



MECHANISM OF ACTION OF PREBIOTICS

Becomes no longer cell associated according to genetically encoded secretion program

Has toxin motivated negative impact on body; can be highly toxic, but also highly tissue targeted

EXOTOXIN

Starts here (in cytoplasm)

Consists of diverse proteins; generally heat labile; are soluble; are not structural aspects of bacterial cells



SOME EXAMPLES OF
EXOTOXIN PRODUCED
BY GRAM +TIVE
BACTERIA



1

DIPHTHERIA TOXIN produced by
CORYNEBACTERIUM DIPHTHERIA

2

TETANUS TOXIN (TETANOSPAZMIN) produced by
CLOSTRIDIUM TETANI

3

BOTULINUM TOXIN produced by
CLOSTRIDIUM BOTULINUM

4

Exotoxin produced by
CLOSTRIDIUM DIFFICILE

5

Exotoxin produced by *CLOSTRIDIUM PERFRINGENS*
and other species of

6 EXOTOXIN OF BACILUS ANTHRACIS

7 TOXIC SHOCK SYNDROME TOXIN (TSST) produced by S. AUREUS and some strains of S. PYOGENS

8 STAPHYLOCOCCAL ENTEROTOXIN

9 EXFOLIATIN produced by S. AUREUS

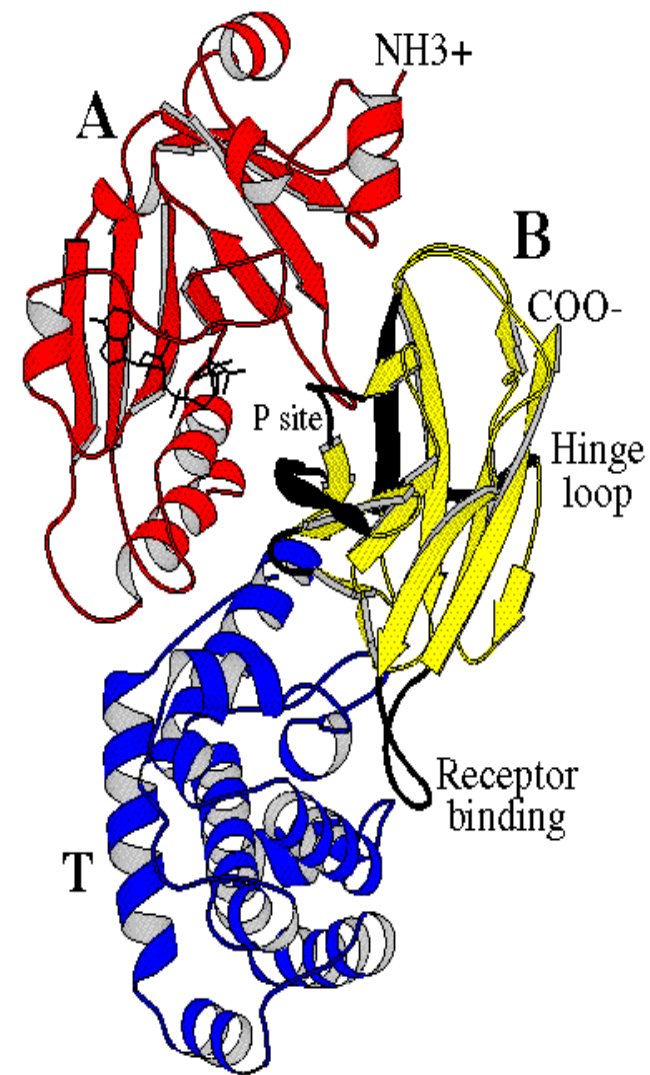
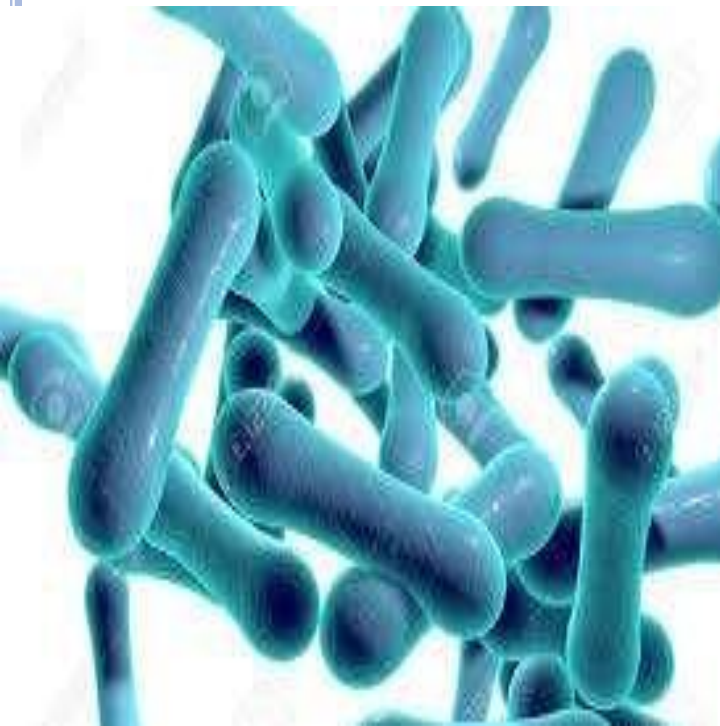
10 PANTON VALENTINE (PV) LEUCOCIDIN produced by METHICILLIN RESISTANT STRAIN OF S. AUREUS

