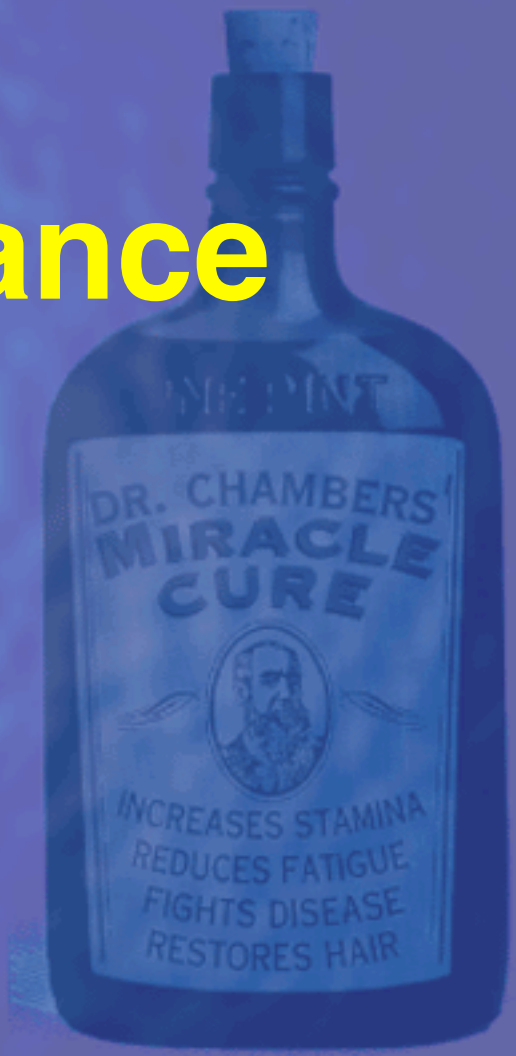
Antibiotic Resistance



Every time you use an antibiotic you exert selection pressure for resistance on pathogens and commensals

resistance mechanisms

- **drug does not reach its target**
  - Pseudomonas
- **drug is inactivated**
  - Staph aureus
  - E.coli
- **target is changed**
  - MRSA
  - streps

resistance

- intrinsic
- acquired

resistance genes

- chromosomes
- plasmids
- transposons
- integrons
- gene cassettes

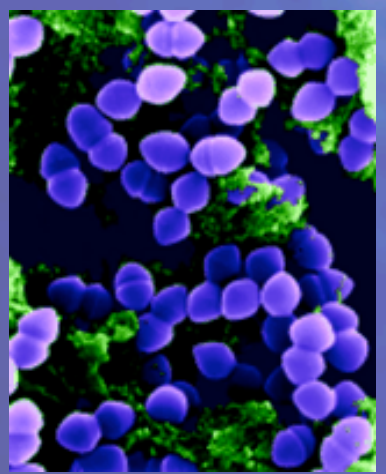
acquired resistance

- **conjugation**
  - coliforms
  - cocci
- **transduction**
  - Staphs
- **transformation**
  - cocci?

