



Emerging and Re-emerging
viral infections
“In a changing World”

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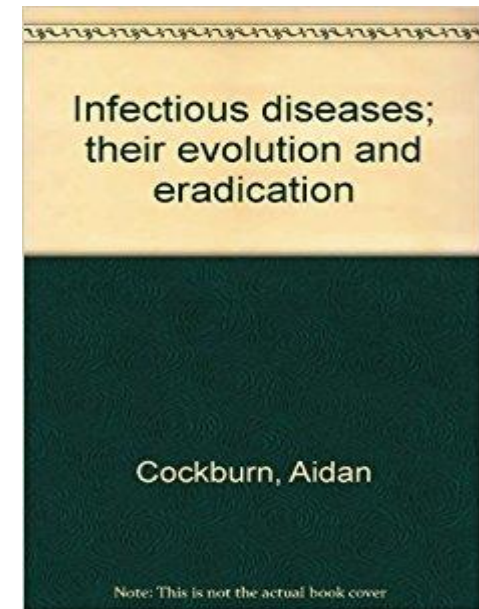
Introduction

- In 1963, physician and anthropologist **T. Aidan Cockburn**, in his book made this statement:

*“We can look forward with confidence to a considerable degree of **freedom from infectious diseases** at a time not too far in the future.”*



Thomas A. Cockburn (1912-81)





Introduction

- Five years later, the U.S. Surgeon General noted that:

*“It might be possible with interventions such as antimicrobials and vaccines to **close the book** on infectious diseases and shift public health resources to chronic diseases.”*

- **But ...** despite considerable progress, infectious diseases continue to present significant challenges as new microbial threats emerge and re-emerge.

Introduction

- Despite remarkable advances in medical science and treatment during 20th century, infectious diseases remain the leading cause of death worldwide.
- Emergence of new infectious diseases, re-emergence of old infectious diseases and persistence of intractable infectious diseases.
- During the last 20 years, at least 30 new infectious have emerged.
- These diseases are the leading cause of death worldwide, claiming at least 17 million lives every year.



Introduction

- **Emerging** *disease* is a disease that has never been recognized before.
- **Re-emerging** infectious diseases are diseases that once were major health problems globally, and then declined dramatically, but are again becoming health problems for a significant proportion of the population.

