

## Classification of Antibiotics:

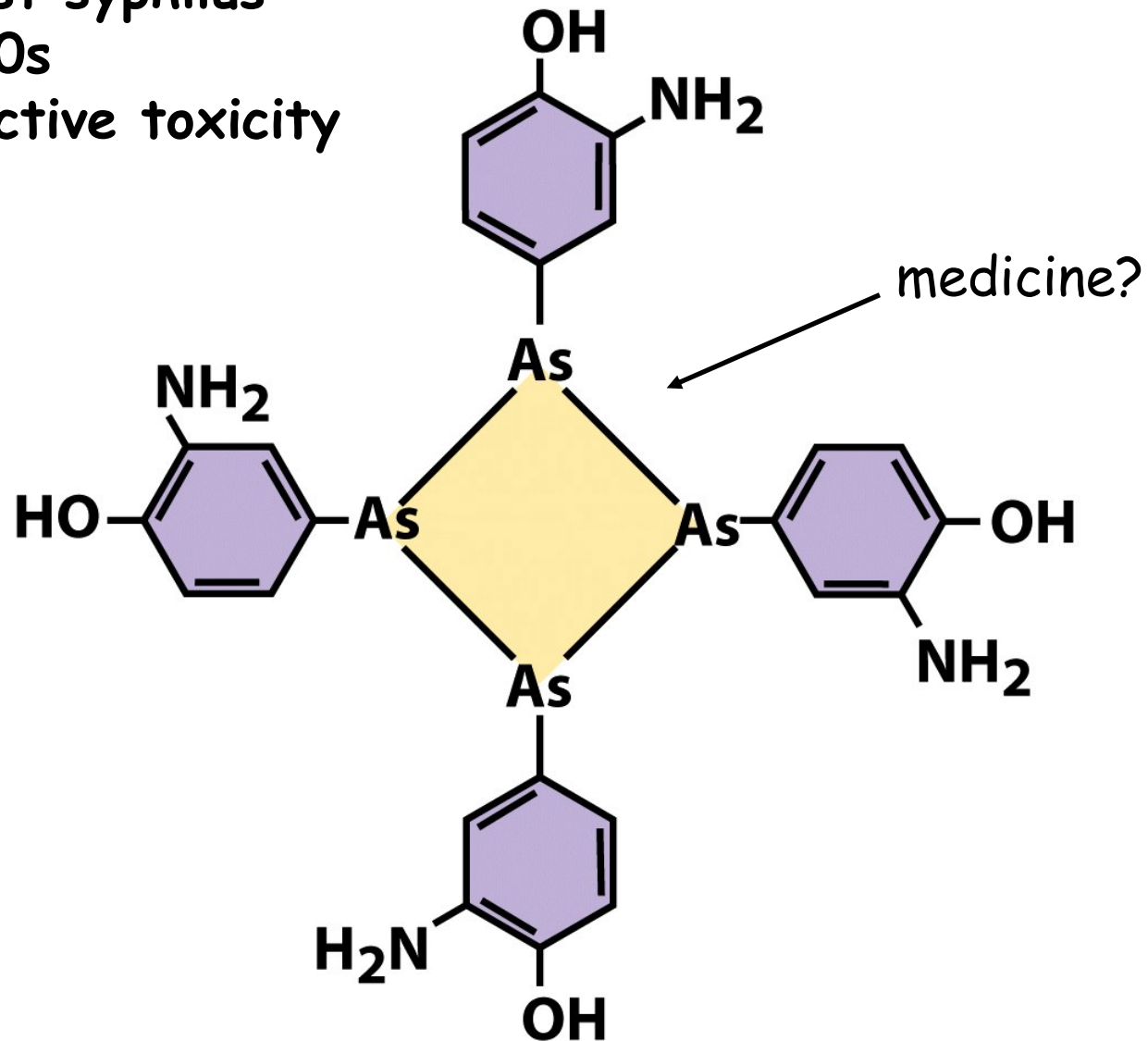
1. Inhibit growth - "stat"  
Kill bacterium - "cide"
2. Broad and Narrow spectrum
3. Production Types:
  - Natural
  - Synthetic
  - Semi-synthetic

