a wide range of infections⁶⁰. Before the arrival of antibiotics, infections with *S. aureus* were frequently fatal, but the introduction of penicillin in the 1940s improved this situation considerably⁶¹. Although the gene responsible for intrinsic methicillin resistance (*mecA* which encodes for penicillin binding protein PBP2a) was present in the earliest *S.aureus* strains identified, it was not until after the introduction in 1959 of the semisynthetic penicillin, methicillin, that the first hospital outbreaks of methicillin-resistant *S.aureus* (MRSA) occurred, probably increasing in numbers as a result of selection by exposure⁶¹. During the 1960s, increased numbers of strains and infections were reported, mainly from Europe, and although incidence decreased during the 1970s, since the 1980s major epidemic strains have emerged⁶². The newest strains are usually resistant to several antibiotics in addition to methicillin, including gentamicin, trimethoprim, ciprofloxacin and mupirocin⁶². Until recently, MRSA have remained susceptible

FACTORS IN EMERGENCE

to the glycopeptide vancomycin, which is the drug of choice for serious MRSA infections⁶³. However, in May 1996, the first documented case of an infection caused by a strain of *S. aureus* with intermediate levels of resistance to vancomycin (VISA) was reported from Japan^{64,65}. This has been followed by reports of VISA in the US in 1997⁶³⁻⁶⁶. The emergence of VISA suggests that strains with full resistance to vancomycin may eventually emerge⁶². If that were to happen, strains resistant to all antibiotics currently available for treatment could arise, with a return to the days of untreatable infections.

ii. Xenotransplants

Human organ transplants are commonplace, but there is a serious lack of donor organs compared to the numbers of patients requiring transplants. Advances in immunological and surgical sciences overcoming cross-species rejection may permit in the future, the use of non-human organs as transplants⁶⁷. Although this would be of benefit for patients with end stage organ diseases, there is a legitimate concern that animal diseases will be transmitted into the human population via this route. The potential risk may be minimal, may be of risk to the transplant recipient only, or most seriously, may be a risk to society as a whole as a result of spread from the transplant recipient to others and adaption to humans. Pathogenic viruses that might pose a risk in xenotransplantation include many adenoviruses; papovaviruses; papillomaviruses; parvoviruses; hepadnaviruses; morbilliviruses; filoviruses; hantaviruses; arenaviruses; arteriviruses flaviviruses and togaviruses⁶⁸. Of particular concern are the animal herpes viruses (eg herpes simplex-like viruses, Epstein-Barr-like viruses, cytomegaloviruses, and HHV6-,7-, and 8-like viruses) and animal retroviruses (including endogenous retroviruses, mammalian type C and D retroviruses, Antiviruses and human T cell leukemia virus/bovine leukemia virus-like virus)⁶⁹.

Transmission and Propagation

For a number of reasons, hospitals and other healthcare facilities occupy a key position in the transmission and propagation of emerging infectious diseases. Firstly, healthcare settings are locations where large numbers of ill people are situated. A wide variety of micro-organisms, some of which are virulent, are therefore likely to be found in such settings. The strains may include ones not indigenous to the area, since the hospital may be the location of sick people from outside the area. The hospital provides ideal circumstances for cross-infection of these organisms, either directly (patient to patient, patient to staff, staff to patient), or indirectly (airborne, environmental).

Secondly, in addition to problems posed by the aggregation of many ill people together, the problem is further aggravated by the aggregation of many people with diminished resistance to infection. In recent times the numbers of immunocompromised patients in hospitals have risen, both as a result of the increase in incidence of patients with underlying medical conditions that damage the body's immune response eg AIDS⁴⁸, and as a result of increasing use of therapies for medical conditions which include treatment with immunosuppressive drugs such as corticosteroids, cyclosporin and azathioprine, for organ transplants, cancer chemotherapy and haemodialysis. Immunosuppression allows micro-organisms in a hospital environment an opportunity to establish pathogenic niches among humans, resulting in immunocompromised patients with increased susceptibility to a variety of opportunistic bacterial, fungal, viral and parasitic infectious diseases⁶⁹.

Finally, even in patients with intact immune systems, therapeutic procedures carried out may make the patient susceptible to infection. Invasive procedures such as surgical operations and instrumentation (eg catheters) and life support systems, allow bacteria

FACTORS IN EMERGENCE

access to tissues, which would normally be protected against contamination⁴³. The use of these therapies allows micro-organisms to circumvent the body's natural defence barriers⁴⁸.

The role of the healthcare setting in the transmission and propagation of emerging diseases is clearly illustrated by the upsurge in tuberculosis (TB) which has occurred since the 1980s. In situations where inappropriate or inadequate drug prescribing has taken place or there is a breakdown in health care delivery, coinciding with a situation of large numbers of immunosuppressed patients, such as those with AIDS, the overlap of the two populations results in a rapid acceleration of active TB and the emergence of multidrug resistant TB (MDR-TB)⁷⁰. This scenario first occurred in hospitals in the United States, particularly in New York City in the late 1980s and early 1990s⁴⁸. During that time more than 200 cases of MDR-TB were transmitted in outbreaks in hospital facilities, with subsequent repercussions in the community⁷¹. The majority of cases occurred in hospitalised AIDS patients. Severe immunosuppression made them more susceptible to the disease and also resulted in an atypical presentation of the disease, delaying diagnosis⁷². Transmission from patient to patient and patient to staff occurred as a result of delayed isolation and diagnosis, insufficient barrier precautions, inadequate engineering and administrative controls and poor screening programmes, resulting in outbreaks⁴⁸.

ARTICULATING A GLOBAL RESPONSE

Contemporary societies are afflicted by infectious disease but not uniquely so when compared with their predecessors. So, if infectious diseases have emerged throughout recorded history, what is the rationale behind the contemporary trend for talking about emerging infections? The truth is that for a period following the second world war we were uniquely blessed. Adequate sanitary and water engineering coupled with improvements in food hygiene reduced the burden of enteric disease. Conspicuous successes were recorded with vaccination against tetanus, polio, diphtheria, pertussis, measles, rubella, mumps, *Haemophilus influenzae* B (HiB) meningitis and, most notably of all, smallpox, which has been eradicated. Vector control raised, tantalisingly, for a while, the prospect of malaria eradication. The utilisation of the discovery of penicillin and the development of effective antituberculous therapies ushered in an era of effective anti-microbial treatment. Through the period 1950-1991 the prevalence of famine world-wide fell⁷³ with beneficial effects on the experience of infectious diseases⁷⁴. Thus if policymakers wish to contain and, ultimately, reverse the resurgence of infectious disease they need to re-adopt, sustain and develop these evidence-based effective interventions at a national and an international level. They also need to develop the discipline of systematically assessing policy more broadly in terms of its impact on health and infectious diseases.

National infrastructures remain key to health policy. Many owe their origins historically to concerns about national security and the desire of nation states in an age of mass warfare to see an adequate supply of healthy fighting men (usually) and the women to nurture and support them. There are numerous examples. Concern about the unfitness of volunteers for the British Army in the Boer War led to the founding of the School Medical Service and in 1911 to compulsory National Insurance (including health benefits)⁷⁵. Concerns for the fitness of the Allied armies expedited effective

ARTICULATING A GLOBAL RESPONSE

strategies for sexually transmitted diseases during the First World War both in Britain and the US⁷⁶. Concern that the French population was being outstripped by the German, particularly following France's crushing defeat during the Franco-Prussian war of 1870-71 engendered a philosophy of 'pro-natalism' and a system of ante-natal benefits that continues to this day⁷⁴. These benefits have not always fared well in the era of superpower *detente*, brought about by the end of the cold war, and of privatisation and fiscal constraint. Diphtheria has re-appeared in the former Soviet Union with the breakdown in vaccination and preventive services. The re-emergence of tuberculosis, the world's most prevalent infectious disease, in the United States, the world's richest country, with evidence of primary infections rather than re-activations of historic infection⁷⁷, and of drug resistance⁷⁸, which is generally the result of incomplete treatment, underscores the importance of not allowing parts of the public health infrastructure to fall into desuetude. Tuberculosis is treatable at relatively low cost and, by contrast, countries which have shown a serious national commitment to tuberculosis control, such as Korea, have shown marked improvements⁷⁹. Equally contrasting, but unfavourably so, are those countries which have virtually collapsed completely such as Liberia, Somalia, Rwanda and Sierra Leone. Famine, war and natural disasters which create large populations of displaced malnourished people in crowded conditions with poor sanitation may contribute not only to tuberculosis but to epidemics of cholera and dysentery (Rwanda) and typhoid (Bosnia).

There is thus a requirement for policy makers to engage in reasoned debate about the level of specific resources which are necessary to underpin national security in the face of infectious diseases. It might be observed, that adequate services for the surveillance, prevention and treatment of infectious disease would go a long way to providing

protection against another contemporary concern, the introduction of infectious disease as a result of warfare or biological terrorism. Such efforts should encompass a broader requirement to ensure training an adequate supply of skilled personnel as well as an open minded research programme. The rapid identification of the *Sin Nombre* hantavirus, responsible for the 'four corners' outbreak of hantavirus pulmonary syndrome in the South Western United States in 1993 was identified in eight days and its means of spread rapidly established not least because of years of work previously accumulated on hantaviruses and the presence of a zoologist in the area collecting data on an increase in the deer-mouse population⁸⁰. Also important is an appropriate allocation of responsibilities to the private and public sectors based on the ability to promote health. Ready markets for much public health activity do not exist. Like law enforcement, the armed services or the judiciary, public health services are part of the essential infrastructure without which a state ceases to function.

