Ractopamine – Growth promoter in meat and meat products

Introduction

Today’s lifestyle and intensive animal production have resulted in human exposure to a variety of adverse effects, such as residues of veterinary drugs, hormones, contaminants and other toxic substances. People are, as individuals, to reduce these effects to a certain extent, through dietary and other non-dietary measures. It is necessary to provide an integral system that combines multi-disciplinary science, to ensure the protection of the consumer's health, i.e., protecting the entire human population from the harmful effects of residues of veterinary medicines (coccidiostats). These may also include meat from the human body through the chain, thus jeopardizing health. This example outlines an effective way in which the production of certain substances in meat, their excretion and body fluids, tissues, animal products, animal feed and drinking water. The Directive also regulates the coordination of work of inspector laboratories through the regulation on the grounds of their national territory and the central competent authority. In the current annual quantity of maximum allowable quantity of daily intake of residues or products is determined to ensure that the residues of the substances or products is placed under the control of authorized persons until the competent authority implements the procedures and measures. This Directive also stipulates the measures to be fulfilled when impor- ted from third countries, and the manner of sampling. All third countries wishing to trade in live animals and animal products with EU Member States are obliged to

Residue Monitoring Plan

In addition to the primary objective of consumer protection, the systemic control of substances is intended to ensure the conditions for free trade in live animals and animal products. To this end, the European Union passed Council Directive 96/23/EC on measures to monitor cer- tain veterinary medicinal products and residues thereof in live animals and animal products, which clearly lays down the necessary measures to be implemented for monitoring substances or products of groups listed as important for this se- gment for the protection of human health (EC, 1996). This includes the monitoring production process of animals and primary products of animal origin, with the aim of detecting the presence of residues of certain substances in live animals, their excrement and body fluids, tissues, animal products, animal feed and drinking water. The Di- rective also regulates the coordination of work of inspector laboratories through the regulation on the grounds of their national territory and the central competent authority.

In order to protect consumer health and to create conditions for the trade of live animals and animal products with the European Union, and with third countries wishing to trade in products with the European Union, there is legal obligation to monitor and control approved substances or products, which may be residues of animal products, and which may be suspected or proven to be harmful to human health. The implementation of the monitoring plan for residues ensures a systematic method for revealing the possible presence of illegal drugs or certain substances above permissible limits in live animals and animal products, and residues thereof in live animals and animal products that are sampled for laboratory testing, the competent inspection authorities are required to implement all the necessary follow-up measures in order to determine the causes and origins of illegal drugs, or the reasons that led to exceeding the maximum allowable amount in foods of animal origin intended for human consumption. This paper describes a follow-up procedure conducted after the detection of coccidiostats in table eggs from farm hens.

Keywords: Residues, plan, follow-up, coccidiostats

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Today’s lifestyle and intensive animal production have resulted in human exposure to a variety of adverse effects, such as residues of veterinary drugs, hormones, contaminants and other toxic substances. People are, as individuals, to reduce these effects to a certain extent, through dietary and other non-dietary measures. It is necessary to provide an integral system that combines multi-disciplinary science, to ensure the protection of the consumer’s health, i.e., protecting the entire human population from the harmful effects of residues of veterinary medicines (coccidiostats). These may also include meat from the human body through the chain, thus jeopardizing health. This example outlines an effective way in which the production of certain substances in meat, their excretion and body fluids, tissues, animal products, animal feed and drinking water. The Directive also regulates the coordination of work of inspector laboratories through the regulation on the grounds of their national territory and the central competent authority. In the current annual quantity of maximum allowable quantity of daily intake of residues or products is determined to ensure that the residues of the substances or products is placed under the control of authorized persons until the competent authority implements the procedures and measures. This Directive also stipulates the measures to be fulfilled when imported from third countries, and the manner of sampling. All third countries wishing to trade in live animals and animal products with EU Member States are obliged to

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Case report

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Summary

Introduction
submit the results of the analysis of the previous and the sampling plan for the coming year, by 31 March of the current year.

The Residue Monitoring Plan (RMP) was passed pursuant to the Decision on the monitoring of residues of certain substances in live animals and animal products (SG BiH, 2002). The RMP is implemented in such a way that samples are taken in the field, properly stored (kept at 4°C or frozen at -18°C if the samples are not submitted immediately after collection), and analyzed in an accredited laboratory. Consequently, in order to avoid feed contamination, it is necessary to perform thorough cleaning of the equipment after the analysis of a single sample to avoid cross-contamination of feed between samples. In the laboratory, the samples are analyzed for all substances to be tested within the RMP.

Anticoccidials

Anticoccidials belong to group B2, for which residue control is intended to control compliance with the maximum allowable quantity of residues applicable in accordance with the Regulations on the maximum levels of pharmacologically active substances in products of animal and plant origin. Anticoccidials are substances intended to kill or retard the growth of protozoan species that cause disease in animals. Due to their chemical properties, anticoccidials are lagging behind the other antimicrobial classes. Consequently, in order to avoid feed contamination, it is necessary to perform thorough cleaning of the equipment after the analysis of a single sample to avoid cross-contamination of feed in animal feed, which is not the target group. This cross-contamination can lead to exposure of animals that are not the target group (hens) and the potential risk to the health of these animals, and the possibility of residues remaining in food products obtained from these animals. To reduce the possibility of cross-contamination of animal feed, the feed business operators are required to abide by the Good Manufacturing Practice principles (EFSA, 2008).

