PRACTICES AND MODELS FOR MONITORING AND CONTROL OF THE MICROBIAL RESIDUE IN PIGS AND POULTRY APPLIED IN ROMANIA

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Abstract

Withdrawal periods after antimicrobial treatment have been defined as preventing in meat the presence of residues above the maximum residue limits (MRLs). However, errors can lead to residues above MRLs (Alban et al., 2023). The aim of the study was to perform a microbial risk assessment on pork and broiler carcasses. In the European Union (EU), the antimicrobial is prescribed by a veterinarian and the prescription contains information about the withdrawal period needed before the animal can be sent for slaughter (EU Parliament and Council, 2019). (Background:) Study wants to investigate the best practices applied in our country for monitoring microbial residues in pork and poultry carcasses. Procedures are in place to help avoid delivery of milk to the dairy processor or animals to the abattoir prior to the end of the withdrawal period. Still, residues can occasionally be present in animals sent for slaughter, with potential consequences along the whole meat chain (Arsène et al., 2022). (Methods:) Research was based on a qualitative analysis based on two questionnaires, one for business operators, the other to competent authority distributed to pigs and poultry abattoirs and competent authority. A statistical method was carried out for questionnaires analysis. (Results:) The results showed a variation in small or big facilities, abattoirs placing meat on national markets or to be traded and exported. Two best practices models were developed equal applied for pork and poultry production.

The European Commission (2017) has encouraged a very precise use of antimicrobials to limit the residues in food products and antimicrobial resistance (AMR) in human and animal health. Thus, the farmers, the basic on the food chain needs in some occasions treatments with antimicrobial for livestock treatments. The AM is prescribed by a veterinarian and the prescription contains information about the withdrawal period needed before the animal can be sent for slaughter (EU Parliament and Council, 2019). Compliance with the withdrawal periods is required to ensure that residues of prescribed AM will be below the established maximum residue limits (MRLs) in meat (EU Commission, 2010).

Procedures are in place to help avoid delivery of milk to the dairy processor or animals to the abattoir prior to the end of the withdrawal period. Still, residues can occasionally be present in animals sent for slaughter, with potential consequences along the whole meat chain (Arsène et al., 2022). This can happen, e.g., if the treated animal was not properly marked, registration was inadequate, a human error occurred leading to wrong use of a medicine mixer, or there was a miscommunication between the person treating the animal and the person sending the animal for slaughter (Alban et al., 2014). In the EU, the General Food Law Regulation 178/2002 states that food such as meat should not contain residues (EU Parliament and Council, 2002), continuing the policy of the former EU Residue Directive 96/23 (EU Council, 1996).

To document the compliance with acceptable levels of residues of medicinal products in target tissues, monitoring should be conducted. Monitoring can be established and run by the Cas in accordance with legislation (EU Commission, 2022a), or by the abattoirs in the form of their own check programmes if their hazard analysis so indicates. Some parts of a programme can be run as a surveillance programme, e.g., when the release of a tested carcass is pending a negative test result, in line with the definition of surveillance suggested by Hoinville et al. (2013). The question is how the practices related to routine detection and handling of AM residues are applied in Romania and what the best practices may consist of, when balancing consumer safety with the EU policy on minimising food waste. The research topic was originally investigated by the RIBMINS COST Action network how detecting and handling or control are applied in different 28 countries, and what the best practices may be , when balancing consumer safety with EU policy on minimizing food waste.

