Attitudes and beliefs of consumers towards pig welfare and pork quality

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Abstract. The aim of this study is to provide an overview of consumer attitudes and beliefs regarding pig welfare and quality of pork meat. Regarding animal welfare, several aspects of farm management and practice were considered, with an emphasis on alternatives to surgical castration without pain control, such as entire male production, castration with anaesthesia and immunocastration. Organic production was also considered. For meat quality, aspects of sensory quality were studied, specifically those related to boar taint, again including organically produced meat. A wide variety of consumer attitudes and beliefs are revealed in these studies as being strongly dependent on culture and influenced by information provided. These insights can be used when producing and commercializing pork and pork products as well as when developing marketing strategies to reach various consumers and satisfy market demands.

1. Introduction
Consumers are the last step in the consumption chain, and thus, it is important to understand their behaviour, which is affected by psychological, sensory and marketing factors [1]. When studying consumers’ behaviour it is important to consider that the relationship between citizen attitudes and consumer attitudes is weak [2]. Citizen attitudes are mainly determined by information, process characteristics, beliefs and feelings. When citizens assume the role of consumer, their attitudes and beliefs can diverge. Consumer attitudes and beliefs are mainly determined by price, taste, health and convenience. Beliefs are the cognitive knowledge related to information that an individual has about something that can be linked to some attribute, action or event. Beliefs can be obtained by either direct observation or experience, provided from outside or inferred. Feelings are affective responses of an individual and are responses towards an object, a person, an issue or an event [3].

This paper focuses on factors related to the type of pig production system, including animal welfare, the specific case of alternatives for piglet castration and organic farming and their impact on sensory and meat quality and willingness to pay.

Several definitions can be found for animal welfare. In general, they all include the (absence of) suffering and level of satisfaction of the animals during their entire life, including at slaughter. One important welfare issue in pig production is castration of male piglets. Worldwide, the majority of the male fattening pigs are surgically castrated, usually without anaesthesia. Castration is performed to reduce the levels of androstenone and skatole in the meat. These are the main compounds responsible
for boar taint, which causes an unpleasant odour and taste in heated meat of entire male pigs. Castration also makes it easier to handle the pigs, as castrates exhibit less aggressive and sexual behaviour than entire males. Pain control during castration by means of analgesia and/or anaesthesia is required in several EU countries. One alternative to castration is immunocastration, a procedure that uses vaccination against endogenous gonadotropin releasing factor to achieve castration-like physiological effects. Production of entire males is another alternative [5]. Slaughtering entire males could increase the risk of boar-tainted carcasses entering the market, as currently no objective boar taint detection system is yet available at slaughterhouses. The negative sensory experience of boar taint in the kitchen can negatively affect consumer acceptance of pork meat. The case of piglet castration and its alternatives is, therefore, interesting to study, as it includes aspects of animal welfare as well as perception of sensory quality, food safety and possibly also the price of meat products. Consumer knowledge regarding piglet castration is generally low but a higher number of consumers are aware of organic production.

The objective of this study was to obtain an overview of consumer attitudes and beliefs towards some aspects related to animal welfare and meat quality, with an emphasis on alternatives to surgical castration without anaesthesia, as well as organic pork production.

2. Attitudes and beliefs of consumers towards animal welfare

Animal welfare has many suggested definitions but most of them consider the level of suffering and satisfaction of the animals. Animal welfare can be evaluated on-farm, during transport and at the slaughter plant. Citizens’ concerns about have increased in the last years, but in general, consumers report having a low level of information about animal welfare and its attributes [6], and only some of them think about animal welfare when buying pork [7]. According to the review of Thorslund et al. [8], concerns about animal welfare can be related both to the naturalness (i.e. space allowance and freedom) and to the level of suffering. In Europe, most of the consumers know little about the conditions under which animals are raised, although they believe the conditions for the animals in their country have improved in the last 10 years [9]. Furthermore, some consumers associate better animal welfare with better meat quality [9][10].

2.1. Production aspects

The perceived importance of animal welfare varies depending on which stakeholders of the production chain are considered. In this sense, differences in perceived importance were found between citizens and farmers regarding aspects of housing and climate, ability to engage in natural behaviour, animal health, transport and slaughter, feed and water, animal suffering and stress, and human/animal relationship. Differences were mainly related to the animals’ ability to engage in natural behaviour and in aspects related to animal production where the experience of the farmers gives the citizens a different perspective [11].