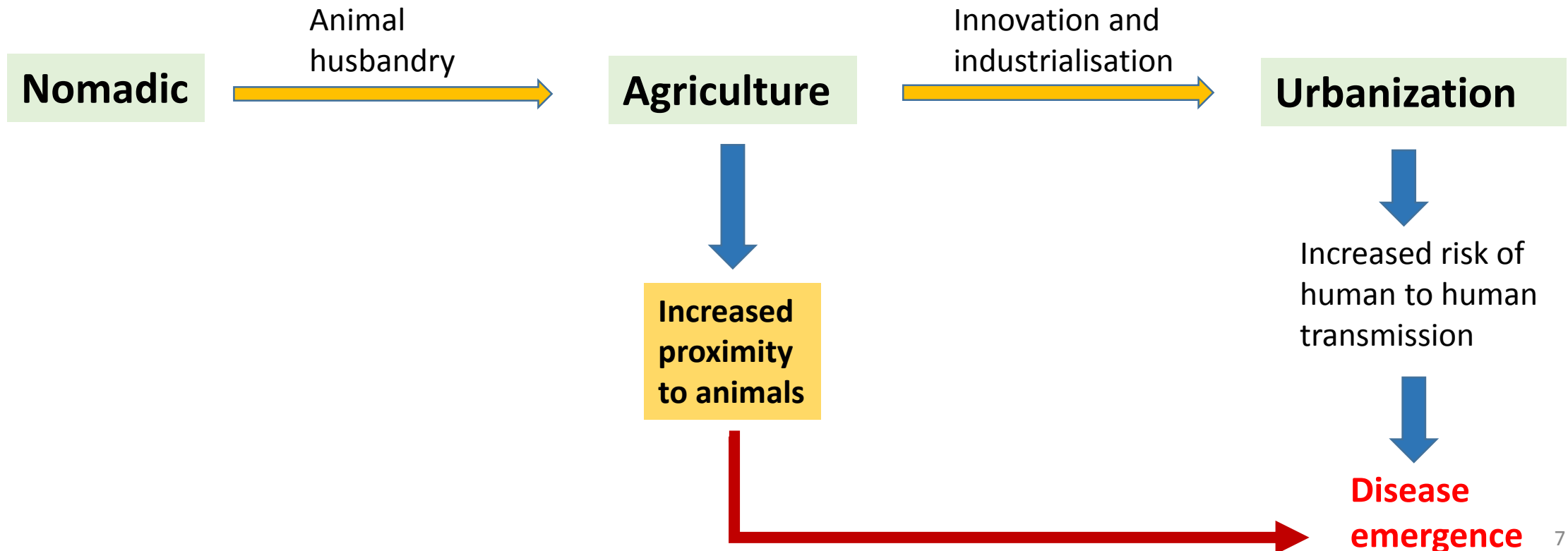


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- The most important mechanisms lead to **emergence of new infectious agent:**
 - Genetic alteration
 - Breakdown of species barriers
 - Pathogen spread from ecological niches



Introduction

- **Up to %70** of emerging infections **have a source in animals** (zoonotic infections).



Zoonotic Infections

- **Over the past century, humanity has witnessed the emergence of numerous zoonotic infections that have resulted in varying numbers of human fatalities.**
- **Influenza viruses that originate from birds account for an important proportion of these deaths, and recently many new zoonotic viruses that originate in bats, such as Hendra virus, Nipah virus, and the SARS coronavirus, have caused outbreaks with high mortality rates.**
- **Between 1999-2013, 39,557 cases of West Nile virus in the United States resulting in 1,668 deaths.**
- **The 2014 Ebola outbreak is the largest in history , fetal rate 90% (9358)**

