



The Vertical Transmission of Antibiotic Residues from Parent Hens to Broilers

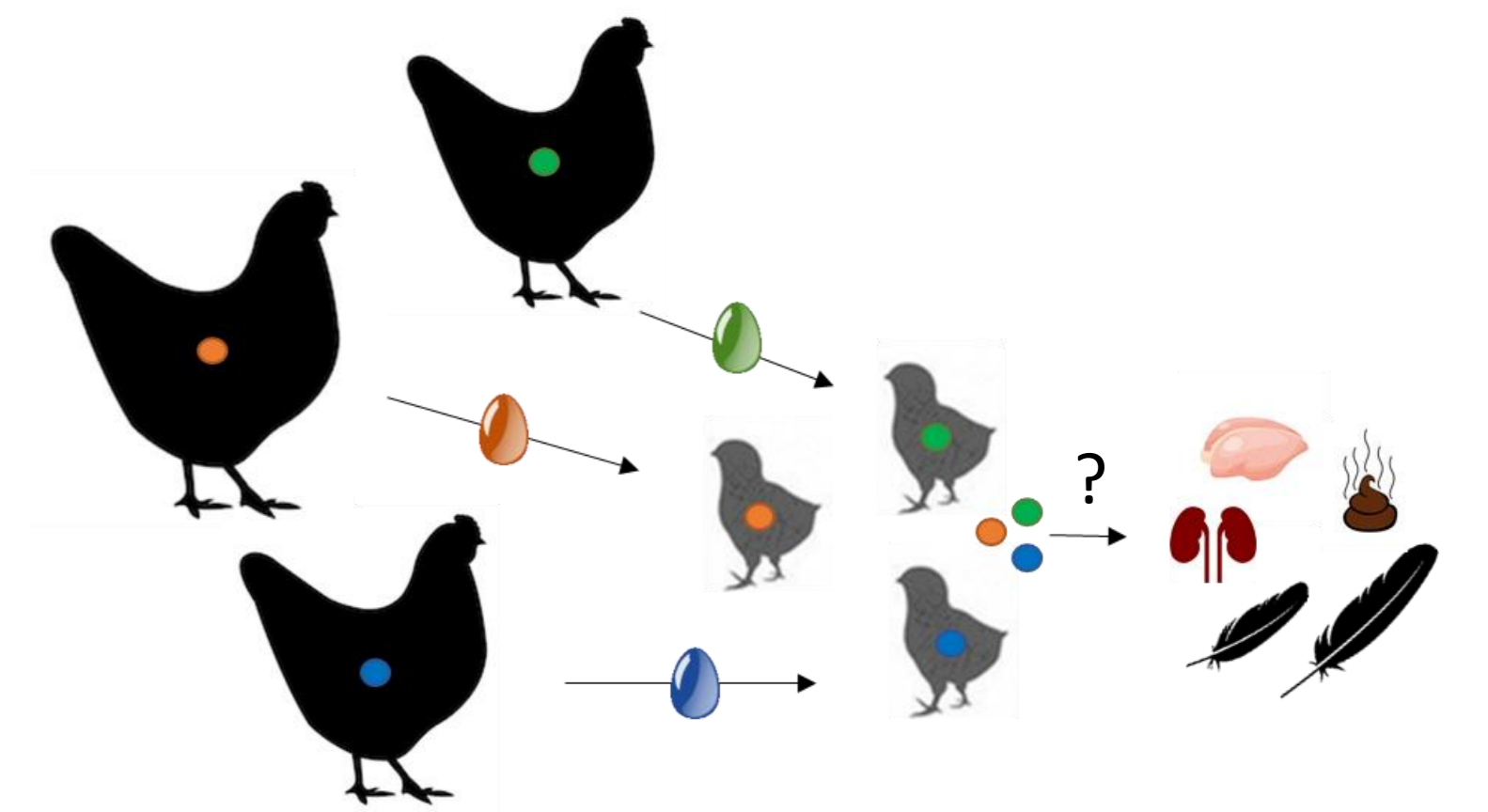
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Introduction

Imprudent and superfluous use of antibiotics contributes to the selection of resistant bacteria, which is a large treat to human health. Therefore, methods have been developed to determine whether animals have been exposed to antibiotics, using matrices in which antibiotic residues persist for a relatively long time, like feathers. To be able to state that antibiotics were administered, other routes besides direct administration, through which animal matrices could contain antibiotic residues, should also be considered. There is a chance that residues from parent hens subsequently transfer to the new-born chick and are detectable in the next generation broiler. However, to what extent vertical transmission of antibiotic residues from parent hens to broilers occurs has not been studied before. In this research the vertical transmission from parent hen to broiler was investigated, including the analysis of eggshells of the hatched broilers, as this is another waste stream potentially reused for feed.