11 ERYTHROGENIC TOXIN produced by S. PYOGENS

1) DIPHTHERIA TOXIN

produced by

CORYNEBACTERIUM DIPHTHERIAE



- Inhibit protein synthesis

$\xrightarrow{\frac{b}{y}}$ ADP-Ribosylation of EF-2 (elongation factor 2)

↓ Which cause
DIPHTHERIA
Pseudomembrane form
↓ symptoms
→ in throat myocarditis

- MECHANISM

toxin synthesized as single polypeptide

↓
Cleaved and modified

↓
Active toxin

→ non toxic (active site is masked)



ACTIVE TOXIN

2 ACTIVE POLYPEPTIDES
FRAGMENT

Fragment A

Derived from amino terminal of toxin

NAD

catalyzes

ADP-Ribose transfer

EF-

As a result

Inactivates

Inhibit protein synthesis

Activity is very potent

Kill a cell in few hours

Specificity for toxin due to

DIPHTHAMID

Modified

histidine Only present in EF-2

Fragment B

Carboxyl end

Receptor

of cell

membrane

for eukaryotic cell

PSEUDOMONAS AERUGINOSA
have same mode of

- An example of lysogenic conversion

↓ have
Beta phage (lysogenic bacteriophage)

↓ infects

tox gene

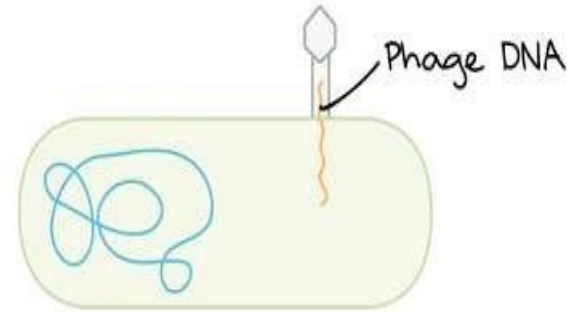
↓ causes

Diphtheria only lysogenic bacteria can cause

- Increase in Fe in medium

→ increases tox gene repressors produced by bacteria

causes → Tox gene transcription stops



2) TETANUS

TOXIN (CLOSTRIDIUM TETANI TETANOSPASMIN)

PRODUCED

- It's a neurotoxin
- It's encoded by plasmid DNA

BY

- It prevents release of inhibitory neurotransmitter in muscle relaxation
- It contain two polypeptide units
- Toxin is released at peripheral wound travel through reteroaxonal transport or blood stream towards anterior horn and interstitial neuron
- It inhibits GABA and glycine which are inhibitory neurotransmitters



