

Antibiotic Resistance

**By the end of this lecture
you should be able to**

- formulate treatment strategies to reduce the development of antibiotic resistance in the animals you treat and their contacts.

2

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

4 yr old bull terrier

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



resistance

- in the animal being treated
- in contact animals
- in the owner
- in the environment / NZ population

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
 - S aphs
- transformation
 - cocci?

resistance

- pathogens
- commensals

human pathogens



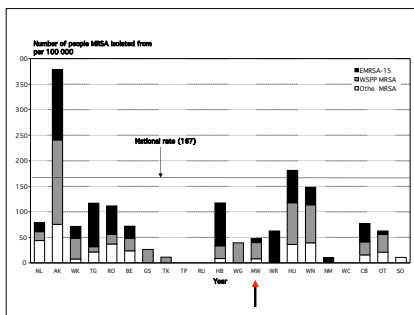
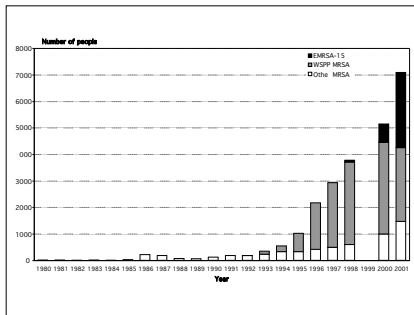
- MRSA
 - Methicillin resistant
Staph aureus
- VRE
 - Vancomycin
resistant
enterococci

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%
- **EMRSA 16 (UK)**
 - 1.9%



VISA

- **vancomycin intermediate**
Staphylococcus aureus
1-2 isolates per 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 / lincomycin
co-trimoxazole
fluoroquinolones
gentamicin
tetracyclines

animal *Staph aureus*

- **fluoroquinolone resistance**
1999 - 0%
2000 - 6.6%
2001 - 12.5%
2002 - stopped monitoring
mostly dogs

food poisoning

- **Salmonella spp (DT104)**
 - rare in NZ
 - 39 human & 3 animal isolates 1992 - 2001
- **Campylobacter**
- **E.coli O157**
 - 92 cases NZ 2005
- **(Shigella)**

fluoroquinolone resistance

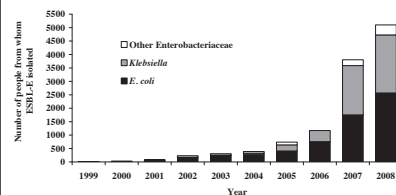
- **Salmonella spp (DT104)**
 - NZ 1998 0%
- **Campylobacter**
 - no figures
- **E.coli (all)**
 - animals 2000/1 2.4%, 1999 0.9%
 - 2001 4 3% dog isolates
 - people 2000 1.3%
- **(Shigella)**

ESBLs

- **extended spectrum beta lactamase producing coliforms**
- **emerged in Hawke's bay**
- **now in Auckland**
- **resistant to cephalosporins**
 - ve erinary use of cephalosporins???

23

Figure 1. ESBL-producing Enterobacteriaceae, 1999-2008



TB

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

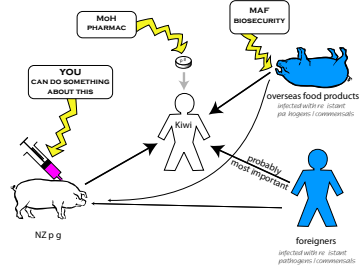
TB drugs

- 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

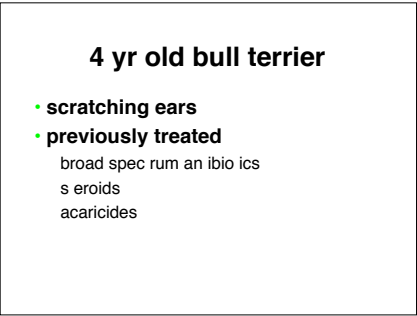
Where do resistant bacteria come from?



controlling resistance

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

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



4 yr old bull terrier

- **scratching ears**
- **previously treated**
 - broad spec rum an ibio ics
 - s eroids
 - acaricides

- ## 4 yr old bull terrier
- **scratching ears**
 - **previously treated**
 - broad spec rum an ibio ics
 - s eroids
 - 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?

[illegible][illegible]

What do you do?

- check for generalised skin disease
- culture and sensitivity?
- flush and check ear
- 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.
