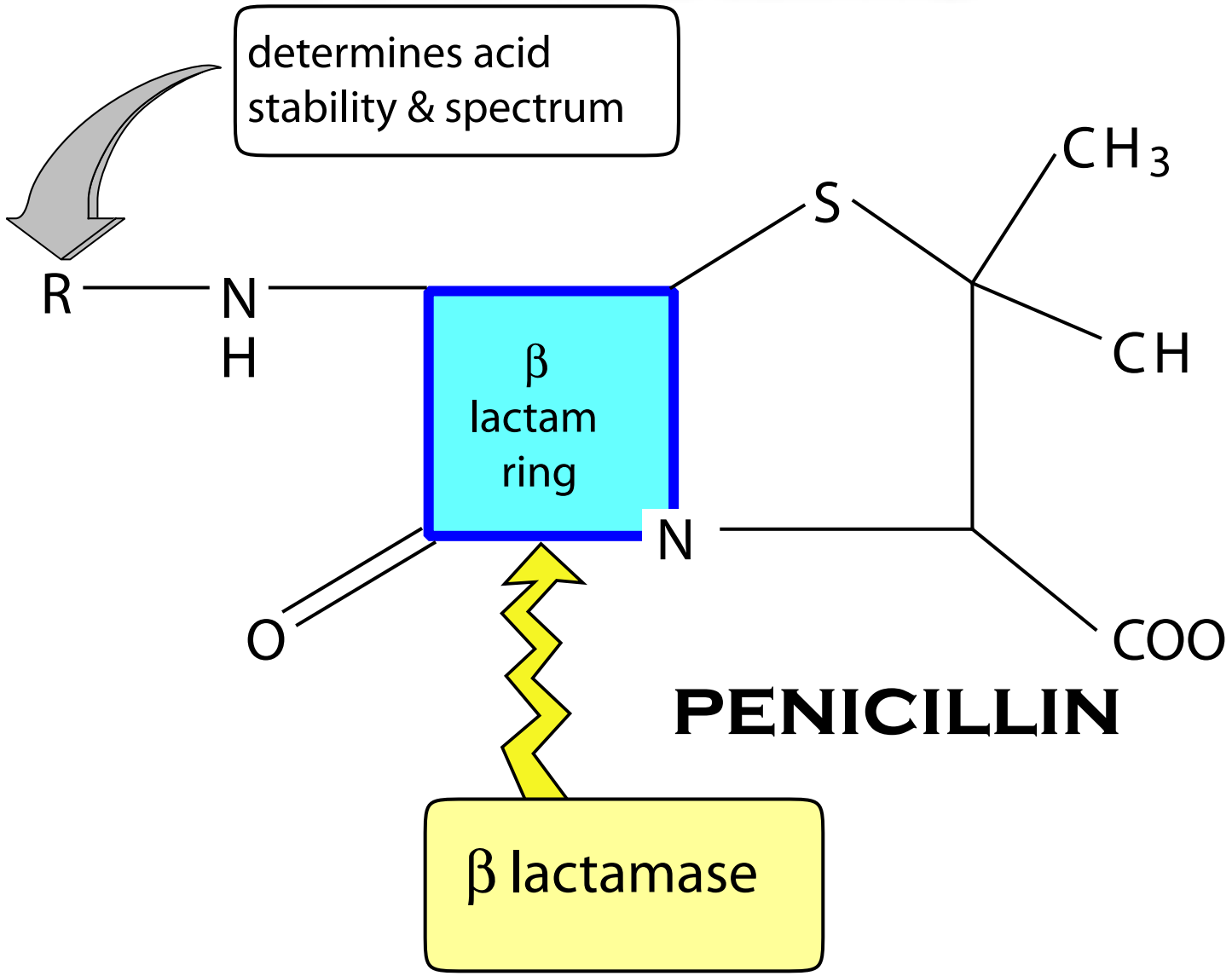
Antibiotics

Penicillins & Cephalosporins

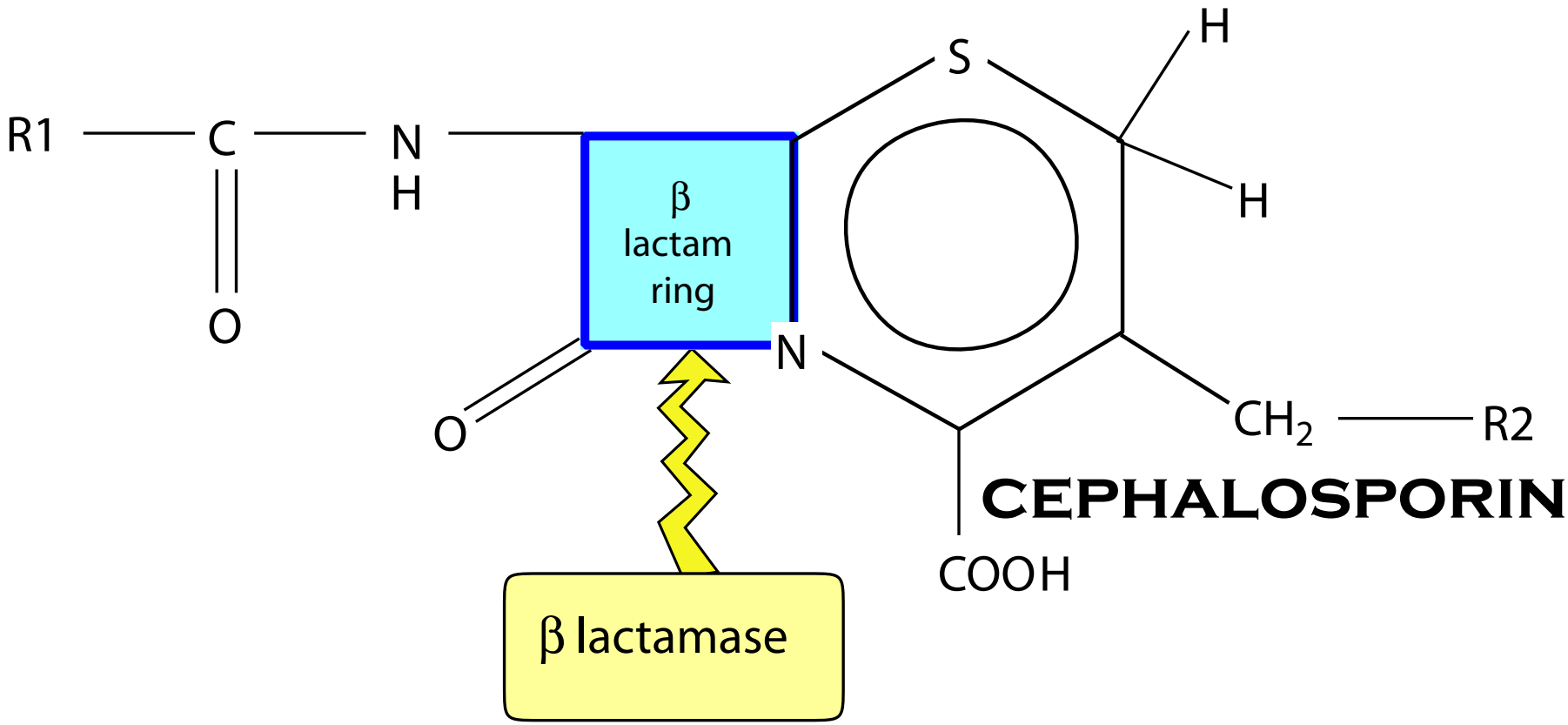
What would you do?