TETANOSPAS

MIN ↓

contain 2 polypeptide chains

Heavy chain

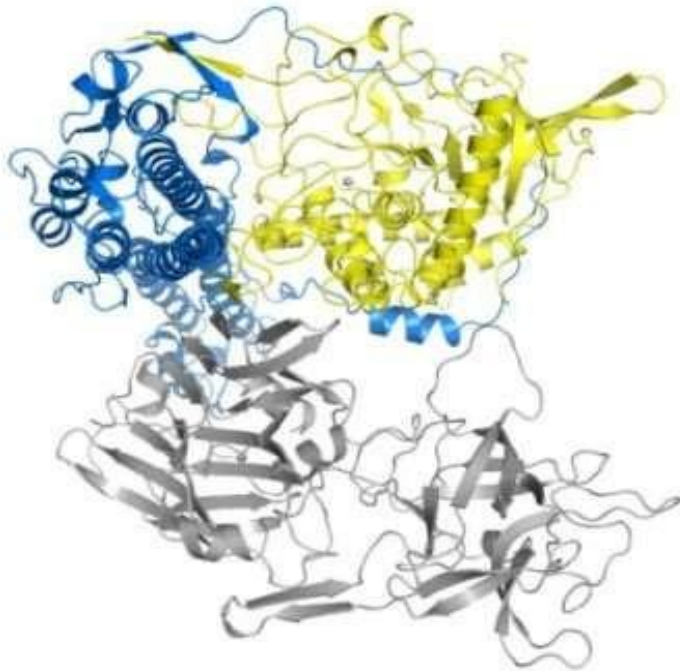
bind to ganglioside in neuron

Light chain

it's a protease

degrades

proteins that produce GABA and Glycine



BOTULINUM

3) CLOSTRIDIUM TOXIN

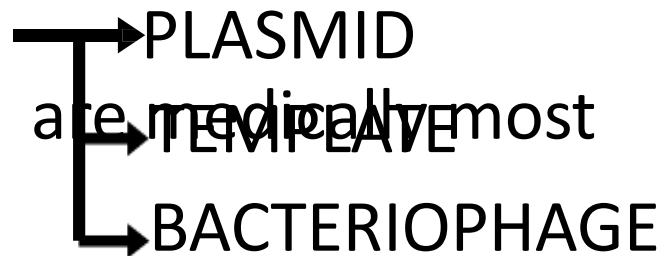
