



The prevalence and causative factors associated with the slaughter of pregnant cattle in the Republic of Croatia

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ABSTRACT

Slaughter of pregnant animals, although not illegal often causes ethical controversies, especially concerning the welfare and suffering of the foetus. The practice was thought to be sporadic, but in new research, the European Food Safety Authority estimates it to be 16% for dairy and 11% for beef cattle. The aim of this study was to determine for the first time the frequency of slaughter of pregnant cattle in Croatia, the reasons for the slaughter of such animals and the stage of pregnancy. The results show that the frequency of slaughter of pregnant cattle was 3.6%, which is below EFSA estimates and below the results of similar studies from other countries. The reason for the slaughter of 97% of pregnant cattle was regular commercial slaughter and the remaining 3% were slaughtered out of necessity. The relatively high frequency of confirmed mid- and highly pregnant cattle in this research confirms that this practice is common in Croatian abattoirs, i.e. it indicates the possibility of omissions in sending animals to slaughterhouse processing.

Key words: welfare; slaughter; pregnancy; cattle, foetuses

Introduction

The act of killing pregnant farm animals very often causes ethical controversies although it is not inconsistent with legal provisions. It happens globally, and since virtually all farm animals end up in slaughterhouses, pregnant animals are occasionally also slaughtered. Cattle are sent to slaughter from both the fattening sector (heifers) and the dairy sector (older animals - cows), whereby they may conceivably be pregnant at the time they get

to the abattoir. Furthermore, results from previous studies in other countries indicate that farmers sometimes knowingly deliver pregnant stock to the slaughterhouse, with the reasons for such a practice varying depending on what the livestock was bred for ([EFSA, 2017](#)). This raises welfare and ethical concerns about cattle foetuses at the time of killing.

[BELLIENI and BUONOCORE \(2012\)](#) describe the possibilities of foetal pain perception, and as frequent arguments for the possibility of

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foetal pain perception, they cite the production of pain mediators, the presence of pain receptors on the skin, the development of thalamocortical pathways, the connection of pain receptors with “sub-plate” neurons, mimic reactions to potentially painful events, the secretion of stress hormones after potentially painful events, and the presence of pain in newborns of a similar age. The most common arguments against the possibility of foetal pain perception with an emphasis on the early stage of pregnancy are weak myelination, lack of proven instruments for measuring foetal pain, difficulties in distinguishing reflexes from pain itself, lack of full connection with the cerebral cortex, the presence of adenosine and prostaglandins in the amniotic fluid, long periods of sleep, and rare reactions to invasive procedures. In addition, the authors also conclude that the probability of arguments for foetal pain increases in the last trimester of pregnancy as the foetal nervous system matures. [MELLOR and GREGORY \(2003\)](#) found that in lambs the foetus reacts to physical stimuli from early pregnancy and acquires behavioural signs at the end of pregnancy, but consciousness can only be spoken of after lambing. Although it is very likely that a certain level of blood oxygenation is required for the perception of pain, they leave open the possibility of foetal pain perception due to the greater capacity of foetal haemoglobin to deliver oxygen to the neces-

sary sites, the higher foetal haematocrit levels, and greater perfusion of foetal tissues.

In cattle, it has been experimentally determined that foetuses do not feel pain during electrical stimulation ([MELLOR et al., 2005](#)), but it is still unknown whether the same can be claimed for the procedures carried out in the slaughterhouse when stunning the pregnant animal before bleeding takes place ([FAYEMI and MUCHENJE, 2013](#)). Furthermore, [FAYEMI and MUCHENJE \(2013\)](#) point to the lack of and need for additional research related to the type of animals for which the frequency of slaughter during pregnancy is increased, and to consider the ways of breeding those species in which this risk is increased, as well as the potential risks when consuming the meat of such animals, that is, awareness of the consumers and the branding of meat associated with pregnant animals.

