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Research Article

Immunohistochemical Distribution of Desmin and Vimentin in the Skin of Zavot Cattle

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Abstract: The distribution patterns of desmin and vimentin were determined in Zavot cattle skin using standard immunohistochemical techniques. Skin samples were collected from the different regions of the bodies. Vimentin-immunoreactivity was observed in the cells of subepidermal region, in the myoepithelial cells surrounding sebaceous and sweat glands, in the fibroblast, smooth muscle, endothelial cells of vessels and some hair follicles. Desmin-immunoreactivity was dense in the smooth muscle of arrectores pilorum muscles and bulbus pilorum of the some hair follicles. Desmin and vimentin immunoreactivities were not different among the various regions of Zavot cattle skin.

Key Words: Desmin, vimentin, skin, cattle.

Zavot Irkı Sığır Derilerinde Desmin ve Vimentinin İmmunohistokimyasal Dağılımı

Özet: Zavot ırkı sığır derilerinde standart immunohistokimyasal teknikler kullanılarak desmin ve vimentinin dağılımı belirlendi. Deri örnekleri, vücudun farklı bölgelerinden alındı.Vimentin immunoreaktivitesi subepidermal bölgedeki bazı hücrelerde, yağ ve ter bezlerini çevreleyen miyoepitel hücrelerinde, fibroblastlarda, damarların düz kas ve endotel hücrelerinde ve bazı kıl folliküllerinde gözlemlendi. Desmin immunoreaktivitesi, muskulus arrektor pilinin düz kas hücrelerinde, ve bazı kıl folliküllerinin bulbus pilisinde yoğundu. Desmin ve vimentin immunoreaktivitesi açısından Zavot ırkı sığırların değişik deri bölgeleri arasında farklılık görülmedi.

Anahtar Sözcükler: Desmin, vimentin, deri, sığır.

Introduction

Desmin and vimentin are intermediate filaments (diameter 7-11 nm) known to be present in many cell types of various origin but difficult to distinguish by structural criteria because of a similar morphology. Recent developments have provided specific antibodies to each of the intermediate filaments. Desmin filaments are found mainly in various muscle types, although several studies have shown that the presence of desmin is not limited to muscle cells. Vimentin filaments are more broadly distributed among tissues such as in the cells of the mesenchymal origin, certain other non-epithelial cells of various other tissues (1-4). However, it has become apparent that even though those subclasses of intermediate filaments are generally associated with these particular cell types, many cell types have more than one type of filament subunit (5).

Comparative desmin and vimentin immunocytochemical studies in the skin of the wild and domestic ruminants are in general rare with the exception of immunoreactivities in the wild goat skin and of cytokeratins in bovine skin (4,6). Thus, the objective of the current study was to determine the distribution patterns of desmin and vimentin filaments in Zavot cattle skin using standard immunohistochemical techniques.

Materials and Methods

Skin samples were collected from 18-month-old Zavot cattle (n=10). Skin samples right after euthanasia were dissected from the neck, ridge, shoulder, abdomen and sacral regions of cattle. Samples were immediately fixed in the formal saline solution and then routinely processed for embedding in paraffin. Tissue blocks were cut into 6 micrometer thick sections on a microtome. The

endogenous peroxidase activity was inhibited by treating sections with 1% hydrogen peroxide and methanol for 30 minutes at room temperature. Sections were treated with pronase (Dako, Glostrup, Denmark) for 7 minutes. Non-specific binding sites for antibodies were suppressed by treating sections with 10% normal rabbit serum for 30 minutes at room temperature. Sections were then processed for standard immunohistochemical techniques using peroxidase antiperoxidase (PAP) procedures (7). As a control, antiserum specificity was determined with a separate experiment in which the primary antiserum was omitted. Positive control was also conducted with tissue sections from the 6 different regions of skin samples of cattle known to contain the intermediate filaments studied. The sections were incubated in primary antibodies (Desmin/HRP, 1:40; Vimentin/HRP, 1:100; Dako, Glostrup, Denmark) diluted in phosphate buffered saline (PBS, 0.1 M) containing bovine serum albumin (2.5%) and Triton X-100 (0.2%) for an hour at room temperature. Subsequently, the binding of primary antiserum was detected using biotinylated rabbit anti-mouse antisera (1:100) and PAP (mouse) (1:300) (both from Dako, Glostrup, Denmark). Finally, the chromogen protocol was used to reveal the distribution of bound peroxidase (8).

Results

The distribution of individual desmin and vimentin-immunoreactivities was not different among the various regions of the skin tested. Vimentin-immunoreactivity was very dense in the dendritic cells of the subepidermal region (Figure 1). It was also strongly stained around the myoepithelial cells surrounding sebaceous (Figure 2) and sweat glands (Figure 3). Vimentin-immunoreactivity was observed in the fibroblasts (Figure 3), the smooth muscle of arrectores pilorum muscle (Figure 4), endothelial cells of vessels (Figure 4) and bulbus pilorum of some hair follicles (Figure 5).

