Development and Analysis of a Rumen Tissue Sampling Procedure. By Lesmeister et al., page 1336. Rumen development varies throughout the rumen of young calves.

Previous studies using tissue sampling procedures have differed in sample location, making comparisons of results between studies difficult at best. The results indicate that measurements of papillae length, papillae width, and rumen wall thickness are effective morphological measurements for determining the extent of rumen development. In addition, tissue samples obtained from the caudal and cranial ventral and dorsal rumen sacs effectively represent rumen development. Finally, the data indicate a minimum of 3 calves per treatment, 12 tissue samples per calf, and 24 morphological measurements per calf are effective for determining different levels of rumen development between treatments.