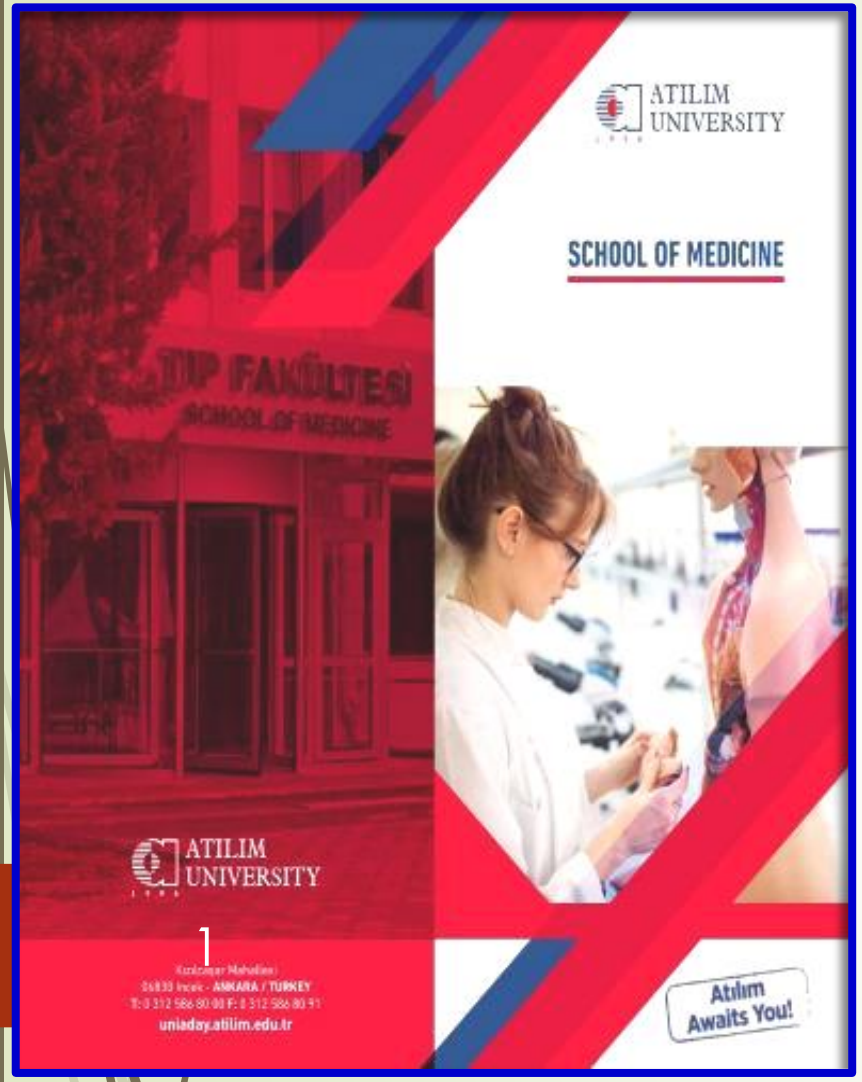

Public Health & Infectious Diseases

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Phase 1 lecture, 2023 - 2024 academic year, spring semester

02nd May 2024, Ankara - TURKIYE

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Learning Objectives

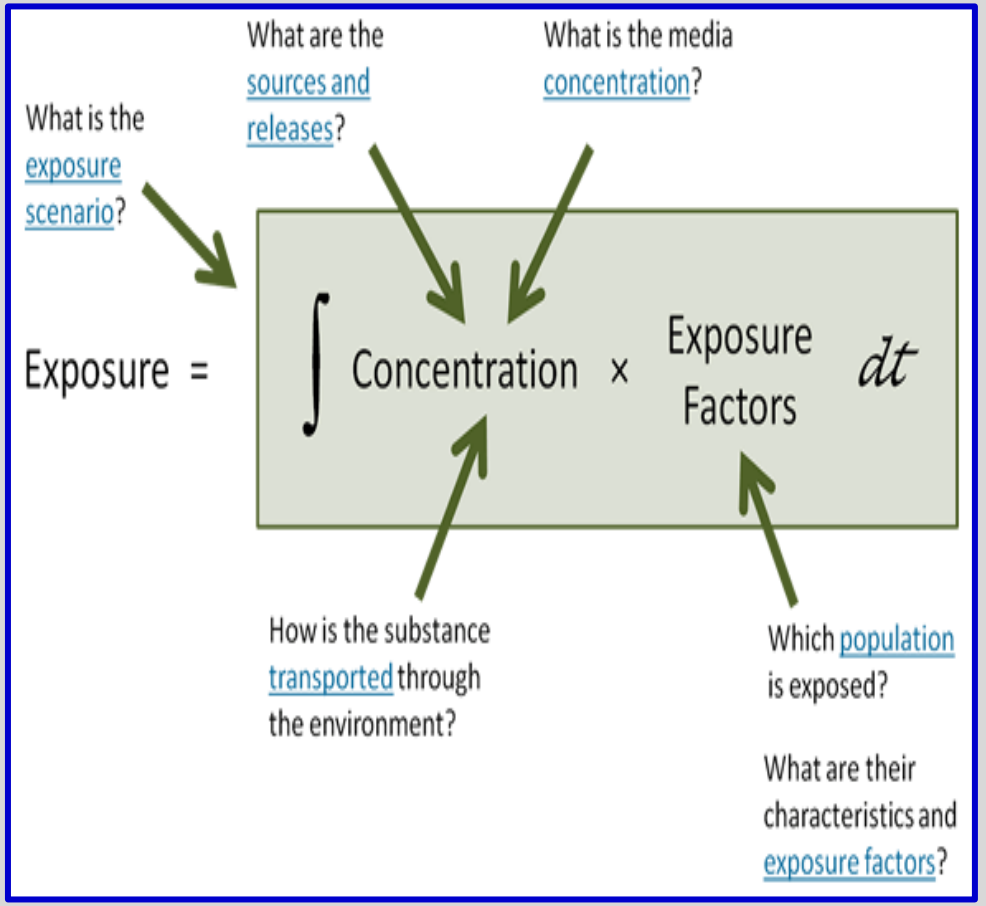
At the end of this lecture you will be able to :

