

Association of wool growth with rumen function in sheep

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Sheep divergently selected for (F+) or against (F-) wool growth differ in efficiency of conversion of feed to wool. F+ sheep have a higher rumen microbial protein outflow and faster rumen kinetics than F- animals. Our hypothesis was that the differences in rumen function observed in F+ and F- sheep exist in animals with different estimated breeding values (EBVs) for clean fleece weight.



- Eighteen 33-month-old wethers (57.2 kg) were fed (oaten/lucerne chaff).
- Two wool genotypes (low and high).
- The average clean fleece weight EBVs for the low and high wool genotypes were 3.4% and 25.9%, respectively.
- Two levels of intake (1.0 × and 1.5 × maintenance energy requirement, MEm)
- Two seven-week periods in a crossover design.



Effect of wool genotype and level of intake

	Wool genotype		Level of intake	
	Low	High	1.0*MEm	1.5*MEm
Liveweight gain (g/d)	38	41	5 ^b	74 ^a
Clean wool growth (µg/d/cm ²)	791 ^b	946 ^a	722 ^b	1015 ^a
Wool fibre diameter (µ)	17.2	17.3	16.6 ^b	18.0 ^a
Dry matter digestibility (%)	61.5	61.4	62.7 ^a	60.2 ^b
Rumen pH	6.4	6.4	6.4	6.4
Rumen ammonia (µg/mL)	217	222	236 ^a	203 ^b
Microbial protein outflow (g/d)	64.6	59.5	46.3 ^b	77.8 ^a
Microbial protein yield (g/kgDM)	60.7	55.2	54.4 ^b	61.5 ^a
Volatile fatty acids (mmol/L)	82.9	84.4	83.6	83.8
Methane production (g/d)	31.6	32.3	28.3 ^b	35.6 ^a
Methane yield (g/kgDM)	20.3	20.8	22.0 ^a	19.2 ^b
Reticulo-rumen volume (cm ³)	7447	7712	7310 ^b	7849 ^a

^{ab}Means within rows and factors (wool genotype and level of intake) with differing letters are significantly different (P < 0.05). There where no interaction between the evaluated factors.

1. There were no differences in fermentation and digestion patterns between genotypes within the same level of intake. Clean wool growth was the only trait affected by wool genotype.

2. Higher dry matter intake was associated with lower dry matter digestibility, rumen ammonia concentration and methane yield but greater levels of microbial protein outflow and yield, reticulo-rumen volume, methane production, wool growth and liveweight gain.

Implications:

- Different genetic selection approaches (e.g. single vs. multi trait) for wool growth may have diverse consequences on feed digestion and fermentation.
- Increases in the level of intake could enhance microbial protein supply to the host, reduce methane yield and increase liveweight gain and wool growth, indicating that level of intake could be used as a tool for modifying rumen function.