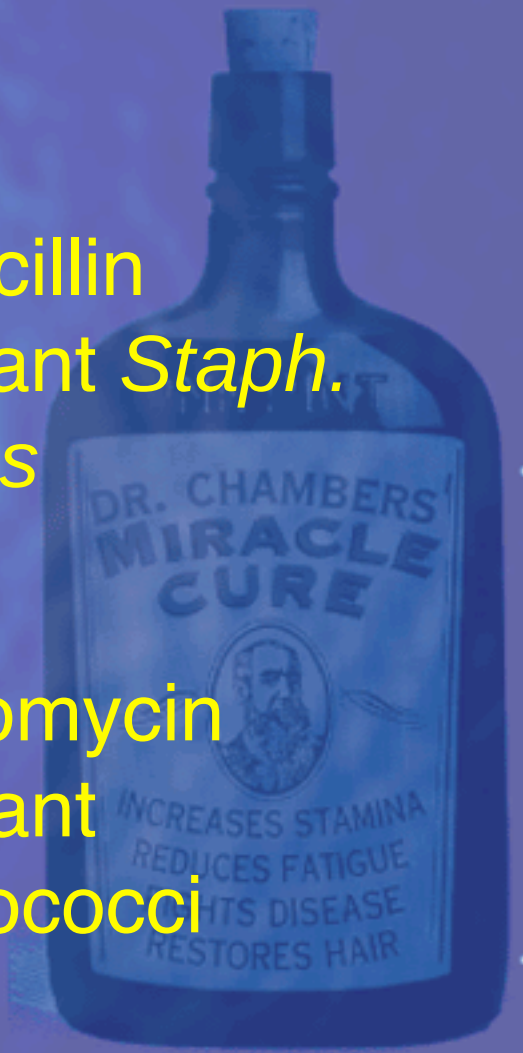
resistance

- pathogens
- commensals

human pathogens



- **MRSA**
  - Methicillin resistant *Staph. aureus*
- **VRE**
  - Vancomycin resistant enterococci

