



## Case Study

# A Non-cutaneous Form of Melanoma in a Goat during Meat Inspection: a Case Report

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## Abstract

Malignant melanoma is a neoplasm that originates from melanocytes. This tumor is observed in cutaneous and non-cutaneous forms, and it is considered one of the most life-threatening types of cancers. Non-cutaneous melanoma is a complex of unique and malignant complications that are easily separable from cutaneous type. Since the ultraviolet radiation from the sun damages DNA and is an oxidative stress factor in melanoma and there are more melanocytes in the basal layer of skin than other parts of the body, the cutaneous form has more prevalence. Most of the time, non-cutaneous form is the result of cutaneous metastasis but both forms can occur primarily. Furthermore, non-cutaneous form usually happens in mucosal layers, intestines, and eyes; moreover, the main reasons are ectopic melanocytes or their unwanted regressive growing. Malignant melanoma can occur in all domestic animals; however, they seem to be rare in sheep and goats. Herein, we describe a rare case of the primary non-cutaneous form of malignant melanoma in a three-year-old indigenous female goat. During meat inspection procedures in a slaughterhouse in Tabriz, Iran, we encountered numerous round firm black masses on visceral surfaces and serous membranes of the abdominal and thoracic cavities. The liver and lungs were prominently affected. Samples were taken from involved parts, and malignant melanoma was confirmed in the histopathological examination due to pleomorphism and polymorphism and melanin pigments in cells with eosinophilic cytoplasm. According to what was stated in the "manual on meat inspection for developing countries", the carcass was not convenient for human use and condemned by the inspector.

**Keywords:** Goat; Meat inspection; Melanoma; Slaughterhouse

## Une Forme Non Cutanée de Mélanome chez une Chèvre lors de l'Inspection des Viandes: un Rapport de Cas

**Résumé:** Le mélanome malin est un néoplasme qui provient des mélanocytes. Cette tumeur est observée sous des formes cutanées et non cutanées, et elle est considérée comme l'un des types de cancers les plus potentiellement mortels. Le mélanome non cutané est un complexe de complications uniques et malignes facilement séparables du type cutané. Étant donné que le rayonnement ultraviolet du soleil endommage l'ADN et est un facteur de stress oxydatif dans le mélanome et qu'il y a plus de mélanocytes dans la couche basale de la peau que d'autres parties du corps, la forme cutanée a plus de prévalence. La plupart du temps, la forme non cutanée est le résultat de métastases cutanées mais les deux formes peuvent survenir principalement. En outre, la forme non cutanée se produit généralement dans les couches muqueuses, les intestins et les yeux; de plus, les principales raisons sont les mélanocytes ectopiques ou leur croissance régressive indésirable. Un mélanome malin peut survenir chez tous les animaux domestiques; cependant, ils semblent être rares chez les moutons et les chèvres. Ici, nous décrivons un cas rare de la forme primaire non cutanée de mélanome malin chez une chèvre indigène de trois ans. Au cours des procédures d'inspection de la viande dans un abattoir de Tabriz, en Iran, nous avons rencontré de nombreuses masses noires rondes et fermes sur les surfaces viscérales et

les membranes séreuses des cavités abdominale et thoracique. Le foie et les poumons ont été gravement touchés. Des échantillons ont été prélevés sur les parties impliquées et un mélanome malin a été confirmé lors de l'examen histopathologique en raison du pléomorphisme et du polymorphisme et des pigments de mélanine dans les cellules à cytoplasme éosinophile. Selon ce qui était indiqué dans le "manuel sur l'inspection des viandes pour les pays en développement", la carcasse (la tonne équivalent-carcasse) ne convenait pas à l'usage humain et était condamnée par l'inspecteur.

