SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai

Approved by Pharmacy Council of India, New Delhi.

Coimbatore -641035

COURSE NAME : PHARMACEUTICAL MICROBIOLOGY - BP303 T

B.PHARM II YEAR / III SEM

UNIT 3

SUB TOPIC :DISINFECTANTS - CLASSIFICATION AND MODE OF ACTION

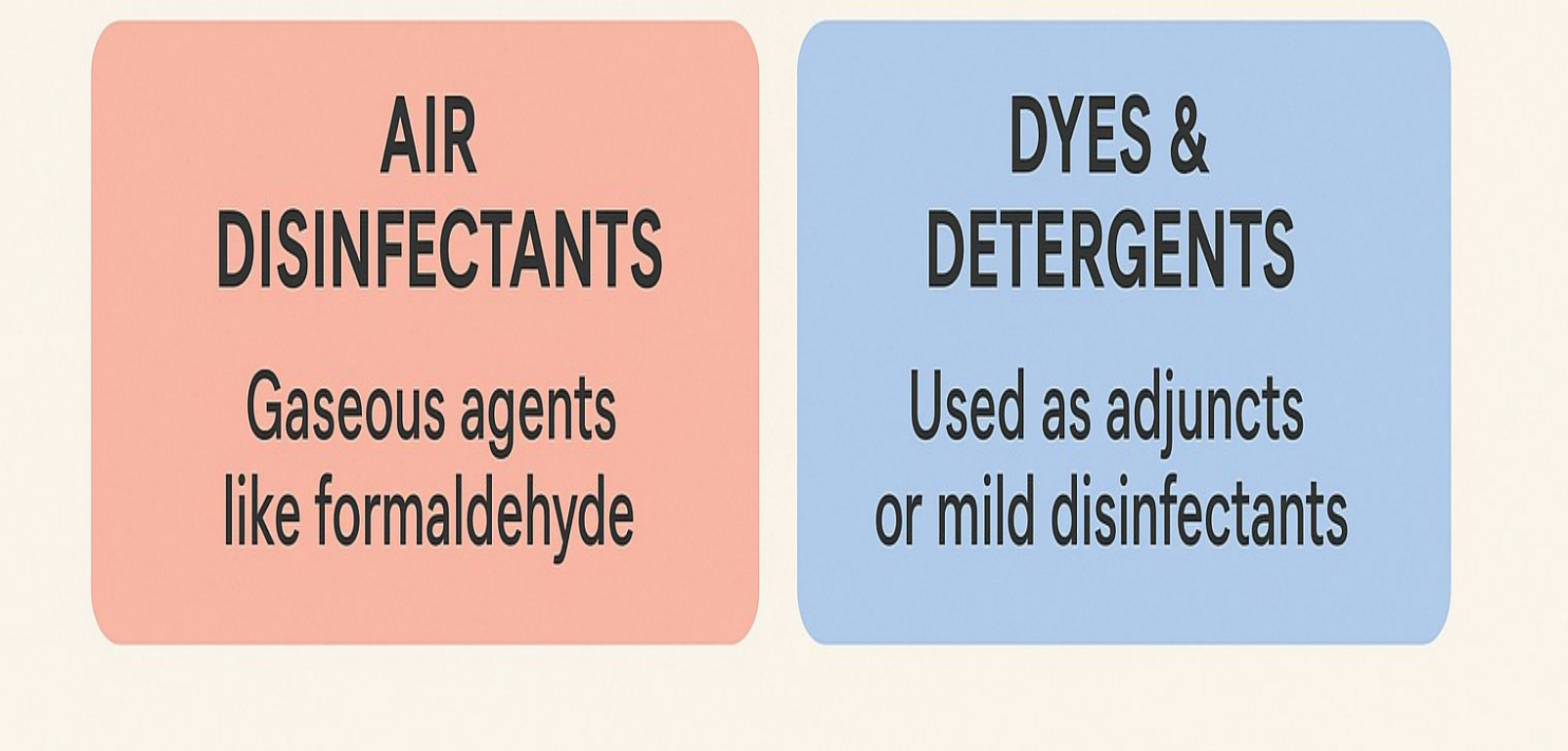
Chemical Type (Chemical Families)

Halogens	Chlorine (bleach, hypochlorites) Iodine (iodophors)
Alcohols	Ethanol, Isopropanol (effective against many microbes, but spores)
Phenolics	Phenol, cresols (disrupt cell membranes)
Aldehydes	Formaldehyde, Glutaraldehyde (high-level disinfectants/sterilants)
Quaternary Ammonium Compounds	Benzalkonium chloride (common in household cleaners)
Oxidizing Agents	Hydrogen peroxide, peracetic acid (release reactive oxygen species)
Biguanides	Chlorhexidine (broad-spectrum, used as antiseptic)
Heavy Metals	Silver, copper (act by binding to proteins)

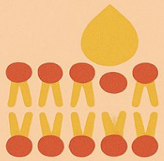
Antimicrobial Spectrum/Level

Low-Level	Kill most bacteria, some viruses, fungi (e.g. QACs, diluted bleach)
Intermediate-Level	Kill vegetative bacteria, mycobacteria, most viruses, but not spores (e.g. alcohol, phenolic compounds)
High-Level	Kill all microorganisms except large numbers of bacterial spores (e.g. glutaraldehyde, hydrogen peroxide)
Sporicidal	Kill all microorganisms, including spores (e.g. glutaraldehyde, peracetic acid)

Other Classifications



COMMON MODES OF ACTION



Membrane damage

Disrupts the cell membrane's integrity, causing it to leak and leading to cell death.

Certain agents can increase membrane permeability, causing cytoplasmic contents to leak out.

