

PIGLET CASTRATION

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Abstract: PIGCAS is the acronym of the project “Attitudes, practices and state of the art regarding piglet castration in Europe” is to our knowledge the first project that has focused on castration practice across European countries plus Norway and Switzerland. About 250 million pigs are slaughtered in Europe each year. Of the 125 million male pigs, approximately 20% are left entire, less than 3% are castrated with anaesthesia and the rest is castrated without anaesthesia.

Key words: castration, pig

Introduction

Castration of animals has been under debate for many years. In animal breeding castration has been performed on animals intended for fattening with the purpose of removal of boar taint or tranquilizing animals temper (gelded horses, bullocks). Castration was (in some countries still is) performed on females. Non-conventional production system in Spain and Portugal prefers castration of all piglets (including gilts). In Spain, on farms, 75% of gilts are castrated at the age of 30 – 50 days (average 35) by vet. In Portugal regards it non-conventional production of Alentejana’s breed. Breed is represented by about 12000 sows and 1200 - 1500 boars. This is primitive, slowly growing breed, slaughtered in 20 months of life. Because meat of non-castrated pigs characterizes negative smell and taste, also gilts are castrated in 90 (50-120) day of life. According to scientists castration in this breed is performed without anaesthesia (Migdal *et al.*, 2008).

In breeding of most livestock castration has been abandoned, and till today names of castrated animals remain:

- bullock – castrated bull
- wether – castrated ram

- billy goat - castrated buck
- capon, gelded cock – castrated cock

Presently, because of breeding practise castration is performed on stallions (gelded horse – castrated stallion) and young boars (barrow, castrated boar). The aim of this procedure is tranquilize temper (stallions) and remove negative meat odour in fact fat odour – sex taint (boars). In European Union castration by any other way then tearing the tissues, without anaesthesia is allowed till 7 day of piglet's life (*Directive 2001/93/WE*). In other cases castration can be performed only by vet with anaesthesia. In Swiss from 2009 surgery castration without anaesthesia, regardless of piglet's age is prohibited. In Norway this restriction is slowly implement and fully ban surgery castration till 2015. In United Kingdom and Ireland generally castration of male piglets is not performed. Young boars are full value pigs of slaughter. It should be taken into consideration that one of the lowest weight of fatteners slaughtered in Europe is in this countries – Great Britain – 76,6 kg, Ireland 74,0 kg (Annual Report, EUROSTAT, PIGCAS). . According to dates provided by responders in PIGCAS project 81 -82 % of male piglets are castrated in Poland. It seems that this dates are underestimated, because only in reproduction farms male piglets aren't castrate and percentage part of reproduction farms in Polish pig's industry are lower then 19%. In many European countries minority of male piglets is castrated – Cyprus (38-39%), Portugal (11-12%) and in Spain (33–34%). Meat from castrated boars in those countries is exported or used to production of high quality products. Also in Greece 24% of boars are not castrated. Some ecological production systems prefer growing entire males e.g. „Milieukeur” in Netherlands (*Migdal et al., 2008*). PIGCAS project showed that in Europe we have three groups of variations in attitudes and practices:

- Great Britain, Netherlands, Greece, Finland and Ireland are oppose pigs castration
- Spain, France, Austria, Denmark, Sweden, Swiss, Norway, Estonia, Slovenia, Poland, Germany and Lithuania are indecisive in this case.
- Cyprus, Italy, Slovakia, Hungary, Belgium and Latvia are countries which opt to use castration (*Migdal et al., 2008*).

Unpleasant meat smell for consumers, often is the reason for disqualification its suitability for human consumption are well known for farmers. The use of fishery products like oils, meal into compound for pigs and poultry in final period of fattening may be cause of “fishy taint in pork meat”. Products from oilseed rape (meal from full seeds and solvent extraction, oils) may cause characteristic rape taint of animal products. Smell of beef or lamb meat may be changed by certain green fodder (clover), beet. Administration of drugs before slaughtering may have negative effect on meat flavour and taste, which is not accepted by consumers.

