Characterizing the expression of Muscle Ankyrin Repeat Proteins at rest and in response to high intensity power resistance exercise in trained human muscle

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Muscle-Ankyrin Repeat Proteins (MARPs) are a family of homologous mechanosensing proteins involved in the sensing and signaling of stress through their interaction with giant sarcomeric protein, titin (N2A region). Two members of the MARP family include CARP/Ankrd 1 and Ankrd 2. Results from cell biology experiments and animal models suggest that MARPs have divergent roles in skeletal muscle, responding to stress (injury/strain) by strengthening their interaction with titin (CARP/Ankrd 1) or moving to the nucleus to affect gene expression (Ankrd 2). Previously, I presented results from a study showing mRNA upregulation of one of the MARPs (CARP/Ankrd 1) in skeletal muscle collected from the vastus lateralis of resistance-trained males, three hours after performing each of three experimental trials: 1) no exercise and no meal (No Ex. + No Meal, resting trial), 2) bout of high intensity power resistance exercise (Ex. Only), 3) bout of exercise and post-exercise meal (Ex. + Meal) (Wette *et al.*, 2012).

This study has been continued here and protein analyses undertaken. Percutaneous needle biopsy samples were obtained muscle using local anesthetic (2% Xylocaine) under each of the conditions described above, Ex Only, Ex + Meal, No Ex + No Meal (n = 7).

Compared to the resting trial (No Ex. + No Meal), there was no change in the abundance of CARP and Ankrd 2 proteins in whole muscle homogenates after either power resistance exercise (Ex. Only) or feeding (Ex. + Meal) (Table 1). Work is continuing with these same samples, examining the relative quantification of the MARPs protein abundances in muscle samples following crude fractionation into cytosolic, membranous/nuclear and cytoskeletal subcellular compartments. Importantly, there is no discarding of sample during sample preparation and so the relative proportion of the MARPs in the compartments can be ascertained. Preliminary results support a divergent function of MARPs in skeletal muscle based on their cellular localization. CARP (structural function) is present mainly in the cytoskeletal fraction at rest and following the exercise bout, indicating that CARP does not move from titin whilst most of the Ankrd 2 (regulatory function) pool is found in the cytosolic and membranous fractions.

This study shows that MARPs do not change abundances following exercise and feeding utilized in the current study, but it is likely that they differentially translocate to cellular compartments. The findings provide novel knowledge about the *in vivo* regulation of MARPs and their likely function during remodeling processes that occur as a consequence of high intensity resistance exercise.

	Ex + No Meal	Ex + Meal	No Ex + No Meal
CARP	0.91 (0.21)	1.26 (0.21)	0.96 (0.15)
Ankrd 2	1.17 (0.15)	1.23 (0.17)	1.10 (0.09)

Table 1: *Total protein expression of CARP and Ankrd 2 in whole muscle homogenate from trained individuals (*n *= 7) after power resistance exercise (Ex Only) and feeding (Ex + Meal). Data are expressed as mean (SEM) fold-changes relative to the No Ex + No Meal trial. A one-way ANOVA with repeated measures on experimental trial (No Ex No Meal* vs *Ex + Meal and Ex + No Meal) were used to analyze the effects of the exercise and feeding on MARP total protein expression. CARP and Ankrd 2 mean fold for Ex + Meal and Ex + No meal were not significantly different from No Ex + No Meal trial (*p *> 0.05).*

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