Desmin-immunoreactivity was very dense in the smooth muscle of arrectores pilorum muscles (Figure 6) and in the endothelial cells. In a serial horizontal section, desmin-immunoreactivity was also seen in several cells of bulbus pilorum of some hair follicles (Figure 7).

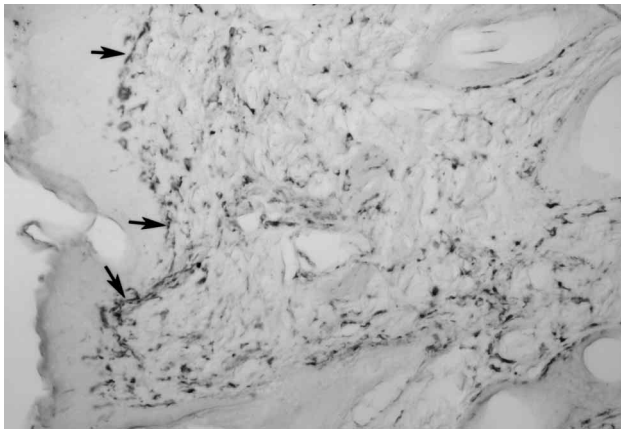

Figure 1. Vimentin-immunoreactivities in the several cells of the subepidermal region (arrows; dendritic cells). X200.

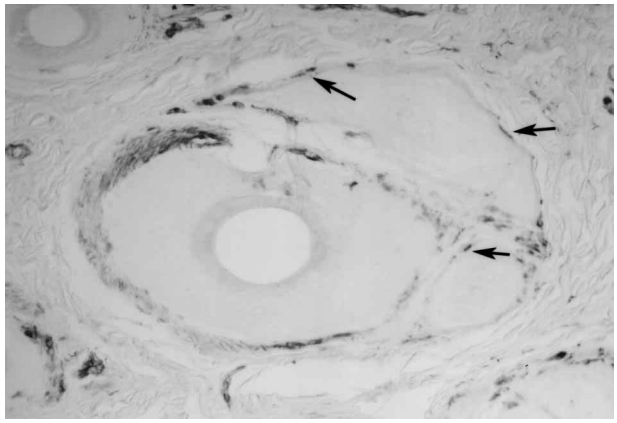

Figure 2. Vimentin-immunoreactivities in the myoepithelial cell of sebaceous glands (arrows). X200.

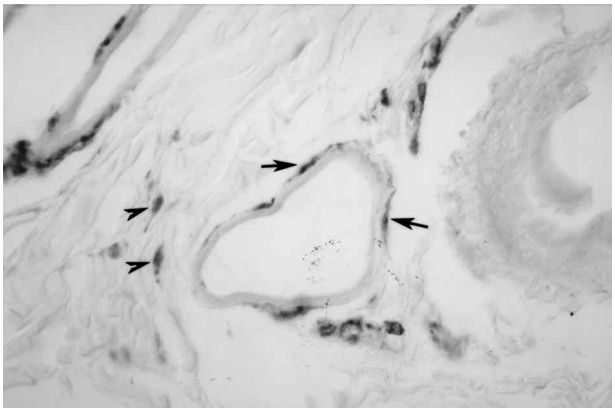

Figure 3. Vimentin-immunoreactivities in the myoepithelial cells of the sweat glands (arrows) and in the fibroblasts (arrowheads). X400.

Discussion

Our findings are in general agreement with the data reported in most of the avian and mammalian species in

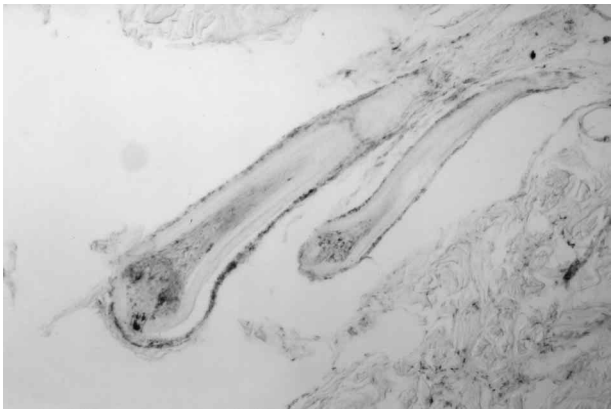

Figure 4. Vimentin-immunoreactivities in the smooth muscle of arrectores pilorum muscles and endothelial cells of vessels. X200.

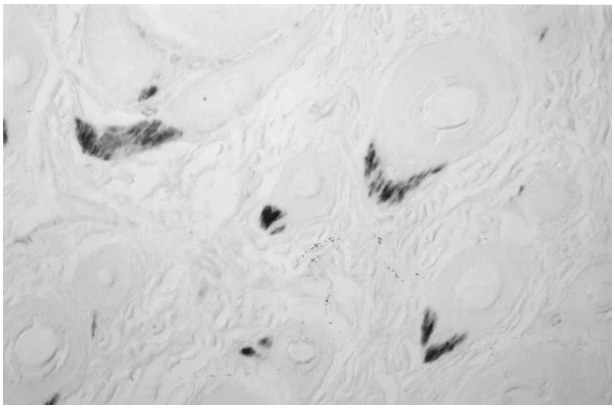

Figure 6. Desmin-immunoreactivity in the arrectores pilorum muscles. X200.

