

# General concept for emerging of new disease and reemerging of old disease

## Introduction

An emerging infectious disease (EID) is an infectious disease whose incidence has increased in the past 20 years and could increase in the near future. Emerging infections account for at least 12% of all human pathogens Taylor.<sup>1</sup> EIDs are caused by newly identified species or strains (e.g. Severe acute respiratory syndrome, HIV/AIDS) that may have evolved from a known infection (e.g. influenza) or spread to a new population (e.g. West Nile fever) or to an area undergoing ecologic transformation (e.g. Lyme disease), or be reemerging infections, like drug resistant tuberculosis. Nosocomial (hospital-acquired) infections, such as Methicillin-resistant *Staphylococcus aureus* are emerging in hospitals and extremely problematic in that they are resistant to many antibiotics Witte<sup>2</sup> of growing concern are adverse synergistic interactions between emerging diseases and other infectious and non-infectious conditions leading to the development of novel syndemics. Many emerging diseases are zoonotic—an animal reservoir incubates the organism, with only occasional transmission into human populations.

## Predisposing factors of emerging and reemerging infectious disease

- a) Microbial adaption; e.g. genetic drift and genetic shift in Influenza A
- b) Changing human susceptibility; e.g. mass immuno compromisation with HIV/AIDS
- c) Climate and weather; e.g. diseases with zoonotic vectors such as West Nile Disease (transmitted by mosquitoes) are moving further from the tropics as the climate warms
- d) Change in human demographics and trade; e.g. rapid travel enabled SARS to rapidly propagate around the globe
- e) Economic development; e.g. use of antibiotics to increase meat yield of farmed cows leads to antibiotic resistance
- f) Breakdown of public health; e.g. the current situation in Zimbabwe
- g) Poverty and social inequality; e.g. tuberculosis is primarily a problem in low-income areas
- h) War and famine
- i) Bioterrorism; e.g. 2001 Anthrax attacks
- j) Dam and irrigation system construction; e.g. malaria and other mosquito borne diseases

## Emerging infectious agent

- a. Australian bat lyssavirus
- b. *Bartonella henselae*
- c. Coronaviruses, including SARS coronavirus

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- d. *Ehrlichiosis*
- e. *Encephalitozoon cuniculi*
- f. *Encephalitozoon hellem*
- g. *Enterocytozoon bieneusi*
- h. *Helicobacter pylori*
- i. Hendra virus (equine morbilli virus)
- j. Hepatitis C
- k. Hepatitis E
- l. Human herpesvirus
- m. Human herpesvirus
- n. Lyme borreliosis
- o. Microsporidia
- p. Parvovirus B19

## Re-emerging infectious agent

- a. *Coccidioides immitis*
- b. Enterovirus 71
- c. Prion diseases
- d. *Streptococcus*, group A
- e. *Staphylococcus aureus*

## Diseases with bioterrorism potential, CDC category a (most dangerous)

- a. Anthrax
- b. *Clostridium botulinum*
- c. Tularemia
- d. Smallpox and other pox viruses
- e. Viral hemorrhagic fevers
- f. Lassa Fever

- g. Hantaviruses
- h. Dengue
- i. Ebola and Marburg
- j. Yersinia pestis

### Diseases with bioterrorism potential, CDC category B

- a. Brucella species (brucellosis)
- b. Burkholderia pseudomallei (melioidosis)
- c. Burkholderia mallei (glanders)
- d. Coxiella burnetii (Q fever)
- e. Epsilon toxin of Clostridium perfringens
- f. Salmonella
- g. Yersinia enterocolitica
- h. Equine encephalitis (EEE)
- i. Japanese encephalitis virus (JE)
- j. Kyasanur Forest virus
- k. Staphylococcal enterotoxin B

### Diseases with bioterrorism potential, CDC category C (Least dangerous)

- a. Influenza
- b. Multidrug-resistant tuberculosis (MDR-TB)
- c. Nipah virus
- d. Rabies
- e. SARS coronavirus
- f. Crimean-Congo hemorrhagic fever virus
- g. Yellow fever

