

Some economic advantages can be gained from the production of young boars as pork animals because they have leaner carcasses than castrates and generally show better growth rates. Unfortunately the meat of such animals sometimes produces during cooking an unpleasant odour, referred to as "sex odour". There exists a potential risk which can be considered as a limiting factor for breeders. Then we need convenient and reliable methods of detecting unpleasant odours at slaughter, to decide the way of using the carcasses obtained,

- which could be consumed as fresh meat, if the boar is recognized as free of "sex odour",

- or which could be processed by manufacturing, if the boar is doubtful or dangerous, with regard to odour.

The present work reports the first results of studies performed on this subject in our research center where an attempt has been made to control odours of various tissues heated in dry state at 80 ° C during one hour. Fatty tissues (backfat, kidney fat, subcutaneous fat of inguinal part, mesenteric fat), submaxillary salivary gland, parotid salivary gland and blood serum were considered.

EXPERIMENTAL

Samples were obtained immediately after slaughter and studied within 15 to 20 hours later, after being kept at cool (8° C).

250 ml of blood were collected. Serum was separated from clot and then poured into one flask shut with a screw cap. About 100 g of each fatty tissue were taken and wrapped in a plastic bag. Just before heating they were roughly minced and one sample of 25 g was put into one flask shut with a screw cap. The glandular material was freed of adhering fatty and connective tissue, cut into small pieces and then immediately put into the same type of flask than other materials.

All the flasks were heated for one hour in a drying oven held at 80 ° C. After that the flasks were opened and smelled a first time by each member of the testing panel, consisting of five people, four women and one man. Three minutes later the odour was once again scored, according to the following scale :

Score	Description of odour
2	Normal, pleasant or very pleasant
I	Weakly pleasant
0	Strong and unpleasant pork odour
-I	Slight boar taint
-2	Strong boar taint present at an objectionable level

Only one or two series of samples were smelled at each meeting of the panel, which held at midday, twice a week on the average.

Animals studied were 41 pigs of Large-White breed, killed at 100 kg live weight, obtained from two experimental treatments :

- 15 young boars were fed different levels of protein in the diet (14, 16 and 18 % protein) ;
- 26 pigs fed with the same three types of diet and castrated at about 70 kg.

In addition to the control of odour by the smelling panel ,the flavor and odour of grilled rib cuts and roast pork were assessed according to the method previously described (Desmoulin et al ,1971). During cooking in the kitchen laboratory , the occurrence of unpleasant odours was registered.

RESULTS AND DISCUSSION

The tests carried out in this experiment were used to detect abnormal odours of the different tissues ,and to study the relationship between these odours and meat acceptance by consumers.

Different kinds of fatty tissue were choosed at first on the assumption that they could contain odorous compounds responsible for the general taint of boar fat (Patterson 1968).In addition ,we want to study the variation in odour existing among different parts of the carcass.Heating in the dry state at 80 °C was retained from earlier study (Desmoulin et al 1971) , where it was found that by increasing time and temperature of heating the odours of different fats became stronger.

Salivary glands were considered because there appeared in literature to be a greater concentration of unpleasant odour in these glands (Nieberle et Cohrs ,1967 ; Patterson 1968).

At last blood serum was studied on an exploratory basis as being one material which could easily be kept at slaughter , or "in vivo".

All the samples were smelled by a panel with a high woman:man ratio, because women are known (Griffiths and Patterson 1970) as being more perceptive.On a general rule , we considered as an abnormal character ,

- the occurrence of boar taint ,even^{if} the detection was made like a slight boar taint by only one member of the panel ;

- the occurrence of disagreeable odour or flavor during meat consumption ,even if it was only mentioned by one member of the testing panel.

Thus it is important to stress that the detection of unpleasant characters was very severe and led to the detection of samples which probably could remained undetected by many people who would consider them as normal.

