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DEPARTMENT OF BIOMEDICAL ENGINEERING

VII Semester

OBT357 BIOTECHNOLOGY IN HEALTH CARE

UNIT- I PUBLIC HEALTH

1.3 Changing Concepts of Public Health

The concept of public health has undergone significant transformations throughout history, evolving from a focus on basic sanitation to a broad, multi-disciplinary approach addressing complex global health challenges. Here's a look at the changing concepts:

1. From Miasma to Germ Theory (Pre-19th Century to Late 19th Century):

- **Early Concept (Miasma Theory):** For centuries, the dominant belief was that diseases were caused by "bad air" or "miasma" emanating from decaying organic matter. Public health efforts focused primarily on sanitation, waste removal, and improving ventilation to eliminate these presumed foul odors.
  - *Example:* Roman aqueducts and sewer systems, early quarantine measures.



Fig. (a) & (b) Sanitation in ancient Rome

- **Shift (Germ Theory):** The revolutionary discoveries of Louis Pasteur and Robert Koch in the late 19th century proved that specific microorganisms (germs) caused infectious diseases. This fundamentally changed public health's direction.
    - *Impact:* Led to an emphasis on microbiology, vaccination, hygiene, sanitation based on scientific understanding, and the establishment of public health laboratories.

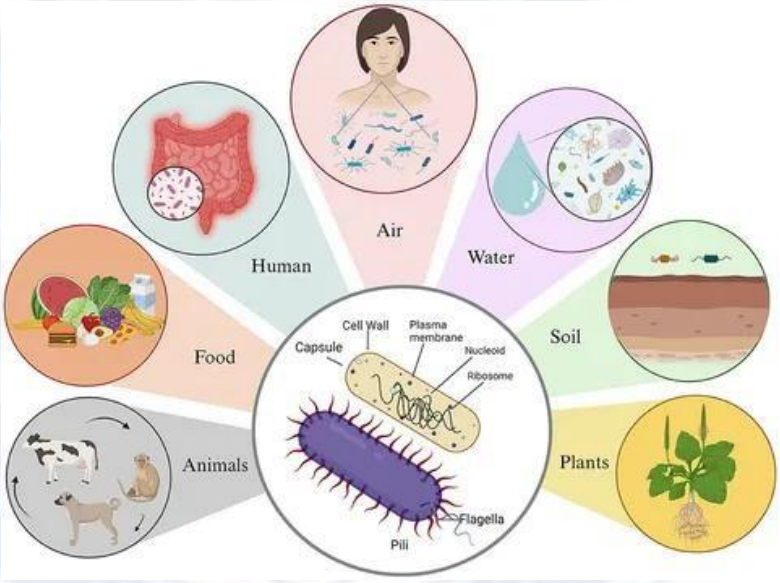

Fig 2. Bacteria commonly found in various environments

2. From Infectious Diseases to Chronic Diseases (Early 20th Century to Mid-20th Century):

- **Initial Focus:** The early 20th century saw massive strides in controlling infectious diseases like cholera, typhoid, tuberculosis, and smallpox through vaccinations, improved water systems, and waste disposal.

Cholera and typhoid are bacterial infections spread through contaminated food and water. Tuberculosis is a bacterial infection primarily affecting the lungs, spread through the air. Smallpox, eradicated globally, was a viral disease

spread through direct contact or droplets.