Detection of coccidiostats (maduramicin and salinomycin) in table eggs

During the regular implementation of the RMP for coccidiostats (maduramicin), the results of laboratory analysis on eggs of farming birds were shown to be compliant results. In the case of suspicion or non-compliant results, the laboratory is required to inform the client and the central competent authority thereof as quickly as possible, and to notify the competent veterinary authority of the results obtained and the maximum permitted residues of authorized substances. The RMP is adopted for each calendar year.

Implementation of the Residue Monitoring Plan

All substances to be tested within the RMP were divided into two groups (A and B) and their subgroups (Table 1). For substances of group A, prohibited substances, residue control is carried out in order to detect the illegal administration of a prohibited substance or abuse of approved substances. In group B, approved substances for use, residue control is carried out to verify compliance with the maximum permitted quantity of residues of veterinary drugs and other substances in accordance with the legislation in force. Animal species and animal products that may be fed to or used on the premises of feed mixing facilities are used as the target group of feed for which the detection of coccidiostat residues is shown in Table 2.

Anticoccidials

Anticoccidials belong to group B2, for which residue control is intended to control compliance with the maximum allowable quantity of residues in food resulting from the unavoidable carry-over of these substances in non-target feed (EC, 2012). At the time of the follow-up the maximum allowed Ordinance was not yet in force. The method used in the quantification of coccidiostats (maduramicin) was liquid chromatography tandem mass spectrometry (LC-MS/MS), which was validated in terms of sensitivity and specificity in accordance with Commission Decision 2002/657/EC (EC, 2002).

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Follow Up - taking action in the case of violations

For the case of a positive result, on 1 December, who was officially notified by the competent authority with instructions on taking measures in the case of a violation. In the further procedure, the competent authority must order a ban on the use of the feed and order a ban on the feed used in the feed production plant. The competent authority must order the feed to be exported from the country. The laboratory results are required to be made by the Good Manufacturing Practice principles.

Feeding included the composition (though no information was given for the included coccidiostatic), instructions for use, expiration date, and the production date. On 2 December, the competent authority performed additional laboratory analysis of samples of feed. The laboratory analysis showed that the amount of maduramicin found was 5 µg/kg, and the level of undertaking measures (level of action) was 2 µg/kg. The Ordinance on the maximum level of coccidiostats or histomonostats in food resulting from the unavoidable carry-over of these substances in non-target feed (EC, 2012) had not yet been in force. The method used in the quantification of coccidiostats (maduramicin) was liquid chromatography tandem mass spectrometry (LC-MS/MS), which was previously validated and accredited in accordance with Commission Decision 2002/657/EC (EC, 2002).

Immediately upon receipt of the laboratory results, the competent central authority notified the competent veterinary inspector, and suggested action according to Articles 21 and 22 of the Decision on the monitoring of residues.

On that same day, 13 December, the authorized veterinary inspector visited the mini-farm, and it was decided that the farm was to be decontaminated. On 17 December, egg samples were taken from the sample of feed from the package showed high amounts of coccidiostats (maduramicin) in the concentration of 25 µg/kg. Immediately upon receipt of the laboratory results, the central competent authority notified the competent veterinary inspector, and suggested action according to Articles 21 and 22 of the Decision on the monitoring of residues. The RMP is implemented in such a way that samples are taken in the field, properly stored (kept at 4°C or frozen at -18°C) if the samples are not submitted immediately after collection, and analyzed in an accredited laboratory. Consequently, in order to avoid feed contamination, it is necessary to perform thorough cleaning of the equipment after the analysis of a single sample to avoid cross-contamination of feed between samples. In the laboratory, the samples are analyzed for all substances to be tested within the RMP.
farm, considering the trade ban on live animals and products which lasted 19 days and resulted in the disposal of 4,560 pieces of table eggs.

Also, we concluded that the animal feed importer suffered economic damage in terms of the limited or total trade bans for animal feed (Figure 3), and the additional costs incurred due to sampling at border crossings and the trade bans on goods pending the results of the laboratory analyses.

Economic damage was also incurred for the feed mixing factory in another country during the period of investigation and implementation of corrective actions. The factory was brought under enhanced inspection, which included a ban on its products on the domestic and export markets, and additional laboratory testing was performed on its finished products and premixes, until it could be determined that the cause of every manufacturer and supplier of premix that is not produced and declared their products in accordance with the applicable legislation of that State.

All food business subjects for which certain incompatibilities according to the current legislation were ascertained in the course of the follow-up, will be subjected to targeted sampling for coccidiostats residues (maduraminycin and salinomycin) in addition to regular audits in the implementation of the RMP in the coming years.

