

Balch C C & Campling R C. Regulation of voluntary food intake in ruminants.
Nutr. Abstr. Rev. 32:669-86, 1962.
[National Institute for Research in Dairying, Shinfield, Reading, England]

High intake is an advantage for ruminants. This review considered special features of intake regulation in ruminants in relation to the products of digestion, wide composition of diets, and need to ruminate. Intake of coarse feeds appeared to be related to gut fill, and intake of concentrates to metabolic factors. [The SCI® indicates that this paper has been cited in over 175 publications since 1962.]

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"In the last 45 years, much has been learned about the fascinating digestive strategy of ruminants and of the modifications in metabolic economy that have been necessary to enable them to become such highly successful herbivores in nature and in agriculture.

"This paper, a review, drew attention to the crucial importance of intake in setting the upper limit to animal production in many extensive and intensive husbandry systems. Theories about mechanisms governing intake regulation, which were summarised, had been based largely on simple-stomached animals and man; interest was centred mainly on preventing overeating and obesity. By drawing on a wide range of observations in ruminants and nonruminants, it was possible to show that, in the domesticated ruminants in particular, intake regulation must be considered in a new light. Here a high intake is an advantage to the individual or the strain. Animal improvement is much concerned with seeking animals with high settings in the intake regulating mechanism. The argument was then developed that the peculiarities of ruminant me-

tabolism necessitate modifications to the previously accepted models of intake regulation.

"The review might have proved less useful if we had not been able to discuss a series of recent experiments in our laboratory. The main characteristics of these were the use of very simple techniques and small numbers of animals, each experiment establishing a single point. For example, the importance of rumen fill was investigated by means of water-filled balloons and the addition or removal of digesta at fixed times in relation to feeding. The work was advanced by adopting a once-daily feeding routine and allowing cows to eat until they lay down or began to ruminate. Behaviour was deduced from simple balloon recordings from the reticulum and jaw. These simple experiments eliminated many of the interactions besetting interpretation of earlier results.

"We find it interesting that this paper has been highly cited. The invitation to write this comment enables us to make two points. First, while the review dealt in a fairly comprehensive manner with intake regulation in ruminants, it also had to touch on a number of related topics in a more superficial manner. If this approach has helped readers appreciate the complexity of the problem, we should be grateful to the editors who allowed us to take a broader view than has perhaps been attempted in the several more recent reviews of intake regulation.¹ Finally, we cannot resist the temptation to point out with relish that the review format can provide the opportunity to argue and speculate more widely than is nowadays possible in the discussion sections of research papers. Although in assessment of research achievements little weight is often given to review articles, the citation of this one appears to suggest that they can play a useful part in the development of concepts over a 20-year period.

"Since 1962, Clive Balch has moved increasingly into research administration but has been pleased to see study of intake become a more central feature of ruminant research programmes in England and worldwide. Robert Campling has moved to Wye College of London University and has continued studies in which research on intake has been a central feature. We have prepared this in collaboration."

1. Dulphy J P, Remond B & Thieriez M. Ingestive behavior and related activities in ruminants. (Ruckebusch Y & Thivend P, eds.) *Digestive physiology and metabolism in ruminants*. Lancaster, PA: MTP Press, 1980. p. 103-22.