The lack of relevant figures, i.e. incidence data, gave the impression that the killing of pregnant animals was arbitrary until recently. However, due to the increase in number of reported cases, four EU Member States asked EFSA for a scientific opinion on the problem of slaughtering pregnant animals in 2017. In this regard, [EFSA \(2017\)](#) noted that its opinion on welfare indicators related to slaughter of pregnant farm animals in Europe shows that current regulations do not contain specific provisions

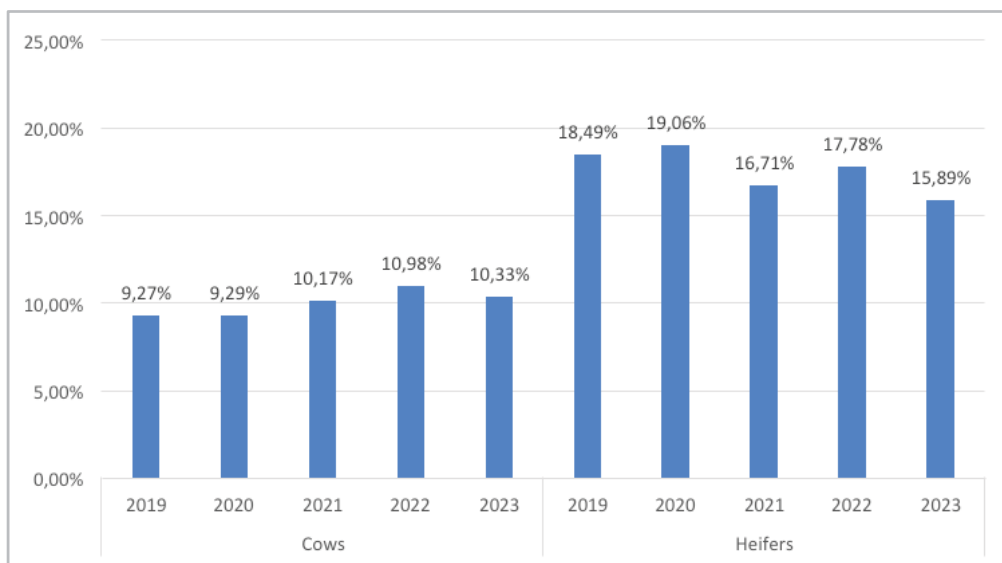


Fig. 1. Percentage of cows and heifers in annually slaughtered cattle (2019-2023)

about foetus protection when bringing a pregnant animal into the abattoir. Although the total number of cattle slaughtered in Croatia has fallen in the last five years from 183,079 in 2019 to 158,815 in 2023, the percentage of slaughtered cows and heifers has remained constant, as shown in Fig. 1. For 2021, the year in which this study was conducted, the total number of slaughtered cattle was 170,812, out of which 10.17% were cows and 16.71% were heifers ([CBS, 2024](#)).

The main objective of this study was to investigate the occurrence rate of slaughtering pregnant cattle in Croatia, as it was recently discovered that the previous professional assumption of it being sporadic was inaccurate. The specific objectives of this study were to identify the reasons behind pregnant cattle being taken to the slaughterhouse, and to determine the stage of pregnancy in which cattle are most frequently sent to the abattoir.

Materials and methods

Slaughterhouse facilities and stunning methods. The research was conducted in two slaughterhouses that are registered for the slaughterhouse processing of cattle of all categories. Both slaughterhouses are located in central Croatia, and are medium sized slaughterhouses, slaughtering between 50-150 cattle per day. The method used to stun the cattle is a penetrating captive bolt. In one slaughterhouse a captive bolt pistol with a powder charge is used, while in the other facility a pneumatically penetrating captive bolt is used. Both subtypes comply with the current legal regulations and are recommended in the legislation as a selected method for the highest quality and safest stunning, from the animal welfare point of view ([EC, 2009](#)).

Animals. The animal species selected for this research were cattle, in two categories - heifers and cows. All the cattle came from different medium sized farms that are the most prevalent farm type in Central Croatia. When processing the data, the age of 30 months was taken as the limit between the mentioned categories, that is, all animals younger than 30 months which had not previously given birth were considered heifers, while older ones were considered cows, no matter what their

reproductive status was. Approximately every third animal was randomly selected for detailed examination. In total, 2830 cows and 1641 heifers were slaughtered during the time of our research (a two-month period), of which 23.6% or 1057 animals were examined for pregnancy, 585 heifers and 472 cows, respectively.

Data collection. Data collection was carried out with the help of a questionnaire that had been designed and sent to slaughterhouses. Data were collected by doctors of veterinary medicine, employees of inspection bodies during regular *ante* and *post mortem* examinations of animals.