acetylcholine → at synapse → ^{causes} function

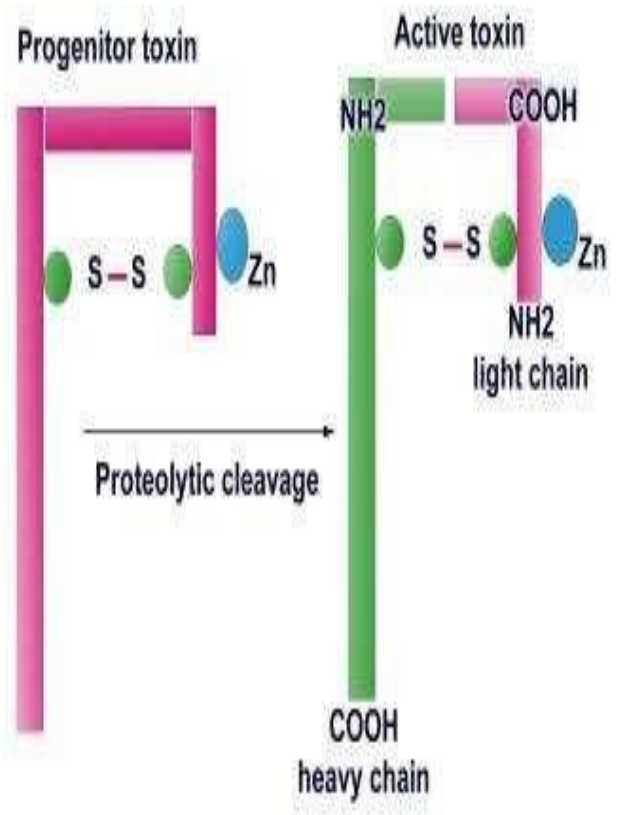
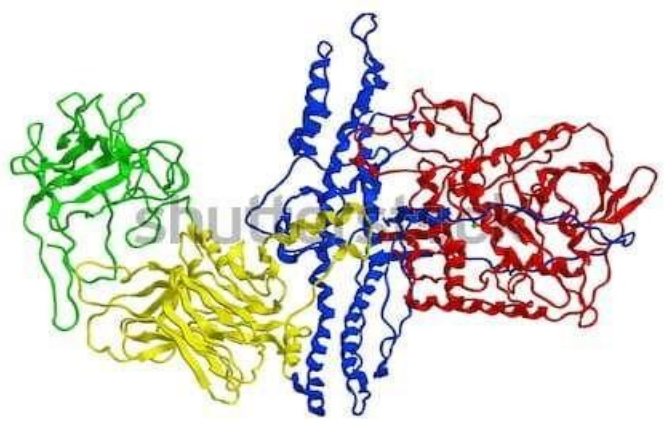
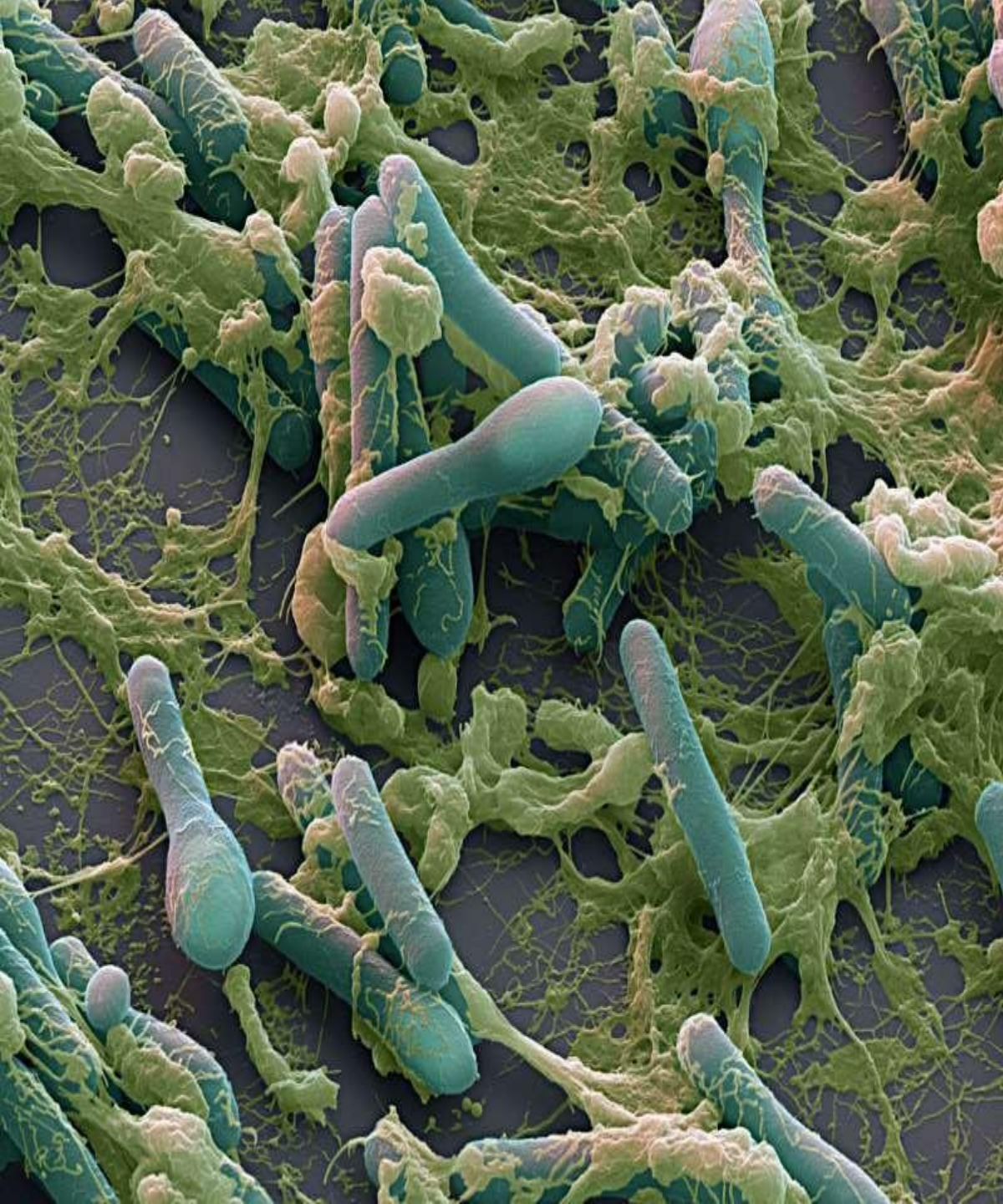
- 1 micro gram is fatal for humans
- It's a neurotoxin that blocks release of many neurotransmitters e.g.

