

Comparison of Hippological Differences Between Jeju Ponies and Jeju Pony Crossbreds : III. The Thickness of the Skin in Racepony Resources

제주마와 제주잡종마의 마학적 차이 : 3. 경주마 자원의 피부 두께

양정진¹

Jeong Jin Yang
국립공원공단 야생생물보전원
야생동물의료센터

박용수²

Yong Soo Park
국립한국농수산대학교
말산업전공

양재혁²

Jae Hyuk Yang
국립한국농수산대학교
말산업전공

¹ Wildlife Medical Center, National Park Institute for Wildlife Conservation, Gurye 57616, Korea

² Major of Horse Industry, Korea National University of Agriculture and Fisheries, Jeonju 54874, Korea

ABSTRACT

Little research has been done on investigating the specific characteristics of Jeju Ponies (Korean native horse) and Jeju Pony crossbreds. The authors performed evaluation of skin thickness of the skin of these breeds (n=205) at Jeju Race Park as a way of find of hippological difference. Results of this study showed that the Jeju Pony's skin were thicker than the Jeju Pony crossbred. The male's skin were thicker than the female's skin in two breeds respectively. Especially, in the Jeju Pony show significant differences ($P < 0.05$). In Jeju Pony crossbreds, as the skin thickness were thinner with age increase. 2-year-old group's skin significantly thinner than 3 and over 4-year-old groups. However, the Jeju Pony's skin were not significantly different by age. In conclusion, the authors thought that causes of the difference of the breeds were origin and genetic differences among the horse and the pony. Furthermore, the modified umbilical herniorrhaphy with rubber rings must be used cautiously in the Jeju Pony. It should be taken into account the animals' skin thickness when the leather goods created by using their skin.

Key Words : Hippological difference, Jeju Pony, Jeju Pony crossbreds, Skin thickness

Received Nov. 16. 2023
Revised Nov. 29. 2023
Accept Nov. 30. 2023

*Correspondence

Jae Hyuk Yang
equinfluenza@daum.net

INTRODUCTION

The skin is the only visible organ of the body and yet it is much more than an inert sheath. Its efficient functioning is essential for health (Hayers 2002, Kainer 1998). The skin consists of two distinct layers: the epidermis and the dermis. The epidermis is a nonvascular, keratinized,

stratified squamous epithelium that varies in thickness. The dermis consists of an intricately woven feltwork of collagen, elastic, and reticular connective tissue fibers (Oldruitenborgh-Oosterbaan 2001, Riegel 2000). The skin and its associated structures play a vital role as a protective barrier, temperature regulator, and surveillance mechanism to detect unwanted foreign invaders



(Crabbe 2007). The skin and hair coat vary in quantity and quality among breeds and among individuals within a breed; they also vary from one area to another on the body, and in accordance with age and sex (Scott and Miller, Griffiths 2008). The Jeju Pony is a Korean native horse and the Jeju Pony crossbred is a cross between a Jeju Pony and a Thoroughbred horse or horses of unknown origin and/or breeds. However, there is little research on the hippological difference between the two breeds (Yang et al., 2015, Yang et al., 2016, Yang and Park 2022), and there have been no reports about skin in Jeju race resources. Also, there have been no public data of thickness of the skin in two breeds also. So, the authors performed evaluation of skin thickness of the skin of these breeds as a way of find of hippological difference.

MATERIALS AND METHODS

Animals

The experiment was conducted with randomly chosen 105 Jeju Ponies and 100 Jeju Pony crossbreds at Jeju Race Park in Korea. Age range of the race resource was 2-9 years old. All animals were healthy clinically because they were checked up by the formal veterinary officer before started the regular races.

Measure and Methods

The thickness of skin in the race resources were measured with a vernier caliper (Digital caliper®, Next, China). Every animal was never start the race within a week for the purpose of measuring accurately. The site of the experiment was the center of the neck's skin in all animals. The method of the measurement was followings. Prior to the test was performed, the assist hold the reins of the animals and then let them calm themselves down. The ponies' skin was pulled and fold with the left hand and the measurement was by the tester's right hand. The data were divided by two because animals' skin was fold. The statistical significance of the two breeds and

thickness of the skin measured by group in this study was verified using paired T-tests (Excel, Microsoft).

RESULTS

Following outcomes have been identified. Results of this study showed that the average of the skin thickness was $2.28(\pm 0.46)$ cm of the whole Jeju Ponies ($n=105$), whereas $1.26(\pm 0.46)$ cm of the whole Jeju Pony crossbreds ($n=100$). Results by sex were as follows: the whole of male $1.98(\pm 0.67)$ cm, whereas the whole of female $1.54(\pm 0.63)$ cm. In the Jeju Ponies, males $2.37(\pm 0.46)$ cm and female $2.10(\pm 0.41)$ cm, whereas males $1.35(\pm 0.44)$ and females $1.18(\pm 0.46)$ cm in the Jeju Pony crossbreds (Fig. 1.). Results by ages were as follows: 2-year-old $1.94(\pm 0.58)$ cm, 3-year-old $1.72(\pm 0.76)$ cm, and over 4-year-old $1.53(\pm 0.67)$ cm in the whole ponies. In the Jeju Ponies, 2-year-old group $2.30(\pm 0.39)$ cm, 3-year-old group $2.32(\pm 0.56)$ cm and over 4-year-old group $2.08(\pm 0.33)$ cm. On the other hand, in the Jeju Pony crossbreds, 2-year-old group $1.46(\pm 0.42)$ cm, 3-year-old group $1.16(\pm 0.42)$ cm and over 4-year-old group $1.05(\pm 0.56)$ cm (Fig. 2.).

