# The effect of intake level of rumen undegradable protein during the extended growing stage on ruminal fermentation and fatty acids composition of intramuscular fat at 17 months of age

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## Background

Recently, commercial beef farms in Korea have been supplying concentrate feeds high in CP content compared to the conventional feeds to shorten the feeding period. This study investigated that the effects of different CP and rumen undegradable protein (RUP) intakes during the extended growing stage up to 17 months of age on the growth performance and blood as well as fatty acid profiles in intramuscular fat of biopsy sample at 17 months of age.

## Materials and Methods

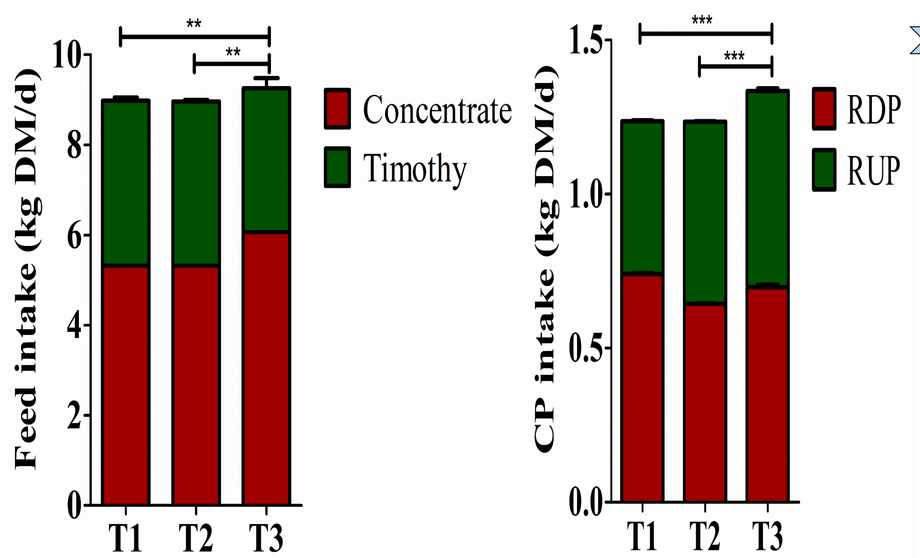
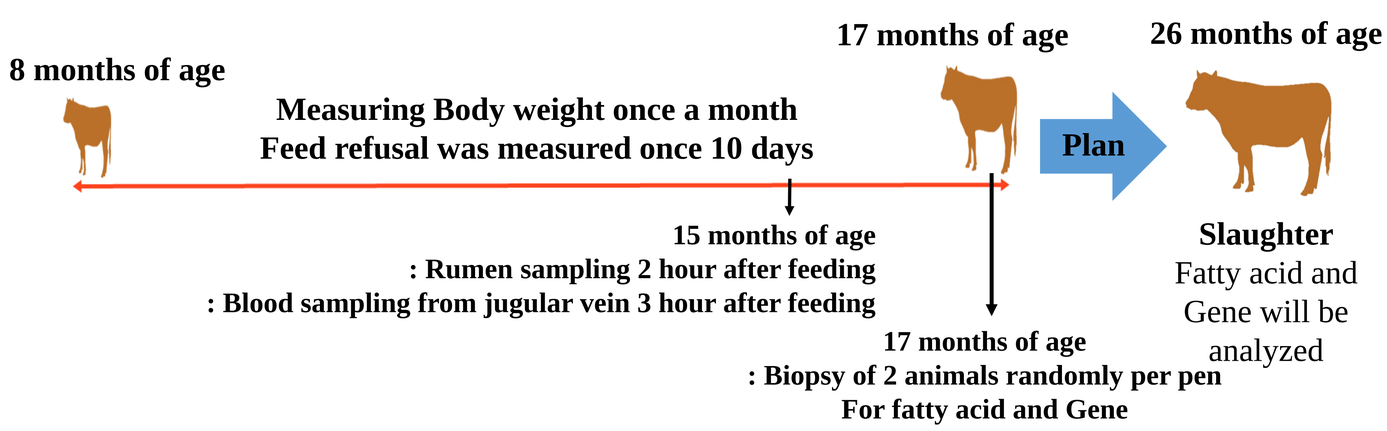



**Figure. 1 Intake of feed, rumen degradable protein (RDP) and rumen undegradable protein (RUP).**

- Forty-eight Hanwoo steers with an average 8 months of age and 217 ± 18.17 kg body weight were assigned in balance; 16 steers per treatment (4 steers per pen;4 pens per treatment).




- All data were analyzed using MIXED procedure of SAS (SAS institute, Cary, NC, USA). Treatments significance was considered at $P < 0.05$ and trends were considered $0.05 \leq P < 0.10$.