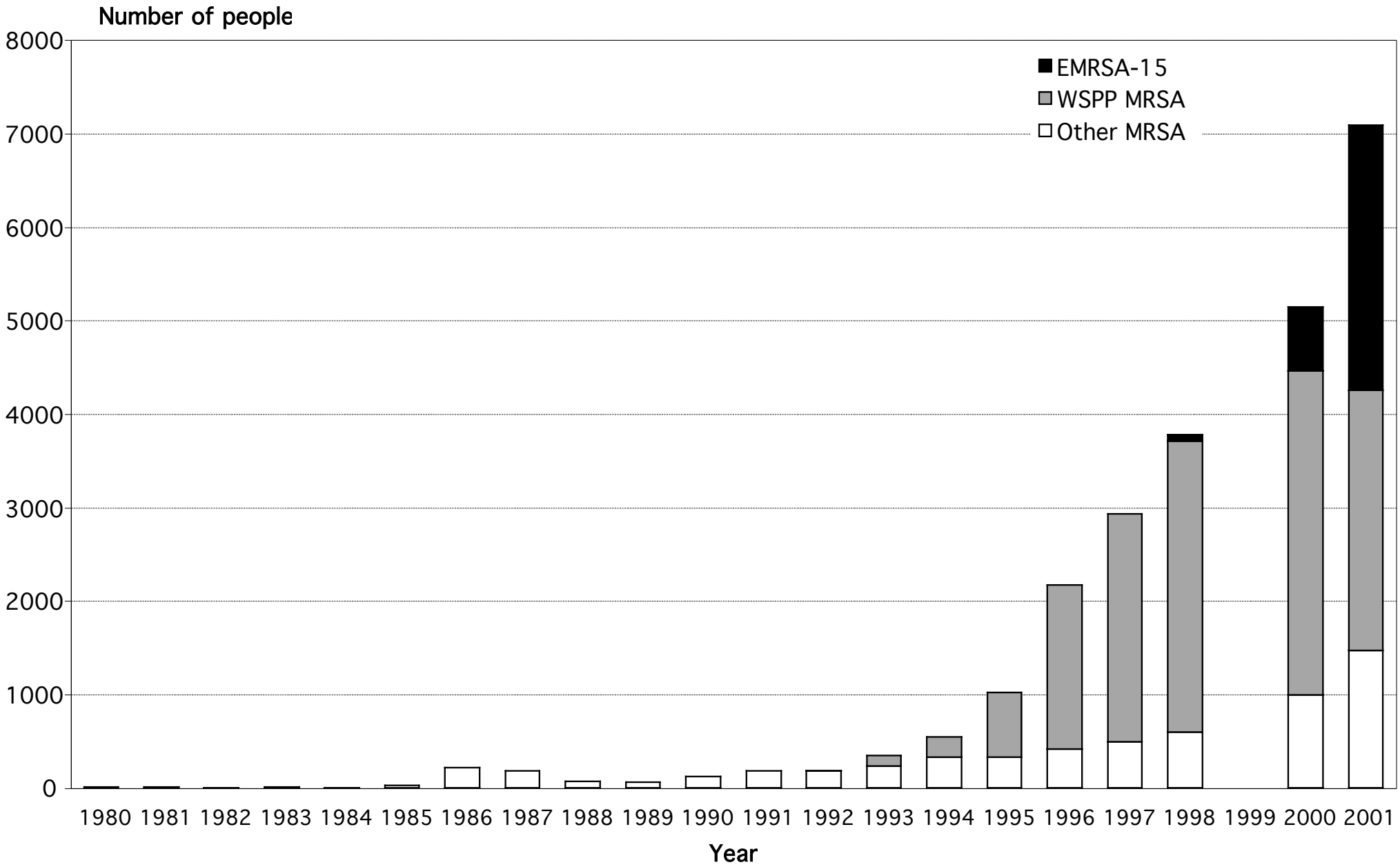


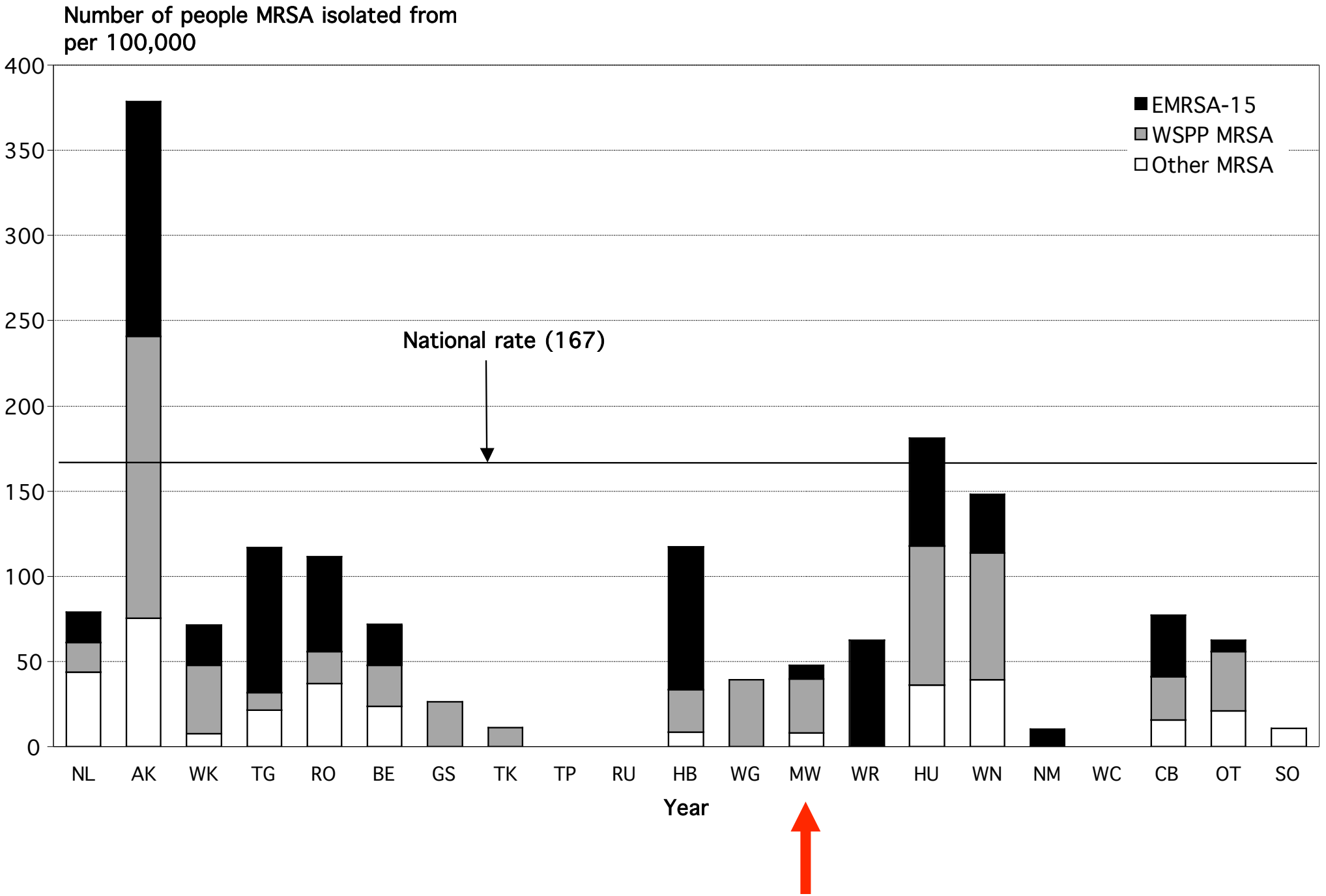
MRSA

- **14% SA isolates 2001**
- **Western Samoan phage pattern**
  - 39% MRSA isolates 2001
  - community acquired
  - Pacific islanders
  - Auckland
- **epidemic MRSA 15**
  - 40%MRSA isolates 2001
  - from UK
  - acquired in hospital

MRSA 2002

- **EMRSA 15 (UK)**
  - 67.5% isolates
- **AKh4 (Aus)**
  - 12.3%
- **WR/AK1**
  - 7.1%
- **WSPP (Samoa)**
  - 2.1%


Number of people
8000
7000
6000
5000
4000
3000
2000
1000
0
EMRSA-15
WSPP MRSA
Other MRSA
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Year


Number of people MRSA isolated from per 100,000
400
350
300
250
200
150
100
50
0
EMRSA-15
WSPP MRSA
Other MRSA
National rate (167)
NL
AK
WK
TG
RO
BE
GS
TK
TP
RU
HB
WG
MW
WR
HU
WN
NM
WC
CB
OT
SO
Year

VISA

- **vancomycin intermediate *Staphylococcus aureus***
  - 2 isolates this year
  - MRSA patients treated with vancomycin

VRE

- 15 human isolates in NZ so far
- chickens in Otago

animal *Staph aureus*

- **more resistant than human to**
  - clindamycin / licomycin
  - co-trimoxazole
  - fluoroquinolones
  - gentamicin
  - tetracyclines

animal *Staph aureus*

- **fluoroquinolone resistance**
  - 1999 – 0%
  - 2000 – 6.6%
  - 2001 – 12.5%
  - mostly dogs

food poisoning

- **Salmonella spp (DT104)**
  - rare in NZ
    - 39 human & 3 animal isolates 1992 – 2001
- **Campylobacter**
- **E.coli O157**
- **(Shigella)**

fluoroquinolone resistance

- **Salmonella spp (DT104)**
  - NZ 1998 0%
- **Campylobacter**
  - no figures but high
- **E.coli (all)**
  - animals 2000/1 2.4%, 1999 0.9%
    - 2001 4.3% dog isolates
  - people 2000 1.3%
- **(Shigella)**

