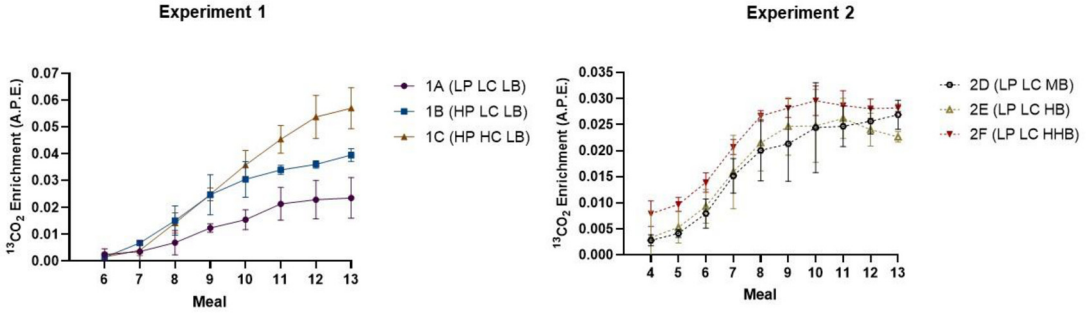

FIGURE 1. Effect of different prime and constant doses of ^{13}C-Phe **(experiment 1)** and prime dose of $NaH^{13}CO_3$ **(experiment 2)** on $^{13}CO_2$ expressed as atoms percent excess (APE) in a cat. Isotope was provided orally over ½-hourly small meals. Values are $\bar{x}$ ± SD. In experiment 1, the 6th meal contained a priming dose of ^{13}C-Phe and $NaH^{13}CO_3$ and the remaining meals the constant dose of ^{13}C-Phe. In experiment 2, the isotope protocol was modified, and the 4th meal contained a priming dose of ^{13}C-Phe and $NaH^{13}CO_3$ and the remaining meals the constant dose of ^{13}C-Phe. **LP**: Low prime (4.8mg/kg ^{13}C-Phe), **HP**: High prime (9.4mg/kg ^{13}C-Phe); **LC**: Low constant (1.04 mg/kg ^{13}C-Phe), **HC**: High constant (2.4 mg/kg ^{13}C-Phe); **LB**: Low bicarbonate (0.176mg/kg $NaH^{13}CO_3$), **MB**: Medium bicarbonate (0.264mg/kg $NaH^{13}CO_3$), **HB**: High bicarbonate (0.352 mg/kg $NaH^{13}CO_3$), **HHB**: Higher bicarbonate (0.44 mg/kg $NaH^{13}CO_3$).

Results and Discussion

In experiment 1, the slope of $^{13}CO_2$ enrichment was not significant in all treatments ($P > 0.05$). However, the enrichment of $^{13}CO_2$ was still rising (Figure 1) and therefore a steady-state was questionable; thus, BLL and BLQ models were developed to estimate the breakpoint. Steady-state was observed at meal 11.8, 10.7 and 12.4 for treatments 1A, 1B and 1C, respectively. The high prime and constant dose of L-[1-^{13}C]-Phe in 1C did not obtain steady-state and resulted in a higher $^{13}CO_2$ as expected. Hence, the lower prime and constant doses of L-[1-^{13}C]-Phe were chosen for experiment 2 while higher $NaH^{13}CO_3$ prime doses were tested. Fasted background samples were collected to allow earlier isotope provision. No differences were observed between fasted and fed background enrichment of $^{13}CO_2$ ($P < 0.05$). However, caution should be taken to use $^{13}CO_2$ background in the fasted state if the macronutrient composition of the dietary treatments differs substantially. The slope of $^{13}CO_2$ enrichment was significant ($P < 0.05$) in treatment 2D, while it was not significant ($P > 0.05$) for the others. Breakpoint was obtained at meals 9.7, 8.9 and 8.6 for treatments 2D, 2E and 2F, respectively. Based on statistical and visual assessments, we recommend using the isotope protocol with a higher dose of $NaH^{13}CO_3$ (2F) to achieve steady-state $^{13}CO_2$ enrichment during isotope dilution studies in cats.

Conclusion and Implications

Steady-state breath $^{13}CO_2$ enrichment can be achieved in cats using a 13 thirty minute small meals regimen; wherein a priming dose of $NaH^{13}CO_3$ (0.44 mg/kg) and L-[1-^{13}C]-Phe (4.8mg/kg) should be provided in the 4th and 5th meal, following by a constant dose (1.04 mg/kg) of L-[1-^{13}C]-Phe in the next meals. Fasted background of $^{13}CO_2$ can be used if there are no major differences in the macronutrient composition of dietary treatments. This protocol resulted in an isotopic steady-state condition necessary to successfully use the IAAO technique in cats, which we plan to use to determine indispensable AA requirements and amino acid bioavailability in cats in the future.