- Toxin contains 2 polypeptide subunits → bind to receptor site of neuron → it's a protease that degrade acetylcholine

- The bacterial producing proteins are from A unit

- Stereotypes gene are encoded from A, B, E, F important to humans





4

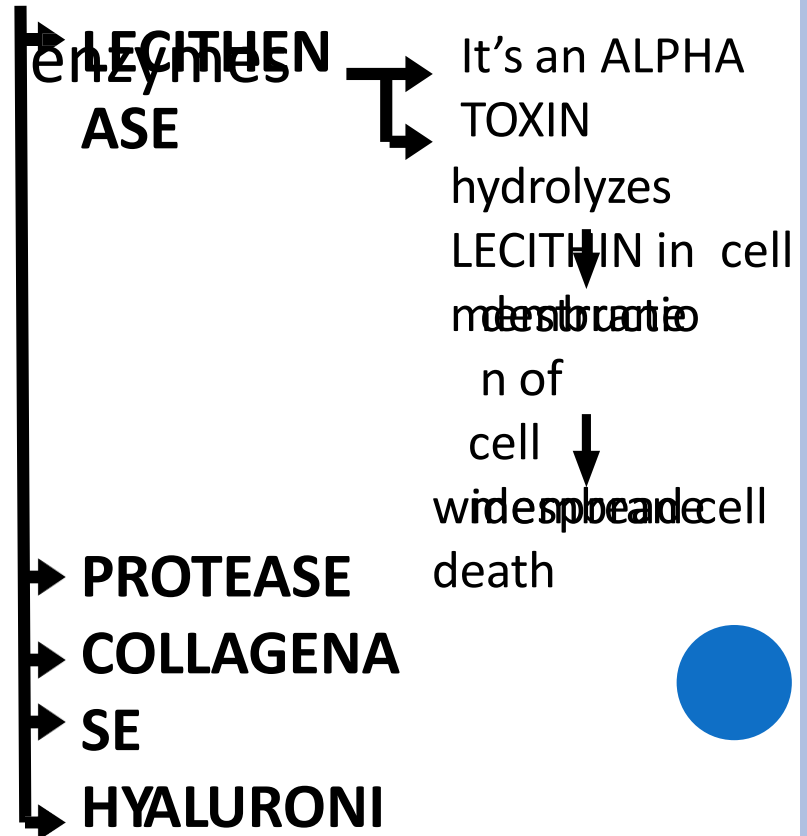
EXOTOXIN PRODUCED BY CLOSTRIDIUM

PREFRENGIS QHER

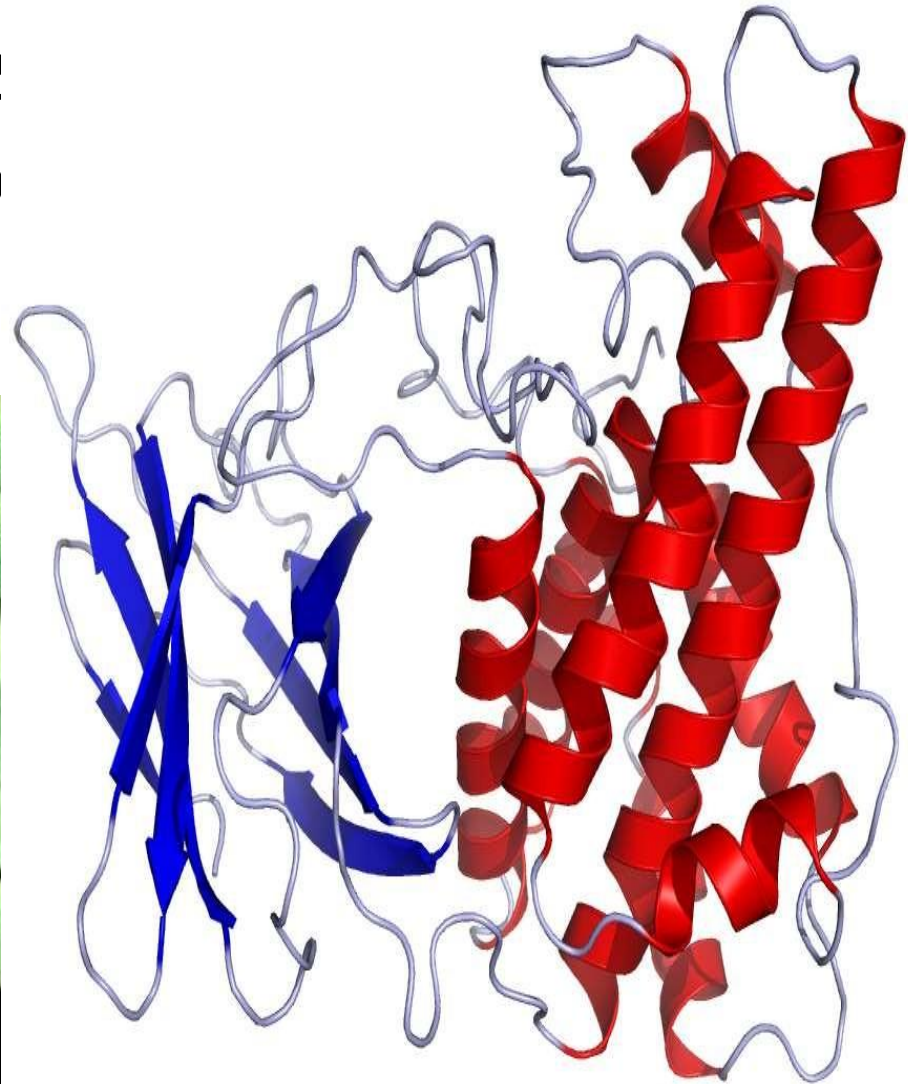
SPECIES OF CLOSTRIDIA

- C. Prefrengis produces multi toxin → Gas → Gangrene

- There are total 7 lethal factors
 - Heterogeneous group
 - Hemolytic and Necrotizing activity



- Certain chains of *C. Perferengis* produces ENTEROTOXINS which act as a **SECRETORIC**
- This enterotoxin is similar to **SECRETORIC**
- Enterotoxin causes **WATTERY D**



