

BEEF CATTLE WELFARE - RISKS AND ASSURANCE

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Review paper

Abstract: Beef production is widespread all over the world but the legislation regarding welfare area of beef cattle is not specifically addressed and fully implemented. Beef cattle welfare assurance affects not only animals but is also a question of ethics and products quality. Today, it is possible to determine welfare quality state in feedlots through relevant methodology such is Welfare Quality®Assessment Protocol applied to fattening cattle. It enables implementation of improvement strategy regarding identified risks and causes of poor welfare. Different literature sources, based on welfare risk assessment, indicate major welfare problems in cattle kept for beef production. According to them, respiratory diseases are usually linked to overstocking, inadequate ventilation, mixing of animals and failure of early diagnosis and treatment. In addition, digestive disorders are associated with intensive concentrate feeding, lack of physically effective fibre in the diet whilst behavioral disorders comes as a consequence of inadequate floor space, and commingling in the feedlot. Particular welfare problems are related to the implementation of animal husbandry methods-mutilation, which expose animals to pain and suffering. This paper gives a review of most important beef cattle welfare topics including recommendations for its assurance and improvement.

Key words: beef cattle, welfare, risks, assurance, legislation, assessment, food quality

Introduction

Beef meet is the fourth produced (by value) animal protein in the world after milk and pork. Production of beef meet in world has increasing trend over the past 55 years, from 23 millions of tonnes in 1960 to 57 millions in 2014 reaching its maximum level. Among countries, the United States is the largest producer of beef in the world followed by Brazil and the European Union. At the same time, those countries are the largest consumers of beef in the world. Recent years beef production in Serbia is not satisfactory although there are substantial potentials for it (*Aleksić et al., 2012*). Our country has been traditional exporter of beef, meat products, and fattening young cattle into many countries. Nowadays, production of

meat is in constant decrease, which is consequence of reduction in total number of cattle as well as insufficient number of slaughterhouses with EU certificate (*Ostojić Andrić et al., 2012a*).

Generally, beef breeding is widespread all over the world and there are six main categories of those production systems: dairy farming, beef breeding herds, semi-intensive grazing systems, bobby calf production, veal farming and intensive fattening units. Each of these systems have advantages and disadvantages regarding the management and production efficiency as well as quality of products obtained (*Petrović et al., 2011*). In recent years however, great attention is paid to the aspect of health and welfare of reared cattle. The initiative of people to care about the welfare of farm animals is based on their moral attitude and concern for the right and wrong treatment of animals, with presumed opposition to over-exploitation and/or cruelty towards animals (*Ostojić Andrić et al., 2012b*). There is also growing concern for many consumers in Europe about farm animal welfare since it becoming increasingly recognized as an important attribute of food quality (*Blokhuis et al., 2008; Blandford et al., 2002; Ostojić Andrić et al., 2006*). Specifically considering beef products, *Veissiere et al. (2007)* report that consumers have relevant concern levels for animal welfare. Guided by the above mentioned, some markets developed farm assurance schemes which guarantying animal welfare friendly products, such as UK's so called "Freedom Food" (*Burgess et al., 2003*). The link between farm animal welfare and food quality becomes even more important with growing evidence that animal welfare has direct and indirect impacts on food safety and quality (*Blokhuis et al., 2008; Wyss et al., 2004*). When it comes to beef meat, poor welfare conditions in beef cattle rearing usually resulted in low meat quality due to stress (dark-cutting beef) and inappropriate handling and transport (bruises, leg fractures, injuries, diseases etc.) (*Aleksić et al., 2013*). It reflects negatively not only the appearance of flesh, but also its sensory characteristics and the ability for technological processing (*Delić et al., 2013*). It is also important to note that chronic exposure to stress has an immunosuppressive effect, decreasing disease resistance and increase using of antibiotics which potentially leads to drug residues in meat that can be harmful for human's health. This paper gives a review of most important welfare issues in beef cattle, including major risks and recommendations for its assurance.

Beef farming systems

Cattle in the EU are primarily reared on a grass and forage-based diet. In Member States, such as the UK, Ireland and France, grazing and grass finishing of cattle is prevalent, whereas Scandinavia primarily feeds cattle on harvested forages. In Central and Southern Europe, where grain yields are higher, cattle tend to feed on less grass and forage and more grain, but not nearly to the

extent of the United States. From an animal welfare perspective, beef cattle reared and finished on pasture benefit in terms of health and well-being and have the opportunity to express natural behavior. Cattle are adapted to a life spent grazing on pasture, which provides them with an appropriate diet for their ruminant digestive system. Beef cattle on pasture also have more opportunities for natural behavior such as grazing, walking, choosing different areas for lying and social interactions.

