INTRODUCTION / DISEASES

WORLDWIDE SITUATION

57 million deaths per year

Developing countries

44 million deaths (77% of all deaths)

18 million deaths were in children under 5 years of age (33%)

Developed countries

13 million deaths (23% of all deaths)

300,000 deaths were in children under 5 years of age (2.4%)

Infectious / parasitic diseases

15 million deaths total

25% of all deaths in the world

5% of all deaths in developed countries

71% of all deaths in children under 5 years

Vaccine preventable diseases

1.1 million children die each year from vaccine preventable diseases

measles

neonatal tetanus

pertussis

Circulatory system / chronic obstructive pulmonary disease

20 million deaths

Cancer

7 million deaths

Injuries

5 million deaths

All other causes (famines, wars, violence, aging)

10 million deaths

PERSPECTIVES

In developing countries, infectious disease deaths often involve children.

In developed countries, the trend is replacement of infectious diseases as a cause of death by degenerative diseases and conditions for which human beings themselves are largely responsible for.

ACUTE RESPIRATORY INFECTIONS (2005)

4.0 million deaths from acute respiratory infections, children under 5 years.
55% occur in first year of life
Leading agents
- Streptococcus pneumoniae
- Influenza A and B
- Haemphilus influenzae
- Parainfluenza
- Respiratory Syncytial Virus
- Measles
- Adenoviruses

Diseases
- Pneumonia
- Acute bronchitis
- Bronchiolitis
- Acute obstructive laryngitis

HIV/AIDS (2007)

2.0 million HIV/AIDS-related deaths
30 - 36 million living with infection
2.7 million new infections
Largest cause of death from a single pathogen
Sub-Saharan Africa accounts for 75% of AIDS deaths
Surveillance figures are far from complete
Millions to billions of viral genotypes
Antiviral therapies expensive / resistance increasing
Vaccines trials in progress / promise?

DIARRHEAL DISEASES (2000)

2.5 million deaths from diarrheal diseases, children under 5 years.
Children in developing world experiences ~ 3 episodes per year.
Risk is higher among infants who are not breast fed.
Association between measles and diarrhea
Global access to oral rehydration salts
Leading pathogens
- Rotavirus (children under 2 years of age in developing countries)
- Vibrio cholerae

Other pathogens
- Escherichia coli O157:H7

Shigella sp.
Salmonella sp.
Campylobacter jejuni
Giardia lamblia
Entamoeba hystolytica
Cryptosporidium
Clostridium difficile

TUBERCULOSIS (2007)

1.8 million deaths from Mycobacterium tuberculosis in the world.
9.3 million new cases of tuberculosis.
1.7 billion people are or have been infected with Mycobacterium tuberculosis.
~1/3 world's population are or have been infected.
Multi-drug and extensively-drug resistant strains increasing
Magnified by HIV pandemic

MALARIA (2006)

1.0 - 3.0 million deaths worldwide per year
Vast majority of malaria deaths occur in Africa.
40% worlds population exposed to malaria
Total of 8 million new cases of malaria were reported in 1994
Actual number of cases is estimated to be 4 - 5 times higher
250 - 300 million clinical cases of malaria are reported in 2006.
More than 80% clinical cases occur in tropical Africa
Estimated 300 million persons carrying the parasite
More than 90% parasite carriers are in tropical Africa
4 species of parasite — falciparum, vivax, ovale, malariae
Plasmodium falciparum causes severe malaria and most mortality

HEPATITIS B (2006)

0.6 - 1.0 million carriers die each year
2 billion people alive today have been infected with hepatitis B virus
350 million are chronic carriers, harboring infection in the liver.
Deaths from cirrhosis of liver & primary liver cancer
5 - 10% of adults become chronic carriers
Remainder of adults eliminate virus from the body with no long-term effects.
70 - 90% infants infected become chronic carriers
Very young are more likely to develop fatal complications in adulthood
Reliable figures on infection and death are not readily available

MEASLES (2007)

200,000 deaths in children due to measles
280,000 reported cases per pear
Actual number of deaths may be twice (or more) as great
45 million cases per year worldwide (2000 estimate)
Before measles vaccine was available, virtually all children contracted measles.
    Estimated 130 million cases per year.
Global coverage with measles vaccine
    1983 = 15%
    2007 = 82%
Serious disease with delayed mortality.
Those who survive acute disease have a greater risk of dying after the illness.
    1 - 2 year olds in Gambia
        9% acute mortality
        13% delayed mortality (within 1 - 9 months)
Vitamin A reduces mortality

NEONATAL TETANUS (2004)

130,000 deaths occurred in developing countries
787,000 deaths occurred in developing countries (1988)
1.3 million deaths expected in absence of immunization (1988)
The number of cases reported grossly underestimates the disease incidence.
    Only 2 - 8% cases reported
Reductions in neonatal tetanus are due to
    Three cleans: hands, surfaces, and cord care
Tetanus toxoid immunization

PERTUSSIS (2007)

150,000 reported cases worldwide
300,000 deaths worldwide
18 million cases worldwide (2003)
Pertussis is an exhausting disease that can last for several months
    Often difficult to diagnose
    Developing countries case-fatality rate 1 - 2%
    Developed countries case-fatality rate 0.04%
Association of case fatality with adequate protein nutrition

ROUNDWORM & HOOKWORM (2002)

165,000 deaths
Ascaris ~1.5 billion people infected
Hookworm ~1.0 billion people involved
Disease is correlated with parasite burdens

EMERGING DISEASES / NATURAL AND MAN-MADE

United States
- West Nile virus
- MDR pneumococcal disease
- Hantavirus pulmonary syndrome
- Community acquired methicillin resistant staphylococcus aureus (cMRSA)
- MDR HIV
- Clostridium difficile

Worldwide
- Novel H1N1 influenza ("swine flu')
- Avian H5N1 Influenza ("bird flu")
- Severe Acute Respiratory Syndrome (SARS)
- XDR Mycobacterium tuberculosis
- Escherichia coli O157:H7
- Hepatitis C
- Dengue
- Diphtheria
- Vibrio cholerae O139
- Yellow Fever

Bioterrorism
- Select Agents
- Category A, B, C
- Bacillus anthracis

CONTRIBUTING FACTORS

Societal events
- Economic impoverishment
- War or civil conflict
- Population growth and migration
- Urban decay

Health Care
- New medical devices
- Organ or tissue transplants

- Drugs causing immunosuppression
- Widespread use of antibiotics

Food production
- Globalization of food supplies
- Changes in food processing, packing and preparation

Human behavior
- Sexual behavior
- Drug use
- Travel
- Diet
- Outdoor recreation
- Use of day care facilities

Environmental changes
- Deforestation and reforestation
- Changes in water ecosystems
- Flood and drought
- Famine
- Global warming

Public Health infrastructure
- Curtailment or reduction of prevention programs
- Inadequate communicable disease surveillance
- Lack of trained personnel
  - epidemiologists
  - laboratory specialists
  - vector and rodent control specialists

Microbial adaptation and change
- Changes in virulence and toxin production
- Development of drug resistance
- Microbes as cofactors in chronic diseases

READING

• Morens DM, Folkers GK, Fauci AS. The challenge of emerging and re-emerging infectious diseases. Nature 2004; 430: 242 - 249.

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