- calved 10 days ago
- all quarters painful and swollen
- clots & blood in milk

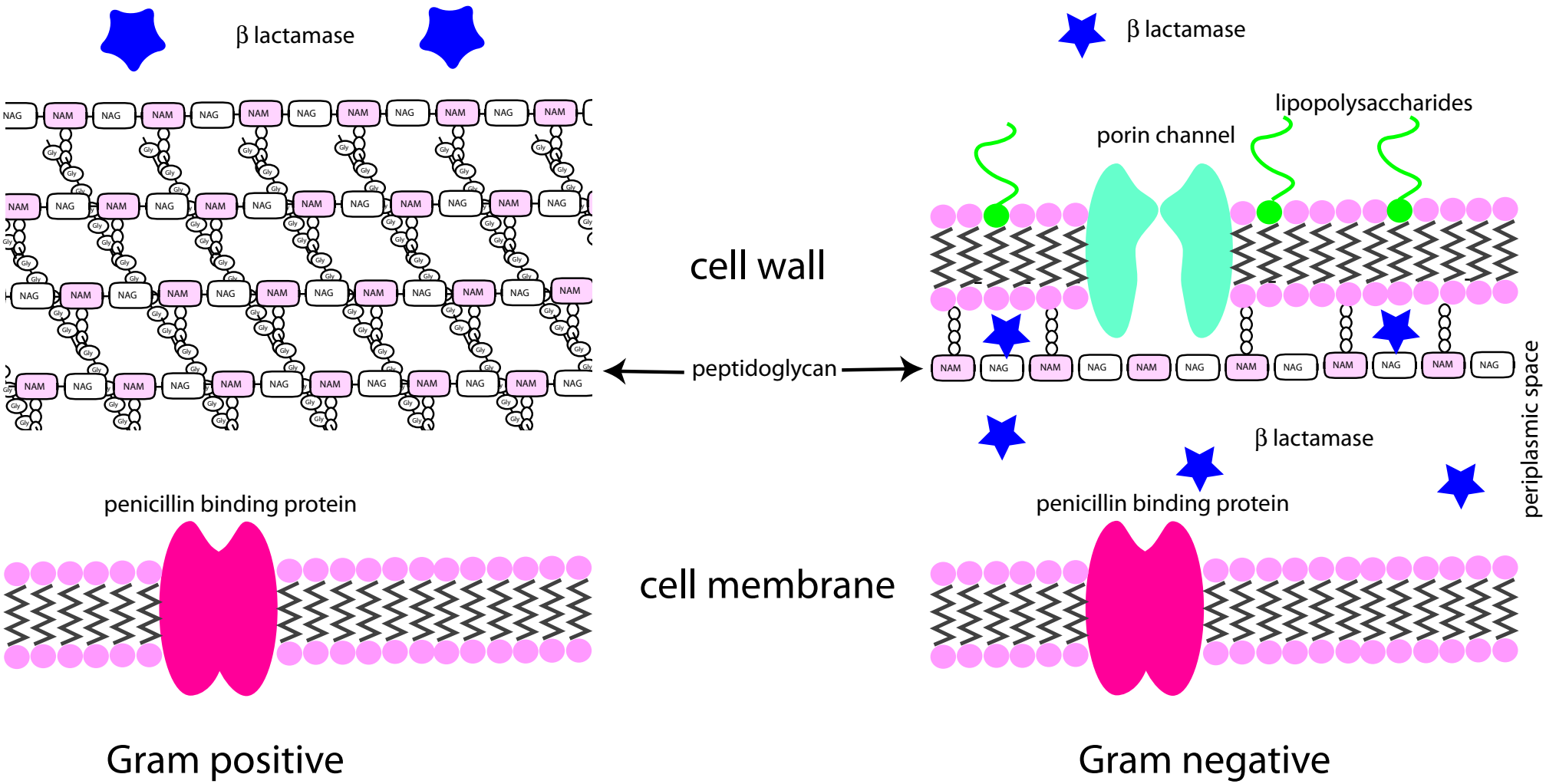
beta lactams



