

# Antibiotics

## Aminoglycosides



# drugs

- **old drugs**

- streptomycin / dihydrostreptomycin
- neomycin (Framycetin)

- **newer drugs**

- gentamicin
- amikacin
- tobramycin
- netilmicin

- **aminocyclitols**

- apramycin
- spectinomycin

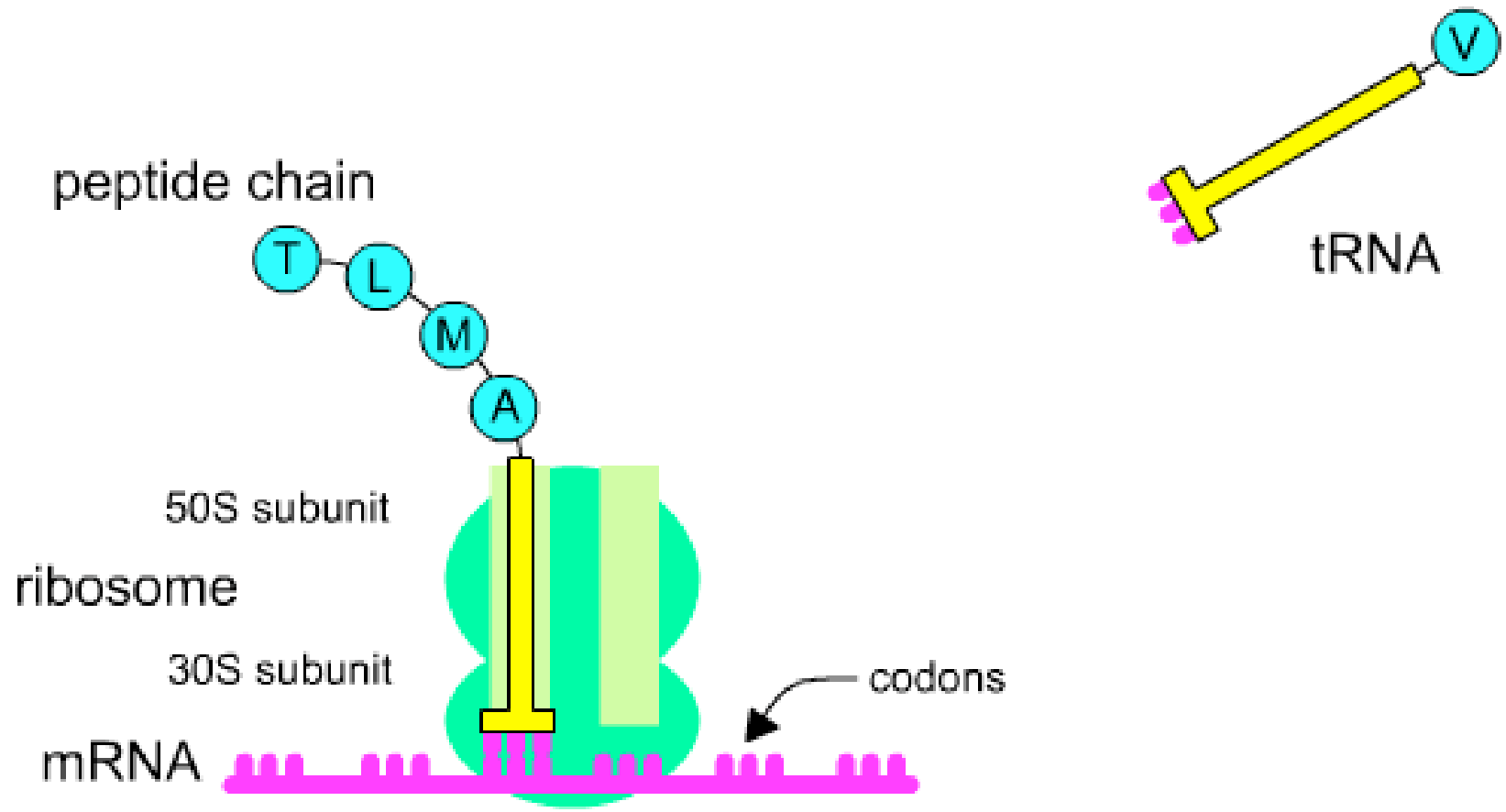


# mechanism

- block peptide synthesis
- rapidly bacteriocidal
- effect concentration dependent
- post antibiotic effect