In addition to specific responses there needs to be formal consideration of infection risk as part of the health impact analysis of any policy. The nascent discipline of microbiological risk assessment marrying, as it does, laboratory and clinical science with epidemiology and sociological and psychological perspectives on risk, may evolve into a helpful tool for this task⁸¹. Formalised approaches may promote more reasoned consideration of topics such as food irradiation, which is unpopular with the public and, hence, the more demotic politicians, but may bring benefits in controlling foodborne infection.

Globalisation has meant that effective interventions have now to be made at an international level. An important first step has been the development of international surveillance networks. Despite its much publicised current difficulties⁸² the World Health Organisation has since its inception in 1948 played a prominent role in this.

ARTICULATING A GLOBAL RESPONSE

It provides a weekly epidemiological service to all the member states notifying the occurrence of outbreaks and epidemics of disease subject to the International Health Regulations (Plague, Cholera and Yellow Fever) and periodic reviews of the epidemiology of other communicable diseases and of control programmes through the Weekly Epidemiological Record and other publications.

In Europe the European Union has increasingly been developing a role in the surveillance of communicable disease. Health issues had not formerly been a clear area of responsibility for the European Community notwithstanding the observed health effects of a 'common market' of the types described above. However Article 129 of the Treaty of Maastricht in 1992 established a basis for EU action in the field of Public Health charging the Community to 'contribute towards ensuring a high level of human health protection'. Further, Article 129 enjoined co-operation between member states, third countries and competent international organisations²⁷. This has provided the political will to underpin these activities.

The executive responsibility for discharging this competence lies with a division of Directorate General V (DGV) (Health and Safety) of the European Commission, although other Directorates are involved in various health related activities. In 1993 an inventory was drawn up of all existing surveillance collaborations involving the member states. A critical appraisal by experts from each country identified gaps, overlaps, and variation in quality, particularly in terms of standardisation of methods, timeliness and the use of the information to inform public health action. The heads of institutes with responsibility for national surveillance in each of the member states have met then to assist in the strategic development of surveillance. A series of disease specific networks have been established, each with an agreed protocol setting out standard case definitions,

standard methods and the ways in which the information will be used to inform others, including those with a responsibility for developing policy. Several other projects are strengthening surveillance within the EU. These include a monthly surveillance bulletin, Eurosurveillance, also available weekly electronically (<http://www.eurosurv.org>), and the European Programme for Intervention Epidemiology Training, EPIET⁸³, a training scheme in field epidemiology, of two years duration. This is a low cost scheme which builds on a willingness to collaborate at an operational level, underpinned by electronic communications systems development and which are designed to be complementary to longer standing WHO collaborations. In addition DGVI (Agriculture) has statutory responsibility for gathering data on certain zoonotic diseases (specifically tuberculosis due to *Mycobacterium bovis*, brucellosis, salmonellosis, trichinosis, campylobacteriosis, echinococcosis, listeriosis, rabies, toxoplasmosis, yersiniosis) under the Zoonoses Order (92/117/EEC). To assist with this activity, which is as much about explicitly facilitating the operation of the market in agriculture as protecting human health, the Central Reference Laboratory (Epidemiology of Zoonoses) has been established in Berlin.

In addition to the establishment of formal networks, informal networks, notably the Internet have permitted the establishment of informal points of contact among doctors and scientists working to combat infectious diseases round the globe. The recent outbreak of H₅N₁ influenza in Hong Kong was notable for the timely availability of information via the Hong Kong Health Department's Web page and via the Emerging Diseases Branch of the World Health Organisation. ProMed (The Program for Monitoring of Emerging Diseases) also allows postings, debate and discussion internationally.

ARTICULATING A GLOBAL RESPONSE

Nevertheless, even though surveillance issues are currently being addressed there remains a requirement to build an effective field capacity to respond to that surveillance data. The EPIET⁸³ programme is an example of international collaboration to develop field capability, but the lack of training programmes and appropriate career paths at national level in many countries is still a major policy issue. The way in which field support is made available internationally is yet another key policy area. Currently, the USA and to a lesser extent France, which have significant field capacity often act independently of WHO to support countries lacking the resources to manage problems themselves. Other technically advanced countries which also have capacity tend to channel support through WHO who can coordinate efforts, a process facilitated by the recently formed Division of Emerging and Other Communicable Diseases. Policy makers need to consider how such contributions can be enhanced and how to address emerging infections in failing states. For example, drugs and vaccines are developed in the face of litigation, in high income countries, but most of the burden of disease is born by low income countries where, commercially, vaccination is unprofitable.

As well as addressing the provision of structures that directly address emerging infections there is also need to consider more widely those policies which may, as a by product, either make emerging infectious disease problems more or less likely. Prominent among these is free trade. Debate on the contribution this makes to ill health has already been alluded to^{30,31}. Certainly some, like the British Association for Public Health, regard the impact of the removal of barriers to trade as detrimental and have written to the Minister for Public Health to propose the designation of an appropriate international non-government organisation to represent health and environmental

interests at meetings of the WTO⁸⁴. As with national policies a formalised approach to assessing the infectious diseases impact, such as microbiological risk assessment, may be helpful. A policy framework might be an overall review of the International Health Regulation to take into account the more diffuse nature of human contacts through globalisation of markets. They were last subject to major revision in 1969, almost a generation ago, and cover only plague, cholera and yellow fever. They do not reflect the modern day nature of a number of markets with an impact on health such as food, tourism and health care. They are being revised and modernised by WHO and will move away from reporting of three specific diseases towards reporting of syndromes of international public health significance. Although WHO will consult WTO in this process there is a case for considering the development of a wider role for WTO in a broader regulation, on health grounds, of the movement of peoples, animals and goods. The latter body is influential on national governments in a way WHO is not⁸⁵. Further, any new regulations may be a legitimate restriction of trade.

PROGNOSIS

Agricultural societies traditionally were societies of high fertility in which the death rate was subject to sudden dramatic peaks reaching levels as high as 150, 300 or even 500/1,000 as a result of war, famine or most importantly infectious disease. All industrial societies have experienced an almost total disappearance of these recurrent peaks of the death-rate⁸⁶. Can we expect this experience to continue? Some see a happy inevitability and propose that all human pathogens evolve to benign co-existence with their hosts. A darker view has it that those pathogens which have a reservoir outside humans, such as water or other animals, are not under selective pressure to ensure their human hosts survive and, thereby, guarantee their own survival. Thus peaks of death remain possible in industrial societies even if hitherto unexperienced. However, this view also implies that if humans pursue social policies that result in retarding the spread of pathogens those pathogens will either die out or evolve to more benign forms. Thus health policy may influence whether pathogens evolve into benign or harmful forms⁸⁷.

There is, thus, a task and it is both important and difficult. It is also truly international.

'Day by day the world seems smaller and smaller and societies that for millennia practically ignored each other are suddenly put in contact - or in conflict. In our dealings, in politics as in economics, in health organisation as in military strategy, a new point of view is forced upon us. Somewhere in the past people had to move from an urban or regional point of view to a national one. Today we have to adjust ourselves and our ways of thinking to a *global* point of view. As Bertrand Russell wrote, "The world has become one not only for the astronomer but the ordinary citizen". (Carlo M. Cipolla, Berkeley, California, October 1960)⁸⁶.

References

1. Gale AH. Epidemic diseases. London 1959: Penguin
2. Hampson AW. Surveillance for pandemic influenza. **Journal of Infectious Diseases:** 1997;176(1):S8-13
3. Ashley J, Smith T, Dunnell K. Deaths in Great Britain associated with the influenza epidemic of 1989/90. **Population Trends:** 1991;65:16-20.
4. Crowcroft NS. Cholera: current epidemiology. **CDR Review** 1994;4:R157-164.
5. Brockington CF. Public health in the nineteenth century. Edinburgh 1965;E&S Livingstone.
6. WHO. Cholera in Africa. **Weekly Epidemiology Record:** 1991;66:305-11.
7. WHO. Cholera in Peru. **Weekly Epidemiology Record:** 1991;66:141-6.
8. Anon. Prevention and health: everybody's business: a reassessment of public and personal health. London 1976;HMSO.
9. Stevens DL, Tanner MH, Winship J et al. Severe group A streptococcal infection associated with a toxic shock-like syndrome and scarlet fever toxin A. **New England Journal of Medicine:** 1989; 321:1-6.
10. CDSC. Invasive group A streptococcal infections in Gloucestershire. **Communicable Disease Report:** 1994;4:97
11. CDSC. Bacteremia, England and Wales: laboratory reports 1995, 1996 and 1997. **Communicable Disease Report:** 1998;8:22.
12. WHO. Our planet, our health, World Health Organisation. 1992.
13. McMichael AJ et al. Human Population Health. In: Climate change 1995. Impacts, adaptations and mitigation of climate change: scientific - technical analyses. Contribution of working Group II to the second assessment report of the Intergovernmental Panel of Climate Change (eds. Watson RT, Zinyowera MC, Moss RH, Dokken DJ) 1996: Cambridge University Press.
14. Epstein PR. Emerging diseases and ecosystem instability: New threats to public health. **American Journal of Public Health:** 1995; 85:168-171.
15. Morse SS. Factors in the emergence of infectious diseases. **Emerging Infectious Diseases:** 1995; 1:7-15.
16. McMichael AJ & Haines A. Global climate change: the potential effects on health. **British Medical Journal:** 1997; 315:805-9.
17. Intergovernmental Panel on Climate Change (WGI). Houghton JT, Meira Filho LG, Callander BA, Harris N, Kattenberg A, Maskell K, eds. Climate change 1995 - the science of climate change: contribution of Working Group 1 to the second assessment report of the Intergovernmental Panel on Climate Change. New York: Cambridge University Press. 1996.
18. Bolin B. The Kyoto negotiations on climate change: a science perspective. **Science:** 1998;279:330-1.
19. O'Riordan, T Jager J (eds). Politics of climate change: a European perspective. London 1996: Routledge.

