In vivo bioimaging to elucidate sex-dependent differences in skeletal muscle function

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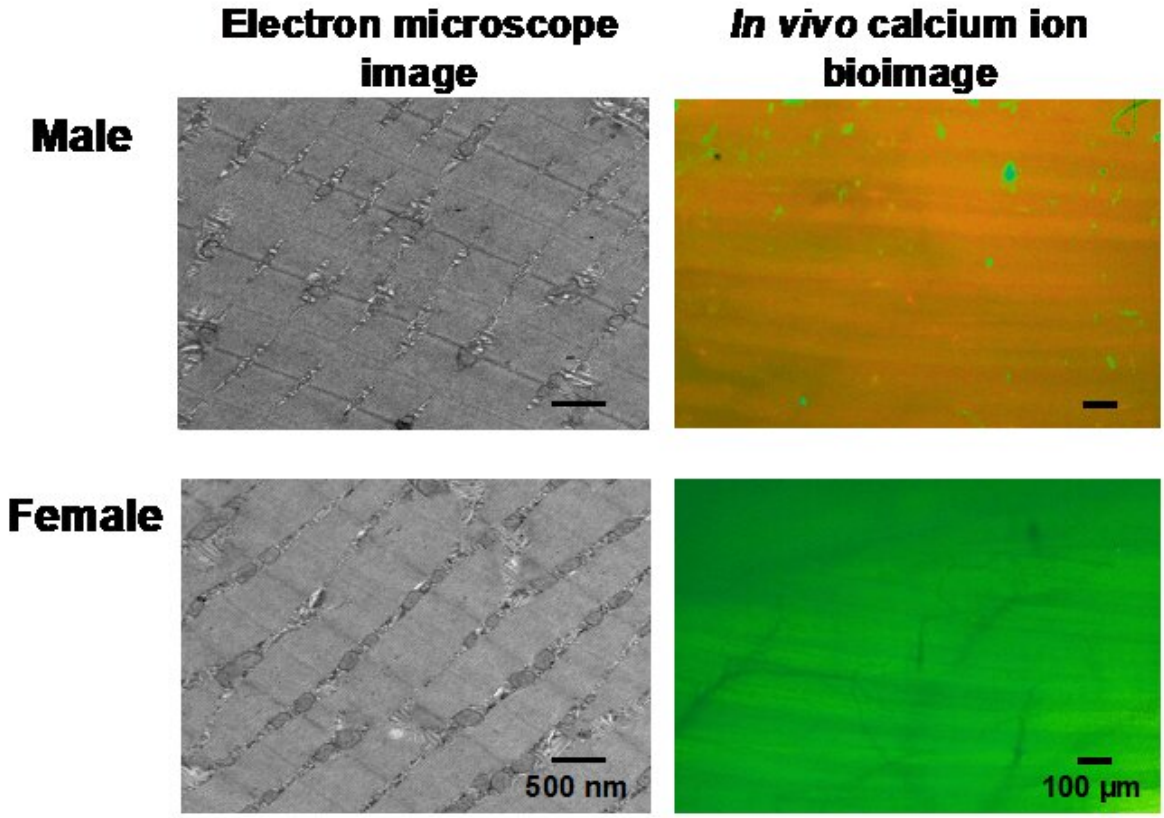

Left: Sex-dependent difference in ultrastructure of intermyofibrillar mitochondria. Right: Effects of Ca2+ uptake inhibition of sarcoplasmic reticulum (SR). The red color area has high Ca2+ concentration (Male). Green color indicates low Ca2+ area (Female). These images show the difference in mitochondrial Ca2+ buffering capacity. Credit: University of Electro Communications

It is widely accepted that there is a sex-dependent difference in physical performance. Specifically, it has been shown that females show superior fatigue resistance compared to males.

However, the relationship between sex differences in skeletal muscle function and mitochondrial ability—known as fatigue resistance—is still not clear.

Now, Yutaka Kano and colleagues at the University of Electro Communications and Kansas State University focused on calcium ion (Ca_2^+) dynamics that regulate muscle contraction and mitochondrial function.

Using in vivo bioimaging system for experimental animal models, they measured changes in cytoplasmic Ca_2^+ concentration after Ca_2^+ uptake inhibition of sarcoplasmic reticulum (SR) in male and female mice.

The results suggest that (a) mitochondrial Ca_2^+ uptake ability is greater in female than male myocytes; and (b) this superior Ca_2^+ uptake ability of female myocytes is due, partly, to the higher intermyofibrillar mitochondrial content.

If this observation is true for human muscles, as well as helping to explain sex-specific exercise adaptations this observation may also open the way for the development of new therapeutic strategies for patient populations characterized by muscle dysfunction and exercise intolerance.

More information: Daiki Watanabe et al. Sex differences in mitochondrial Ca2+ handling in mouse fast-twitch skeletal muscle in vivo, *Journal of Applied Physiology* (2020). DOI: 10.1152/japplphysiol.00230.2019

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