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doi: 10.1016/j.anscip.2022.07.197

O188 Estimating endogenous nitrogen losses in ileal digesta of broiler chicken fed fibres differing in particle size and solubility by ^{15}N-isotope dilution technique

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Keywords: Chicken; Arabinoxylan; Soybean hulls; Grain; ^{15}N-labelling

Introduction

Ingested feed, especially dietary fibres, along the gut provokes endogenous nitrogen losses (ENL) that originate from sloughed epithelial cells, mucins, and digestive enzymes. Coarse and insoluble dietary fibres are typically considered to have an abrasive effect on the mucosal

Table 1
Effect of particle size and addition of soluble fibre on [^{15}N]-atom percentage in ileal digesta and body tissues, and estimated endogenous N proportion in ileal digesta of female broilers measured at 37 days of age.

Dietary treatment			[^{15}N]-atom percentage				Endogenous N proportion
Particle size	Arabinoxylans addition	N	Ileal digesta	Ileum	Pancreas	Liver	
Coarse	No	24	0.398	0.51	0.589	0.584	0.75
Fine	No	24	0.399	0.517	0.588	0.583	0.741
Coarse	Yes	24	0.389	0.485	0.553	0.544	0.774
Fine	Yes	24	0.395	0.499	0.57	0.584	0.766
Pooled SEM			0.001	0.003	0.004	0.005	0.004
P-values[1]							
PS			0.243	**	0.264	*	0.275
AX			*	***	***	**	**
PS×AX			0.143	0.682	0.43	**	0.961

[1] Model established P-values for fixed effects of particle size (PS) arabinoxylans (AX) or their interaction (PS×AX); *P*-values are indicated by $^{*}P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$.

surface of the gut, whereas soluble fibres tend to increase mucus layer and bind enzymes (Mateos et al., 2012). Dänicke et al. (2000) proposed a method to quantify ENL using ^{15}N-isotope dilution technique with oral supplementation of a ^{15}N-non-protein-N source. This experiment aimed to estimate ENL in broilers fed fibres varying in particle size and solubility using oral administration of a mixture of non-protein-^{15}N and protein-^{15}N. The endogenous nitrogen proportion (ENP) in ileal digesta was calculated from the N-enrichment in ileal digesta and digestive organs, assuming the latter is representing the endogenous N-pool.

Material and Methods

Effects of particle size and soluble fibres were tested in a 2 × 2 factorial arrangement. Four maize-based diets were formulated to contain coarse (intact) or fine (hammermilled using a 1.5 mm screen) soybean hulls (SBH) (10%,w/w), with or without addition of purified arabinoxylans (5%, w/w, substituted for maize starch) fed from 10 d of age. A total of 96 day-old female Ross308 broiler chickens were obtained from a commercial hatchery and randomly assigned to blocks of 32 pens (3 birds/pen), located in three climate-controlled rooms.
Endogenous N-constituents were labelled by oral administration of a mix of g/L ^{15}N-enriched milk protein concentrate (AP = 2.27) and g/L ^{15}NH4Cl (AP $\geq$ 98) dissolved in saline solution, (25 mL/day at the first day followed by 10 mL/day) between 26 and 31 days of age. After a withdrawal period of 6 days, birds were dissected and ileal digesta and ileum-, pancreas-, and liver tissues were collected, immediately frozen and stored at -20oC. ^{15}N-enrichment of samples was analysed by combustion-isotope ratio mass spectrometry. Subsequently, the ENP in ileal digesta was calculated as follows:

$$\text{Endogenous N proportion} = (\text{AP ileal digesta})/(\text{AP endogenous N})$$

Where enrichment of the endogenous N-pool was calculated as the weighted average of enrichment of ileum, pancreas, and liver tissues, assuming relative nitrogen turnover contributions of these tissues based on Souffrant (1991).

$$\text{AP endogenous N} = (\text{AP ileum} \times 0.71) + (\text{AP pancreas} \times 0.19) + (\text{AP liver} \times 0.10)$$

Data were analysed using a General Linear Model including the fixed effects of particle size, arabinoxylan addition, and their interaction. The results were considered statistically significant if $P < 0.05$.

Results and Discussion

^{15}N-enrichment in ileal digesta was smaller (−0.004, $P = 0.025$) and the estimated ENP was greater (+0.0245, $P = 0.002$) in diets with AX addition (Table 1). Moreover, ^{15}N-enrichment in the ileum was lower in chickens offered coarse SBH (+0.0105, $P = 0.008$). The AP in the liver was greater when feeding different particle SBH only when AX were present in the diet (PS AX, $P = 0.032$). The results of this study are not in line with those of Dänicke et al. (2000), where the ENP and ^{15}N-enrichment in body tissue were lower and not significantly different among dietary treatments. To investigate the cause of variation among studies, it requires further observations of the change in ^{15}N-enrichment of the excreta during the labelling and withdrawal period. The maximal enrichment realized during labelling period and the decline rate in enrichment during withdrawal period may indicate differences in ^{15}N-absorption and protein turnover among the treatments, respectively.