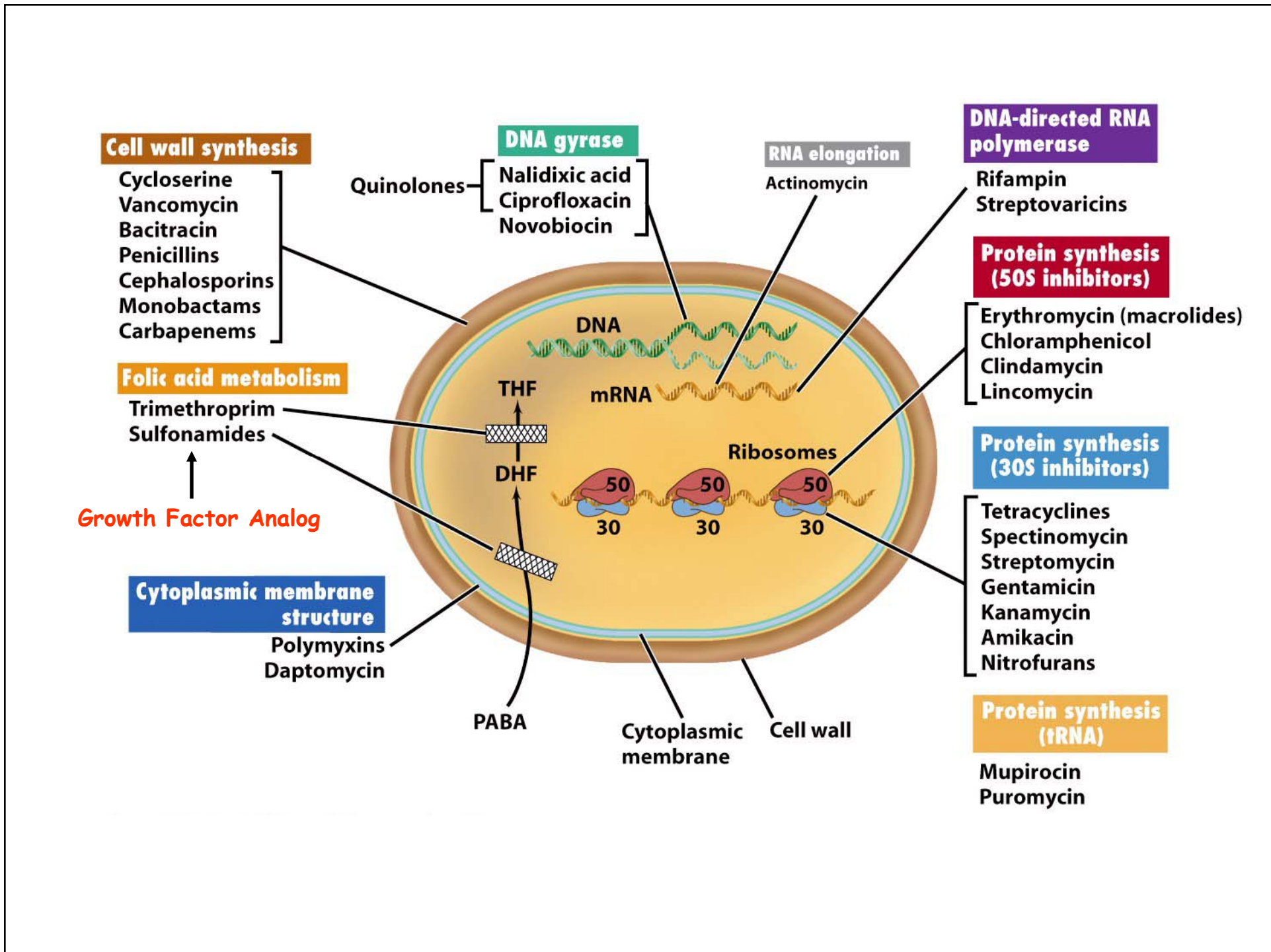
# Salvarsan: The first magic bullet

Works against syphilis

Ehrlich, 1900s

Idea of selective toxicity





## Antibiotics Affecting Replication, Transcription, & Translation

### DNA replication:

Nalidixic Acid & Novobiocin - Inhibits DNA gyrase

### Transcription:

Rifampin - Beta subunit of RNA polymerase

Actinomycin - DNA binding, blocks elongation

### Translation:

Streptomycin - Blocks initiation on SSU of ribosome

