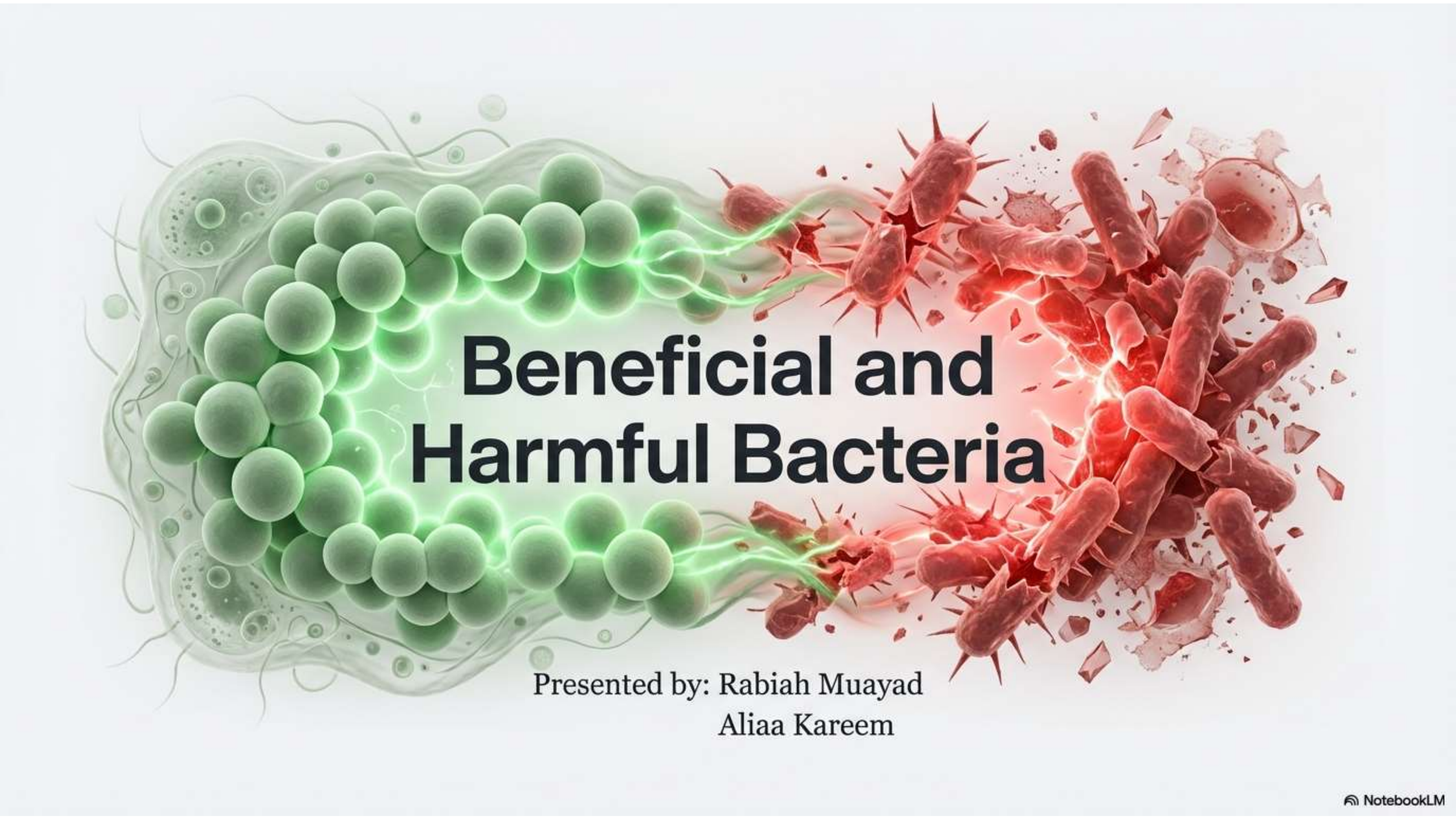


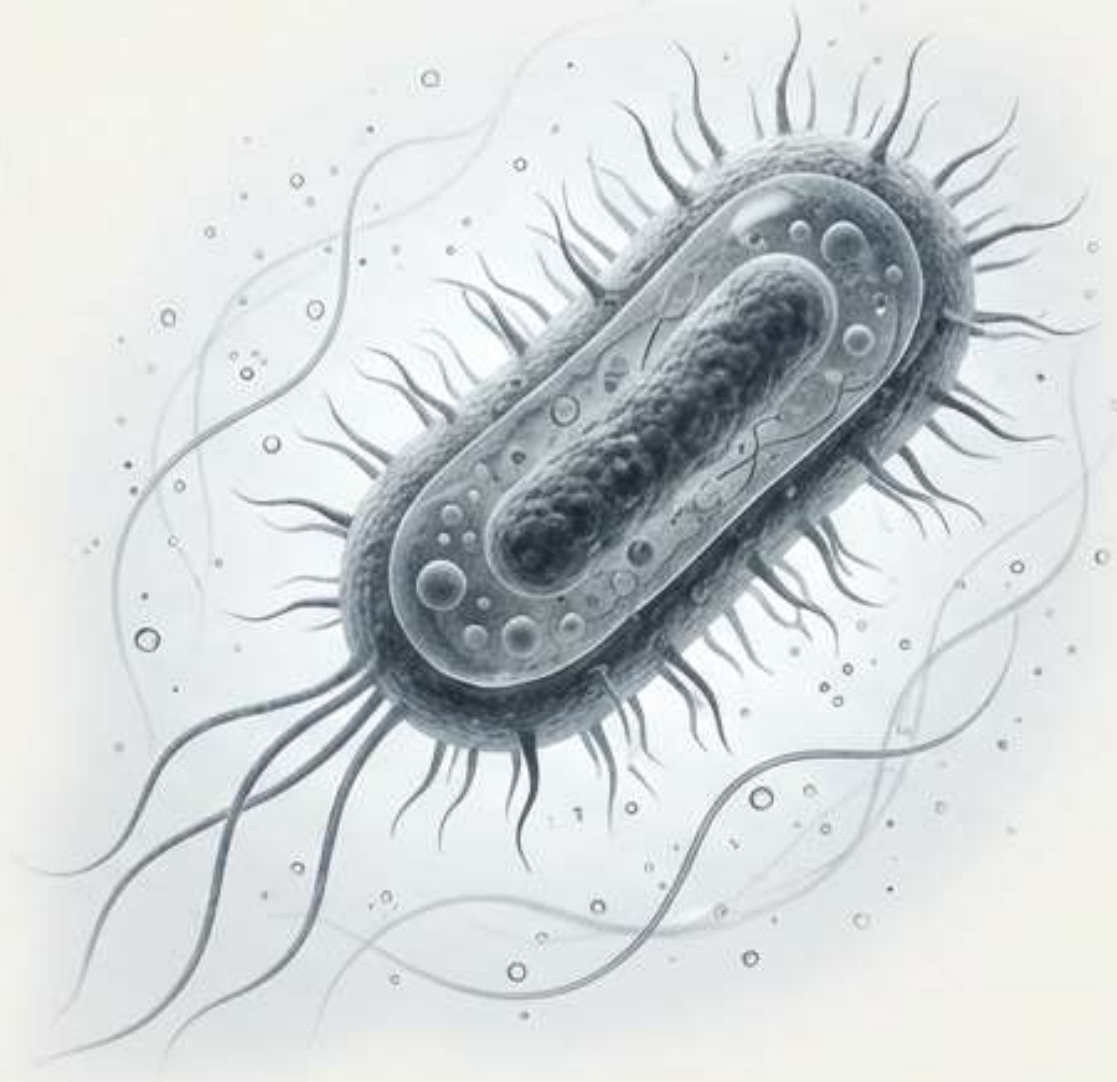


Beneficial and Harmful Bacteria

Presented by: Rabiah Muayad
Aliaa Kareem

What Are Bacteria?