Protein denaturation

Coagulates or denatures proteins, which are vital for cellular functions

Alcohols, phenols, and aldehydes work by denaturing proteins.

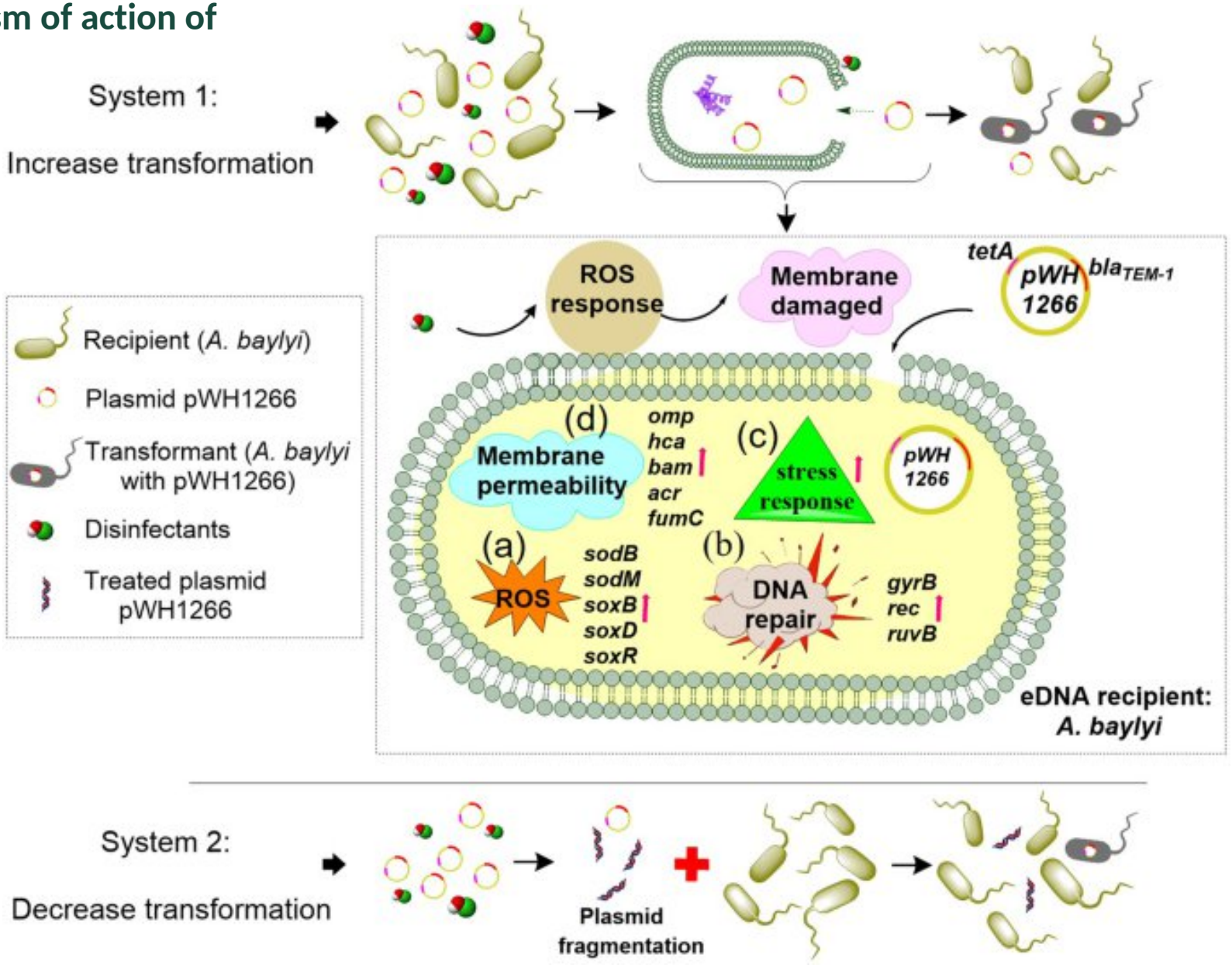
Oxidation

Strong oxidizing agents like chlorine and hydrogen peroxide can damage proteins, DNA, and other cellular components by oxidizing them.

Nucleic acid damage

Disinfectants can damage or inhibit the synthesis of DNA and RNA.

Mechanism of action of halogens



HOW HALOGENS WORK

CHLORINE

Forms hypochlorous acid (HOC) in water, its active agent, which penetates cells and oxidizes components.

