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Risk assessment of coccidostatics during feed cross-contamination: Animal and human health aspects

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ABSTRACT

Coccidiosis, an intestinal plasmodium infection, is a major infectious disease in poultry and rabbits. Eleven different coccidiostats are licensed in the EU for the prevention of coccidiosis in these animal species. According to their chemical nature and main biological activity, these compounds can be grouped as ionophoric (monensin, lasalocid sodium, salinomycin, narasin, maduramicin and semduramicin) or non-ionophoric (robenidine, decoquinate, nicarbazin, diclazuril, and halofuginone) substances. Coccidiostats are used as feed additives, mixed upon request into the compounded feed. During the technical process of commercial feed production, cross-contamination of feed batches can result in the exposure of non-target animals and induce adverse health effects in these animals due to a specific sensitivity of mammalian species as compared to poultry. Residue formation in edible tissues of non-target species may result in unexpected human exposure through the consumption of animal products. This review presents recent risk assessments performed by the Scientific Panel on Contaminants in the Food Chain (CONTAM) of the European Food Safety Authority (EFSA). The health risk to non-target species that would result from the consumption of cross-contaminated feed with coccidostats at levels of 2, 5 or 10% was found to be negligible for most animal species with the exception of salinomycin and monensin in horses because of the particular sensitivity for which toxicity may occur when cross-contamination exceeds 2% and 5% respectively. Kinetic data and tissue analyses showed that residues of coccidiostats may occur in the liver and eggs in some cases. However, the level of residues of each coccidiostat in edible animal tissues remained sufficiently low that the aggregate exposure of consumers would not exceed the established acceptable daily intake (ADI) of each coccidiostat. It could be concluded that technical cross-contamination of animal feeds would not be expected to adversely affect the health of consumers.

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Introduction

Coccidiosis is a common protozoan infection in farm animals, affecting predominantly young animals, whereas older animals develop immunity. Currently, herd health management cannot exclude coccidian infections in large poultry and rabbit units and the use of coccidiostatic agents (coccidiostats) is considered necessary to maintain animal health and welfare, and to avoid substantial losses due to acute and often lethal coccidiosis. Of the 40.7 million tonnes of feed produced annually for chickens for fattening, turkeys and rabbits, approximately 18.3 million tonnes is manufactured with the addition of a coccidiostat (IFAH, 2007; EFSA, 2008a, 2008b, 2008c, 2008d, 2008e, 2008f, 2008g, 2008h, 2008i, 2008j). In the European Union, 11 coccidiostatic substances are authorised as feed additives for the prevention of coccidiosis in one or more animal species (mainly chicken, turkeys, and rabbits). According to their chemical nature and main biological activity, these compounds can be allocated to two groups: the group of ionophoric carbocyclic polyethers (monensin, lasalocid, salinomycin, narasin, maduramicin and semduramicin) and the non-ionophoric compounds, covering structurally diverse substances: robenidine, decoquinate, nicarbazin, diclazuril, and halofuginone. An overview over these products and the corresponding maximum limits in feed (MRL) are given in Table 1a and 1b.

Coccidiostats for poultry and rabbits are exclusively used as feed additives, mixed with compounded feeds in the producing feed mills upon request. For the mandatory pre-marketing licensing procedure, a sound database including efficacy testing, technical properties and toxicological testing needs to be provided by the applicant. The data package includes studies on kinetics in the target animal species and the deposition (residue formation) of the drug and/or its metabolites in animal tissues. For feed additive use of coccidiostats, these data on the coccidiostat-containing feed additive product are submitted to the European Food Safety Authority (EFSA) and more specific to the Panel dealing with Additives and Products or Substances used in Animal Feeds (FEEDAP) for assessment. The FEEDAP established, on the basis of the toxicological data, acceptable daily intakes (ADI) for human consumers and compared the ADIs and other toxicological data with residue depletion data to establish maximum residue limits for food products of animal origin intended for human consumption. The MRL for a foodstuff gives a legally-enforceable limit to the amount of a marker residue (either the coccidiostat or a metabolite of it) that is without a health risk for consumers.

Practical experience indicates that during the technical production process, residual amounts of a feed batch remain into the production line of the feed mill, thereby contaminating the following feed batches. This type of cross-contamination of subsequent feed batches can result in an exposure of non-target animals. This situation is not addressed during the licensing procedure by the FEEDAP Panel. Therefore the Panel on Contaminants in the Food Chain (CONTAM) of EFSA was given the task to assess the health risks for humans and animals associated with the currently technically unavoidable cross-contamination of feed batches. In this approach, three scenarios were considered, i.e. a level of cross contamination of 2%, 5% and 10%, respectively as these rates reflect potential managerial options to prescribe the maximum rate of cross-contamination in feed mills. This review presents the considerations and outcome of the recent risk assessments on coccidiostats performed by the (CONTAM) of the (EFSA) given the task to evaluate the potential risk for animals and consumers at this level of cross contamination.

Definitions and regulatory framework for coccidiostats

Prerequisites for licensing

Currently, coccidiostats are authorised for use as feed additives according to the provisions of Council Directive 70/524/EEC and Council Regulation No (EC) 1831/2003 that repeal Directive 70/524/

Table 1a
Coccidiostats authorised in the EU as feed additives according to Council Directive 70/524/EEC (list of authorised additives in feedingstuffs (2004/C 50/01)) and Regulation (EC) No 1455/2004 with amendments. This table presents the commercial products and their target species, including the statutory maximum levels in feed and the withdrawal periods for the group of ionophoric carbocyclic polyethers.

Coccidiostat	Species	Trade name	Concentration in feed[a] (mg/kg)	WP[b] (days)
Lasalocid A sodium	Chickens for fattening	Avatec	125	5
	Chickens reared for laying (max 16 weeks)	Avatec		
	Turkeys (max. 12 weeks)	Avatec		
Maduramicin ammonium	Chickens for fattening	Cygro	5	5
	Turkeys (max. 16 weeks)	Cygro	5	5
Monensin sodium	Chickens for fattening	Coxidin	125	1
		Elancoban		
	Chickens reared for laying (max. 16 weeks)	Elancoban	120	1
	Turkeys (max. 16 weeks)	Coxidin	100	1
		Elancoban		
Narasin	Chickens for fattening	Monteban	70	1
Salinomycin sodium	Chickens for fattening	Salinomax	70	1
		Sacox		1
		Kokcisan		3
	Chickens reared for laying (max. 12 weeks)	Sacox	50	–
	Rabbits for fattening	Sacox	25	5
Semduramicin sodium	Chickens for fattening	Aviax	25	5

[a] The maximum level authorised in complete feed (mg/kg) is given.
[b] WP: Withdrawal period.