The effect of age and taurine supplementation on glycogen associated protein abundance in *mdx* mice: A comparison between 28 and 70 d *mdx* mice, a model of Duchenne muscular dystrophy

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Previously we identified that taurine supplementation (Tau) favourably increased contractile force characteristics and muscle architecture in 28 d, but not 70 d old *mdx* mice (Barker *et al.*, 2013). We also observed significant differences in calcium handling protein abundance (DHPR, SERCA1 and CSQ1) in *mdx* mice with age between control and Tau groups (Barker et al 2013). The *mdx* mouse undergoes a peak damage period between 21-28 d. Beyond this time the mouse experiences a reduction in pathology severity with age, to the point where damage is chronic yet stable (70 d). It has recently been shown that glycogen and various relevant proteins were upregulated in 16 w *mdx* compared with WT mice (Stapleton et al 2014). We hypothesized the 28 d *mdx* mouse experiences increased metabolic demands due constant bouts of muscle degeneration and regeneration when compared to the 70 d *mdx* mouse, and this would be alleviated with Tau. To test this, we extended our previous work to investigate whether age or Tau influence glycogen or its associated proteins in *mdx* and C57BL/10ScSn (WT) mice.

WT (n=4) and *mdx* mice at 28 d and 70 d, with (n=6) or without Tau (*mdx* only, n=6), were euthanized by cardiac excision following Nembutal overdose post experimentation in a study approved by the La Trobe University Animal Ethics Committee. The *extensor digitorum longus* (EDL) muscle was excised and analysed for abundance of glycogen synthase (GS), glycogen phosphorylase (GP), glycogen branching enzyme (GBE), glycogen debranching enzyme (GDE) and glycogenin proteins by quantitative western blotting using Criterion Stain Free gels.

Compared with WT mice, we found no difference in glycogen related protein abundance in both 28 and 70 d *mdx* groups, or as a consequence of Tau (Table). These findings suggest that during the acute phase of muscle degeneration and regeneration at 28 d, glycogen does not play a major role in supplying a greater ATP yield to the regenerating muscle. Based on these findings, investigation into the mitochondrial proteins may provide a greater scope into this obviously complex relationship as a future direction.

Table. Glycogen associated protein abundance in 28 and 70 d WT, mdx *and* mdx *Tau mice. The density obtained for each protein is expressed relative to density of total protein and expressed relative to the average of 28 d WT mice. Number of mice indicated (n), mean ± SD,* $P<0.05$*, 1-way ANOVA with Dunn's multiple comparisons test between relevant groups.*

	28 d			70 d		
	WT	**mdx**	**mdx Tau**	**WT**	**mdx**	**mdx Tau**
GS	1 ± 0.3	1.9 ± 1	2.3 ± 1.4	3 ± 1.4	3.5 ± 1.7	1.2 ± 0.9
GP	1 ± 0.2	0.6 ± 0.4	0.6 ± 0.4	0.8 ± 0.6	0.8 ± 0.3	0.8 ± 0.4
GBE	1 ± 0.2	0.9 ± 0.2	1 ± 0.3	0.9 ± 0.2	0.9 ± 0.1	0.7 ± 0.3
GDE	1 ± 0.2	0.8 ± 0.3	0.9 ± 0.4	0.7 ± 0.4	0.7 ± 0.2	1 ± 0.2
Glycogenin	1 ± 0.6	1.5 ± 0.8	2.3 ± 1.4	1.8 ± 0.7	2.3 ± 0.9	1.6 ± 0.3

Barker RG, van der Poel C, Murphy RM, Horvath D. (2013). Taurine supplementation can improve *tibialis anterior* force production and muscle architecture: A comparison between the 28 and 70 day old *mdx* mouse model of Duchenne muscular dystrophy. *Proc Aust Physiol Soc* **44**, 56P.

Stapleton DI, Lau X, Flores M, Trieu J, Gehrig SM, Chee A, Naim T, Lynch GS & Koopman R. (2014). Dysfunctional muscle and liver glycogen metabolism in *mdx* dystrophic mice. *PloS one* **9**, e91514. doi: 10.1371/journal.pone.0091514