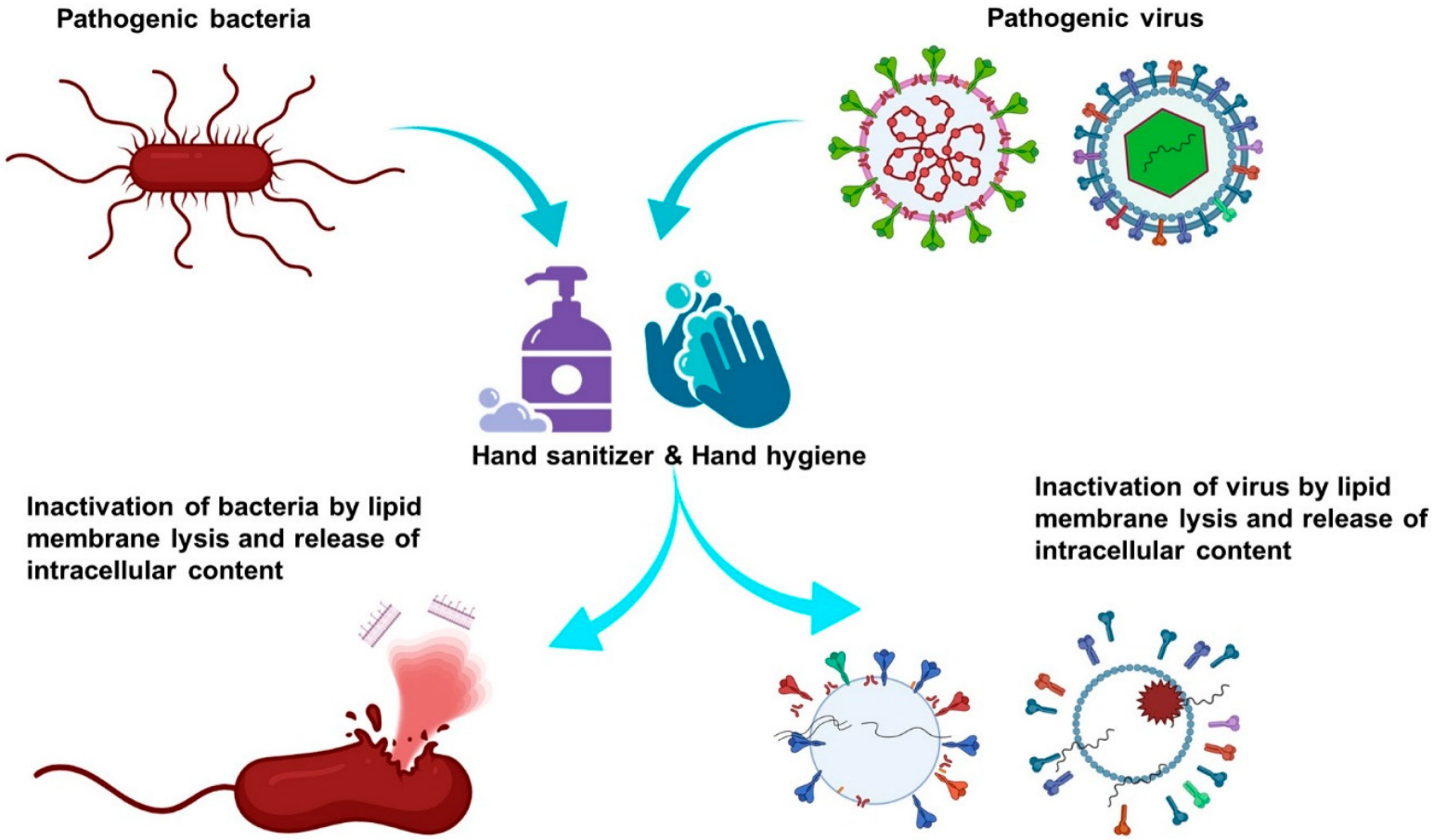
IODINE

Oxidizes proteins and lipids, destabilizing cell structures; used topically but can irritate skin

