ABSTRACTS PRESENTED AT SYMPOSIUM ON INTAKE BY FEEDLOT CATTLE

1. Modeling effects of nutrition on visceral organ mass. D.E Billings and R.D. Sainz. University of California, Davis 95616

Individual tissue growth patterns are set by their specific inherent cellularity characteristics. The smaller cells of the visceral organs are indicative of high metabolic function and are associated with an increased bioenergetic demand relative to other tissue types. Estimates of total body heat production from visceral tissues range from 30-50%. Therefore, visceral tissues have a major influence upon whole body energy expenditures, composition, and feed efficiency. Mathematical models of growth must represent all tissue types to accurately predict carcass and whole-body responses to level of nutrition. Mechanistic models address tissue growth based upon cell numbers (i.e. DNA content) and cell size (i.e. protein DNA). The relationship between protein accretion, rate constants (k) for DNA synthesis, and availability of glucose, amino acids, VFA's, anabolic hormone, and NDF were examined in four tissue pools (carcass, gastrointestinal tract (GIT), other viscera and remaining tissues). This was done by comparing outputs of a mechanistic model of lamb growth and metabolism (Sainz and Wolff, 1990) with the effects of diet (alfalfa or alfalfa/barley pellets) and intake (from 1.5 M to *ad libitum*; Sainz et al., 1990). Statistical analyses of simulation results indicated that anabolic hormone (Ahav, based upon glucose status) best accounted for observed effects of diet and intake on carcass growth patterns, but that substantial residual errors remain. On the other hand, visceral growth patters were best accounted for by inclusion of ME intake as a regulator for DNA synthesis. Synthesis of remainder DNA was insensitive to any of the treatments examined, and was unaffected by the drivers mentioned above. Finally, synthesis of GIT DNA showed dramatic responses to diet and intake, but the drivers examined were unable to fit the observed patterns. This may be due to inadequacies in the data or in some other component of the model (e.g. regulation of protein synthesis an degradation). While all of the modeling results presented here require validation against actual DNA and protein data, preliminary conclusions may be drawn. Among these, the primary conclusion is that the factors controlling turnover and accretion of carcass and GIT tissues are poorly understood at present. Given the importance of these tissues to the overall energy economy of the animal, elucidation of these mechanisms must receive a high priority.

Sainz, R.D. and Wolff, J.E. 1990. *Animal Production* 51, 535-549.
Sainz, R.D., Wolff, J.E. and Upsdell, M.P. 1990. *Animal Production* 50, 129-139.