REFERENCES

20. United Kingdom Climate Change Impacts Review Group. The potential effect of climate change in the United Kingdom: HMSO 1991: London.
21. Whyte I D. Climate change and human society. London 1995: Arnold.
22. WHO. Rift Valley Fever widely distributed in Kenya and Somalia. Press Release WHO/13. 26 January 1998.
23. Loevinsohn M. Climatic warming and increased malaria incidence in Rwanda. **Lancet**: 1994;343:714-18.
24. Sehgal R. Dengue fever and El Nino. **Lancet**: 1997; **349**: 729-30.
25. Stephenson J. Ecological monitoring helps researchers study disease in environmental context. **JAMA**: 1997; 278:189-191.
26. Rodrigue DC, Tauxe RV, Rowe B. International increase in *Salmonella enteritidis*: a new pandemic? **Epidemiology and Infection**: 1990;105: 21-7.
27. Lederberg J, Shope RE, Oaks SE Jr (Eds). *Emerging Infections: Microbial Threats to Health in the United States*. Washington DC, National Academy Press. 1992.
28. McCarthy M, Rees S. Health systems and public health medicine in the European Community: London 1992; Royal College of Physicians.
29. Richards T. 1992 and all that. **British Medical Journal**: 1991;303:1319-1322
30. Daly HE. The perils of free trade. *Sci Am*: 1993;269:24-9
31. Bhagwati J. The case for free trade. **Sci Am**: 1993;269:18-23
32. Salmon RL, Bartlett CLR. European surveillance systems. **Rev Med Micro**: 1995;6:267-76
33. Anon. A foodborne outbreak of *Shigella sonnei* infection in Europe. **Communicable Disease Report**: 1994;4:115
34. Herwaldt BL, Ackers M-L et al. An outbreak of cyclosporiasis associated with imported raspberries. **NEJM**: 1997;336:1548-56.
35. Osterholm MT. Cyclosporiasis and raspberries - lessons for the future. **NEJM**: 1997;336:1597-8.
36. Gill ON, Sockett PN, Bartlett CLR et al. Outbreak of *Salmonella napoli* infection caused by imported chocolate bars. **Lancet**: 1983;1:574-77
37. Burslem CD, Kelly MJ, Preston FS. Food poisoning - a major threat to airline operations. **J Soc Occup Med**: 1990;40:97-100
38. Cowden JM, O'Mahony M, Bartlett CLR et al. A national outbreak of *Salmonella typhimurium* DT124 caused by contaminated salami sticks. **Epidemiology and Infection**: 1989;103:219-225
39. O'Mahony M, Cowden JM, Smyth B et al. An outbreak of *Salmonella saint paid* infection associated with bean sprouts. **Epidemiology and Infection**: 1990; 103:219-225
40. Joseph CA, Dedman D, Birtles R, Watson JM, Bartlett CLR. Legionnaires' disease surveillance in England and Wales, 1993. **CDR Review**: 1994;4:R109-111
41. Roizman B (Eds). *Infectious Diseases in an age of change: The Impact of Human*

- Ecology and Behaviour on Disease Transmission. Washington DC: National Academy Press: 1995: 15-29.
42. Stanwell Smith RE, Ward LR. An international point source outbreak of typhoid fever; a European collaborative investigation. **Bulletin WHO**: 1986;64:271-278
 43. Breiman, RF. Impact of technology on the emergence of infectious diseases. **Epidemiologic Reviews**: 1996;18:4-9.
 44. Evans, AS. Causation and disease: effect of technology on postulates of causation. **Yale Journal of Biology and Medicine**: 1991;64:513-28(Abs only).
 45. Engleberg, NC. Molecular methods: applications for clinical infectious diseases. **Annals of Emergency Medicine**: 1994;24:490-502.
 46. Low, DE, McGeer,A. The use of molecular biology techniques for diagnostic microbiology and hospital epidemiology. **New Horizons**: 1995;3:161-9.
 47. Sharara, AI, Hunt, CM, Hamilton, JD. Hepatitis C. **Annals of Internal Medicine**: 1996;125:658-68.
 48. Ostroff, SM. Emerging infectious diseases in the institutional setting: another hot zone. **Infection Control and Hospital Epidemiology**: 1996;17:484-9.
 49. Tobler, LH, Busch, MP. History of post-transfusion hepatitis. **Clinical Chemistry**: 1997;43:1487-93.
 50. Laperche, S, Courouge, AM. Development of a biological diagnosis for hepatitis C. **Transfusion Clinique et Biologique**: 1997;4:291-8.
 51. The Prevention and Management of *Clostridium difficile* infection. A report by the joint DH/PHLS Working Group, 1994.
 52. Cassell, GH. Emergent antibiotic resistance: health risks and economic impact. **FEMS Immunology and Medical Microbiology**: 1997;18:271^t.
 53. Cowley, G. Too much of a good thing. **Newsweek**: 1994;March 28:60-1.
 54. Craig, LF, Hughes, JM. Trends in antimicrobial drug prescribing among office-based physicians in the United States. **Journal of the American Medical Association**: 1995;273:214-9.
 55. Starr, JM, Rogers, TR, Impallomeni, M. Hospital-acquired *Clostridium difficile* diarrhoea and herd immunity. **The Lancet**. 1997;349:426-8.
 56. Settle, CD, Wilcox, MH. Review article: antibiotic-induced *Clostridium difficile* infection. **Alimentary Pharmacological Therapy**. 1996;10:835^11.
 57. Gaynes, R, Monnet, D. The contribution of antibiotic use on the frequency of antibiotic resistance in hospitals. **Ciba Foundation Symposium**. 1997;207:47-56.
 58. Orton, P. Resistant organisms: a dilemma for primary care? **British Journal of General Practice**. 1997;47:415-6.
 59. Shales, BM, Binczewski, L, Rice, LB. Antimicrobial resistance and the immunocompromised host. **Clinical Infectious Diseases**. 1993;17(Suppl 2):S527-.
 60. Cookson, B. How to resist. **Health Services Journal**: 1997;30 Oct:9-11.
 61. Brakstad, OG, M(land, JA. Mechanisms of methicillin resistance in staphylococci. **APMIS**: 1997;105:264-76.

REFERENCES

62. Ayliffe, GAJ. The progressive intercontinental spread of methicillin - resistant *Staphylococcus aureus*. **Clinical Infectious Diseases**: 1997;24 (Suppl 1):S74-9.
63. CDC. Update: *Staphylococcus aureus* with reduced susceptibility to vancomycin - United States, 1997. **MMWR**: 1997;46:813-815.
64. CDC. Reduced susceptibility of *Staphylococcus aureus* to vancomycin - Japan, 1996. **MMWR**: 1997;46:624-6.
65. Hiramatsu, K, Hanaki, H, Ino, T, Yabuta, K, Oguri, T, Tenover, FC. Methicillin - resistant *Staphylococcus aureus* clinical strain with reduced vancomycin susceptibility. **Journal of Antimicrobial Chemotherapy**: 1997;40:135-6.
66. CDC. *Staphylococcus aureus* with reduced susceptibility to vancomycin - United States, 1997. **MMWR**: 1997;46:765-6.
67. Piatt, JL. Xenotransplantation: recent progress and current perspectives. **Current Opinion in Immunology**: 1996;8:721-8.
68. Murphy, FA. The public health risk of animal organ and tissue transplantation into humans. **Science**: 1996;273:746-7.
69. Armstrong, D. History of opportunistic infection in the immunocompromised host. **Clinical Infectious Diseases**: 1993;17 (Suppl 2): S318-21.
70. Reichman, LB. Multidrug resistance in the world: the present situation. **Chemotherapy**: 1996;42 (Suppl 3): 2-9.
71. Shafer, RW, Edlin BR. Tuberculosis in patients infected with human immunodeficiency virus: perspective on the last decade. **Clinical Infectious Diseases**: 1996;22:683-704.
72. Hopewell PC. Impact of human immunodeficiency virus on the epidemiology, clinical features, management and control of tuberculosis. **Clinical Infectious Diseases**: 1992; 15:540-7.
73. Kates RW. Ending deaths from famine. The opportunity in Somalia. **NEJM**: 1993;328:1055-7.
74. McKeown T. The role of medicine. Oxford 1979;Blackwell.
75. Porter R. The greatest benefit to mankind. A medical history of humanity from antiquity to the present. London 1997;Harper Collins.
76. Adler MW. The development of the venereal services. In: Farrow S ed. The public health challenge. London 1987;Hutchinson.
77. Small PM et al. The epidemiology of tuberculosis in San Francisco - a population based study using conventional and molecular methods. **NEJM**: 1994;330:1710-6
78. Frieden TR et al. The emergence of drug-resistant tuberculosis in New York City. **NEJM**: 1993;521-6.
79. Raviglione MC, Snider DE, Kochi A. Global epidemiology of tuberculosis - mortality and morbidity of a worldwide epidemic. **JAMA**: 1995;273:220-6.
80. Wenzel RP. A new hantavirus infection in North America. **NEJM**: 1994;330:1004-5.
81. Advisory Committee on Dangerous Pathogens. Microbiological risk assessment: an interim report. London 1996. HMSO.