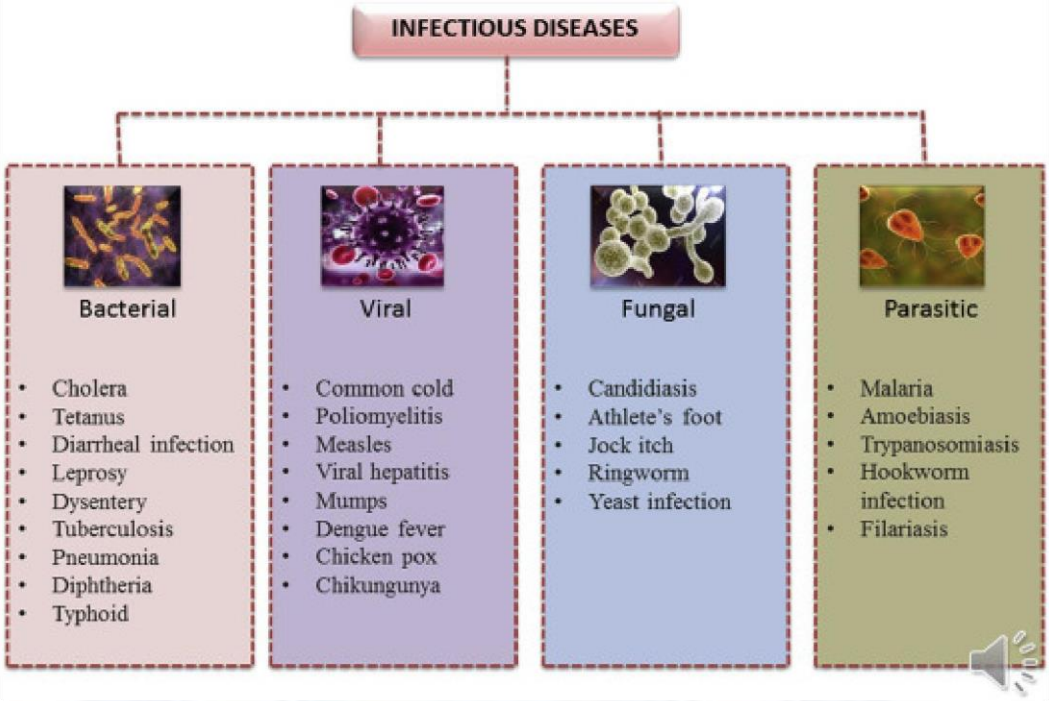

Fig.3 Types of Infectious Diseases

- **Emergence of Chronic Diseases:** As populations lived longer, chronic non-communicable diseases (NCDs) like heart disease, cancer, and diabetes became leading causes of mortality and morbidity.
  - *Shift:* Public health expanded to include health education campaigns on diet, exercise, smoking cessation, and early detection and screening programs.

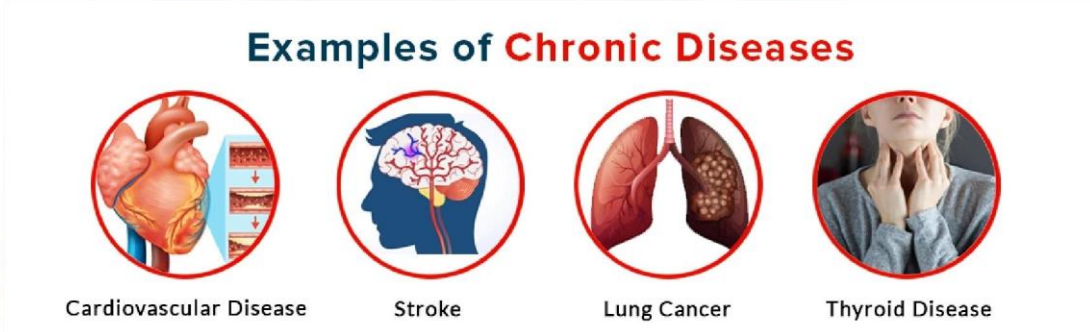

Fig.4 Examples for chronic Diseases

3. From Environmental Sanitation to Behavioral and Lifestyle Factors (Mid-20th Century to Late 20th Century):

- **Beyond Physical Environment:** While sanitation remained important, it became clear that individual behaviors and lifestyle choices played a huge role in health outcomes, especially for NCDs.
- **Emphasis:** Focus on individual responsibility, health promotion, and behavioral change interventions. This led to campaigns against smoking, promoting healthy eating, and encouraging physical activity.

4. From Individual Risk Factors to Social Determinants of Health (Late 20th Century to Present):

- **Broader Understanding:** While individual behaviors are important, public health increasingly recognized that people's choices are often constrained or influenced by their living and working conditions. The concept of "social determinants of health" (SDOH) gained prominence.
  - *SDOH:* These are the non-medical factors that influence health outcomes, including socioeconomic status, education, neighbourhood and physical environment, employment, social support networks, and access to healthcare.
- **Impact:** Public health interventions now increasingly aim to address root causes of health inequities by advocating for policies that promote education, secure employment, safe housing, and equitable access to resources. This represents a shift from a purely medical model to a more holistic, socio-ecological model of health.

5. From National to Global Health (Late 20th Century to Present):

- **Interconnectedness:** The rise of globalization, rapid travel, and interconnected economies made it clear that diseases and health challenges do not respect national borders.
- **Global Health:** Focus shifted from solely national public health concerns to recognizing the interconnectedness of health worldwide.
  - *Examples:* Coordinated international responses to pandemics (HIV/AIDS, SARS, H1N1, COVID-19), global vaccination campaigns,

efforts to address health disparities between high-income and low-income countries. International organizations like the WHO play a crucial role.

6. From Top-Down to Community Engagement (Increasingly since Late 20th Century):

- **Earlier Approach:** Historically, public health interventions were often designed and implemented by experts and authorities with less community input.
- **Participatory Approach:** There's a growing recognition that sustainable health improvements require active participation and empowerment of communities themselves.
- *Emphasis:* Community-based participatory research, engaging local leaders, understanding cultural contexts, and tailoring interventions to specific community needs and assets.

7. From Reactive to Proactive/Preventive (Ongoing Evolution):

- **Traditional Approach:** Often reactive, responding to outbreaks or existing health problems.
- **Modern Approach:** Increasingly proactive, focusing on primary prevention (preventing disease before it starts), health promotion, and building resilient health systems capable of anticipating and mitigating future threats.

8. Integration of Technology and Data Science (21st Century):

- **New Tools:** The digital age brings new capabilities to public health.

✓ *Examples:* Big data analytics for disease surveillance and trend prediction, mobile health (mHealth) interventions, telemedicine, artificial intelligence for diagnostics and personalized health messages, and rapid information dissemination.

In summary, public health has moved from a narrow, disease-focused approach, to one that is broader, more holistic, globally oriented, and deeply intertwined with social justice and equity, continuously adapting to new scientific understanding and societal challenges.

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