Chloramphenicol - Blocks elongation on LSU via peptide bond

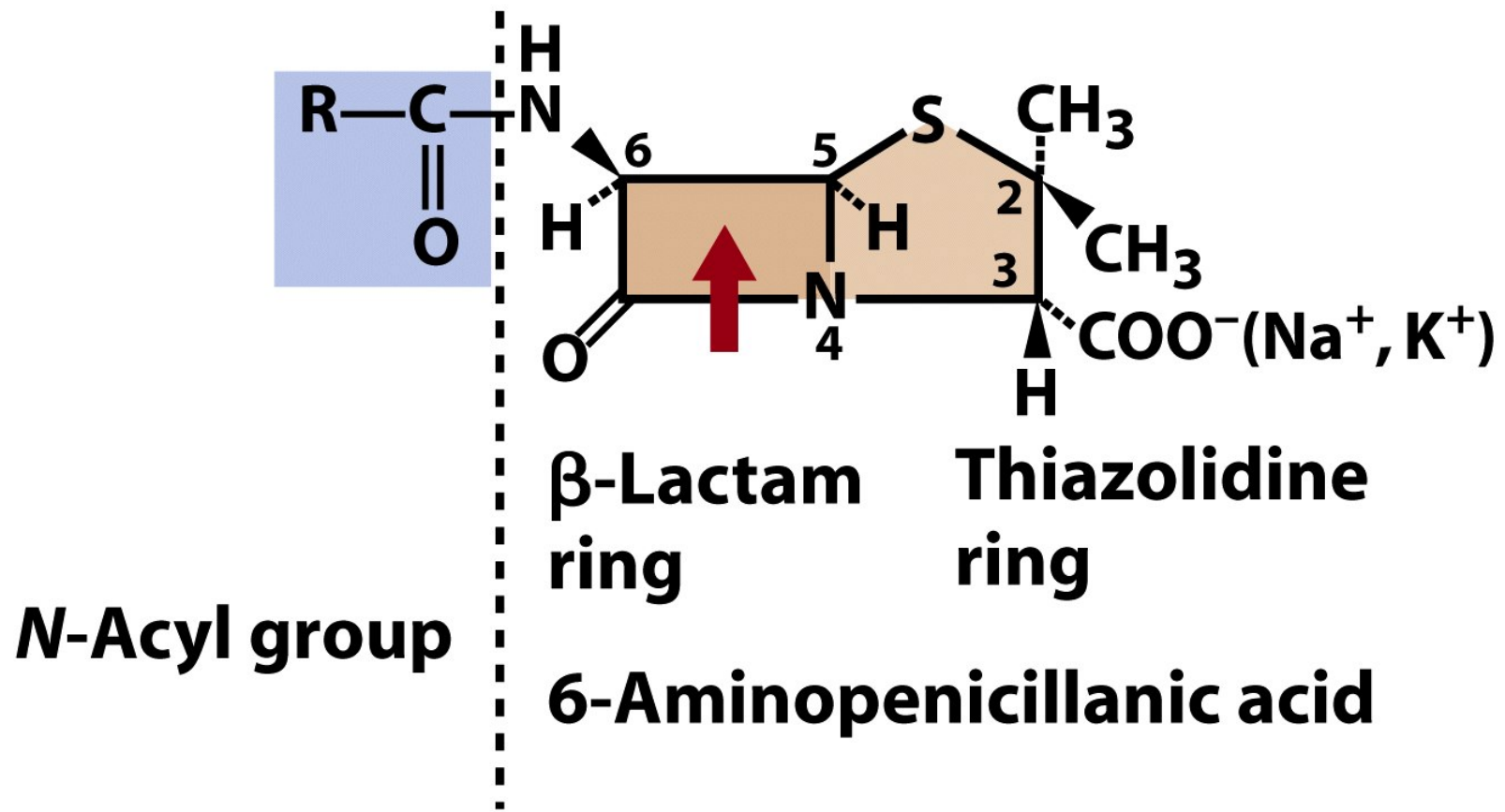
Tetracycline - Blocks elongation SSU

Cycloheximide - Eucarya ribosome specific

Diphtheria Toxin - EF blocker; both Archaea and Eucarya

# How to build a better mouse trap: Penicillin

A  $\beta$ -lactam antibiotic



Inhibits transpeptidation of peptidoglycan chains  
Forms the old 1-2-punch with autolysins

