Antibiotic usage in Equine practice

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There is a widely cited study which predicts that by 2050 ten million people will die every year due to antibiotic resistance (O'Neill 2016). In 2019 there were 1.27 million deaths attributable to (not associated with) antibiotic resistance (Murray *et al.* 2022). Since the pandemic began there have been ~7 million deaths, thus since 2020 more people have died of antibiotic resistance than of Covid.

It is easy to ask what has it got to do with us? The first consideration is regulation. There is a clamour to limit antibiotic usage in animals. The World Health Organisation Guidelines on the use of Medically Important Antimicrobials in Food Producing Animals, advise that antibiotics classified as Highest Priority Critically Important should not be used in animals with a clinically diagnosed disease. They suggest the undesirable consequences associated with such a restriction appear to be relatively small or non-existent. Our right to prescribe antibiotics is under threat.

The second consideration is the effect on us personally. MRSA nasal carriage on admission to hospital remains one of the most important risk factors for subsequent infection. MRSA carriage was significantly higher among veterinary practitioners (3.9%) than among the participants not professionally exposed to animals (0.7%) (Moodley *et al.* 2008). At the RVC in London MRSA carriage in veterinary staff was significantly higher than reported for the UK community (18% vs. 1%) (Loeffler *et al.* 2005).

The WHO classifies antibiotics as: Important, Highly important, Critically important and Highest Priority Critically Important (HPCIA). The European Medical Agency, less imaginatively named A, B, C, D. In essence, category B is largely the same as HPCIA.

In the UK Farm Animal Antibiotic use is published as the Veterinary Antimicrobial Resistance and Sales Surveillance Report (VARSS). In 2013 a target of 50mg of antibiotics / kg of livestock was set for the food producing sector and this was achieved in 2016. For the last few years Farm Animal Practice has used ~25mg/kg antibiotics.

Equine antibiotic use is harder to monitor. Many antibiotics are unlicensed and there is no compulsory recording. We worked with Brian Whitt of Eclipse Practice Management Software. This introduced the option to classify any 'product' as an antibiotic, with a subclassification of antibiotic class and WHO category. The critical step is to classify the drug by mg of active ingredient per 'sales unit'. For instance, procaine penicillin is typically sold per ml so Depocillin® is 300mg/sales unit. Oral potentiated sulphonamides are sold per sachet or tube, so can be 18,000mg/ Equibactin® paste. A denominator is all horses treated, regardless of whether treated with antibiotics, vaccinated, examined etc. The average weight of horses was used when the weight was recorded (hospital practices). We were able to compile the data from 14 practices, with a maximum number of horses treated of 107,977 in 2019 (Tallon, Whitt and Bladon 2023). The British Equestrian Trade Association Survey (2023) estimates there are 726,000 horses in the UK.

We reported that the overall use of antibiotics had decreased from 60mg/kg in 2012 to 46mg/kg in 2021. An improvement but nothing like as much as seen in Farm Animal practice. Equine usage was dominated by use of potentiated sulphonamides, and HPCIA usage was low, with an apparent recent drop from 0.82mg/kg in 2018 to 0.59mg/kg in 2021.

Reviewing Highest Priority Critically Important antibiotics. In the UK ceftiofur is licensed for treatment of horses. It has been associated with diarrhoea. It is not ideal for topical use as active metabolite desfuryl ceftiofur is produced in the liver. It is quite expensive, £101 per day.

Enrofloxacin is licensed for intravenous or oral for cattle, pigs, chickens etc but not horses. It is used in horses. It is detrimental to articular cartilage so is not recommended in foals. Published evidence shows enrofloxacin is associated with less post-operative colic than other antimicrobials. Enrofloxacin is as cheap as chips, daily iv treatment of a 500kg horse is £48, daily oral treatment £36. The only reason not to use enrofloxacin is to do the right thing!

There are extensive guidelines for the prevention of surgical site infections. These include not removing hair, or if it must be removed, clipping but not shaving (Leaper *et al.* 2019). It is quite well established now that joint injections should be done through through unclipped skin. We have done arthroscopy through unclipped skin. Antibiotics should be present in the tissue fluids at the time of surgery, which ideally means intravenous administration within 60 minutes of the first incision. The normal time from induction to incision in equine surgery should be about 30 minutes, so it is easy to administer antibiotics too soon. Antibiotics should be repeated if more than two half-lives duration expires. One study showed that only 40% (50/153) horses were administered antibiotics within 60 minutes of first incision, and the first incision was performed more than two half-lives after administration in 31% (47) horses (Muntwyler, Dubois and Weese 2020).

Cefazolin is a first-generation cephalosporin, 'only' a Highly Important Antibiotic. A single dose of cefazolin may be ideal for surgical prophylaxis(Bratzler *et al.* 2013). It is still more expensive than ceftiofur at £62 per day. It is our choice for surgical antibiotic prophylaxis. We have seen fatal diarrhoea in one horse, which was treated with cefazolin, doxycycline, potentiated sulphonamides, multiple antibiotics. Guidelines also suggest that for clean and clean-contaminated procedures, do not administer additional prophylactic antimicrobial doses after the surgical incision is closed, even in the presence of a drain. There is no evidence to support the use of post-operative antibiotic prophylaxis.

There are several papers investigating the frequency of synovial sepsis following endoscopic surgery. We reported an increased risk associated with tendon sheaths in general (5.2 x) and the carpal sheath in particular (14.9 x) compared to other synovial structures (Hawthorn *et al.* 2016). We reported 0.5% of synovial structures and 1% of horses with subsequent septic arthritis. Another study without antimicrobial prophylaxis reported infection rate was 0.5% of joints (3 of 636) in 0.7% of horses (3 of 444) (Borg and Carmalt 2013). Since November 2018 our routine protocol is no antibiotics for arthroscopy. We have seen post operative synovial sepsis in the digital flexor tendon sheath only, seven cases, a non-significant increase in post operative synovial sepsis incidence. Four horses developed post operative pneumonia. We have however found that discontinuing antibiotics in this way did not alter the total consumption of antibiotics in the hospital.

The mg/kg antibiotic consumption data is not an ideal metric. Potentiated sulphomanides might require 36g/day/horse, oxtetracycline only 8g/day/horse, while ceftiofur is 2.2g/day/horse. Thus, the mg/kg metric is an incentive to use more reserved antibiotics. An alternative is the Defined Daily Dose. If we know the mg used, the standard dose and the total weight of horses treated then it is easy to calculate how many doses have been used – in essence the number of days per year the average horse receives a dose of antibiotics. Antibiotic use in humans tends to be reported in Defined Daily Dose, as the number of people per 1000 taking antibiotics on any given day. It has been reported that the global antibiotic consumption rate was 14·3 defined daily doses per 1000 population per day in 2018, an increase of 46% from 9·8 in 2000 (Browne *et al.* 2021). Thus we also reported the DDDVet/yr [5]based on the number of equids treated (for any transaction. We showed that the DDDVet/1000 was 4.2, compared to 16.4 for humans in the UK and 27.7 for New Zealand. This data does not support the suggestion that antibiotic use in horses is a significant part of the antibiotic resistance problem.

BEVA has continued this project with the goal of providing national data on antibiotic consumption in equine practice, suitable for publication in the VARSS report. For 2023 we have data from 32 practices treating over 140,000 horses. The DDDVet/year of antibiotics for horses was 1.22, a 19% decline over 2021. The use of Highest Priority Critically Important Antibiotics also declined, by 39% to 0.067 DDDVet/yr (0.02 later generation cephalosporins and 0.05 fluoroquinolones).

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