

Die Zucht von Pfahlmuscheln (*Mytilus galloprovincialis*) als sichere Nahrung

Zusammenfassung

Die Erzeugung von Krebssternchen und Krabben ist eine Tätigkeit, die aus den früheren Zeiten stammt. Sie ist traditionell mit der Bewohnerschaft verbunden. In der letzten Zeit entwickelt sich in eine einträgliche Industrie, die mit dem Tourismus verbunden ist. In Kroatien werden jährlich etwa 3 000 Tonnen Pfahlmuscheln erzeugt, die ausschließlich auf dem Binnenmarkt placiert werden, als schmackhafte und sehr gute Nahrung von eigenartigen sensorischen Eigenschaften und qualitativ sehr guten Qualität. Gefangene Krebssternchen, bestimmt für die Marktzwecke, entsprechen den Verordnungen der Dienstvorschrift über Hygiene der Nahrung animaler Herkunft (Anon., 2007b) und als solche werden sie in die Distributionszentren geliefert, wo sie in Einblatteinheiten verpackt werden. Neben dem Monitoring in Erzeugungsbereichen und Gebieten für neues Anlegen, ist ein Kontrollsystem entwickelt worden, das Laboruntersuchungen einschließt, mit dem Ziel der Überprüfung der Subjekte, die mit Nahrung handeln, im Sinne der Erfüllung von Forderungen für Endprodukte in allen Herstellungsphasen und Distribution. Neben der angeführten Kontrolle ist es wichtig, eine gute hygienische Praxis (und HACCP System) beim Transport und Lagerung der Krebssternchen mit dem Ziel des Verbraucherschutzes durchzuführen.

Schlüsselwörter: Pfahlmuschel, Kontrolle

Allevamento di cozze (*Mytilus galloprovincialis*) come alimentari sicuri

Sommario

La produzione di molluschi e granchi è conosciuta già dai tempi antichi, ed è tradizionalmente legata alla popolazione, e negli ultimi tempi sta diventando un'industria che porta molto denaro essendo legata strettamente al turismo. In Croazia vengono prodotte 3 000 tonnellate di cozze, che poi si offrono e vendono solo al mercato domestico come un alimento gustoso e di qualità, dalle particolari caratteristiche sensoriche, e con una notevole percentuale di proteine. I molluschi destinati al mercato sono contemporaneamente conformi alle norme del Regolamento di igiene degli alimenti di origine animale (Anon., 2007 b) e come tali arrivano negli centri di distribuzione dove vengono confezionati nelle unità d'imballaggio. Insieme con il monitoraggio nelle aree di produzione e nelle aree per un nuovo deposito, è stato stabilito anche il sistema di sorveglianza in cui si eseguono le ricerche laboratorie con lo scopo di controllare tutte le fasi di produzione e distribuzione. Per proteggere la salute di consumatori è molto importante una buona pratica igienica (ed il sistema HACCP) durante il trasporto e l'imballaggio di molluschi.

Parole chiave: cozze, sorveglianza

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Consumer opinion on influence of animal welfare to meat quality during processing

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short communication

Summary

In recent years consumers have been even more interested in the manner and procedures of food production. They want to know about the origin of meat they buy, and they choose the products according to their findings. Consumers are interested in whether the animals were treated in accordance with welfare during breeding, transport and processing, and they demand humane methods even more. A poll was conducted in the period from October to December in 2011 on the sample of 187 randomly selected examinees from the area of Sisak – Moslavina County, City of Zagreb County and Zagreb County; 45.5% of male and 54.5% of female examinees took part in the research. Similarly to the results of the researches conducted so far in Croatia, but also to the prevailing opinion in the EU countries, the majority of examinees in this research lists high concern for animal welfare. But, regardless of their concern, most of them don't take animal welfare into consideration when they buy meat. Sample size and the procedure of sampling in this research enable making some conclusions on Croatian meat consumers and their attitudes toward animal welfare. But, these researches are necessary to be repeated on a larger sample and the distribution of examinees through all the areas of the Republic of Croatia.

Keywords: animal welfare, meat quality, consumers, poll

Introduction

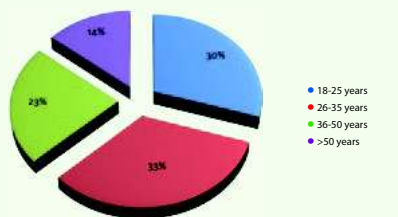
Along with the development, progress and maturation of human civilization there appears empathy, not only towards other people, but towards animals too, including those which are used for food. Except for the welfare of animals which at some points becomes a goal in itself, we also become conscious of its influence to meat quality, taking into consideration health safety of the meat, as well as its sensory characteristics. In recent years consumers have become more interested in the manner and procedures of food

production (Gade, 2002), they want to know about the origin of the meat they buy (Warriss and Brown, 2000), and they choose the products according to these findings (Busquin, 2004).