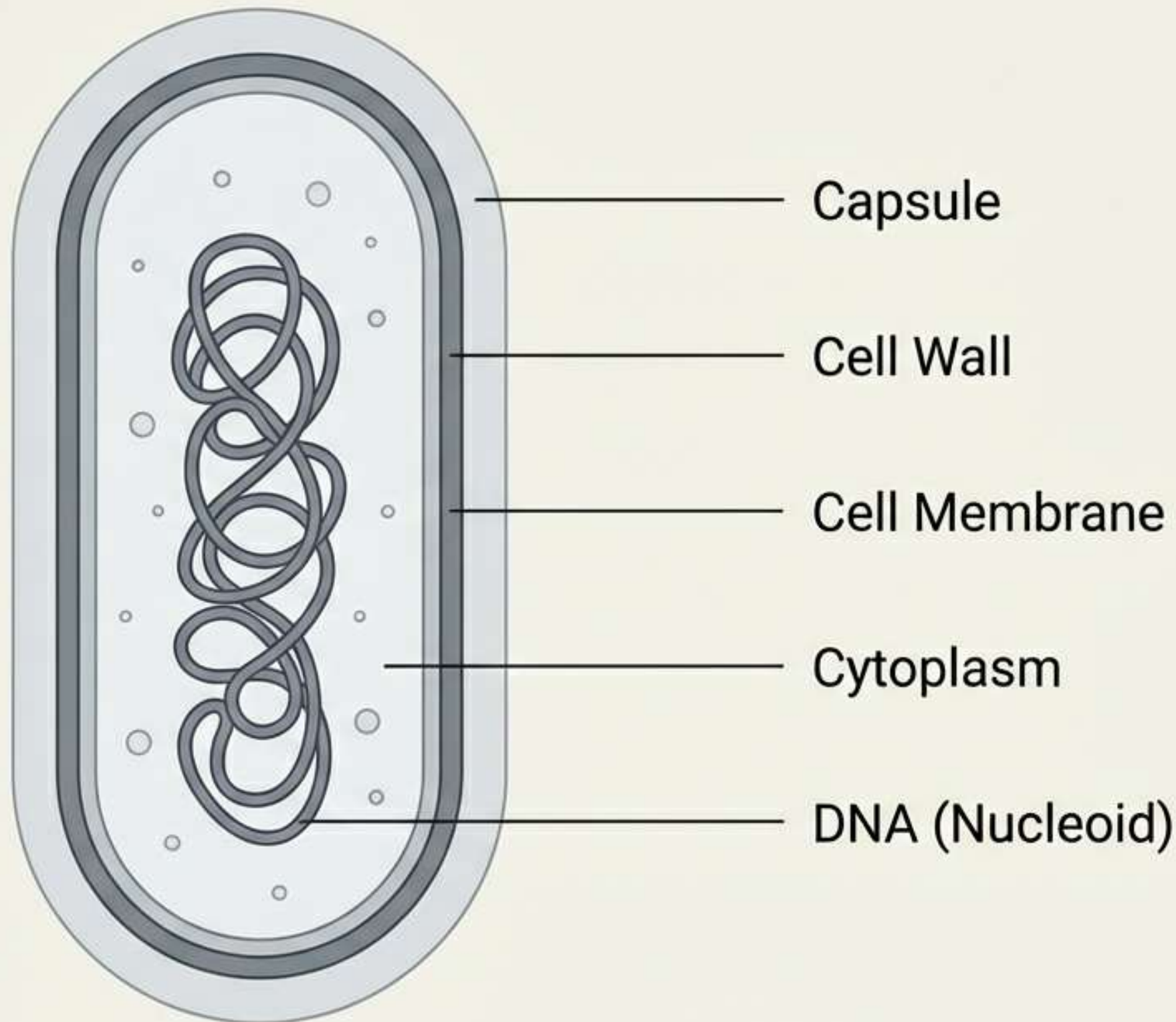
- Microscopic single-celled organisms.
- Prokaryotic (no true nucleus).
- Found everywhere in nature.
- Some are useful, some harmful.



General Characteristics

- Reproduce by binary fission.
- Can survive extreme conditions.
- Have different shapes.
- Rapid growth under suitable conditions.