### Strategies and response capacities in India against emerging and reemerging infection

EIDs and ReEIDs will continue to challenge public health infrastructure, test credibility of health services, and threaten to devastate health and economic development unless a strategic vision and an effective plan of action is developed to combat these. This will increasingly require the application of sophisticated epidemiologic and molecular biologic technologies, changes in human behaviour, and a national perspective. In view of this, the WHO has made several recommendations for national strategies including the need to strengthen epidemic preparedness and rapid response, public health infrastructure, risk communication, research and its utilization, and advocacy for political commitment and partnership building. Several initiatives are underway in the country as outlined below

### Strengthening surveillance and rapid response mechanisms

The Central Council of Health and Family Welfare (CCHFW) is the apex political and policy formulating body with the Union Minister

of Health and Family Welfare (as chairperson) and health ministers from all the States/Union Territories of the country as members. These initiatives and policy level decisions led to the establishment of the National Surveillance Programme on Communicable Diseases (NSPCD) in 1997. In 1999, the Government of India constituted a technical advisory group on diseases of international public health importance. Following a detailed appraisal of the NSPCD, the Integrated Disease Surveillance Project (IDSP) was established in 2004 in 101 districts.

### Complying with international health regulations (IHR)

As a legal instrument, the aim is to ensure public health through the prevention of disease spread across borders, with limited interference to international traffic and trade. At the time of the SARS outbreak, countries were only required to notify WHO of yellow fever, cholera and plague outbreaks under the IHR. After SARS, it was clear that the rules needed to be updated considering the increase in international travel and trade, and emergence and re-emergence of new international disease threats. A revised version was developed and in May 2005 it was approved by the World Health Assembly. The purpose and scope of the new regulations are not limited to any specific diseases or manner of transmission, but rather address illness or medical condition, irrespective of origin or source.

### Building capacity in epidemiology

Complementing Government's strategy to augment epidemiological capacities at the national, State and local level various short- and long term field epidemiology training programmes (FETP) have been started. The National Institute of Epidemiology in Chennai has been offering two years FETP which is an in-service training programme in applied epidemiology. It trains public health leaders while providing epidemiologic services to health authorities in India Murhekar et al.<sup>3</sup>

### Strengthening of laboratory and networks

The National Institute of Communicable Diseases (NICD) has been upgraded to National Centre for Disease Control (NCDC) as a centre of excellence with responsibility for enhanced capabilities for rapid response and laboratory based surveillance of communicable diseases. Under the IDSP, 50 district public health laboratories are being strengthened all over the country. Alongside, a network of referral laboratories utilizing the services of existing functional laboratories in the nine States is being established. These include existing laboratories in microbiology departments of medical colleges and other large institutions for the aetiological diagnosis of outbreaks. This network would allow access to quality public health laboratory services for selected linked districts.

### Research and development

Cross-cutting research that informs key policy decisions such as rational use of drugs and pesticides; climatic change; environmental impact assessment is the cornerstone of disease prevention and control. The Indian Council of Medical Research (ICMR) is the apex body in India for the formulation, coordination and promotion of biomedical research funded by Department of Health Research, Ministry of Health and Family Welfare. ICMR has a network of institutes devoted to specific infectious diseases and a chain of regional centers. In late 1990s the ICMR stepped up its funding in communicable diseases, accelerating research inputs for emerging infections Kant.<sup>4</sup>

## Information sharing and partnerships

The recent pandemic HINI influenza and avian influenza brought the international scientific community together showing the importance of effective partnerships in combating emerging infections. Under the international health regulations, national focal points are required to work closely with relevant ministries in timely identification of extraordinary public health events. As the national focal point for International Health Regulations (IHR) in India, the NCDC is in the process of identifying and partnering with other relevant ministries in identification of public health emergencies of international concern (PHEIC).

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## Conflict of interest

The author declares no conflict of interest.

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