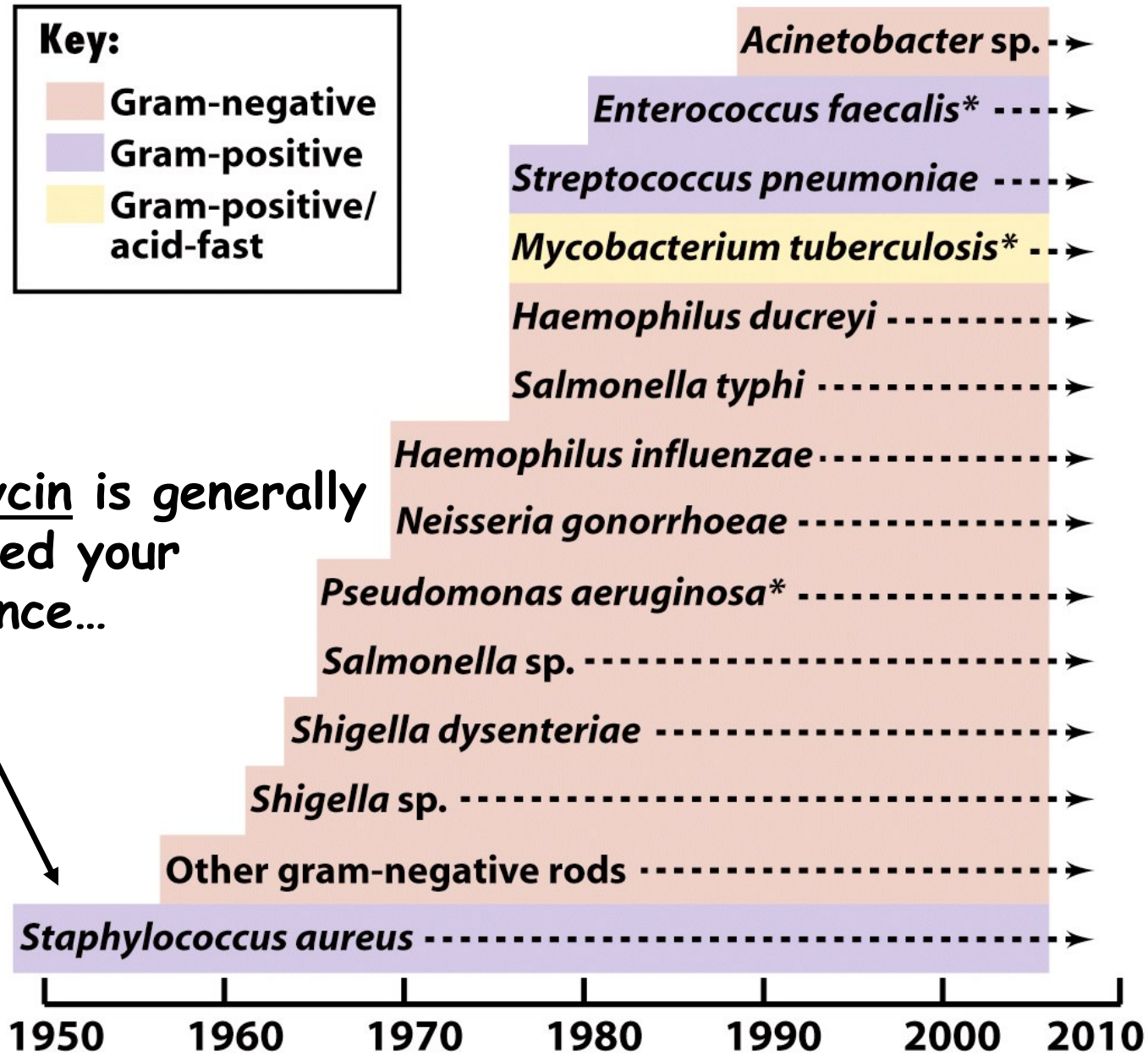
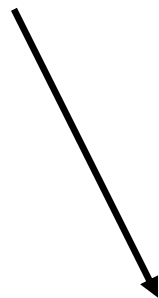
## Mechanisms of Antibiotic Resistance