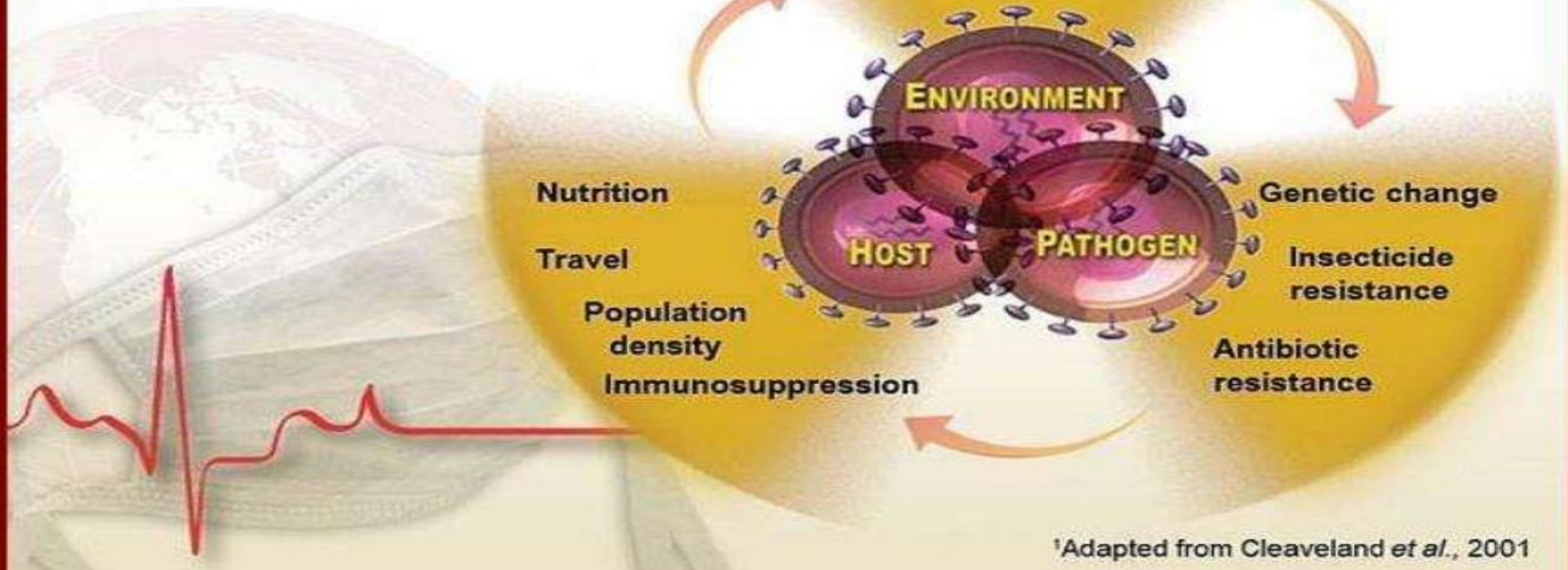


Introduction

- **Viruses** are over-represented in this group, with **RNA viruses** accounting for a **1/3** of emerging and re-emerging infections.
 - A. The virus can affect the host's cells, physiology, and behavior. Beyond the focal host, viruses can affect the **broader ecosystem**.
 - B. Under natural selection alone, viruses are understood to **adapt to the environment**.

DRIVING FORCES TO EMERGE

**It takes more than
a microbe to
cause disease...**



'Adapted from Cleaveland et al., 2001

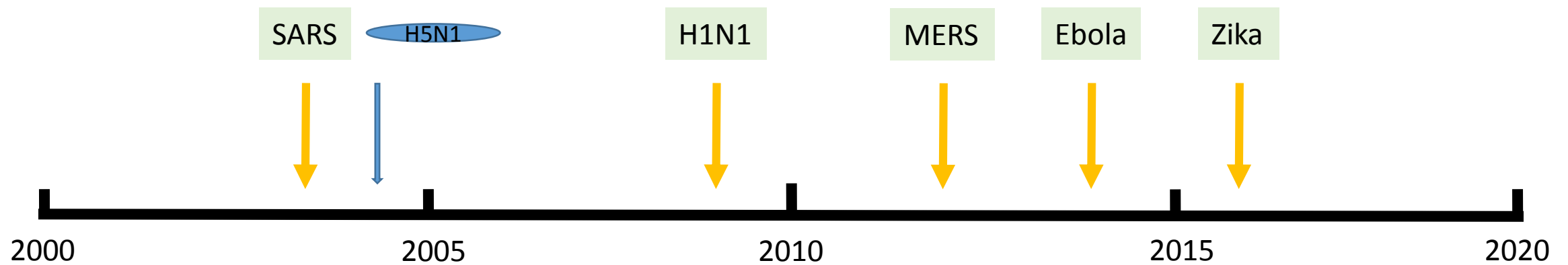
Emerging Infections in the world in 20th Century

1973	Rotavirus	Enteritis/Diarrhea
1977	Ebola virus	VHF
1977	Hantaan virus	VHF w/ renal flr
1980	HTLV-1	Lymphoma
1982	HTLV-II	Leukemia
1983	HIV	AIDS
1988	Hepatitis E	Hepatitis
1989	Hepatitis C	Hepatitis
1990	Guanarito virus	VHF
1993	Sin Nombre virus	Hanta Pulm. Synd.
1994	Sabia virus	VHF
1994	Hendra virus	Respiratory
1995	Hepatitis G	Hepatitis
1995	H Herpesvirus-8	Kaposi sarcoma
1996	vCJD	prion Variant CJD
1997	Avian influenza (H5N1)	Influenza
1999	Nipah virus	Encephalitis
1999	West Nile virus	Encephalitis



Emerging Infections in the world in 21st century

- Emerging and reemerging diseases are the result of the **interaction of multiple factors.**
- Five major outbreaks of viral infectious disease in **the 21st century:**



WHO identifies top emerging diseases

- Crimean Congo hemorrhagic **fever**.
- **Ebola virus disease**.
- Marburg hemorrhagic **fever**.
- **Lassa fever**.
- **Middle East respiratory syndrome coronavirus (MERS-CoV)**
- Severe acute **respiratory** syndrome (**SARS**)
- Nipah **virus** disease.
- **Rift Valley fever**.

Global examples of emerging and re-emerging infectious diseases, Moren et al

