

# Rapid Serial Sarcomere Loss Caused by Electrical Stimulation in Rabbit *Triceps Surae* Muscles

Maria Yamamoto, Tim Leonard, Walter Herzog

*University of Calgary (2500 University Dr. NW, Calgary, Alberta, Canada T2N 1N4)*

Muscle spasms, such as those observed in cerebral palsy patients, are involuntary muscle contractions that usually occur due to a lesion in the brain. These muscle spasms cause muscles to become hypoextensible, or very stiff. This hypoextensibility may be explained by a decrease in serial sarcomere number concomitant with a long stimulation period. In 1981, Tabary and Tardieu showed a 25% decrease in the number of serial sarcomeres in guinea pig Soleus muscles over a 12 hour stimulation period. As these results seem very extreme, it was necessary to try duplicating these results in our laboratory, as well as in a different animal model. The Medial Gastrocnemius, Plantaris, and Soleus muscles were stimulated via the tibial nerve in New Zealand White rabbits (n=3) for 10 hours in one of the legs (20 Hz at 3 times the  $\alpha$  motoneuron threshold). The tibial nerve in the contralateral control leg was transected to ensure no cross-over training effects. After the stimulation period, the animals were sacrificed and the hind limbs were then placed in a 10% formalin solution at carefully controlled knee and ankle angles. Three to five samples were harvested from each muscle. After a digestion process, individual fascicles were teased out and mounted on prepared slides. These slides were then analyzed for fascicle length by using a camera system with specialized software and sarcomere lengths were determined using a laser diffraction method. Analysis showed that the serial sarcomere number decreased in the Medial Gastrocnemius by  $23 \pm 4.4\%$ , in the Plantaris by  $25 \pm 2.9\%$ , and the Soleus by  $29 \pm 7.0\%$ . These numbers concur closely with the 25% loss of serial sarcomeres reported by Tabary and Tardieu in guinea pigs. These confirmed results will allow for more research to be done in this area.

## References

1. Tabary, J., Tardieu, C., Tardieu, G., Tabary, C., "Experimental Rapid Sarcomere Loss with Concomitant Hypoextensibility", *Muscle & Nerve*, Issue 4, 1981, pp. 198-203.