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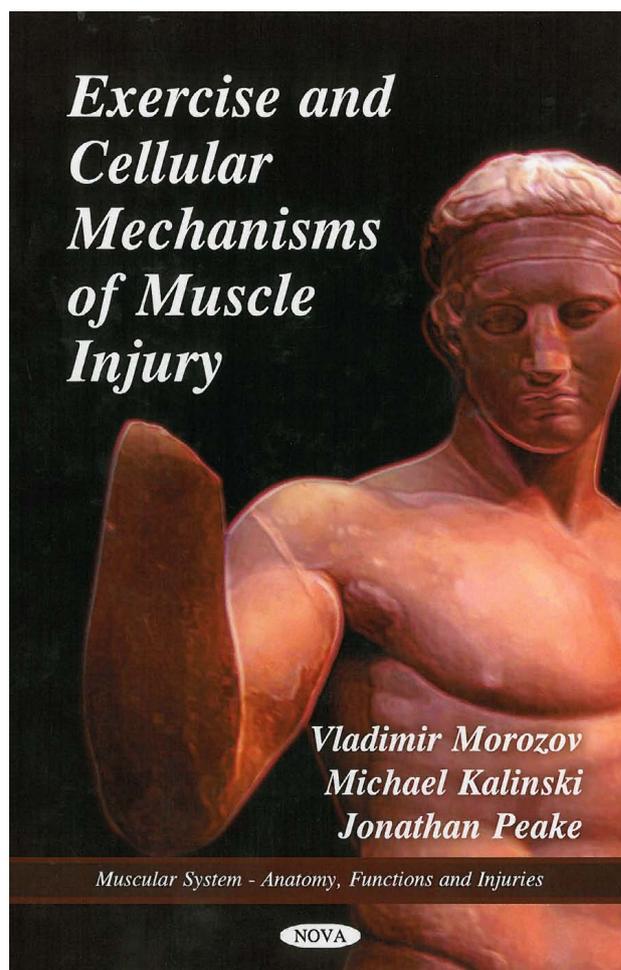
VLADIMIR I. MOROZOV, MICHAEL I. KALINSKI, JONATHAN PEAKE “EXERCISE AND CELLULAR MECHANISMS OF MUSCLE INJURY”*

The field of muscle physiology is “going cellular”, and today muscle physiologists and biochemists have unprecedented capacity to investigate some of the outstanding questions in the muscle damage field. The recent “marriage” between cellular and molecular biology is beginning to flourish. With this approach to addressing muscle physiological questions, the field offers an ability to characterize the cellular physiology of skeletal muscle, as well as the cellular pathology of muscle disease. Although we are still in the early years of cellular muscle physiology research, we are beginning to harvest the fruits of this field as we come to understand muscle damage at its very core. Yet, we have just begun to tap the surface and the very near future holds many exciting new developments in muscle damage research.

The general aim of this book is to provide a comprehensive summary of the characteristics of exercise-induced muscle damage and the mechanisms of tissue inflammation. Authors have presented a large amount of their own original data and have summarized the research of others.

This book is organized into six chapters. Topics are explored throughout each chapter via reviews of research, figures, tables, and illustrations. The information is easily accessible to a wide range of readers. The introductions and summaries reinforce the theme of each chapter.

Chapter 1 adequately covers the original data from animal studies in authors’ laboratory and findings from other researchers regarding changes in the circulating concentrations of myocellular proteins following exercise. It describes that strenuous physical exercise, may cause muscle injury and results in rupture of sarcolemmal membrane and cause muscle proteins (such as CK and Mb) leakage into the bloodstream. Author’s data demonstrate that the degree of skeletal muscle injury and the magnitude of increased skeletal muscle proteins in the plasma depend on the intensity and the duration of the exercise. This chapter also established that following exercise, the leakage



of proteins into the plasma is substantially lower in trained subjects compared with untrained subjects. A decrease in the concentration of circulating muscle proteins is evidence of either resistance or adaptation to exercise-induced injury. Chapter 2 discusses changes in blood supply to tissue as a potential mechanism of muscle injury, with a focus of ischemia/reperfusion and preconditioning. It shows that as a result of intense exercise, muscle tissue hypoxia may contribute to muscle injury. Chapter 3 considers the calpain family of proteolytic enzymes, and its role in muscle injury, ischemia/reperfusion and muscle atrophy. Muscle

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contraction and ischemia-reperfusion can activate calpain; however, the extent and time course of calpain activation may depend on influx of extracellular Ca^{2+} . Calpain may attract phagocytic cells, such as neutrophils, to the site of muscle injury. This chapter describes the increasing evidence that calpain activation in muscle does not always induce muscle damage *per se*, but may actually represent a response to initial muscle damage that is necessary for muscle repair and regeneration. Chapter also discusses whether calpain is involved in the adaptation of skeletal muscle to repeated bouts of muscle damaging exercise. It also provides clear evidence that calpain is implicated in muscular dystrophy and cachexia, whereas its role in sarcopenia awaits further investigation. Chapter 4 addresses the effects of exercise on circulating leukocytes and details alterations in leukocyte function following exercise in both animals and humans. Chapter 5 deals with the role of neutrophils in exercise-induced muscle damage. Injurious exercise causes neutrophils and macrophages to accumulate in skeletal muscle at the sites of muscle injury. Authors presented a wealth of own experimental data to show that the direction of exercise-induced changes in leukocytes in trained rats is similar in untrained animals, but the magnitude of changes is different. At rest plasma myeloperoxidase (MPO) concentration is elevated in trained animals, whereas MPO concentration per neutrophil is significantly lower in trained rats compared with untrained rats. The lower MPO concentration per neutrophil suggests that neutrophil degranulation increases in trained animals as a result of the intense training program. Single bouts of intense exercise suppress neutrophil phagocytosis and oxidative burst. Taking all of these data into account, authors suggested that an increase in the spontaneous degranulation of neutrophils in trained animals is more likely. The observed increased degranulation of neutrophils in trained animals as a result of very intense training may suppress

other neutrophil functions such as phagocytosis and oxidative burst. Authors hypothesized that alterations in blood leukocyte and MPO status of trained animals at rest may represent adaptive response to intense exercise training. Presented information provides the foundation for understanding how neutrophils could influence the events associated with muscle injury. Because the authors are well versed in this field, studying the effects of exercise on leukocytes and neutrophils and contributed to the published literature, these chapters are particularly loaded with substantial amount of their own data and evidently represent the strength of the book. Topics discussed in Chapter 6 include oxidative stress in blood and muscle following exercise, and adaptations in oxidative stress that occur with training.

The clarity of organization, the depth of thought, and the overall tone of the book are excellent. The authors have been able to achieve their goals in an easy-to-follow format. Well presented up to date commendable account of the characteristics of exercise-induced muscle damage, biochemical and physiological responses to damage and the mechanisms of tissue inflammation. Authors also have summarized the research of others. With the expansion of knowledge and growing interest in the area of cellular mechanisms of muscle injury in recent years this book is necessary.

This book should be in the library of those, who need to get understanding with how exercise mode and training status affect skeletal muscles. It will be helpful to students interested in basic physiological and immunological factors in skeletal muscle damage. This volume is also suitable for those who do research on the cellular mechanisms of muscle injury. Physiotherapists and occupational therapists may find this book useful. The book is written at an intermediate-to-advanced level and researchers in this field will find it abundantly useful. This book makes an important contribution to the field of cellular mechanisms of muscle injury.

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