1. Lacks structure antibiotic inhibits:  
Mycoplasmas lack a typical cell wall.
2. Impermeable to the antibiotic:  
Gram - bacteria impermeable to penicillin G.
3. Alteration of antibiotic:  
 $\beta$ -lactamase degrades antibiotic e.g., springs open the mouse trap.
4. Modifies the target of the antibiotic.
5. Genetically modifies the pathway that the antibiotic affects.
6. Efflux of the antibiotic:  
Tetracycline gets pumped back out of the cell.

**Key:**

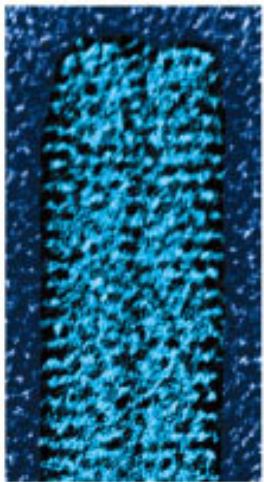
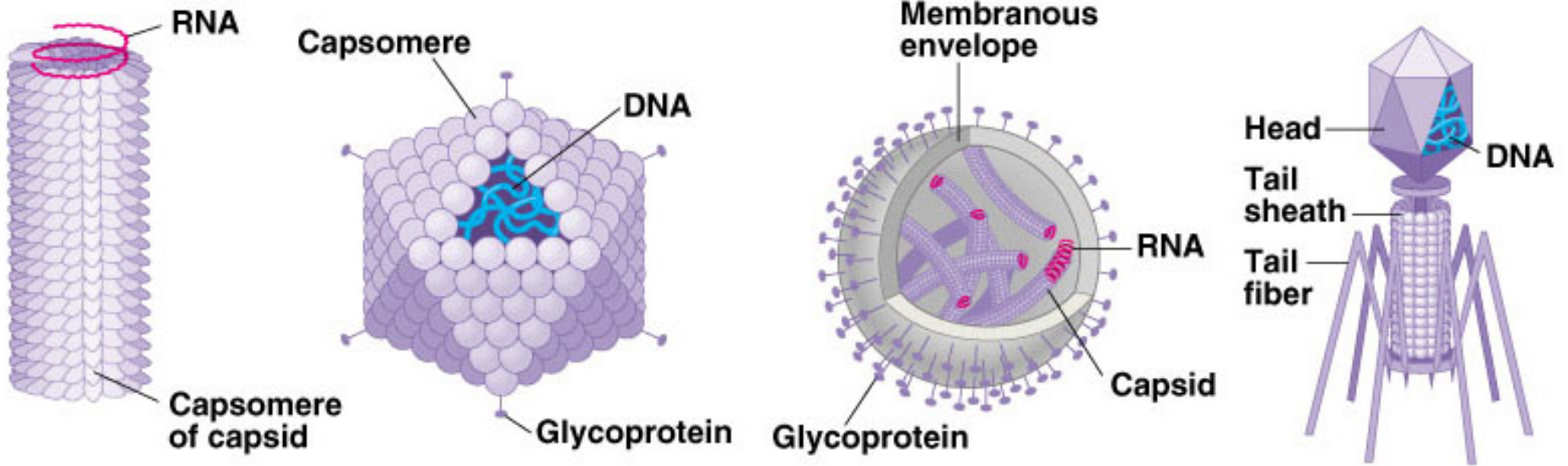
- Gram-negative
- Gram-positive
- Gram-positive/acid-fast

Vancomycin is generally considered your last chance...



