THIN SOW SYNDROME (TSS): THE EFFECT OF AMPEROZIDE

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SUMMARY

Sixty sows suffering from typical post-weaning TSS were divided into three groups: (1) 20 as negative controls (NC); (2) 20 as positive controls (PC) treated with vitamins, trace elements and antibiotics; and (3) 20 injected with amperozide (2 mg/kg body weight), a new neuroleptic compound with antistress and anxiolytic properties. Amperozide treated sows fully recovered (P<0.05) and 80% became pregnant, while figures for the PC and NC groups were only 15% and 10% respectively. Mortality was up to 50% in the NC, 40% in the PC and only 15% in the amperozide treated group (P<0.05). These field results warrant further studies in unravelling the aetiology and prevention of this condition.

INTRODUCTION

The thin sow syndrome (TSS), first reported in 1968 by MacLean, is a common problem particularly in stalled sows of lean breeds, in which weight loss occurs in lactation and early pregnancy, followed by failure to regain weight. This may become progressive, resulting in poor fertility, emaciation and death (Taylor, 1986). The aetiology may be related to a combination of causes such as parasitism, low environmental temperatures and inadequate feed intake during lactation (Taylor, 1986). Nevertheless, in many field cases when all the above factors are not present, TSS still occurred (Kyriakis & Olsson, 1988, personal observations), causing economical problems in pig farms using intensive methods of production. Thus, TSS may have an aetiology related mainly to social and environmental stressors during the very critical period of lactation, especially in cases of large litters. Also, in many clinical cases of this syndrome, renal vascular lesions, unrelated to parasitism, believed to be stress induced, have been identified (MacLean, 1968; Leigh, 1978). For these reasons TSS may be related to another stress-induced disease, the wasting pig syndrome (WPS) at weaning. The characteristic wasting symptom of the pigs is a reduction in body weight gain, accompanied by biochemical changes that include decreased plasma levels of alkaline phosphatase and zinc, frequently combined with a non-specific eczema on the back and an increase of hair growth (Martinsson et al., 1976, Correspondence to S.C. Kyriakis, POB 21559, Panorama 552 01, Thessaloniki, Greece.)
1978). In the majority of cases, TSS has similar clinical symptoms to WPS (Kyriakis and Olsson, 1988, personal observations), but the biochemical profile of the WPS is yet unknown. In the case of WPS amperozide (Fig. 1) was used with very good results (Kyriakis & Andersson, 1989). Amperozide is a new psychotropic compound with effects on nerve transmission in the central nervous system (CNS), specifically in the limbic part of the brain. The characteristic feature of amperozide is that it modifies emotional behaviour (aggression, conflict and social stress) without causing sedation. Furthermore, amperozide seems to interact with central neuroendocrine processes involved in the regulation of stress reactions (Andersson & Albinsson, 1985; Kyriakis & Andersson, 1989). The aim of the present investigation was to elucidate the effect of amperozide on the weight gain of sows with TSS and on their health status.

![Chemical formula of amperozide: 4-[4,4-bis(4-fluorophenyl)butyl]-N-ethyl-l-piperazinecarboxamide.](image)

**Fig. 1. Chemical formula of amperozide: 4-[4,4-bis(p-fluorophenyl)butyl]-N-ethyl-l-piperazinecarboxamide.**

**MATERIALS AND METHODS**

**Trial farm and animals**

The field study was conducted in the facilities of the largest commercial pig farm in Greece, with 3250 sows under production. The prevalence of TSS was approximately 6% of the sows during post-lactation. Supporting treatment is based on the use of injectable products that stimulate appetite and the immune system, such as B-complex vitamins, especially cyanocobalamin-B₁₂, vitamins A and D₃, selenium and vitamin E and broad spectrum antibiotics. Also special attention was given to improve nutrition, with the use of special feed (with DE, 14·5 MJ/kg; crude protein, 18%; lysine, 1·0% and with the addition of aromatic compounds) and housing conditions. Recovery rate is very low, long lasting and it is not cost effective.

General sow management at the farm includes: (1) two antiparasitic medications per year using ivermectin, (2) proper nutritional standards during pregnancy and lactation (with the feed containing DE, 13·5 MJ/kg; crude protein, 14%; lysine, 0·8% at 1·5 kg/sow plus 0·5 kg/suckling piglet) and (3) farrowing houses with an electronically controlled environment, with only 20-24 raised crates. The farm follows the genetic programme of a very well known European hybrid brand name of lean breed. The 'classical' factors that are associated with TSS are not present in this farm, except that the incidence of this syndrome is common in stalled sows of lean breeds (Taylor, 1986). Piglets are weaned twice weekly at 25 days (± 3) of age and the average number of litters per sow/year is 2·32, with 19·50 slaughter pigs (per sow/year).
Treatments
Sixty newly weaned sows, showing typical symptoms of TSS, were selected in a period of 2 months, from the different farrowing houses of the farm. At the end of each week the selected sows (maximum 10/week) were randomly allocated to the three treatments (trial day 0). Therefore all the experimental animals were within one week post-weaning at the starting point of the medication (trial day 1). The three treatments were as follows:
T1: 20 sows served the trial as negative control animals (NC);
T2: 20 sows served the trial as positive control animals (PC) and they were medicated on day 1 with injectable vitamins: B₁₂ and A plus D₃ preparations on day 2 with injectable vitamin E and selenium and on day 3 with injectable long-acting oxytetracycline (at the recommended doses);
T3: 20 sows treated on the day 1 with 2 mg/kg injectable amperozide (AMP).