Definition of welfare

Welfare is commonly define as a list of needs (freedoms) which should be provided to the animal and which are contained in “The principle of Five Freedoms and Provisions” (FFP) given in Table 1. It is defined by the Farm Animal Welfare Council (*FAWC, 2014*) for whom the welfare of an animal includes its physical and mental state. These freedoms identify the elements that determine the animals’ own perception of their welfare state and define the provisions necessary to promote that state (Webster, 2001). According to these freedoms the assurance of animal welfare can only be accomplished by proper production practices, specific not only to the animal species, but also to production systems and husbandry, climatic and farming conditions, housing and management methods, feeding, etc.

Table 1. The Principle of Five Freedoms and Provisions (FFP), *FAWC (2014)*

| | |
|---|--|
| 1. Freedom from hunger and thirst | access to fresh water and diet to maintain full health and vigour |
| 2. Freedom from discomfort | provision of an appropriate environment including shelter and a comfortable resting area |
| 3. Freedom from pain, injury or disease | prevention or rapid diagnosis and treatment |
| 4. Freedom to express normal behaviour | provision of sufficient space, proper facilities and company of the animal's own kind |
| 5. Freedom from fear and distress | ensuring conditions and management which prevents mental suffering |

Assessment of welfare quality in beef cattle

Regardless of conditions that are present in animals' rearing, welfare assessment should be a scientific procedure and should include health, physiology, performance and behaviour measures (*European Commission, 2000*). One of the

novel method for welfare assessment in beef cattle is those developed under the *Welfare Quality Project® (2009)* which utilizes physiological, health and behavioural aspects to assess the welfare of fattening cattle on farm and at the slaughterhouse. Description of the measures that will be used to calculate the overall assessment of welfare are given in *Welfare Quality® Assessment Protocol for Cattle (2009)*, (Table 2). Starting from mainly animal-based measures, collected on farm or slaughterhouse, this assessment enables us to convert them to

Table 2. Collection of data for fattening cattle on farm (*Welfare Quality® Protocol, 2009*)

| Principle | Welfare Criteria | | Measures |
|-----------------------|------------------|--|--|
| Good feeding | 1 | Absence of prolonged hunger | Body condition score |
| | 2 | Absence of prolonged thirst | Water provision, cleanliness of water points, number of animals using the water points |
| Good housing | 3 | Comfort around resting | Time needed to lie down, cleanliness of the animals |
| | 4 | Thermal comfort | <i>As yet, no measure is developed</i> |
| | 5 | Ease of movement | Pen features according to live weight, access to outdoor loafing area or pasture |
| Good health | 6 | Absence of injuries | Lameness, integument alterations |
| | 7 | Absence of disease | Coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, bloated rumen, mortality |
| | 8 | Absence of pain induced by management procedures | Disbudding/dehorning, tail docking, castration |
| Appropriate behaviour | 9 | Expression of social behaviours | Agonistic behaviours, cohesive behaviours |
| | 10 | Expression of other behaviours | Access to pasture |
| | 11 | Good human-animal | Avoidance distance |
| | 12 | Positive emotional state | Qualitative behaviour assessment |

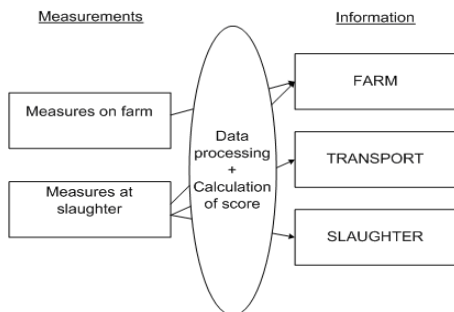


Figure 1. From measures to information (*Welfare Quality® Protocol, 2009*)

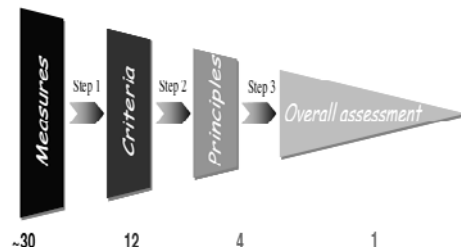


Figure 2. Integration of measures to an overall welfare assessment (*Welfare Quality® Protocol, 2009*)

summary information about overall welfare state on given farms as it is shown in Figures 1 and 2. Potential use of the output generated includes not only information provided to improve welfare quality but is also available to consumers, advisors and retailers in beef industry (*Ostojic Andrić et al., 2013*).

