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Surveillance for prohibited substances and environmental contaminants in pig meat

Evaluating the effect of changing sampling schedule

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The European Union (EU) Residue Directive 96/23 is up for renegotiation. According to the Directive, 0.05% of the slaughter pig population should be sampled. These samples should be divided into 0.02% which should be analysed for Group A, which are substances with anabolic effect and prohibited substances, and 0.03% for Group B, which are veterinary drugs and environmental contaminants. Sampling frequencies are stipulated for six subgroups under Group A and three under Group B. The objective of the current work was to identify the safety and cost-effectiveness of different future sampling schemes for residues in pig meat while considering that highly sensitive laboratory techniques such as HPLC LC-MS/MS can provide results for a high number of substances simultaneously. EU monitoring data from year 2014 were used.

Six scenarios were set up assuming use of HPLC LC-MS/MS. The first five scenarios (S1–S5) used the current sampling frequencies and mirrored the current way of analysing, where the samples are not analysed for all substances in the group, but further divided into subgroups. For scenarios S2–S5, a varying degree of dependency was assumed between presence of a Group A substance and a Group B1 substance (wrong use of antimicrobials). In these scenarios, it was assumed that samples, which were found positive for Group A were subsequently analysed for Group B1 substances – and vice versa. For scenario S6, it was assumed that 0.02% of the animals were sampled and simultaneously analysed for both Group A and B1 substances.

The prevalence of residues in pig meat in the EU in 2014 was very low; 0.06% for Group A and 0.38% for Group B. Findings in Group A consisted of different substances, in very low numbers and from several Member States. Wrong use of antimicrobials was found in 0.16% of the samples analysed. The analyses showed that the safety of the system would in no means be jeopardized by subjecting the same samples for analysis of both Group A and B substances, while using the current sampling frequencies. In fact, use of HPLC LC-MS/MS harbors the possibility of having more positive samples, and hence, extra safety. Moreover, this approach could imply lower sampling costs, because fewer samples are collected (0.02% versus 0.05% of the slaughter population), possibly enabling a wider use of the costlier HPLC LC-MS/MS method. More details about the possibilities and limitations when using HPLC LC-MS/MS are needed, before the full economic potential of a future sampling scheme can be realized.

KEYWORDS

>> Residues
>> Food safety
>> Monitoring
>> Directive 96/23

The consequences of human exposure to residues found in meat are usually not grave (Baptista et al., 2010; Alban et al., 2018). Still, from a consumer perspective, residues in food are unwanted. This was highlighted in a consumer perception survey, undertaken in 2010 (TNS, 2010). In the European Union (EU), legislation is in place to prevent presence of residues. A central piece of legislation is the EU Directive 96/23 on monitoring of certain substances and residues thereof in animals and animal products (Anon., 1996). This Directive is up for renegotiation, implying that discussions are currently taking place aiming at further improving the legislation. Such discussions will among others consider the technological development in relevant areas, which has taken place since the Directive was issued in 1996. Moreover, the discussions will include the balance between flexibility and harmonization. In line, an agreement on the minimum number of samples to be taken as part of the official monitoring will be reached. Too few samples disable a meaningful comparison between commodities or Member States, whereas a high number of samples is costly (Alban et al., 2018).

New multi-class and highly sensitive laboratory techniques like e.g. HPLC LC-MS/MS can provide results for a high number of substances simultaneously. However, this laboratory method is more expensive than the biological methods in place in some countries for some substances. Hence, to avoid an increase in costs, the sampling frame need to be evaluated and maybe adjusted. Moreover, monitoring data are available, which can be used to estimate the prevalence of residues in various food items.

The EU monitoring of residues in meat is, according to Annex I, Directive 96/23, based upon a division of substances into Group A and B. Group A consists of substances with an anabolic effect as well as substances which are prohibited. Group B consists of veterinary drugs as well as environmental contaminants (Anon., 1996). Annex IV in the Directive prescribes that a total of 0.05% of the slaughter pig population should be sampled, and the minimum sample size is 0.02% for Group A, and 0.03% for Group B. These sampling frequencies are further divided into sub-groups; hence not all samples are analysed for all substances in the main group (Anon., 1996), also because sample preparation may depend on matrix and substance. For Group B, a minimum of 30% of the samples are analysed for Group B1 (Antibacterial substances), minimum 30% for Group B2 (Other veterinary drugs), 10% for Group B3 (Other substances and environmental contaminants), and the remaining 30% are distributed in accordance with the local conditions (Anon., 1996). Group B2 and Group B3 are further, each divided into six categories.

As part of the current negotiations about the future legislation, the sampling frequencies are being discussed. The livestock and meat sector is interested in having monitoring programs, which are mean-