Data analysis and records
For statistical evaluation the general linear models (GLM) procedure of the analysis of variance of the Statistical Analysis System (SAS, 1982) was used.
The sows were individually weighed on day 1 and on day 30. During the first 30 days of the trial, health status control was performed using a practical score from 0 to 4: 0 for very poor condition and 4 for normal healthy sow. Mortality and fertility data were recorded for 2 months.

RESULTS

Body weight gain (BWG) and average daily gain (ADG)
On day 1 there was no statistical difference in body weight (P > 0.05) in the three groups. The results of the body weight gain (BWG) and the average daily gain (ADG) are presented in Table I.

<table>
<thead>
<tr>
<th></th>
<th>BWG (kg)</th>
<th>ADG (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative controls (NC)</td>
<td>8.0± 3.2</td>
<td>0.267</td>
</tr>
<tr>
<td>Positive controls (PC)</td>
<td>12.3± 5.1*</td>
<td>0.410*</td>
</tr>
<tr>
<td>Amperozide (AMP)</td>
<td>17.1± 4.0†</td>
<td>0.570†</td>
</tr>
</tbody>
</table>

*Means in each row with asterisk are significantly different in comparison with controls (P<0.05).
†Means in each row with dagger are significantly different in comparison with those having one asterisk and those without an asterisk (P<0.05).

The results show that the sows treated with AMP had an ADG of 570 g compared to 410 g for the PC (P<0.05) and 267 g for the NC (P<0.05). In addition the PC with a daily gain of 410 g was statistically different in comparison to NC (P<0.05).
Health score
The results of the first 30 days for the health score are presented in Table II.
The health score and the general health status, for the majority of the amperozide treated sows, 30 days post-medication, were almost normal and there was a very significant difference in comparison with both PC and NC ($P<0.001$). Also the PC animals had a significant improvement in comparison to NC ($P<0.01$).

### Table II
Average health score (on daily basis) for the first 30 days (0–4; 4=normal health status)

<table>
<thead>
<tr>
<th></th>
<th>NC</th>
<th>PC</th>
<th>AMP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.4±0.52</td>
<td>1.75±0.62*</td>
<td>3.08±0.64†</td>
</tr>
</tbody>
</table>

*Means in each row with asterisk are significantly different in comparison with controls ($P<0.01$).
†Means in each row with dagger are significantly different in comparison with those having one asterisk and those without an asterisk ($P<0.001$).

Mortality and fertility data
Mortality was recorded for 2 months post-medication and the results are presented in Table III.

### Table III
Mortality for 2 months post-medication

<table>
<thead>
<tr>
<th></th>
<th>NC (n=20)</th>
<th>PC (n=20)</th>
<th>AMP (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 sows=50%</td>
<td>8 sows=40%</td>
<td>3 sows=15%*</td>
</tr>
</tbody>
</table>

*Means in each row with asterisk are significantly different in comparison with all other treatments including controls ($P<0.05$).

The fertility data are presented in Table IV.

### Table IV
Fertility data 2 months post-medication

<table>
<thead>
<tr>
<th></th>
<th>NC</th>
<th>PC</th>
<th>AMP*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=20 sows</td>
<td>n=20 sows</td>
<td>n=20 sows</td>
</tr>
<tr>
<td></td>
<td>10 alive</td>
<td>12 alive</td>
<td>17 alive</td>
</tr>
<tr>
<td></td>
<td>2 pregnant (10%)</td>
<td>3 pregnant (15%)</td>
<td>16 pregnant (80%)*</td>
</tr>
</tbody>
</table>

*Means in each row with asterisk are significantly different in comparison with all other treatments including controls ($P<0.05$).
Mortality and fertility data in the amperozide-treated sows were significantly different compared with the other two groups ($P<0.05$). The most important observation was that 80% of the amperozide-treated sows became productive animals again.

**DISCUSSION AND CONCLUSION**

Although the thin sow syndrome (TSS) is a problem in many herds, there are few investigations with regard to prevalence, pathogenesis and treatment. However, in Denmark, it was found that about 30% of condemned sows in one abattoir were 'thin sows' (Kristensen, 1982). Analysis of blood and faeces from these sows did not show any significant changes compared to normal sows. It was concluded that the clinical and haematological changes had similarities with a hyperfunction of the thyroid gland.

In another investigation (Stevens, 1974) it was concluded that 'social stress' was important in the pathogenesis of TSS.

From the present results, the most interesting point is that sows suffering from typical symptoms of TSS and medicated with amperozide recovered shortly after and up to 80% (16 pregnant sows) became productive animals. Only three animals (15%) died and one sow did not become pregnant in the AMP group compared with eight deaths and three pregnant animals in the PC group and 10 deaths and two pregnant sows in the NC group ($P<0.05$). The health status was also almost back to normal 30 days post-medication for amperozide-treated sows and significantly different from PC and NC ($P<0.001$). Finally, BWG in the same period of time, of amperozide-treated sows (30 days) was correlated to the improvement in health status for these pigs. Another interesting observation was that PC sows had better performance in the areas of BWG and health score compared with the NC, but they had almost the same very high mortality (50% versus 40%) and low fertility (15% versus 10%).

However, these results do not imply that amperozide should be used as a 'treatment' to cover up poor husbandry, but it might be a good exploratory tool in studying the complex aetiology of this condition.

**REFERENCES**


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