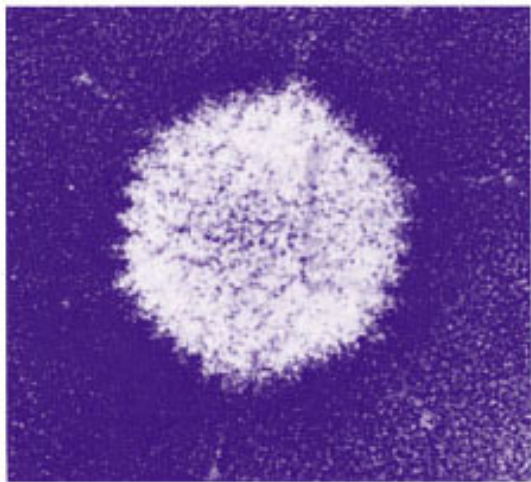
\*symbol indicates that some multi-drug resistant strains of these organisms are now untreatable with known antimicrobial drugs.

# Viral structures



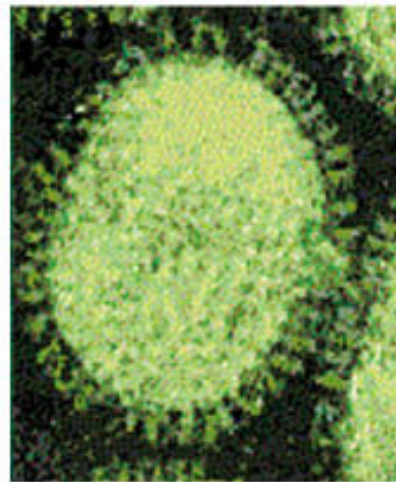
10 nm

(a) Tobacco mosaic virus



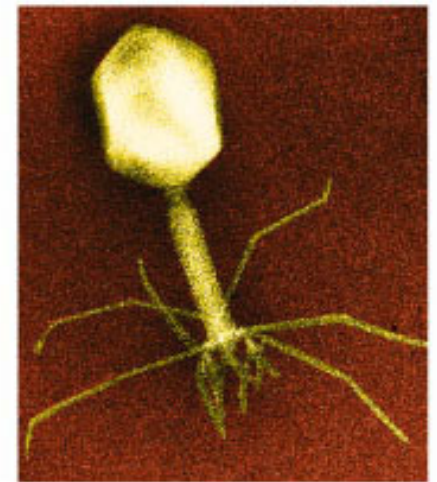
50 nm

(b) Adenoviruses



50 nm

(c) Influenza viruses



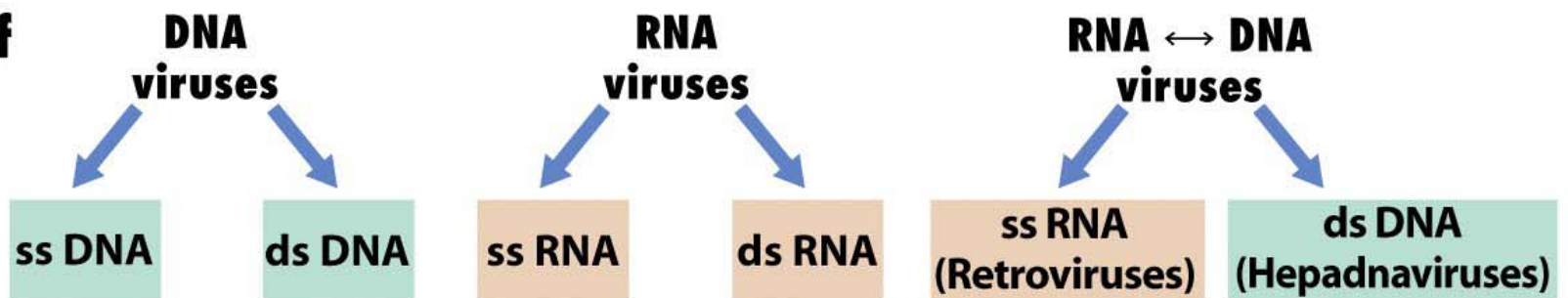
50 nm

(d) Bacteriophage T4



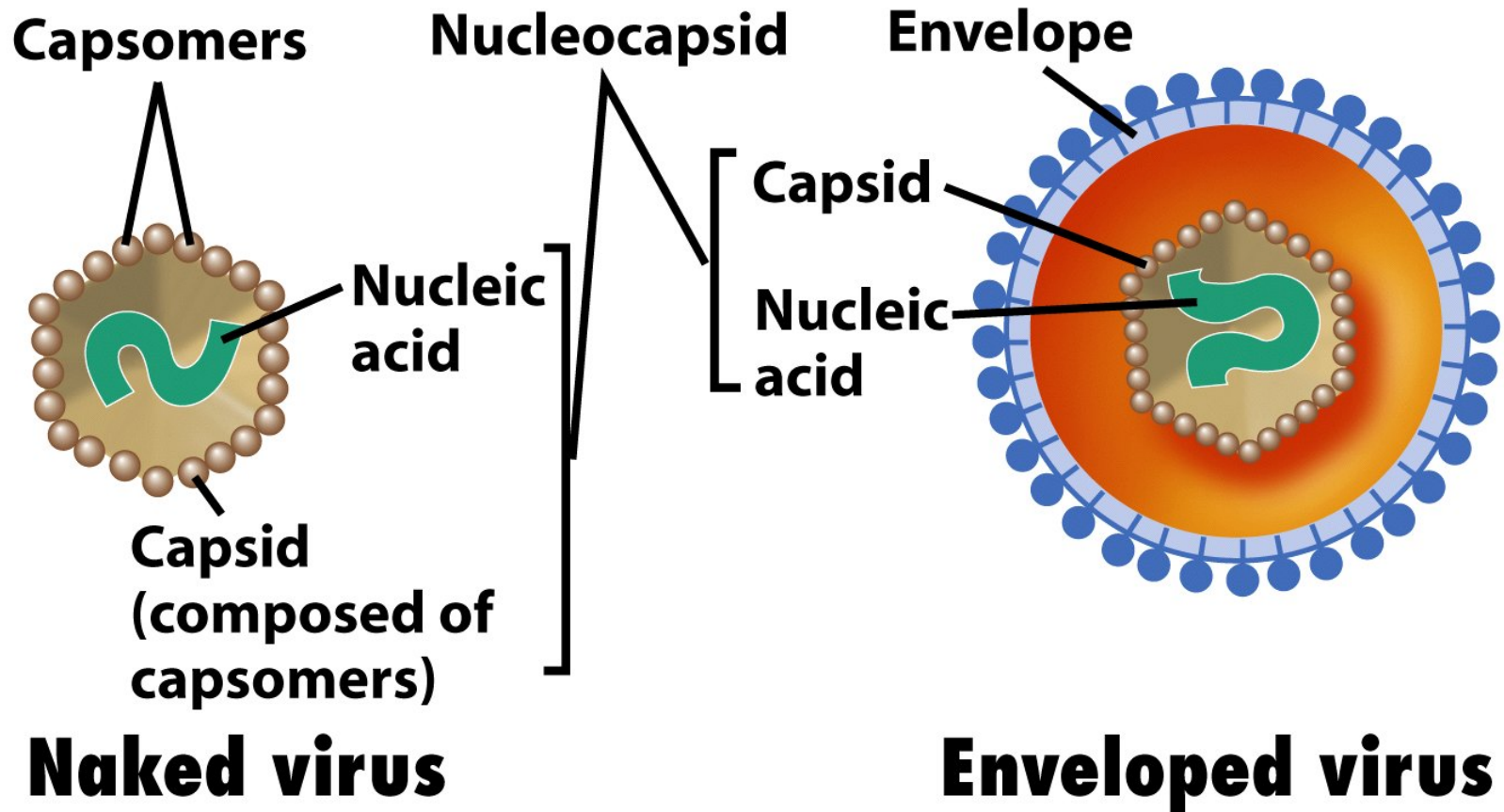