The questionnaire consisted of a total of ten questions divided into two groups. The first group of questions referred to general information about the animals that arrived for slaughter - breed, age, origin, purpose and reason for slaughter. The second part of the questionnaire was devoted to details of the pregnancy, if a pregnancy was established, and data on the stage of the pregnancy, the length of the foetus, and the ways in which the foetus was handled. If it was not possible to determine pregnancy status through documentation, the foetuses were measured in accordance with the recommendations from the literature ([KROG et al., 2018](#)), using one of the standard methods - Crown-Rump Length (CRL). The measurement was carried out from the front point of the calvaria with the neck bent by 90° to the most caudal part of the thigh (*tuber ischiadicum*), while the interpretation of the results was carried out according to the data from the University of Wisconsin (available at: http://www.ansci.wisc.edu/jjp1/ansci_repro/lab/lab12_03/growth.html).

At the end of the questionnaire, space was left for additional comments and notes if there was a need for them. An example of the questionnaire is attached to the paper as Appendix 1.

Ethical acceptability. The research was approved by the Faculty Council of the Faculty of Veterinary Medicine of the University of Zagreb as a study of samples not covered by the Animal Protection Act (Official Gazette 102/2017), class 640-01/21-02/05; editorial number: 251-61-01/139-21-44, dated April 21, 2021.

Data processing. Data processing was carried out with the Microsoft Office Excel (Microsoft, 2017, USA), in which graphs were drawn to display the results.

Results

Fig. 2 shows the total number and percentage of female cattle examined and the number of preg-

nant animals detected by category and slaughterhouse during the regular post-mortem inspection in the two-month period in question.

After determining the percentage of pregnant cattle, the age of the foetuses, that is, the pregnancy status, was also determined. Fig. 3 shows the distribution (%) of the age of foetuses detected in heifers, while Fig. 4 shows the same information, the age of foetuses detected in cows.