Legislation

There is no specific EU legislation considering the welfare of cattle kept for beef production (*Blandford et al., 2002; European Commission, 2001*). However, some general EU legislations relating to the protection of the welfare of calves as well as animals at the time of slaughter, killing and during transportation, are applicable. Veal production has been a controversial welfare topic within Europe and led to the implementation first in 1991, and later in 2008, of legislation laying down minimum standards for calves' protection (Council Directive 2008/119/EC, laying down minimum standards for the protection of calves). European Convention for the protection of animals for slaughter (1979) and Council Directive 93/119 EC on the protection of animals at the time of slaughter and killing were adopted in order to improve handling, restraint, stunning and slaughter conditions. Also, animal transportation is a very relevant issue for animal welfare and therefore being subject to specific legal requirements such as European Convention for the protection of animals during international transport (1968) and Council regulation 1/2005 on the protection of animals during transport and related operations.).

At the national level, welfare legislation may address minimum requirements for beef cattle, for example, in Austria (*Tierschutzgesetz, 2004*). In Serbia, first law on animal welfare was adopted in 2009 (*“Official Journal RS”, No.41/2009*), including set of regulations which refer to rearing conditions, traffic and record in terms of farm animal welfare (*“Official Journal RS”, No. 6/10*) and the procedure for deprivation of animal life in slaughterhouse (*“Official Journal RS”, No. 14/2010*). The limited extent of legal standards regarding beef production

contrasts with numerous welfare concerns, as highlighted, for example, by *SCAHAW (2001)*.

Welfare risks in beef cattle production

For centuries, cattle were grown in a traditional manner, within small farms, mainly grazing. Since the second half of the nineteenth century, the development of industry and continuously raising of population pointed to the need of rapidly increasing production of protein products which led to the industrialization of cattle breeding and implementation of new solutions in animal husbandry. This new era in cattle breeding included a significant reduction in the housing area, inadequate or completely deprived movements and thus the impossibility of expressing natural behaviours and social interactions (*Ostojić Andrić et al., 2011; Hristov et al., 2011*). Today, there are serious indications that the increased frequency, particularly the so-called production diseases, is directly related to disturbed animal welfare. According to *Gregory (1998)* the most important welfare risks which occur in beef production are summarized in table 3.

Table 3. Most important stress and welfare issues in beef cattle (*Gregory, 1998*)

| | Dairy cow | Beef breeding herd | Semi-intensive beef grazing systems | Feedlots | Veal units | Bobby calf production |
|-----------------------------------|-----------|--------------------|-------------------------------------|----------|------------|-----------------------|
| Dystocia | ✓ | ✓ | | | | |
| Cow–calf separation | ✓ | | | | ✓ | ✓ |
| Mastitis | ✓ | | | | | |
| Lameness | ✓ | | | | | |
| Metabolic and digestive disorders | ✓ | | | ✓* | ✓* | |
| Poor body condition/ underfeeding | ✓* | ✓* | | | | |
| Social stressors | ✓ | | ✓* | | | ✓ |
| Dehorning/disbudding/ docking | ✓ | ✓ | | | | |
| Castration | | ✓* | | ✓ | | |
| Hot-iron branding | | ✓* | ✓* | ✓* | | |
| Handling | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Transport | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

* Only applies to particular systems, countries, or regions.

In a broader context, as reported by *EFSA Scientific Opinion (2012)* major welfare problems in cattle kept for beef production were respiratory diseases linked to overstocking, inadequate ventilation, mixing of animals and failure of early diagnosis and treatment, digestive disorders linked to intensive concentrate feeding, lack of physically effective fibre in the diet, and behavioural disorders linked to inadequate floor space, and co-mingling (mixing of animals from different sources in the feedlot). In further text, only some of most important welfare risks will be discussed more detailed.

The impact of heat and cold stress

Beef cattle can tolerate and adapt to a wide range of air temperatures, and metabolic heat production increases with increasing feed intake. Thus, animals on the highest rations are least sensitive to cold and most sensitive to heat. Cold stress can be reduced by provision of appropriate shelter and a dry lying area. Therefore, it is recommended that beef cattle confined in houses or open feedlots should be provided with structures and facilities to reduce the effects of factors contributing to thermal stress such as excess air movement, precipitation, relative humidity and solar load. Provided that these are effective there is no need to make provision for the control of air temperature (*EFSA, 2012*).

