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Version 1

🌐 Adipose depot innervation: whole mount staining, imaging, quantification V.1

DOI

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Kristy Townsend¹, Jake Willows²

¹Ohio State University; ²Ohio State University, Columbus

Townsend Lab Neurobiology and Energy Balance

Tech. support phone: +12075812541 email: kristy.townsend@maine.edu



Kristy Townsend

Ohio State University, University of Maine

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Protocol status: Working

We use this protocol and it's working

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Keywords: white adipose tissue (WAT), adipose innervation, adipose neuropathy, aging, obesity, diabetes, metabolic health, exercise, cold, peripheral neuropathy, diabetic peripheral neuropathy, DPN, innervation of adipose tissue, related adipose neuropathy, crucial adipose tissue, adipose depot innervation, adipose tissue, mouse adipose tissue, adipose tissue neural plasticity with cold exposure, adipose organ, adipose, metabolic dysfunction, loss of proper innervation, loss of innervation, surgical denervation study, proper metabolic health, maintaining proper metabolic health, neural innervation, metabolic, neuropathy in muscle, exacerbate metabolic disease, various conditions of metabolic, loss of nerve fiber protein, metabolic control, communication between the master metabolic regulator, innervation, proper innervation, nerve fiber protein, peripheral nerve, neuropathy, metabolic control in condition, master metabolic regulator, pathophysiological condition, lower neurotrophic factor expression, pathological situa

Abstract

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The difficulty in obtaining as well as maintaining weight loss, together with the impairment of metabolic control in conditions like diabetes and cardiovascular disease, may represent pathological situations of inadequate neural communication between the brain and peripheral organs and tissues. Innervation of adipose tissues by peripheral nerves provides a means of communication between the master metabolic regulator in the brain (chiefly the hypothalamus), and energy-expendng and energy-storing cells in the body (primarily adipocytes). Although chemical and surgical denervation studies have clearly demonstrated how crucial adipose tissue neural innervation is for maintaining proper metabolic health, we have uncovered that adipose tissue becomes neuropathic (ie: reduction in neurites) in various conditions of metabolic dysregulation. Here, utilizing both human and mouse adipose tissues, we present evidence of adipose tissue neuropathy, or loss of proper innervation, under pathophysiological conditions such as obesity, diabetes, and aging, all of which are concomitant with insult to the adipose organ as well as metabolic dysfunction. Neuropathy is indicated by loss of nerve fiber protein expression, reduction in synaptic markers, and lower neurotrophic factor expression in adipose tissue. Aging-related adipose neuropathy particularly results in loss of innervation around the tissue vasculature, which cannot be reversed by exercise. Together with indications of neuropathy in muscle and bone, these findings underscore that peripheral neuropathy is not restricted to classic tissues like the skin of distal extremities, and that loss of innervation to adipose may trigger or exacerbate metabolic diseases. In addition, we have demonstrated stimulation of adipose tissue neural plasticity with cold exposure, which may ameliorate adipose neuropathy and be a potential therapeutic option to re-innervate adipose and restore metabolic health.

Attachments



[1 Whole Mount scWAT ...](#)

282KB



[2 Whole Mount Adipos...](#)

308KB



[3 Confocal Imaging o...](#)

222KB



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