Animal study

Parent hens were treated with sulfachloropyridazine (SCP) ●, doxycycline (DC) ● and enrofloxacin (ERF) ●.



Phase 1: Two eggs per treatment group were taken for analysis on the day before commencing the treatment (day 0), daily during the treatment (day 1 – 5) and at the 4 days after the end of the treatment (day 6 – 9).

Phase 2: Remaining eggs were hatched, and matrices of the broilers were investigated for each treatment; **Muscle, kidney** (4, 5, 6 weeks of age), **manure** (1 day after hatching and weekly until slaughter), **feathers** (4, 5 and 6 weeks of age).

Results & discussion

After treatment in laying hens, residues in the eggs increase rapidly and decrease after 5 or 6 days after the start of the treatment (figure 1). DC concentrations found in eggshell were higher than in egg.

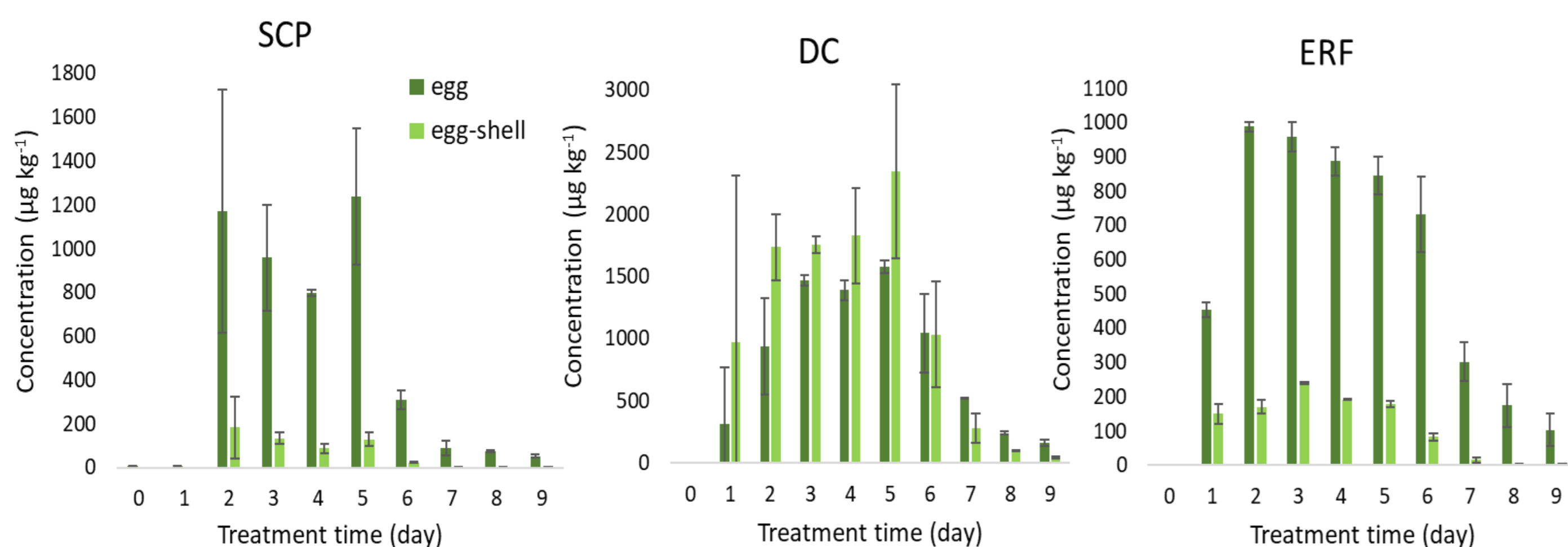


Figure 1. Figure 1. Detected residues of SCP, DC and ERF in egg (dark green) and eggshells (light green) of animals treated during day 1 – day 5. Vertical lines indicate the standard deviation of the concentrations found in the two samples taken (biologic variation).

None of the muscle and kidney samples contained any detectable residues of SCP, ERF or DC.

High concentrations of residues are present in broiler manure 1 day after hatching; **2.0 mg kg⁻¹ (SCP), 2.4 mg kg⁻¹ (DC) and 3.0 mg kg⁻¹ (ERF)**. Residues then decrease exponentially and remain detectable until 8 days (SCP) or even 30 days after hatching (DC and ERF).