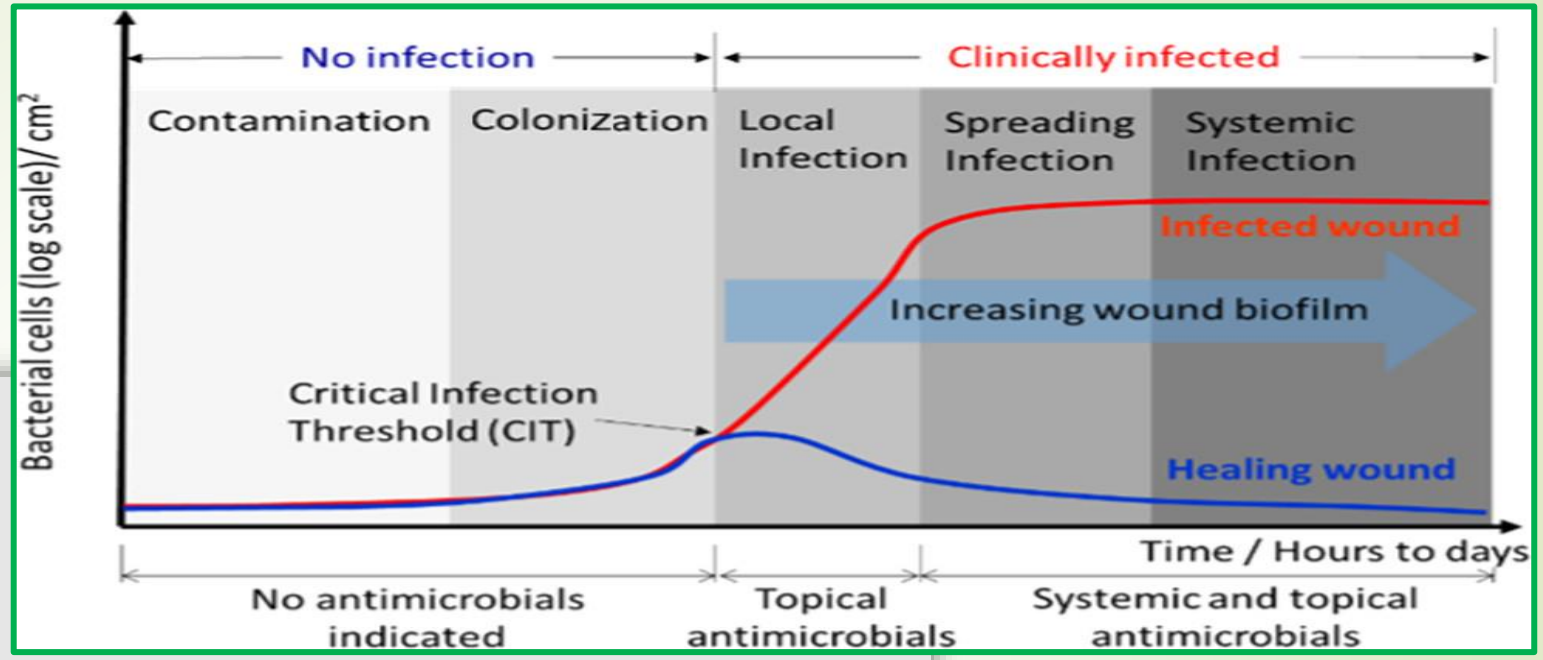
- **Conceive** the critical role of Public Health for managing infectious diseases in the community
- ***Understand*** *dynamic pathogenesis of infectious disases within the community medicine*
- **Explain** Surveillance system for infectious diseases by Community Physicians
- ***Define*** *major control measures of infectious disease outbreaks - epidemics*

  by Public Health authority at national and international levels
- ***Learn*** *basic legal arrangements on the issue; notifcation, quarantine, isolation etc.*
- **Describe** chain of infection and how to break the weakest loop(s) of 3
- ***Utilise*** *the «management of risk» instead of «managing disaster of epidemics/pandemics»..*

Assessing Exposures

- Where is the agent found?
- What are the routes of exposure?
- How many people are exposed?
- Who is exposed?
- What is the intensity, frequency, and duration of exposure?