**Mots-clés:** Chèvre; Inspection de la viande; Mélanome; Abattoir

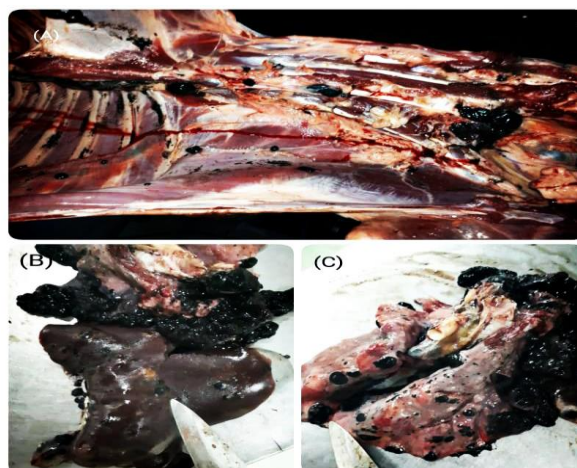
## 1. Introduction

Malignant melanoma is a malignant neoplasm that originates from melanocytes and is observed in cutaneous and non-cutaneous forms. The primary sites of non-cutaneous melanomas could be unknown or they can happen in other parts of the body, including the mucosal membrane or ocular region. Melanocytes are commonly found in the basal layer of the skin, and therefore, most cases of melanoma are noted in the skin, and most of the time, the metastasis of this form can lead to the non-cutaneous one (Kibbi et al., 2016). There are various theories about the unknown primary origin of these tumors (melanoma of unknown primary), which can be referred to as the spontaneous regression of the primary tumor and the presence of ectopic melanocytes in other sites of the body (Abood et al., 2018). These tumors can be found in many animal species, such as cats, dogs, and horses (Nishiya et al., 2016), as well as in wildlife animals, such as penguins and other avian species (Rambaud et al., 2003). Furthermore, they can occur in all domestic animals, and in large domestic animals, they are most common in horses; however, these tumors are not mostly observed in cattle (Mesarić et al., 2002), and they are also rare in sheep and goats (Derakhshanfar et al., 2007). In previously conducted studies, other terms have been proposed for this malignancy based on tumor sites and origins, as well as some other reasons. These terms include melanocytic tumors (Parsons et al., 1990), melanocarcinoma (Srivastava, 2003), malignant melanoma (Mavangira et al., 2008), melanotic carcinoma (Yang et al., 2010), melanocytoma (Derakhshanfar et al., 2007), and melanosarcoma (Kufuor-Mensah and Watson, 1992). In this case report, we report a rare case of

malignant melanoma during a meat inspection procedure in a three-year-old indigenous female goat, which had not any symptoms in the antemortem inspection.

## 2. Material and Methods

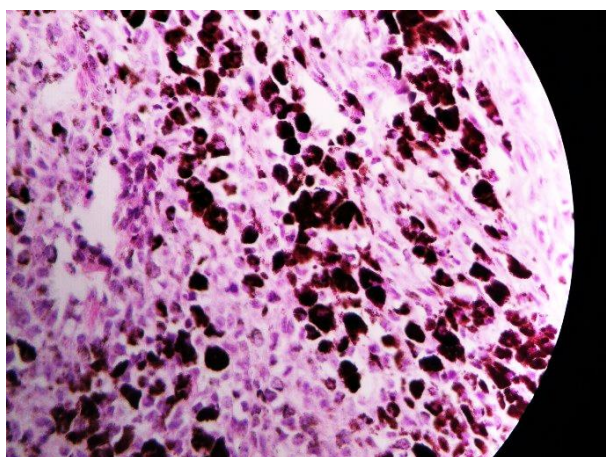
The case under study was observed in an industrial slaughterhouse in Tabriz, Iran, during 2018. Some multifocal to coalescing round firm black masses with the diameter of 1-3 cm scattered on visceral surfaces of the carcass, serous membranes (Figure 1A), and some organs, especially the liver (Figure 1B) and the lungs (Figure 1C) were found during the inspection. These findings led to the suspicion of malignant melanoma. Afterward, several pieces of the lesions were fixed by 10% formaldehyde, and sections from paraffin embedded blocks were cut at 5 microns and presented for histopathologic details through routine H & E staining method (Murray et al., 2004).