In a study carried out with German consumers, “The sow can walk around freely instead of being restrained for most of its life” was the most chosen attribute of pork (41.5%) when shopping. With the same study performed in Poland, the most chosen attribute (49.4%) was “The pigs are guaranteed free of microbial contaminants like Salmonella”. Besides the interest in sow welfare found in Germany, the other most-chosen attributes were related to food safety. In both countries, four clusters of consumers (each with a different attitude), were identified. The first cluster was defined as being interested in production (environment and farm) issues, the second in fat content and colour attributes, the third cluster focused mainly on price and the last mainly on the origin of the pork [12]. In other research conducted with consumers from Belgium, Denmark, Germany and Poland, which aimed to determine how attitudes are affected by characteristics of pig production, the factors “housing and floor type” and “efforts to protect soil, air and water on the farm” were the most important. Housing with outdoor access was the most preferred, followed by litter housing, while slatted floor housing was the least preferred. That study again identified four consumer segments. The one supported by the largest portion of consumers (59.1%) had indifferent attitudes towards animal welfare, environmental...
protection and industrial food production while only 12.3% of consumers, mainly from Germany and Denmark, belonged to the segment highly aware of animal welfare [2]. In Serbia, greater awareness towards animal welfare were found in the statements “animal welfare should be strictly controlled”, “increased regulation on the treatment of farm animals is needed in Serbia”, “animal welfare should be guaranteed by specific label” and “high animal welfare standards are necessary to guarantee the quality and safety of food”. Clustering the consumers revealed that 35% of consumers are indifferent towards animal welfare, 30% of them are truly interested in animal welfare, 25% know where to find animal welfare-guaranteed products and 10% of them are antagonistic towards animal welfare [13]. In a study carried out in 13 Eastern European countries, results show notable country-based differences in attitudes and beliefs towards animal welfare, whereas a cross-country cluster analysis divided consumers in three groups, the first one (35% of consumers) “highly concerned about animal welfare”, the second one (43%) “indifferent towards animal welfare” and the third one (22%) “somewhat concerned about animal welfare” [14].

Consumer willingness to pay is an important factor when studying meat produced under higher animal welfare standards. The review of Clark et al. [15], using 54 studies and including data from 17 countries, mainly from Europe and the United States, studied willingness to pay for animal welfare. Although the results were not conclusive, they show that consumer willingness to pay is only half of a standard deviation higher for meat produced with attention for animal welfare. Willingness to pay depends on the country or region. This cultural diversity should be considered by policy makers and can be relevant when developing marketing strategies. Socio-demographic characteristics also affect willingness to pay, because this decreases with age, is higher for women than for men, and increases with income and education level. This diversity could also be seen in a European (EU-28) survey, where the percentage of consumers willing to pay more for animal welfare meat varied between 22 and 93%, whereas in a recent study carried out in Eastern Europe, willingness to pay varied between 3.8 and 5.2 on a 7-point scale [14].

2.2. Alternatives to surgical castration: entire male production, anaesthesia and immunocastration

Surgical castration of piglets without analgesia/anaesthesia is experiencing growing public criticism due to pain experienced by piglets during the procedure [17][4]. Non-anaesthetised surgical castration of piglets is gradually being phased out in Europe, often voluntarily, and alternatives like rearing of entire males, immunocastration and surgical castration with anaesthesia are being introduced. The consumer acceptability of these alternatives is still poorly investigated [5], and differences in study set-up and results make it difficult to draw straightforward conclusions from the few studies published. In general, consumers are not greatly aware of the boar taint issue and the methods available to avoid it, while the majority do not even associate pork with castration [6][18]. A wide study on consumers from six EU countries revealed that people do not perceive pig castration to be a relevant aspect of animal welfare, nor are they aware of its relationship with pork quality. Most consumers do expect the availability of healthy, safe and tasty meat, and therefore, factors like boar taint in entire male production could be an important issue for consumer acceptance [6]. Regarding the alternatives, European stakeholders involved in the pig production chain (i.e. veterinarians, producers, slaughterhouse operators, meat processors and others) prioritised surgical castration with anaesthesia and rated the prospects of immunocastration as low, mainly because of fear of a negative consumer response, which was identified as one of the main disadvantages for implementation of that method [5]. In general, consumer acceptance of surgical castration with anaesthesia seems to be the highest, followed by entire male production. Immunocastration rates second-lowest, with surgical castration without pain relief in last place [5]. The studies showed rather large differences in acceptance or preference across Europe. In Switzerland, surgical castration with anaesthesia was found to be the most acceptable, while immunocastration was disfavoured [19]. Norwegian consumers preferred surgical castration with anaesthesia more than immunocastration (the latter ranked higher than entire male or surgical castration without anaesthesia [20]). It is worth noting here that anaesthesia is required when performing surgical castration in those two countries. Swedish consumers evaluated
immunocastration more positively than rearing entire or surgically castrated males [21], which was similar to Belgian consumers, but only after having received more information about the alternatives [22]. Alternatives were ranked similarly (i.e. surgical castration with anaesthesia > entire male > immunocastration > surgical castration) by German consumers of organic pork [23], whilst the percentage of participants unwilling to pay more were the highest for immunocastration (48%) and surgical castration (41%) compared to entire male (21%) and surgical castration with anaesthesia (14%).