Classification of Bacteria



- Shape: Cocci, Bacilli, Spirilla.
- Gram-positive / Gram-negative.
- Aerobic / Anaerobic.
- Beneficial / Pathogenic.

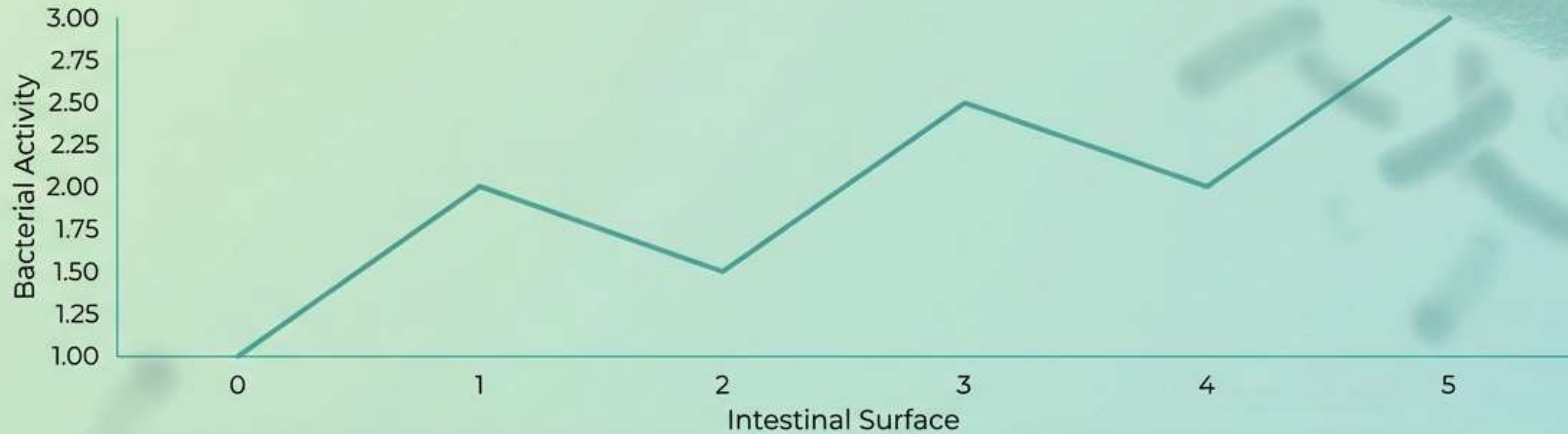
Part 1: Beneficial Bacteria

- Known as Good Bacteria.
- Essential for life.
- Maintain ecological balance.
- Important in human health.

Normal Flora

- Live naturally in the body.
- Found in gut, skin, mouth.
- Prevent pathogen colonization.
- Maintain microbial balance.

Gut Microbiota



Lactobacillus

- Produces lactic acid.
- Helps digestion.
- Found in yogurt.
- Maintains vaginal health.



Bifidobacterium

- Supports immune system.
- Reduces harmful bacteria.
- Produces vitamins.
- Improves gut health.



Environmental & Medical Allies

Rhizobium

- Lives in plant roots.
- Fixes nitrogen.
- Improves soil fertility.
- Important in agriculture.



Streptomyces

- Produces antibiotics.
- Used in medicine.
- Found in soil.
- Important in biotechnology.



Microbial Impact & Scope

Benefits in Human Body

- Aid digestion.
- Produce Vitamin K and B.
- Stimulate immunity.
- Reduce inflammation.

Industrial Importance

- Food production (cheese, yogurt).
- Antibiotic production.
- Biotechnology research.
- Waste treatment.

Environmental Role

- Decompose organic matter.
- Recycle nutrients.
- Maintain ecosystem balance.
- Support plant growth.



Probiotics

- Live beneficial bacteria.
- Improve gut balance.
- Available as supplements.
- Support digestive health.



The background of the slide is a detailed 3D rendering of a microscopic environment. It features numerous rod-shaped bacteria, some glowing with a bright orange-yellow light, while others are a darker red. These bacteria are scattered throughout the frame. In the background, there are larger, more complex structures that resemble cells or tissue, with visible membranes and internal components. The overall color palette is dominated by dark reds, oranges, and yellows, creating a sense of depth and biological complexity.

