INFLUENCE OF ZEOLITE ON SCATOLE CONTENT OF SWINE FAT TISSUE

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Introduction

Boar taint may represent a well-known disadvantage of pork quality. It appears in a number of non-castrated male swine (young boars). It is caused by presence of lyposolubile compounds, androstenone and scatole, that are the main constituents of boar taint. It has been estimated that these compounds, individually or in combination, are involved in boar taint in about 70% of the variations (Lundstrom et al, 1988). The origin of these compounds, however, is quite different.

Androstenone is an end product of the steroid pathway in the testis which is released into the bloodstream and accumulated in the adipose tissue and salivary glands. Variations of androstenone content in fat tissue basically depends on mass and /or age of the animal, as well as on genetic factors (Lundstrom et al).

In contrast, scatole is produced via degradation of amino-acid tryptophane by intestinal microorganisms (Brooks and Pearson, 1986). Scatole content in swine fat tissue depends on many factors. Nevertheless, unlikely to androstenon, variations of the scatole content in the fat tissue are very closely related to the nutrition and other non-genetic factors.

Materials and Methods

Eighty swine (Landrace/Yorkshire cross) were divided in two groups. Within the control group, twenty gilts and twenty young boars were fed without added zeolite in their diet. Within the experimental group, twenty gilts and twenty young boars were fed with 0.5% zeolite added to their diet. All animals from both groups were held during the study under the same conditions.

Zeolite is natural mineral with 90% of active compound klinoptilolite. The rest of mineral components are heilandite, mordenite, quartz, sanidine and biotite. Chemical composition: 64.88% of SiO_2, 12.99% of Al_2O_3, 3.26% of CaO, 2.00% of Fe_2O_3 and 0.07% of MgO, as well as some other minor compounds.

At age of 165-172 days, swine were transported to the slaughterhouse, held in stables for 20 hours and then slaughtered. Stunning and bleeding of swine and other post-slaughter operations with the carcasses were performed in a identical manner for all swine. Samples of fat tissue were taken after completion of chilling of the halves (24 hours post-slaughter), packed in the plastic bags, frozen and stored in that way until analysing. The content of scatole in fat tissue was determined by a method based on spectrophotometry.

Results and Discussion

As presented in Table 1, the average scatole content in fat tissue of gilts was 0.23 mg/kg and 0.15 mg/kg in the control group and in the experimental groups, respectively (difference $p<0.05$). The fat tissue of young boars contained scatole, on average, 0.35 mg/kg and 0.16 mg/kg in the control and the experimental groups, respectively (difference $p<0.001$). There was no significant difference in the average scatole content in the fat tissue between gilts and young boars within the experimental group (0.15 mg/kg and 0.16 mg/kg, respectively). However, within the control group, the average scatole content in fat tissue differed significantly ($p<0.01$) between gilts and young boars (0.23 mg/kg and 0.35 mg/kg, respectively).

It is generally considered that the upper limit for scatole content in swine fat tissue, based on organoleptical acceptance, is 0.25 mg/kg (Mortensen 1991; Stole and Sedlmeier 1990). In our investigations, in the control group, the contents of scatole in fat tissue higher than 0.25 mg/kg were found in 50% of young boars and 25% of gilts. In the experimental group of swine (fed with zeolite in their diet), scatole contents higher than 0.25 mg/kg were found in only 15% of young boars and gilts. The odour of "tainted meat", however, is not a unique characteristic of the boars only. Boar taint may be detected, at the low levels, also in castrates and gilts. Nevertheless, much higher incidence of boar taint has been reported for boars, than for castrates and gilts (Hansson et al. 1980).

There are many factors contributing to formation of scatole in swine, but nutrition is frequently considered as a factor that play the major role. It seems that higher energy level and smaller amounts of raw fibres in swine diet may lead to the decrease of scatole content in the fat tissue (Judge et al., 1987), but, on the other hand, there are opinions that higher energy intake by swine via the feed increase scatole content in the fat tissue.

Furthermore, treatment of swine with wide-spectrum antibiotics may decrease the scatole content in the fat tissue (Jensen, 1988). In contrast, the application of the testosterone to swine increases scatole content in the fat tissue (Mortensen 1991). Also, pH may play certain role in the scatole formation, as (Jensen et al. 1995) reported an increased initial rate of production of scatole at pH 6.5, but it was decreased at the pH 5.0 and pH 8.0.

When considering the mechanism of the effects of zeolite on scatole formation in swine, it is important to notice that zeolite has no influence on pH in the digestive system environment. It is known that this mineral firmly binds mycotoxins, prevents their resorption and then is being excreted via

faeces. It may be assumed that the scatole binding and elimination from swine organism occur in a similar way.

Conclusion

The addition of 0.5% of zeolite to swine feed significantly decreased the scatole content in swine fat tissue. Percentage of fat tissue samples with scatole content above 0.25 mg/kg was significantly lower in swine that were fed with feed supplemented with zeolite.

Table 1 - The effects of zeolite added to feed on content of scatole in swine fat tissue

		Control animals (no zeolite in diet)		Experimental animals (0.5% zeolite in diet)	
		Gilts	Boars	Gilts	Boars
Number of animals in experimental group		20	20	20	20
Mean value of live weight prior to slaughtering (kg)		93.60	96.10	94.55	92.22
Content of scatole in fat tissue (mg/kg)	Mean value	0.23 (A)	0.35 (B)	0.15 (A1)	0.16 (B1)
	Range	0.162-0.480	0.146-0.638	0.066-0.344	0.098-0.262

Significance of differences:
A versus A1 $p<0.05$
B versus B1 $p<0.001$
A versus B $p<0.01$
A1 versus B1 no significant difference

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