82. Godlee F. WHO in crisis. **British Medical Journal**: 1994;309:1424-8.
83. Moren A, Rowland M, Van Loock F, Giesecke. The European Programme for Intervention Epidemiology Training. **Euro Surveillance**: **1996;1(4)**.
84. Reid D. Global health for all. **Public Health Forum**: 1997;1(4):1-2.
85. Godlee F. The World Health Organisation: WHO in retreat: is it loosing its influence? **British Journal Medical**: 1994;309:1491-4.
86. Cipolla CM. The economic history of world population. London 1974: Penguin.
87. Ewald P. The evolution of virulence. **Sci Am**: 1993;268:56-62.

PROCEEDINGS OF THE WORLD HEALTH FORUM

These proceedings
of the World
Health Forum on
Emerging Plagues
and Resurrected
Pestilence held at
Grapevine, Texas,
22-27 February
1998, are
reproduced by kind
permission of the
Health Industry
Council of the
Dallas - Fort Worth
Region, sponsor of
the Forum.

A. Executive Summary

The Health Industry Council and The International Hospital Federation welcomed an international audience of 20 participants from 15 countries and five international organizations to the third biannual World Health Forum (WHF). Participants in the WHF 1998 were nominated by their peers because of a distinguished professional record in their respective fields in their own nations. Countries represented included Belgium, Chile, China, Greece, Hungary, India, Israel, Mexico, Nigeria, Russia, Sweden, Switzerland, Thailand, the UK and the USA.

The purpose of this year's event was to examine emerging and re-emerging infectious diseases from an international perspective and to develop a set of guidelines and recommendations for proactively managing potential and recurring infectious disease outbreaks. This topic was chosen to provide an opportunity for different nations to come together and respond to the growing international public health threat posed by the increased proliferation of antibiotic drug-resistant microorganisms, food-borne illnesses and emerging and re-emerging outbreaks of infectious diseases.

Recent research and policy papers describing the natural history and evolution of infectious disease outbreaks, for example, conclude that there are a number of identifiable contributing social factors affecting the spread and increased risk of infectious disease outbreaks. These include mounting political tensions, human rights issues, the growth in urban populations and continued crowding of cities, faster international transport of goods, people and agricultural products, and ecological and environmental changes such as El Nino, the destruction of the rain forests, and global warming, among many others.

PROCEEDINGS OF THE WORLD HEALTH FORUM

In 1998, the WHF convened in Grapevine, Texas, to begin to address the need to develop international infectious disease management policy and recommendations. This five-day event involved key speeches, group activities to explore critical management issues and discussions with a wide range of experts. The goal was to help develop a set of recommendations and action plans that could be utilized by most every nation.

Throughout the Forum, invited speakers presented on a variety of topics pertaining to policy, management and the epidemiology of infectious diseases including:

- 1) the history and evolution of both emerging and re-emerging infectious diseases;
- 2) the importance of focusing on the social factors associated with the spread of infectious disease, including the failure of nations to protect and preserve basic human rights;
- 3) the need to develop a proactive communication strategy that includes approaches to handling the media in the event of an infectious disease outbreak;
- 4) the epidemiology and need for an integrated international strategy for managing infectious disease outbreaks.

Facilitated discussions were also conducted on different days during the Forum. Group consensus was reached that recommendations and action plans for developing an international strategy for proactively responding to infectious disease outbreaks should be organized around seven broad management themes including:

politics and policy, leadership, strategic planning, information systems, communication, infrastructure and capacity building. Participants were then organized into three small working groups to develop and share recommendations on subsets of these themes.

It is important to note that the participants in the WHF 1998 share the view that there are three critical reasons that the recommendations and action plans must be communicated and acted upon now:

- 1) Nations continue to operate independently despite the need to build an international infectious disease management strategy.
- 2) The appointment of a new Director General of the World Health Organization (WHO) presents an opportunity to revitalize and re-focus the goals of WHO on the issue of new and re-emerging infectious diseases.
- 3) A new WHO administration can begin to address the need to develop a sustainable source of funding to support emerging infectious disease (EID) management initiatives, explore innovative strategies for building public and private partnerships and consider alternative mechanisms to pool public and private voluntary and commercial funds.

Politics and Policy: Policy efforts should focus on the preparation of an agreement that will lead to international legislation on EID that promotes collaboration. Policies addressed within this agreement should be developed along the following lines: protecting the health and well-being of people within all communities, preserving the basic human rights of individuals, balancing individual and community rights, as well as ensuring the socioeconomic stability

PROCEEDINGS OF THE WORLD HEALTH FORUM

of societies including national security, while observing and protecting the sovereignty of nations.

Leadership: Leadership is a central organizing principle that affects the implementation of a strategic plan to address EID and improve population health. Effective leadership should be a priority and include both the ability to anticipate change and envision a future state and the capacity to deploy and manage the implementation of an appropriate response. Leadership activities should focus on developing lay and professional leaders at every level of society. This includes governments, programs, organizations, health providers, opinion leaders and the general public. Support mechanisms to ensure continued training and development of effective leaders should include access to continued academic and professional training.

Strategic Planning: The management of EIDs requires a proactive and planned approach to ensure the appropriate prevention and control of the spread of disease by health authorities. The major stages should include:

Phase 1 - Non-Alert: 'Non-alert' is an early, routine, preparatory or normal state.

Phase 2 - Alert: The alert phase is the detection, confirmation and declaration of changes identified during non-alert conditions.

Phase 3 - Response: The response phase includes the ongoing assessment of information and the planning and implementation of an appropriate response, which includes the coordination and mobilization of resources to support intervention activities at the local, regional, national and international levels.

Phase 4 - Follow-Up: Follow-up activities include re-evaluation, restructuring, reporting and continuing education, and redefining strategic parameters.

Information systems: To effectively manage the spread of disease, it is the responsibility of the international community to have minimum standards in place for the development of information systems. This includes addressing both the need for technology as well as ensuring the human capability to analyze and share information locally, regionally, nationally and internationally.

Communication: Information technology is really one form of communication. A comprehensive communication strategy is also required to ensure accurate, timely sharing of information. The communication plan should be established and disseminated. Specific communication strategies should address containment of new and re-emerging diseases.

Infrastructure and Capacity Building: Efforts to manage EIDs, particularly during outbreaks, suggest there is frequently a lack of coordination and what appears to be a delayed response. A well-planned, systematic response is required that should include assessment of emerging and re-emerging infectious diseases, an evaluation of existing resource capacity and the formulation of a strategic and operational plan to ensure a coordinated intersectoral global response. Global activities should be tailored to circumstances where problems occur and address a range of situations from civil unrest to more stable circumstances.

Summary Recommendations:

- 1) The International Hospital Federation, The Health Industry Council and the members of the WHF hope that this year's event

PROCEEDINGS OF THE WORLD HEALTH FORUM

will stimulate the leadership present at the Forum as well as their host countries to continue the dialogue started in Texas, and that it will motivate an international and collective effort to prepare for and proactively manage the global spread of emerging and re-emerging infectious diseases.

- 2) Key to the successful implementation of these recommendations is the adoption of a systems approach, such as continuous quality improvement. This will provide a framework for intersectoral collaboration and create specific opportunities to improve the alignment of authority and enhance operational performance, among other benefits. Broadly defined, strategic operational goals should focus on the four E's: efficiency, equity, effectiveness and economy.
- 3) To facilitate implementation, the members of the WHF 1998 should identify a task force of experts to foster the continued development of a strategic business plan.
- 4) Further, the World Health Assembly 2000 should adopt a formal resolution endorsing a comprehensive strategic approach to managing EID.

B. Report

B. 1. Introduction

The Health Industry Council and the International Hospital Federation welcomed an international audience of 20 participants from 15 countries and five international organizations to the third biannual World Health Forum (WHF). Participants in the WHF 1998 were nominated by their peers because of a distinguished professional record in their respective fields in their own nations. Countries

represented included Belgium, Chile, China, Greece, Hungary, India, Israel, Mexico, Nigeria, Russia, Sweden, Switzerland, Thailand, the UK and the USA.

The purpose of this year's event was to examine emerging and re-emerging infectious diseases from an international perspective, and to develop a set of guidelines and recommendations for proactively managing potential and recurring infectious disease outbreaks. This topic was chosen to provide an opportunity for different nations to come together and respond to the growing international public health threat posed by the increased proliferation of antibiotic drug-resistant micro-organisms, food-borne illnesses and emerging and re-emerging outbreaks of infectious diseases.