RUN



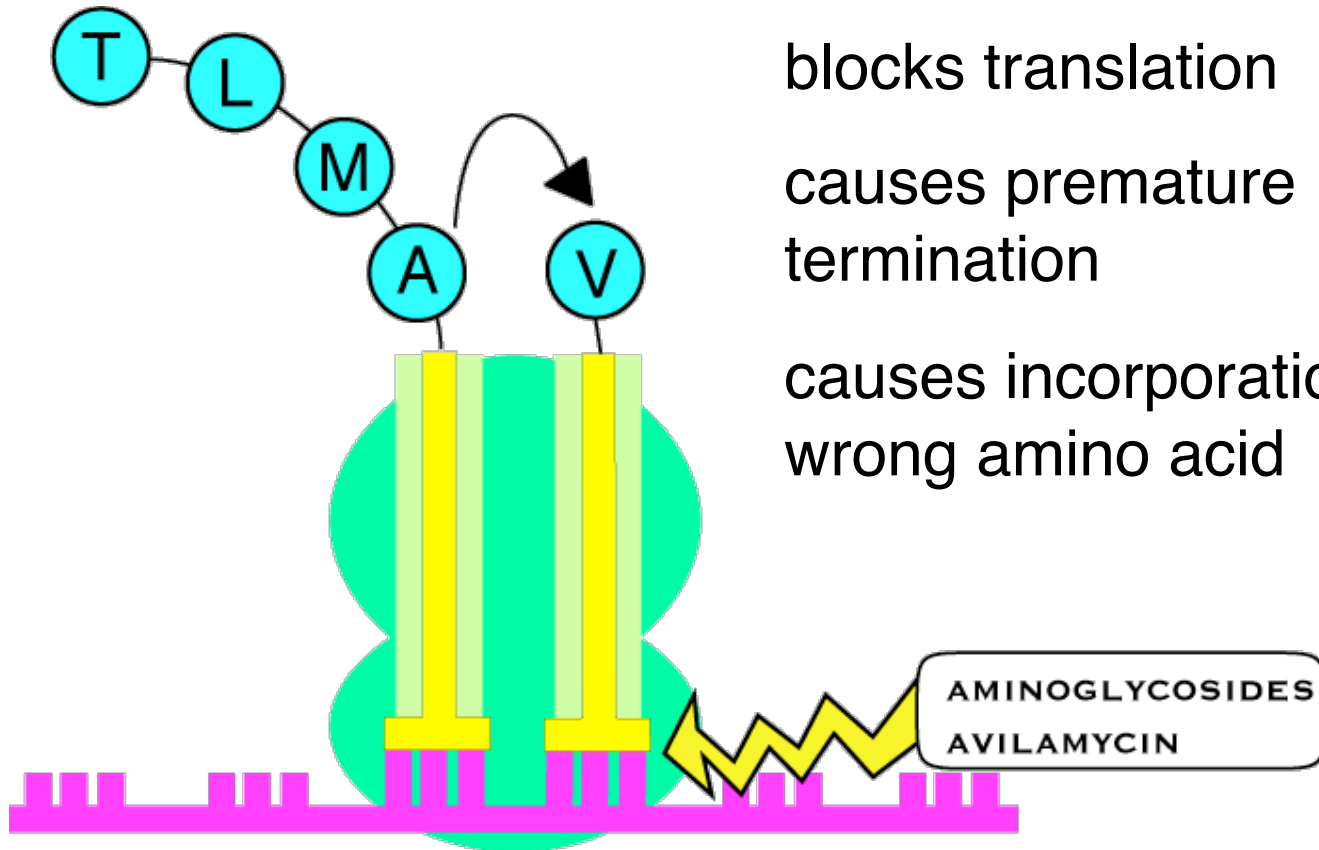


blocks initiation of protein synthesis

blocks translation

causes premature termination

causes incorporation of wrong amino acid



# mechanism

- **must get into cell to act**
  - oxygen dependent polyamine carrier
  - not present in anaerobes
  - blocked by low pH,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  
hyperosmolar conditions