Infection vs. Colonization

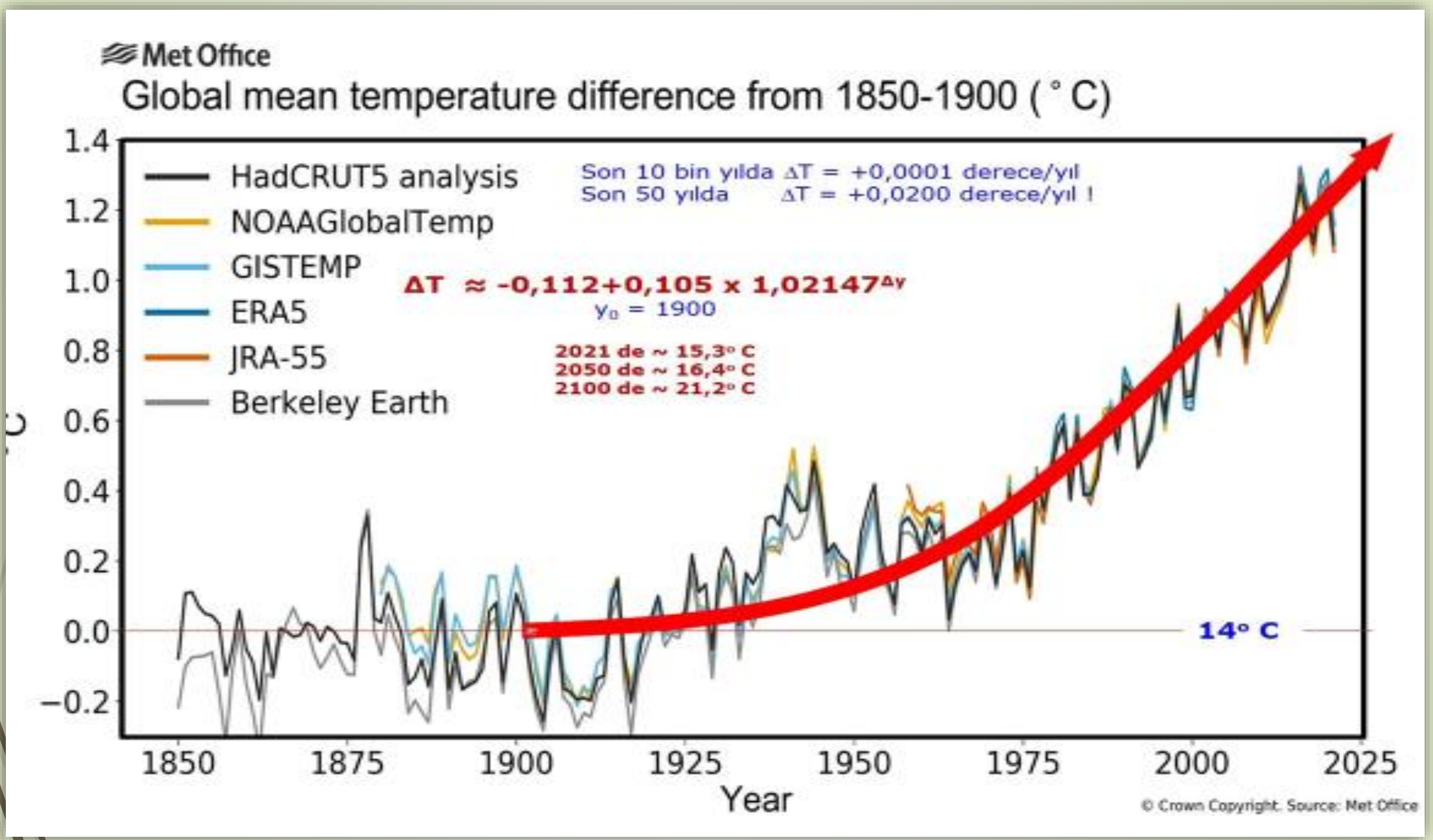
Infection

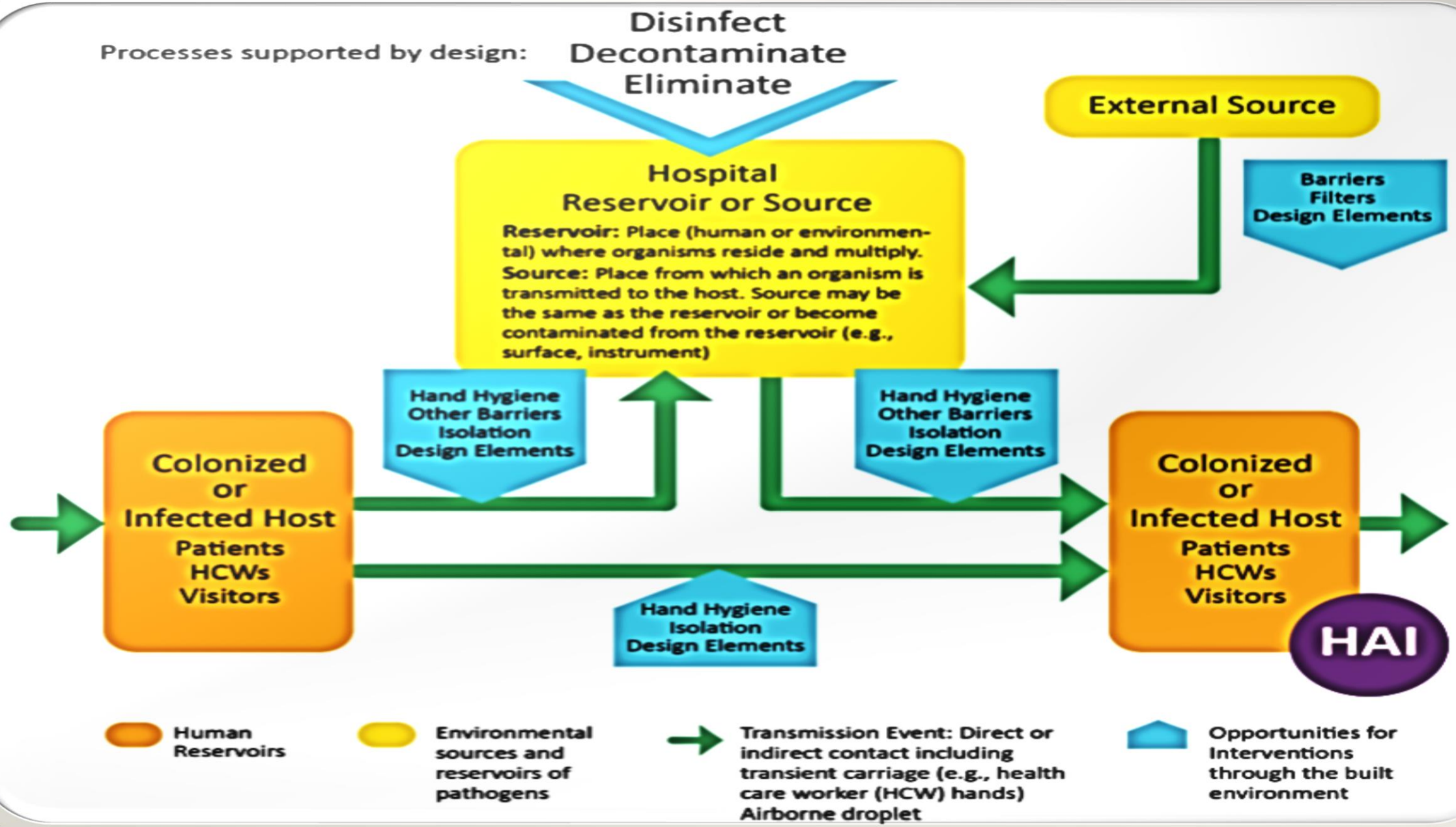
Occurs when pathogens and other microorganisms are present in the body and cause tissue damage and signs and symptoms of illness (e.g., fever, redness, pain, sepsis).

Colonization

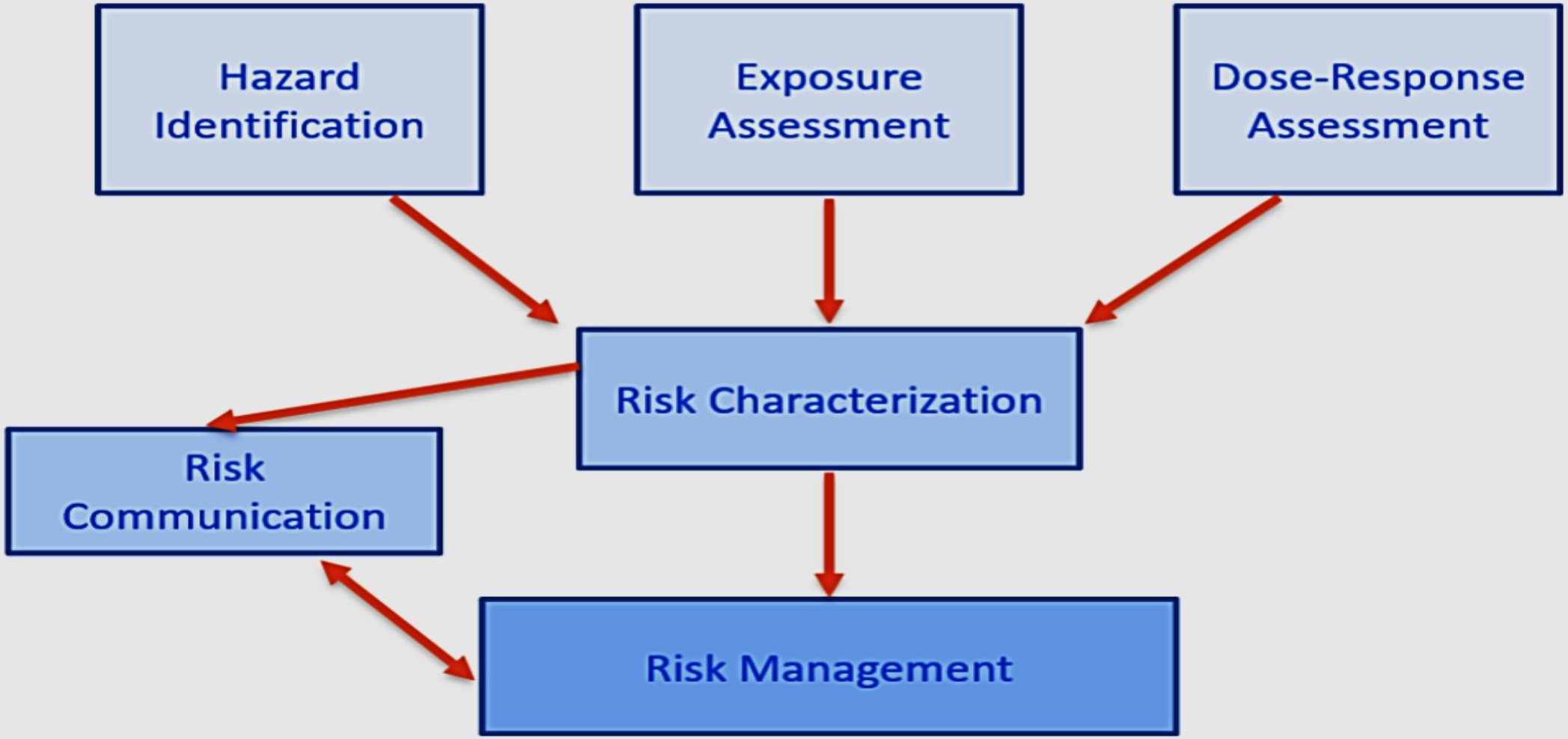
Occurs when pathogens and other microorganisms are present but do not cause signs and symptoms of illness.

