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MEAT QUALITY OF WILD BOARS - METABOLISM POST MORTEM AND HYGIENE

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Introduction: A variety of studies on the muscle metabolism[1] and hygiene of domestic pigs after slaughter was performed during the last years and a wide spectrum of knowledge about deviations in pork quality (PSE, DFD)[2, 3] and the hygienic status[4] of the carcasses was reported in literature. However only few informations in this respect are available in the case of wild boars. Therefore we started to investigate the biochemical processes in muscles of wild boars post mortem and to study the microbiological conditions of the carcasses as well as the content of residues in offals and muscles.

Material and methods: Of a total of 72 wild boars only 15 animals were living in a free hunting-ground, whereas 57 wild boars were kept in preserves with an average density of 100 animals/km^2. Both groups of animals were additionally fed with maize during the winter months. The hunting days were divided in up to 6 different battues of 2 h maximum. Shot animals were collected, transported to a special evisceration site and emboweled. The outside temperature during the hunting days was not higher than 5°C maximum. In the evening the unsplit and not-deskinned carcasses were put into a chilling room and stored there at 3°C.
For the determination of residues (heavy metals, organochlorine compounds and radioactive isotopes) a part of the liver (lobus caudatus), one kidney, knob fat and 500 g of M.long.dorsi thoracis and lumborum were collected. Factors of meat quality were recorded by measuring pH, electric conductivity, temperature and colour brightness L* within a period from 1 to 24 h post mortem. Microbiological investigations were performed dissecting muscle cubes of a surface of 10 cm^2 from critical sites of the carcasses.

Results and conclusions:
Metabolism post mortem:
According to their weight the carcasses of the wild boars were divided into 3 groups: < 40 kg; 41 - 80 kg and > 80 kg. The middle weight group corresponds to carcasses of domestic pigs with an average weight of about 60 kg. In figure 1 the dependency of the pH_1 measured in M.long.dorsi upon the carcass weight is shown. With one exception the pH_1-values in M.long.dorsi of the old and relatively heavy animals are higher than 5,8. The average pH_1 in M.long dorsi of the group of wild boars with a weight between 41 and 80 kg is lower than that of the first group (< 40 kg). As the pH_1 is an indicator for the velocity of the glycolysis post mortem it appears that the wild boars of the middle weight group tend to have a faster glycogen metabolism post mortem than the others.
The colour brightness L* measured 24 h post mortem in M.long.dorsi of wild boars was generally lower than in the case of domestic pigs. It can be clearly seen in figure 2 that the colour brightness L* (24 h post mortem) of the younger animals (< 40 kg) is in average higher than for the wild boars of the middle weight group. This means that in the group of animals with a middle carcass weight the colour of the meat is relatively dark, although the average pH_1 was lower than with the other animals. In domestic pigs the colour brightness (24 h post mortem) is negatively correlated with pH_1. This means that carcasses with a low pH_1 normally show a high L*-value.
The electric conductivity determined in M.long.dorsi of wild boars is much more at variance than in domestic pigs. Measurements 3 h post mortem reveal values scattering between 3 and 25 mS/cm.

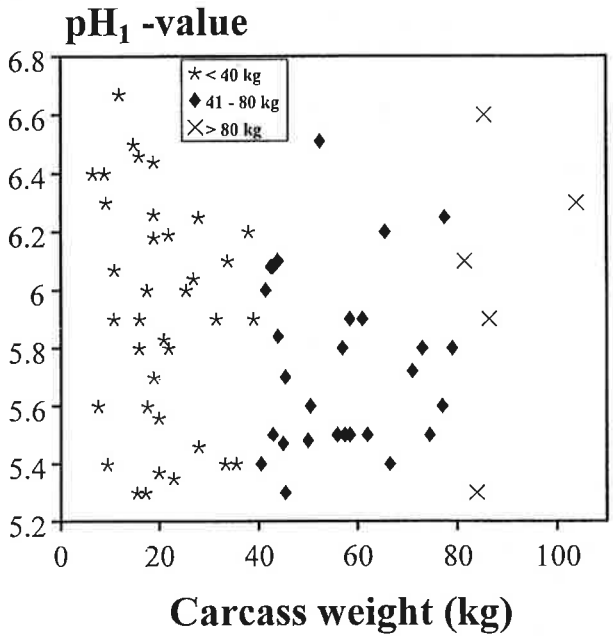

Fig. 1:
pH_1-value in M.long.dorsi in dependency upon the carcass weight (kg).

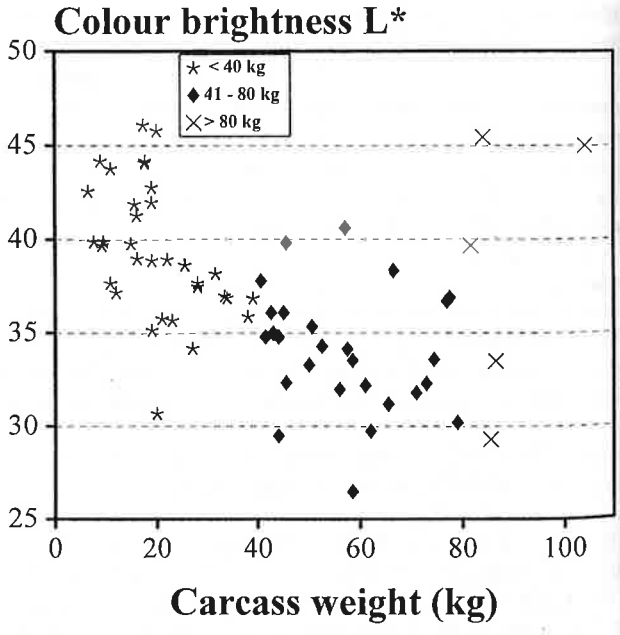

Fig. 2:
Colour brightness L* in dependency upon the carcass weight (kg).