## Classes of viruses

### Genome in virion

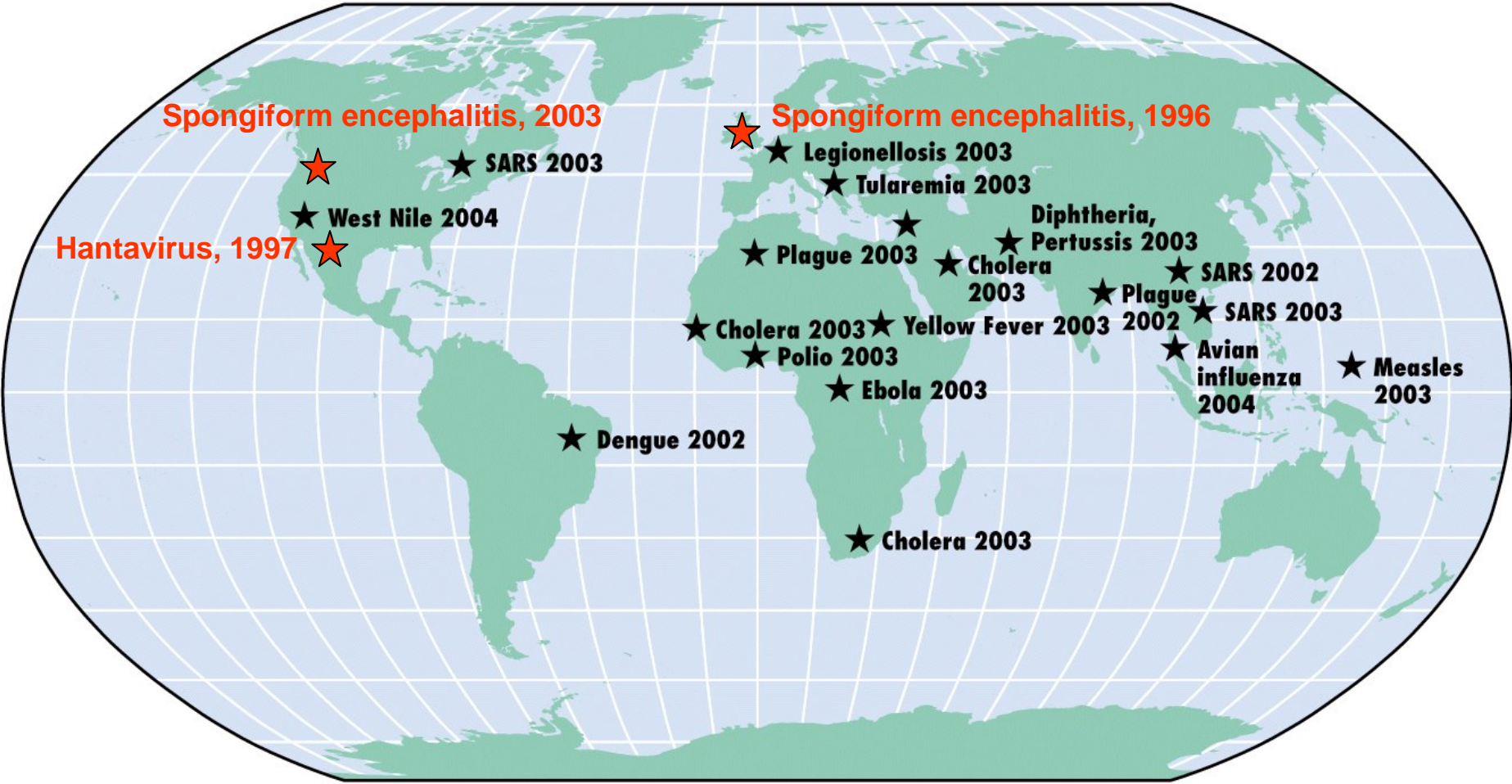


**Viral genomes.** The genomes of viruses can be composed of either DNA or RNA, and some use both as their genomic material at different stages in their life cycle. However, only **one** type of nucleic acid is found in the virion of any particular type of virus.

# Comparison of naked and enveloped virus, two basic types of virus particles.



# Recent outbreaks of emerging and reemerging infectious diseases.



**Table 30.4****The recommended immunization schedule for infants and young children in the United States**

<b>Age</b>	<b>Vaccine Employed</b>
Birth	Hepatitis B
2 months	Diphtheria; pertussis; tetanus (DPT) Hemophilus B (Hib) Poliomyelitis (OPV)
4 months	DPT; OPV; Hib Hepatitis B
6 months	Hepatitis B DPT; OPV; Hib
12–15 months	DPT; Hib; chicken pox, measles, mumps, rubella (MMR)
4–6 years	OPV; DTP; MMR