# Research on Carcass Examination in the Slaughterhouse of Different Cattle Breeds

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**Abstract**

The slaughter of cattle involves a sequence of operations such as stunning, bleeding, skinning, evisceration and cutting. The carcass and the organs accompanying the animal must be subjected to a post-mortem inspection immediately after slaughter. Depending on the result of the examination of the organs, the carcass can be examined superficially or in detail, so that it can be assessed whether the changes that occurred in the organs had repercussions on the carcass or not. The organs are examined taking into account the following aspects: the covering serosa, the parenchyma itself and the adjacent lymphocenters. The actual examination of the carcass is usually carried out by inspection - overall and in detail and palpation. The primary examination of organs and carcasses in cutting units is carried out by macroscopic methods - such as inspection, palpation and sectioning. If deemed necessary, additional examinations are carried out, such as palpation and incision of certain parts of the carcass and edible organs, as well as laboratory testing to diagnose or confirm a certain pathology, bacterial infection, or the presence of certain residues above the permitted limits. All these operations are carried out taking into account the legislation in force, regarding both the actual slaughter and ensuring the well-being of the cattle, from transport to the resting period before slaughter.

**Keywords**: changes, diagnosis, health, inspection, pathology.

## 1. Introduction

Cattle slaughter is a technological process that includes several stages, such as: preparation for slaughter, stunning, bleeding, carcass processing, evisceration, sanitary-veterinary control, grooming and refrigeration [1,2].

The multitude of cattle breeds, characterized by differences in genetic, morphological and productive aspects, have a direct impact on carcass parameters, such as the proportion of meat, fat and bone, as well as tissue quality. Thus, comparing the results obtained from the examination of carcasses from different breeds becomes an important tool for optimizing production and adapting breeding and selection strategies [2].

The slaughter process, and especially the examination of carcasses, is of particular importance in guaranteeing the quality and safety of products intended for human consumption. Carcass evaluation is not limited to identifying possible diseases or non-conformities, but provides valuable information about the yield, conformation and particularities of the cattle breeds subjected to slaughter. Therefore, the veterinary examination to which the post-sacrifice carcasses are subjected is very important. By correlating the data obtained from veterinary inspections with racial characteristics, the study contributes to a better understanding of the factors that influence the commercial value and safety of beef [3].

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## 2. Materials and methods

Bibliographic sources from the specialized literature, relevant to the topic, were used for the creation of this article. The manner in which the examination of organs and carcasses of cattle is carried out after slaughter will be monitored.

## 3. Results and discussion

The veterinary health examination in the slaughterhouse is regulated by Regulation (EU) 2019/627 and provides for the immediate examination of the carcass and post-mortem organs. It is carried out by manipulating the carcass and edible organs, with all external surfaces being analyzed. The regulation provides that, if deemed necessary, additional examinations such as palpation and incision will be performed, both on the carcass and the organs. Also, to confirm the diagnosis, laboratory examinations can be performed that can certify: [1]

- the presence of a disease;
- the presence of residues or contaminants in quantities greater than the maximum permitted limit;
- the presence of bacteria;
- the presence of other factors that may lead to the meat being declared unfit for human consumption or to restrictions being imposed on its use.

If communicable diseases are suspected, during the post-mortem veterinary examination, precautions must be taken to ensure that the risk of contamination is reduced to a minimum. In order for the veterinary examination to be carried out in optimal conditions, it is necessary to carry out it in spaces with natural or artificial light - at an intensity of 550 lux/m². Sections made in organs and areas without changes will be made with different knives than those used in areas with changes [1].

The primary examination of carcasses and organs is performed using macroscopic methods such as inspection, palpation, smell and taste. If necessary, additional examinations may be used. The inspection aims to assess the general condition of the carcasses and organs, observing their shape, size, color, appearance of edges and surfaces, and the presence of surface formations. This is done comparatively in the case of paired organs. Being an objective method, it is important to be performed by an examiner with sufficient experience [1,2].

Palpation is done both superficially and deeply, using one or both hands, depending on the body region approached or the organ examined. With its help, information is known about the consistency, temperature, elasticity, hydration status, the presence of nodular formations and complements the information obtained from the inspection. [1,2].