Table 1. Statistics on number of pigs slaughtered in EU, and selected other countries (Numbers are millions of heads) 2002-2006 (Report of PIGCAS, 2008)

	Total 2002 (Millions)	Total 2003 (Millions)	Total 2004 (Millions)	Total 2005 (Millions)	Total 2006 (Millions)
Austria	5.4	5.4	5.4	5.3	5.4
Belgium	11.1	11.3	11.1	10,9	10.7
Bulgaria	3.2	1.0	1.0	0.9	
Cyprus	0.7	0.7	0.7	0.7	0.6
Czech Republic	4.5	4.4	4.1	3.8	4.0
Denmark	22.4	22.5	22.9	22.9	21.4
Estonia	0.5	0.5	0.5	0.5	0.4
Finland	2.1	2.3	2.4	2.4	2.4
France	26.6	26.5	25.3	24.9	25.5
Germany	44.3	45.4	46.9	48.3	50.1
Greece	2.2	2.2	2.2	2.2	2.0
Hungary	6.6	5.4	5.2	4.9	5.2
Ireland	3.1	2.9	2.7	2.8	2.7
Italy	13.3	13.6	13.6	13.0	13.4
Latvia	0.5	0.5	0.5	0.5	0.5
Lithuania	1.1	1.3	1.3	1.4	1.3
Luxemburg	0.1	0.1	0.1	0.1	0.1
Malta	0.1	0.1	0.1	0.1	0.1
Netherlands	15.4	13.9	14.3	14.5	14.0
Poland	23.0	25.3	23.1	22.5	24.3
Portugal	5.1	5.2	5.0	5.1	5.4
Romania	5.3	6.3	4.6	4.4	
Slovak Republic	2.1	2.0	1.8	1.5	1.3
Slovenia	0.7	0.8	0.9	0.9	0.4
Spain	37.0	38.2	37.8	38.0	39.3
Sweden	3.3	3.3	3.4	3.2	3.0
UK	10.6	9.4	9.2	9.2	9.1
Norway	1.3	1.3	1.5	1.5	1.4
Switzerland	2.7	2.6	2.6	2.7	2.9

Fundamental problem is boar taint, caused by high concentration of androsterone and skatole. In 1968 Patterson diagnosed androsterone -5-alfa-androst-16-en-3-on, urine-smell compound, produced in Leydig's cell of testis, responsible of specific meat smell – boar taint. Androsterone is pheromone, chemically similar to testosterone. Maximum concentration of fat 3-8 µg/g occurs

in 240 day of life and then it is reduced to 1 µg. If we take into consideration the consumption suitability of castrated boars meat :

- concentration lower than 0,5 µg of androsterone in 1 g of fat – carcass without boar taint
- 0,5 – 1,0 µg of androsterone – moderate contamination of carcass – boar taint is eliminated after primary meat treatment
- Higher than 1 µg of androsterone – sensible smell – disqualification of carcass (*Bonneau and Sellier, 1986; Bonneau et al. 2000*).

Table 2. Mean carcass weight of pigs slaughtered in EU, and selected other countries 2002-2006 (Report of PIGCAS, 2008)

