

MUSCLE FIBER TYPOLOGIES IN ELITE CYCLING DISCIPLINES

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Introduction. Classical muscle biopsy studies demonstrated that elite endurance athletes exhibit a more slow muscle typology, while elite athletes who excel in explosive disciplines, have a predominant fast muscle typology¹. Muscle carnosine quantification by proton magnetic resonance spectroscopy (¹H-MRS) was developed as a non-invasive alternative to estimate muscle typology. The validity of this technique was initially demonstrated in track-and-field, where muscle carnosine levels in elite athletes gradually decrease with increasing running distance². In cycling, solid data on muscle typology are scarce and therefore the aim of this study was to compare muscle carnosine levels between elite cyclists excelling in different disciplines. **Methods.** The muscle carnosine content of 61 male and 23 female elite cyclists (37 track riders, 4 BMX riders, 23 road cyclists, 11 mountain bikers and 9 cyclo-crossers) was measured in the soleus and gastrocnemius medialis muscle by ¹H-MRS on a 3T whole body MRI scanner (Siemens Trio - Belgium; Philips Medical Systems - Australia). Based on the UCI points and the rider profiles on ProCyclingStats, the track riders were further divided into “track-sprint athletes” (n=9) and “track endurance riders” (n= 28) and the road riders were split up into “one day racers” (n=14), general classification riders” (n=7) and “time-trial specialists” (n=2). Z-scores of muscle carnosine were calculated for each cyclist relative to a reference population with same age and sex. One-way anova and independent samples t-tests were used to compare the carnosine levels between the different cycling disciplines. **Results.** Looking at the 5 main disciplines, BMX riders (Z= 1.47; range: 0.79 to 2.43) are characterized by higher carnosine levels compared to the other disciplines which is indicative for a fast muscle typology. Mountain bikers (Z= -0.99; range: -1.94 to -0.06), road riders (Z= -1.00; range: -2.22 to 0.61) and cyclo-crossers (Z= -0.81; range: -1.45 to -0.10) exhibit significantly (p <0.001) lower carnosine levels suggesting a slow muscle typology. Track riders (Z= 0.11; range: -1.41 to 3.62) also dispose of higher carnosine levels compared to mountain bikers (p=0.028) and road riders (p<0.001). As we observed broad carnosine ranges in the track and road riders, we further divided these riders into specific disciplines with different characteristics. Track-sprinters show a significant faster muscle typology (Z= 1.40; range: 0.55 to 3.62) compared to track endurance riders (Z= -0.31; range: -1.41 to 1.11) (p<0.001). Where, one day road racers (Z= -0.79; range: -1.94 to 0.61) (p=0.043) and time-trial specialists (Z= -0.06; range: -0.43 to 0.41) (p=0.031) demonstrate higher carnosine levels compared to general classification riders (Z= -1.67; range: -2.22 to -0.96). **Conclusion.** Prominent differences in muscle carnosine levels exist between elite cyclists of various disciplines, in line with their respective functional demands. The non-invasive character and the high intra-individual stability of the technique open opportunities for application in transfer and talent orientation in cycling.

References. ¹Gollnick, P. (1972). *J. Appl. Physiol*, 33, 312–319; ²Baguet, A. (2011). *PLoS One*, 6, 1–6.