Antimicrobial use and resistance in Irish pig farms

TEAGASC researchers have compiled the first nationwide dataset on antimicrobial use in Irish pig production and will now investigate the dynamics of antimicrobial resistance at farm level.

The World Health Organisation, World Organisation for Animal Health, and the Food and Agriculture Organisation of the United Nations have included antimicrobial resistance (AMR) in the list of the biggest threats to human health. There is growing concern that the use of antibiotics in animal production may have a role in the emergence and dissemination of antimicrobial-resistant organisms relevant to human health. The spotlight often falls on intensive production sectors, such as pig production, because a high level of antimicrobial use (AMU) is assumed in these sectors. Until now, data on current AMU was not available in Ireland. Project AMURAP (Antimicrobial Use and Resistance in Animal Production), a Department of Agriculture, Food and the Marine (DAFM)-funded collaborative project between Teagasc and UCD, has collected the first nationwide database on AMU in Irish pig production, setting the baseline for future reference. Starting in summer 2019, the project will measure the evolution of AMR throughout the pig's life cycle.

How are antimicrobials used in pig production?

AMU data for the year 2016 was collected from 67 farrow-to-finish pig farms, representing one-third of the pigs in Ireland. The majority (89.2%) of antimicrobials used in pig production were administered in medicated feed, mostly to weaner pigs, to treat or prevent disease. The average total use of antimicrobials per farm was 108.5mg/kg liveweight sold (lwt; weight of all animals sent to slaughter), or 161.9mg/PCU, where PCU or 'population correction unit' is an estimate of weight at treatment defined for each species. **Figure 1** depicts the antimicrobial consumption for 2016 in six European countries, including all routes of administration. The total antimicrobial consumption in Irish pig farms was lower than in the UK, but much greater than reference countries such as Sweden, the Netherlands or Denmark.

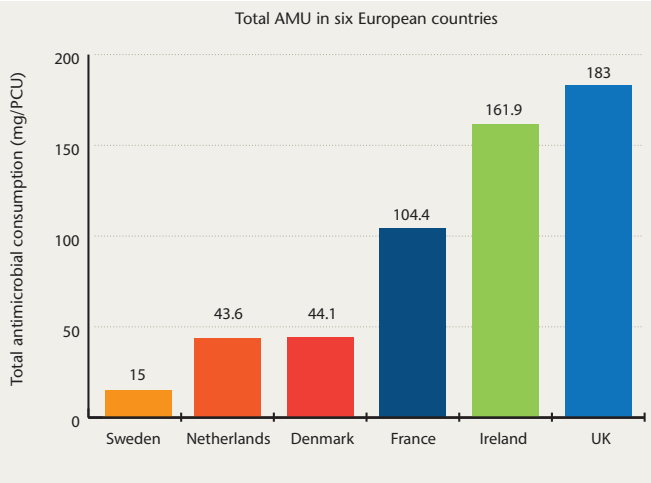

FIGURE 1: Total antimicrobial consumption in six European countries in mg/PCU in 2016. The population correction unit (PCU) is an estimate of weight at treatment defined for each species. For each country, the weight of antimicrobials consumed was taken from the respective national reports (Sweden – Swedres Svarm, 2016; the Netherlands – Sda, 2016; Denmark – DANMAP 2016; France – Anses, 2016; UK – VMD, 2017). The PCU for each country was taken from the European Surveillance of Veterinary Antimicrobial Consumption *report for 2016 (ESVAC, 2018).*