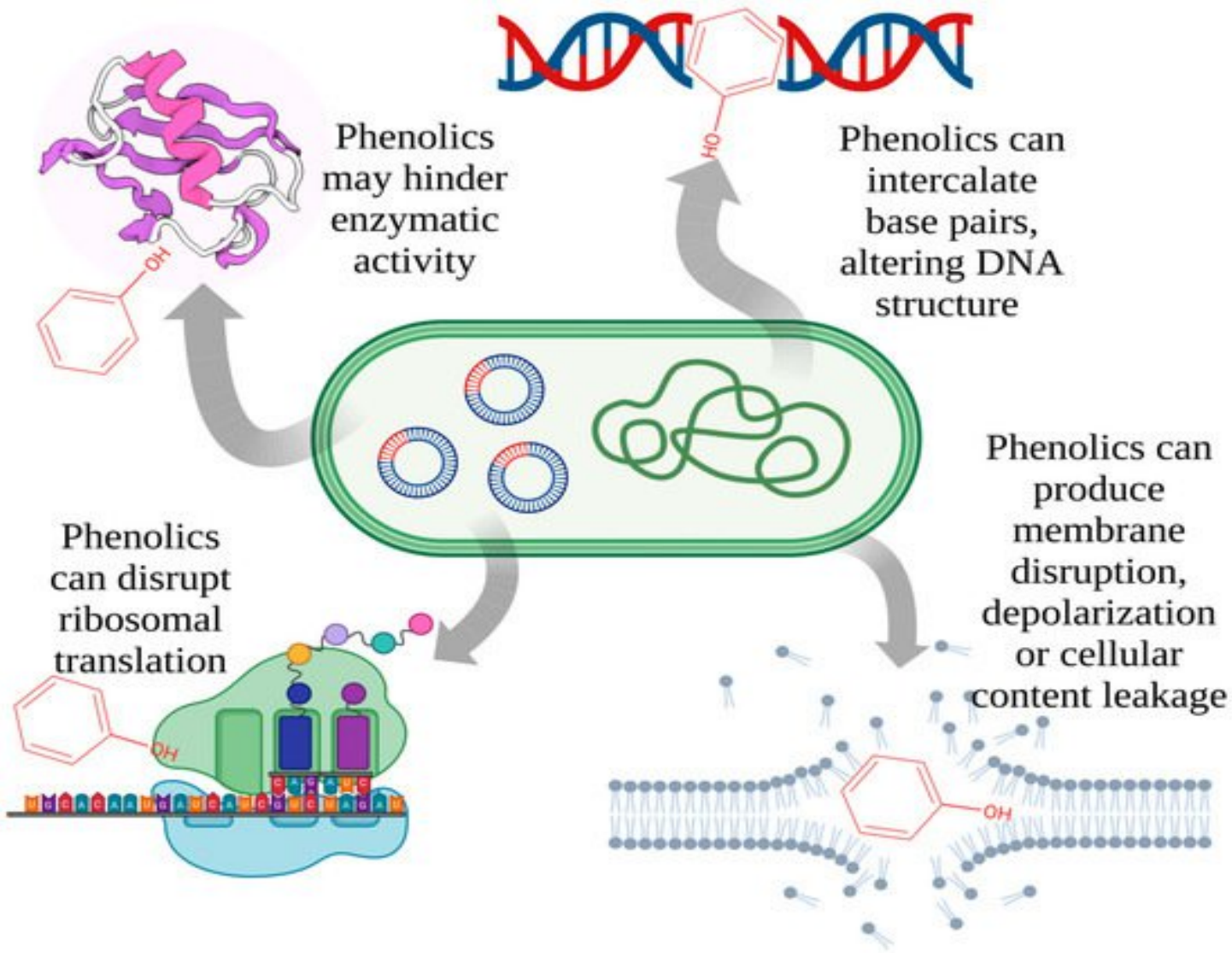
BROMINE

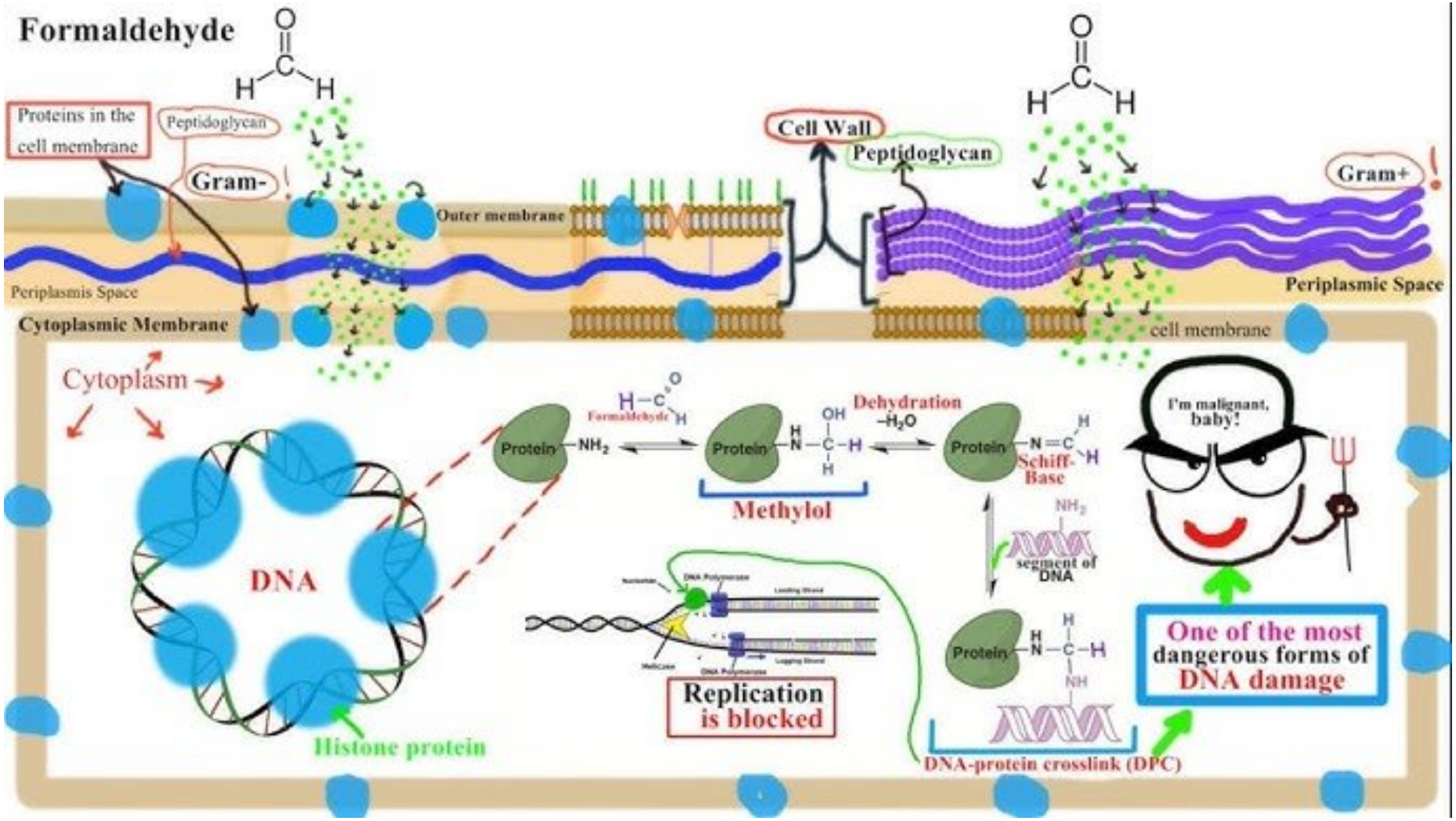
Similar action, often used in pools where it's more stable with organic matter than chlorine