Speaking of animal welfare, there is often forgotten the fact that it doesn't stop when an animal leaves the farm, but it should continue through the entire process of transport and processing. Therefore, animal welfare in general, but welfare of farm animals in slaughter line as well have been taking increasingly

important role nowadays (Petak and Mikuš, 2011). The researches conducted in Great Britain have shown that 87% of the poll examinees were concerned for handling farm animals, i.e. whether they suffered in the process of meat production (Bennett, 1996). Consumers are interested in whether the animals were treated in accordance with welfare during breeding, transport and processing (Warriss and Brown, 2000) and they demand humane methods to be used (Appleby and Hughes, 1997).

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Graph 1. Age of examinees



Graph 2. Education level of the examinees



Graph 3. Salary amount of the examinees in the household

Table 1. Statistical significance of the relation of average monthly earning and their readiness to pay more

| Chi-Square Tests | | | |
|------------------------------|--------|----|-----------------------|
| | Value | df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 7.714* | 3 | .052 |
| Likelihood Ratio | 7.650 | 3 | .054 |
| Linear-by-Linear Association | 6.087 | 1 | .014 |
| N of Valid Cases | 187 | | |

Indicating that a well – conducted animal welfare leads to a better production quality is an extra commercial encouragement to improve the manners of breeding and handling an animal, but to improve processing as well (Warriss and Brown, 2000). A humane slaughter is a procedure conducted in a manner so it guarantees animal welfare until bleeding out (de Oliveira Roca, 2002).

Researches in Great Britain, Ireland, Italy, France and Germany have shown that consumers use the term animal welfare as an indicator of other, more important characteristics of products, such as food safety, quality and health. Consequently, they equalize good standards of animal welfare with good standards of food. They define animal welfare in terms of natural life and humane death, which means that animals should be bred, fed, accommodated and their reproduction should be conducted in a way to enable them behavior which is as similar to natural one as it can be. Consumers equalize natural organic production with safer food quality. They use the term "humane" to denote fast and painless death through processing (Harper and Henson, 2001).

The aim of this paper was to determine how familiar Croatian citizens are with the terms animal welfare and animal welfare on slaughter line, and whether they are ready to pay more money for meat and meat products originating from animals bred in welfare.

Material and methods

While working on this paper, information were gathered by the method of questioning by the instrument of a questionnaire. A poll was conducted in the period from October to December 2011, on the sample of 187 randomly selected examinees from the area of Sisak – Moslavina County, City of Zagreb County and



Graph 4. Importance of farm animal welfare

Table 2. Statistical significance of the relation of sex of the examinees with care of animal welfare on farms and slaughterhouse facilities

| Chi-Square Tests | | | |
|------------------------------|--------|----|-----------------------|
| | Value | df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 9.347* | 3 | .025 |
| Likelihood Ratio | 10.541 | 3 | .014 |
| Linear-by-Linear Association | 8.336 | 1 | .004 |
| N of Valid Cases | 187 | | |

* 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.36.

Zagreb County. The choice of examinees was random and they were of different sex, age groups, level of education and monthly incomes. The poll took from 7 to 15 minutes. Before conducting the poll, the questionnaire was tested on the sample of 5 examinees in order to correct potential uncertainties in the order and formulation of the questions.

The questionnaire consisted of 23 questions which were separated to few groups. In the first part of the poll there was questioned the knowledge of the examinees of animal welfare and animal welfare on slaughter line. Then follows a group of questions on the importance of animal welfare and consumers' readiness to pay more money for meat products originating from the animals whose welfare was respected. The last group of questions in the questionnaire related to sociodemographic characteristics, such as age, sex, education level, profession, household size, a place of growing

up (town / village) and income.

The data obtained by the poll were encrypted and processed by univariate (frequency, data distribution) and bivariate data analysis (Chi-square test). The total data processing was made by the statistical package SPSS.

Results

1.1 Socio-economic characteristics of the examinees

The age of the examinees who took part in the research was between 18 and 80. The examinees were grouped into four age categories: 18 – 25, 26 – 35, 36 – 50 and over 50. It was determined by the data analysis that all age groups were equally represented in this research and that there is no significant difference in their notion of welfare during meat processing. Even though the most represented group of examinees was the one of 26 – 35 years of age (33%), it is noticeable that other age groups are well- represented in

the research too (Graph 1).