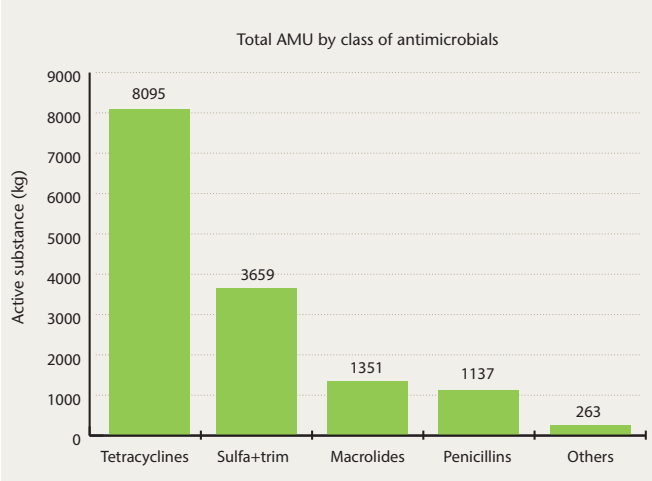

FIGURE 2: Total antimicrobial consumption by weight of active ingredient (kg) across all routes of administration on 67 Irish farrow-to-finish pig farms, 2016.

The World Health Organisation defines antimicrobials that are most important for treating human disease as "critically important antimicrobials" (CIAs). Only 0.39mg/kg lwt of AMU in pigs was comprised of CIAs. AMU breakdown by class of antimicrobials is shown in **Figure 2**.

Comparison of farms

Teagasc researchers put together a report summarising the information gathered on each farm, and compared the values obtained to the other Irish farms surveyed. This practice is known as benchmarking and it allows farmers to compare their data to that of their peers. **Figure 3** is an example of a benchmarking report where the farm in question is above the national average.

Relating AMU to AMR

Besides setting the baseline reference for future AMU estimates in Ireland, these data are useful to better understand the links between patterns of AMU and the development of AMR. Previous research indicates that AMR peaks after weaning and decreases thereafter. However, further research is needed to understand the dynamics of resistance at farm level, and to help identify points in the production chain where interventions to control the development of resistance might be most effective. In AMR investigations, zoonotic bacteria (infectious agents that spread between animals and humans) such as *Salmonella spp.*, are studied due to their links to public health while *Escherichia coli*, which live normally in the gut, are studied due to their ability to transfer AMR to other bacteria. Project AMURAP will follow batches of pigs in high- and low-user farms, and measure AMR throughout the pig's life cycle. Particular attention will be paid to resistance against the critically important antimicrobials for human medicine. The project aims to provide a better understanding of how AMR evolves through the production period, how it is affected by AMU, and to identify patterns of use that present the highest risk for the development of resistance. Thus, farmers will have improved knowledge of the strategies available to minimise the risk of AMR while maintaining good health status in their herds.

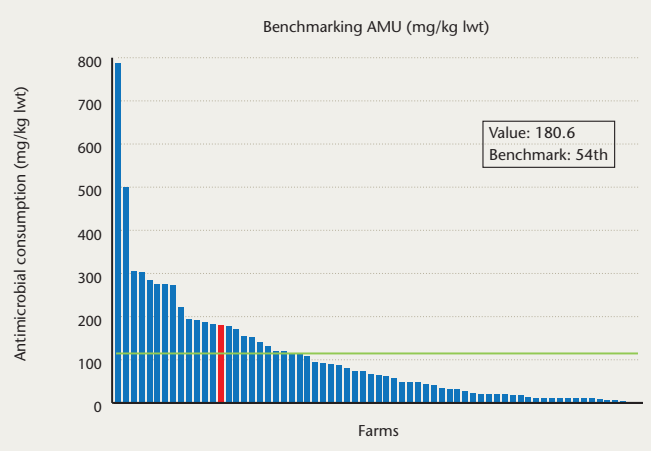

FIGURE 3: Benchmarking total in-feed antibiotic use in Irish pig farms. The red bar represents the farm benchmarked against its peers and the green horizontal line represents the national average.

Conclusions

- The pig sector is the first in Ireland to publish information on the use of antibiotics.
- Almost all antimicrobials used in pig production are administered in feed.
- AMU in pig production is greater than for other sectors, but it is lower than expected and the use of CIAs is low.

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