Mechanism of action of Alcohols

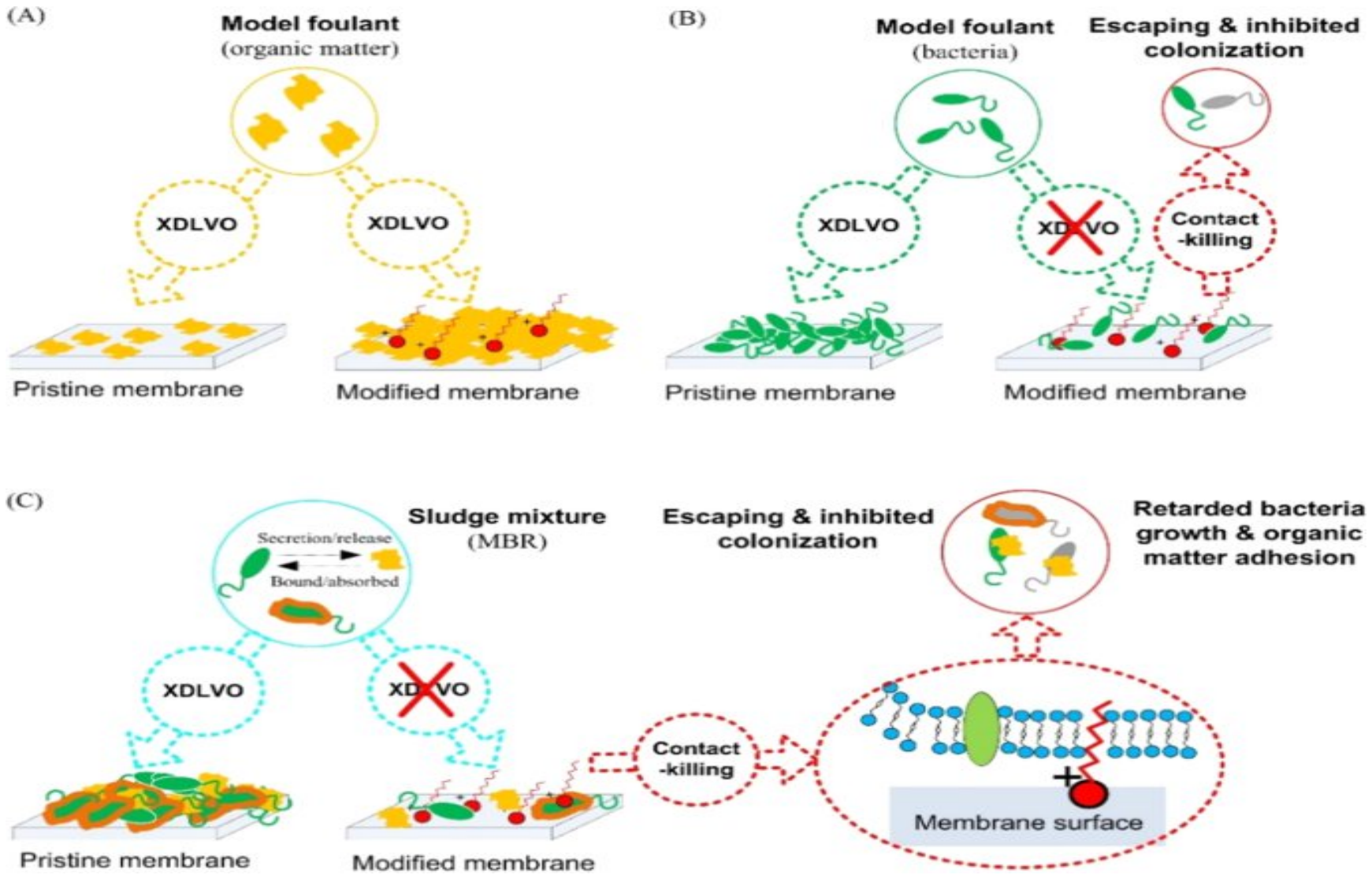


Mechanism of action of Phenolics

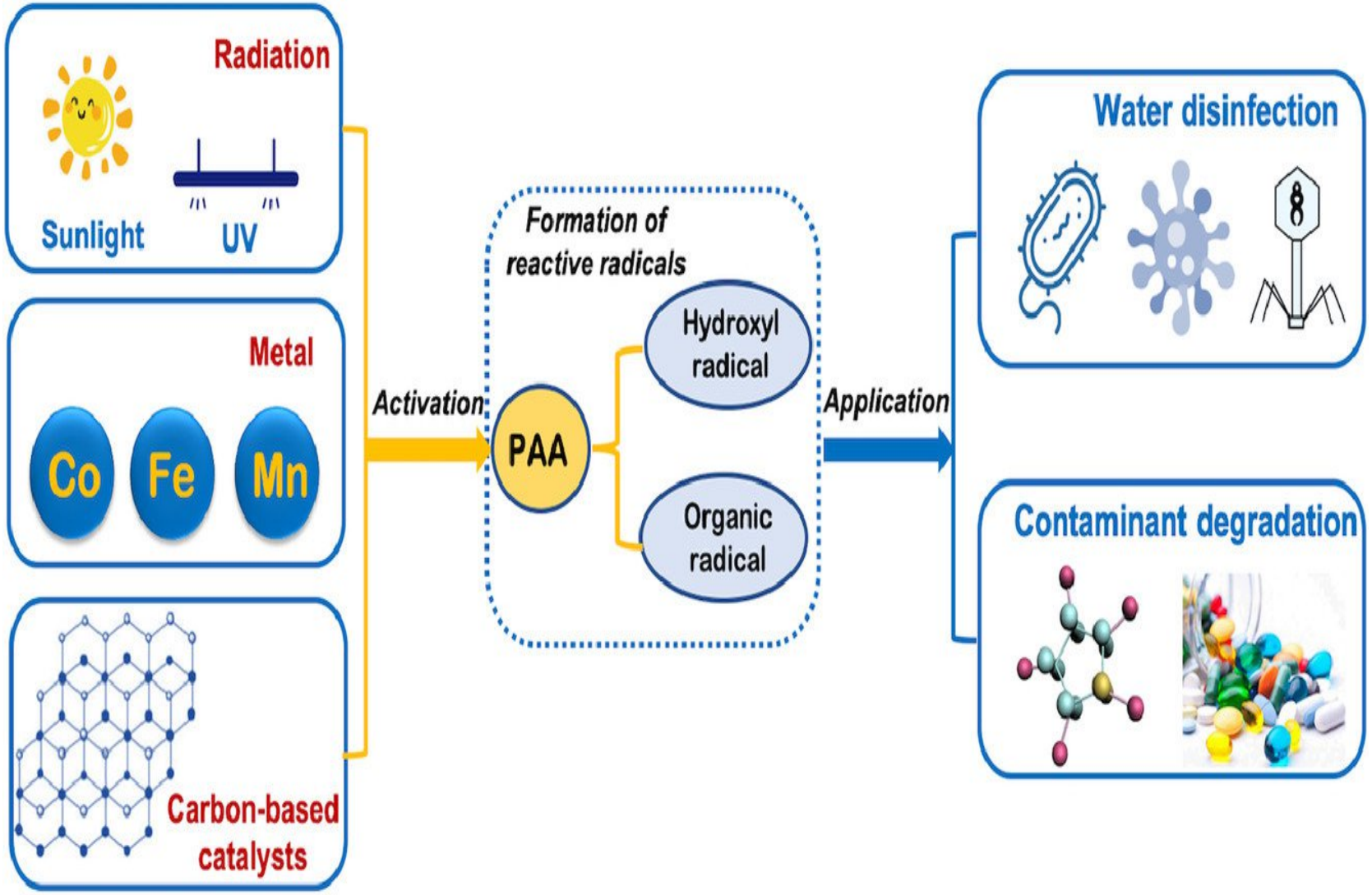



Formaldehyde
Proteins in the cell membrane
Peptidoglycan
Gram-
Outer membrane
Periplasmis Space
Cytoplasmic Membrane
Cell Wall
Peptidoglycan
Gram+
Periplasmic Space
