ANTIMICROBIALS

Use of antibiotics in animals and people

THE veterinary profession and the agricultural industry have been placed under a lot of pressure to reduce the use of antibiotics in veterinary medicine by both the media and government. I think the responsible use of antimicrobial drugs is the way forward for the profession but I think the medical profession, the O'Neill report (Review on Antimicrobial Resistance 2016) and government have overestimated the role that antimicrobial use in animals is having on human antimicrobial resistance in the UK. The Chief Medical Officer, Dame Sally Davies, said at the 2014 BVA Congress that 'Lack of evidence doesn't mean it doesn't happen, it just means that no one has invested in looking before' (*VR*, November 29, 2014, vol 175, pp 522-523). Well, I have tried.

I think most people accept that the use of antibiotics will select for antimicrobial resistance. This is especially the case when they are given orally either in feed or drinking water, or also by tablets and capsules. This direct oral application of antibiotics will have a direct effect on the bacterial flora found in the gut, whether pathogenic or commensal and whether in animals or humans. If we look at human use of antibiotics in the UK, figures of 21.46 defined daily doses (DDD) per 1000 population per day were used in 2013 (HM Government 2015), or 2.136 per cent of the population receive an antibiotic each day. So what does that actually mean? If we multiply by 365 days and divide by an average patient course of 21.5 DDD (DANMAP 2015), then 36.43 per cent of the UK population, or 36,430 people per 100,000 population, are likely to be receiving antibiotics each year and are also likely to develop antibiotic resistance related to these antibiotics.

Recent work (Burch 2016) looked at the attribution of indirect transmission of antimicrobial resistance from pigs and chickens to man in the EU by *Campylobacter* species, *Salmonella* species and *Escherichia coli*, and at resistance to various antimicrobial compounds of concern such as macrolides, fluoroquinolones and third- and fourth-generation cephalosporins, which select for extended-spectrum beta-lactamase (ESBL) enzyme-producing bacteria. The results are summarised in Table 1.

In percentage terms, the combined indirect transference of critical resistance from pigs was 0.00025 per cent or 0.25 people per 100,000 population. Transmission from chickens was higher, at 0.01959 per cent or 19.59 people per 100,000 population – approximately 78 times greater. Combined, chicken and pigs indirect attribution of resistance via the consumption of meat represented 0.01984 per cent or 19.84 people per 100,000 population or 0.05 per cent of potential human resistance in comparison with the use of antibiotics directly in man.

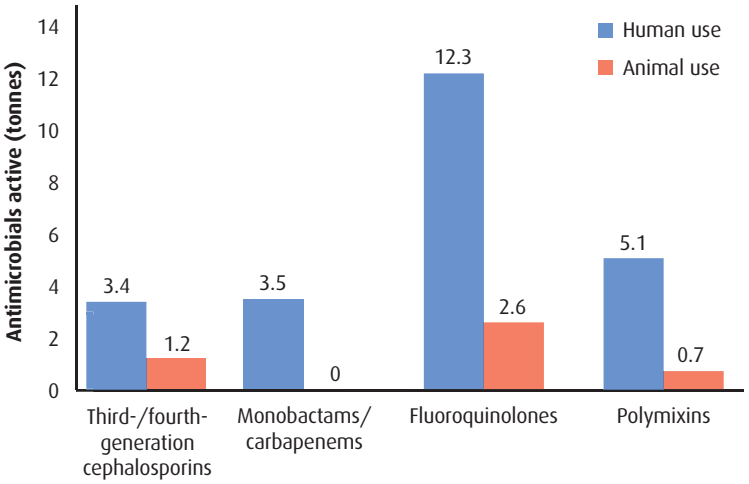

FIG 1: Comparison of use of certain critical antimicrobial drugs in man and animals in the UK (HM Government 2015)

TABLE 1: Attribution of indirect transmission of antibiotic resistance from pigs and chickens to man in the EU (Burch 2016)

Bacterial species	Antimicrobial	Resistance from pigs (%)	Resistance from chickens (%)
Campylobacter species	Macrolides	0.00003	0.0005
Campylobacter species	Fluoroquinolones	0.00004	0.0169
Salmonella species	Fluoroquinolones	0.00014	0.0016
Salmonella species	Third- and fourth-generation cephalosporins	0.00004	0.00037
Escherichia coli	Third- and fourth-generation cephalosporins	–	0.00022
Totals		0.00025	0.01959

If one compares the direct use of certain key antimicrobials in man and animals, such as third- and fourth-generation cephalosporins, monobactams and carbapenems, fluoroquinolones and polymixins, major differences can be seen (Fig 1). In many cases these critical drugs are used directly in humans at several times the amount used in veterinary medicines for both farm and companion animals. Penicillins comprise the largest group in man at 350.1 tonnes (63.8 per cent) of the total antimicrobials used (531.2 tonnes) and 90.8 tonnes (21.7 per cent) in animals of the total antimicrobials used (418.7 tonnes). The amounts of macrolides were 51.9 tonnes in man (9.9 per cent) and 43.0 tonnes (10.3 per cent) in animals. It is not surprising then that the indirect route of spreading infections from chickens and pigs via meat is so small, especially if properly cooked, in comparison with the direct, often repeated use of antibiotics in man.

It is unfortunate that government, the O'Neill report and the EU establishment did not appear to consider this information, before developing their antimicrobial resistance policies and the over-restrictive EU legislation that is partially already here through the Animal Health Law (EU Regulation, 2016/429). This law permits the European Commission to ban products on the grounds of antibiotic resistance from human and especially animal use (watch for colistin, a polymixin). Additional regulations are currently being developed on veterinary use of antimicrobials and also on feed use. This legislation is unlikely to have any significant effect on the antimicrobial resistance issues that are being seen in human medicine today but may have serious adverse impacts on veterinary medicine and farm animal health and welfare in the future.

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