B. 2. Background

Accumulating evidence in the clinical, economic, public policy and healthcare management literature suggests that infectious diseases represent a major public health threat. Internationally, emerging and re-emerging infectious diseases are considered the No. 1 cause of death.

The data from studies examining outbreaks suggest that a heavy social and economic toll is exacted when an outbreak of infectious disease occurs. For example, in 1991, an outbreak of Cholera in Mexico affected the lives of approximately 300,000 people, resulting in more than 3,000 deaths and an estimated \$700,000 in expenses for the nation. In India, an outbreak of several plagues in 1994 devastated an already impoverished nation, resulting in an estimated loss of \$1.7 billion.

Although there are many potential contributing factors, reluctance to report and a lack of preparedness from a management

PROCEEDINGS OF THE WORLD HEALTH FORUM

standpoint continue to be some of the most important factors motivating substantial economic and human loss. For example, recently, in the United States, food-borne pathogens such as *E. coli* have been linked to undercooked meats. Illness and injury resulting from these outbreaks may have been prevented if effective policy and infectious disease risk management practices had been developed.

The potential to prevent and control infectious disease continues to raise concerns internationally. It should, however, result in a call to action for both developed and developing nations. There are many examples of the ways in which sound policy and management practices have led to the successful management and control of emerging and re-emerging diseases. These deserve international consideration.

For example, Zaire, and probably the entire world, 'dodged a bullet' in 1995 when an outbreak of Ebola occurred. Many contend that effective surveillance followed by prompt management intervention helped reduce the magnitude of this crisis and more than likely saved millions of lives. Further, effective communication was one of the most important factors that contributed to the successful management of this potentially devastating infectious disease outbreak.

While many are focused on microbiological and clinical research, there is also a need to develop better policy and improve our understanding and approaches to better managing the social aspects of emerging and re-emerging infectious diseases. Nations must recognize that many diseases are spreading rapidly because of sociological factors and poor management practices in addition to the microbiological changes and adaptations of infectious diseases.

Recent research and policy papers describing the natural history and evolution of infectious disease outbreaks, for example, conclude that there are a number of identifiable contributing social factors affecting the spread and increased risk of infectious disease outbreaks. These include mounting political tensions, human rights issues, the growth in urban populations and continued crowding of cities, faster international transport of goods, people and agricultural products, and ecological and environmental changes such as El Nino, the destruction of the rain forests, and global warming, among many others.

In 1998, the WHF convened in Grapevine, Texas, to begin to address the need to develop international infectious disease management policy and recommendations. This five-day event involved key speeches, group activities to explore critical management issues and discussions with a wide range of experts. The goal was to help develop a set of recommendations and action plans that could be utilized by most every nation.

The following report presents information about the WHF 1998 including a summary of the methods employed to facilitate discussions and to formulate recommendations and action plans. In addition, highlights from the presentations and facilitated discussions are included.

B. 3. Methods

Prior to attending the WHF 1998, participants received case studies and questions about a hypothetical infectious disease outbreak. Questions were designed to elicit information about how each nation might respond to a hypothetical occurrence of an infectious disease outbreak. Information obtained from the participants was compared and reviewed prior to the first day of the Forum.

PROCEEDINGS OF THE WORLD HEALTH FORUM

Upon arrival, participants registered for the Forum and received a binder of information that outlined the activities for the week; several articles discussing various aspects of emerging and re-emerging infectious diseases; and case study responses from each of the participants.

Following a keynote address and formal presentation, participants were organized into working groups to engage in facilitated discussions to determine their goals for attending the Forum, their views on current international management strategies for responding to emerging and re-emerging infectious diseases, and their responses to the case studies, as well as to develop objectives for the week.

Facilitated discussions were utilized to stimulate the group process and to highlight variation in international capacity, capabilities, preparedness, and approaches to managing potential outbreaks of infectious disease. Topics discussed included: the role of government regulation, the role of the military, domestic and international epidemiology and surveillance strategies, border control policies, education and training programs, the availability of financial resources, capacity and use of information technology, potential liability issues, and approaches to establishing inter-organizational networks to facilitate communication, among many other issues.

Throughout the Forum, invited speakers presented on a variety of topics pertaining to policy, management and the epidemiology of infectious diseases including: 1) the history and evolution of both emerging and re-emerging infectious diseases; 2) the importance of focusing on the social factors associated with the spread of infectious disease including the failure of nations to protect and preserve basic human rights; 3) the need to develop a proactive communication strategy that includes approaches to handling the media in the

event of an infectious disease outbreak; 4) and the epidemiology and need for an integrated international strategy for managing infectious disease outbreaks.

Presentations were followed by breakout sessions in which three groups of participants shared insights, reflections and ideas. Each group assumed responsibility for developing recommendations and reaching a preliminary consensus around a set of key management issues including: policy and politics, leadership, ethical and legal considerations, information technology, communication strategies, and action plans for allocating scarce resources among competing clinical, social, economic and management priorities.

On the final day of the Forum, representatives from each of the three working groups presented their recommendations to a group of expert panelists during an open lyceum, led by a facilitator. The audience included Forum participants, the media, students, invited guests and others from the local Dallas - Fort Worth area.

B. 4. Presentation Summaries

John Stelling, M.D., M.P.H., Medical Officer, World Health Organization. 'Emerging Infectious Diseases: A New Public Health Threat?'

Dr. John Stelling discussed the changing nature of emerging and re-emerging infectious diseases from a historical perspective, emphasizing the interaction between biological, individual, behavioural and social processes. In addition, he reviewed the role and current activities of the World Health Organization to enhance international efforts to better manage infectious disease outbreaks.

Highlights from several major periods in history when major infectious disease outbreaks occurred were presented. These were

PROCEEDINGS OF THE WORLD HEALTH FORUM

followed by an examination and discussion of changing behaviours, social patterns and trends.

Data pertaining to a number of historical, re-emerging infectious diseases suggest that the important determinants of the changing character of infectious diseases are social. For example, the problem of Polio occurred in civilizations as old as ancient Egypt long before it was recognized and nearly eradicated in the United States after the 1930s. Polio, however, continues to be a problem in many developing nations. Both microbiological adaptation as well as access to vaccinations are factors associated with the continued presence and spread of this disease.

Further, while many believe that emerging infectious diseases such as Ebola, E.coli, HIV and CJD, among others, are recent phenomena, chances are they have been around for a very long time. The changes that have occurred in these diseases are correlated with our ability to detect, document, and describe these potential threats.

Changes in the epidemiology of disease, however, have also continued to shape human understanding of disease processes. For example, hemorrhagic fever associated with the Ebola virus was not documented until the 1970s. Since then, the virus has emerged as a major public health concern. Subsequently, efforts have been focused on improving our understanding of its aetiology and epidemiology. Evidence suggests that it is carried by animals, probably bats, and may have existed for many years.

In addition to an improved ability to recognize diseases, many factors are believed to be associated with recent occurrences of infectious disease emergence and re-emergence. These include enhanced travel capabilities, population growth, rapid urbanization and crowding among others. The key point is that the aetiology

of disease and the epidemiology of disease interact. Individual, behavioural, and social factors create opportunities for infectious diseases to emerge and re-emerge. In turn, adaptations and changes in the diseases themselves lead to bio-psycho-social changes in human populations. While current public health interventions and practices should continue, there is also a need for new public health models that can adapt to the changing nature of infectious diseases as well as the changing characteristics of the human condition.

To help foster international dialogue and collaboration, the World Health Organization (WHO) is establishing new partnerships, building global infectious disease surveillance systems, advancing research activities, and implementing improved approaches to disseminating information internationally. Ongoing activities will continue, including providing field training opportunities in the epidemiology of infectious diseases.

A new division of emerging and other communicable diseases has also been established. The goal is to strengthen surveillance activities and efforts to control disease and potential outbreaks, as well as to ensure a timely and effective response when an outbreak occurs.

Further, the WHO is focused on a more syndromic approach in their efforts to help control the spread of disease. This will require the stronger use of epidemiological methods and an expansion in the range of diseases of interest to WHO.

In summary, infectious diseases should be viewed as both an old and a new problem. The greatest change has been in our perception that infectious diseases have been conquered. While many advances have been made in prevention, control, and treatment, it

PROCEEDINGS OF THE WORLD HEALTH FORUM

is important to recognize that the nature of the problem continues to change. There is no guarantee that past interventions will continue to be effective in the future.

Jonathan Mann, M.D., M.P.H., Dean, Allegheny School of Public Health. 'Concepts of Emerging Epidemics and What We Can Learn from the HIV Experience: Opportunities to Reduce World Vulnerability'

Dr. Jonathan Mann presented on three key themes:

- 1) concepts of emerging epidemics;
- 2) what we can learn from the HIV epidemic;
- 3) what might we do to reduce the world's vulnerability?

Dr. Mann's presentation began with a provocative statement: 'The world's vulnerability (to emerging and re-emerging infectious diseases) is greater today than ever before and we are not prepared.'

A key issue addressed in his presentation is the importance of recognizing that internationally, people do not share a belief that as a matter of birth, we are all entitled to basic human rights. This fact alone is probably responsible for much of the spread of infectious diseases in developing countries.

New epidemics are emerging and re-emerging, driven by a number of important factors. For example, the movement of people through alternative means of travel at faster speeds is creating an environment that enables diseases to spread more quickly. An experiment

was conducted in which mosquitoes were placed in the wheel base of a 747 jet airplane. After approximately 24 hours of air travel, the plane arrived at a destination in another country. All of the mosquitoes were alive and 'doing fine.'