DISCUSSION

The horse's skin is the largest organ of his body, and ranges in thickness from 1 to 5 mm (Crabbe 2007). The reported average thickness of the general body skin is 3.8 mm, with a range of 1.7 to 6.3 mm. The average skin thickness in the areas of the mane and tail was 6.2 mm, with a range of 3.8 to 10.7 mm (Talukdar 1972).

The outer layer of the skin, or epidermis, is composed of multiple layers of cells defined by position, shape, polarity, morphology, and state of differentiation of the keratinocytes. These are of four distinct types: keratinocytes, melanocytes, Langerhans' cells, and Merkel's cells, which are associated with tylotrich pads (Smith 1888).

The dermis (corium) is an integral part of the body's connective tissue system and is of mesodermal origin (Dunstan 1995). In areas of thickly haired skin, the dermis accounts for

most of the depth, whereas the epidermis is thin. In very thin skin, the decreased thickness results from the thinness of the dermis. In general body skin, the dermis ranges from 1.6-6.1 mm thick; in the mane and tail region, 3.7 to 10.5 mm. The dermis is composed of fibers, ground substance, and cells (Taluk 1972). The subcutis (hypodermis) is of mesenchymal origin and is the deepest and usually thickest layer of the skin (Dunstan 1995). However, for functional reasons, there is no subcutis in some areas (e.g., lip, cheek, eyelid, external ear, anus); in these areas, the dermis is in direct contact with musculature and fascia (Scott and Miller). The thickness of the subcutis is inversely proportional to blood flow, with slow circulation promoting lipogenesis (Ryan 1995). As a result of these factors, fat is particularly susceptible to diseases and, with even minor injury, damage occurs in the absence of an efficient system for removing the damaged tissue (Scott and Miller).

The ponies were resistant to cold, and lived in northern Eurasia; however, the Arabian horses, the ancestor of Thoroughbreds, were heat-resistant desert horses. The spare frame, devoid of fatty tissue, the thin skin, and the ultra-fine coat allowed it to withstand the effects of heat and enabled it to go for long periods without water (Edwards 2000). The ancestors of Jeju Ponies had lived in cold and frost area. Jeju Pony crossbred is mixedbred pony with hot-blood such as Thoroughbreds or others. Hot-bloods are small, fine-bone, dry and heat - resistant desert horse (Edwards 2000). Skin

conditions are significant in soundness because of being infectious or cancerous, or by acting as a nuisance through situation (Gray 1993).

Horseskin(hide) has long been used as a material for making products such as shoes. The lifespan of the product depends on the thickness of the skin and the processing technology. Results of this study showed that the Jeju Pony's skin were thicker than Jeju Pony crossbreds significantly. In detail, The skin of male and female of Jeju Ponies were thicker than Jeju Pony crossbreds (Fig. 1). The skin were most thick in 2-year-old, followed by 3 and above the age of 4-year-old in two breeds respectively. At 3-year-old of the Jeju Pony, the skin two times accurately thicker than Jeju Pony crossbreds (Fig. 2).

The Jeju Pony's skin were thicker than the Jeju Pony crossbred. The male's skin were thicker than the female's skin in two breeds respectively. Especially, in the Jeju Pony show significant differences ($P < 0.05$). As the thickness of the skin was thinner with age increase in two breeds respectively. In Jeju Pony Crossbreds, 2-year-olds showed significant differences from 3 or over 4-year-olds. However, the Jeju Pony's skin were not significantly different by age. In conclusion, the authors thought that causes of the difference of the breeds were origin and genetic differences among the horse and the pony.

The reason why males have thicker skin than females and the decrease in skin thickness with age is unknown. This should be taken into account

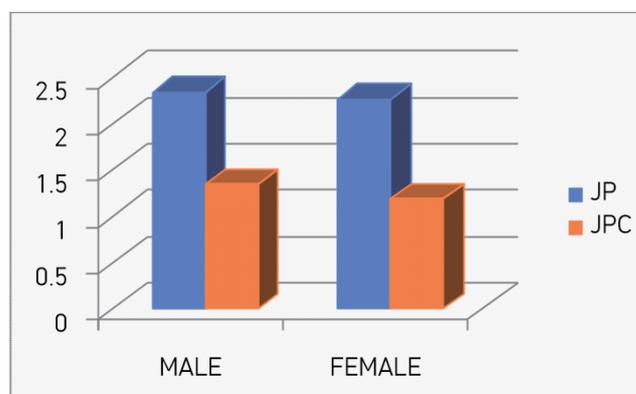


Fig. 1. Difference of thickness of skin in raceponies by sex
JP=Jeju Ponies; JPC=Jeju Pony Crossbreds

