DISTRIBUTION OF BOVINE α-LACTALBUMIN AND κ-CASEIN GENOTYPES IN TAIWAN.

F.C. Mao and R.D. Bremel
Department of Veterinary Medicine, National Chung Hsing University, Taichung, 40227, Taiwan and Department of Dairy Science, University of Wisconsin-Madison, 53706, USA.

SUMMARY

Holstein cattle α-lactalbumin and κ-casein gene frequencies from four different farms in Taiwan were analyzed. Different frequencies were found between Taiwan and other countries. Farms using frozen semen in their breeding scheme showed a higher frequency of α-lactalbumin A genotype and a higher frequency of κ-casein B genotype.

INTRODUCTION

Holstein cattle having the α-lactalbumin AA or AB genotypes have higher PTA milk than BB cattle (Greg and Bremel, 1993). Different κ-casein genotypes can also affect milk protein percentage and milk protein stability, and is especially important in cheese manufacturing. In this study, we analyzed 159 Holstein cattle from 4 different farms in Taiwan and compared these gene frequencies with other countries.

MATERIALS AND METHODS

The DNA samples were purified from blood or milk. Alpha-lactalbumin genotypes were identified according to the procedure of Greg and Bremel (1993). In brief, a 166 bp fragment was amplified by polymerase chain reaction. The fragment was digested with *MnlI* and separated by 3% agarose gel electrophoresis. Kappa-casein genotypes were done by using the protocol as in Cowan et al. (1992). After a 30 cycle PCR reaction, the 347 bp fragment of κ-casein gene between exon IV and intron IV was amplified. The fragment was further digested with *HinfI* and separated by 2% agarose gel electrophoresis.

RESULTS

Due to a guanosine to adenosine point mutation in the 5' flanking region of α-lactalbumin gene, dairy cattle could be identified as AA, AB and BB types. Kappa-casein genotypes could be identified by a point mutation in exon IV.

Table 1. Distribution of α-lactalbumin genotypes in four different farms in Taiwan.

Genotypes	Farm A	Farm B	Farm C	Farm D	Total	%
AA	2	0	0	2	4	2.5
AB	7	3	8	28	46	28.9
BB	14	9	38	48	109	68.6

Table 2. Distribution of κ-casein genotypes in four different farms in Taiwan.

Genotypes	Farm A	Farm B	Farm C	Farm D	Total	%
AA	13	10	37	60	120	76.9
AB	7	2	7	16	32	20.5
BB	2	0	0	2	4	2.6

DISCUSSION

Cows with α-lactalbumin AA or AB genotype produced 300 kg more milk (305d) than BB type cows. The frequencies of these genotypes were significantly different between Taiwan and US population. The A gene frequency was 0.29 in the US cattle and 0.17 in Taiwan. About one half of the Holstein cows screened in US have a BB genotype, however, in Taiwan more than two thirds of the examined Holstein cows fall into the BB group. Cows with B type κ-casein gene has a higher milk protein percentage and the milk is good in cheese making. In this study the κ-casein B-gene frequency in Taiwan is 0.13 and is significantly lower than other western countries. Farms routinely using frozen semen from western world showed a higher frequency of α-lactalbumin A genotype and a higher frequency of κ-casein B genotype.

REFERENCES

BLECK, G.T. and BREMEL, R.D. (1993) J. Dairy Sci. 76 : 2292-2298.

COWAN, C.M., DENTINE, M.R. and COYLE, T. (1992) J. Dairy Sci. 75 : 1097-1104.