The highest share of the examinees who took part in the poll, 64% of them, had secondary education (Graph 2), 31% of the examinees had tertiary education and only 5% of them had just elementary school education. The highest share of the examinees (31%) earned 6001 – 9000 kn on average monthly. We determined that there is a statistical difference $p=0.053$ (Table 1) in comparison to the readiness of the examinees with higher incomes to pay more money for the products produced in welfare.

1.2. Consumer opinion on welfare on farms and slaughterhouse facilities

Although majority (62.6%) of the examinees said that they were familiar with the term welfare on slaughter line, very few of them were able to define it, once they were asked that question.

Except for the welfare on slaughter line, the examinees find it very important (43%) and important (42%) to pay attention to farm animal welfare and a very low percentage of the examinees find it unimportant (1%). It is interesting to apply a statistically significant difference in the opinion on animal welfare on farms considering the sex of the examinees. Namely, women find it more important ($p<0.05$) to pay attention to animal welfare on farms (Table 2).

Also, 55% of the examinees think that there is a difference in the quality of meat produced in welfare as opposed to classically produced meat, 33% are not sure, whereas 12% believe that that difference doesn't exist. That indicates that there is no proper education of consumers on advantages of producing meat in welfare. This is supported by the information that 33% of the examinees are not sure if the differ-



Graph 5 Criteria related to animal welfare - conditions at slaughter



Graph 6 Criteria related to animal welfare - importance of staff education

that everyone should think of animal suffering (4.18). On the other hand, the examinees think that welfare in a slaughterhouse is very important and that meat that they buy comes from the animals bred in welfare (average grade 3.75).

More than half of the examinees (62%) consider conditions at slaughter to be very important (Graph 5) as well as the education of the staff at slaughter line (very important 58%; important 31%; Graph 6). According to the research conducted in the area of the city of Zagreb (Cerjak et al., 2011) about 31% of the examinees believe that protection of welfare of farm animals in Croatia was improved in the last decade, whereas that percentage in our research is somewhat higher and amounts 40%. 8% of the examinees in our research think that animal welfare deteriorated and 44% of the examinees in the research by the quoted authors believe the same. That can be explained by a smaller sample of the examinees in the other research, as well as by the fact that the poll was conducted at a fair of the traditional products, where the population of the examinees is more specific.

1.3 Attitude of examinees to welfare of farm animals

In order to determine the attitudes of consumers on welfare of farm animals (with an emphasis on processing), the assignment of the examinees in the questionnaire was to evaluate on a five - point Likert scale the degree of agreeing, i.e. disagreeing with the statements relevant to improvement of products and production in welfare, where 1 represented a complete disagreement with that statement and 5 was a complete agreement.

More than half of the examinees (52%) think that the level of welfare in Croatia hasn't changed a bit in the last ten years, whereas 40% think

Table 3 Attitudes of the examinees to welfare of farm animals (with an emphasis on processing)

| STATEMENTS | Average grade | Standard deviation |
|--|---------------|--------------------|
| It is important to me that meat comes from " animals bred in welfare " | 3.75 | .95794 |
| Taste of meat is more important than the manner of animal breeding | 2.76 | 1.32317 |
| Welfare in a slaughterhouse is irrelevant matter | 1.72 | .94908 |
| Everyone should think about animal suffering | 4.18 | 1.05193 |
| The manner of animal breeding is irrelevant, they are not accustomed to better conditions anyway | 1.61 | .92247 |
| Animals should be enabled conditions for natural behavior | 4.11 | .88792 |
| Pets deserve a better treatment than farm animals | 2.38 | 1.24494 |
| I think that society has a moral commitment to maintain high standard in farm animal welfare | 4.24 | .82361 |
| Consumers should be informed more on welfare of farm animals | 4.67 | 2.98873 |

ence exists and that group of people could be informed about advantages of such production manner by a good marketing and education. This conclusion can also be made out of the Likert scale (Table 3) where we can see that many examinees find it

necessary to inform the consumers more on welfare of farm animals (average grade 4.67). Also, many examinees think that society has a moral obligation for maintaining high standard in terms of welfare of farm animals (average grade 4.24) and



Graph 7 Trends in the level of welfare for the last 10 years



Graph 8. Future purchase intentions of the buyers



Graph 9 Spending readiness of the examinees related to price

that the level of welfare has been improved (Graph 7).