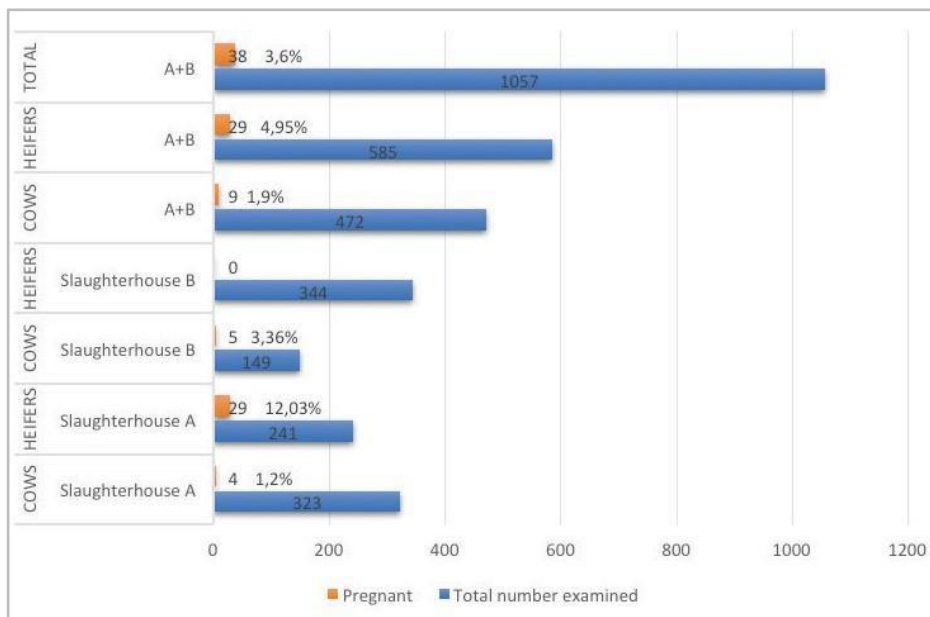


Fig. 2. Number of pregnant animals in the total number examined

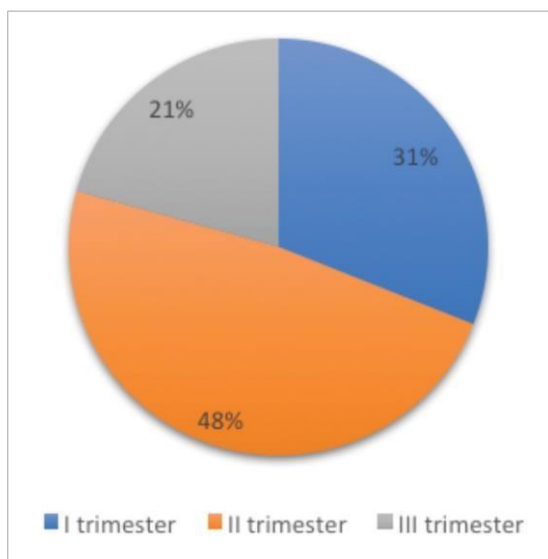


Fig. 3. Age of foetuses detected in heifers (%)

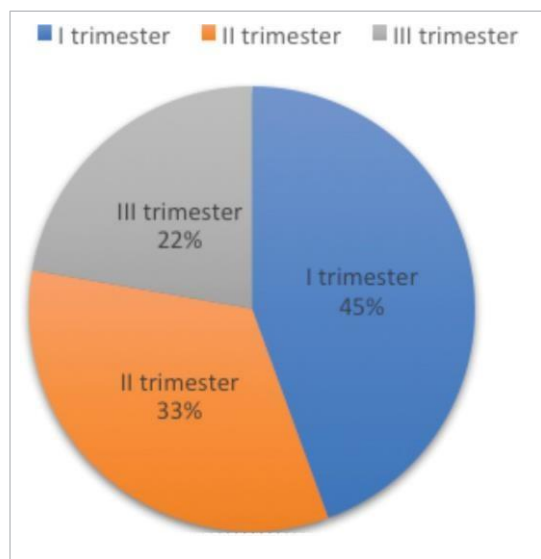


Fig. 4. Age of foetuses detected in cows (%)

Examples of foetuses of different ages discovered during regular post-mortem examinations and during our research are shown in figures 5-7.

The reasons for slaughtering the animals were also investigated, and it was determined that all heifers were sent for regular slaughter, while of the total 472 cows slaughtered during the observation period, 16 were sent to slaughter out of necessity (10 an-

imals due to lameness related issues and 6 due to pregnancy related health issues) (Fig. 8).



Fig. 5. Foetuses in the first trimester



Fig. 6 and 7. Foetuses in the second and third trimesters



Fig. 8. Reasons for slaughter – cows

Four pregnant cows were found within the group of cows slaughtered out of necessity (16 animals), which accounted for 25% of the share.

Discussion

The slaughter of pregnant animals is a very current topic related to farm animal welfare. Although some studies were carried out almost 40 - 50 years ago, [LADDS et al. \(1975\)](#) and [HERENDA \(1987\)](#), the topic is experiencing a resurgence in the light of animal welfare research. The welfare of animals for slaughter is increasingly being researched and supported by scientifically based arguments, but the issue of the welfare of pregnant animals and consequently foetuses is still in its infancy due to the lack of data and the potential controversy of the topic itself. Although it was considered a sporadic phenomenon until recently, more and more studies confirm that the slaughter of pregnant animals is not uncommon in slaughterhouses around the world. Out of 255 students of veterinary medicine at the University of Leipzig, 63.6% had the opportunity to see the slaughter of pregnant cattle during student internships at slaughterhouses, and 15 subjects recorded vital signs in the foetus after the death of the mother ([MAURER et al., 2016](#)). ZIT-

TERER and PAULSEN (2021) examined 1633 female cattle in one abattoir in Austria over a course of one year, and detected pregnancy in 6.4% of cows and heifers examined. The authors found no statistically significant difference in the percentage of pregnant cattle sent to slaughter between beef, dual-purpose breeds and dairy cattle. [RIEHN et al \(2011\)](#) sent a questionnaire to 53 German slaughterhouses and found that on average 9.6% of the slaughtered female cattle were pregnant. The examination of the muscle and fat tissue of 50 slaughter cattle showed that the edible tissues of animals slaughtered in an advanced stage of pregnancy contained levels of estrogen that were sometimes ten times higher than those of non-pregnant animals. The authors therefore claimed that a risk to consumers through alimentary exposure to steroid hormones from the meat of pregnant animals cannot be ruled out in principle ([RIEHN et al. 2011](#)). [NIELSEN et al. \(2019\)](#) also reported a high percentage (23%) of slaughtered pregnant cattle, while [SWAI et al. \(2015\)](#) emphasized that this practice is also a regular occurrence in Tanzania and represents a great risk of a decline in the livestock of that country. [ADEBOWALE et al. \(2020\)](#) estimated that almost 45,000 pregnant cattle were slaughtered in Nigeria over 9 years. The authors concluded that this practice has an extremely negative impact on the agronomic and economic progress of developing countries. [HERENDA \(1987\)](#) examined 5800 heifers in a Canadian abattoir for reproductive anomalies and found 6.6% of them to be pregnant