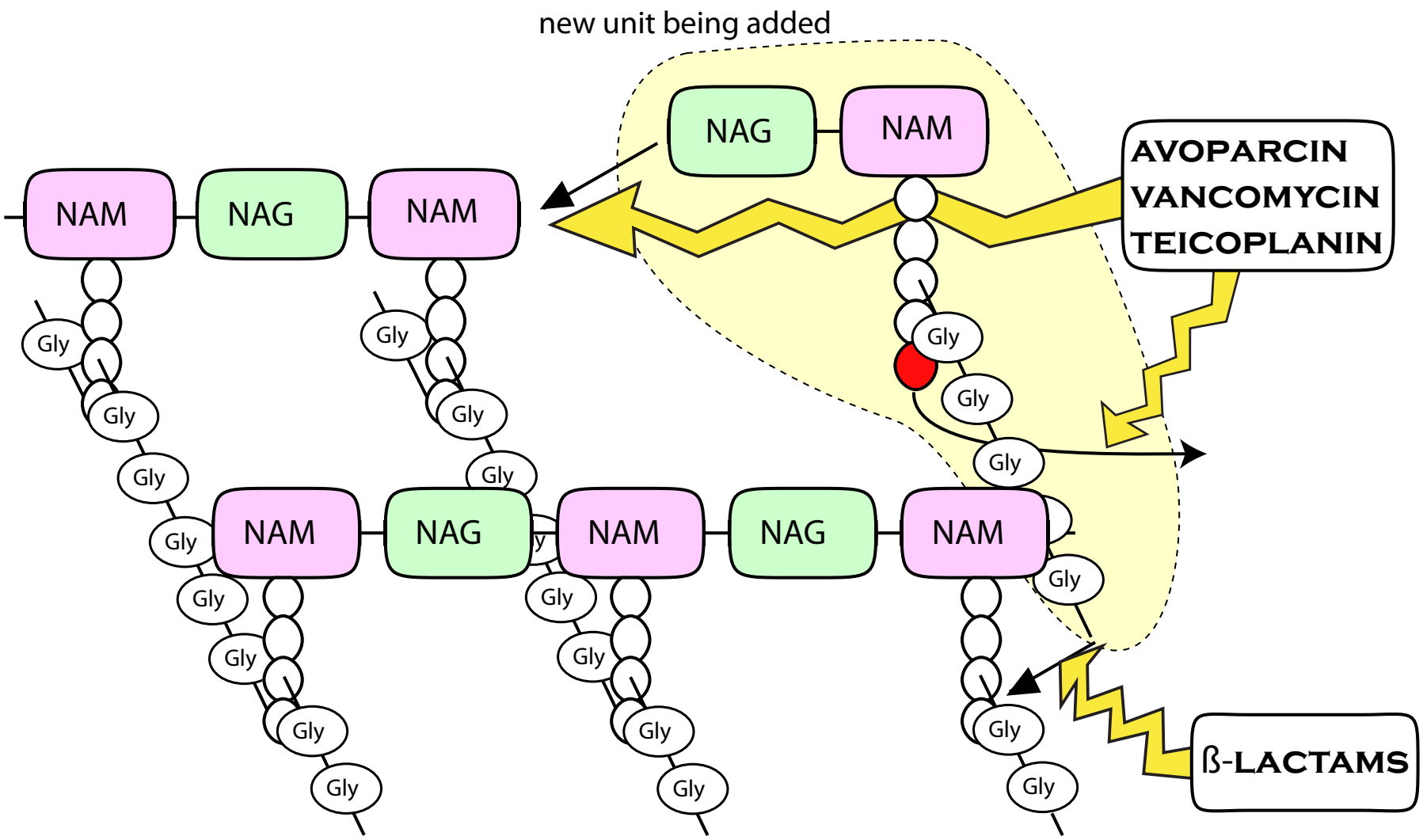
beta lactams



bacterial cell walls

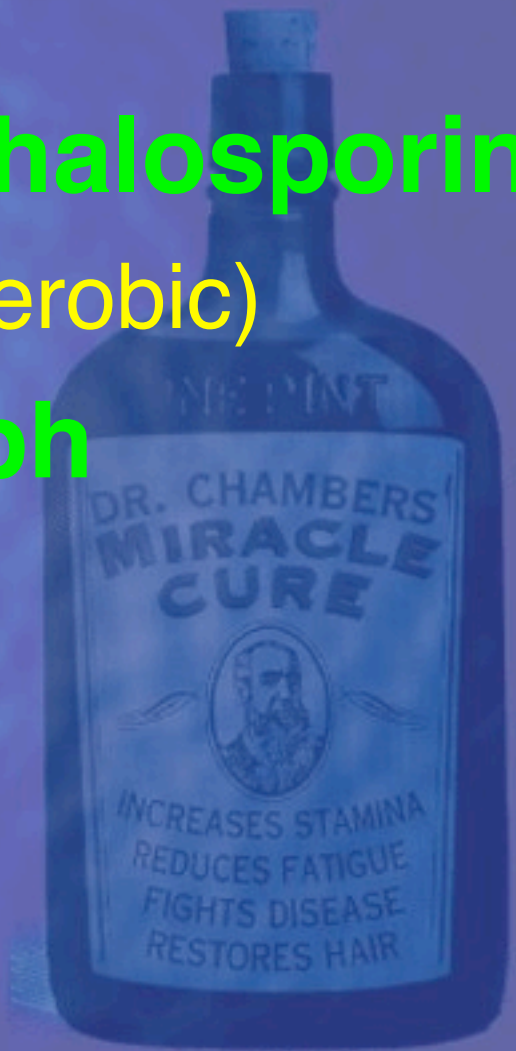


mechanism

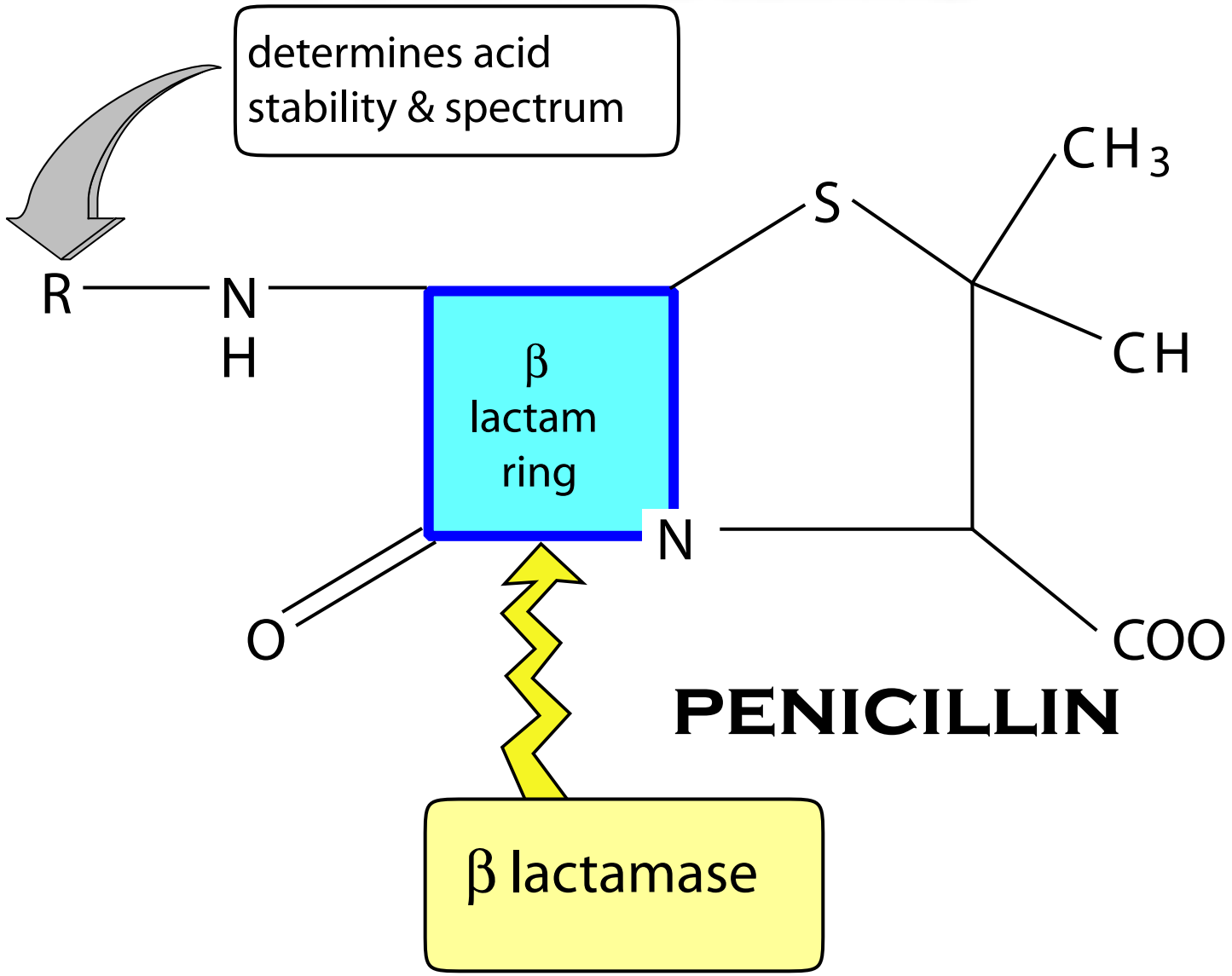

