

Effects of Birth Weight and Postnatal Nutrition on Neonatal Sheep: I. Body Growth and Composition, and Some Aspects of Energetic Efficiency^{1,2,3}

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ABSTRACT: We investigated the effects of birth weight and postnatal nutrition on growth characteristics of neonatal lambs. Low- and high-birth-weight male lambs were individually reared on a high-quality liquid diet to grow rapidly (ad libitum access to feed) or slowly (ADG 150 g) to various weights up to 20 kg live weight (LW). Average daily gain tended to be greater in the high- (mean \pm SE 345 \pm 14 g) than in the low- (329 \pm 15 g) birth-weight lambs given ad libitum access to feed owing to slower growth by the small newborns during the immediate postpartum period. At birth, on a weight-specific basis, small newborns contained 6.4% less nitrogen and tended to have more ash (8.9%) than the high-birth-weight newborns. Daily rates of fat, ash, and GE accretion were greater, and nitrogen accretion tended to be greater in the rapidly grown large newborns than in their small counterparts. At any given empty body

weight (EBW) during rearing, low-birth-weight lambs contained more fat and less ash, resulting in slowly and rapidly grown small newborns containing 39.3 and 42.7 Mcal GE, respectively, at completion of the study (17.5 kg EBW), compared with 34.8 and 40.5 Mcal in their large counterparts. The differences in fatness and energy content between the birth weight categories are attributed to energy requirements for maintenance that were approximately 30% lower, coupled with higher relative intakes in the low-birth-weight lambs, during the early postnatal period. At this time, the ability to consume nutrients in excess of lean tissue growth requirements was apparently more pronounced in small than in large newborns, which resulted in lower efficiency of energy utilization for tissue deposition. Furthermore, body composition differences between the slowly and rapidly reared lambs support the notion of a priority of lean tissue over fat when nutrient supply is limited.

Key Words: Lambs, Nutrition, Growth, Body Composition

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Introduction

The effects that maternal nutrition (Everitt, 1968) and litter size (Fahmy, 1996) have on birth weight, and that birth weight has on subsequent growth during rearing by the dam (Fahmy, 1996), have been

demonstrated in sheep. However, few experiments have investigated the effects of prenatal nutritional restriction as a consequence of reduced maternal nutrition or the effects of insufficient placental mass that may occur in large litters (Rhind et al., 1980; McDonald et al., 1981), on the growth of lambs during artificial rearing.

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