Sectioning is performed optionally in areas without changes and mandatory when the carcass or organs show pathognomonic changes of certain diseases or when the qualitative and quantitative definition of exudates from some cavities is sought. With the help of this maneuver, the examiner will be able to appreciate the resistance of the tissues to sectioning, the presence or absence of liquids or secretions, the existence of abnormal formations in depth. The smell is examined during evisceration, when the tissues and organelles are warm, in this way being more correctly perceived and analyzed [1].

Taste is used less frequently and only when organs or tissues are subjected to heat treatments. For a better appreciation of taste, the temperature of the tissues or organs must be between 20 and 25°C, outside these limits the perception may be adversely influenced [1].

Since the organs are the ones that best record the changes that have occurred at the body level, they are examined first. Depending on what results from the examination of the organs, the carcasses are examined superficially or in more detail, because certain changes in the organs can also have repercussions on the carcass. The method of examining the organs also involves examining the serosa, the parechima proper and the adjacent lymphocenters.

Regarding the examination of the head, in cattle they examine the tongue, pharynx, larynx, brain, eyes. Three important aspects are taken into account, namely [1]:

- The head as a whole
- The oral cavity and tongue
- Adjacent lymph nodes

The upper gingival margin is inspected where the examiner observes the presence or absence of ulcers or scars, pathognomonic signs for certain contagious diseases such as foot-and-mouth disease. The presence or absence of other defects such as abscesses, cysts, cysticerci, edema, tumors, etc. is

also observed. If changes are found following the inspection, the examination is completed with palpation and sectioning. Sectioning is mandatory in cattle over 3 months of age in the internal and external masseter muscles to detect parasitic formations in cysticercosis. This is done in 2-3 planes, parallel to the bone surface. [1,2].

The examination of the oral cavity is done starting with the inspection of the oral cavity, pharynx and larynx. The presence of surface changes, color, etc. is monitored. If changes are found to be present, the examination continues with palpation and sectioning of the modified areas. The pharynx is opened by section to examine the tonsils. The tongue is initially examined by inspection where the dimensions, shape, color, presence of lesions are monitored. It continues with papation which provides information about elasticity and consistency, as well as the presence of certain formations in depth. In the case where changes have been observed following inspection or palpation, sectioning of the areas where changes are present is performed [2].

At the head level, the lesions specific to certain pathologies that can be identified are aphthae, cysticerci, actinomycomas in the mandibular bone, actinobacillosis-wooden tongue disease and ocular lesions specific to thelaziosis. [1,3].

Regarding the examination of lymph centers, in cattle, the retropharyngeal, parotid and mandibular lymph centers are examined by inspection, palpation and sectioning. The examination by inspection aims to assess the shape, volume, color and the presence of surface changes. Palpation and sectioning are performed regardless of the findings obtained by inspection. At their level, specific lesions for tuberculosis can be identified where miliary foci or caseated areas are observed, nodular foci or diffuse lesions with a sarcomatous-splenic appearance, pyobacillus - encapsulated abscesses with a creamy purulent content of yellow-green color or plague, observing hemorrhagic lymphoreticulitis with a marbled appearance [1].

The examination of the lung includes the examination of the visceral pleura, the pulmonary parenchyma and the adjacent lymph centers. The inspection of the pulmonary pleura is done by observing the appearance, humidity, color, smoothness, integrity and if there are any structural changes, and palpation is performed if changes have been observed following the inspection [1,3].

The lung parenchyma is examined by inspection, observing the shape, volume, color and appearance of the edges. Palpation is performed bimanually, deeply, initially starting with the apical lobe, continuing with the cardiac and diaphragmatic lobes. Sectioning is mandatory and is done through a transverse section on the long axis, followed by pressing between the periphery in order to observe any secretions, as well as their appearance and quantity. In case of changes, additional sections are performed in the areas of interest [1,3].

The lymph nodes adjacent to the lung are the left tracheobronchial, right apical and posterior mediastinal. They are examined by inspection, observing the appearance, shape, color, volume, by palpation the consistency, elasticity, presence of formations in depth and by sectioning, the appearance is analyzed by section. [3].