In addition to the movement of people, economic links have made it possible to move manufactured and agricultural goods almost anywhere in the world. While the benefits of this growing capability are great, there is also an enhanced vulnerability. The movement of goods may engender the spread of infectious diseases if there are not suitable management controls in place to protect the public's health.

The movement of ideas is yet another factor motivating the emergence and re-emergence of known and unknown epidemics. The world is increasingly coded by way of electronic means sending images of what it means to be modern. For example, image statements can influence cognition and social perception, and change behaviours that may lead to the spread of sexually transmitted diseases.

In addition to social changes, microbes themselves are changing all over the world. Agricultural practices, international transport practices, and the continued growth of technology and industry play a major role in the spread of infectious diseases. Technology itself can create opportunities for new diseases to emerge and spread. For example, the emergence of 'mad cow' disease resulted from an agricultural practice of utilizing 'road-kill' for farm animal feed. At the same time, the technology for creating feed changed from a process of batch heating to kill microorganisms to one that utilized a continuous heating process. This established the necessary conditions that allowed the 'mad cow' disease to enter into the animal food chain.

PROCEEDINGS OF THE WORLD HEALTH FORUM

While the nature of infectious diseases continues to change, the world of nations is not changing along with it. Some contend that the world will eventually be taken over by microbes causing a complete breakdown in the public health infrastructure and capacity of nations to respond. At the same time, the world of nation states are in transition due to the globalization of economies. Few are willing to report the occurrence of infectious disease outbreaks because of the potential economic impact of disclosing that an epidemic may be occurring.

Evidence of lying to the public by health officials, a weakening infrastructure and ability to diagnose emerging and re-emerging infectious diseases have been identified internationally. Moreover, many local health authorities, particularly in developing nations, actively limit necessary communication when infectious disease outbreaks occur.

For example, evidence suggests that many will deny, diminish or attack the credibility of those who try to disclose information about infectious disease outbreaks. 'The next global epidemic is not a question of where, but a question of when.' Nations need a new approach to identify, respond rapidly and motivate transnational action.

The AIDS epidemic provides an important case history in motion where nations can observe a number of important points. First, effective responses to the global threat of emerging and re-emerging infectious diseases require both science and good public health. The absence of either will lead to an inappropriate political response.

International success reducing human vulnerability to the problem of emerging and re-emerging infectious disease, however, will depend

on how the problem is defined. In the old public health paradigm, diseases were defined as dynamic and society as static. Over time, it is increasingly clear that disease and society are inter-connected, that is, both are dynamic.

If this is true, then the challenge is to determine what makes a country vulnerable in the face of AIDS and other diseases. Efforts to prevent and control problems must begin with a search for a better understanding of the societal roots of disease, disability and premature death.

A new public health approach to framing these issues might include looking at disease in at least two ways in the future. First, leaders should engage in the intellectual exercise of looking at the world as if it were the world of the past. For example, nation states are making independent nation state decisions rather than operating as a collective force. Second, transnational movements and globalization should lead nations to conclude that it is no longer permissible for any one country to fail to report and share information. The world is continuing to move from independence to inter-dependence.

Accepting this new global public health view of inter-dependent nations creates a social challenge and a challenge to science. The great author Chekhov once said, 'National science is not science at all.' Inherently, science is international in perspective. Therefore, nations must draw on the strengths of other nations. Further, nations must recognize and understand the reasons that countries respond to disease and the reasons that they will persist are social and have to do with different views with regard to who should be afforded basic human rights. These are the fundamental determinants of how society will be organized nationally and internationally.

PROCEEDINGS OF THE WORLD HEALTH FORUM

Looking into the future, the challenge of the World Health Organization and others is to assume a visionary perspective and to motivate change of existing paradigms. There is an emergent need to do more than just enhance current approaches. Historically, there was a great movement in Greek Theater which may provide an appropriate metaphor for the current state of the infectious disease world. Greek plays moved from stories about one man and a chorus engaged in a dialogue between gods to real dramas between people. In the latter example and in the true history of the world, these plays are discussions about respect, humanness and the struggle of the enemy.

This is similar to and should set the stage for our discussion of human rights. People everywhere must understand we are all born equal and that the borders constructed between the self and others have to change. Similarly, the borders between nations and nation-states have to change as well. A helpful perspective might be to adopt a different perspective of the world as a blue, green and white mass traveling through space. This may be an important next vision of the world necessary to motivate collective challenge: 'The world is our spaceship.'

In conclusion, Martin Luther King once said, 'The arc of history is long, but bends toward justice.' Similarly, the arc of history of the control of infectious diseases is long, and requires us to pull on that arc toward social justice as well.

Steven Littlejohn, Fleishman-Hillard. 'Infectious Disease Communication Strategy: Handling the Media'

Steven Littlejohn presented a broad overview of the media and its role in shaping public perception of emerging and re-emerging infectious disease outbreaks. Major themes of his presentation included

the wide variation in approaches to managing the media across nations; the likelihood that the media will distort facts and information; the utility of message-charting tools and other approaches to planning a media communications strategy; and tactical strategies for handling media in the event of an international infectious disease outbreak.

According to Mr. Littlejohn, whether the media are a help or a hindrance in times of crisis, it is impossible to ignore the potential impact and influence of advanced communication in shaping public perception. The media are here to stay and must be managed.

If nations establish effective strategies for media management, they may be in a better position to turn the media into a critical partner who can help communicate with a wide range of audiences who may need to be reached in the event of an emerging or re-emerging infectious disease outbreak. Alternatively, if the media are not managed, they can be a hindrance to mounting an effective infectious disease management strategy because the tendency is to share wrong or distorted information that can quickly send people off in the wrong direction.

To effectively manage the media, it is important to learn and understand how members of the media think. For example, Ruben Frank of NBC once said that we have more and more news outlets emerging, but less and less 'real' news. In fact, many people are involved in chasing 'no news' at all. Much of the desire for something, whether it is 'no news' or 'real news,' is driven by the need for broadcasting companies, newspapers, and magazines and other forms of media to achieve high ratings and to sell advertising space.

PROCEEDINGS OF THE WORLD HEALTH FORUM

The pressure for ratings and to sell ad space often motivates the media to distort issues and problems. This occurs often because the media tend to focus on the negative aspects of events and sensationalize them. For example, two recent events reported by the media, the crisis in the Gulf and the ongoing scandals emerging from the White House, are both described as crises by the media.

Recently, the media have been expanding into new venues including cable television and the Internet. For example, media executive Ted Turner focused his efforts on the emerging cable television market in 1980 because, in his opinion, there weren't any media left to purchase by 1978. As part of his cable acquisition strategy, he also developed CNN and achieved international recognition for boosting headlines about various international crises over the years such as hijackings and the Gulf War.

Turner's success set off a news rush, first with Rupert Murdoch's FOX television news and MSNBC. Now, the British Broadcasting Company is entering into the market to compete and taking advantage of its long history of correspondence around the world. Recent statistics suggest that CNN may reach about one billion people everyday. The emerging area of activity, however, is occurring on CNN's Web site. Estimates record 329,000 visits to CNN's Web site each day. This portends a major move into the Internet as a broadcast medium for most major networks. Some contend that this is a trend that affects only Americans; however, more recent data show that 45 per cent of Singapore households, for example, are online and political parties in India are accessing the Web. This is bringing politics and international issues into remote places, such as local villages in even the poorest of nations.

In general, electronic exchanges and reporting of information by way of the Internet are transforming the Web into an instant access point to international information. Recent studies suggest that television required about 26 years to capture 25 per cent of the U.S. market. Estimates are that the Internet, however, will require less than seven years to capture a similar size audience.

The implications of this growth for the media are numerous. News is becoming 'real-time' and reporting deadlines are established minute to minute. For example, the Dallas Morning News got hold of a confession of Timothy McVeigh. Normally, this type of information would be reported in the paper in the next edition. Instead, the confession was first posted on the paper's Web site and then printed in the paper. This is one of the first instances of Web site information replacing the printed word as the prime source of news information.

A similar trend occurred in Washington, D.C. Information about Olympic successes and failures were reported on the Internet before emerging anywhere else. This enabled sports reporters, for example, to instantly communicate information online.

Development of a successful communication strategy is a critical management issue during an infectious disease outbreak. If a nation is dealing with a newspaper reporter, it is possible that the individual person is not actually interested in conducting research and really understanding the story. The pressure for real time news suggests that a reporter is more likely to want to get the story out as fast as possible. Reporters are moving very fast and looking for sharply defined stories that can grab attention. Often, information is cast in a somewhat negative light and in 'sound bites' to stimulate the audience's interest.

PROCEEDINGS OF THE WORLD HEALTH FORUM

Increasingly, anyone can become part of the media and there is little that can prevent nations and people from adding their information to the media. People can quickly build Web sites of their own and share whatever information they choose, news or otherwise. It is important to think about how this fact can be used during a crisis to influence the media.

With the growing ability and access to build one's own Web sites and post any information one chooses 'news or opinion' it seems that any person can become a 'member of the media.' This is an important consideration in the midst of a crisis, for these media members possess the power to influence, and they can also be influenced.