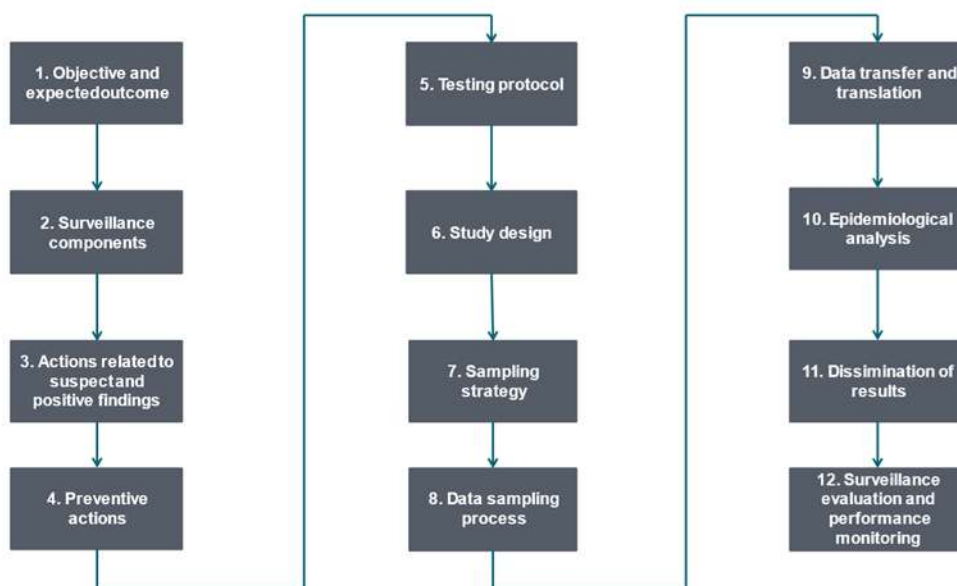The present study shows Romanian example with the expanded studied in pork production applied for poultry industry.

Figure1. . Model for questions followed the elements that form part of risk-based surveillance as described in RISKSUR and SANTERO projects (Alban et al. 2018)

Table 1

Ranked list of objectives for monitoring, where 5 = the most important objective, and 1 = the least important, divided into CA and FBO, and sorted by average value

Objective of monitoring	Average value		Average value	
	CA	No. of answer	FBO	No. of answers
Detect and handle positive samples	4.3	8	3.7	10
Show compliance with legislation Asse	4.1	8	3.6	10
Assess prevalence in pig / poultry meat	3.6	8	3.4	10
Show pig / poultry producers that monitoring is in place in abattoir	2.9	8	3.4	10
Other objectives	2.1	8	3.2	10

Table 2

Handling of the tested carcass

	When a sample is taken from pig / poultry carcass, how is carcass handled?					
	Carcass detained, until result becomes available	Carcass not detained	Other handling	I do not know	No. of answers	No. of respondents
CA	NA	8	1	1	8	8
FBO	NA	10	2	2	10	10

MATERIAL AND METHOD

Two questionnaires were developed, targeting the competent authority (CA) and the food business operator (FBO). The survey was undertaken in spring 2022 then in spring 2023 was completed with poultry answers.

Questionaries consists of 1) a general description, 2) a description of the monitoring/surveillance programme in force, 3) Food chain information and 4) a special case when a pig or poultry producer contacts the abattoir because one or more pigs have been sent in before the end of the withdrawal period. Romanian study case involved 12 respondents. The statistical analysis was carried out with the statistical software programme SAS version 9.4 (SAS Institute, Inc., Cary, North Carolina, USA). For quantitative questions, the chi-square test was used (or Fisher's test, if one or more of the cells in the contingency table had an expected cell count of <5) to determine statistical differences between the CA and FBO responses. Unless mentioned specifically, the group of answers saying "I do not know" was not included in the analyses. For qualitative questions, the text was condensed to produce a short summary using grounded theory (Creswell & Poth, 2017). Two different models for a set of best practices for detecting and handling in relation to AM residues in pigs were developed. In the next step of the research the models were expanded to poultry industry. The development was inspired by the general principles of the microbiological criteria for foodstuffs (EU Commission, 2005). The questionnaires were based on previous research developed in RISKSUR project. a set of guidelines developed by Codex Alimentarius were used, which present the principles for the design and implementation of food safety assurance programmes associated with the use of veterinary drugs (Codex Alimentarius, 2014). The general principles of the microbiological criteria for foodstuffs (EU Commission, 2005) were a base line for developing the models of the best practice. In that Regulation, a distinction is made between a requirement for immediate action, such as a recall because of a perceived food safety risk, and a requirement for investigating the process due to an observed deviation that raises suspicion the procedures in place were not employed correctly (Alban at al. 2023)

RESULTS AND DISCUSSIONS

In total, 18 responses to the questionnaires were received during the collection period. Of these, 8 were from CA representatives and 10 from FBO representatives (Table1).