The main results are given in Tables I to IV.The distribution of individual judgments of odour according to tissue is shown in Table I.Scoring of odours of the different samples is shown in table II ,where is mentioned also the number of boar taints detected in each tissue .The average score was obtained by adding scores of each judge and dividing the sum by the number of animals.The score can then vary from + 10 to - 10.In Table II are given too the results of testing panel for eating qualities.The frequency of associated unpleasant characters in the same pig is given in Table III .The number of pigs in which two unpleasant characters were found is shown in Table IV ,which mentions the whole combination of characters two and two.

It is clear that there is a difference between the two groups of animals for the frequency of unpleasant characters .The second group seems to be of better quality than the first one .As the aim of this note is not to compare the two types of experimental pigs , we shall consider them as a unique pig population in which may exist

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some problems of odour , as a result of their system of management (Texier et al 1970).

From individual results ,and from Tables III and IV one can advance that the variation of different characters is aleatory .None of the 41 pigs showed more than six unpleasant characters. Within animals the occurrence of many unpleasant characters was not usual. The only two exceptions are the relationship existing between number of unpleasant odour of roast pork and boar taint in mesenteric fat , and between boar taint in mesenteric and in kidney fat .In very few animals there is a relationship between unpleasant odour and unpleasant flavor of the meat.

The various tissues strongly differs in the nature and intensity of their odours during heating .They are not all comparable as boar taint indicators (Table II).The results obtained in this study confirm that it would be very interesting to set an "odour profile" of various types of pig production. Such a profile would characterize for each type of tissue , and specially for fatty tissues , the nature and the intensity of odours at different temperatures of cooking. To score subjectively the odour produced from heating fat samples (or other biological material) we suggest to use the following scale in which odours are considered both by their intensity and their pleasant or unpleasant character :

- neutral or weak odour , acceptable ;
- moderate odour , very or extremely pleasant ;
- rather strong odour , but yet acceptable ;
- unpleasant odour , too strong (though without any sexual component) ;
- slight boar taint , weakly unpleasant ;
- strong boar taint , very unpleasant to extremely unpleasant.

From our experience with smelling panel ,it seems necessary to distinguish among unpleasant odours those which have a sex origin (boar taint ,in the literal sense of the word) and those which are unpleasant only because they are too strong , though quite normal of the pig species.

If the young boar have lower scores than the castrated pigs for the various tissues , we have never found in entire male any boar taint which was judged as objectionable when consumed by testing panel or even only unpleasant during cooking. We must stress that the absence of abnormal odour during cooking meat was accompanied by the absence of scoring " very unpleasant" during odour or flavor assessment of grilled rib and roast pork by testing panel. This observation leads to the conclusion that the system of production used in this experiment (type of breed , feeding , ...) may produce pork carcasses without boar taint.

But this situation did not permit to study with our experimental animals the value of different tests we intended to use to exclude from trade channel those of the carcasses which could have been found and classified as "dangerous" ,because they were abnormally odorous. The fact that ,in our experiment ,most of the tissues show little or no tendency to very bad smelling cannot be considered like a proof of their lack of interest for detecting boar taint. To make this point clear we must study in the future older and heavier entire pig males where the occurrence of boar taint is quite sure.

We must specially look to the case of mesenteric fat ,which received from the panel the lower score for odour.In the worst condition for its odour (four scores " very unpleasant ,objectionable odour" , one score " unpleasant") it was not possible to detect any unpleasant odour during cooking , neither to find any very unpleasant judgment by the testing panel.Thus ,if the unpleasant odour of mesenteric fat may justify its elimination from trade ,it cannot be considered , per se , as sufficient to condemn the whole corresponding carcass.

CONCLUSION

Smelling of various fatty tissues heated at 80 °C reveals in some of them more or less pronounced boar taint .Boar taint was thus detected in mesenteric fat of 11 young boar and in kidney fat of 6 young boars.

The unpleasant odour of these tissues has not been found related to unpleasant odour of meat cuts during cooking neither to objectionable odour or flavor of meat.Therefore odours revealed by heating tissues at 80 ° C cannot be used as an absolute proof , at the moment of the potential risk presented by carcasses of boars in commercial channel.

