In the wake of selection of pigs for meatiness of final product, an increased susceptibility to stress has accumulated in heavily muscled breeds. A symptom of stress susceptibility is the pale and watery appearance of skeletal muscles, PSE, and the porcine stress syndrome, PSS, released through an interaction of metabolic events among which a protracted mobilization of adaptive endocrine systems play an important role in the defense mechanism, when the organism is exposed to e.g. excessive muscular activity.

Mobilization of the pituitary-adrenal cortical axis (ACTH and adrenal cortical steroids) is a vital function of the systems meeting external as well as internal situations of stress reactions. The importance of adrenal cortical steroids on the behaviour and reactions of pigs exposed to physical activity (running) has been demonstrated, Ludvigsen, 1959, as well as the effect of adrenal cortical steroids on temperature and pH drop in skeletal muscle after slaughter following exposure of the living pig to high environmental temperature, Ludvigsen, 1960, 1968. Adrenal cortical steroids increase the resistance of the organism to the subcutaneous area followed by a pericardic oedema formation in skeletal muscles.

The Danish Landrace is systematically selected for meatiness throughout the last 50 years. Along with the selection for high protein deposition, stress susceptibility is rather widely distributed within the breeding stock.

The Pietrain pig is well known for its high meatiness, and is very susceptible to PSE and PSS disease, together with high Halothane positivity, resulting from a deficient defense mechanism followed by a lack of adaptability to PSE and PSS conditions, when exposed to external stressors as transportation or other kinds of physical strain.

EXPERIMENTAL

89 Danish Landrace and 7 Pietrain sows were treated with 30-60 i.u., ACTH i.m. on the 100th day of pregnancy. The duration of treatment was determined from the first to the last piglet born including stillborn piglets, the number of which is given as a percentage of piglets born.

The results are shown in the table:

<table>
<thead>
<tr>
<th>Breed</th>
<th>Litter Size</th>
<th>Min</th>
<th>Diff.</th>
<th>% per pig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>166</td>
<td>11.1</td>
<td>7.8</td>
<td>24</td>
</tr>
<tr>
<td>Pietrain</td>
<td>67</td>
<td>10.9</td>
<td>4.8</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>10.7</td>
<td>2.8</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>9.4</td>
<td>1.2</td>
<td>23</td>
</tr>
</tbody>
</table>

Following ACTH treatment the average interval between piglets born was reduced from 24 to 15 minutes in the Danish Landrace, and from 30 to 23 minutes in the Pietrain, a reduction in parturition time in the order of 21-25%. The percentage of stillborn piglets was reduced by around 45% in both breeds. The reason for the lower percentage of stillborn piglets in the Pietrain was that the sows were under constant surveillance during parturition saving a number of asphyxic born piglets.

DISCUSSION

It is known that an increase in circulating adrenal cortical steroids takes place prior to parturition, as it is known that high doses of adrenal cortical hormones induce labor and even abortions. The shortening effect of ACTH on the parturition time thus can be explained by the increase in adrenal cortical hormone release following the ACTH treatment. Reducing parturition time about 21-25% in two breeds, most likely is due to stimulation of uterine contractions. The noticeable difference in parturition time between Danish Landrace and Pietrain, although the Pietrain material is limited may give rise to some general considerations of the response for parturition time per piglet being 36 minutes versus in Danish Landrace 24 minutes in the untreated groups, as well as ACTH reduced the parturition time of the Piettrain to the same time interval as that of the untreated Landrace sows, as mentioned the incidence of PSE and the overall stress susceptibility, the role of Halothane positivity in the Piettrain is much higher than in other breeds, as symptoms of lack of adaptability to external as well as internal reactions.

From this point of view the explanation of the prolonged parturition time is, that Pietrain sows are less able to mobilize the endocrine systems involved in parturition including mobilization of the pituitary-adrenal cortex axis, so that the increase in circulating adrenal cortical steroids essential to uterine contractions do not reach optimal levels. A prolonged parturition time is a major disposing factor.

The shortening of the parturition time by means of ACTH does not seem to be the only cause of the suppression of the clinical PSE cases in the experiment. Most likely the uterine wall through the stimulation of the adrenal cortex is better protected against bacterial infections and development of toxicosis.

Imputed stimulation of the release of adrenal cortical hormones in situations in which optimal function of the adaptive mechanisms is required is the most likely explanation of parturition time of the Piettrain is longer than that of other breeds, indicating a genetic inter-relationship between susceptibility to PSE and normal physiological events as parturition.

CONCLUSION

Injection of a long-acting ACTH preparation on the 110th day of pregnancy reduces parturition time by 21 and 25% in Danish Landrace and Pietrain, respectively. The parturition time of the Piettrain sows was about 25% longer than in the Danish Landrace.

The difference in parturition time between the two breeds, and the shortening effect of ACTH is discussed from general stress susceptibility points of view the Piettrain having a higher incidence of PSE, PSS and Halothane positivity than Danish Landrace, caused by an impaired genetic ability to mobilize adaptive endocrine systems, especially the pituitary-adrenal cortical axis at time of parturition.

ACTH stimulates the adaptive system by way of an increased release of adrenal cortical steroids. One of the effects of an increase in circulating adrenal cortical hormones, is a stimulation of uterine contractions.

The mode of action of adrenal cortical hormones in the defense mechanism of the organism against external as well as internal stress situations, in the present case parturition, is discussed.