ANTIMICROBIAL RESISTANCE

Animal to human transmission of AMR

I WAS disappointed to read that 14 representatives of the medical profession had written to *The Daily Telegraph* requesting the Government to introduce a nationwide ban on the preventative mass-medication of animals, and to curb farm use of the 'critically' important antibiotics (CIAs) (*VR*, November 19, 2016, pp 502-503). This demonstrates that we are not getting our message on 'responsible use' across to our medical colleagues. The BVA President, Gudrun Ravetz, has emphasised that 'a unified approach between veterinary and medical leaders must continue to tackle antimicrobial resistance (AMR).' This must be the case and the way to go forward. We must update them on the efforts and progress that is being made on the veterinary side, especially, overall use reduction, future targets and CIA reductions. The medical profession itself is also under a lot of pressure on the subject of AMR and has genuine fears about its spread, particularly in hospitals and secondary care homes.

One of its concerns, according to newspaper reports, is the recent discovery of antibiotic-resistant *Escherichia coli* on meat. Recent data from Denmark (DANMAP 2015 [2016], Roer and others 2016) compared extended-spectrum beta-lactamase (ESBL) and AmpC-producing *E coli* from local and imported meat sources with 294 *E coli* from human bloodstream infections. They found three matching *E coli* of the same sequence types and the identical ESBL or AmpC genes from poultry (broiler and duck meat) with the human strains. By using whole genome sequencing they found many different single nucleotide polymorphisms, between 1640 to over 6000 differences, between animal and human isolates, demonstrating that there was no clonal or zoonotic transmission of these strains.

Although the three resistant genes were identical (one was from a previous year), the Danish researchers could not determine in which direction the spread had occurred, but they felt it was more likely to be from meat to people, as one of the ESBLs was CTX-M-1 which is more commonly found in animals, whereas the two CMY-2 genes can be found in both animals and people. Even so, this would represent a two in 294 or 0.68 per cent attribution rate per year regarding *E coli* bacteraemias.

Further work to look at the relationship with zoonotic transmission to human urinary tract infections is also planned. Colonisation of the human gut by animal *E coli* is thought to be very low, apart from in the case of verocytotoxigenic *E coli*, mainly from cattle/ruminants, which affects approximately 1.2 in 100,000 people per year (ECDC 2015), or 0.0012 per cent of the EU population, and is not usually associated with antibiotic resistance issues. It is thought that the lack of gut colonisation by animal *E coli* will cause the exchange of resistance genes to human *E coli* to be by transformation rather than conjugation; it is therefore likely to be a much slower process and only a transitory one as gut contents pass through.

Another area of increasing medical concern is the rise in resistance to carbapenems, which are not licensed for use in veterinary medicine. It is gratifying that the recent UK Veterinary Antibiotic

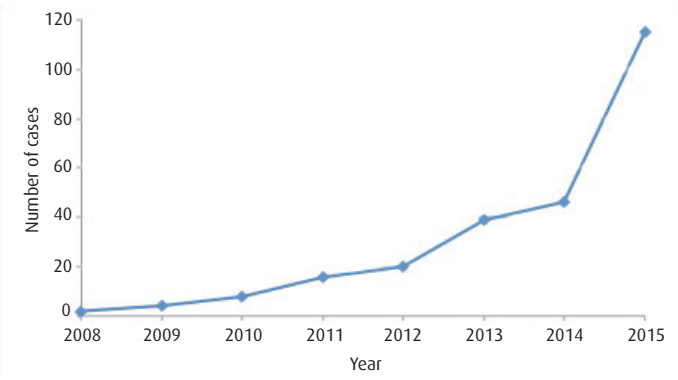

FIG 1: Number of annual cases of carbapenemase resistance reported in Sweden (SVARM 2015 [2016])

Resistance and Sales Surveillance report for 2015 (VMD 2016) highlighted that there was no carbapenemase resistance found in the samples of *E coli* and *Salmonella* species tested from animals. The same was reported in DANMAP 2015 (2016) and also in SVARM 2015 (2016) from Sweden. In contrast, on the human side, Sweden has recently seen a substantial increase in carbapenemase resistance in Enterobacteriaceae (Fig 1). The SVARM report associates this with a rise in the number of refugees arriving in Sweden in 2015, including many from Syria (SVARM 2015 [2016]).

The rise in resistance to carbapenems highlights some of the problems facing the medical profession. Carbapenems are approaching being the last safe antibiotics for use for many infections, including *E coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, and if resistance becomes extensive from their overuse in medicine and becomes endemic in hospitals it will cause severe problems in controlling these infections. It also highlights that this is a global problem and that, with increased movement of people, whether refugees, migrants or those travelling for pleasure or business, mitigating the risk of the spread of AMR needs to involve all parties. The O'Neill report (2016) recognises these global issues, hence the involvement of the United Nations and its representative organisations, and the UK's financial support for medium and lower income countries to develop their own monitoring ability regarding use and sensitivity testing.

It is hoped that the veterinary and medical professions in the UK can resolve their differences and work together in a more positive manner to combat this difficult and potentially dangerous AMR problem in the future.

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Notes