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K. Punkt

Fibre Types in Skeletal Muscles

With 43 Figures and 6 Tables



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*Dedicated to my children,
Anita and Torsten*

Preface

Worldwide, numerous textbooks and publications have dealt with research on muscle fibres carried out under different points of view. In addition, comprehensive works such as *Myology* (Engel and Franzini-Armstrong 1994), *Disorders of Voluntary Muscle* (Walton et al. 1994), and *Skeletal Muscle* (Schmalbruch 1985) as a volume of the work *Handbook of Microscopic Anatomy*, have been published. Moreover, proceedings from myology symposiums give us access to the present state of the art in muscle research. The book *The Dynamic State of Muscle Fibres* (Pette 1990a) summarizes the contributions to the symposium of the same name, which was held in Constance in 1989.

Considering these outstanding works one has to ask the question: Why do we need the present book?

The first reason is that results from ongoing research expand scientific knowledge continuously. When dealing with muscle research one soon realizes that muscle tissue is a fascinating subject, whose secrets have not yet been revealed completely. The application of new techniques in muscle fibre research enables and provokes us to go deeper into the nature of muscle tissue. The results are findings that add a new dimension to what is already known. For instance, the detailed metabolic characterization of muscle fibre types in the context of an intact histological section has been performed only recently using cytophotometrical quantification of enzyme activities.

The second reason for this book is of a more pragmatic nature. In my opinion, researchers, physicians, and students who are interested but not specialized in myology will be pleased to have a concise summary of our present knowledge on muscle fibres. After all, 109 pages are read more quickly than thousands!

The present book aims at characterizing fibre types of skeletal muscles from different current points of view. For this purpose results from our own research have been compared to and combined with the results found in the literature. A main emphasis of this review is put on fibre typing by quantitative enzyme histochemistry as well as the adaptability of defined fibre types to altered physiological and pathological conditions. We

show that the fibre metabolism is very flexible under changing conditions. This impressively demonstrates the plasticity of muscle fibres.

I am very grateful to Professor Schiebler who encouraged me to write this review of the current knowledge on skeletal muscle fibres. If this book can offer the reader a general overview about the properties of the different fibre types, and if it perhaps inspires the reader to further work on muscles, then it will have served its purpose.

Leipzig, November 2001

K. PUNKT

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Abbreviations

AB	Antibody
ATP	Adenosine triphosphate
ATPase	Adenosine triphosphatase
EDL muscle	Extensor digitorum longus muscle
EGb	Extract Ginkgo biloba
EOM	Extraocular muscle
FF	Fast-twitch-fatiguable
FG	Fast-glycolytic
FOG	Fast-oxidative glycolytic
FR	Fast-twitch-fatigue-resistant
GAST muscle	Gastrocnemius muscle
GPDH	Glycerol-3-phosphate dehydrogenase
HMM	Heavy meromyosin
IgG	Immunoglobulin G
LDH	Lactate dehydrogenase
LMM	Light meromyosin
MDF	Myogenic determination factor
MHC	Myosin heavy chain
NBT	Nitro blue tetrazolium
NOS	Nitric oxide synthase
PKC	Protein kinase-C
RNA, mRNA	Ribonucleic acid, messenger RNA
S	Slow-twitch
SDH	Succinate dehydrogenase
SO	Slow-oxidative
SOL muscle	Soleus muscle
SR	Sarcoplasmic reticulum
STZ	Streptozotocin
TnT	Troponin T
VAST muscle	Vastus lateralis muscle