5) EXOTOXIN PRODUCED BY CLOSTRIDIUM DEFICILE

Clostridium
deficile

Produces

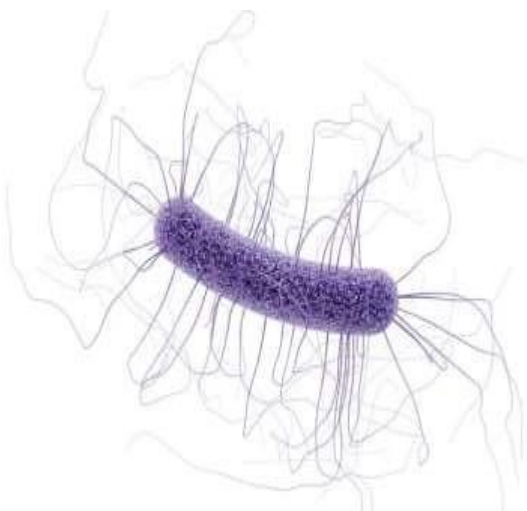
2

exotoxins

Exotoxin A

↓
n A

Water causes
Diarrhea



Signal transduction

Both are **GLYCOSYL TRANSFERASES**

modify

→ Rho GTPases

which then causes

PSEUDOMEMBRANOUS COLITIS

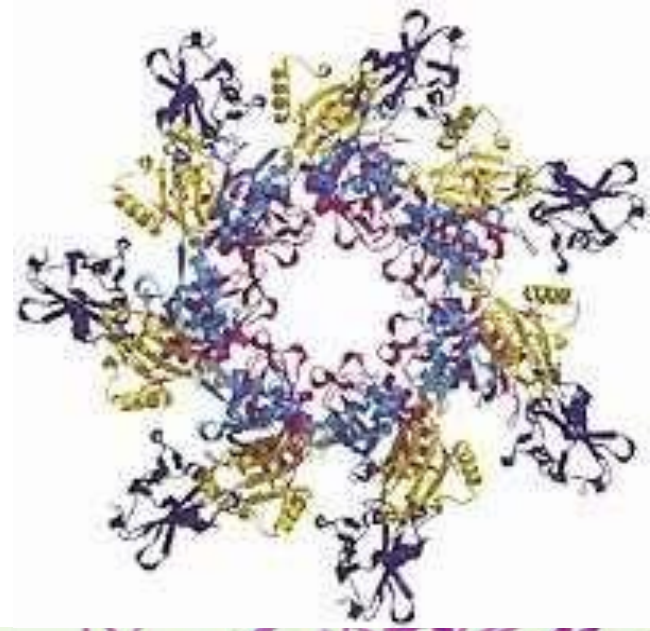
Exotoxin B

n B

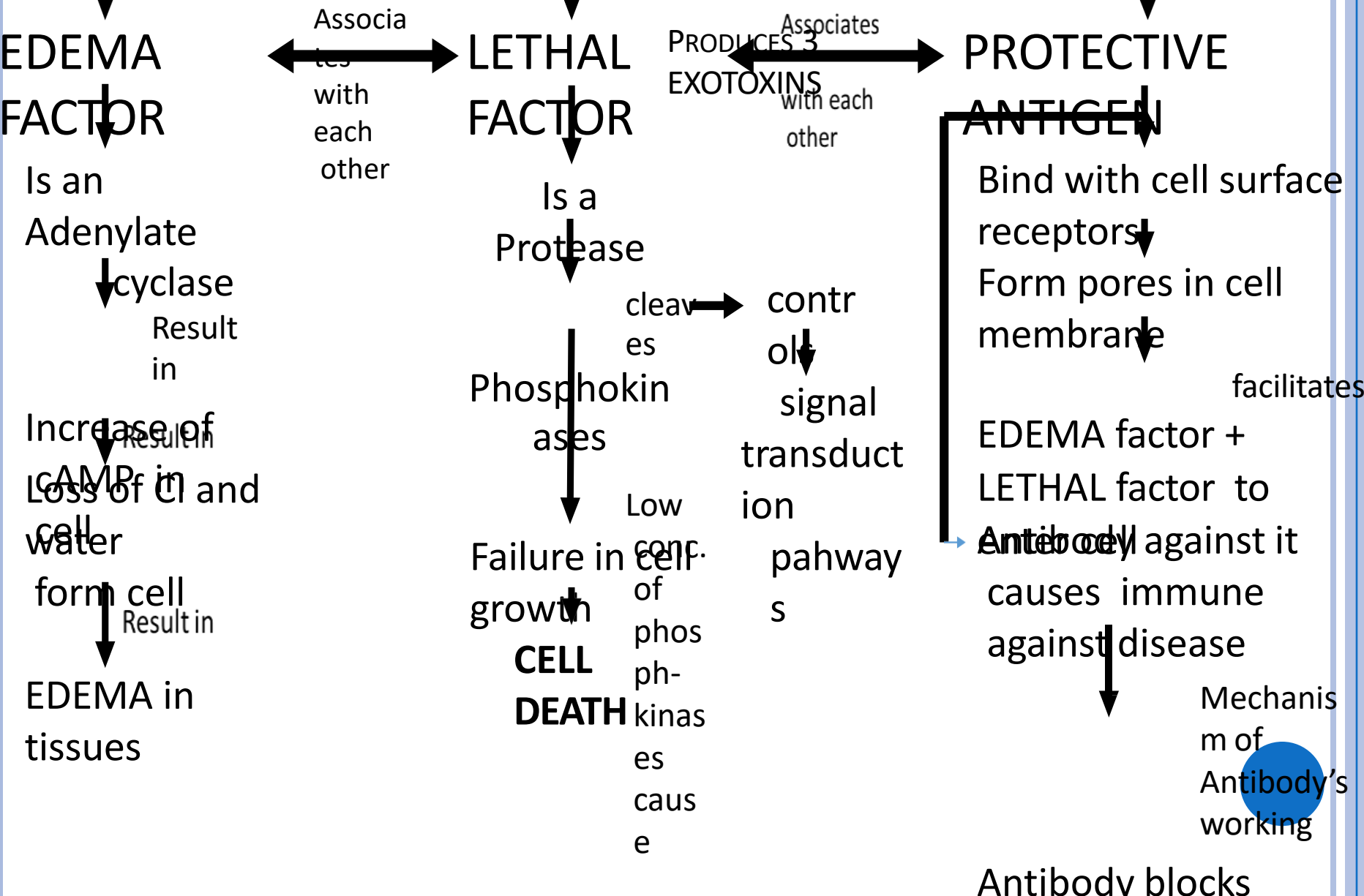
Is a cytotoxin
Damage colonic Mucosa

Form **PSEUDOMEMBRANOUS**
Disaggregation of actin filament of cytoskeleton causes **APOPTOSIS** and cell death

