Skeletal Muscle Metabolism in Hypokinetic Rats

NAGW-227 (July 1981 - October 1985);
NAG2-384 (November 1985 - December 1993)

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FINAL TECHNICAL REPORT

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This grant focused on the mechanisms of metabolic changes associated with unweighting atrophy and reduced growth of hind limb muscles of juvenile rats. Metabolic studies included a number of different areas. Amino acid metabolic studies placed particular emphasis on glutamine and branched-chain amino acid metabolism. These studies were an outgrowth of understanding stress effects and the role of glucocorticoids in these animals. Investigations on protein metabolism were largely concerned with selective loss of myofibrillar proteins and the role of muscle proteolysis. These investigations lead to finding important differences from denervation and atrophy and to define the roles of cytosolic versus lysosomal proteolysis in these atrophy models. A major outgrowth of these studies was demonstrating an ability to prevent atrophy of the unweighted muscle for at least 24 hours. A large amount of work concentrated on carbohydrate metabolism and its regulation by insulin and catecholamines. Measurements focused on glucose transport, glycogen metabolism, and glucose oxidation. The grant was used to develop an important new in situ approach for studying protein metabolism, glucose transport, and hormonal effects which involves intramuscular injection of various agents for up to 24 hours. Another important consequence of this project was the development and flight of Physiological-Anatomical Rodent Experiment-1 (PARE-1), which was launched aboard space shuttle Discovery in September 1991.

Detailed descriptions of these many studies can be found in the 30 peer-reviewed publications, 15 non-reviewed publications, 4 reviews and 33 abstracts (total 82 publications) which were or are scheduled to be published as a result of this project. These publications grouped by area (i.e. amino acid metabolism, protein metabolism, carbohydrate metabolism, and space flight studies) are found on the following pages in chronological order.
Amino Acid Metabolism


Protein Metabolism


Space Flight Studies


Reviews