Housing condition - floor quality

Beef cattle kept on slatted floors have a higher incidence of abnormal standing and lying movements and also a higher incidence of injuries than animals kept on straw or sloped, partially straw-bedded areas (*Absmanner et al., 2009*). Partial rubberisation or rubber mats on concrete floors, especially for lying areas, reduces the prevalence of lesions to claws and joints. However, wherever possible, cattle housed on slatted concrete floors should have access to a bedded area. *Lowe et al. (2001)* showed that Continental-cross steers of 450 kg kept on straw were significantly cleaner than steers kept on perforated rubber mats or conventional slats.

Mutilations - castration, disbudding/dehorning

Castration is carried out in cattle in order to: reduce aggressive and sexual behaviour, reduce the incidence of meat quality problems, particularly dark-cutting meat, encourage fattening, or avoid unwanted pregnancies (*Stafford and Mellor, 2005*). It is common practice in Ireland, UK, north western France and USA, where the males are fattened as steers. All castration methods cause intense acute pain and chronic pain that may last for some days and even up to 2 weeks (*Marti et al., 2010*). A study of *Bretschneider (2005)* showed that loss of weight also increased greatly with the age of castration, independently of the method used.

Approximately 35 % of beef cattle in European Union (EU) are disbudded and about 15 % are dehorned. Disbudding of young calves seems to be more

acceptable than dehorning from a welfare point of view and does not cause as much pain as dehorning older animals (EFSA, 2012).

It has been shown that very young animals feel pain, but they may actually feel more pain than adults due to the immaturity of the nociceptive system (Fitzgerald, 1994). On the other hand, in older animals, mutilation will result in a more extensive area of tissue damage and so may cause more pain and a more prolonged recovery period (Bretschneider, 2005). Restraining animals during mutilation procedure usually cause some distress in addition to the existing pain. This stress may be lower in animals under 6 months of age compared to older animals simply due to their size. Overall, this could mean that when calves are mutilated at a young age they may suffer less overall pain and distress than old larger animals (King et al., 1991). In most EU Member States, there was a reinforcement of using anesthesia for most mutilations but the use of analgesia in post-operative period is less common and should be more practiced (Hewson et al., 2007).

In conclusion, all mutilation measures should be followed by use of appropriate anesthetics and analgesic in order to avoid stress and pain as important welfare risks. Some non-invasive procedures such as immunocastration and genetic selection of polled animals should be widely implemented.

Social stress and abnormal behavior

Inappropriate human-cattle interactions are often seen as a source of social stress, especially, rough handling of animals in everyday managing, transport or during veterinary procedures. Nowadays, with increasing herd sizes and mechanisation, loose housing become more convenient in beef production, which resulted in less frequent contacts of animals with humans and increase their perception of humans as a potential danger. In these situations, fear reactions and antipredatory strategies, such as flight or fight, are typically observed during handling (Waiblinger et al., 2006). Several studies (SCAHAW, 2001; Krohn et al., 2001) have shown that early human contact with calves (during the first few days following weaning) is of great importance for establishing good human-animal relationship and most effective in terms of reducing fear of humans.

Interaction between animals in feedlot can also be a source of social stress (EFSA, 2012). Mixing and regrouping of cattle increase the incidence of agonistic behaviors and also have disadvantages from a health perspective. Older and more aggressive animals may cause trauma and severe stress to lower ranking calves. There is also a risk that young, immature, heifers may be harassed and become pregnant when kept with sexually mature bulls. In terms of behavioural disorders, beef cattle are often prone to tongue rolling and urine drinking, that usually occur as a consequence of inappropriate nutrition and feeding (high starch, fibre or proteins ratio in diet).

Growth-promoting hormones

In the United States (US) beef production growth promoters (hormones and beta-agonists) are widely administered in approximately two-thirds of all beef cattle (WAP, 2014). Producers administer these non-therapeutic drugs in view of reducing production costs as they allow animals to grow larger and more quickly on less feed. Growth promoters are problematic for animal welfare because they stress the animals' metabolism, diverting resources into growth rather than maintenance, increasing hunger and vulnerability to suboptimal management. Furthermore, some of these drugs are used as an easy alternative to good husbandry, suppressing disease but allowing other poor practices such as overcrowding.

Diseases and injuries

Many health problems of beef cattle can be attributed to errors in management (Radostits, 2001). Observation of the animals is particularly important as problems are likely to be expressed through animal behaviour, although many stockpersons do not recognise early signs of respiratory disease (Gorden and Plummer, 2010).