It is suggested to adopt the same type of olfactory analysis for various kinds of tissues from different types of animals ,and to use , for that purpose , a specific scoring system.The "odour profile" of different kinds of fatty tissue would usefully define a part of the carcass quality in one species ,like pig , where fat deposit represents a noticeable amount of the alimentary energy invested in animal production.

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Note :this text is the tentative translation of an original French version which shall be sent to anyone who shall request it of the authors.

TABLE I
DISTRIBUTION OF INDIVIDUAL JUDGMENTS
OF ODOUR ACCORDING TO TISSUE

	NORMAL	WEAKLY PLEASANT	STRONG UNPLEASANT	BOAR TAIN	
				SLIGHT	STRONG
KIDNEY FAT	55	52	74	10	7
INGUINAL FAT	57	78	60	3	0
BACKFAT	64	72	59	3	0
MESENTERIC FAT	10	29	107	21	31
PAROTID GLAND	37	68	58	3	2
SUB-MAXILLARY GLAND	57	78	61	2	0
BLOOD SERUM	45	47	102	1	3

TABLE II
RESULTS OF TESTING PANEL

A) ODOUR

	YOUNG BOARS (N=15)		LATE CASTRATED PIGS (N=26)	
	BOAR TAIN DETECTED	AVERAGE SCORE FOR ODOUR	BOAR TAIN DETECTED	AVERAGE SCORE FOR ODOUR
BACKFAT	2	4,07	I	5,46
INGUINAL FAT	3	4,87	0	4,62
KIDNEY FAT	6	3,40	9	3,31
MESENTERIC FAT	11	-1,67	12	-0,50
SUB-MAXILLARY GLAND	I	4,07	0	5,15
PAROTID GLAND	4	3,00	0	3,46
BLOOD SERUM	3	2,67	I	4,46

B) EATING QUALITIES

	YOUNG BOARS (N=15)		LATE CASTRATED PIGS (N=26)	
	BOAR TAIN DETECTED	AVERAGE SCORE	BOAR TAIN DETECTED	AVERAGE SCORE
ODOUR OF ROAST PORK	5	7,15	7	7,35
FLAVOR OF ROAST PORK	I	7,59	2	7,47
ODOUR OF GRILLED RIB CUT	7	7,09	I	7,43
FLAVOR OF GRILLED RIB CUT	5	7,26	4	7,46

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TABLE III
ASSOCIATED UNPLEASANT CHARACTERS
IN THE SAME PIG

NUMBER OF UNPLEASANT CHARACTER	NUMBER OF PIGS	
	BOARS (N=15)	LATE CASTRADED (N=26)
0	I	8
I	-	7
2	5	5
3	3	5
4	2	I
5	3	-
6	I	-
7 and more	-	-

TABLE IV
COMBINATION OF UNPLEASANT CHARACTERS
(41 PIGS)

CHARACTER	I	2	3	4	5	6	7	8	9	10	11	12
I UNPLEASANT ODOUR OF GRILLED RIB	5	3	I	I	2	2	4	I	2	I	-	-
2 UNPLEASANT FLAVOR OF GRILLED RIB		I	-	I	I	3	4	-	-	-	-	-
3 UNPLEASANT ODOUR OF ROAST PORK			I	I	I	5	10	-	3	I	-	-
4 UNPLEASANT FLAVOR OF ROAST PORK				-	I	I	2	-	-	-	-	-
5 BOAR TAIN IN BACKFAT					2	I	3	-	-	-	-	-
6 BOAR TAIN IN INGUINAL FAT						I	2	-	-	-	-	-
7 BOAR TAIN IN KIDNEY FAT							10	-	3	I	-	-
8 BOAR TAIN IN MESENTERIC FAT								I	4	4	-	-
9 BOAR TAIN IN SUB-MAXILLARY GLAND									-	-	-	-
10 BOAR TAIN IN PAROTID GLAND										I	-	-
11 BOAR TAIN IN BLOOD SERUM												-
12 UNPLEASANT ODOUR DURING COOKING												-