1.3. Future purchase intentions of the buyers

With the goal of determining future buying intentions of consumers toward the products "produced in welfare", we asked the examinees if they plan to buy such products in the future and if they are ready to pay more money for them.

More than half of the examinees (probably 24% and very probably 27%) plan to buy and consume products produced in welfare in the future, whereas approximately one third of the examinees will maybe buy such products. Only 8% of the examinees are not sure about their future purchase intentions, while 6% of the examinees said that they will not buy these products in the future

(Graph 8).

More than half of the examinees (71%) are willing to pay more for meat products which are produced in welfare. As much as 24% of the total examinees are willing to pay an over 20% higher price for such products and 37% are ready to pay 5 - 20% of the current price of meat products (Graph 9).

If we take into account all the results of our research, we can freely conclude that what mostly influences the opinion of the examinees on welfare of farm animals in slaughterhouse facility is sex (women are statistically significantly more sensitive). Age of the examinees, place of residence or level of education do not have a significant influence on consumer opinion. Therefore, based on this research, it is desirable to conduct the education of meat consumers in the future and to explain all the advantages of such breeding, as for animals, so for the level of quality of end products.

Conclusion

Similarly to the researchers conducted so far in Croatia, but also to the predominant opinion in the EU, majority of the examinees in this research lists a high concern for animal welfare. But, even though there is a great concern in terms of welfare, most of them don't take animal welfare into account when they buy meat.

Room for progress is possible in the segment of the indifferent ones, i.e. those consumers who don't know about the influence of welfare to meat quality. Therefore consumers themselves have recognized that a better education of Croatian consumers is necessary in terms of animal welfare on farms and slaughterhouse facilities, as well as about the influence of different levels of welfare to meat quality.

Meinung der Verbraucher über den Einfluss des Wohlergehens der Tiere bei der Schlachtaberarbeitung auf die Fleischqualität

Zusammenfassung

In den letzten Jahren interessieren sich die Verbraucher immer mehr für die Art und die Verfahrensweisen bei der Nahrungsherstellung. Sie wollen wissen, woher das Fleisch, das sie kaufen, herkommt und wählen demgemäß, was sie kaufen. Die Verbraucher interessieren sich dafür, ob mit den Tieren im Sinne ihres Wohlergehens während der Zucht, des Transportes und der schlachtlichen Verarbeitung umgegangen wurde. Sie verlangen, dass dabei immer mehr humane Methoden verwendet werden. Die Umfrage wurde in der Zeitspanne vom Oktober bis Dezember 2011 auf 187 zufällig ausgewählten Kandidaten durchgeführt. Die Kandidaten waren vom Gebiet der Sisacko-moslavačka županija, Županija grada Zagreba und Zagrebačka županija. Darunter befanden sich 45,5 % männliche und 54,5 % weibliche Kandidaten. Ähnlich wie in bisherigen Untersuchungen in Kroatien, betonte die meiste Zahl der Kandidaten ihre Fürsorge für das Wohlergehen der Tiere. Trotz ihrer Fürsorge, führen sie keine Rechnung darüber, wenn sie Fleisch kaufen. Die meisten Musterproben und Musterproben-Verfahren in dieser Untersuchung ermöglichen Beschlussfassungen über die kroatischen Fleischverbraucher und deren Standpunkte bezüglich des Wohlergehens der Tiere. Trotzdem ist es nötig, solche Untersuchungen auf einer größeren Zahl der Prüflinge aus allen Regionen Kroatiens durchzuführen.

Schlüsselwörter: Wohlergehen der Tiere, Fleischqualität, Verbraucher, Umfrage

Opinione dei consumatori dell'influenza di benessere di animali durante la lavorazione in macelleria sulla qualità della carne

Sommario

Negli ultimi anni i consumatori sono più interessati del modo e procedimenti di lavorazione e produzione di alimentari: vogliono sapere da dove proviene la carne che comprano, e secondo l'informazione ottenuta scelgono ciò che comprano. I consumatori ora vogliono sapere se gli animali sono stati trattati bene durante il loro allevamento, il trasporto e la lavorazione in macelleria, e richiedono ogni giorno di più che si usino i metodi umani in tutto il procedimento. La ricerca sociale fatta nella forma di questionario, nel periodo dall'ottobre al dicembre del 2011 sul campione di 187 intervistati a vicenda nella Contea della città di Sisak e regione di Moslavina e nella zona della Contea della città di Zagabria ed i suoi dintorni (ambidue situate nella Croazia centrale). La ricerca ha incluso il 45,5% dei maschi e il 54,5% delle femmine intervistate. Simile alle ricerche eseguite finora in Croazia, ma anche conforme all'opinione che prevale nei paesi dell'Unione europea, una notevole maggioranza degli intervistati in questa ricerca sottolinea il loro grande interesse per il benessere degli animali. Ma, ciò nonostante, la loro maggior parte non ci pensa mentre compra la carne. La grandezza del campione ed il procedimento di campionaggio in questa ricerca ci portano alla conclusione legata ai consumatori croati e ai loro atteggiamenti e opinioni che riguardano il benessere degli animali, ma è necessario ripetere queste ricerche su un campione e sulla distribuzione ancora più grandi in tutte le regioni della Repubblica di Croazia.