Conclusions

- Eggshell is a possible non-invasive matrix that could be used to detect the application of antibiotics in parent hens.
- Vertical transmission cannot result in MRL violations in the broiler kidney or meat at slaughter.
- Vertical transmission to manure and feathers taken at 4-6 weeks of age is still detectable.
- This route of exposure should be considered when low levels of antibiotic residues (freely or not-freely extractable) are detected.

After treatment of the parent hens, the broilers' tail feathers contain on average < 50 µg kg⁻¹ and the wing feathers < 10 µg kg⁻¹ freely extractable antibiotic residues (figure 2). Not-freely extractable residues were also determined (table 1) and found to be < 10 µg kg⁻¹.

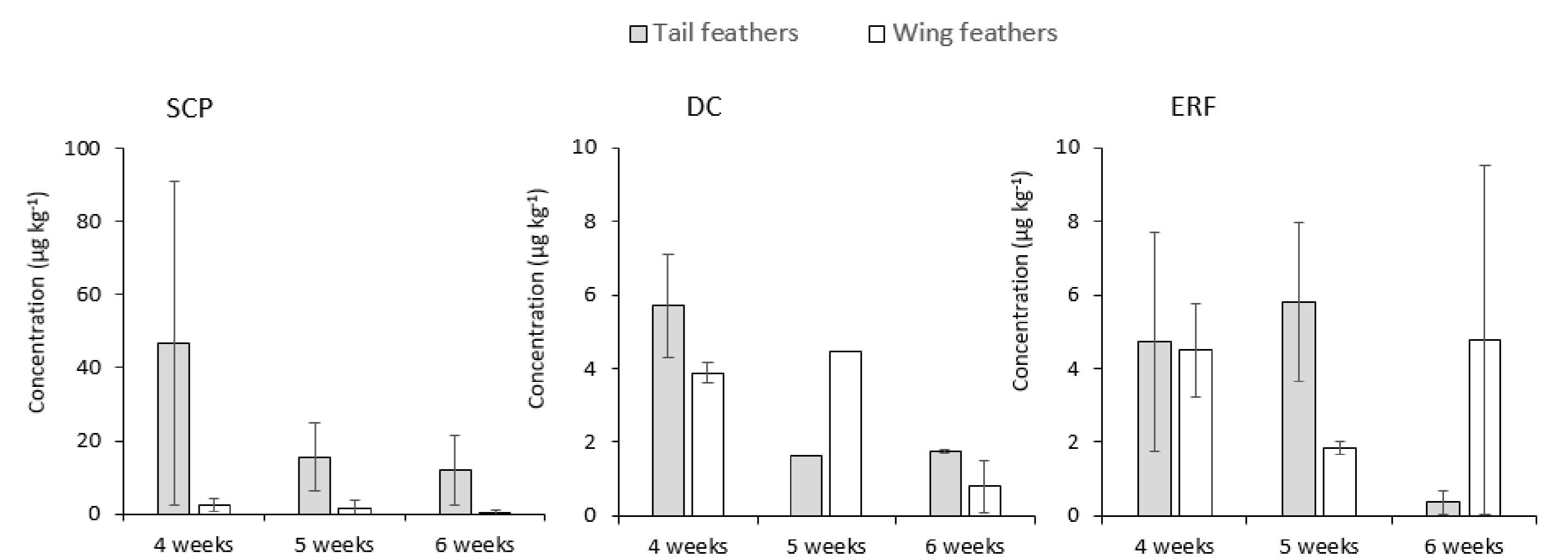


Figure 2. Figure 2. Detected (freely extractable) concentration of SCP, DC and ERF in tail and wing feathers of broilers of the 3 respective antibiotic treatments at 4, 5 and 6 weeks of age. Vertical bars represent the standard deviation, n=3 (except for DC at 5 weeks: n=1).

Table 1. Comparison of freely / not-freely extractable residues of SCP, DC and ERF (µg kg⁻¹) in a selection of wing and tail feathers

Treatment parent hen	Wing/tail	Sampling time	SCP	DC	ERF
SCP	Tail	Week 6	14 / 2	-	-
	Wing	Week 5	4 / <2	-	-
DC	Tail	Week 4	-	5 / <2	-
	Wing	Week 4	-	4 / <2	-
	Wing	Week 4	-	4 / 2	-
	Wing	Week 4	-	4 / 3	-
ERF	Wing	Week 4	-	-	5 / 3
	Wing	Week 4	-	-	3 / <2
	Wing	Week 4	-	-	5 / 6
	Wing	Week 4	-	-	9 / <2

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