Conclusion and Implications

Preliminary data showed that the isotope dilution technique indicates differences in ENL in ileal digesta, mainly related to addition of soluble fibres to the diet but not fibre particle size. Furthermore, the dietary effects on tissue enrichment are interesting and deserve more attention.

Funding

This work was performed within the framework of the research program Innovational Research Incentives Scheme Veni with project number 15948, financed by the Netherlands Organisation for Scientific Research (NWO), Wageningen University & Research, and Trouw Nutrition R&D.

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doi: 10.1016/j.anscip.2022.07.198

O189 Altered feed intake of the sow during lactation has productive consequences

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Keywords: Feed intake pattern; Lactating sows; Reproductive performance; Electronic feeders

Introduction

The reproductive and productive consequences of insufficient nutrient intake of sows during lactation are well known (Martineau and Badoouard, 2009). Knowing the sow feed intake pattern and having the possibility of detection of sows with poor or altered feed intake would allow to anticipate possible problems and maximize their production. In this regard, the use of electronic feeders permits to have a real-time data available and to evaluate more precisely feed consumption of sows during lactation (Piñeiro et al., 2019). The aim of this work was to evaluate the feed intake of multiparous sows by using electronic feeders and their impact in productive parameters.

Material and Methods

A total of 1058 daily feed intake records were collected from 585 Topigs lactating sows (from parity 2 to parity 6) in a commercial farm in Segovia, Spain. Data were collected using a computerized feeding system (Gestal Solo, JYGA Technologies, Quebec, Canada). In order to unify the data, lactation was set to 28 days and sows with lactation less than 21 days were removed from the database.
The lactation feed intake data was classified in three different groups by clustering using k-medoids from the family of unsupervised classification machine learning algorithms. Clustering was applied in six standarized variables determined according to the averages of feed consumption in the different sub-periods of the lactation phase. Consequently, three clusters were defined: 1) High consumption group (HFI): 661 sows (62.5%); 2) Medium consumption group (MFI): 356 sows (33.7%); and 3) Low consumption group (LFI): 41 sows (3.8%). Reproductive parameters of the current cycle were analyzed including prolificacy (total number of piglets and born alive, percentage of stillborn), preweaning mortality (PWM) and weaning-to-first service interval (WFSI). Farrowing rate of sows in the following cycle was also analyzed. Data analyses were conducted by using the proc GLIMMIX (ANOVA parametric test) and proc NPAR1WAY1 (Wilcoxon non-parametric test) of the SAS software (version 9.4; SAS Inst. Inc., Cary, NC).

Results and Discussion

Feed intake during the lactation period of all three groups is presented in the Figure 1. The HFI sows showed a high, and considered as normal, feed intake pattern during lactation. The MFI followed the same tendency, but the total feed consumption was statistically lower ($P < 0.05$). The feed intake of sows from the LFI group was very low, especially during the first third of lactation. In total, sows in HFI consumed 16.2% and 41.0% more kg of feed during the whole lactation period than the MFI and LFI sows, respectively (HFI: 196.4 kg; MFI: 164.5 kg; LFI: 115.8 kg; $P < 0.01$). Despite the differences found in total consumption, all patterns grew logarithmically as previously described by Koketsu et al. (1996).

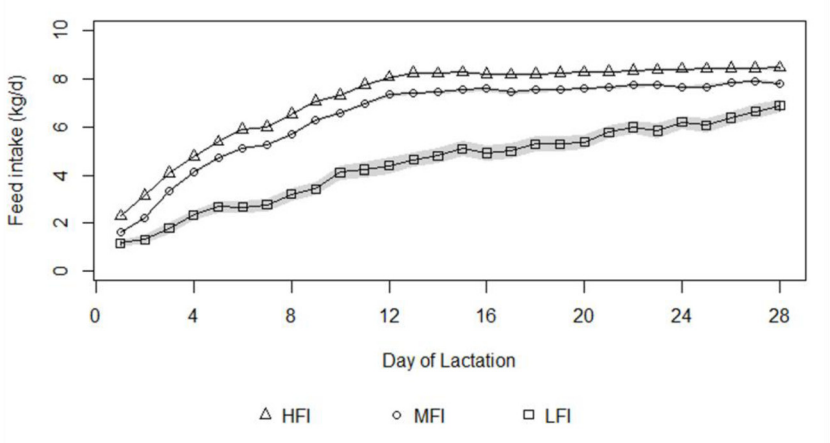

Figure 1. Mean ± estimated standard error (shaded area) feed intake of sows during the lactation period. HFI: high feed intake; MFI: medium feed intake; LFI: low feed intake. HFI, MFI and LFI were statistically different (P<0.05).