# resistance

- **develops quickly**
  - especially Staphs
- **cross resistance not complete**
  - amikacin not easily broken down





# resistance

- **inactivation**
  - at least 9 enzymes
  - plasmid transmitted
- **failure to get into cells**
  - cell wall damaging drugs
  - chloramphenicol
- **alterations in binding site**
  - chromosomal mutation





# spectrum of activity

- aerobic Gram negatives
  - Pseudomonas
- (Staphs)
- (Mycobacteria)
- not Streps



# side effects

- **ears**
  - deafness
  - loss of balance
- **kidneys**
  - failure
- **(neuromuscular blockade)**



# ears

- **deafness**

- dihydrostreptomycin
- neomycin
- amikacin
- people & cats most sensitive

- **loss of balance**

- streptomycin
- gentamicin





# kidneys

- all aminoglycosides
- potentiated by
  - dehydration
  - frusemide
  - low blood pressure
  - NSAIDs?



# pharmacokinetics

## absorption

- highly polar
  - not absorbed from gut
  - do not penetrate CNS / eye / secretions
  - useful concentrations in synovial fluid



# administration

- usually given parenterally
  - im or sc 90% bioavailable
  - im injections painful
- other preparations
  - intramammary
  - oral





# distribution

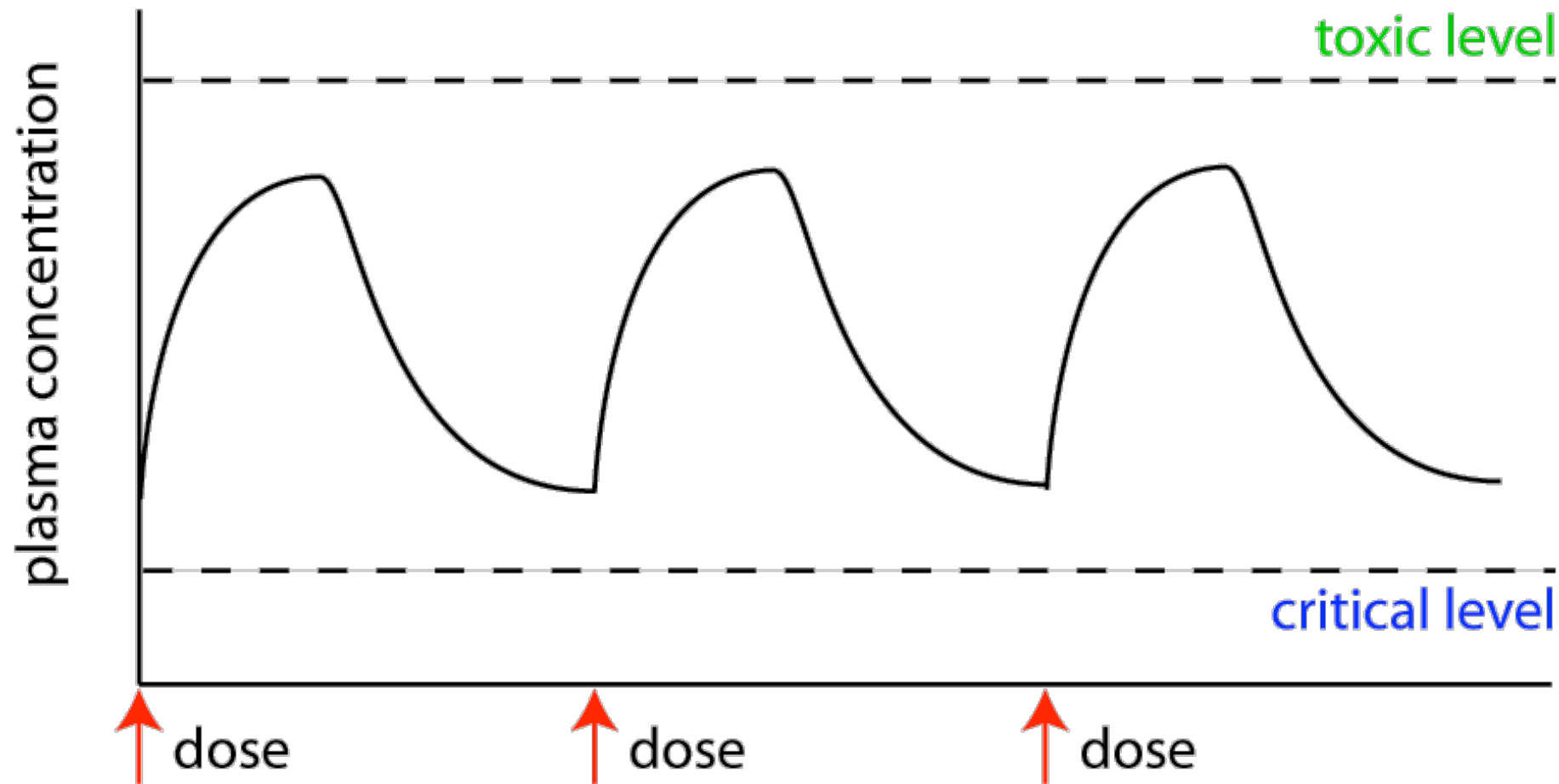
- to extracellular fluid
  - not into cells
- rapid
- not protein bound