In our research, during the two monitored months in facility A, out of a total of 2507 slaughtered cattle, 323, or 12.9%, were examined for pregnancy, and out of a total of 925 slaughtered heifers, 241 heifers, or 26.05%, were examined for pregnancy. In facility B, in the same period, out of a total of 323 slaughtered cows, 149, i.e. 46.13%, were examined for pregnancy, and out of a total of 716 slaughtered heifers, 344 were examined for pregnancy, i.e. 48.04%. In total, out of 2830 slaughtered cows and 1641 slaughtered heifers, 472 cows and 585 heifers, or 1057 slaughtered animals, were examined for pregnancy in both slaughterhouses. Similar research was conducted in Denmark on a sample of 837 females ([NIELSEN et al., 2019](#)),

in Austria on 1633 ([ZITTERER and PAULSEN, 2021](#)), in Tanzania on 2256 ([SWAI et al., 2015](#)), so we can consider our sample to be representative.

Throughout the observed research period in facility A, the percentage of slaughtered pregnant cows was 1.2%, while the percentage of heifers was 12.03%. In facility B, the percentage of pregnant cows was almost three times higher (3.36%), but the complete absence of pregnant heifers is somewhat surprising. In total, in both slaughterhouses, 1.9% of cows and 4.95% of heifers were pregnant, which is an average of 3.6% of the total number of female animals. Comparing the results of our research with the estimates of EFSA (16% for dairy and 11% for beef cattle), as well as the results of research by [NIELSEN et al. \(2019\)](#), [ZITTERER and PAULSEN \(2021\)](#) and [SWAI et al. \(2015\)](#) the percentage of slaughtered pregnant cattle in the Republic of Croatia is much lower. The stated results and the distribution of the results (high percentage of pregnant heifers in facility A) should be taken with caution, and in the future, we should try to conduct a more comprehensive study at a larger number of slaughterhouses in the Republic of Croatia.

When it comes to the age of the fetuses, the results differ depending on whether the animals being slaughtered were heifers or cows. In heifers, the fetuses were most frequently in the second (48%), then the first (31%) and at the end of the last trimester (21%), while in cows the most frequently confirmed fetuses were in the first trimester (45%), then the second with 33% frequency, and the third at 22%. These results are consistent with the data of [MAURER et al. \(2016\)](#) who state that almost 50% of detected pregnancies are in the second or third trimester, which is also consistent with research by [SWAI et al. \(2015\)](#) where the percentage of detected pregnancies ranged from 42% in the second to 31% in the last trimester of pregnancy, and research by [ZITTERER and PAULSEN \(2021\)](#) which found most pregnant animals to be in the first and second trimesters of pregnancy. [NIELSEN et al. \(2019\)](#) present different results, where the percentage of fetuses discovered in the last trimester was very low (1.6%) and most pregnancies were related to the first trimester (70.1%), which agrees with the

EFSA estimate of 3% for dairy cattle and 1.5% for beef breeds of cattle in the last third of pregnancy ([EFSA, 2017](#)). The relatively high frequency of confirmed mid- and highly pregnant cattle in this research confirms that this practice is common in our slaughterhouses, that is, they point to the possibility of omissions in sending animals to slaughterhouse processing.