In a study carried out in 13 Eastern European countries, the results show there is probably a low level of awareness about castration of pigs, and that differences between countries can be important. For instance, in the statement ‘I think that surgical castration of pigs is easy (1) or difficult (7)’ the lowest score was for consumers from Bosnia and Herzegovina (3.1) and the highest was for Hungarian and Ukrainian consumers (5.7 in both countries). As for the attitudes and beliefs towards castration, three segments of consumers were identified: the first (47% of consumers) ‘against castration’, the second (31%) ‘indifferent towards castration’ and the third one (22%) ‘pro-castration’ [24].

While some consumers favour immunocastration, others question the practice mainly from a food safety standpoint [25] or their preference for reduced use of pharmaceuticals [26]. A guarantee of food safety and the level of food safety are important consumer concerns [20][25][27]. Norwegian consumers [20] were, in general, positive about immunocastration (for 51% it was completely acceptable, for 23% possibly acceptable, 16% did not know), while 10% found immunocastration unacceptable. The main reasons for rejection were fear of residues, fear of unknown long-term effects and unnaturalness, and their preference for the method currently in use (i.e. surgical castration with anaesthesia). The scepticism toward immunocastration did not decrease when more information on food safety was provided (i.e. there are no residues, no risk for human safety). On the other hand, the reason for the relatively high acceptance of immunocastration was the trust that Norwegian consumers have in their national food safety authority. Similarly, Italian consumers [26] accepted immunocastration even for traditional products, when institutions guarantee a strong involvement in quality, safety and ethical treatment. Swedish consumers showed no aversiveness towards immunocastration when compared to surgical castration [20], indicating the importance of animal welfare concerns over biotechnology aversion or perception of food safety risk.

2.3. Organic production

Organic production is one of the production systems perceived as being related to high animal welfare requirements and expectations. Organic production is regulated by the European legislation [28], stating that in organic production “physical castration shall be allowed in order to maintain the quality of products and traditional production practices, but only by applying adequate anaesthesia and/or analgesia and by carrying out each operation at only the most appropriate age by qualified personnel”.

Consumers, especially Danes and Swedes, consider animal welfare and food safety the most important quality characteristics of organic meat. They believe that animals produced organically have access to outdoor areas and better feed and that the meat is safer because it is free of antibiotics [8].

Organic farming is perceived as being more ethical and more sustainable than conventional farming by most of the organic producers. Their motivation to produce organically is related to environmental, ethical and societal concerns. Furthermore, organic production can satisfy consumer and market demands [29].

3. Attitudes and beliefs of consumers towards meat quality

Meat quality is a broad concept that includes at least the aspects of sensory quality (visual appearance, tenderness, juiciness, aroma, flavour), technological quality (water holding capacity, pH), nutritional quality (content and composition of fat, proteins, vitamins, micro- and macro-nutrients), and safety-related quality traits (microbiological and toxicological aspects). In addition, meat quality includes the socio-ethical value of the product (including production system, animal welfare and environmental aspects). Meat quality is affected by several factors, and the perception of quality can differ among
and within the different stakeholder groups. For instance, for retailers and the restaurant/catering sector, the most important quality criteria when purchasing pork meat was price, while butchers prioritise food safety, and consumers value quality the most. For consumers, quality was followed by price, origin, fat content and freshness. Butchers were the only ones that included sex category of the pig as a quality criterion [30].

As explained before, meat quality includes several points of view. Consumer acceptance and perception of pork are affected by the sensory quality of the meat, which in turn depends on numerous different factors, such as genotype, sex, ante-mortem and post-mortem treatment and processing.

3.1. Colour and fat content
Colour is one of the most important sensory attributes because consumers relate it to freshness [31] and shelf life [32]. In a study involving 23 countries, Ngaipo et al. [33] showed that colour was the most important characteristic of pork compared to fat cover, marbling and drip. Nevertheless, preferences for colour varied between countries. In some countries like Australia, Ireland and Poland, light pork was clearly preferred to dark, while the opposite was observed in Taiwan.

Fat content (either fat cover or marbling) also affects consumer perception of meat. A thin external fat layer on pork was most preferred in countries like Poland, Finland, Mexico and the Netherlands while none of the 23 studied countries showed a strong consumer preference for a thick fat layer [33]. Even though marbling was not the most important parameter for the majority of the consumers, some consumers, like those from Korea, Taiwan and Japan preferred marbled pork while pork without marbling was preferred in Ireland and Australia [33]. In Spain, one segment of consumers clearly preferred marbled meat while others preferred it less marbled. It is also important to note that, although consumers can be differentiated according to their preference for marbled meat, in blind taste tests, they mainly preferred marbled pork compared to lean pork [34]. Marbling affects the tenderness of the meat, which is an important sensory attribute of pork [35]. The preference for leaner meats can be due to consumer perceptions of fatty meat as being less healthy than leaner meats [36][37] and because health is an important criterion for some consumers [38].