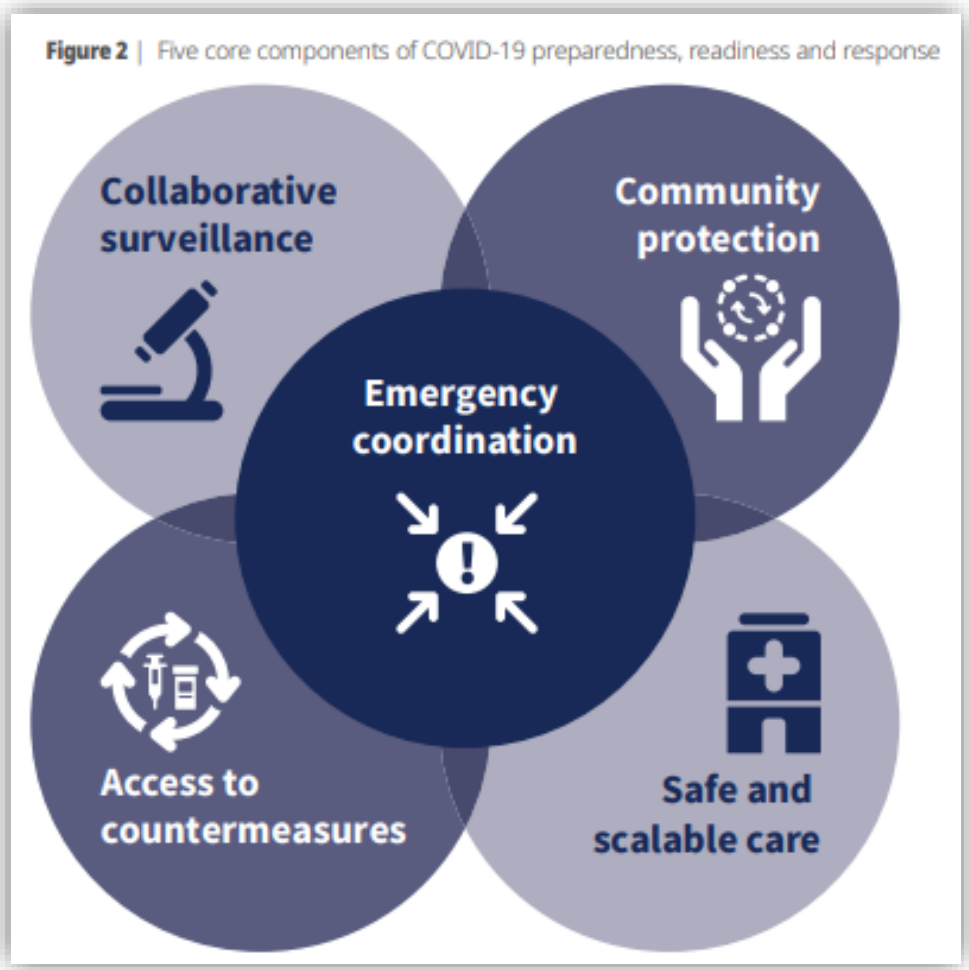
If the pathogen is present, disease transmission is possible