When we talk about the reasons for sending cattle for slaughter, the reason for slaughter in 97% of pregnant cattle was regular commercial slaughter, and the remaining 3% were sent to slaughter out of necessity, from the recently earthquake-ravaged area of the Republic of Croatia. EFSA points out that the most common causes of slaughtering pregnant cattle are: lack of supervised mating, absence or failure of pregnancy testing, loss and lack of information in the business chain, animal health and welfare, and economic necessity ([EFSA, 2017](#)). These reasons are certainly in line with our research, because 25% of the pregnant cows were sent to slaughter out of necessity, i.e. due to economic necessity, while the majority of heifers sent to commercial slaughter were from meat breeding farms where the animals are kept in mixed groups, so unplanned mating often occurs. [SINGLETON and DOBSON \(1995\)](#) cite infertility, mastitis and old age as the main reasons reported by farmers for culling pregnant cows.

The reasons presented in the research from Denmark state that dairy cattle are sent for slaughter for health reasons (70%), and farmers cite animal welfare as an important factor in the decision to slaughter a pregnant animal, as they consider this a more moral option than going through another stressful lactation period ([NIELSEN et al., 2019](#)).

Although this research was conducted on a significant number of cattle, due to the circumstances caused by the COVID-19 pandemic, we were not able to conduct a survey of farmers and investigate in more detail the reasons why breeders decide to slaughter pregnant animals, i.e. whether they are even aware of the pregnancy when making the decision to send an animal for slaughter. For this reason, in the future it is necessary to carry out additional research in order to obtain as detailed an insight as possible into the reasons for referral of

pregnant animals to the slaughterhouse, and consequently to be able to introduce the necessary measures to reduce the number of slaughtered pregnant cattle, such as those recommended by EFSA - keeping animals separated by sex, supervised mating, pregnancy testing, ensuring the traceability of pregnancy information, staff training, and the implementation of research necessary to increase the accuracy of animal pregnancy tests. The quality of farm animal welfare protection is only complete if every stage of production is covered, and all ethical issues related to breeding methods and procedures carried out on animals are discussed.

Conclusions

From the results of the present research on the frequency and causes of slaughter of pregnant cattle in the Republic of Croatia, the following can be concluded:

This is the first research ever conducted in the Republic of Croatia to examine the incidence and reasons regarding slaughter of pregnant cattle. As in many other countries, the accidental slaughter of pregnant cattle occurs. The overall percentage of pregnant cattle detected is lower than in similar surveys worldwide. The proportion of animals slaughtered in the second and third trimesters of pregnancy is higher than EFSA's estimates and indicates the possibility of omissions in referring animals to slaughterhouse processing. Most of the animals were sent for regular, commercial slaughter, which also confirms the previous assumption that there may be errors when sending animals to slaughter.

Declaration of competing interest

No potential conflicting interest was reported by the authors

Authorship contribution statement

This paper is an excerpt from a student paper by Čudina, N. (2021): The incidence and causes of the slaughter of pregnant cattle in the Republic of Croatia, Faculty of Veterinary Medicine, University of Zagreb, Croatia.

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ČUDINA, N., M. VUKŠIĆ, T. MIKUŠ: Prevalencija i uzročni čimbenici povezani s klanjem gravidnih goveda u Republici Hrvatskoj. Vet. arhiv 95, 263-271, 2025.

SAŽETAK

Klanje gravidnih životinja, iako nije nezakonito, često izaziva etičke kontroverze, posebno s obzirom na dobrobit i patnju fetusa. Ova se praksa smatrala sporadičnom, ali uvažavajući nova istraživanja, Europska agencija za sigurnost hrane (EFSA) procjenjuje da iznosi 16% za mliječna i 11% za mesna goveda. Cilj je istraživanja, po prvi put u Hrvatskoj, odrediti učestalost klanja gravidnih goveda, razlog klanja ovih životinja i stadij gravidnosti. Rezultati pokazuju da je učestalost klanja gravidnih goveda 3,6%, što je manje od EFSA-ine procjene i manje od rezultata sličnih istraživanja iz drugih zemalja. Razlog klanja gravidnih goveda u 97% slučajeva bilo je redovito komercijalno klanje, a u preostalih 3% slučajeva zaklana su iz nužde. Relativno visoki postotak potvrđenih srednje i visoko steonih goveda u ovom istraživanju potvrđuje da je praksa klanja gravidnih goveda učestala u hrvatskim klaonicama, odnosno upućuje na mogućnost namjernog izostavljanja informacija pri slanju životinja na klaoničku obradu.

Ključne riječi: dobrobit; klanje; gravidnost; goveda; fetusi
