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Saturated fatty acids lead to mitochondrial dysfunction and insulin resistance

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Excessive levels of certain saturated fatty acids cause mitochondria to fragment, leading to insulin resistance in skeletal muscle, a precursor of type 2 diabetes, according to a paper in the January issue of the journal *Molecular and Cellular Biology*. This is the first time mitochondrial fragmentation has been implicated in insulin resistance, says corresponding author Yau-Sheng Tsai, of the College of Medicine, National Cheng Kung University, Taiwan, Republic of China.

Mitochondria are the intracellular machines that turn sugar into energy, and skeletal muscle is packed with them. Normally, cells respond to insulin, a hormone, by importing glucose from the bloodstream. Type 2 diabetes is characterized by insulin resistance, a cellular impairment in glucose uptake.

The new research offers an explanation for this phenomenon. “Disruption of mitochondrial dynamics may underlie the pathogenesis of muscle insulin resistance in obesity and type 2 diabetes,” says Tsai. That explanation suggests a hypothetical treatment. “Manipulating mitochondrial morphology may provide a novel therapeutic strategy for insulin resistance and type 2 diabetes,” says Tsai. In the study, the research showed that inhibiting mitochondrial fission in mouse models reduced the insulin resistance, he says.

The study also supports previous research suggesting that reducing saturated fats in the diet would reduce insulin resistance, says Tsai. “It has been well documented that saturated fatty acids can lead to insulin

resistance in humans and rodents." Palmitate, a particularly harmful saturated fatty acid, "is very abundant in lard, butter, and margarine," says Tsai.

"Most studies of mitochondria and diabetes have focused on mitochondrial quantity, and they all agree that increasing mitochondrial biogenesis does help mitochondrial function and cellular metabolism," says Tsai. "Our study showed that maintaining the balance of mitochondrial dynamics is also important for mitochondria to maintain normal function."

More information: H.-F. Jheng, et al., 2012. Mitochonrial fission contributes to mitochondrial dysfunction and insulin resistance in skeletal muscle. *Mol. Cell. Biol*. 32:309-319

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