



MENOPAUSE

INDICATIONS FOR THERAPEUTIC CARBOHYDRATE REDUCTION (TCR) TO SUPPORT METABOLIC HEALTH - STUDIES AND MECHANISMS
REFERENCE HANDOUT

As oestrogen/progesterone are insulin-sensitizing hormones, a reduction in these hormones can increase insulin resistance which may contribute to the metabolic dysregulation and symptoms of menopause. This section/handout includes studies that support potential benefits of a TCR approach to help manage areas of common concern during menopause, primarily as a means of reducing glycaemic variability and insulin resistance.



INSULIN RESISTANCE, WEIGHT GAIN AND CARDIOVASCULAR DISEASE

Therapeutic carbohydrate reduction is one way to combat [insulin resistance](#), [weight gain](#), and [inflammation](#) - risk factors for CVD. Insulin resistance also contributes to [platelet dysfunction and clotting risk](#).

Mozaffarian D, Rimm EB, Herrington DM. Dietary fats, carbohydrate, and progression of coronary atherosclerosis in postmenopausal women. Am J Clin Nutr. 2004;80(5):1175-1184. [doi:10.1093/ajcn/80.5.1175](https://doi.org/10.1093/ajcn/80.5.1175)

Blomquist C, Chorell E, Ryberg M, et al. Decreased lipogenesis-promoting factors in adipose tissue in postmenopausal women with overweight on a Paleolithic-type diet. Eur J Nutr. 2018;57(8):2877-2886. [doi:10.1007/s00394-017-1558-0](https://doi.org/10.1007/s00394-017-1558-0)

McPhee JC, Zinn C, Smith M. Exploring the acceptability of, and adherence to a carbohydrate-restricted diet as self-reported by women aged 40-55 years. J Holistic Performance NutritionTM. [doi: 10.26712/230120181](https://doi.org/10.26712/230120181) PDF



GLYCAEMIC VARIABILITY, INSULIN RESISTANCE AND HOT FLASHES

In addition to reducing [hyperinsulinaemia](#), a TCR approach reduces [glycaemic variability](#) - keeping blood sugars more stable and can successfully reduce [abdominal adiposity](#).

Dormire SL. The Potential Role of Glucose Transport Changes in Hot Flash Physiology: A Hypothesis. Biol Res Nurs. 2009;10(3):241-247. [doi:10.1177/1099800408324558](https://doi.org/10.1177/1099800408324558)

Dormire S, Howharn C. The Effect of Dietary Intake on Hot Flashes in Menopausal Women. J Obstet Gynecol Neonatal Nurs. 2007;36(3):255-262. [doi:10.1111/j.1552-6909.2007.00142.x](https://doi.org/10.1111/j.1552-6909.2007.00142.x)

Huang W-Y, Chang C-C, Chen D-R, Kor C-T, Chen T-Y, Wu H-M. Circulating leptin and adiponectin are associated with insulin resistance in healthy postmenopausal women with hot flashes. PLoS One. 2017;12(4). [doi:10.1371/journal.pone.0176430](https://doi.org/10.1371/journal.pone.0176430)

Thurston RC, Sowers MR, Sutton-Tyrrell K, et al. Abdominal adiposity and hot flashes among midlife women. Menopause. 2008;15(3):429-434.

[doi:10.1097/gme.0b013e31815879cf](https://doi.org/10.1097/gme.0b013e31815879cf)



SLEEP

Sleep has a bidirectional effect on metabolic health. Poor sleep patterns, such as [shift work](#), can increase insulin resistance and increase the risk of developing metabolic syndrome. Increasing insulin resistance via other mechanisms, like changes in hormones, can reduce melatonin ([inverse relationship](#)) and affect sleep.

Kravitz HM, Kazlauskaitė R, Joffe H. Sleep, Health, and Metabolism in Midlife Women and Menopause: Food for Thought. Obstet Gynecol Clin North Am. 2018;45(4):679-694. [doi:10.1016/j.ogc.2018.07.008](https://doi.org/10.1016/j.ogc.2018.07.008)

Gangwisch JE, Hale L, St-Onge M-P, et al. High glycemic index and glycemic load diets as risk factors for insomnia: analyses from the Women's Health Initiative. Am J Clin Nutr. 2020;111(2):429-439. [doi:10.1093/ajcn/nqz275](https://doi.org/10.1093/ajcn/nqz275)

Siegmann MJ, Athinarayanan SJ, Hallberg SJ, et al. Improvement in patient-reported sleep in type 2 diabetes and prediabetes participants receiving a continuous care intervention with nutritional ketosis. Sleep Medicine. 2019;55:92-99.

[doi:10.1016/j.sleep.2018.12.014](https://doi.org/10.1016/j.sleep.2018.12.014)



BRAIN GLUCOSE HYPOMETABOLISM & COGNITIVE DECLINE

'The peri-menopausal transition is a tipping point for female brain aging. From the metabolic perspective, the process begins with decline in glucose metabolism and increase in insulin resistance, followed by a compensatory mechanism to use fatty acids and ketone bodies as an auxiliary fuel source' [Wang et al](#)

TCR reduces brain insulin resistance and inflammation. If carbohydrate intake is sufficiently reduced ketone bodies can provide an alternative fuel source for the brain, further supporting cognitive function.

Cunnane SC, Trushina E, Morland C, et al. Brain energy rescue: an emerging therapeutic concept for neurodegenerative disorders of ageing. Nat Rev Drug Discov. 2020;19(9):609-633. [doi:10.1038/s41573-020-0072-x](https://doi.org/10.1038/s41573-020-0072-x)

Phillips MCL, Deprez LM, Mortimer GMN, et al. Randomized crossover trial of a modified ketogenic diet in Alzheimer's disease. *Alzheimer's Research & Therapy*. 2021;13(1):51. [doi:10.1186/s13195-021-00783-x](https://doi.org/10.1186/s13195-021-00783-x)



INSULIN RESISTANCE AND BONE TURNOVER

Diet quality affects [bone markers](#) and metabolic syndrome is associated with [reduced bone mineral density](#).

Hu T, Yao L, Bazzano L. Effects of a 12-month Low-Carbohydrate Diet vs. a Low-Fat Diet on Bone Mineral Density: A Randomized Controlled Trial. *The FASEB Journal*. 2016;30(S1):678.12-678.12. [doi:10.1096/fasebj.30.1_supplement.678.12](https://doi.org/10.1096/fasebj.30.1_supplement.678.12)

Campillo-Sánchez F, Usategui-Martín R, Ruiz -de Temiño Á, et al. Relationship between Insulin Resistance (HOMA-IR), Trabecular Bone Score (TBS), and Three-Dimensional Dual-Energy X-ray Absorptiometry (3D-DXA) in Non-Diabetic Postmenopausal Women. *Journal of Clinical Medicine*. 2020;9(6):1732. [doi:10.3390/jcm9061732](https://doi.org/10.3390/jcm9061732)



BREAST CANCER AND INSULIN RESISTANCE

Multiple factors contribute to increased risk of breast cancer - the presence of insulin resistance/metabolic syndrome is known to impact risk and prognosis.

Dong S, Wang Z, Shen K, Chen X. Metabolic Syndrome and Breast Cancer: Prevalence, Treatment Response, and Prognosis. *Front Oncol*. 2021;11. [doi:10.3389/fonc.2021.629666](https://doi.org/10.3389/fonc.2021.629666)

Individual responses to dietary composition can vary so appropriate medical monitoring is advised. Patients who are taking medication should consult with their doctor as the following [clinical guidelines](#) (Society of Metabolic Health Practitioners - Hite et al.) may need to be considered.

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