Age related changes in mass contractile properties and eccentric contraction damage of fast- and slow-twitch mouse muscles

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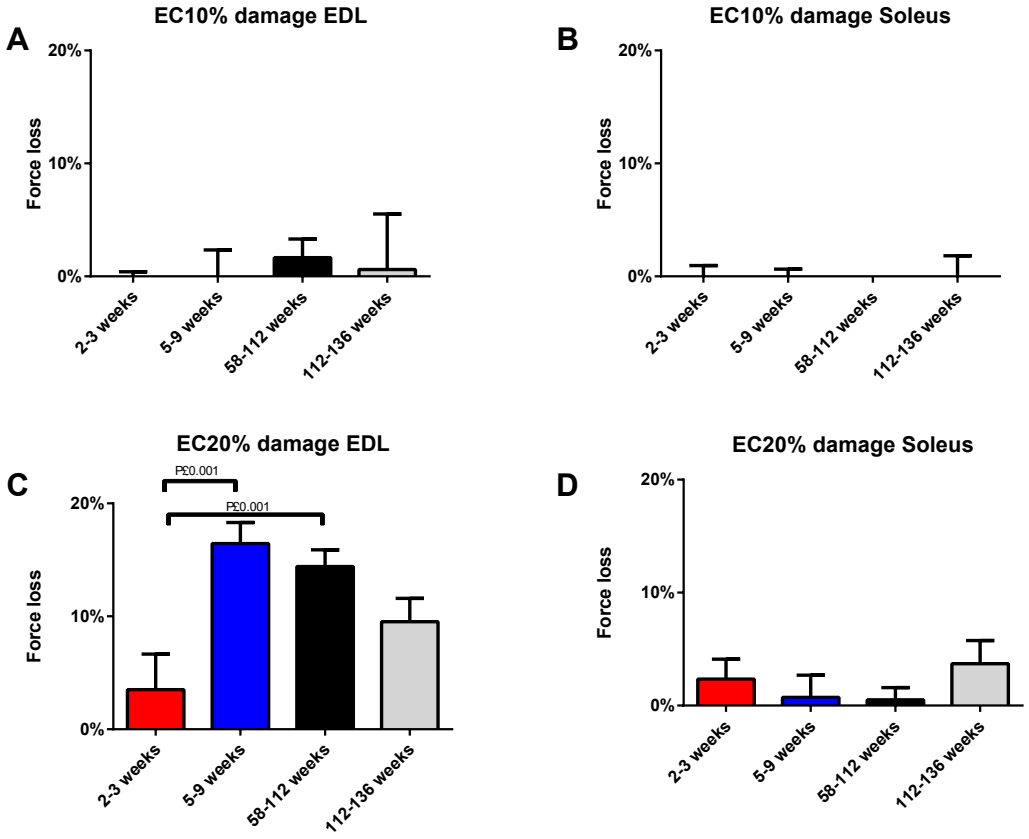
As we age our muscles undergo progressive changes, primarily involving loss of muscle mass and strength. This ageing atrophy, termed sarcopenia, seems to be due to a reduction in both number and size of muscle fibres. Studies indicate that sarcopenia mainly involves type 2 muscle fibres (Evans & Lexell, 1995) but evidence in support of this from old animals is limited.

Our present study investigates the effects of ageing on muscle mass, contractile kinetics and force loss as a consequence of eccentric contractions of 10% and 20% >Lo. We used fast-twitch *extensor digitorum longus* (EDL) and slow-twitch *soleus* muscles from C57BL6 mice of four age groups 2-3, 5-9, 58-112 and 113-136 weeks old. Mice were killed with an overdose of isoflurane (UNSW animal ethics approval 11/140B). Muscles were dissected out and attached to a force recording rig (Aurora Scientific) at room temperature.

We confirm the earlier findings of Brooks & Faulkner (1988) that a significant loss of muscle mass with age in mice occurs around 104 to 130 weeks in both fast- and slow-twitch muscles. In line with this decrease in mass there was a significant drop in twitch and tetanic force (max). The 10% eccentric stretch protocol produced no significant differences in Po for any age group in both fast- and slow-twitch muscles (see figure). During the 20% eccentric stretch all fast-twitch muscles experienced force loss to some degree; surprisingly mice 5-9 weeks lost the most amount of force (panel C). Slow-twitch muscles were resilient to eccentric damage at all ages (panels B & D).



The isolated muscle procedure used here removes any CNS effects enabling us to differentiate between responses due to neural factors and those which are myogenic. We employed eccentric contraction protocols to test muscle fragility. Surprisingly, age did not increase susceptibility to damage in our oldest group of mice. Possibly the older muscles were protected by a fibre type shift and lower maximal force.

Evans WJ, Lexell J (1995). Human aging, muscle mass, and fibre type composition. *J Gerontol A Biol Sci Med Sci* **50**, 11–6.

Brooks SV, Faulkner JA (1988). Contractile properties of skeletal muscles from young, adult and aged mice. *J Physiol* **404**, 71–82.