## Results

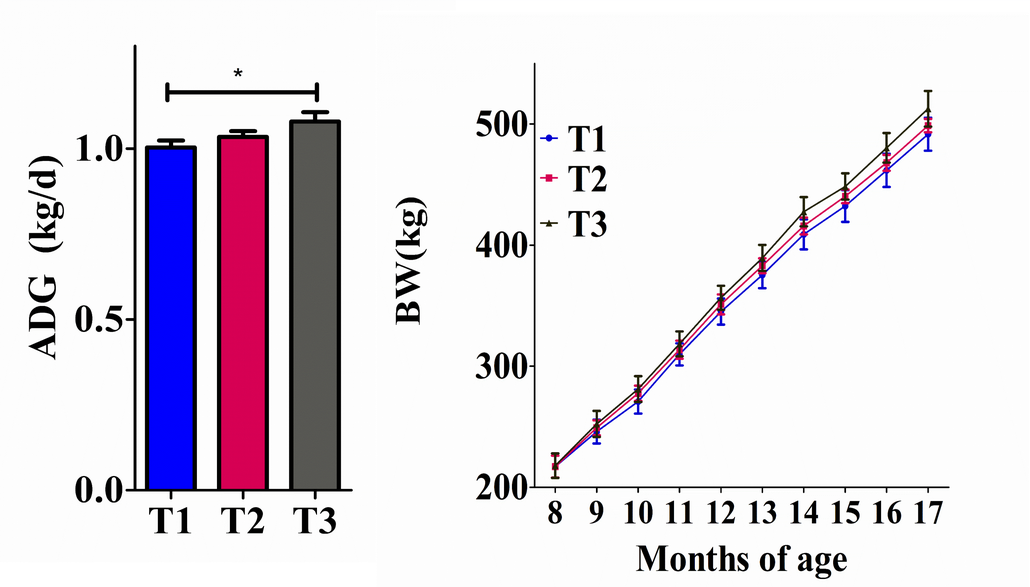



**Figure. 2 The Effect of CP and RUP intake on ADG and BW.**

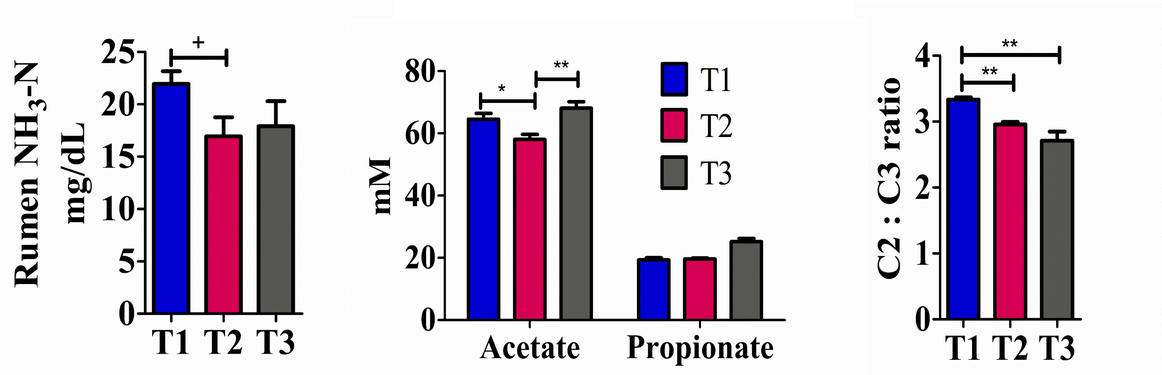



**Figure. 4 The Effect of CP and RUP intake on rumen fluid fermentation.**

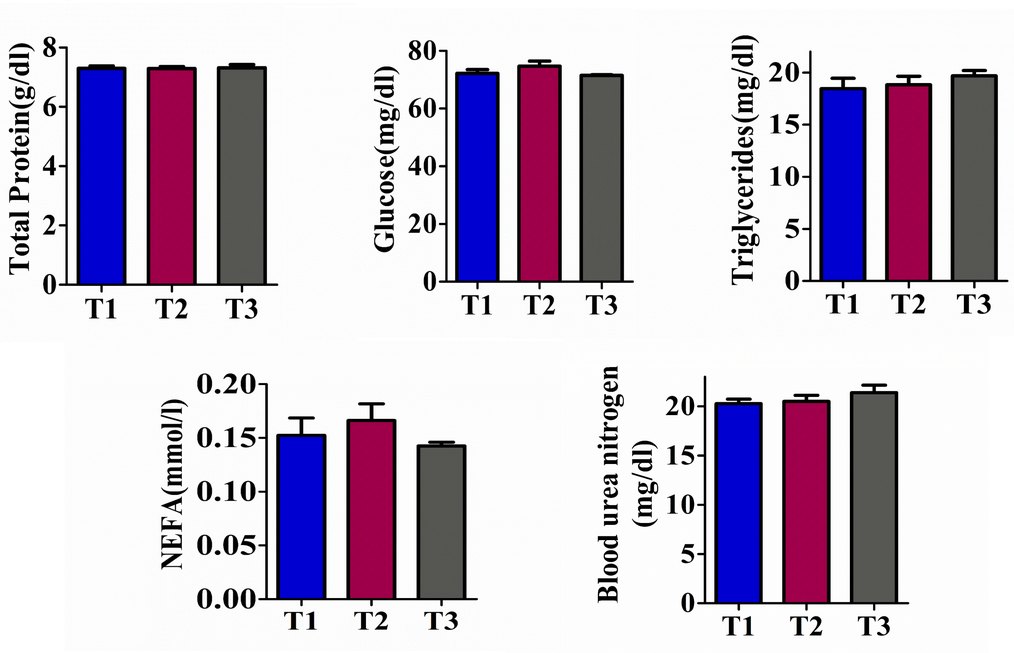



**Figure. 3 The Effect of CP and RUP intake on blood metabolites.**

**Table. 1 Fatty acid amount of intramuscular fat on longissimus muscle (mg/ 100g tissue)**

| | Treatment | | | | P-value | | |
|---|---|---|---|---|---|---|---|
| Fatty acid | Treatment 1 | Treatment 2 | Treatment 3 | SEM | T1 x T2 | T1 x T3 | T2 x T3 |
| Myristic acid, C14:0 | 172 | 206 | 272 | 47.1 | 0.4809 | 0.0469 | 0.178 |
| Myristoleic acid, C14:1 | 46 | 50 | 70 | 12.8 | 0.7397 | 0.0778 | 0.1441 |
| Pentadecenoic acid, C15:1 | 6 | 10 | 9 | 1.4 | 0.0199 | 0.0594 | 0.6042 |
| Palmitic acid, C16:0 | 1463 | 1582 | 1965 | 309.2 | 0.7046 | 0.1194 | 0.2290 |
| Palmitoleic acid, C16:1 | 264 | 268 | 338 | 57.5 | 0.9405 | 0.2098 | 0.2366 |
| Stearic acid, C18:0 | 598 | 629 | 774 | 131.4 | 0.8150 | 0.1955 | 0.2837 |
| Elaidic acid, C18:1n9t | 86 | 86 | 121 | 23.1 | 0.9879 | 0.1428 | 0.1466 |
| Oleic acid, C18:1n9c | 2257 | 2253 | 2762 | 459.0 | 0.9929 | 0.2830 | 0.2792 |
| Linoleic acid(LA), C18:2n6c | 164 | 174 | 197 | 15.9 | 0.5507 | 0.0501 | 0.1559 |
| Dihomogamma-linolenic acid, C20:3n6 | 13 | 16 | 15 | 1.3 | 0.0243 | 0.0482 | 0.7457 |