One example of the media's influence surfaced during an influenza outbreak that killed people in Kenya and Hong Kong. More deaths occurred in Kenya, but the media focused greater attention on Hong Kong. Some experts opine that the difference occurred because most of the world feels reasonably safe from harm when something happens in a place like Kenya. In Hong Kong, however, which is more accessible and modern, the occurrence of an uncommon variant of a globally communicable disease during flu season presented a major potential threat. The world felt more exposed to Hong Kong even though more people were dying in Kenya.

Fundamentally, however, the basic challenges remained the same for both countries. But for all the rush to complete stories about both Kenya and Hong Kong, the public is still largely struggling to determine what actually happened. The Kenya story and the Hong Kong story occurred within a few days of each other but failed to reference each other. The public's ability to assess what is really happening is not as strong as the media would like everyone to

believe. The media reported sequential and conflicting stories and opposite conclusions. It is important to recognize that the media may provide conflicting information on a day-to-day basis.

David Ornstein suggests that we should encourage people to do everything possible to educate themselves because, frequently, the most basic questions are not asked by the media. There is a Web site, for example, called www.outbreak.org. This location catalogues outbreaks and provides up-to-date reports about where things stand.

One way to help organizations prepare for media management in the midst of an outbreak is to conduct drills. For example, a hospital might conduct an education drill that includes preparing a fact sheet to disseminate background information to media about the event. It might be worthwhile to consider including the media in a practice drill.

In the United States, for example, hospitals accredited by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) are required to conduct practice crisis drills and invite the local media. The important point is that individuals, organizations and nations must manage the media proactively. The media will expect a rapid national, regional and local response to an occurrence of an infectious disease outbreak.

The media are not the only important audience. Anyone potentially at risk must be considered, including both victims and carriers. Why? The media will approach and gather information from these groups as well.

Often, the best media relations process begins with mapping the key groups. To help nations prepare, a useful tool to develop is a

PROCEEDINGS OF THE WORLD HEALTH FORUM

media chart. At each stage of the disease outbreak, nations can identify the type of information needed or that will be needed by different audiences. This proactive response can enable groups to shape the message before it is heard and then integrate and prioritize the messages into 'sound bites.'

Several proactive tactical recommendations are also worth noting, such as developing practice communication plans, scenario building, preparing written materials, and selecting and training spokespeople with technical backgrounds.

In addition, providing a place for the media to arrive, set-up and interview people provides greater control over the situation.

Operationally, nations should be prepared to inform the media extensively. For example, the media might be directed to a Web site for information about the management of an infectious disease outbreak. This can help ensure that a nation or nations are sharing a consistent message. It is also important to be prepared to communicate at the local level, including small villages. The communication strategy must address at-risk populations without telephones, computers, televisions or other media access. In summary, nations need a system that can operate at both a high level and at the local level. To be prepared, it is helpful to think of questions and answers in advance. Further, decisions about what to communicate should be handled at a senior level and instituted at the center of a communication management process.

Finally, there is a basic rule in the media business to consider. At the stage when the media have descended, they know they have a story to tell and they want facts and details to help fill out the picture. A useful strategy is to provide an accessible spokesperson

who can give straightforward facts. It is best to assume that the media know as little as possible, and every effort should be made to educate them.

If the media leave feeling as if insufficient information was shared, they often report information anyway and focus on the fact that problems are not under control. In fighting the war on disease, nations need to have a plan, local control, and maximum flexibility with a proactive media strategy.

James Hughes, M.D., Centers for Disease Control and Prevention (CDC). 'Addressing Global Challenges Posed by Emerging Infectious Diseases'

Dr. James Hughes discussed the complacency that has developed over the last 25 years regarding emerging and re-emerging infectious diseases (EIDs), largely because of the development of antibiotics and vaccines. Particular attention was given to the Institute of Medicine (IOM) report by Lederberg and Shope (1992), which highlighted this complacency, identified factors that contribute to disease emergence and re-emergence and stressed the need to heighten vigilance and strengthen response capacity. Dr. Hughes noted that the report was directed toward the CDC. The CDC's response and current activities were the focus of the discussion.

In response to the recommendations in the IOM report, the CDC developed a strategy for addressing emerging infections in consultation with outside experts in clinical infectious diseases, microbiology and public health. The strategy contains four goals that focus on strengthening surveillance and response capability, addressing applied research priorities, improving prevention and control strategies and strengthening the public infrastructure at the local, state,

PROCEEDINGS OF THE WORLD HEALTH FORUM

and federal levels. Incremental implementation of this plan requires effective partnerships with other federal, state and local public health agencies, clinicians and clinical micro-biologists, academic institutions, industry, the WHO and other international organizations and agencies.

B. 5. Facilitated Discussions

John Burnside, M.D., Associate Dean of Professional Education, University of Texas Southwestern Medical Center at Dallas

Following the presentations, Dr. John Burnside introduced and led the first closed working group session with a review and discussion of participants' responses to the case study material distributed prior to the WHF event. The conversation focused on the fictional town of Pleasantville, which recently suffered an outbreak of some unknown infectious disease.

WHF participants were asked to share their views with other group members about this incident to illustrate the different issues and concerns of nations as well as the variety of management approaches that might be employed. The goal was to motivate group understanding of the variation in management approaches when responding to an actual outbreak occurrence. Key issues focused on procedures and mechanisms for dealing with failure to report cases of infectious diseases, including actions that might be taken, persons or groups responsible for taking action and action steps.

In addition, differences in government responses and participation in managing infectious disease outbreaks were explored. Issues of leadership, communication, border control and policy development were discussed. Next, participants were asked to consider the possible responses to the emergence of an infectious disease outbreak

from an international perspective, taking into consideration the different capacity, capabilities and political constraints of different nations.

Topics also focused on different nations' approaches to treating the sick, vaccinating the well, and how key decision-makers would be selected. Further, participants were asked to consider issues such as product liability for newly developed vaccines and international government perspectives on issues such as the destruction of livestock, subsidies for farmers, and efforts to address the potential impact of controlling infectious disease outbreaks in other industry segments.

Christopher Cassirer, Sc.D., M.P.H., Assistant Vice President, MMI Companies, Inc.

Dr. Christopher Cassirer summarized the key issues discussed during the first closed working group session.

The second closed session began with the presentation of a matrix indicating the wide variation among nations in their approaches to managing outbreaks of infectious diseases. Given the large number of issues and perspectives presented and discussed (including border issues, behavioural incentives, communication strategies, economic impact, education impact, education and training, epidemiology/surveillance, financial resources, government regulation, information technology, liability, military, organizational networks, public/private liberties, quarantine and reporting), participants were asked to explore different ways of framing an approach to developing an international infectious disease management strategy and set of recommendations.

The discussion began with a review of possible models for framing an international approach to managing infectious diseases. Several options were reviewed initially, including utilizing an approach that followed closely the WHO's activities or the CDC's step-wise approach to epidemiological surveillance and control of emerging and re-emerging infectious disease outbreaks.

The group concluded that the recommendations produced during the WHF 1998 should address the important need for international policy and management strategies that can be utilized by every nation. The framework should complement existing recommendations from other groups, but focus on the identification of preferred management practices.

Consensus was reached that recommendations should be organized around seven broad management themes including: politics and policy, leadership, strategic planning, information systems, communication, infrastructure and capacity building. Participants were then organized into three small working groups to develop and share recommendations on subsets of these themes.

Marc Gelinas, Business Directions

On the final day of the WHF, Mr. Marc Gelinas facilitated an open lyceum discussion and review of the recommendations developed by the participants. Lyceum participants included representatives from the working groups and three panelists including scholars and clinical experts recognized for their work in the study and treatment of emerging and re-emerging infectious diseases.

Following presentations of the recommendations by each of the three working group representatives, lyceum panelists and audience

participants shared comments, thoughts and suggestions for ways to enhance the quality and utility of the recommendations developed during the Forum.

B. 6. Recommendations

Participants in the WHF 1998 developed the recommendations and action plans in response to the following needs and opportunities:

- 1) Nations continue to operate independently despite the need to build an international infectious disease management strategy. Recommendations are presented for mounting an international proactive response to the growing threat of infectious diseases.
- 2) The appointment of a new Director General of WHO presents an opportunity to revitalize and re-focus the goals of WHO on the issue of new and re-emerging infectious diseases.
- 3) A new WHO administration can begin to address the need to develop a sustainable source of funding to support EID management initiatives, explore innovative strategies for building public and private partnerships, and consider alternative mechanisms to pool public and private voluntary and commercial funds.

Recommendation 1: Politics and Policy. Policy efforts should focus on the preparation of an agreement that will lead to international legislation on EIDs that promotes collaboration. Policies addressed within this agreement should be developed along the following lines: Protecting the health and well-being of people within all communities, preserving the basic human rights of individuals, and balancing individual and community rights, as well as ensuring the socio-economic stability of societies including national security, while observing and protecting the sovereignty of nations.

PROCEEDINGS OF THE WORLD HEALTH FORUM

Policy statements support the effort and provide guidelines for establishing an infrastructure to address emerging and re-emerging infectious diseases. Examples of issues that need to be addressed around policy statements include:

Policies need to be in place to ensure the safety and security of populations in the likely event of an outbreak of EIDs.

Funding should be available for suspected or known problems and activities focused on preparing a funding pool and developing a plan for shifting resources.