3.2. Taste and flavour: boar taint
Taste/flavour and odour are also important sensory attributes of meat. In fact, taste is the most important factor that affects consumer satisfaction for pork and pork products [39] and is the most important criterion for purchase [40]. Because the sex of the pig can have a considerable impact on the sensory quality, boar taint (an unpleasant odour/flavour) is an important issue. Surgical castration and immunocastration both reduce or eliminate boar taint [41]. Several studies have shown consumer acceptability of boar meat is affected by the boar taint levels while other studies present different conclusions. Moreover, the acceptability depends on consumer’s sensitivity to androstenone [42] and skatole [43][44] and to repeated exposure to androstenone [45]. As mentioned above, consumers are generally unaware of piglet castration and the boar taint problem [27]. However, the type and the amount of information provided could affect their attitudes [22]. Some consumers report having detected boar taint when eating pork (16.5% in Switzerland) and consequently, some of them have decreased their pork consumption [19]. In addition to the possible presence of boar taint, pork from entire males is generally considered to be less tender and juicy compared to pork from castrated males, with meat from immunocastrates rated as intermediate.

Swedish consumers preferred conventional pork from surgically castrated pigs more than pork from entire boars [20], showing the importance of food quality in their decision making. As suggested by Heid and Hamm [23], differences in preference could be related to the lack of familiarity with boar taint, as most participants of their study were unfamiliar with this off-odour. Nevertheless, the participants of the focus group study of Fredriksen et al. [20] indicated the presence of boar taint or reduction of pork quality would induce them to reduce their pork consumption. Possibly, differences in background information provided to the consumers are the basis for these attitudes. Overall, a real sensory experience when conducting attitude surveys can clarify this difference. As reported by Kallas
et al. [6], those consumers that were able to differentiate meat from entire males from meat from surgically castrated pigs or considered the odour during cooking as unpleasant were willing to pay more for avoiding boar taint. Sensory experience (eating meat with boar taint or an unmasked meat product) significantly decreased the degree of randomness and consumer uncertainty [46].

3.3. Organically produced meat
EU legislation on organic production [42] defines organic products to be of high quality because they are produced with ‘the observance of high health, environmental and animal welfare standards’. Organic production has been considered as an important quality cue for some consumers because they relate it to good taste (quality) and higher animal welfare [10]. In fact, expectations of consumers towards sensory quality of organic meat (and free-range pork) is higher than towards conventionally-raised pork, and they would also pay more for it (although not much more). However, the experienced quality (i.e. after tasting the meat) was not in agreement with consumer expectations. Consumers found the organic pork to have a slightly lower quality in terms of taste, juiciness and overall acceptability, but tenderness was rated equal [47], although tenderness could possibly decrease in organic pork due to higher physical activity [48]. Consumers also perceive organic meat as being healthier to eat than conventionally-raised meat [40]. Organic production has been associated with domestic meat [40], while domestic meat is considered to be healthier and of good quality [10]. Hemmerling et al. [49][47], when reviewing 58 papers about organic production, described protecting human health as the most important purchase motive and product attribute (34), followed by taste (9), environmental protection (7), no/less chemicals/pesticides (7) and safety (3). Thus, health is an important point that affects the choice of the consumers and their preferences for organic meat. Saba et al. [38] divided consumers in three groups according to their interest in human health: low, medium and high. The higher the interest in human health, the lower the consumption of red meat and preserved and processed meat products. Such was the case with students from New Zealand, perceiving meat as less healthy than vegetables and fruits. Furthermore, the lower the interest in health, the lower the ranking of organic food. When comparing meats from different types of animals, Italian consumers perceived pork as being less healthy to eat and having more calories than lamb, beef and chicken [50].

4. Conclusions
Differences in consumer characteristics and in the information received may affect attitudes and beliefs towards animal welfare and meat quality. It is difficult to compare results between studies because information provided is different among studies and this information influences consumers’ opinion. Several segments of consumers can be found according to their attitudes and beliefs, thus it is important to know the characteristics of these consumers. This information can be used when producing, commercializing, and consuming meat and meat products, as well as to develop marketing strategies to reach all the consumers and to satisfy market demands.

Acknowledgement
The authors wish to acknowledge COST action CA15215 IPEMA, CERCA Programme from ‘Generalitat de Catalunya’ and the Slovenian Research Agency (grant P4-0133). Ms. Miriam Levenson, from ILVO, is acknowledged for the English correction of the manuscript.

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