Conclusions

During the implementation of the RMP, past practice has shown that laboratory results of analyzed samples almost always show compliance with the prescribed standards. For this reason, some have questioned the justifiability of spending financial resources for such programs if the results are still unsatisfactory. The example outlined here shows that such programs are justified and they should continue to be implemented and improved, both in providing targeted education for veterinary inspectors, laboratory personnel and food business operators as well as for developing new laboratory methods and information systems, for the purpose of protecting consumers and creating conditions for free trade in live animals and animal products. The starting point in this case was the negligence of the premix manufacturers, who disregarded the principles of Good Manufacturing Practice and did not clearly declare the presence of coccidiostats on their product. Damage in terms of endangerment of human health and the economic damages that it caused to safely assumed larger proportions of the RMP is not spent on a professional and highly responsible manner.

We hope that this example will assist other colleagues dealing with these or similar situations, by sharing the lessons we have learned. The complete procedure of regular sampling carried out in legally defined terms was that the period from sampling to its delivery to the laboratory must be short, which since then has been applied in practice. We are confident that any future follow-up in the same or a similar situation should be carried out as in Figure 4, where the period of consumer exposure to harmful impacts of certain residues and the resulting financial costs caused by the follow-up is significantly reduced.

Table 1. Classification of substances to be tested as part of the RMP.

| Group A – Substances which have an anabolic effect and unapproved substances |
|-----------------------------|-------------------------------------------------|
| 1.                         | Steroids (androst-17β, testosterone, progesterone) |
| 2.                         | Antithyroid substances (2-thiouracyl) |
| 3.                         | Antibiotics (aminoglycosids, ampicillin, benzylpenicillin, clavulanic acid, cephalexin, cefuroxime, cefotaxime, enrofloxacin, erythromycin, macrolides, nitrofurantoin) |
| 4.                         | Organophosphorus pesticides (chlorpyrifos, diazinon, disulfoton, parathion, parathion-methyl) |
| 5.                         | Hexachlorobenzene, hexachloride (α,β,δ), lindane, metoxychlor, PCBs |
| 6.                         | Anticoccidials including nitroimidazoles (tontrazuril, amprolium, robenidin, nicarbazin, narazin, losalocid, monensin, salinomycin) |
| 7.                         | Coccidiostats (amitraz, fenvalerate, permethrin, pyrantel, salinomycin) |
| 8.                         | Sedatives / including a tranquilizer and beta-blockers (azaperone, ketamine) |
| 9.                         | Other steroidal anti-inflammatory drugs (cortisone) |
| 10.                        | Other pharmacologically active substances (dexamethasone, methylprednisolone) |
| **Total number of substances** | **36** |

| Group B – Veterinary drugs and contaminants |
|---------------------------------------------|-------------------------------------------------|
| 1. Antibacterial substances, including sulfonamides and quinolones |
| 2. Antihelmintics (clonazen, levamisole, thiamazole, fenbendazole, flubenazole, oxfendazole, oxfendazole, thiabendazole, triclabendazole, mebendazole, sequester) |
| 3. Anticoccidials including nitroimidazoles (tontrazuril, amprolium, robenidin, losalocid, monensin, salinomycin) |
| 4. Coccidiostats (amitraz, fenvalerate, permethrin, pyrantel, salinomycin) |
| 5. Sedatives / including a tranquilizer and beta-blockers (azaperone, ketamine) |
| 6. Other steroidal anti-inflammatory drugs (cortisone) |
| 7. Other pharmacologically active substances (dexamethasone, methylprednisolone) |

| **Total number of substances** | **27** |

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Consistent implementation of the residue monitoring plan for consumer health protection

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Figure 2. Destruction of eggs, re-sampling and lifting the trade ban on the farm.

Figure 3. Sampling of feed and sales ban.

Figure 4. Chronological comparison of survey conducted and a future follow-up procedure.

Summary
Listeria monocytogenes and other Listeria species are microorganisms which can significantly affect the health of consumers transferring by meat and meat products. Special interest was emphasized due to the possibility of aerogenic contamination of meat and products with microorganisms forming bioaerosol. In this paper, the presence of Listeria monocytogenes and Listeria spp and in bioaerosol in air of meat processing plants and the importance of selecting the methods of air sampling as impaction or cyclonic method were studied.

In experiment the cyclonic method shows higher sensitivity for the detection of L. monocytogenes and other Listeria spp in bioaerosol of the air in meat industry. With cyclonic bioaerosol sampling method, we found the presence of Listeria spp in 41% of the sample, of which 24% of the sample confirmed on the presence of L. monocytogenes. The results show a significant potential for aerogenic contamination of meat and meat products with L. monocytogenes via bioaerosol in the meat industry. Cyclonic method indicated more reliable air sampling in detecting the presence of L. monocytogenes in bioaerosols compared with the impact method.

Key words: Listeria monocytogenes, impaction and cyclonic air sampling methods, meat production

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Znanstveni rad

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Ispravak

U broju 4/14 za rad pod nazivom „Izolacija zrakom prenosive bakterije Listeria spp u mesno-prerađivačkoj industriji” objavljena je kategorizacija rada kao Pregledni rad umjesto Znanstveni rad.

Isoliation of airborne Listeria spp in meat processing industry

Scientific paper