6) EXOTOX IN OF BACI LIS ANT

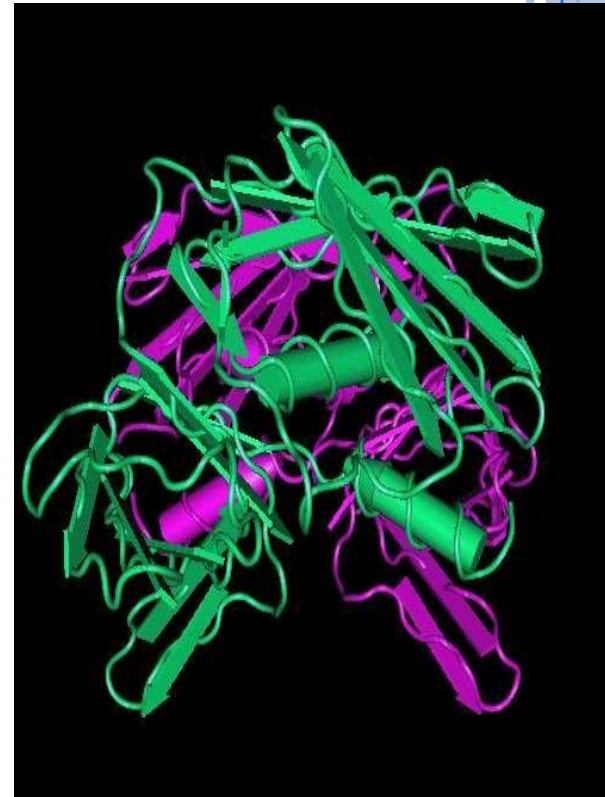


BACILUS ANTHRACIS



7) TSST (TOXIC SHOCK SYNDROME TOXIN)

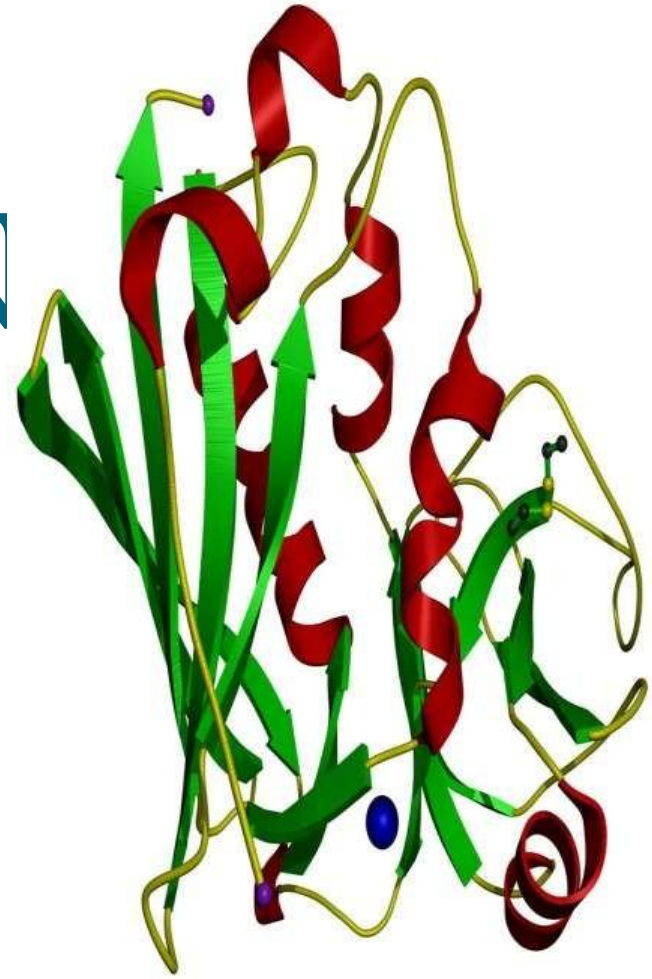
- Is a **SUPER ANTIGEN**
- Produced primarily by *S. pyogenes*
- Binds directly to **class 2 MHC protein** on surface of macrophages without intracellular processing and form complex
 - ↳ interacts with T cell receptors of Helper T cell activates T cells
 - ↳ release of large amount of **IL-1, IL-2, and TNF**