TB

- 2002 0.6% MDR, 13% single drug resistant
- most cases in people born overseas

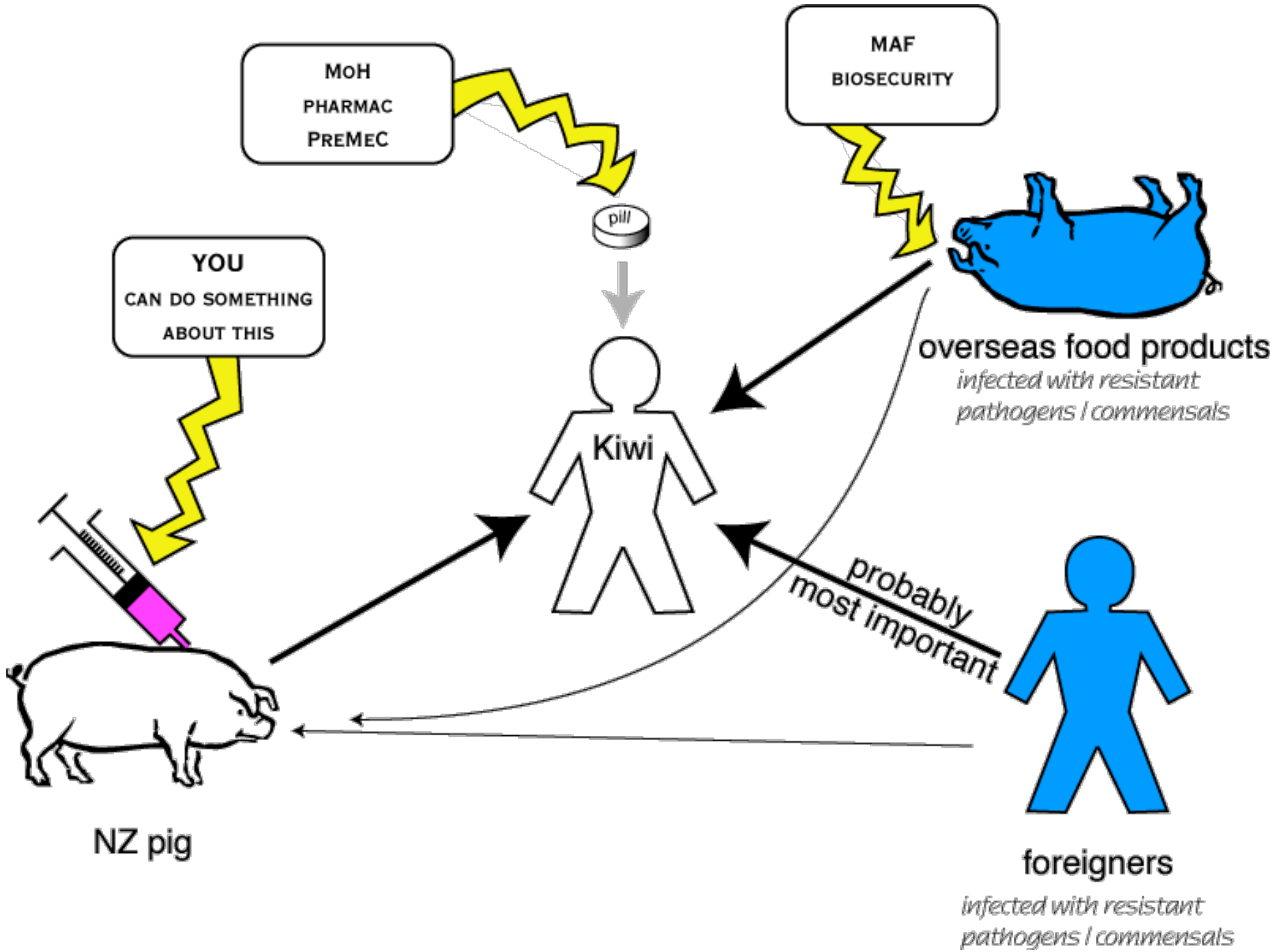
TB drugs

- rifampicin
- clarithromycin / azithromycin
- ethambutol
- isoniazid
- pyrazinamide
- streptomycin

