

## Editorial on special issue “lifestyle and ageing in muscle disease”

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Published online: 27 July 2012  
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### Introduction

We live in the era of Lifestyle diseases, i.e. conditions that are caused by our modern bad habits (such as tobacco use, lack of exercise, bad diet and alcohol misuse). As reported by the BBC, quoting World Health Organization (WHO) figures and statements, “Lifestyle-related diseases are now the leading cause of death worldwide, killing 36 million people a year” (BBC 2011). We also live in an ageing modern world. For example, in the European region, according to the WHO, the proportion of the population aged over 65 years will increase from 14 % in 2010 to 25 % in 2050 (WHO 2012).

A variety of disease states, or ‘just’ healthy ageing, are essentially associated with an altered metabolic and contractile behaviour of the musculature. This is because these chronic conditions and ageing affect contractile protein structure/function, expression levels, and/or prevailing intracellular conditions, and thus they essentially modify muscle function. Hence, research that helps us to understand how muscles work and which can ultimately help towards maintaining/restoring muscle function can have a pervasive beneficial impact for society.

### How do lifestyle and ageing link to muscle disease?

Some ‘lifestyle’ diseases are clearly associated with directly or indirectly damaging the myocardium and/or smooth muscle (e.g. hypertension, heart failure, smoking induced respiratory problems etc.). However, ranging from fat infiltration to atrophy/sarcopenia, skeletal muscle also ‘suffers’ from our modern habits.

There are still many unanswered questions in our understanding of skeletal muscle’s performance. In the present special issue, Rassier (2012) reviews evidence concerning the mechanisms of stretch-induced force enhancement in skeletal muscle. Rassier explains the approaches taken by his group and others to study the behaviour of sarcomeres in series in a myofibril, with an emphasis on single sarcomeres isolated for mechanical testing, a novel approach championed by his group. Evidently our understanding of the nature of the force–length relationship and the stretch-induced force enhancement is still not complete and further research is warranted in this area.

Exercise is accepted as an important means to preserve muscle mass and confer long term health benefits. Unaccustomed exercise (as in the case of a previously sedentary person being advised to exercise) may result to muscle damage with subsequent negative sensations and functional changes followed however by a multitude of short and long term benefits. In this issue, Philippou et al. (2012) examine human skeletal muscle function after eccentric exercise. Using an elbow flexors model, their findings do not support a dependence of the rate of force development and of isotonic function on the observed rightward shift of the angle–force relationship; thus, extending the discussion on which factors possibly contribute to an impaired isotonic performance after eccentric exercise. Again on the subject

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of muscle damage, van de Vyver and Myburgh (2012) examine the relationship between pro-inflammatory cytokine release and satellite cell proliferation following whole body exercise (downhill running). Apart from the complexity of this relationship the article shows that the biopsy procedure commonly used in human studies is not confounding the results—an important methodological finding. The same group (Macaluso and Myburgh 2012) reviews the mechanisms of satellite cell renewal in skeletal muscle in response to acute and chronic exercise. As satellite cells are a type of adult stem cells, the authors make an interesting case on how chronic exercise could promote the growth factors and mitogens affecting the adult stem cell pool in other organs as well. Could this explain the ‘rejuvenating’ effect of exercise? Further research is needed to prove the proposed new concept.

Other lifestyle issues such as smoking can also have an important impact on muscle homeostasis. Smoking is a habit that poses grave risks on health by increasing morbidity and mortality. While western societies have increasingly sought ways to address smoking addiction and prevent smoking, it is a sad truth that in both developed and under development countries smoking is still widely prevalent. In this issue the Reznick group (Rom et al. 2012) reviews the available evidence that link cigarette smoke components to muscle catabolism and thus to the ‘hastening’ of the development of sarcopenia. The authors discuss direct and indirect (systemic) effects of cigarette smoke on skeletal muscle anabolic/catabolic processes and energy expenditure and highlight the largely unrecognised detrimental effects of cigarette smoking on skeletal muscle and subsequently to overall health.

In contrast to skeletal muscle, smooth muscle may not immediately come to mind as a prime target for ageing research. While much has been reported on women’s fertility problems with advanced age, the Wray group (Arrowsmith et al. 2012) reports on another aspect of ageing in women, i.e. how myometrial function may be affected as women age. The article includes novel data in pregnant and non-pregnant myometrium and discusses also future directions in “uterotonics” research.

The special issue closes with an article on muscle and motility research “transfer” to wider applications. Månsson (2012) offers the reader a concise review on principles and recent developments behind ‘motor-driven’ devices, discusses current obstacles in translational actomyosin research and gives us a flavour of future applications in rapid diagnostics and elsewhere (biocomputation and nanomechanics).

## Conclusion

This special issue was created in response to the burgeoning research in muscle either presented or discussed within the ESMR’s meetings which directly or indirectly links lifestyle and ageing to muscle disease.

The contributors of this special issue will present their work in the oncoming 41st European Muscle Conference (Sept 1–5 2012, Rhodes, Greece). We hope that this issue will help generate a fruitful discussion on issues that span from the bench to application of muscle research by bringing together reports from diverse scientific groups. Efficient communication amongst muscle scientists and effective dissemination from scientists to the society is necessary if as a research community we are to progress from strength to strength and remain in the ‘radar’ of funding bodies and research councils. This diversity shouldn’t be viewed as an impediment but as an asset of the muscle research community. After all, by studying how muscles work we study the essence of life!

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