

Effect of improved feed efficiency by *Lawsonia intracellularis* vaccination on Nitrogen emission in fattening pigs

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Background and Objectives

Nitrogen (N; elementary protein component) in adequate quantity and quality is essential for optimal growth and performance in pigs. Negative environmental impact, like subsequent eutrophication resulting from too high N-output e.g., by pig production, led to a regulatory limitation on N-emission for German agriculture. The objective of this report was to show the impact of improved feed efficiency after *Lawsonia intracellularis* vaccination in combination with ration design on the N-excretion in fattening farms.

Material and Methods

Performance data (e.g. average daily gain, ADG; feed conversion ratio, FCR; Table 1) from field observations of 9 farms with a history of subclinical or clinical ileitis was recorded in non-vaccinated (NV) and vaccinated (PL) (intramuscularly/ intradermally Porcilis®*Lawsonia*/ID; at 3-11 weeks of age) batches. NV batches, used as historical control, were compared to PL vaccinated batches after implementing *Lawsonia intracellularis* vaccination to control ileitis.

Table 1. Animal numbers and performance data of the 9 observed farms before (NV - Non-Vaccinated) and after (PL - Vaccinated) introduction of Porcilis®*Lawsonia* vaccination.

	Animal number	ADG	Weight Gain	Mortality	FCR
NV	64943	920.7	94.9	2.8	2.84
PL	21951	936.9	96.6	1.8	2.73

N-excretion was modeled using the freely available program "Calculation of an individual stable balance" of the Lower Saxony Chamber of Agriculture (LWK NDS) (1). Effects of performance data on N emission were calculated with four crude protein (CP) levels in feed rations (CP %/kg; 88% dry matter: "universal" 17.0, "N reduced" 16.4; "N greatly reduced" 15.4; "N very greatly reduced", 14.4).

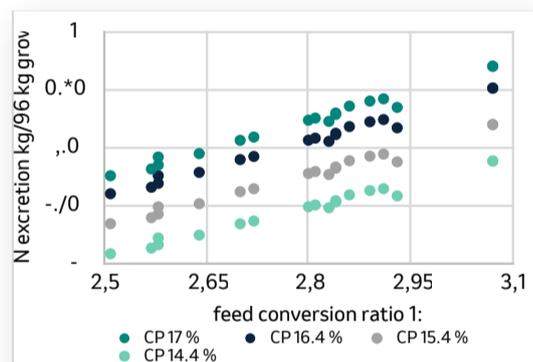
Results

The mean reduction of N-excretion in PL vaccinated batches was 5.4-5.9% for all feeds when compared to non-vaccinated batches. The farm with the biggest improvement of FCR with PL vaccination (-0.27; -9.5%) showed a reduced N-excretion of 15.7% (Table 2). Between the non-vaccinated group with worst FCR and highest assumed CP content in feed (FCR 3.07; CP 17.0%; 57.9 g N/kg LW) and the PL vaccinated group with the best FCR and very greatly N-reduced feed (FCR 2.51; CP 14.4%; 32.6 g N/kg LW) a saving of 25.3 g N/kg LW (43%) was calculated. When this was related to the observed average weight gain of 96 kg/pig, the worst group emitted 5.6 kg N/ finishing pig, whereas the best groups showed 3.2 kg N/ finishing pig (Fig. 1).

Table 2. Calculated effect of FCR change with Porcilis®*Lawsonia* vaccination on the N excretion (%) of fatteners fed with different N containing rations (CP 17.0-14.4%; 88% DM)

farm	FCR change		Calculated change N excretion %			
	1:	%	CP 17.0%	CP 16.4%	CP 15.4%	CP 14.4%
1	-0.16	-5.21	-7.55	-7.68	-7.92	-8.21
2	-0.27	-8.79	-12.6	-12.8	-13.2	-13.7
3	0.02	0.74	0.91	0.93	0.97	1.01
4	-0.03	-1.06	-1.32	-1.34	-1.39	-1.45
5	-0.10	-3.41	-3.60	-3.67	-3.79	-3.95
6	-0.07	-2.71	-5.52	-5.63	-5.86	-6.14
7	-0.06	-2.27	-3.33	-3.40	-3.54	-3.70
8	-0.27	-9.51	-14.3	-14.6	-15.1	-15.7
9	-0.03	-1.04	-1.27	-1.29	-1.34	-1.39

Figure 1. Calculated N excretion of fatteners (kg/96 kg growth) with different P containing rations (5.1 to 4.1 g/kg FM; 88% DM) and FCR observed on the farms before and after the introduction of the Porcilis®*Lawsonia* vaccination.



Discussion and conclusion

Under the conditions of this field observation and model calculation, it has been shown that N-emission from pig farms can be limited by reducing CP content in feed and increasing feed efficiency by *Lawsonia intracellularis* vaccination. This suggests that both are favorable and suitable tools to reduce N-emission, making pig production more sustainable.

¹ LWK NDS: Berechnung einer individuellen Stallbilanz; https://www.duengebehoerde-niedersachsen.de/duengebehoerde/news/33749_Berechnung_einer_individuellen_Stallbilanz; Retrieval date 10.07.2023