Harmful Bacteria

Understanding Pathogens, the Diseases
They Cause, and How to Stop Them.

The Microscopic Invaders

Pathogens are microscopic, single-celled organisms capable of overpowering **host defenses** to cause **disease**.

Structure

Pathogens possess specialized structures, like surface proteins or capsules, that enable them to evade the immune system and invade host tissues.

Size & Scope

Pathogens are incredibly small, microscopic organisms. Their minuscule size allows them to easily infiltrate the body and hide from immune cells.

Growth

Pathogens can multiply rapidly through processes like binary fission. This fast growth allows them to quickly establish an infection and outnumber host defenses.

Mechanisms of Disease: How Pathogens Attack



Toxin Production

Releasing powerful chemical poisons (exotoxins and endotoxins) that damage tissues and cause systemic reactions like fever.



Tissue Invasion

Breaking through cellular walls and mucosal barriers to colonize deep within host tissues.

Host Cell



Immune Evasion

Hiding from or directly destroying the body's white blood cells using protective capsules or specialized enzymes.



Rapid Multiplication

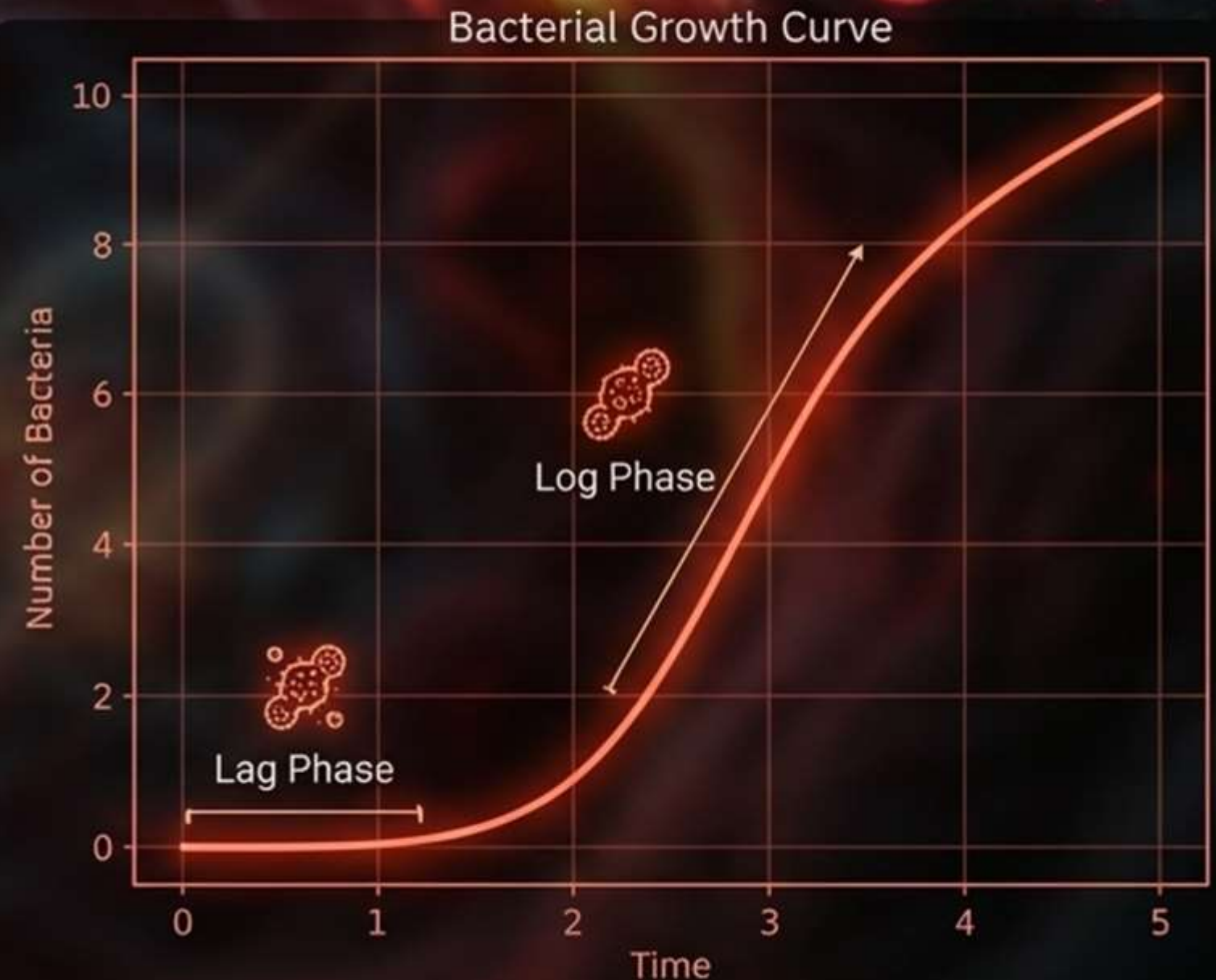
Overwhelming the host's bodily systems and immune responses through sheer numbers.