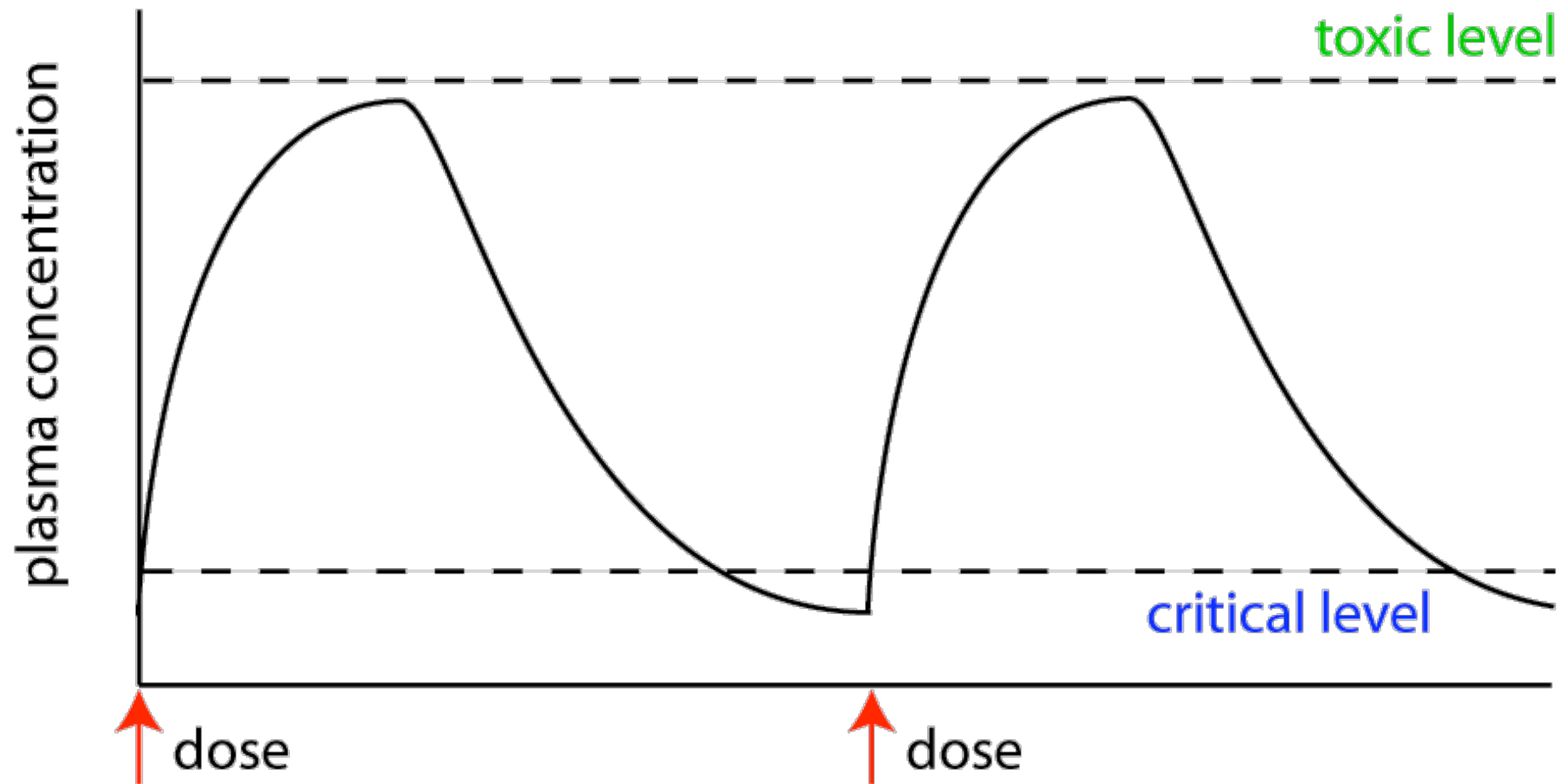
# elimination

- **parenteral**
  - glomerular filtration
- **oral**
  - faeces
- **short half lives - 2 - 3 hours**
- **inactivated by pus**









# administration

- give a big dose once daily rather than small doses often
- reduce the dose in kidney failure
- monitor creatinine



# residues

- hangs around in kidneys for years