Parole chiave: benessere di animali, qualità di carne, consumatori, questionario **Parole chiave:** ferro, tossicocinetica, alimenti

Sample size and sampling procedure in this research enable making some conclusions on Croatian meat consumers and their attitudes on animal welfare, but these researches should certainly be repeated on larger sample and distribution of examinees from all regions of the Republic of Croatia.

* This paper is an excerpt from the diploma thesis by Davorin Mijatović "Consumers' opinion on the influence of animal welfare at processing to meat quality" (mentor: Lidija Kozačinski, PhD, full professor)

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Procedure with slaughterhouse by - products after poultry processing

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professional paper

Summary

Along with carcasses and confiscated waste, by-products of animal origin appearing in livestock production on farms or in slaughterhouse facilities, plants for processing and production of food of animal origin, during transport, in ZOOs, hunting grounds, etc., are a serious hygienic – epidemiological problem, as well as ultimately an ecological one. Due to a potential danger for the environment and human and animal health, a great attention is paid to disposing and harmless removing of by – products of animal origin within a wider community. At the same time it is a part of the activities carried out by the Veterinary Public Health. On the other hand, rendering plants are facilities for hygienic processing by decomposing animals which are dangerous or potentially dangerous for human health. In rendering plants' technological process, procedures of heating, separation and filtration are used in order to destroy bacteria successfully, extract protein, remove moisture and separate protein from technical fat. The first real beginning of rendering industry is considered to be the moment when fat obtained by melting by – products of animal origin was started to be used in everyday life. Except for the ecological meaning, facilities for processing slaughterhouse by - products also have a large economical meaning which is reflected in the income approach of obtaining highly valuable protein supplements for production needs, i.e. for the preparation of highly valuable protein supplements for the needs of production, i.e. preparation of fodder. Our current legislation is in accordance with the EU legislation, but unfortunately, it will take some more time until its full application.

Key words: slaughterhouse by – products, rendering plant

Introduction

Along with carcasses and confiscated waste, by-products of animal origin appearing in livestock production on farms or in slaughterhouse facilities, plants for processing and production of food of animal origin, during transport, in ZOOs, hunting grounds, etc., are a serious hygienic – epidemiological problem, as well as ultimately an ecological one which is tried to be solved within the activities carried out by the Veterinary Public Health (Njari, 2001, Njari et al., 2001). Due to a potential danger for the environment and human and animal health, a great attention is paid to disposing and harmless removing of by – products of animal origin within a wider community (Majurdžić and Njari, 2004a and b). Numerous laws and regulations regulate this issue, e.g. the Veterinary Medicine

Act (Anon., 1997, 2007), the Environmental Protection Act (Anon., 2007), the Waste Act (Anon., 2004) and the Regulation on animal by – products not intended for human consumption (Anon., 2006).

Procedure with by – products of slaughterhouse processed poultry

A slaughterhouse poultry processing has its own hygienic – technological sequence which makes a processing whole (Diagram 1). During that processing we come across a whole array of inedible by – products which are taken care of by the Veterinary Public Health. Handling of animal by – products in the Republic of Croatia is regulated by the Veterinary Act (Anon., 1997 and 2007) and the Regulation on handling of animal carcass-

es and by – products of animal origin and their destruction (Anon., 2003). Handling of by – products of animal origin by the veterinary – sanitary principles and principles of veterinary environment protection implies accepting, collecting, categorizing according to the risk degree, temporary storing of by – products in collection centers with cooling devices, autopsy of dead animals (diagnosing causes of death) and thermal processing. According to the Regulation on handling animal by – products not intended for human consumption (Anon., 2009), the Regulation 1774/2002 was completely transferred to Croatian legislation and animal by – products were divided to three categories (K1, K2, K3).

The material of the first category (K1) includes by – products of animal

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