A quantitative risk assessment for the cross-contamination of pig feeding-stuffs as a cause of antimicrobial residues

Marilena Filippitzi[1*], Jeroen Dewulf[1]

[1] Veterinary Epidemiology Unit, Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium

* E-mail address: mariaeleni.filippitzi@ugent.be

Background Information

Cross-contamination (or "carry-over"): The transfer of traces of an antimicrobial from a batch of medicated feed (MF) to the following batch of non-medicated feed (n-MF).

A public health risk posed by resistance to antimicrobials and a potential influence of this "carry-over" on resistance selection.

Belgium: cessation of MF production on the main mixing line. Now, mixing at the end mixer or the fine dosing system (FDS) which is attached to the transport truck.

AIM:

(1) Investigate all possible pathways of exposure of pigs to cross-contaminated feed

(2) Estimate the total weight of cross-contaminated batches of non-medicated feed produced per year (focus: Belgium)

Methodology

Description of exposure pathways (figure 1).

Model built using @Risk® software (Palisade Corporation®) and run at 10,000 iterations per simulation.

Data used: Belgian Compound Feed Industry Association (BEMEFA), 2013; Putier F., 2010; Stolker et al., 2013.

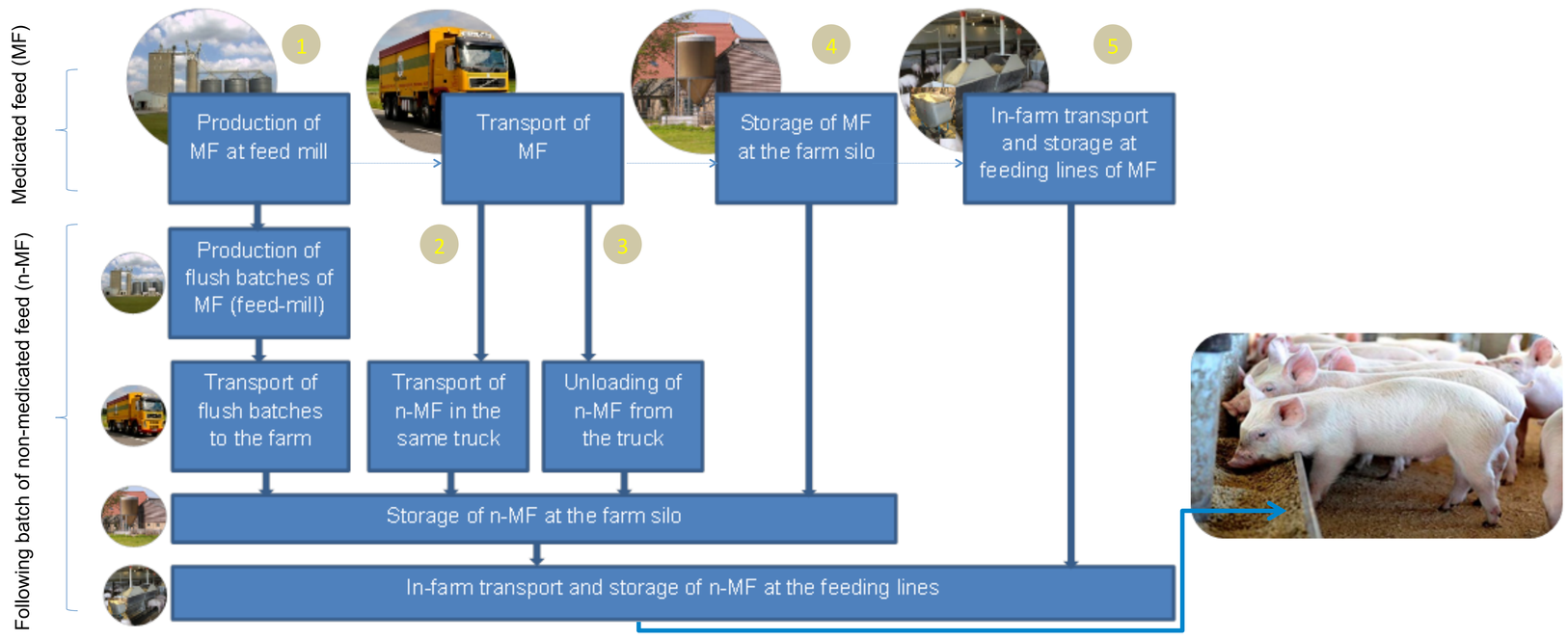

Figure 1. The exposure pathways (1 - 5)

Results

Table 1. Estimated weights of cross-contaminated bathes of non-medicated feed (in tons) and levels of cross-contamination, in total and for different combinations of pathways, for antimicrobial concentrations (AB) >0.

Variable	Description	Formula	min	mean	max
W_T	Total weight of cross-contaminated batches of n-MF produced in Belgium (BE) per year	$= W_{FM} + W_{TR} + W_F$†	262,309	651,446	1,732,819
W_1	Total weight of cross-contaminated batches of n-MF produced in BE per year, via the transport and farm-related pathways only	$= W_{TR} + W_F$	227,960	323,484	352,608
C_T	Level of cross-contamination of feed batches, in the total of feed produced in BE per year	$= (W_T/T)*100$, where T (total weight of animal feed produced in BE per year)= 6,500,000 tons	4.1 %	9.9 %	26.4 %
C_1	Level of cross-contamination of feed batches, in the total of feed produced in BE per year, via the trasnport and farm-related pathways only	$= (W_1/T)*100$	3.6 %	4.9 %	5.4 %
C_2	Level of cross-contamination saved due to the new measures taken in BE, in the total feed produced in BE year	$= (W_{FM}/T)*100$	0.3 %	5.0 %	21.9 %
C_{Cross}	Level of cross-contamination saved due to the new measures taken in BE, in the total amount of cross-contaminated feed	$= (C_2/ C_T)*100$	5.5 %	41.1 %	83.3 %

† W_{FM} is the weight of cross-contaminated flushing batches produced in BE per year through the feed-mill pathway (1). Likewise, W_{TR} and W_F correspond to the transport- (2, 3) and farm- (4, 5) related pathways, respectively. Note: The figures are rounded for presentation purposes.

Discussion

Cross-contamination is almost unavoidable, but a considerable risk of antimicrobial "carry-over" is **avoided** due to the cessation of the MF being produced in the main mixing line (Belgium).

Transport- and **farm- related pathways not to be underestimated**, despite the **low** concentrations of antimicrobial residues detected.

High degree of uncertainty included in these estimations, due to very limited quantitative data.