Energy Metabolism of Human Muscle

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Energy Metabolism of
Human Muscle

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Translated by J. S. Skinner, Montreal
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Translator’s Note
During recent years many articles published in American and British journals have not referred to similar work reported in German journals; this is also partially the case with German authors. Not only were the German articles not cited, but in several instances research done previously in Germany was repeated by scientists who were perhaps unaware of the publication. Thus, when I had the opportunity to translate this book, I considered it fortunate that I could learn more about research in this field done in Europe, as well as hopefully provide a service to those who will read this English edition. I appreciate the help and confidence that Dr. Keul and his coworkers have given me during this past year.

J. S. Skinner

Foreword to the First German Edition

In 1964, our investigation ‘Über den Stoffwechsel des menschlichen Skelettmuskels’, which makes up an important part of this book was awarded the Carl Diem Prize. The description of the energy transfer in skeletal muscle, which was then stimulated by the Board of Trustees of the Carl Diem Foundation, was only later realized since it was necessary to expand and substantiate portions of the findings in this area of investigation. Thus, it seemed meaningful to us to include investigations on the human heart and skeletal muscle under conditions of an oxygen deficiency.

The investigation and evaluation of the influence of physical activity, training, hypoxia, etc., on the heart and skeletal muscle without biochemistry, measurements is no longer conceivable. It cannot be the task of this book to closely examine all of the metabolic processes in the muscle cell. Instead, it is to discuss the transfer of energy in skeletal muscle, especially in regard to its functional importance. We are aware of the risk that through an incomplete description of the various areas of muscle metabolism only a fragment of the knowledge will be available. However, the fact that we have set a narrow goal to examine the relationships between energy supply and the functional performance of human skeletal muscle has yielded a uniform result. Thus, primarily those findings and investigations which have importance for the evaluation of the metabolism in human skeletal muscle have been considered.

Special attention has been given to those changes in skeletal muscle metabolism which occur under the influence of physical work. During single bouts of work, as well as during repeated exercise (training), certain metabolic phenomena are visible and the range of adaptation of skeletal muscle is evident. At this time we can only outline these individual mechanisms.
responsible for adaptation in the muscle cell which make possible an increased range of performance in skeletal muscle. A number of scientists and laboratories have intensely concerned themselves with this problem and it is to be expected that essential new findings will be forthcoming in the near future which offer further insight into the regulatory processes in muscle metabolism.

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We are very obliged to Prof. Dr. H. Reindell for his understanding and continued support for our investigations. We wish to thank Prof. Dr. H. Holzer for the opportunity to work for some time at the Biochemical Institute in Freiburg, and Prof. Dr. I. Witt and Prof. Dr. A. W. Holldorf for their valuable suggestions and support. We would also like to thank the Deutscher Sportbund, and especially its president, Mr. Willi Daume, for their magnificent support of our research and for the printing of this book. We are very grateful to the Deutsche Forschungsgemeinschaft, which has given our work unlimited support and without their help it would not have been possible for us to construct and supply our laboratories in Freiburg. The numerous personal investigations reported in this book were only possible with the cooperation of our research group, namely Drs. Adolf, Erichsen, Eschenbruch, Gammelin, Heise, Homburger, Kern, Mäckler, Maiwald, Merz, Schwärzer, and Singer, as well as technical assistants Brechtel, Fleer and Henrich and the secretaries Justh and Scheibel. Finally, we also wish to thank Dr. G. Haralambie, biochemist, for his collaboration in the writing of several chapters and for the stimulating discussions.

Freiburg im Breisgau
Summer, 1969

J. Keul
E. Doll
D.Keppler

Foreword to the English Edition

Due to the fact that no comprehensive summary on the energy metabolism of the human skeletal muscle existed in English, there were numerous requests for such an edition. For this reason it was decided to translate the German edition which appeared under the title ‘Muskellostoffwechsel’. This English edition has been expanded by adding more recent research
findings from other authors, as well as from our own investigations. In addition, we have received and incorporated many helpful suggestions which we hope will improve the presentation of facts in several chapters. Dr. James S. Skinner’s presence for one year in our medical department in Freiburg, presented us with an excellent opportunity resulting in a rapid and well-translated work. We would like to express our gratitude to Dr. Skinner for his cooperation in this effort.

We hope that those involved in this area of research will find this English edition to be of interest and value.

Freiburg im Breisgau
Spring 1972

J. Keul
E. Doll
D. Keppler