veterinary pathogens

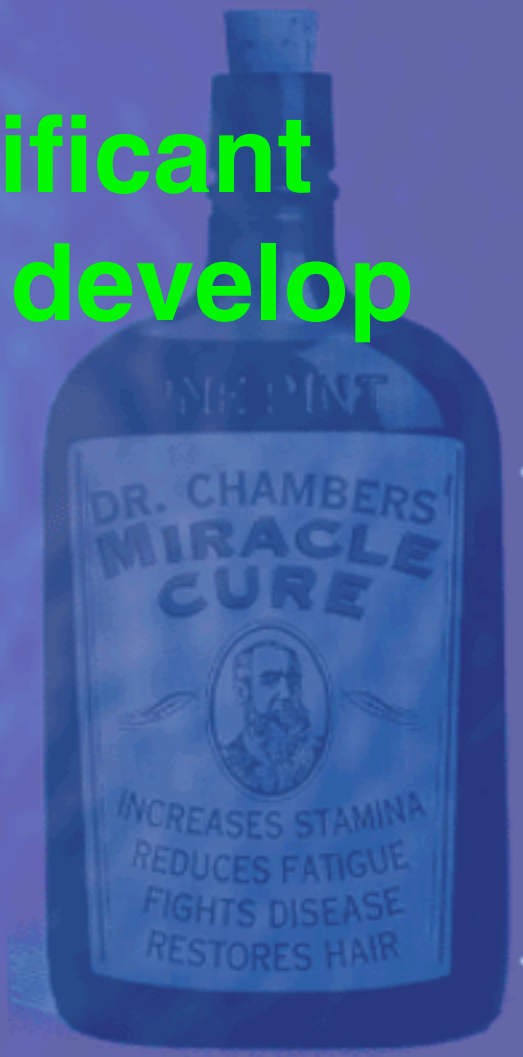
- **Pseudomonas aeruginosa**
  - large genome
  - lots of drug efflux pumps
  - lots of redundant systems
  - common after inappropriate antibiotics
  - causes problems in people too

Where do resistant bacteria come from?



controlling resistance

- use drugs to which significant resistance is unlikely to develop
- infection control



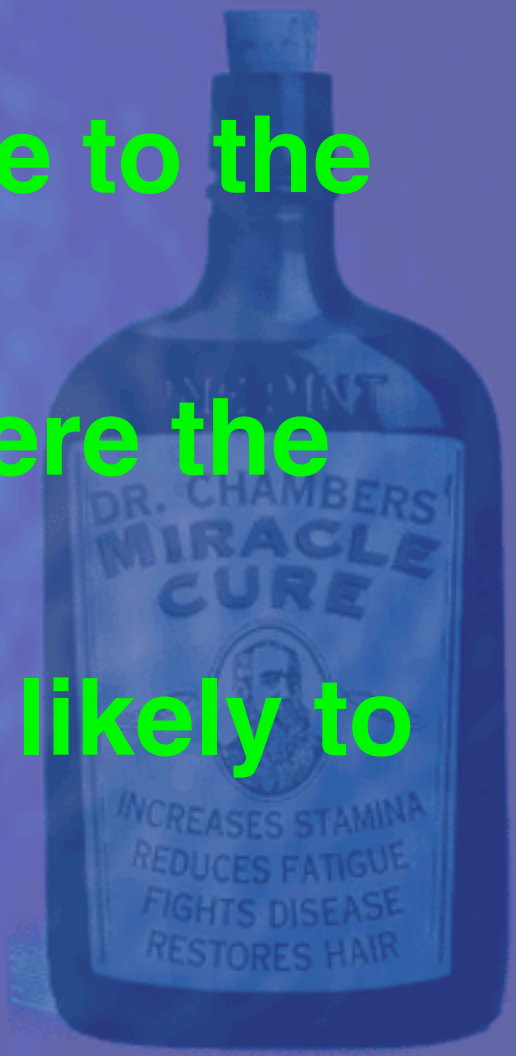
4 yr old bull terrier

- **scratching ears**
- **previously treated**
  - broad spectrum antibiotics
  - steroids
  - acaricides

What do you do?

antibiotic treatment

- are the bacteria sensitive to the drug?
- does the drug get to where the bacteria are?
- is significant resistance likely to develop?



What do you do?

- check for generalised skin disease
- flush and check ear
- culture and sensitivity?
- parenteral antibiotics?
- parenteral steroids?
- non-antibiotic treatment?
- alter environment?

reducing resistance

- Choose a drug on resistance testing, where practicable.
- Use narrow spectrum antimicrobials whenever possible.
- Use the full effective dose for as short a period as possible.
- Isolate the patient (and wash your hands / gumboots!).
- Use antibacterials not prone to producing resistance.
- Restrict the prophylactic use of antimicrobials to high risk patients only.
- In chronic care patients, regularly (but not frequently) change antimicrobial drugs.
- With aminoglycosides, use the longest effective dosage interval.