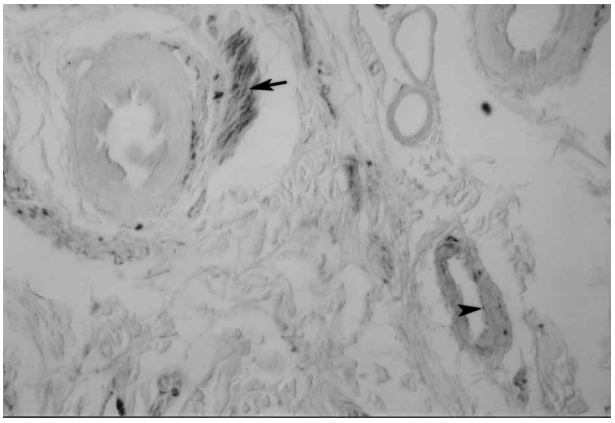

Figure 5. Vimentin-immunoreactivities in the bulbus pilorum of some hair follicles. X100.

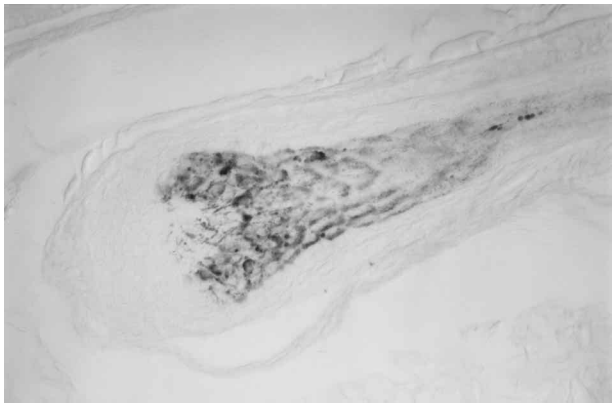

Figure 7. Desmin-immunoreactivity in the hair follicle. X200.

terms of desmin and vimentin filaments distribution in the skin (1,2,4,9-11). These studies have reported that desmin and vimentin are known as intermediate filaments, mainly found in mesencyhym originated cells and muscle tissues, respectively.

In the present study, vimentin-immunoreactivity was very dense in the smooth muscle cells of vessels, while it was weakly stained in the arrectores pilorum muscles. These findings were in agreement with the published results of the domestic mammals (1,4,9-11). They reported that vimentin-immunoreactivity was present in the fibroblasts, endothelial cells and smooth muscles of vessels. Vimentin-immunoreactivity was also observed in the arrectores pilorum muscles of the skin (4,10,12), as shown in our study.

Vimentin-immunoreactivity in the bulbus pilorum of the some hair follicles and in the myoepithelial cell surrounding sebaceous and sweat glands of the normal and infested chamois skin was not detected (4). Additionally, some researchers showed that vimentin-immunoreactivity was present in the myoepithelial cells of various organs (13,14), while others were not able to detect vimentin immunoreactivities in those regions (5,15,16). Furthermore, Franke et al. (15) did not observe vimentin-immunoreactivity in the myoepithelial cells of the mammary, sweat and sebaceous glands of the skin. Vimentin-immunoreactivity was present in those regions of the Zavot-bred cattle skin of the present study. Along with our results, Heid et al. (17) reported vimentin-immunoreactivity in the hair follicle bulbs of mammalian skin. Vimentin staining was also present in

the dentritic cells, Langerhans cells, and fibroblasts (18), whereas Rode et al. (4) demonstrated that there was no vimentin staining in the epidermal Langerhans cells of the infested chamois skin. In the present study, we did not also observe any vimentin staining in the epidermal Langerhans cells of Zavot cattle skin. Mahrle et al. (19) reported similar findings to our study, namely that vimentin-immunoreactivity was seen in the dermal dentritic cells in which their processes extended into the epidermis.

Our findings on the distribution of desmin-immunoreactivity in Zavot cattle skin were mostly similar to the previous studies (1,2,4,10,11,16). For instance, those studies demonstrated that desmin was clearly detected in the smooth muscle cell bundles of arrectores pilorum muscles (10,12) and in endothelial cells of the blood vessels of the cattle, horse, chamois and human skins. Additionally, desmin-immunoreactivity was fairly weak in the blood vessels of the skin as compared to the vimentin staining (20).

Interestingly, in the current study, desmin-immunoreactivity was observed in some cells of the bulbus pilorum of some hair follicles. To our knowledge, this was the first report of the existence of desmin-immunoreactivity in the hair follicles. Finally, desmin and vimentin immunoreactivities were not significantly different among the various region of Zavot cattle skin, agreeing mainly with published results. The existence of vimentin-immunoreactivity in the myoepithelial cell of the sweat and sebaceous glands and particularly desmin-immunoreactivity in some cells of the bulbus pilorum of hair follicles should be investigated in detail.

Acknowledgment

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