cell membrane
Cytoplasm
DNA
Histone protein
Protein
Formaldehyde
Dehydration
-H2O
Methylol
Schiff-Base
segment of DNA
I'm malignant, baby!
One of the most dangerous forms of DNA damage
Replication is blocked
DNA-protein crosslink (DPC)

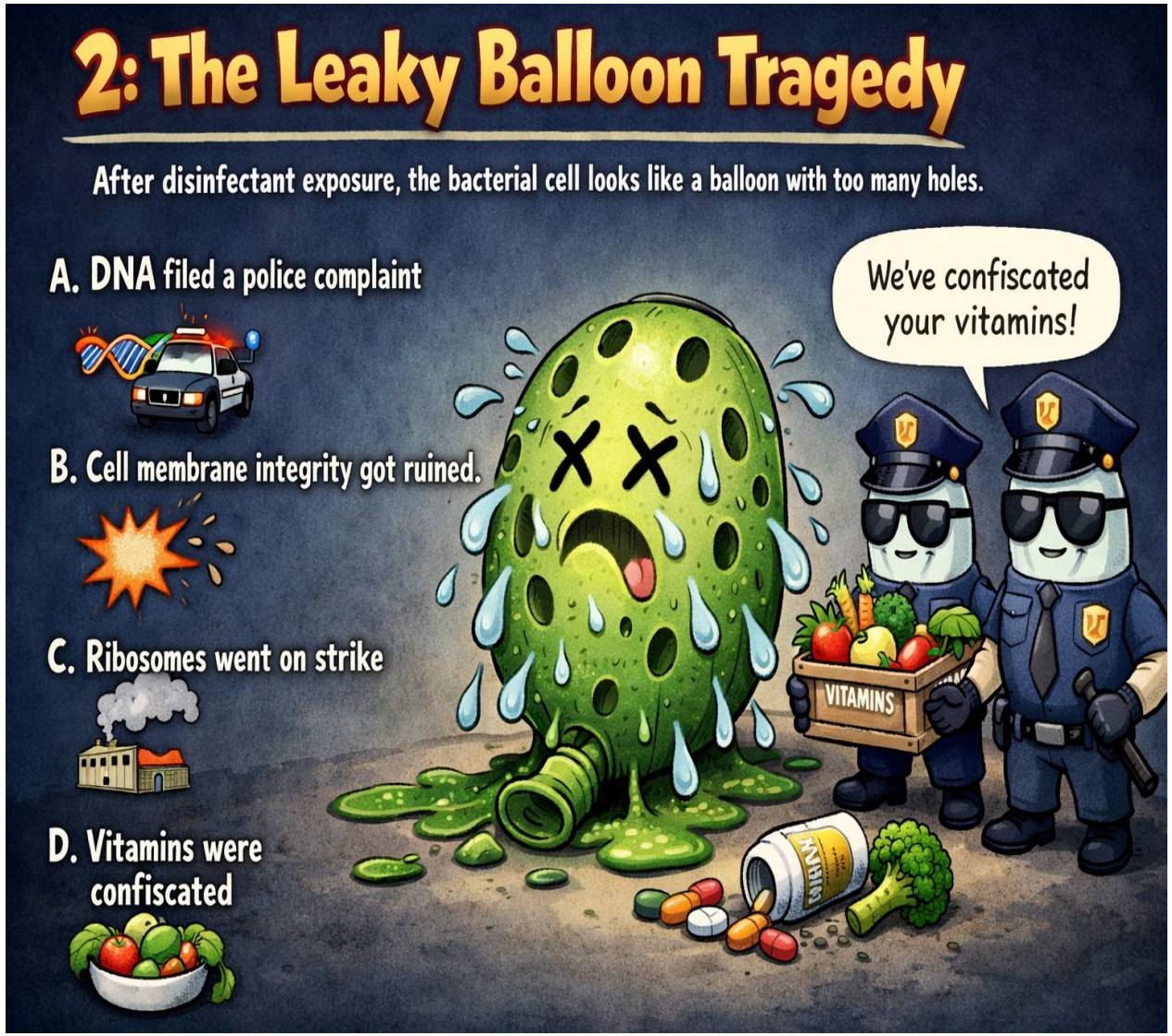
Mechanism of action of Quaternary Ammonium Compounds