The Microscopic Battlefield

The Multiplication Threat

“Pathogens don’t just invade; they outnumber.”

Bacteria reproduce through binary fission—one cell divides into two, two become four, four become eight. Under the right conditions, a single bacterium can multiply into millions within a few hours, racing to overpower the immune system before it can react.



Major Bacterial Threats



Salmonella

- Disease: Food poisoning.
- Symptoms: Severe diarrhea, fever.
- Transmission: Contaminated food (poultry, meat, eggs).



Escherichia coli (E. coli)

- Disease: Severe intestinal/urinary infection.
- Symptoms: Cramps, high risk of kidney damage.
- Transmission: Contaminated water and food.



Mycobacterium tuberculosis

- Disease: Tuberculosis (TB).
- Symptoms: Severe lung damage.
- Transmission: Airborne droplets (coughing/sneezing). Requires long-term treatment.



Staphylococcus aureus

- Disease: Skin infections, pneumonia, sepsis.
- Symptoms: Painful skin lesions, fever.
- Transmission: Direct contact; high risk of antibiotic-resistant strains (MRSA).

Modes of Transmission: How They Spread



Contaminated Food & Water

Ingesting pathogens through undercooked meat, unwashed produce, or unsanitary drinking water.



Airborne Droplets

Inhaling microscopic moisture particles expelled when an infected person coughs, sneezes, or talks.



Direct Contact

Touching contaminated surfaces (fomites) or skin-to-skin contact with an infected individual.



Hospital Environments

Healthcare-associated infections spread via surgical instruments, catheters, or compromised immune systems.

The First Line of Defense: Prevention



Hand Washing

Most effective method to remove pathogens from skin, preventing entry.



Proper Cooking

Uses high heat to kill bacteria in raw meat and poultry.



Clean Water

Relies on sanitation and treatment to prevent outbreaks.



Vaccination

Prepares immune system to recognize and destroy bacteria before multiplication.

The Role of Antibiotics



Primary Function

Medicines specifically engineered to kill or inhibit the growth of harmful bacteria within the host by targeting their cell walls or metabolic processes.



Crucial Distinction

Antibiotics are completely ineffective against viruses (like colds or the flu). They must be used properly, strictly for bacterial infections, to remain effective and prevent the rise of resistance.



The Microscopic Battlefield

The Global Challenge of Antibiotic Resistance

Misuse & Overuse

Mutation & Gene Transfer

The Rise of Superbugs



Prescribing antibiotics unnecessarily or failing to finish a full prescription leaves the strongest bacteria alive.



Surviving pathogens mutate. Through 'horizontal gene transfer,' they can even share their resistance genes with nearby bacteria—like passing a survival manual.



Bacteria become immune to standard treatments, turning ordinary infections into dangerous global health emergencies.

Conclusion

Bacteria can be beneficial or harmful.

Good bacteria are essential for life.

Harmful bacteria cause disease.

Balance and hygiene are key to health.



2017

The End