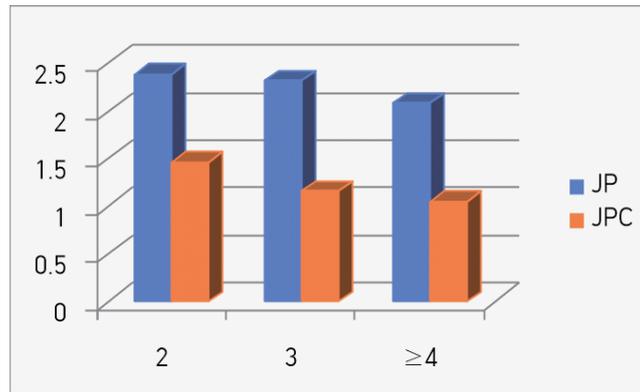


Fig. 2. Difference of thickness of skin in raceponies by age
JP=Jeju Ponies; JPC=Jeju Pony Crossbreds

when making horsehide products. Furthermore, the modified umbilical herniorrhaphy with rubber rings must be used cautiously in the Jeju Pony. It should be taken into account the animals' skin thickness when the leather goods created by using their skin. In the meantime, hippological differences were confirmed in the prevalence of the wolf teeth, the anhidrosis, and the innate Pacers in Jeju Ponies and Jeju Pony Crossbreds (Yang et al., 2015, Yang et al., 2016, Yang and Park 2022). This study also confirmed the difference in skin thickness between the two breeds. Furthermore, when making horse skin products, using Jeju Ponies are expected to be more durable.

CONFLICT OF INTEREST

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

ACKNOWLEDGEMENT

We would like to thank Ji-Hye Moon at Equine hospital of Jeju Race Park, Korea Racing Authority (KRA) for her assistance. All data of this study were used under permission of KRA.

REFERENCES

1. Crabbe B. 2007. The skin. In: The comprehensive

- guide to equine veterinary medicine (Crabbe B ed). 1st Ed. Sterling, New York, USA, pp:193-210.
2. Dunstan RW, Henry GA. 1995. Pathophysiology and diagnosis of skin diseases. In: The horse; Diseases and clinical management, Vol. 1. (Dunstan RW, Henry GA, ed). Saunders, Philadelphia, USA, pp:487-488.
3. Edwards EH. 2000. The new encyclopedia of the horse. 1st ed, Dorling Kindersley Book, Hampshire, UK, pp:10-73.
4. Gray P. 1993. Soundness in the horse, 1st Ed. J. A. Allen, London, UK, pp:7-11.
5. Griffiths JT. 2008. Equine anatomy. In: Equine science; Basic knowledge for horse people of all ages, 1st Ed. Equine Network, Colorado, USA, pp:199-213.
6. Hayers MH. 2002. Veterinary notes for horse owners, 18th Ed. Simon & Schuster, New York, USA, pp:131-134.
7. Kainer RA, McCracken TO. 1998. Horse anatomy, 2nd Ed. Alpine, Colorado, USA, pp:7-11.
8. Oldruitenborgh-Oosterbaan MMS, Knottenbelt DC. 2001. The practitioners guide to equine dermatology, 1st Ed. Uitgeverij Libre BV, Netherland, pp:11-13.
9. Riegel RJ. 2000. Illustrated atlas of clinical equine anatomy and common disorders of the horse. 1st Ed. Equistar Publications, Ohio, USA, pp:293-306.
10. Ryan TJ. 1995. Lymphatics and adipose tissue. Clin Dermatol. 13:493-498.

11. Scott DW, Miller WH. 2003. Structure and function of the skin. In: Equine dermatology (Scott DW, Miller WH, es). 1st Ed. Saunders, St. Louis, USA, pp:1-53.
12. Smith F. 1888. Histology of the Skin of the Horse. J Anat Physiol. 22:142-53.
13. Talukdar AH, Calhoun ML, Stinson AW. 1972. Microscopic anatomy of the skin of the horse. Am J Vet Res. 33:2365-2390.
14. Yang J, Han J, Hwang KK, Lim YK. 2015. Incidence of Wolf Teeth in Jeju Ponies and Jeju Pony crossbreds. J Vet Clin. 32:285-287.
15. Yang J, Moon KH, Lim YK. 2016. Comparison of Hippological Differences Between Jeju Ponies and Jeju Pony Crossbreds: II. The Incidence of Innate Pacers in the Jeju Raceresource. J Vet Clin. 33:400-401.
16. Yang J, Park YS. 2022. Comparison of Hippological differences between Jeju Ponies and Jeju Pony crossbreds: I. The incidence of anhidrosis in two racepony populations. JPAF. 24:36-40.