- long withholding times





# use

- used to be main treatment for G-aerobes
- fluoroquinolones now 1st choice
  - less toxic in most species
  - horses?



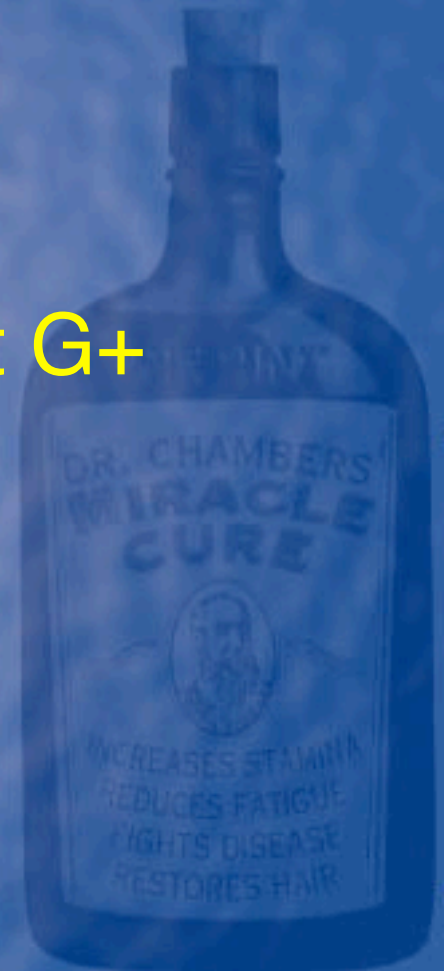
# indications

- **streptomycin**
  - leptospirosis
  - (TB in people)
- **gentamicin etc**
  - serious G- infections
  - *Pseudomonas* infections
  - mainly horses