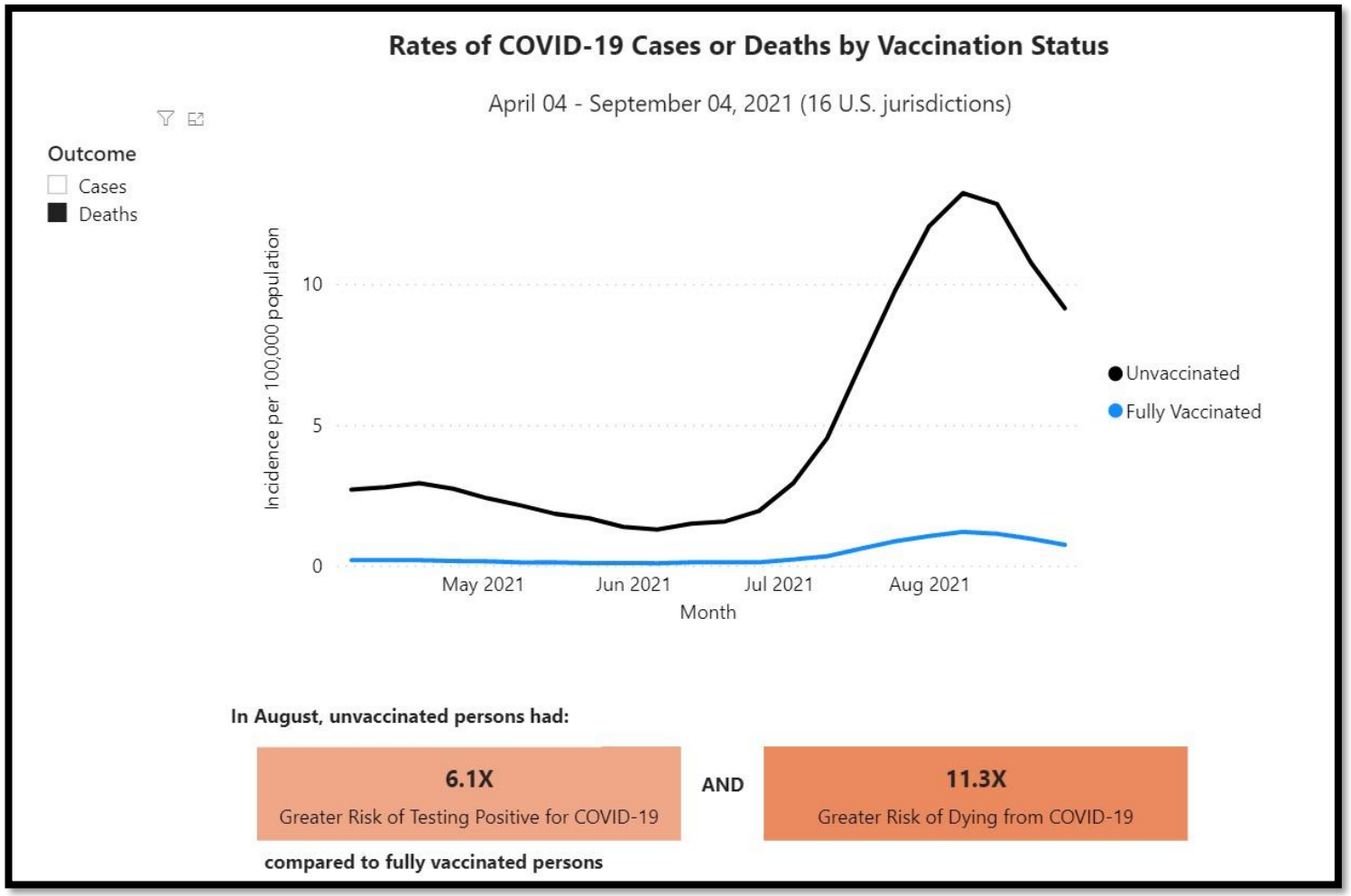

Met Office
Global mean temperature difference from 1850-1900 (° C)
HadCRUT5 analysis
NOAAGlobalTemp
GISTEMP
ERA5
JRA-55
Berkeley Earth
Son 10 bin yılda ΔT = +0,0001 derece/yıl
Son 50 yılda ΔT = +0,0200 derece/yıl !
ΔT ≈ -0,112+0,105 x 1,02147^Δy
y0 = 1900
2021 de ~ 15,3° C
2050 de ~ 16,4° C
2100 de ~ 21,2° C
14° C
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
1850
1875
1900
1925
1950
1975
2000
2025
Year
© Crown Copyright. Source: Met Office


Processes supported by design:
Disinfect
Decontaminate
Eliminate
External Source
Barriers
Filters
Design Elements
Hospital
Reservoir or Source
Reservoir: Place (human or environmental) where organisms reside and multiply.
Source: Place from which an organism is transmitted to the host. Source may be the same as the reservoir or become contaminated from the reservoir (e.g., surface, instrument)
Hand Hygiene
Other Barriers
Isolation
Design Elements
Hand Hygiene
Other Barriers
Isolation
Design Elements
Colonized
or
Infected Host
Patients
HCWs
Visitors
Colonized
or
Infected Host
Patients
HCWs
Visitors
Hand Hygiene
Isolation
Design Elements
HAI
Human Reservoirs
Environmental sources and reservoirs of pathogens
Transmission Event: Direct or indirect contact including transient carriage (e.g., health care worker (HCW) hands) Airborne droplet
Opportunities for Interventions through the built environment

Human Health Risk Assessment Model



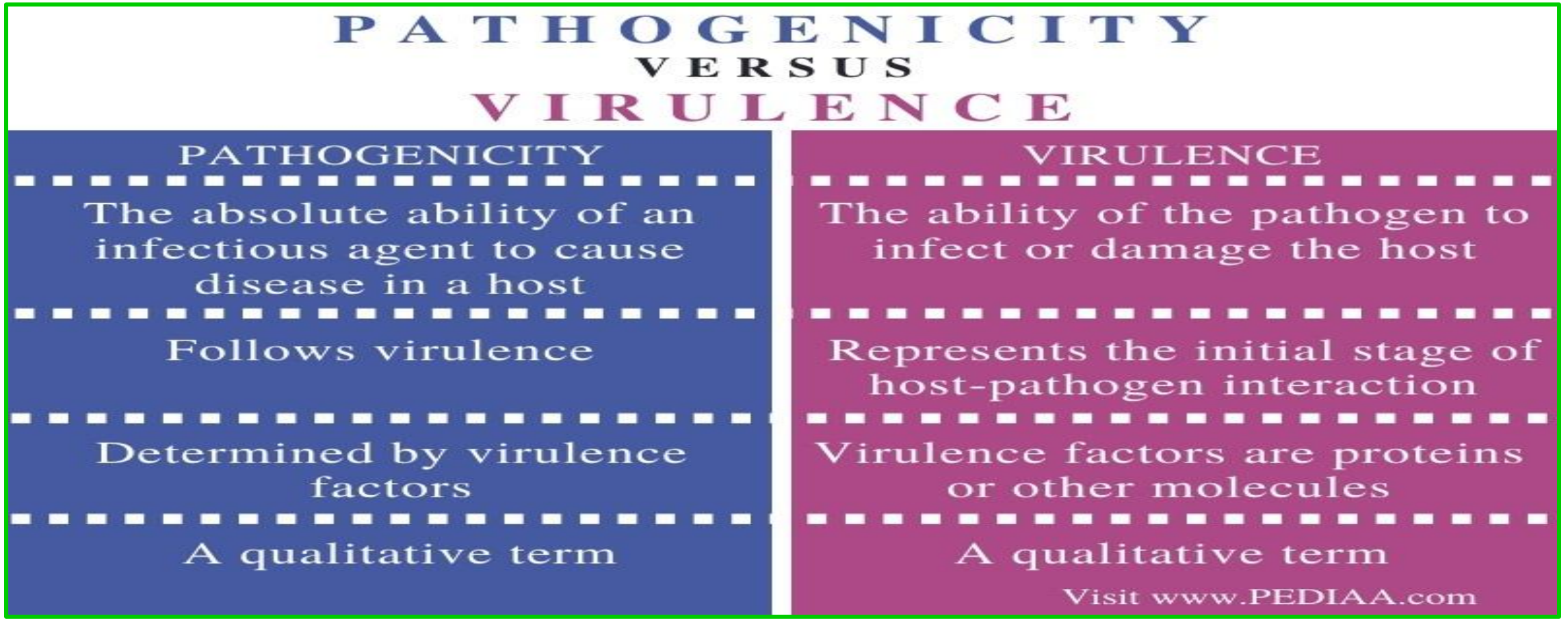




[WHO-WHE-SPP-2023.1-eng.pdf]

The main difference between pathogenicity and virulence

- The main difference between pathogenicity and virulence is that ***pathogenicity is the ability of a pathogen to cause disease***, whereas virulence is the ability of a pathogen or microbe to infect or damage a host. Furthermore, pathogenicity is determined by virulence factors.

