Letters

ANTIMICROBIAL RESISTANCE

Transmission of antimicrobial resistance from animals to people

I WAS delighted to see that the Government via the Research Councils is sponsoring research at Bristol university looking at the risk of transmission of

antimicrobial resistance from animals to people, including dairy cattle (*VR*, June 18, 2016, vol 178, p 622). It is long overdue. In a recent letter to *Veterinary Record* (*VR*, May 28, 2016, vol 178, p 565) I compared the estimated relative transmission of resistance from chickens and pigs to people (Burch 2016a). Infectious agents, such as *Campylobacter* and *Salmonella* species, which may be carrying antimicrobial resistance, can be transmitted directly to farm workers in close contact with the animals but the major other route is considered via food. In the case of pigs it is primarily via meat; broiler chickens can also transmit infections via meat but eggs from layers are also important (Table 1). With cattle there can also be transmission via meat but milk can also play a role, especially in the case of unpasteurised milk and dairy products such as cheese.

Overall, it can be seen from Table 1 that there were substantially larger numbers of human outbreaks reported associated with *Salmonella* species than *Campylobacter* species, in spite of the number of human cases with *Salmonella* infections being less than half the number of human cases with *Campylobacter* infections. Chicken meat was largely associated with *Campylobacter* species infections in comparison with pig and cattle meat. Interestingly, all meats were associated with *Salmonella* species infections at a similar rate but eggs were still predominantly associated with *Salmonella* species infections in people, primarily caused by *S enteritidis*. Unpasteurised milk could be mainly associated with *Campylobacter* infections but milk was unlikely to be significant if pasteurised. Somewhat surprisingly, cheese was potentially associated with *Salmonella* infections but not *Campylobacter* species.

In the Netherlands, Mughini Gras and others (2012) attributed 20.7 per cent of human *Campylobacter* species infections to cattle, 66.2 per cent to poultry and 0.3 per cent to pigs. Beef and/or veal contamination with *Campylobacter* would hardly be considered a major source of infection in comparison with chicken meat. Unpasteurised milk could be important but most milk is processed and sold as pasteurised or sterilised. This would suggest that environmental contamination in fields could be a significant factor with regard to *Campylobacter* infections in people, especially when cattle are out to grass in the summertime and people are enjoying walking and picnicking in fields, which is when the disease in people is at its highest. In contrast, on pig and poultry farms, access is not normally encouraged for biosecurity reasons and the smell is also not inviting.

If the attribution of resistance models from animals to people described for pigs and poultry by Burch (2016b) are applied to cattle, a combined resistance transmission can be estimated as 3.6 cases/100,000 population or 0.0036 per cent (Table 2).

This compares with 19.59 cases/100,000 population for chickens and 0.25 cases/100,000 population for pigs, or a combined chicken, pig and cattle attribution of 23.44 people/100,000 population. This in turn compares with an estimated 36,430 people/100,000 population in the UK receiving antibiotics every year (Burch 2016a).

It will be interesting to see if the future work at Bristol corroborates these observations.

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TABLE 1. Zoonotic disease outbreaks in people linked to animal edible products reported in 2012 and 2014 in the EU (EFSA/ECDC 2014, 2015)

		Salmonella species		*Campylobacter* species	
		2012	2014	2012	2014
Number of EU reported human cases		91,034	88,715	214,268	236,851
Number of EU reported human outbreaks		347	225	25	29
Product attribution (%)					
Pig	Meat	5.8	9.3	4.0	0
Chicken	Meat	3.7	3.6	44.0	55.2
	Mixed meat	NR	NR	8.0	6.9
	Eggs	45.2	44.0	0	0
Cattle	Meat	2.0	2.2	4.0	3.4
	Milk	NR	0.9	20.0*	6.9
	Cheese	7.8	3.1	0	0

NR Not recorded, *Unpasteurised

TABLE 2: Attribution of indirect transmission of antibiotic resistance from cattle to people in the EU

Bacteria	Antimicrobial	Resistance from cattle (%)
Campylobacter species	Macrolides	0.000053
Campylobacter species	Fluoroquinolone	0.00292
Salmonella species	Fluoroquinolones	0.00059
Salmonella species	Cephalosporins 3 & 4 G (ESBL)	0.000041
Totals		0.0036

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Notes