

Digestibility of the same diet in cattle and sheep

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The question is posed of the applicability to cattle feeding, of digestibility data obtained with sheep. An experiment is described where the same high concentrate diet was fed at three levels, equalised per kg body mass between species. In energy and crude fibre cattle showed consistently lower digestibilities than sheep. The difference is probably due to longer rumen retention time in sheep.

Die vraag word gestel of verteerbaarheidsgegewens wat met skape verkry is in beesvoeding toegepas kan word. 'n Proef word beskryf waarin dieselfde hoëkragvoerdiëet op drie voedingspeile wat op 'n per kg liggaamsmassabasis tussen spesies gelyk gestel is aan beeste en skape gevoer is. Beeste het deurlopend energie en vesel swakker verteer as skape. Die verskil word toegeskryf aan die waarskynlike langer rumenretensietyd by skape.

Keywords: Feed evaluation, digestibility, sheep, cattle

Introduction

In many laboratories, especially in Europe, sheep are used as 'instruments' for determining the digestibility of feeds and mixed diets. The most obvious reason for this is that sheep are smaller than cattle and hence costs are much lower. Blaxter and Wainman (1961) could find no significant differences between sheep and cattle in the digestion of different feeds over a range of levels. The exception was a diet of low protein content, where the protein was better digested by sheep than cattle. Schiemann, Jentsch and Wittenburg (1971) found that digestibility figures in cattle and sheep correlate well, an assumption that was also prevalent in the Netherlands for a number of years. Therefore it is no surprise that the new energy feeding system which was introduced in the Netherlands and other European countries in 1978, derives the ME-contents of feed from digestibility data obtained using sheep (Van Es, Vermorel and Bickel, 1978). On the other hand, in the USA, data on digestibility or metabolizability of feeds from sheep trials are not considered to be of great value for cattle (Moe, Tyrell and Flatt, 1974). There are indications that sheep ruminate more effectively

and therefore digest grain more efficiently than cattle, while cattle are more efficient in digesting long roughages. In their comprehensive overview of the subject Schneider and Flatt (1975) found published data with significant results to prove both similarities and differences.

If there is a difference in digestive capacity between cattle and sheep it could quite possibly be related to the difference in size of the reticulo-omasal orifice, through which digesta has to enter the lower digestive tract. In sheep it is so small that it is difficult for larger food particles to pass. The result is that these particles are regurgitated, resulting in a higher digestibility after rumination. This may be true of whole grains but it still leaves open the question of the relative digestibility of a finely-ground, high-grain, complete diet in cattle and sheep.

Materials and Methods

In a recent experiment the digestibility of such a diet containing 30% hay ground through a 6,25 mm screen and which analysed 145 g crude protein (CP), 124 g crude fibre (CF) and 18,7 MJ gross energy (GE) per kg DM, was determined with both steers and wethers fed at three comparable levels in terms of feed DM per kg body mass per day.

Both the wethers and the steers were penned individually and adapted to the experimental diet for a period of 28 days at an estimated maintenance level of feeding, followed by ten days at the appropriate experimental feeding level. The three levels tested were 11, 16 and 21 g per kg live body mass per day. Faeces were collected over a ten day period following the 38 day adaptation period (28 at maintenance plus 10 at experimental level). The sheep were fitted with harnesses and faeces bags. With steers faeces were quantitatively collected immediately they were voided on the concrete floor using the external marker chromic oxide to correct for recovery.

Results and Discussion

The apparent digestibility of the diet as fed at three levels to cattle and sheep is presented in Table 1. The apparent digestibility of CP corresponded fairly well in sheep and cattle with sheep showing slightly lower values except at the highest feeding level. In apparent digestion of GE, sheep showed consistently higher values than cattle at all levels. In apparent digestion of CF it was interesting to

Table 1 Apparent digestibility of energy, crude protein and crude fibre of the same diet fed at three levels to sheep and cattle

Feeding level (g/kg BW/d)		Digestibility (%)					
		Energy		Crude protein		Crude fibre	
Cattle	Sheep	Cattle	Sheep	Cattle	Sheep	Cattle	Sheep
11,3	11,2	70,1	78,8	86,8	81,8	37,3	59,8
16,9	16,7	69,0	78,2	83,9	81,6	45,2	57,7
21,3	21,0	65,8	74,3	75,1	76,6	49,4	50,1

note that sheep showed considerably higher values than cattle at the two lower feeding levels, while at the highest level digestibility of CF was almost equal in the two species. Another noticeable aspect of CF digestion was that in cattle the apparent digestibility increased with increasing level of feeding, while with sheep it declined, as was expected.

If the ME-content of the diet is estimated for the two species at each level of feeding, the values in Table 2 are obtained (ME calculated as $DE \times 0,81$). These data indicate a consistent 10% difference between cattle and sheep.

Table 2 ME concentration of the diet in cattle and sheep fed at three levels

Feeding level (g/kg BW/d)	ME (MJ/kg DM)		Cattle/Sheep × 100
	Cattle	Sheep	
11	10,9	11,9	91,6
16	10,7	11,8	90,7
21	10,2	11,2	91,1

One of the unanswered questions is whether these feeding levels were, in effect, comparable in the two species although the intakes were equal on a per kg live body mass basis. However, since sheep have a significantly lower maintenance energy requirement than cattle (Blaxter, 1962) a difference in relative feeding level cannot be responsible for the difference in energy digestibility found between cattle and sheep in this experiment, because the

sheep should then have shown lower values.

The conceptual framework for understanding food intake and relative digestive capacities of ruminants, has changed over the past years. Much more light has been cast on fermentation rate and rumen retention time of ingesta. The fact that the reticulo-omasal orifice is physically smaller in sheep than in cattle, would lead to a longer retention time in sheep than in cattle. Therefore, sheep are able to digest the slowly fermented CF more efficiently than cattle as shown in Table 1. This effect would decrease as feeding level increased as shown, and thus rate of passage would be increased and retention time decreased with a consequent reduction in CF digestibility. This explains the above finding that the sheep obtained more ME from the diet at each feeding level despite intakes which were equal on a per kg live body mass basis.

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