# combinations

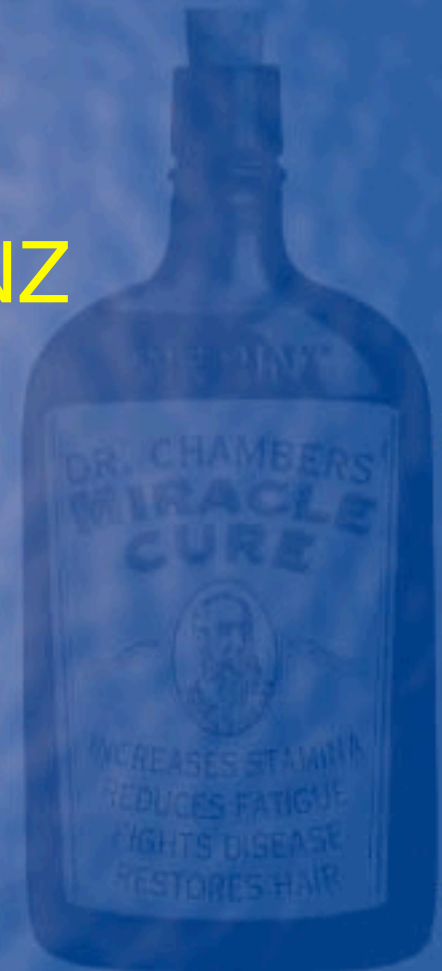
- **penicillin & gentamicin**
  - broad spectrum
  - sometimes used for difficult G+
- **penicillin, gentamicin & metronidazole**
  - covers most bacteria
  - peritonitis etc





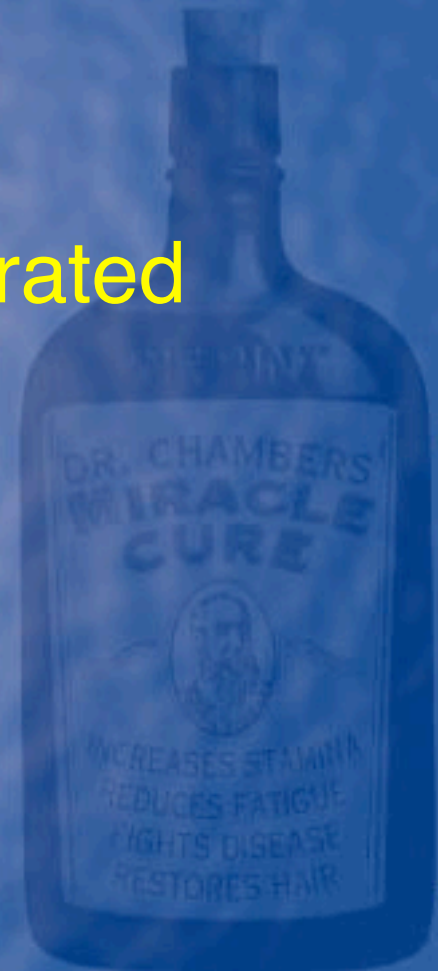
# abuse

- **mastitis**
  - no evidence of efficacy in NZ
- **neonatal diarrhoea**
  - use fluids instead
- **horticulture**
  - fireblight
  - use declining



# precautions

- **fluid balance**
  - ensure animal is not dehydrated
  - watch blood pressure
  - avoid nephrotoxic drugs
- **working dogs**



# interactions

- **penicillins**
  - synergy?
  - chemically incompatible
- **some cephalosporins**
- **frusemide**
  - nephrotoxicity





# 3 yr old thoroughbred

- injured knee 3 days ago
- knee now swollen, hot & painful
- TPR normal



# diagnosis

- **septic arthritis**
  - bacteria unknown



# treatment

- flush joint
- intra-articular penicillin & gentamicin
- systemic penicillin & gentamicin





# aminoglycosides

- G- aerobes
- toxic to kidneys and ears
- give a big dose once daily rather than small doses often
- may be synergistic with penicillins under some conditions