new unit being added
NAG
NAM
AVOPARCIN
VANCOMYCIN
TEICOPLANIN
NAM
NAG
NAM
NAM
NAG
NAM
NAG
NAM
Gly
ß-LACTAMS

spectrum

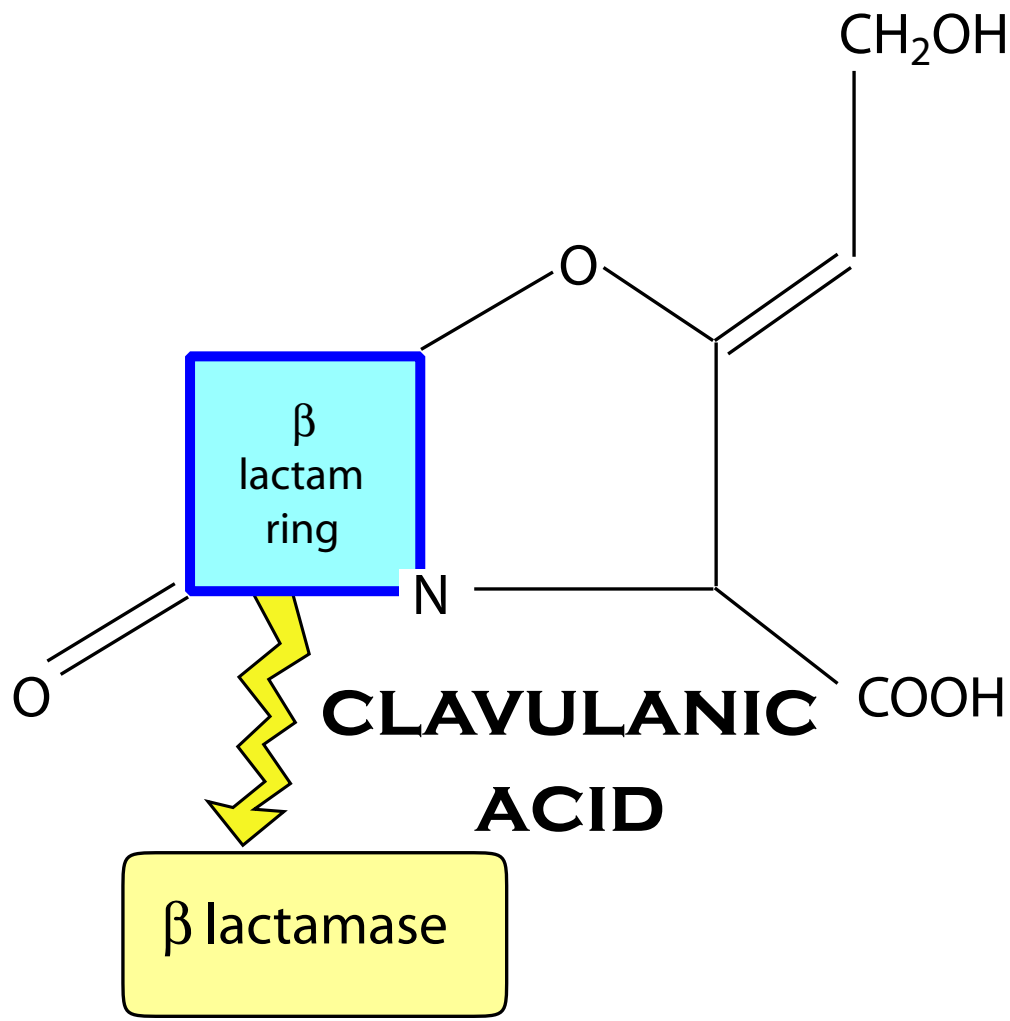
- **simple penicillins & cephalosporins**
  - mainly G+ (aerobic and anaerobic)
- **semisynthetic pen & ceph**
  - BL producing G+
  - G-
  - *Pseudomonas*