It has been demonstrated that colostrum-deprived and stressed calves, nervous animals and some breeds are more susceptible to bovine respiratory disease-BRD (Pereira and Stilwell, 2011). "Bullers" (hierarchical lower animals that are constantly harassed by pen mates) are 2.5 times more likely to have respiratory disease and 3.2 times more likely to die (Taylor et al., 2010). Animal weight when entering the feedlot is also a significant factor (Thomson and White, 2006) and comingling animals of different ages and size will predispose to BRD those that are smaller.

Most beef cattle diseases have a multi-factorial etiology. In addition to pathogens and animal-related conditions, other contributing factors include stocking density and environmental stressors that disturb homeostasis in the animal. If infection is not detected and treated early in the course of disease, what is frequently happen in large herds, than severe, chronic infection usually arises. Chronic pneumonias, for example, cause very poor welfare with pain, asphyxiation and ill thrift (EFSA, 2012).

Some diseases occur due to inappropriate feeding regime. Rumen bloat can occur when the percentage of legumes in the diet is high, but also growing cattle fed intensively on high grain rations (<15% physically effective fibre) are at a high risk of sub-acute ruminal acidosis (SARA).

Considering, beef breeds have been selected for a high meat production, there are often associated with a hypermuscularity which can cause leg disorders, increase calving difficulties and decrease cow longevity (EFSA, 2012).

Current state of beef cattle welfare

One of novel studies conducted in Austria, Germany and Italy on a total of 63 beef bull farms (deep litter or cubicle housing systems) and assessed by *Welfare Quality® Assessment Protocol for Cattle (2009)*, shown there are significant areas for improvement of beef cattle welfare (*Kirchner et al., 2013*). The highest average welfare scores were obtained from 'Absence of prolonged hunger' (94/100 points) followed by 'Absence of pain induced by management procedures' (88/100) and 'Comfort around resting' (77/100). Most welfare concerns related to the criteria 'Absence of disease' (40/100), 'Expression of social behaviour' (44/100) and 'Positive emotional state' (48/100), thus indicating room for improvements. Two-thirds of the farms achieved the 'Enhanced' level, about one-third was estimated 'Acceptable' and only one farm 'Excellent'.

Conclusion

Beef production is a highly subsidized activity in the EU, with payments provided to livestock producers providing incentives to follow EU environmental and animal welfare principles. Traceability systems that include mandatory animal identification and product labelling have been progressively developed in the EU. Animal welfare legislation has been introduced, banning electric cattle prods, phasing out certain routine management practices including castration without pain relief, dehorning and branding as well as the introduction of housing requirements during the winter season. Although it seems to be a major shift, recent studies showed there are still many risks in beef production that need to be eliminated in order to provide welfare assurance of beef cattle. Further objectives in improving the beef cattle welfare should be directed towards satisfying the social and emotional needs of cattle, as well as the prevention and control of the most common diseases.

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Dobrobiti tovne junadi - obezbeđenje i rizici

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Rezime

Proizvodnja junećeg mesa je široko rasprostranjena u svetu ali je zakonodavstvo koje se odnosi na oblast zaštite dobrobiti tovnih goveda još uvek nedovoljno specifično i ne primenjuje se u potpunosti. Obezbeđenje dobrobiti tovnih goveda od značaja je samim životinjama, a istovremeno je i pitanje etike i kvaliteta proizvoda. Danas je moguće utvrditi stanje kvaliteta dobrobiti u tovilištima putem pouzdane metodologije kao što je Protokol za ocenu kvaliteta dobrobiti tovnih junadi. On omogućava primenu strategija unapređenja dobrobiti na farmama u odnosu na utvrđene rizike i uzroke loše dobrobiti. Različiti literaturni izvori, zasnovani na metodi ocene rizika, ukazuju na ključne probleme dobrobiti tovnih junadi. Respiratorne bolesti obično su u vezi sa prenaseljenim objektima, neodgovarajućom ventilacijom, mešanjem životinja i neblagovremenom dijagnostikom i lečenjem obolelih životinja. Oboljenja digestivnog sistema nastaju kao posledica intenzivne ishrane koncentrovanim hranivima, u nedostatku vlaknastih hraniva. Neodgovarajući podovi u objektima, mešanje životinja iz različitih grupa/uzrasta i loš postupak odgajivača dovode do poremećaja ponašanja i socijalnog stresa. Posebni problemi dobrobiti odnose se na primenu zootehničkih metoda-mutilacija, kojima se životinje izlažu bolu i patnji.

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