**Figure 1.** (A) Caprine non-cutaneous malignant melanoma. Multifocal nodular melanotic tumors scattering on visceral surfaces  
(B) Caprine non-cutaneous malignant melanoma. Multifocal to coalescing melanotic tumors scattering on the liver and visceral diaphragmatic surface  
(C) Caprine non-cutaneous malignant melanoma. Multifocal to coalescing melanotic tumors scattering on the lungs and mediastinum

### 3. Results

In histopathological examination, neoplastic cells exhibited polymorphism and pleomorphism with an eosinophilic cytoplasm containing large amounts of melanin pigments. These neoplastic cells encompassed round to oval vesicular nuclei with stippled chromatin and a prominent basophilic nucleolus. Numerous mitotic figures were observed in high magnifications (Figure 2). These microscopic findings confirmed the diagnosis of malignant melanoma.



**Figure 2.** Caprine non-cutaneous malignant melanoma in the liver; Diffuse atypical melanocytes are observed

### 4. Discussion

Melanoma is originated from melanocytes that can occur in two ways, namely cutaneous and non-cutaneous forms. Non-cutaneous melanoma has a very rare incidence, and it is probably due to the fact that the number of melanocytes is fewer than that of the cutaneous regions and less affected by etiological factors, such as sunlight and harmful radiations because of oxidative stress effects (Parsons et al., 1990; Sachs et al., 1999).

Non-cutaneous melanoma (which occurs in non-cutaneous regions, such as ocular, mucosal, or unknown primary regions) is not necessarily the result of metastasis and spreading of the cutaneous type. It can happen primarily as it is reported in some

previously conducted studies (Boggio et al., 2019; Li et al., 2019)

In a study performed by Brandly and Migaki (1963), it is claimed that out of 800,000 slaughtered goats, 70 goats were involved with neoplasia. Moreover, regarding the rarity of its frequency, they showed no melanoma among carcasses, which was consistent with the results of this study.

It is worth mentioning that these tumors are rare in sheep and goats (Derakhshanfar et al., 2007). However, in various studies, malignant melanoma has been reported in multiple organs in goats. In 2013, Lohr (2013) claimed that from 1987 to 2011, out of 1146 slaughtered goats, four goats had been involved with melanoma. In a study carried out in Sudan on 62 goats with malignant melanoma, it was mentioned that most of them were brown and gray, and the tumors were locally located on the perineum; moreover, they were metastatic and spread through lymphatic vessels and bloodstream (Ramadan et al., 1988). In another study, malignant melanoma was reported in a Pygora goat on its horn base (Mavangira et al., 2008). Similarly, in a case report study entitled "Epibulbar melanocytoma in a goat", malignant melanoma was reported in a two-year-old female crossbreed goat on the dorsal interface of the cornea and sclera of the left eye (Rezaie et al., 2013). In the same vein, another study reported melanocytoma on the left hoof of a two-year-old female goat (Derakhshanfar et al., 2007). Based on the review of other studies and reports, we reported a very rare malignant melanoma of the goats in this case study.

According to the "manual on meat inspection for developing countries", the carcasses affected with metastatic neoplasms or even benign tumors in different organs must be condemned (Herenda et al., 1994). Therefore, this carcass was also condemned by the inspector.

#### Authors' Contribution

Study concept and design: A. H. and M. A.

Acquisition of data: A. H., D. M. and M. S.  
 Drafting of the manuscript: A. H.  
 Critical revision of the manuscript for important intellectual content: D. M.  
 Administrative, technical, and material support: A. H. and D. M.

### Ethics

We hereby declare all ethical standards have been respected in preparation of the submitted article.

### Conflict of Interest

The authors declare that they have no conflict of interest.

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