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Austria	91.5	94.5	97.5	98.7	92.4	93.9	95.6	95.4	95.4	95.8	94.2
Belgium					93.8	94.2	93.7	91.0 ²	94.8	93.1	93.9
Belgium/Luxemb.	92.2	92.2	93.1	94.4							
Luxembourg					71.5	91.6	94.7	95.1	94.7	94.5	94.4
Denmark	75.7	76.5	77.7	77.1	77.5	78.5	78.6	78.3	79.0	78.6	81.2
Finland	81.8	82.0	83.8	83.7	84.2	85.1	85.8	84.3	84.3	84.8	83.3
France	85.0	86.2	87.1	86.4	85.9	87.5	88.2	88.1	90.5	90.7	88.8
Germany	91.9	92.4	92.7	92.0	92.1	92.5	92.8	93.4	92.2	93.3	94.0
Greece	59.9	60.6	60.0	63.3	63.6	61.4	49.3	50.7	62.6	62.6	61.7
Ireland	72.1	71.7	71.3	71.6	73.1	74.0	74.3	75.6	75.9	75.5	74.0
Italy	118.1	114.8	112.3	113.3	114.4	114.8	115.7	117.0	117.0	116.4	116.6
Netherlands	87.9	89.8	89.5	87.5	87.4	91.2	89.4	90.2	89.9	90.1	90.2
Portugal	71.0	65.5	66.5	66.2	64.9	65.7	64.6	62.8	62.6	63.6	63.0
Spain	81.3	80.6	79.8	81.1	81.8	82.4	82.9	83.5	81.3	81.5	81.2
Sweden	83.0	84.1	85.3	85.7	85.2	86.3	86.5	87.0	87.5	87.1	86.1
UK	70.3	70.4	70.6	70.8	70.8	73.1	73.2	76.4	76.9	77.0	76.6
Bulgaria	72.1	73.1	73.2	74.2	73.6	77.0	76.6	69.4	78.6	78.8	
Cyprus	78.6	79.1	80.3	80.7	81.1	78.7	79.6	79.3	79.6	80.3	81.1
Czech Republic	81.6	80.8	81.9	83.7	95.5	96.7	94.3	93.2	95.1	92.5	87.9
Slovakia	105.0	107.5	104.4	94.0	73.1	72.5	73.9	92.1	91.8	92.3	86.4
Estonia	62.9	70.5	71.5	70.2	72.3	73.9	73.2	72.8	75.9	79.0	74.3
Hungary	90.9	94.4	94.8	97.6	96.9	98.7	88.2	94.7	93.7	92.3	93.0
Latvia	82.8	81.8	81.2	72.8	76.9	77.3	78.6	73.6	75.2	76.9	78.0
Lithuania	82.0	78.4	81.3	85.7	87.3	85.9	83.9	72.1	73.4	78.1	78.9
Malta	75.6	80.0	83.9	82.4	74.8	80.6	82.0	80.7	81.1	81.1	79.3
Poland	87.8	87.1	87.3	83.7	84.9	84.2	87.8	86.6	84.7	86.8	85.5
Romania	75.3	80.2	88.2	86.3	87.2	87.9	89.6	84.5	81.6	90.0	
Slovenia	87.4	72.8	84.0	83.6	82.2	82.9	84.8	78.2	83.6	81.6	86.0
Norway	80.8	78.4	80.0	77.7	75.7	76.3	78.3	79.4	77.8	76.7	76.5
Switzerland	82.7	84.3	84.6	84.3	85.2	84.8	85.9	86.7	87.1	86.7	

Second compound linked with boar taint is scatole (3-methylo-indol), which is synthesized in large intestine as product of degradation of tryptophan by intestine bacteria. Scatole is absorbed from intestines or by skin if environment is polluted by excrements. Gilts and castrated boars remove scatole from organism by liver. Boars sex hormones reducing metabolism of scatole, that is why concentration of scatole in carcass is higher. Only by nutrition changes scatole can be limited in meat. (*Bonneau and Sellier, 1986; Bonneau et al., 2000*).

Depending on breed, line 8 – 75% puberty males are affected by boar taint. But researches showed that boar taint is present in gilts and castrated boars. Duroc breed has highest concentration of androstenone, while Large White breed has highest concentration then Landrace breeds. Coefficient of inheritance is between 0,25 – 0,87 depending on breed, line and research team (*Tuz, 2008*). Androstenone is also synthesized in adrenal gland cortex and ovary, so boar taint occur also in gilts and castrated boars (*Andersson, 1995; Paschma et al., 1998*). Because androstenone is lipophilic and occur (except submandibular glands) in fat, adiposis animal can be characterized by higher intensity of boar taint. Especially during heat treatment boar taint can be sensible (roasting, frying, boiling). Interestingly, when informing panelist that he judge boar meat, percentage of negative assessment of smell and taste is increased. Cheat consumer that he judge boar meat (instead of this we provide gilts or castrated boars meat) also increase negative assessment. Testis notice during slaughter also has influence on negative assessment. Most reliable method of boar taint detection are HPLC/FL or ELISA test (*Tuz, 2008*). Consumer's assessment by sensory panel is subjective, often wrongly, because smell sensibility of every human being is different. According to *Bonneau (2000)* number of consumers dissatisfied from boar meat's smell is about 6,5 % higher then dissatisfaction from gilts meat. Lowest different taste and smell was observed in Great Britain. Moreover it was found that scatole was more sensible, while androstenone's detection depended of smell sensitivity of panelist. 25% of men and 16 – 16% of women don't detect androstenone, but there is huge diversification between cultural and countries (*Gilbert and Wysocki, 1987*). In Germany and Spain significant more people do not detect androstenone then in Great Britain, nevertheless in Great Britain boars are not castrated and this is no problem for consumers. It seems that boar taint problem is rather created by media, therefore from many years there are carried out experiments leading to remove or limit boar taint of meat. This including keep up and fattening young boars (Great Britain and Ireland) was hard to introduce in Poland because meat industry prefer heavy fatteners for ham production. This method can be genetic selection and breeding lines of boars not affected by boar taint (boar taint of meat is in 8 – 75% puberty boars). Sperm sorting is considered as a very good solution for the long term. Chemical castration by potassium tetraoxomanganate (VII), lactic acid, acetic acid, zinc and silver salts is effective but can cause inflammation of testis and whole

scrotum. Till 1998 in Australia and New Zealand boars vaccination is way to eliminate boars taint of meat. Nowadays vaccinations against boar taint are used in Brazil, Chile, Mexico, Korea and South Africa and recently also in Swiss.

