ANALYSIS OF MYOFIBRILLAR PROTEIN UBIQUITINATION IN MUTTON WITH DIFFERENT TENDERNESS

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I. INTRODUCTION

Tenderness reflects the texture of meat, determines the eating taste, and affects the purchase willingness of consumers [1]. It is affected by many complex factors in the actual production. It has been shown that post-translation modification of proteins can affect the quality of meat by affecting postmortem energy metabolism, muscle contraction and other ways [2]. Recently, some studies have found that ubiquitination has an important function in protein degradation. The addition of ubiquitin inhibitor effectively inhibited the degradation of myofibrils, and the low ubiquitination level group had a more complete muscle fiber microstructure and shorter sarcomere length compared to the control group [3]. This study aimed to analysis the ubiquitination level of myofibrillar protein in mutton with different levels of tenderness, and clarify the role of ubiquitination on meat tenderness.

II. MATERIALS AND METHODS

The *longissimus dorsi* muscles from both sides of 64 sheep carcasses with the same age, gender and feeding condition were collected. According to the shear force on day 1 postmortem, the samples were selected and divided into tender and tough groups and there were 9 samples in each group. The samples were stored at 4 ℃ for 1 h, 12 h, 1 d, 3d postmortem. The pH was measured by portable pH meter. The shear force was measured by a texture analyser. The ubiquitination level of myofibrillar protein was measured by western blotting. The data were analysed by SPSS Statistic 19.0. Correlation analysis was run by Origin 2021.

III. RESULTS AND DISCUSSION

The shear force and pH results were shown in Table1. There were significant differences in shear force between the two groups on 1d postmortem ($P<0.05$), indicating that the grouped samples could be used for subsequent studies.

Table 1. The variation of pH and shear force during postmortem in samples of different tenderness

	Groups	Postmortem time				SEM	P-values		
		1h	12h	1d	3d		Time	Groups	T×G
pH	Tender	7.17^{a}	6.22^{b}	5.77^{cX}	5.72^{cX}	0.08	<0.001	0.757	<0.05
	Tough	6.89^{a}	6.07^{b}	5.92^{bY}	5.88^{bY}				
Shear force	Tender	63.4^{a}	72.8^{ab}	63.0^{bX}	46.4^{ab}	1.88	<0.001	<0.05	<0.05
	Tough	60.3^{a}	58.2^{b}	83.0^{bY}	64.2^{b}				

Note: a-c different letters in the same row and X-Y different letters in the same column of treatment indicate statistically significant differences at $p<0.05$.

The ubiquitination level in the tender group had no significant change during postmortem, while it was gradually decreased in the tough group. A higher ubiquitination level of myofibrillar were shown in tender group compared to tough group on 1d postmortem ($P<0.05$, Fig. 1). It indicated that

ubiquitination is involved in regulating the degradation of myofibrillar proteins, and affects the tenderness of meat.

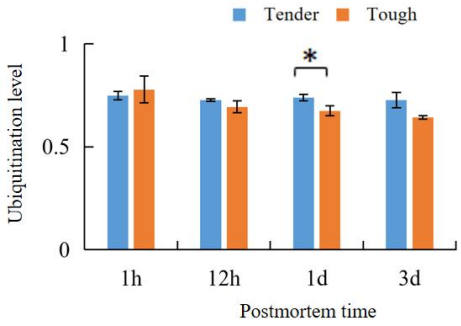

Figure 1. The ubiquitination level of myofibrillar protein in tender and tough groups *P<0.05

There was no significant correlation between the pH, shear force and the ubiquitination level of myofibrillar protein in the tender group (P>0.05, Fig. 2A). In tough group, the ubiquitination level of myofibrillar protein and pH showed positive correlation and the shear force was negatively correlated with pH and ubiquitination level of myofibrillar protein (P<0.05, Fig. 2B). It suggested that the ubiquitination of myofibrillar protein in tough group promotes protein degradation.

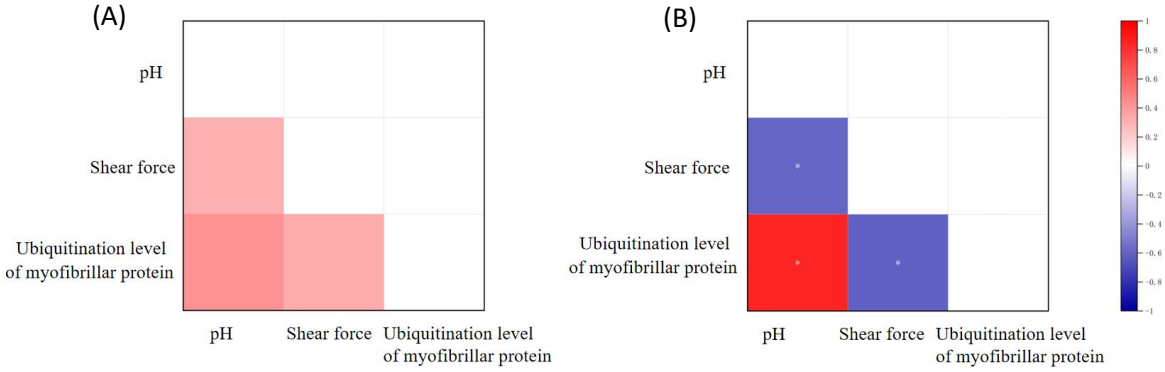

Figure 2. Correlation analysis between pH, shear force and ubiquitination level of myofibrillar protein

Note: Red color represents positive correlation, blue color represents negative correlation *P<0.05.

IV. CONCLUSION

The ubiquitination of myofibrillar protein was different in mutton with different levels of tenderness. Ubiquitination played an important role in postmortem protein degradation and might contribute to the tenderness of meat.

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