In original study applied in and outside Europe, two different approaches were used for detection and handling, where the first was based on not retaining the tested carcass (monitoring approach) whereas the second was based on detaining the carcass until a negative test result would be become available (surveillance approach).

Based on the original questionnaires and upon the answers (78 answers from 28 countries), two models for best practices were developed showing that the surveillance objectives differ substantially between the individual abattoirs / countries. The first model (monitoring), based on cheap biological laboratory methods can be used followed by chemical verification. The limitation of the method implies the results are delivered in 6 to 8 weeks. The matrix needs to be kidney for pork and liver for poultry because biological methods have a low sensitivity. .

For the second model (surveillance), it is important that the results become available fast, because the release of the carcasses is pending a negative test result. This implies that direct chemical verification is used, which is more expensive than the biological methods, but with a higher sensitivity. The meat may be used like matrix for both species pork and poultry, reflecting a more appropriate exposure for the real consumer case.

In monitoring model, a detection of residues above MRL s may be interpreted like a process hygiene criterion, with focus on the process. This implies that a visit would be made to the pig or poultry farm, from which the positive animal originated, but the carcass tested would not be detained and meat will be recall if possible but in most of the cases when the results become available the meat could be already consumed with an impossibility of recalled.

In surveillance model, findings would be interpreted as a food safety criterion implying a visit to the farm as well as detaining the carcass to be tested to avoid expensive call-backs and food waste for a sustainable environment.

In Romania, the carcasses are not detained until MRL result becomes available, but if tests prove positive results a call- back through Rapid Alert System for Food and Feed (RASFF) system in line with Article 50–52 in the EU General Food Law Regulation 178/2002.

This approach reflects the view that detection and handling of meat/carcasses with residues is one of the main objectives for a safe product to the customer. Table 2 illustrates the image of our country.

Model of monitoring could reflect abattoirs mainly placing meat on the national market, whereas Model of surveillance could reflect abattoirs with main parts of meat traded and

exported. In specific Romanian case main export is represented by poultry meat, for pork some restrictions being in place due to Swine Fever.

Problems may arise if the FBO interprets the system as monitoring, but the competent authority interprets it as surveillance. Because with the arrival of test results weeks to months after slaughter, meat from the slaughter day may have been distributed widely, complicating withdrawals. Therefore, there should be an agreement between FBO and CA regarding which system is in place. The food safety level is low in both models, because the proportion of carcasses tested is very low.

In Romania national surveillance programme implies tests annually and private standards monitoring up to 2 times per year. This implies that the testing should more be seen as a verification of the procedures in place of which compliance with withdrawal periods is the most important and main responsibility is on the farm level or antemortem inspection. The questionnaires showed another limitation – the withdrawal period may differ widely in between countries for the same drug and concentration.

CONCLUSIONS

Based on the surveillance, we -have shown there is a plethora of ways to undertake routine monitoring and control of AM residues in pigs and poultry. The main difference in the systems in place in Europe relates to whether the tested carcass is detained (the least common) or not (the most common). The two models developed were based on the approach used in the EC Regulation on microbiological criteria for foodstuffs. When not detained, the system can be characterized as monitoring, where the only corrective action in case of a positive sample > MRL is to visit the farm of origin. In contrast, when the tested carcass is detained, the system can be characterized as surveillance,

involving condemnation of the tested carcass if the test results indicate that the concentration is above MRL. Problems arise when the two model are mixed, e.g., the FBO sees it as monitoring and the CA interprets it as surveillance and if positive results above MRL are found require product withdrawal (Alban et al., 2023)

The outcome of this study could act as a basis for more evidence-based and harmonised procedures in the future to improve decision-making regarding condemnation of carcasses and by-products that contain (or might contain) AM residues above the MRLs. With a recommendation

of surveillance model to be applied in Romania, too to reduce food waste (in case of expensive call-back) without jeopardizing consumer safety, which is in line with the EU ambition to ensure more sustainable and climate friendly food production.

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