

Antibiotics

**used for promoting
growth**

**by the end of this lecture
you should**

- understand the benefits and problems associated with the use of antibiotics to promote growth in food animals

growth promoters

- anabolic steroids
- antibiotics
- somatotropins
- probiotics
- banned drugs

growth promoters

- animals do not grow well unless they are :
 - fed properly
 - looked after properly
 - kept healthy

use of antibiotics

- **treatment**
 - sick animals, full doses
- **metaphylaxis**
 - healthy contact animals, full doses
- **prophylaxis**
 - healthy animals, low doses
- **growth promotion**
 - healthy animals, (very) low doses

COMMENTARY



COMMENTAIRE

Antibiotics: Miracle drugs or pig food?

John F. Prescott

The crisis of antibiotic resistance in medically important bacteria has taken the bloom off the antibiotic miracle. Infection specialists talk daily of entering the postantibiotic era. In the public debate going on over this issue, the use of feed antibiotics in farm animals is increasingly questioned. Clearly, the major cause of resistance to antibiotics in human pathogens is medical prescription use of these drugs. There is, however, the danger that agricultural use of antibiotics is becoming a ready scapegoat for problems of resistance in human medicine, made easier because of the complexities of the topic and because agricultural use of these drugs has technicalities that take some understanding.

It was the unexpected discovery in the 1950s that antibiotics increased growth rates and improved the efficiency of food utilization in pigs and chickens that has led to their use as growth promoters ever since. About 40% of antibiotic production in the United States is

Table 1. Estimated annual antibiotic use in livestock in the United States, 1985 ('000 kg) (1)

Species	Therapeutic use	Subtherapeutic use	Growth promotion
Cattle*	458	1100	340
Swine	230	3735	1381
Poultry†	204	580	315

*Mainly beef cattle

†Mainly meat chickens

Table 2. Antimicrobial agents prescribed to people in Canada, 1996 (2)

Antimicrobial agent	Number of prescriptions (millions)
Amoxicillin	6.78
Cephalexin	3.31
Erythromycin	2.72
Trimethoprim-sulfonamide	1.76

Every time an antibiotic is given, there is selection pressure for resistance in pathogens and commensals.

history

- **1949**
 - pigs fed old cultures of *S. rimosus* for vit B12 grew faster
- **1967**
 - Swann report - only non therapeutic drugs to be used for growth promotion
- **1997**
 - Denmark gets EU to ban avoparcin

mechanism

- gnotobiotic animals grow about 5% faster
- inhibition of G+ bacteria in gut
- inhibition of protozoa in ruminants???

residues

- fed at very low level
- most are not absorbed
- no residues at GP doses
- may be residues at prophylactic doses

resistance

- exposure to antibiotics selects for resistance
- animals exposed for long periods

resistance

- pathogens
- commensals
- targets unknown in growth promotion

species

- poultry
- pigs
- feedlot cattle
- calves
- grazing cattle

transfer of resistance

- drug causes emergence of resistance in animal
- carcase contaminated by resistant organisms
- resistant organisms survive cooking and eating
- resistant organisms colonise people
- resistant organisms cause disease in people, or
- resistant organisms pass on resistance to human pathogens

politics

- 1960s
 - widespread emergence of tetracycline resistance
- 1967
 - Swann report
- 1980s / 1990s
 - emergence of VRE & MRSA

politics now

- WHO recommendations
- most banned in EU
- most under pressure in USA & Australia
- Most banned as growth promoters in NZ, but allowed for prophylaxis

drugs

- avilamycin
- avoparcin
- bacitracin
- dimetridazole
- macrolides
- monensin
- quinoxalines
- virginiamycin

avilamycin

- broiler chickens
- pigs
- cross resistance
 - everninomycin
- still used in NZ, recently banned in EU

avoparcin

- cross resistance
 - vancomycin
- now history - not manufactured any more

bacitracin

- broiler chickens
- pigs
- calves
- no cross resistance
- toxic parenterally
- banned in EU, RVM in NZ
 - prevention of necrotic enteritis

dimetridazole

- **pigs**
- **carcinogenic**
- **cross resistance**
 - other nitroimidazoles
- **banned everywhere except NZ**
 - swine dysentery

macrolides & similar

- **tylosin**
- **lincomycin**
- **tiamulin & valnemulin**
- **pigs**
- **cross resistance**
 - other macrolides, streptogramin Bs?
- **RVM in NZ and EU**

monensin

- **coccidiostat**
- **cattle & broiler chickens**
- **toxic to horses and dogs**
 - pigs in combination with macrolides
- **no relevant cross resistance**

oxytetracycline

- **RVM**
 - respiratory disease in pigs
- **grossly over / ab used**

quinoxalines

- carbadox
- olaquinox
- dinitro-o-toluamide
- carcinogenic
- banned everywhere except NZ
- do not use
 - swine dysentery

virginiamycin

- broiler chickens and horses
- (feedlot cattle overseas)
- cross resistance
 - other streptogramins - Synercid
- RVM with notification
- avoid if at all possible

legal status

- growth promoters
 - general sales
 - being phased out
- disease preventers
 - RVM

The future??

- more paperwork
- surveillance system
- vets will have to be able to justify their actions

role of the vet

- only use as part of an integrated herd health plan
- ensure good husbandry before use
- do not use drugs for disease prevention without evidence of disease
- provide written protocols for farmers (with withholding times)
- keep records
- monitor results - culture & sensitivity
- investigate outbreaks of disease properly