Following lung examination, circulatory, inflammatory, volume and cutting technology-specific changes can be observed [1].

The circulatory changes that can be observed are [1]:

- Anemic lungs
- Hypostasis – appears on the side where the animal died, the other lung having a normal appearance; it is characterized by hemolyzed blood and a dark red color.
- Congestion – which can be active – the lung has an increased volume, a red-brown color, rounded edges, and when sectioned, a red, foamy liquid leaks, or passive – this is located at the base of the lung, when sectioned, blackish blood leaks, in a small amount.
- Pulmonary hemorrhage – appears in the form of ecchymosis and subserous petechiae.

Volume changes refer to emphysema - emphysematous areas appear deformed, enlarged, crepitant upon palpation, lacking elasticity, and atelectasis - the pulmonary alveoli have decreased in volume, the consistency is compact, and there is no crepitus upon palpation [2].

Examination of the heart includes examination of the pericardium and myocardium. The pericardium is examined by inspection, observing its integrity, appearance and presence of surface changes, presence or absence of fluid. If changes are found following inspection, palpation is performed. Sectioning is performed so that the pericardial fluid can be examined, normally it has

a clear appearance, light yellow color and in small quantity [2].

The myocardium is examined by inspection, the origin of the great vessels, the volume, surface changes are observed, palpation is performed by passing the hand over its surface, followed by sectioning. This is done by opening the four chambers and the origin of the great vessels. After this opening has been made, at least two sections are performed parallel to the median plane, on one side and the other of it. In cattle older than 4-5 years, a bone formation known as the cardiac bone is observed, located in the fibrous skeletal structure that supports the atrioventricular valves. After opening the myocardium, it is examined, observing the symmetry of the 4 chambers of the heart, the presence or absence of certain formations, necrotic areas, abscesses, whitish spots, nodular or caseous granulomas, aspects that are pathognomonic for certain diseases such as tuberculosis, necrobacillosis, foot-and-mouth disease, infectious bovine anemia. [1,2].

The examination of the esophagus is performed by inspection, considering that certain parasites such as *Hypoderma bovis, Gongylonema* and *Gasterophilus* larvae can be found at the level of the esophagus. If changes are found, palpation and sectioning are performed. [1,2].

Examination of the liver involves examining the liver capsule, liver parenchyma, gallbladder and portal lymph nodes. Inspection of the capsule is performed by observing its transparency, integrity, smoothness and the existence of formations such as nodules or adhesions. [3].

The liver parenchyma is initially examined by inspection, observing the shape, size, color, appearance of the edges and the presence or absence of formations on the surface. Palpation is performed with both hands and on both sides, initially superficially, until deep palpation. Normally, the liver is of a soft consistency. The sectioning is performed as deeply as possible to highlight any formations and as many bile ducts as possible. If areas with changes are observed, several sections are made so that the affected area can be examined. During the sectioning, the resistance of the parenchyma to sectioning, the architecture of the organ, the consistency, color, appearance and content of the bile ducts are assessed. [4].

The gallbladder is examined by inspection, observing its shape, size, state of fullness and connection with the parenchyma. Palpation is performed to observe the functionality of the common bile duct, after which the gallbladder together with the common bile duct is removed [1,4].

The morphopathological changes that may occur at the liver level are partial or total atrophy, granular dystrophy, hepatosteatosis, necrotic lesions - in necrobacillosis, hemorrhages, hepatitis - suppurative, aposteomatous, phlegmonous, hemorrhagic, proliferative, infectious or lesions produced by parasites - fasciolosis, hydatidosis, caused by bacterial, viral or parasitic infections [5].

The spleen is examined by assessing the capsule, the splenic parenchyma and the adjacent lymph nodes. Its inspection focuses on the color of the capsule, the existence of formations on the surface, its shape and volume. Palpation is performed over the entire surface of the organ, and is performed with two fingers. This is to check for consistency, elasticity and the presence of deep formations. Sectioning is mandatory along the longitudinal axis, along the entire length. The consistency, the presence of deep formations and the liquid that flows on the section are taken into account. If necessary, additional sections can be performe [1,5].