| The others fatty acid (n=16) | 189 | 188 | 223 | - | - | - | - |
| SFA | 2357 | 2545 | 3159 | 498.6 | 0.7099 | 0.1226 | 0.2316 |
| MUFA | 2699 | 2705 | 3350 | 550.5 | 0.9916 | 0.2506 | 0.2548 |
| PUFA | 203 | 212 | 238 | 20.5 | 0.6559 | 0.1035 | 0.225 |
| MUFA:SFA | 1.13 | 1.06 | 1.07 | 0.1 | 0.2709 | 0.3624 | 0.8438 |
| PUFA:SFA | 0.10 | 0.09 | 0.08 | 0.0 | 0.5595 | 0.2893 | 0.6263 |
| Omega6:3 | 17 | 21 | 22 | 1.7 | 0.0325 | 0.0037 | 0.3399 |
| Total fatty acids (mg/100g Tissue) | 5258.94 | 5462.03 | 6746.47 | 1059.2 | 0.8498 | 0.1748 | 0.2387 |

## Conclusion

- Lower rumen ammonia ($NH_3$-N) concentration ($P < 0.1$) in T2 compared to T1 implies the increase in protein supply or degradability in small intestine.
- The significant differences ($P < 0.01$) in acetate/propionate ratio may be responsible for the higher ADG in T3 than T1.
- Non significant effect on blood metabolism suggests that there was no metabolic disorder associated with increases in intakes of RUP and CP.
- Final results obtained after slaughtering the steers at 26 months of age (July 2021) should provide a more clear explanation of the factors influencing growth performance, quality grade, fatty acid composition of intramuscular and gene expression involved in lipogenesis of steers fed different intakes of CP and RUP to shorten the feeding period.