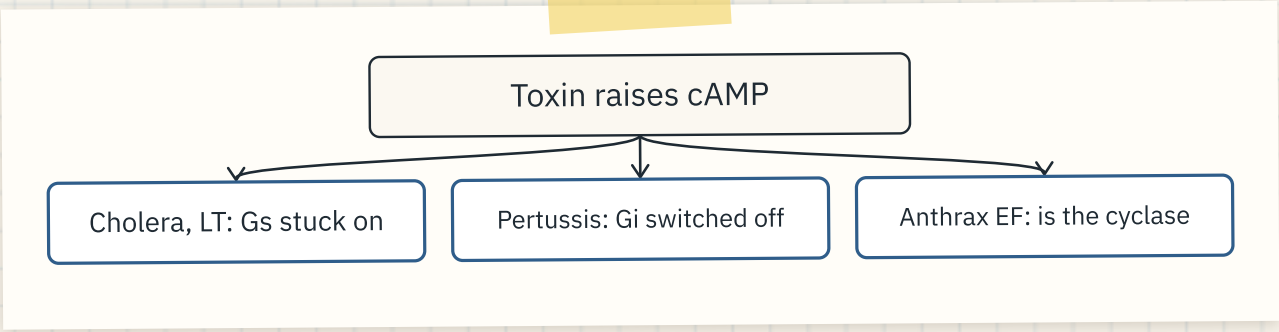
Toxins that raise cAMP

Which route does each toxin take?



Step by step

1. Receptor activates Gs: adenylyl cyclase on, cAMP up
2. Gi inhibits adenylyl cyclase
3. cAMP opens CFTR; Na^+ and water follow Cl^-
4. SGLT1 still works, so oral rehydration works

Toxin	Route	Result
Cholera, E. coli LT	ADP-ribosylate Gs alpha	Gs on; watery diarrhoea
Pertussis toxin	ADP-ribosylates Gi alpha	Gi off; lymphocytosis
Anthrax edema factor	Is the cyclase	cAMP direct; oedema
Anthrax lethal factor	Cleaves the MEKs (MAPKKs)	Host cell death
E. coli heat-stable	Guanylate cyclase C	cGMP, not cAMP

Three routes to cAMP, plus two other toxins

Three lines to keep

Cholera: Gs on

Pertussis: Gi off

Anthrax: the toxin is the cyclase

Exam traps

- Heat-stable E. coli toxin raises cGMP, not cAMP.
- Edema factor bypasses G proteins entirely.
- Lethal factor is a MEK-cleaving protease, not a cyclase.

Bacterial toxins that raise cAMP: cholera, pertussis, anthrax

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/microbiology/bacterial-toxins-that-raise-camp

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