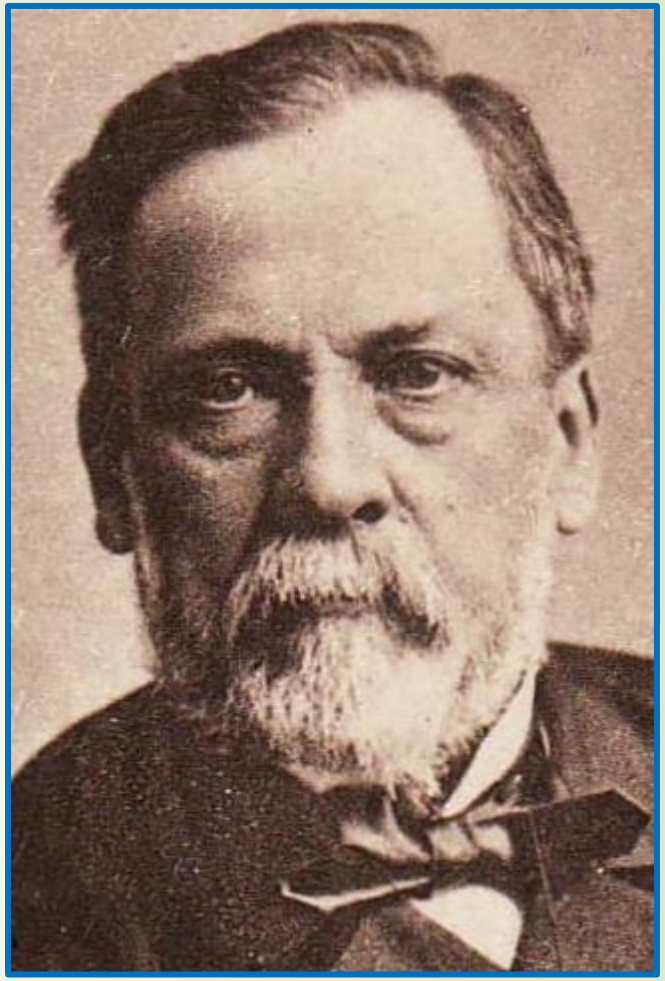


Healthcare Associated Infection (HAI)

- An infection acquired in a healthcare facility by a patient who was admitted for a reason other than the infection
- An infection occurring in a patient during the process of care in a hospital or other healthcare facility that was absent or incubating at the time of admission
  - Includes infections that appear after discharge

Germ Theory

- Infectious diseases are caused by microorganisms (e.g., bacteria, virus, fungi) that invade the body and multiply
- Established in the 1800s
- Recognizes contributory host factors
- Basis for other theories of disease transmission, e.g., chain of infection



Louis Pasteur Discovers Germ Theory, 1861

New Approaches: Antimicrobial surfaces

Candidate	Pros	Cons
Metal		
Copper	Rapidly microbicidal Reduces acquisition	? Sporicidal Acceptability / retrofitting
Silver	Rapidly microbicidal	? Sporicidal Tolerance development
Chemical		
Organosilane	Easy to apply	Limited microbicidal activity Durability
Light-activated	Broadly microbicidal	? Sporicidal
Topography		
"Liquid glass"	Reduces deposition Improves 'cleanability'	Not microbicidal
Sharklet pattern	Reduces deposition Reduced biofilms	Not microbicidal

Page *et al. J Mat Chem* 2009

Healthcare-associated Legionnaire's disease

- Of 27 CDC field investigations of Legionnaire's disease outbreaks from 2000-2014
  - 33% were associated with healthcare facilities
  - Deficiencies in water system maintenance contributed to at least 85% of outbreaks
- In 2015, 21 U.S. jurisdictions reported exposure information for most of their *Legionella* infections
  - 76% of jurisdictions had at least one definite healthcare-associated Legionnaire's case
- Most problems leading to healthcare-associated outbreaks could be prevented with effective water management

Water management programs

1. Establish a water management program team
2. Describe the building water system using text and flow diagrams
3. Identify areas where pathogens could grow and spread
4. Decide where control measures should be applied and how to monitor them
5. Establish ways to intervene when control limits are not met
6. Make sure the program is running as designed and is effective
7. Document and communicate all activities

Summary: Strategies to Interrupt Transmission of Pathogens Related to Water

- Decontamination of water sources
  - Chlorination, hyper-chlorination, superheat-and-flush, copper-silver ionization, and UV
- Design elements
  - Selection of faucets, sinks, aerators
  - POC filters (cost-risk balance)
  - Decorative; avoid open fountain systems
- Safe plumbing practices
  - Eliminate dead legs
  - Temperature and pressure

WASH
WATER
SANITATION
AND HYGIENE

New Approaches: "No Touch" Disinfection

Hydrogen peroxide vapor (HPV)