Vaccination against boars taint frequently is called “immunocastration”, cause controversy amongst consumers because of name. “Immunocatratriation” among common people suggest using hormone. In reality this method work by administration of analogue of gonadotrophin releasing factor. Analogue bound with protein carrier determinate antigen function. In Australia, New Zealand there are using long – absorbing implants produced by Peptech, including deslorelin – synthetic analogue of GnRH. Similar implants were used in by *Tuz (2008)* with conclusion that “ freeing from implants agonist of GnRH (deslorelin) cause stoppage of testis development and accessory glands and lower concentration androgens to level guarantee elimination of boar taint from carcasses. Similar working Suprelorin was allowed to use by European Commission on whole European Union. Research from Sweden (*Einarsson et al., 2002*) showed full efficiency of this vaccine and good quality of boars meat. Moreover for the Swedes pork after immunocastration has better quality then after surgical castration. In Swiss two to three consumers rate pork after immunocastration higher then from surgical castration. Opponents of this method are afraid of accidentally self-injection, for them problem is time-consumption of this method (two times injection) and it’s complication, but final decision will depend on costs of this vaccine and breeders acceptation, which know best about benefits from entire boars rising. Entire boars are higher growth rate (4,5-14%) comparing to castrated boars, lower (6,6-9,5%) feed consumption, better (7,5-14%) use of feed for gain 1kg body weight, lower (4-20%) content of fats, beneficial tissues profile and higher stress resistance. It should be taken in consideration that meat is less tenderness, higher concentration of unsaturated fatty acids – mainly linoleic acid, less resistance for PSE and DFD and higher aggression during transport to slaughterhouse (fights between males) (*Tuz, 2008*).

Using of vaccinate against boar taint, which is incomplete analogue of gonadotrophin releasing factor bound with protein carrier allow breed fatteners – boars without boar taint. Vaccinate stimulating immunological system to produce specific antibodies against endogenous releasing GnRF from hypothalamus. Specific antibodies neutralizing gonadotrophin releasing factor, which block releasing LH and FSH hormone. Testis functions are blocked (testis size decreasing twice or threefold comparing to not vaccinated boars) as well as pheromones production. So far in research vaccinate was used in two dose, with 4 weeks break at least, in dorsal part of neck, just behind auricle with the aid of special applicator. Date of first vaccination is optional but second must be performed 4-6 weeks before slaughter. During this time liver removing substances responsible for boar taint. Lack of boar taint can be noticed 2 weeks after second vaccination and

upkeep for about 8 weeks. After this period testis size and functions are working like before vaccination. There is no waiting period (Lundström and Malmfors 1993).). Researches from Sweden (Lundström and Malmfors, 1993), Spain (Font-i-Furnols et al., 2008) earlier in Australia and in USA (Dikeman, 2007) shown efficiency of vaccine and good meat quality.

Highly interesting connected with boar taint, or lack if it are Naravé pigs from Oceania, they have handicapped enzymatic pathway of steroid hormone production. This defect manifested itself in phenotype, while they are hermaphrodites. During fattening they are recognize as males but meat is free from boar taint, because they are lacking testicular hormones and males pheromones. These pigs have high slaughter value for natives.

Kastracija prasadi

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Rezime

PIGCAS je akronim projekta “Attitudes, practices and state of the art regarding piglet castration in Europe - Stavovi, praksa u vezi sa kastracijom prasadi u Evropi”, i to je prvi projekat koji se fokusira na praksu kastracije u evropskim zemljama uz Norvešku i Švajcarsku. Oko 250 miliona svinja se zakolje u Evropi svake godine. Od tog broja 125 miliona su nerastovi, 25% je netaknuto, 3% je kastrirano uz anesteziju, a ostatak bez anestezije 20% are left entire, less than 3% are castrated with anaesthesia and the rest is castrated without anaesthesia.

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