8) SAPHYLOCOCC

AL ENTEROTOXIN

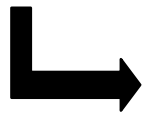
- Is a super antigen
- Produced by *S. aureus* in contaminated food
- Act locally on lymphoid cell lining the small intestine , because it is ingested
- Causes food poisoning within 1-6 hrs after ingestion
- Symptoms are vomiting and watery diarrhea
- Vomiting is caused by cytokines



9

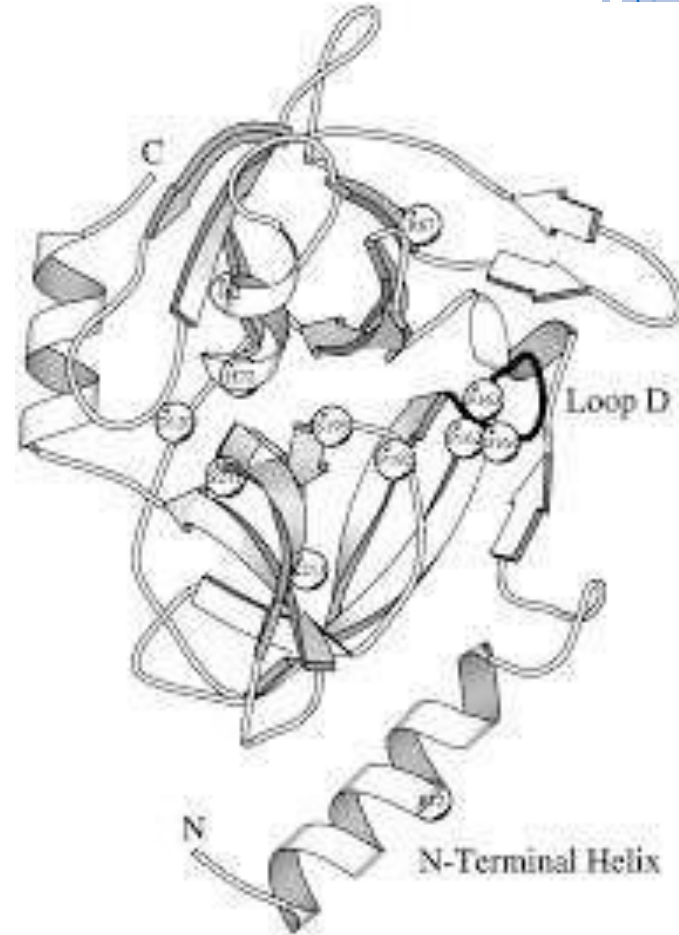
EXFOLIA

- Produced by S.AUREUS
- Also called **EPIDERMOLYTIC TOXIN**
- Is a protease
- Cleaves **DESMOGLEIN**



a protein in
desmosomes of the
skin)

detachment of



10) PANTONE VALENTINE (LEUKOCIDIN)

- Pore forming exotoxin
- Produced by
METHICILLIN-RESISTANT strains of
S.AUREUS (MRSA)
- Destroys WBCs, skin and subcutaneous tissues
- It contains 2 subunits of toxin
assembles in cell membrane
form pores through cell



11)

ERYTHROGENIC TOXIN

- Produced by **S. FLYOGENES**
- Causes rash characteristics of **SCARLET FEVER**
- Mechanism of action similar to **TSST**
- Acts as **SUPER ANTIGEN**
- DNA that codes for it resides on **TEMPERATE BACTERIOPHAGE**
- **NONLYSOGENIC BACTERIA** don't cause **SCARLET FEVER**