Splenic examination may reveal lesions such as hyperemia, passive or active congestive, splenic infarction, hemorrhages, inflammation - necrotic, suppurative, granulomatous, hemorrhagic-necrotic, caseating necrosis with calcifications and fibrosis, suppurative. These may occur in diseases such as anthrax, traumatic reticulo-peritonitis, necrobacillosis, tuberculosis, septicemic diseases [4].

The examination of the gastrointestinal mass includes the examination of the abdominal compartments, intestines and adjacent lymph nodes. The inspection of the stomach and forestomachs includes the evolution, color, appearance of fat and appearance of the peritoneal serosa. In case of changes, palpation and sectioning will be performed. Following sectioning, lesions such as the existence of possible hemorrhages, ulcers or scars on the mucosa can be highlighted, which indicates important data regarding pre-existing lesions, inflammatory reactions or other nature [2].

The intestines are assessed by inspection - volume, integrity, state of fullness, color or other surface formations and palpation - elasticity and consistency are assessed. In case of changes, their sectioning is also performed [1].

In cattle, the gastric lymphocenters, cranial and caudal mesenteric lymphocenters must be examined by inspection, palpation and sectioning. [1].

At the level of the gastrointestinal tract, changes such as circulatory disorders - hyperemia, stasis, hemorrhages, edema and inflammation - seromucous, diphtheroid, hemorrhagic, purulent and hyperplastic gastritis, catarrhal, hemorrhagic, pseudomembranous, hyperplastic and granulomatous enteritis can be encountered, these being present in diseases such as tuberculosis and actinomycosis [2,3].

The examination of the kidneys is done by inspecting it, observing changes in color, volume, size, the presence of formations on the surface, and palpation follows the consistency and the presence of formations in depth. Also, the way in which the decapsulation is performed, difficult or easy, is appreciated. The sectioning is done on the greater curvature, opposite the hilum, involving the cortical and medullary up to the basinal papillae or pelvis [1,4].

Regarding the examination of the carcass, according to table 1, in France, during the period 2016-2020, the total rate of confiscation of cattle carcasses was 4.5%, the most frequent causes being peritonitis, serous infiltration, abscesses, muscle lesions.

The examination of the carcass is carried out on whole carcasses in calves or in the form of half carcasses in cattle. Initially, it is dressed, washed with water and cleaned of blood and other impurities [4].

**Table 1.** The rate of confiscation of cattle carcasses in France during the period 2016-2020. [7]

| | |
|---|---|
| Total and partial confiscations | 4.5% |
| Total confiscations | 0.7% |
| Partial confiscations | 3.8% |

The actual examination of the carcass is done by inspection and palpation. The inspection assesses the exterior of the carcass, the muscle mass and its degree of development, the bone structures, the joints, the quantitative and qualitative assessment of the adiops test. The detailed inspection is carried out by regions, from top to bottom, both outside and inside the half-carcasses. At the same time, the joints are inspected because dairy cattle are frequently affected by infectious arthritis. Se urmareste simetria acestora, pretenta inflamatiilor sau deformari si calitatea lichidului synovialTheir symmetry, the presence of inflammation or deformation and the quality of the synovial fluid are observed. The examination of the half-carcasses on the outside, in the thigh region, where the muscle mass is better highlighted, is observed for the symmetry of the area, the presence of surface formations, the appearance and color of the area. The flank and fat fold area is examined to observe any acute myositis or scars resulting from ruminotomies or ruminocentesis. The appearance of the handling at the fat fold level is also examined here [3].

The examination continues with the abdominal and thoracic areas, observing any changes in color, surface and volume formations, the symmetry of the shoulders, the scapulohumeral joints, and the development of muscle mass.Examaminarea zonelor externe a semicarcaselor se termină prin inspecţia regiunii gâtului, jgheabului jugular şi a plăgii de sângerare, cea din urma trebuie să fie infiltrată cu sânge şi cu suprafaţa musculaturii secţionate neregulat, ceea ce dovedeste că animalele au fost tăiate în viaţă [4].