Hygiene:
Microbial surface counts of meat samples from 39 wild boars were determined (see box plots in Fig. 3). Samples (10 - 20 g) were taken (i) from the *M. semimembranosus* (5 animals shot in an open hunting ground; 20 hours *post mortem*), (ii) from the *M. longissimus dorsi* as delivered from a game butcher within 2 days (7 animals shot in a private preserve) and 6 days (14 and 13 animals from two different private preserves) *post mortem*. All carcasses and samples were stored below 5°C until examination. Homogenization and dilutions were done in 0.9% NaCl. Aerobic total viable counts (TVC) were determined on Standard-I agar (Merck, Darmstadt), *Enterobacteriaceae* (EBC) on VRBG agar (Merck) incubated anaerobically, *Micrococcaceae* (MCC) on mannitol-salt-egg yolk agar, and lactic acid bacteria (LAB) on MRS agar (Merck). Pseudomonads (PSM) were obtained on VRBG as the difference between the VRBG aerobic count and the VRBG anaerobic count. All plates were incubated for 2 days at 30°C. All samples had a TVC below $5x10^6$ c.f.u./g, a value still accepted for retail meat in Germany. The hygiene class distribution on the basis of TVC and EBC from one of the huntings is shown in Tab. 1.

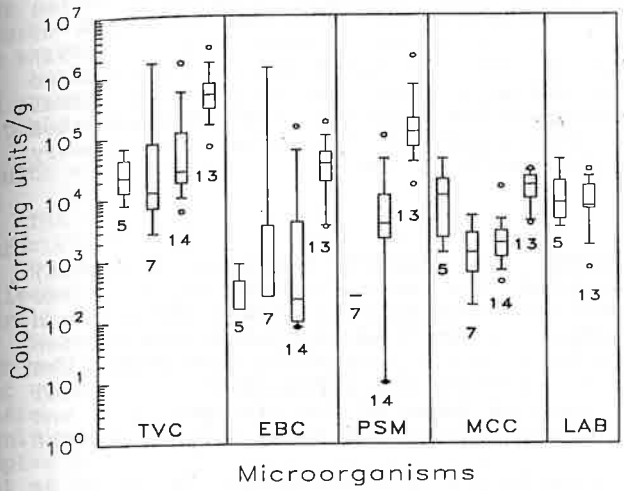

Fig. 3:
Microbial counts on wild boar meat. (see text for explanation).

Class	A (excellent)	B (good)	C (still o.k.)	D (bad)
N%	48	19	19	14
TVC	$3x10^4$	$4x10^4$	$2x10^6$	$3x10^6$
EBC	$2x10^2$	$5x10^3$	$2x10^4$	$2x10^6$
PSM	$2x10^4$	$4x10^4$	$2x10^5$	$3x10^2$
MCC	$2x10^3$	$3x10^3$	$2x10^4$	$7x10^3$
LAB	$6x10^2$	$6x10^2$	$4x10^3$	$4x10^4$

Tab. 1:
Hygiene classes of wild boar meat. (c.f.u./g; N%, percentage of total sample size (n=21).

Group of Residue	Residue	Investigated Tissue	N	Median $\tilde{x}$	90-Percentile	Limit	Unit
Radioisotope	study 1 Cs-137	muscle	13	55.5	96.9	(600)	Bq/kg fm
	study 2	muscle	20	29.9	135	(600)	
Heavy metals	Pb	liver	22	0.12	0.34	0.50	mg/kg fm
	Cd	liver	22	0.38	0.87	0.30	mg/kg fm
	Cu	liver	22	4.1	8.4	-	mg/kg fm
	Zn	liver	22	34.2	57.2	-	mg/kg fm
Organochlorine compounds	α-BHC	flare fat	13	4.7	9.2	200	µg/kg fat
	ß-BHC	flare fat	13	5.6	12.2	100	µg/kg fat
	lindane	flare fat	13	7.4	20.6	2000	µg/kg fat
	HCB	flare fat	13	12.6	61.4	200	µg/kg fat
	pp'-DDT	flare fat	13	61.0	231		
	pp'-DDE	flare fat	13	148 219	700 972	ΣDDT3000	µg/kg fat
	pp'-DDD	flare fat	13	10.1	40.7		
	PCB-138	flare fat	13	17.6	101	100	µg/kg fat
	PCB-153	flare fat	13	19.4	131	100	µg/kg fat
	PCB-180	flare fat	13	11.0	88.4	80	µg/kg fat

Tab. 2:
Residues of environmental origin

Residues in tissue of wild boars:
The results of an investigation on the environmental pollutants of the wild boars are shown (table 2) comparing them with German legal limits. No problems are related to radiocesium and even lead. But higher levels of cadmium are found in livers and especially in kidneys. There are no problems connected to the organochlorine pesticides but the 90th percentiles of the persistent PCB-congeneres in fatty tissue of the wild boars exceed the limits demonstrating the air filtering by needles and leaves of the forests leading to a clearly higher contamination of the litter and humus as one of the main sources of wild boars feed.

References:

1.) Briskey, E. J. (1964). *Adv. in Food Res.* **13**, 89.
2.) Schwägele, F., Lopez, P., Haschke, C. & Honikel, K. O. (1994). *Fleischwirts.* **74**, 95.
3.) Potthast, K. & Hamm, R. (1976). *Fleischwirts.* **56**, 978.
4.) Hecht, H. (1993). *Fleischwirts.* **73**, 240.