beta lactams



clavulanate



narrow spec penicillins

- **benzylpenicillin (pen G)**
- **phenoxymethylpenicillin (pen V)**
  - non BL G+
- **cloxacillin**
- **flucloxacillin**
  - BL G+

broad spec penicillins

- **amoxycillin**
- **ampicillin**
  - non BL G+ & G-
- **co-amoxiclav**
  - BL G+ & G-

anti-Pseudomonas

- ticarcillin (± clavulanate)
- piperacillin (± tazobactam)

use

- **benzylpenicillin**
  - most horse infections
  - most mastitis
- **co-amoxiclav**
  - general purpose broad spectrum drug

penicillin resistance

- **rare (apart from *Staph aureus*)**
- **develops slowly**
- **usually not clinically significant**
  - animals
  - owner

human use

- **penicillin**
  - URT infections
- **flucloxacillin**
  - Staph aureus skin infections
- **amoxycillin**
  - general purpose broad spectrum drug
- **co-amoxiclav**
  - 2nd line broad spectrum drug

cephalosporins

- **G1**
  - good G+, moderate G-, not Ps
- **G2**
  - very good G+, moderate G-, not Ps
- **G3**
  - moderate G+, very good G-, some Ps
- **G4**
  - good all round
- **cephamycins**
  - mainly G-, not Ps, good Bacteroides

cephalosporins

- **G1**
  - skin disease dogs
- **G2**
  - mastitis cows
- **G3**
  - foot rot cows!
- **G4**
  - mastitis cows
- **cephamycins**
  - not used

cephalosporin resistance

- **rare**
- **develops slowly**
- **can be clinically significant**
  - animals
- **very significant**
  - people

human use

- **G1 / 2**
  - second / third line drugs
- **G3 / 4**
  - life-threatening G- infections

pharmacokinetics absorption

- **iv**
  - Na or K salts (duration 4-6h)
- **im / sc**
  - procaine, benzathine penicillin (duration 12-24h)
  - amoxycillin trihydrate
- **po**
  - phenoxymethyl penicillin
  - flucloxacillin
  - many cephalosporins

pharmacokinetics distribution

- **weak acids**
- **generally low Vd**
  - poor penetration into tissues
  - cephs mainly better than pens

pharmacokinetics elimination

- **eliminated by kidneys**
- **anion pumps in PCT**
  - probenicid
  - aspirin
- **most modern cephs rapid elimination in animals**

other cell wall inhibitors

- bacitracin
- fosfomycin
- carbapenems
- monobactams
- glycopeptides
  - vancomycin
  - teicoplanin

What would you do?

- calved 10 days ago
- all quarters painful and swollen
- clots & blood in milk

problems?


DR. CHAMBERS
MIRACLE
CURE
INCREASES STAMINA
REDUCES FATIGUE
FIGHTS DISEASE
RESTORES HAIR

problems?

- mastitis

decision process

- **Does the drug kill the bacteria?**
- **Does the drug get to where the bacteria are?**
- **Is clinically significant resistance likely?**
  - in the cow?
  - in the herd?
  - in the farmer?

bacteria?

- Strep uberis?
- Staph aureus?
- other Streps?
- other Staphs?
- E. coli?

treatment?

- sample for C & S?
- intramammary drugs?
- parenteral drugs?
- withholding times?

resistance?

- **narrow spectrum G+**
  - penicillin
  - cloxacillin
  - G1 cephalosporins
- **broad spectrum**
  - ampicillin
  - co-amoxiclav
  - cefquinome

withholding times

- at peak lactation
- cure vs value of discarded milk?

penicillins & cephalosporins

- block formation of cell walls
- early drugs G+, modern drugs broad spectrum
- relatively polar - poor penetration
- safe and widely used
- resistance to cephalosporins potentially serious in people