Reporting of diseases should focus on agencies' responsibilities including oversight, surveillance and reporting, dissemination and information processing.

Responses to EIDs may require quarantine decisions that need to reflect a shared understanding of International Health Regulations to ensure parameters for decision-making are consistent and appropriately applied. The list of appropriate diseases and syndromic conditions should be consistently reviewed.

Management policies are required to promote coordination of on-site operations and activities and to ensure responsiveness, preparedness and coordination.

Appropriate legal instruments should be in place to ensure local, state and national compliance when the health of population is threatened by EIDs. These include waivers, indemnification strategies, appropriate protections and mechanisms to evaluate liability, among others. These instruments should provide direction, coordination and appropriate legal powers for identified lead government

agencies and provide appropriate coordination and support for national and international entities.

Countries should establish policies to address border issues, including the potential for temporary or permanent dislocation, migration and immigration issues.

The military's role should be to support government action by ensuring law, order and preparedness, including deployment of medical resources and providing logistical support as needed.

Leadership capabilities should be developed and maintained internationally and include the public and private communities, individual nations and federal and local governments to effectively address new and emerging infectious diseases.

Effective communication strategies are critical to ensuring the effective management of infectious diseases. Policy initiatives should focus on establishing strategic communication parameters that promote continuous dialogue with a wide range of audiences.

Recommendation 2: Leadership. Leadership is a central organizing principle that affects the implementation of a strategic plan to address EIDs and improve population health. Effective leadership should be a priority and include both the ability to anticipate change and envision a future state and the capacity to deploy and manage the implementation of an appropriate response. Leadership activities should focus on developing lay and professional leaders at every level of society. This includes governments, programs, organizations, health providers, opinion leaders and the general public. Support mechanisms to ensure continued training and development of effective leaders should include access to continued academic and professional training.

Recommendation 3: Strategic Planning. The management of EIDs requires a proactive and planned approach to ensure the appropriate prevention and control of the spread of disease by health authorities. The following information presents major phases and related sets of activities that should be addressed:

Phase 1 - Non-Alert: 'Non-alert' is an early, routine, preparatory or normal state. Critical sets of activities that should be operating in non-alert conditions include: ongoing surveillance, routine reporting, clarity and definition of legal and ethical responsibilities, collecting and analyzing data and disseminating information about a broad range of health and non-health indicators.

Phase 2 - Alert: The alert phase is the detection, confirmation and declaration of changes identified during non-alert conditions. Activities during this period include the ones noted above, along with contact, communication and consultations with experts including local leaders, ministers of health, WHO, CDC, the Pasteur Institute and other international government and non-government organizations.

Phase 3 - Response: The response phase includes the ongoing assessment of information and the planning and implementation of an appropriate response, which includes the coordination and mobilization of resources to support intervention activities at the local, regional, national and international levels. These may include needs assessment, prioritization, the identification of barriers, contingency planning, communication strategies, research and development of vaccines, drugs and insect control interventions, among others.

Displaced populations, border issues, quarantine, isolation and emergency issues should also be addressed.

Phase 4 - Follow-Up: Follow-up activities include re-evaluation, restructuring, reporting and continuing education, and redefining strategic parameters.

Recommendation 4: Information Systems. To effectively manage the spread of disease, it is the responsibility of the international community to have minimum standards in place for the development of information systems. This includes addressing the need for technology and ensuring the human capability to analyze and share information locally, regionally, nationally and internationally.

Globally, there is a need to continue to build a well-functioning and comprehensive global network. Operationally, this will require funding and other resources to support information technology development as well as appropriate education and training of people.

Recommendation 5: Communication. Information technology is really one form of communication. A comprehensive communication strategy is also required to ensure accurate, timely sharing of information. The communication plan should be established and disseminated. Specific communication strategies should address containment of new and re-emerging diseases.

Communications to the public should be prompt, honest and focused on fully informing the public. The purpose should be to contain the transmission of disease and relieve any unnecessary panic.

Recommendation 6: Infrastructure and Capacity Building. Efforts to manage EIDs, particularly during outbreaks, suggest there is frequently a lack of coordination and what appears to be a delayed response. A well-planned systematic response is required, which

PROCEEDINGS OF THE WORLD HEALTH FORUM

should include assessment of emerging and re-emerging infectious diseases, an evaluation of existing resource capacity and the formulation of a strategic and operational plan to ensure a coordinated intersectoral global response. Global activities should be tailored to circumstances where problems occur and address a range of situations from civil unrest to more stable circumstances.

Infrastructure support and capacity development should follow the goals of the WHO for EID. These include:

- 1) Strengthening global surveillance activities
- 2) Strengthening infrastructure support
- 3) Fostering applied research initiatives
- 4) Strengthening prevention and control efforts

Additional recommendations for continuing to promote infrastructure support and capacity development are as follows:

The members of the WHF 1998 should identify a task force of experts to foster the continued development of a strategic business plan.

The World Health Assembly 2000 should adopt a formal resolution endorsing a comprehensive strategic approach to managing EID.

Key to the successful implementation of these recommendations is the adoption of a systems approach such as continuous quality

improvement. This will provide a framework for intersectoral collaboration and create specific opportunities to improve the alignment of authority and enhance operational performance, among other benefits. Broadly defined, strategic operational goals should focus on the four E's: efficiency, equity, effectiveness and economy. Focusing on these goals will empower leaders to make better use of existing resources and when bidding, present a range of options for describing the benefits and costs of planned interventions.

B. 7. Next Steps

The International Hospital Federation, The Health Industry Council and the members of the World Health Forum hope that this year's event will stimulate the leadership present at the Forum as well as their host countries to continue the dialogue started in Texas, and that it will motivate an international and collective effort to prepare for and proactively manage the global spread of emerging and re-emerging infectious diseases.

In addition, it is hoped that nations will focus on enhancing our understanding and awareness of the important effects of social factors on the spread of infectious disease. It is clear from the information shared during the Forum that tremendous progress can be made by focusing on ways to better manage infectious diseases. Together, nations should establish the development of international infectious disease management strategies as a priority. Individually, nations should assume greater responsibility for creating systems that support united leadership and that address the dynamic and rapidly changing social threats to health posed by infectious diseases.

While much progress was made during the short five days in Grapevine toward the development of an effective international disease management strategy, real success can only be achieved with

PROCEEDINGS OF THE WORLD HEALTH FORUM

the continued commitment and combined effort of all those present at the meeting. The global public health threat of emerging and re-emerging infectious disease stands alone as a significant concern for international leaders. Each participant must operate as an ambassador of change and share the responsibility for motivating and leading the continued discussion of these issues nationally and internationally.

C. References

- American Association for World Health. Emerging Infectious Diseases: Reduce the Risk. AAWH, 1825 K Street NW, Suite 1208, Washington, DC 20006, 1997.
- Centers for Disease Control and Prevention. Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States. Atlanta, Georgia: U.S. Department of Health and Human Services, Public Health Service, 1994.
- Cohen, F.L., Larson, E. Emerging Infectious Diseases: Nursing Responses. *Nursing Outlook*, 44, 1996: 164-8.
- Coughlin, C. Iraq Deployed Anthrax During 1991 Gulf War. *The Sunday Telegraph*, *International News*, February 15, 1998: 26.
- Fidler, D.P., Heymann, D.L., Ostroff, S.M. O'Brien, T.P. Emerging and Reemerging Infectious Diseases: Challenges for International and State Law. *The International Lawyer*, 31, 3, Fall, 1997: 773-799.
- Kasindorf, M. Tests for Anthrax are Under Way. *USA TODAY*, Fri/Sat/Sun, February 20-22, 1998: 1.
- Larson, E. The Flu Hunters. *Time*, 151, 7, February 3, 1998: 54-64.
- Larson, E. Social and Economic Impact of Infectious Diseases-United States. *Clinical Performance and Quality Healthcare*, 5, 1, January/February/March, 1997: 31-37.
- Lederberg, J., Shope, R.E., Oaks, S.C.Jr. (Eds) Emerging Infections: Microbial Threats to Health in the United States. Washington, DC: National Academy Press, 1992.
- LeDuc, J.W. World Health Organization Strategy for Emerging Infectious Diseases. *JAMA*, 275, 4, January 24/31, 1996: 318-320.
- Levine, M.M., Levine, O.S. Influence of Disease Burden, Public Perception, and Other Factors on New Vaccine Development, Implementation, and Continued Rise. *The Lancet*, 350, 9088, November 6, 1997: 1386-1392.
- National Science and Technology Council (NSTC). Infectious Disease D A Global Health Threat: Report of the National Science and Technology Council Committee on International Science, Engineering, and Technology Working Group on Emerging and Re-emerging Infectious Diseases. *Centets for Disease Control and Prevention*, September, 1997.

Weekers, J., Siem, H. Overseas Screening of Migrants Justifiable? Public Health Reports, 112, September/ October, 1997: 397-402.

Woodall, J. Stalking the Next Epidemic: ProMED Tracks Emerging Diseases. Public Health Reports, 112, January/February, 1997: 78-112.

World Health Organization. Emerging Infectious Diseases: World Health Day, 1997. World Health Organization, CH-1211, Geneva 27, Switzerland.

World Health Organization Western Pacific Region. New, Emerging and Re-emerging Diseases. Health and Development, December, 1996.