**Figure 1.** Cattle carcass in slaughterhouse [original].

The internal surface of the half-carcasses is examined from top to bottom, starting with the thigh muscles where the cross-sectional area,

changes in color or appearance are observed and the presence or absence of parasitic cysts that appear in cysticercosis is assessed. The examination continues with the ischio-pubic symphysis area, a site of choice for bone tuberculosis, along with the vertebral bodies, ribs and sternum, and with the internal surface of the pelvis and the fat in the lumbosacral area. Carcasses from cattle with advanced gestation appear with hemorrhagic infiltrates [1,2].

We continue with the abdominal muscles, having as precise points the discovery of scars on the left flank, the presence of adhesions or parasitic formations and lesions on the peritoneum, which may appear as nodular or diffuse infiltrate, fatty in leukosis. In addition to the presence of formations, the color and appearance of the abdominal muscles are also observed. Inspection of the diaphragm is done to look for possible abscesses or the presence of parasitic formations, such as *Cysticercus* or *Sarcocystis* [6].

Examination of the thoracic area begins with inspection of the peritoneal serosa to observe any formations characteristic of tuberculosis or inflammation, and continues with the intercostal muscle area - where cysts of *Sarcocystis* or *Cysticercus*, sternum - to detect cysts of *Cysticercus* and the sectioning surface of the sternum - for detecting osteitis found in tuberculosis [6].

In Romania, according to figure 2, the most common carcass defects observed are abscesses, peritonitis, hemorrhages and trauma.

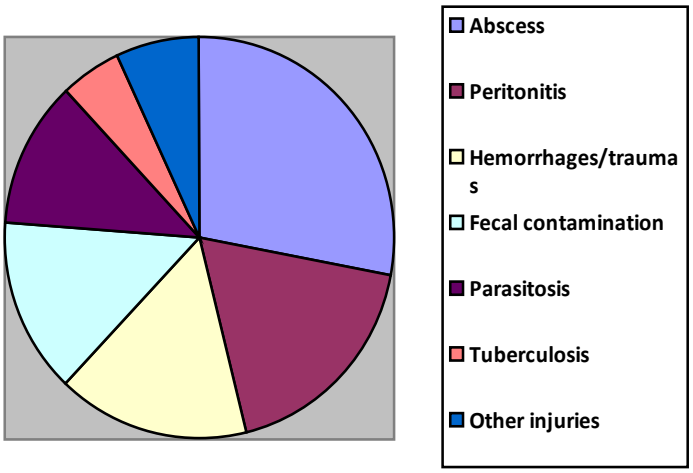


**Figure 2.** The most common injuries observed in the carcass [1].

Following the post-mortem veterinary inspection carried out in the slaughterhouse, the percentage of carcasses accepted for consumption was approximately 96.8%, while total seizures represented 0.7% and partial seizures 2.5%. The main lesions identified are shown in Table 2. [8]

A comparative analysis by breed, shown in Table 3, highlights a lower incidence of seizures in specialized meat breeds, such as Angus and Charolais, compared to mixed or dairy breeds, such as the Romanian White or Holstein, where the frequency of lesions and seizures is higher [9].

**Table 2.** Comparative analysis of cattle carcass seizures.[8]

| Race | Total confiscations (%) | Partial confiscations (%) |
|---|---|---|
| Angus | 0,4% | 1,8% |
| Charolaise | 0,5% | 2,0% |
| Bălțată românească | 0,9% | 3,1% |
| Holstein | 1,1% | 3,5% |

The values presented in table 3 are of an estimative nature and are based on the ranges reported in the international literature, in the period 2010–2023, corroborated with general data from the reports of the National Sanitary, Veterinary and Food Safety Authority regarding controls and confiscated products at national level, observing the percentage of acceptance or rejection of carcasses, respectively, as well as the reason for them. [9, 10].

**Table 3.** Indicators of veterinary control in cattle [9,10].

| | Average value | Observations |
|---|---|---|
| Carcasses admitted | 96,8% | Most carcasses are fit for consumption |
| Carcasses totally confiscated | 0,7% | Associated with serious or generalized diseases |
| Carcasses partially confiscated | 2,5% | Most common in practice |
| Total prevalence of injuries | 3,2% | Includes minor + major injuries |
| Quantity of meat confiscated | 18 kg/100 heads | Depends on type of injuries |

## 4.Conclusions

Carcass and organ examination in slaughterhouses is an essential task for assessing meat quality and animal health. Choosing the right breeds, together with implementing modern breeding and slaughtering technologies, can improve the quality of final products and reduce economic losses.