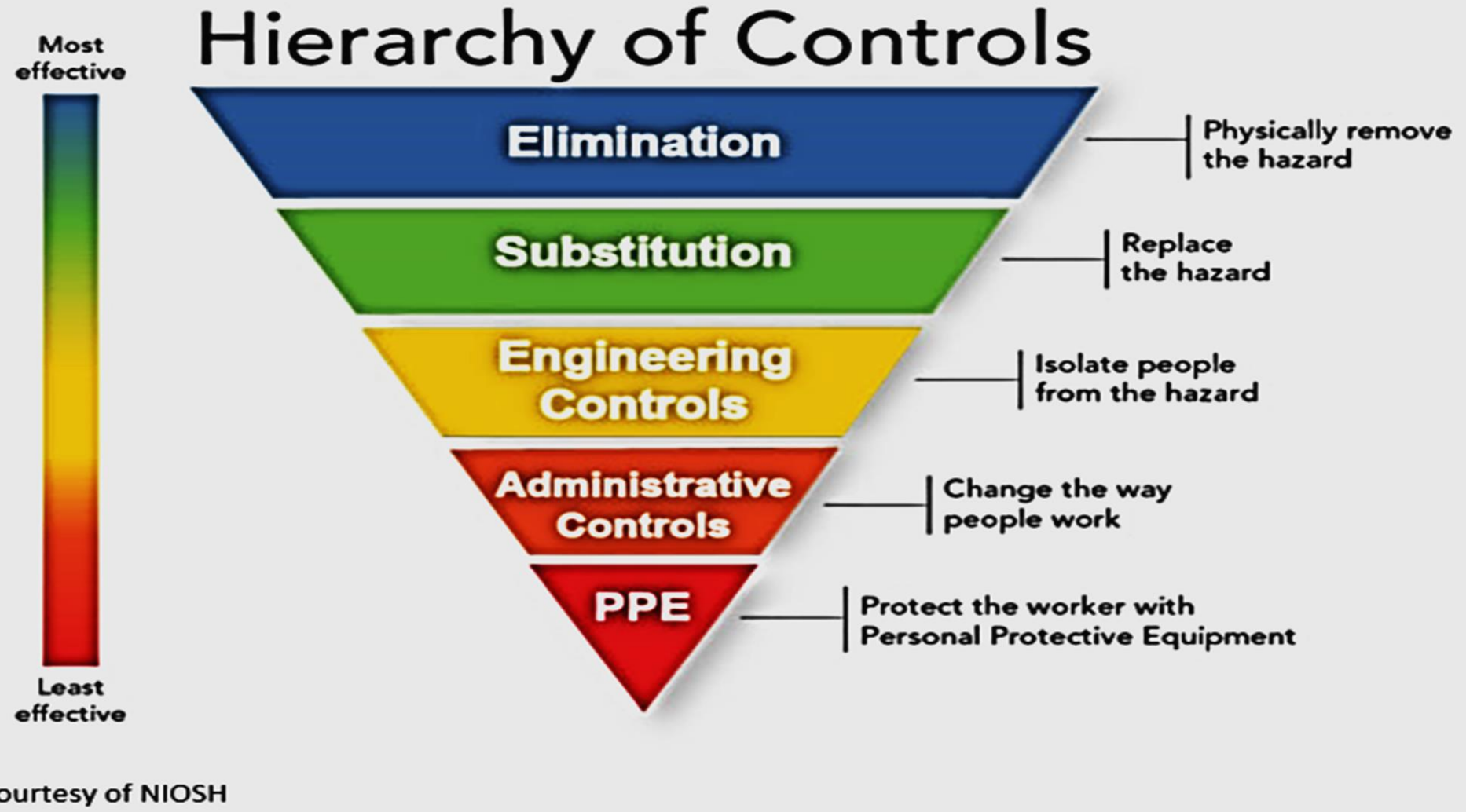
Aerosolised hydrogen peroxide (aHP)

Ultraviolet radiation C (UVC)

Pulsed-xenon UV (PX-UV)

Otter *et al. J Hosp Infect* 2013;83:1-13.

Infection Prevention and Control Measures



What is Risk Recognition?

- Real-time awareness of things that can transmit infection
  - Understand why we take certain precautions, rather than just memorizing
- Broad approach to infection control that includes both direct patient care and consideration of the environment
  - Get into the habit of recognizing potential problems
  - Scan the environment constantly to look for hazards

Cleaning, Disinfection & Sterilization

Cleaning	The removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products.
Disinfection	Process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects
Sterilization	Process that destroys or eliminates all forms of microbial life and is carried out in health-care facilities by physical or chemical methods.

CDC, Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008

Mitigating Risks Through Environmental Cleaning and Disinfection

High touch items

- Facilities must ensure adequate cleaning high touch surfaces in the patient environment
- Examples:
  - Bed rails
  - Restroom hand rails
  - Bed side tables
  - See CDC checklist for full list*

Disinfectant selection & preparation

- Facilities must ensure proper preparation and use of disinfectants including appropriate:
  - Dilution
  - Storage
  - Application
  - Contact Time
- EPA-registered hospital-grade products

Proper use of disinfectants

- Factors that influence disinfectant effectiveness:
  - Porosity of surface
  - Crevices or ridges
- Avoid cross contamination, e.g., PPE, changing mop heads
- Training/Audits
  - Procedures
  - Safety Data Sheets

Water management programs

1. Establish a water management program team
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Preventing water-related healthcare infections

- Center for Medicare and Medicaid Services (CMS) surveys and certifies healthcare facilities based on certain standards

- In 2017, CMS released a memo stating that facilities must develop and adhere to policies and procedures that inhibit microbial growth in building water systems that reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens in water.
  - Conduct risk assessment
  - Develop a water management program
    - Based on industry standards (ASHRAE 188) and CDC toolkit
  - Test for control measures and take action when control limits are not maintained

- Applies to hospitals, critical access hospitals, skilled nursing facilities and nursing facilities

Cyclone Idai

Thousands displaced
in Central Mozambique

Tropical Cyclone Idai made landfall near Beira City near Mozambique in the early hours of 15 March 2019, leaving extensive destruction in its wake. The system also brought heavy rains and flooding to **Mozambique**, **Zimbabwe and Malawi**. The UN Office for the Coordination of Humanitarian Affairs estimates that a total of **1.6 million people have been affected** in the three countries. WHO is supporting the health response by deploying staff, dispatching medicines and strengthening disease detection and response in affected areas.

FDA's Foodborne Outbreak Response Improvement Plan

New Era of Smarter Food Safety

Date: April 13, 2022

Time: - 2:00 - 3:00 p.m. ET

PPE such as gowns, gloves, masks, and goggles provide physical barriers that prevent the hands, skin, clothing, eyes, nose, and mouth from coming in contact with infectious agents.

Summary: Strategies to Interrupt Transmission of Pathogens that Spread by Contact

- Adherence to and monitoring of cleaning protocols
- Technologies to supplement manual cleaning
- Surfaces that are easy to clean
- Materials with antimicrobial properties for high touch surfaces
- Physical barriers such as single patient rooms
- Hand hygiene infrastructure: clearly visible sinks and gels in convenient and standardized locations

HIV remains a major public health issue that affects millions of people worldwide.
According to the World Health Organization (WHO),
more than 33 million people have died of HIV since the start of the pandemic.

37,700,000: Estimated number of people living with HIV in 2020

680,000 : People died from HIV-related causes in 2020

1,500,000 : People were newly infected in 2020

10.2 million [9.8 million–10.2 million] who were not on HIV treatment.
Among those not on treatment, about 4.1 million did not know their HIV-positive status
and 6.1 million knew their HIV status but could not access treatment

EVERY DAY THERE ARE 4000 NEW HIV INFECTIONS (ADULTS and CHILDREN),
2797 people were newly infected in Turkiye in 2020.

Let's Stop HIV Together / *Get tested, protect yourself, tell others*

The theme of World AIDS Day 2021 is "End inequalities. End AIDS"

Prof. Dr. Ahmet SALTIK MD, LLM, BSc / Atilim Univ. Medical School, Ankara / TÜRKİYE

- There are 4 types of vaccines in **clinical trials**:
  whole virus, protein subunit, viral vector and nucleic acid
  (RNA and DNA), each of which protects people,
  but by producing immunity in a slightly different way.
- Despite the record speed at which they have been developed, COVID-19 vaccines have still been subject to the same checks, balances, and scientific and regulatory rigour as any other vaccine, and shown to be safe.

