

Garrett W N, Meyer J H & Lofgreen G P. The comparative energy requirements of sheep and cattle for maintenance and gain. *J. Anim. Sci.* 18:528-47, 1959.
[Animal Husbandry Dept., Univ. California, Davis, CA]

Energy retention, as fat and protein, associated with an increase in weight of growing sheep and cattle was the critical measure of response to different levels of energy intake. Mathematical expressions were derived which described and compared energy requirements in quantitative terms. [The SC]⁹ indicates that this paper has been cited in over 170 publications, making it one of the three most-cited papers published in this journal.]

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January 24, 1984

"During the very early 1950s, while completing the requirements for an MS degree in animal science at Pennsylvania State University, I enrolled in two courses given by Swift and French at the Institute of Animal Nutrition (home of the famous Armsby Animal Calorimeter). These courses (concerned, for the most part, with whole animal bioenergetics and the techniques of calorimetry) sparked my interest in energy metabolism.

"A research assistantship from the University of California, Davis (location of Kleiber and his large animal calorimeter), allowed me to continue graduate study. I was assigned, however, to work with two assistant professors rather than Kleiber. (Kleiber's research emphasis had shifted to using isotopes to study various aspects of animal metabolism.)

"The research which resulted in this paper was part of my PhD program carried out under the direction of the asso-

ciate authors, J.H. Meyer and G.P. Lofgreen. The research, as originally conceived, was to use serially determined body water as the index to changes in body composition during growth. Energy retention could then be estimated as described by Reid *et al.*¹ Antipyrine had been used by Kraybill *et al.*² and others to estimate body water in large mammals. We did not find the antipyrine technique appropriate for our purposes due, in most part, to variability caused by the fluctuating size of the gut water pool. An alternate procedure (an adaptation of the century-old comparative slaughter and analysis technique³) using carcass density as the key to estimate body composition and energy retention proved an adequate substitute with groups of similar animals.

"There are probably four reasons for the popularity of this paper. Beginning in the middle to late 1950s, a renewed interest in energy metabolism arose in several countries. This paper used a unique adaptation of existing knowledge and techniques to obtain (with groups of animals housed under practical husbandry conditions) information similar to that from calorimetry investigations. The animals' energy requirements were factorialized so that maintenance and growth requirements could be estimated separately. Finally, the quantitative relationships established which related energy requirements to different measures of feed value were precise enough for many practical on-farm uses and led to the establishment of a new system of feed evaluation for ruminants. A recent review concerned with developments in nutritional energetics of ruminants over the last 25 years has been published."⁴

1. Reid J T, Wellington G H & Dunn H D. Some relationships among the major chemical components of the bovine body and their application to nutritional investigations. *J. Dairy Sci.* 38:1344-59, 1955. (Cited 95 times since 1955.)
2. Kraybill H F, Hankins O G & Blitter H L. Body composition in cattle. I. Estimation of body fat from measurement *in vivo* of body water by use of antipyrine. *J. Appl. Physiol.* 3:681-9, 1951.
3. Lawes J B & Gilbert J H. On the composition of oxen, sheep, and pigs, and of their increase whilst fattening. *J. Roy. Agr. Soc. Engl.* 21:433-88, 1860.
4. Garrett W N & Johnson D E. Nutritional energetics of ruminants. *J. Anim. Sci.* 57(Suppl. 2):478-97, 1983.