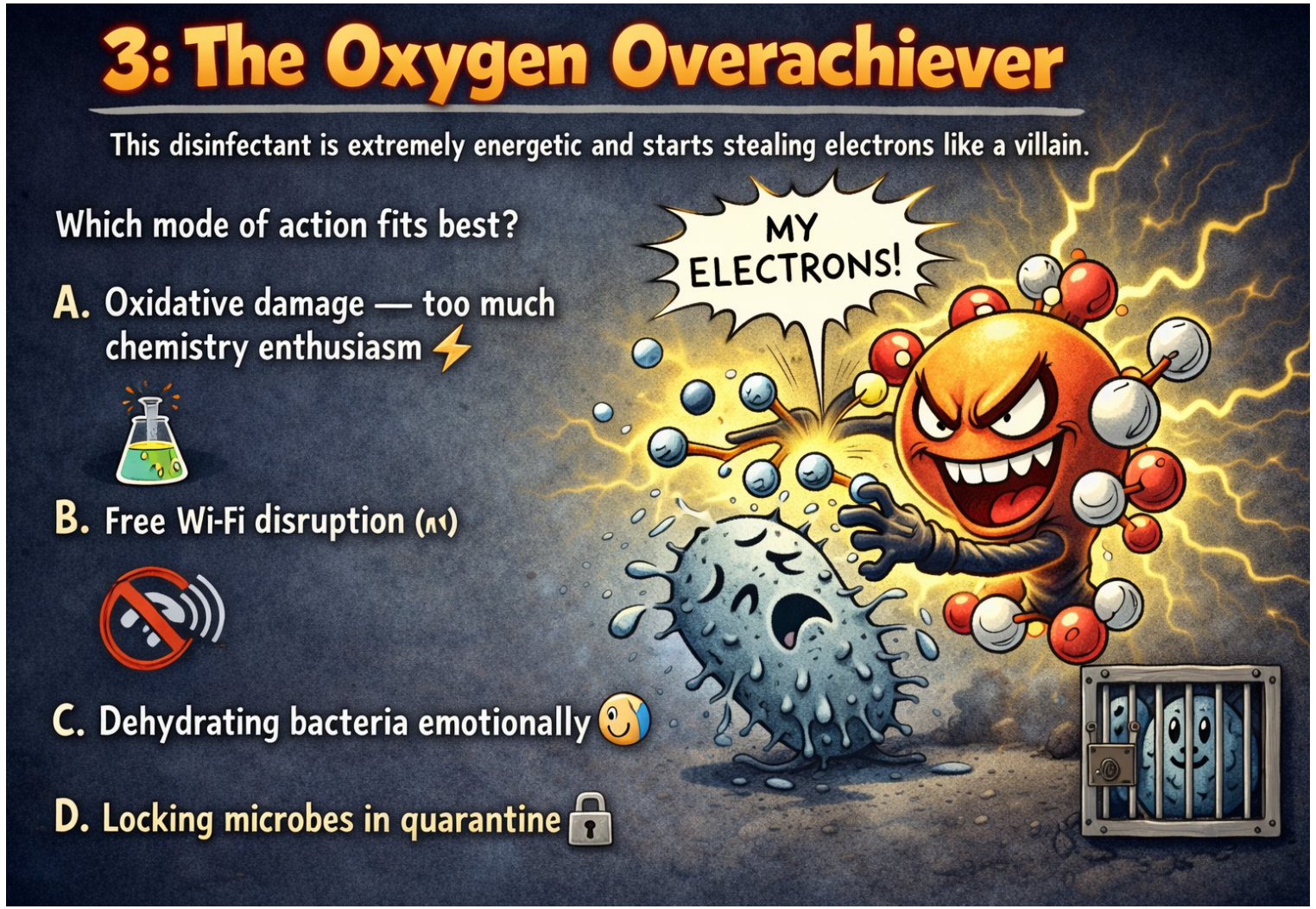


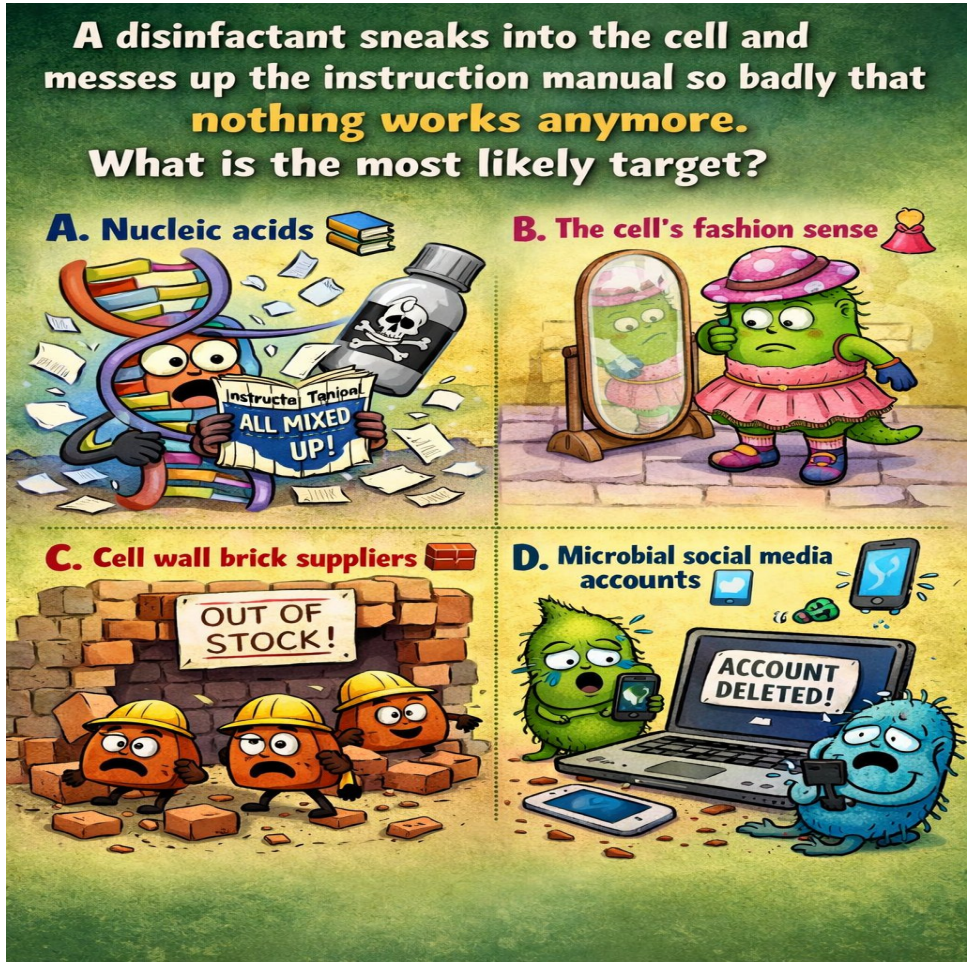
Mechanism of action of Oxidizing agents



ASSESSMENT QUESTIONS


2: The Leaky Balloon Tragedy
After disinfectant exposure, the bacterial cell looks like a balloon with too many holes.
A. DNA filed a police complaint
B. Cell membrane integrity got ruined.
C. Ribosomes went on strike
D. Vitamins were confiscated
We've confiscated your vitamins!
VITAMINS


3: The Oxygen Overachiever
This disinfectant is extremely energetic and starts stealing electrons like a villain.
Which mode of action fits best?
A. Oxidative damage — too much chemistry enthusiasm
B. Free Wi-Fi disruption
C. Dehydrating bacteria emotionally
D. Locking microbes in quarantine
MY ELECTRONS!


A disinfactant sneaks into the cell and messes up the instruction manual so badly that nothing works anymore.
What is the most likely target?
A. Nucleic acids
ALL MIXED UP!
B. The cell's fashion sense
C. Cell wall brick suppliers
OUT OF STOCK!
D. Microbial social media accounts
ACCOUNT DELETED!


The Enzyme Retirement Plan
After exposure, all enzymes stop working as if they've taken early retirement.
Brrr!
Retired
A. Protein coagulation & enzyme inactivation
Woo!
Too Much Energy!
B. Energy drinks overdose
Zzz...
What's the point?
C. Sudden loss of motivation
New Jobs:
D. Microbes switching careers

Disinfectants – Classification and Mode of Action

EMPATHIZE

- → Understanding the challenges of disinfectant selection, classification, effectiveness, and safety
- → Confusion about the different types of disinfectants
- → Concerns about the proper use of disinfectants to prevent microbes

DEFINE

"How might we create an educational experience that makes the classification, modes of action and proper use of disinfectants clear and engaging for all learners?"

IDEATE

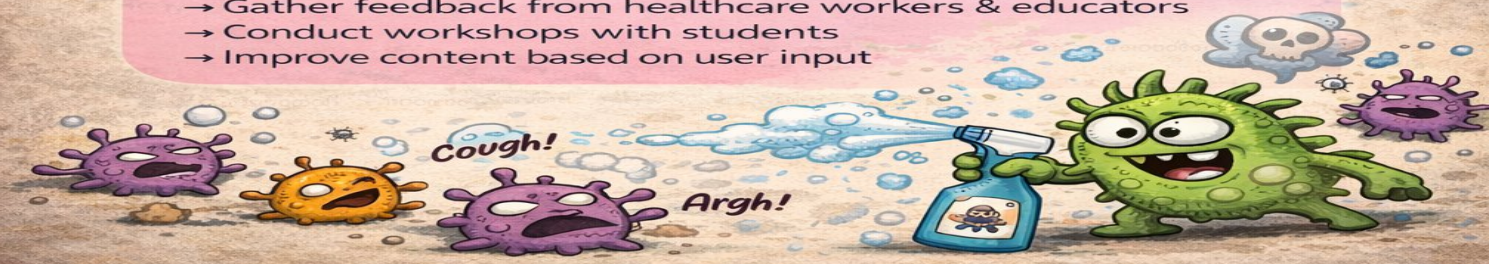
- → Interactive classification charts
- → Mode of action infographics & animations
- → Animated videos of disinfectants in action
- → Animated videos of disinfectants in action
- → Fun mnemonics for different classifications
- → Hands-on safe disinfection experiments

PROTOTYPE

- → Sketch informative flowcharts & diagrams
- → Develop educational videos & quizzes
- → Design infographics & interactive visuals
- → Create safe experiment kits & guides

TEST

- → Gather feedback from healthcare workers & educators
- → Conduct workshops with students
- → Improve content based on user input



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2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.

3. Ananthanarayan : Text Book of Microbiology, Orient-Longman, Chennai


THANK YOU