Carcass examination is usually done by inspection, in order not to depreciate the carcass unnecessarily and not to participate in contamination with microorganisms through unnecessary manipulations, palpation and sectioning being performed in certain situations, when changes are found during inspection.

In particular, lesions caused by pathologies that can affect the quality of meat are monitored, as its consumption has repercussions on consumers.

If deemed necessary, laboratory tests are performed in addition to the macroscopic examination to rule out any suspicion of disease.

Special attention is paid to lesions present in brucellosis, leukosis, tuberculosis, cysticercosis and transmissible spongiform encephalopathy.

## References

1. Savu, C., Georgescu, M., Boncea, L., Savu, O., Controlul si expertiza alimentelor de origine animala, editua Transversal, 2009.

2. Nicolaisen, S., Langkabel, N., Thoene-Reineke, C., & Wiegard, M., Animal Welfare during Transport and Slaughter of Cattle: A Systematic Review of Studies in the European Legal Framework. *Animals : an open access journal from MDPI*, 2023, *13*(12), 1974. https://doi.org/10.3390/ani13121974.

3. Bouzraa, S., Agüera, E. I., Requena, F., Rodríguez, I., & Serrano, S., Influence of the Slaughter Method on the Hygienic Quality of Beef Cattle Meat and Animal Welfare Biomarkers. *Animals: an open access journal from MDPI*, 2023, *13* (6), 1014. https://doi.org/10.3390/ani13061014

4. Njoga, E. O., Ilo, S. U., Nwobi, O. C., Onwumere-Idolor, O. S., Ajibo, F. E., Okoli, C. E., Jaja, I. F., & Oguttu, J. W., Pre-slaughter, slaughter and post-slaughter practices of slaughterhouse workers in Southeast, Nigeria: Animal welfare, meat quality, food safety and public health implications. *PloS one*, 2023, *18*(3), e0282418. https://doi.org/10.1371/journal.pone.0282418

5. Özdemir, S., Kecici, P. D., Yalcintan, H., & Ekiz, B., Behaviors in the Slaughter Corridor, Carcass, and Meat Quality Traits of Anatolian, Italian, and Italian × Anatolian Crossbreds ($F_1$) Water Buffaloes. *Animal science journal = Nihon chikusan Gakkaiho*, 2025, *96*(1), e70042. https://doi.org/10.1111/asj.70042

6. Gholami, N., Mosayebi, M., Dehghan Rahim Abadi, P., Rasmi Atigh, H., Sedaghat, R., Naji Zadeh, M. H., & Farahani, M., Bovine cysticercosis in feedlot cattle in central region of Iran. *Journal of parasitic diseases: official organ of the Indian Society for Parasitology*, 2020, *44*(1), 25–30. https://doi.org/10.1007/s12639-019-01157-9

7. Collineau, E., Corbière, F., Darnal, S., Holleville, N., & Salines, M., Analysis of bovine postmortem condemnation data in France: Contributions from a comprehensive and standardised information system at the slaughterhouse. *The Veterinary record*, 2022, *191*(2), e1733. https://doi.org/10.1002/vetr.1733

8. Ciui, S., Morar, A., Tîrziu, E., Herman, V., Ban-Cucerzan, A., Popa, S. A., Morar, D., Imre, M., Olariu-Jurca, A., & Imre, K., Causes of Post-Mortem Carcass and Organ Condemnations and Economic Loss Assessment in a Cattle Slaughterhouse. *Animals*, 2023, *13*(21), 3339. https://doi.org/10.3390/ani13213339

9. Webb, E., & Tlhapi, P., Cumulative incidence and causal risk factors of carcass condemnations in a South African high-throughput cattle abattoir. *South African Journal of Animal Science*, 2020, *50*(1), 170–177. https://doi.org/10.4314/sajas.v50i1.18
10.https://www.ansvsa.ro/informatii-pentru-public/sanatate-publica.