❖ ***Am I fully protected after my two doses of vaccine?***

❖ While the vaccine will normally protect you from becoming ill, you are still advised to continue following ***protective measures*** such as wearing **masks**, social **distancing** and **washing-sanitizing your hands** regularly.

- An unprecedented combination of political will, global collaboration and funding have enabled the rapid development of **COVID-19 vaccines**, without compromising vaccine safety.
- The currently available coronavirus vaccines have been demonstrated to be safe for adults of various ages, as well as those with chronic health conditions.
- But there are a few groups who should avoid being vaccinated for now.

A crisis of vaccine inequity

- *The longer vaccine inequity persists, the more the virus will keep circulating and changing, the longer the social and economic disruption will continue, and the higher the chances that more variants will emerge that render vaccines less effective."*
- **Health leaders have called for urgent global cooperation on COVID-19 vaccine supply and access, particularly in Africa where only 2% of total doses worldwide have been administered.**

Dr. Tedros Adhanom Ghebreyesus, Director-General, WHO

Booster shots for COVID-19 - profsaltik@gmail.com - Gmail (google.com) 17.9.21

The dream of wiping out polio might need a rethink

- The global campaign to eradicate polio has been incredibly successful except in one key way: It hasn't actually **eradicated polio**.
- *Some prominent scientists who've spent their entire careers battling polio are now saying it's time to rethink the multi-billion dollar fight against the disease.*
- When the **Global Polio Eradication Initiative** was launched in 1988, the goal was to extinguish polio by the year 2000.
- At the time, polio was still paralyzing hundreds of thousands of people a year, and some cases were even fatal.
- *In the first three months of this year there have been 15 cases, total, in the entire world.*

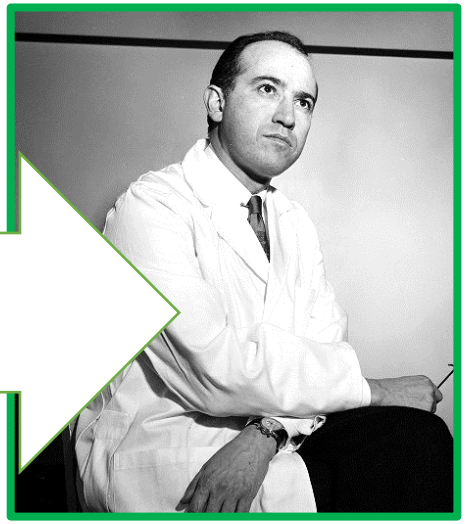
The dream of polio eradication might need a rethink : Goats and Soda : NPR 10.4.23

Dr. Jonas Salk : "Could you patent the sun?"

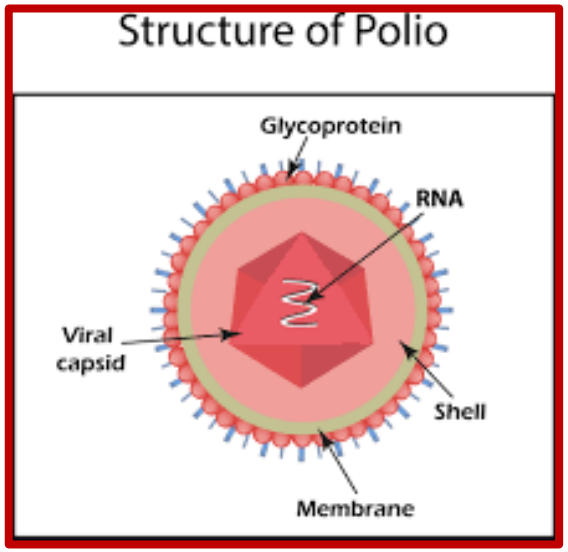
- **Dr. Jonas Salk** became a national hero when he allayed the ***fear of polio*** with his vaccine, approved in 1955.
- Although it was the **first polio vaccine**, it was not to be the last;
- **Dr. Albert B. Sabin** introduced an ***oral vaccine*** in the 1960s that replaced Salk's.

Jonas Salk and Albert Bruce Sabin | Science History Institute
10.4.23

Retro Report takes us back to **Jonas Salk**, the developer of the ***life saving polio vaccine***. When asked in an interview by CBS's Edward R. Murrow if he owned the patent, he famously replied that the ***patent belonged to the people***, asking ***"Could you patent the sun?"***



Dr. Jonas Salk



Dr. Albert B. Sabin

The dream of wiping out polio might need a rethink

- Even such a relatively small number of cases, say some specialists, shows that the goal of ***wiping out the disease*** may be elusive.
- *Countries, particularly in Africa, were declared polio-free only to have* ***polio pop up*** *again years, even decades, later.*
- Last year, the United States, which had officially eliminated polio in 1979, had a case of the **paralytic disease**.
- *The virus has also been found in* ***sewage*** *samples in London, Finland and Jerusalem, all places where it supposedly was extinguished decades ago.*

The dream of polio eradication might need a rethink : Goats and Soda : NPR 10.4.23


Vision 2030
Universal access to sexual and reproductive health and reproductive rights
End unmet need for family planning
End preventable maternal deaths
End gender-based violence and harmful practices
Leave no one behind
SUSTAINABLE DEVELOPMENT GOALS
UNFPA

Quick reminders-1

- Globally, the **burden of disease** is categorized into 3 groups :

1. **Non-communicable diseases (NCDs)**: These account for the majority of the global disease burden.
2. **Communicable, maternal, neonatal, and nutritional diseases**: These are significant but have seen a decline over time.
3. **Injuries**: These also contribute to the ***global disease burden*** but to a lesser extent compared to diseases.

Ref. https://ourworldindata.org/burden-of-disease, 02.05.24

Quick reminders-2

- The distribution of the disease burden varies significantly around the World. For instance, in 2019, some regions with better health had a **DALY** rate under 20,000 per 100,000 people, while in the worst-off regions, particularly in parts of Africa, the rate was over 60,000 per 100,000 people.

1. ***The Global Burden of Disease (GBD)*** study provides comprehensive data on these metrics, tracking changes over time and across different regions. It's important to note that while the ***burden from communicable diseases*** has declined, it still represents a significant challenge, especially in low-income countries. *Ref. https://ourworldindata.org/burden-of-disease, 02.05.24*

Quick reminders-3

- For example, a study estimated the economic burden of **8 major infectious diseases *(HIV/AIDS, malaria, measles, hepatitis, dengue fever, rabies, tuberculosis, and yellow fever)*** at up to USD 8 trillion, with more than 156 million life years lost for the year 2016 alone. *https://www.nature.com/articles/d41586-021-02909-5 02.05.2024*
- This brief overview gives you an idea of the ***impact of infectious diseases*** globally. For more detailed and updated information, you can refer to the resources provided by ***Our World in Data*** and the ***IHME-Institute for Health Metrics and Evaluation***.

Thank You

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