

THE EFFECT OF ACTH ON PARTURITION AS
DEFENCE MECHANISM STIMULATOR IN SOWS
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In the wake of selection of pigs for meatiness of final products, an increased susceptibility to stress has accumulated in heavy 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 defence mechanism, when the organism is exposed to e.g. excess 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, 1957, 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 splanchnic area followed by a periferic vasoconstriction 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 a very high susceptibility to PSE and PSS together with around 100% Halothane positivity, resulting from a deficient defence mechanism followed by a lack of adaptability to PSE and PSS conditions, when exposed to external stressors as transportation or other kinds of physical strains.

EXPERIMENTAL

89 Danish Landrace and 7 Pietrain sows were treated with 30-60 I.U. ACTH i.m. on the 110th day of pregnancy. The duration of parturition was recorded 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.

	No. of litter sows size		Stillborn %	Min. per pig	Diff. %
	N	\bar{x}	\bar{x}	\bar{x}	
D.L.					
-ACTH	166	11.1	7.8	24	
+ACTH	89	10.9	4.8	19	21
Pietrain					
-ACTH	14	10.2	2.8	30	
+ACTH	7	9.4	1.5	23	23

Following ACTH treatment the average interval between piglets born was reduced from 24 to 19 minutes in the Danish Landrace, and from 30 to 23 minutes in the Pietrain, a reduction in parturition time in the order of 21 to 23%. The percentage of stillborn piglets was reduced by around 40% 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 asphyxiated born piglets.

DISCUSSION

It is known that an increase in circulating adrenal cortical steroids takes place prior to parturition, as well as it is known that high doses of adrenal cortical hormones induce labour 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 about 21-23% in the two breeds, most likely by 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 reasons for parturition time per piglet being 30 minutes versus in Danish Landrace 24 minutes in the untreated groups, as well as ACTH reduced the parturition time of the Pietrain to the same time interval as that of the untreated Landrace sows. As mentioned the incidence of PSE and the overall stress susceptibility, the rate of Halothane positivity in the Pietrain 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 MMA 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 MMA cases in the experiment. Most likely the uterine wall through the stimulation of the adrenal cortex is better protected against bacterial infections and absorption of toxins.

Impaired stimulation of the release of adrenal cortical hormones in situations in which optimal function of the defence mechanism is required is the most likely explanation of parturition time of the Pietrain 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 longacting ACTH preparation on the 110th day of pregnancy reduces parturition time by 21 and 23% in Danish Landrace and Pietrain sows respectively. The parturition time of the Pietrain sows was about 20% 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 Pietrain 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, in a stimulation of uterine contractions.

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

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