SM Journal of Biology ISSN: 2573-3710

Opinion Article

Are Xanthophylls Truly The Future Therapy For Obesity Management In Humans?

Mukundaswamy Chethankumar

JSS College of Arts, Commerce and Science, Postgraduate Department of Biochemistry, India

OPINION

Obesity is well-known as a chronic multifactorial disease with significant health impacts, showing-up metabolic disorders, cardiovascular disease, type 2 diabetes, certain cancers, weakened quality of life, and significant economic burden on health systems worldwide. Although, lifestyle change, pharmacotherapy, and surgery, which constitute a traditional therapeutic approach, and are effective but certainly limited by adherence, side effects, cost, and long-term sustainability in managing the obesity.

Advancing the understanding of obesity, xanthophylls, a class of oxygenated carotenoids abundant in plants, algae, and vegetables have arisen as promising natural agents with potential anti-obesity effects. But the question which knocks is do they truly represent the "future" of obesity therapy? With obesity being a multifactorial disorder. The scientific evidence available over a large database is exciting but variegated.

WHY XANTHOPHYLLS MATTER SO MUCH?

Xanthophylls are pigmented compounds (e.g., lutein, zeaxanthin, fucoxanthin, astaxanthin, beta-cryptoxanthin) found in many fruits, vegetables, and algae [1]. They are documented for powerful antioxidant and anti-inflammatory properties (which could mitigate oxidative stress and chronic inflammation, the central drivers of adipose tissue dysfunction), modulation of lipid metabolism (including regulation of transcription factors (e.g., PPARγ, SIRT1), enhanced lipid oxidation, and increased energy expenditure), and effects on cellular signaling pathways (that are increasingly recognized as important regulators of body weight and energy homeostasis [2]) that may traverse with obesity pathophysiology thus justifying focus on xanthophylls as candidates for obesity therapy.

IMPACT OF EVIDENCE FROM HUMAN STUDIES

Though a large portion of the work to date is preclinical (animal, cellular), several human studies hint at beneficial effects of xanthophyll supplementation. A randomized, double-blind, placebo-controlled trial found that daily intake of paprika xanthophylls (9 mg) for 12 weeks significantly reduced visceral and total abdominal fat, subcutaneous fat, and BMI compared with placebo in overweight volunteers. Total and LDL cholesterol also decreased, with no reported adverse effects [3]. In another study, a 16-week trial among obese premenopausal women (with non-alcoholic fatty liver disease), a formulation containing fucoxanthin combined with pomegranate seed oil led to statistically significant reductions in body weight, waist circumference, body fat, liver fat, triglycerides, and inflammatory markers, and even increased resting energy expenditure compared to placebo [4]. The above studies although limited in scale demonstrate that xanthophyll-based formulations can safely influence obesity-related parameters in humans.

Several Preclinical models provide further promising results, such as Fucoxanthin, which has been shown to induce uncoupling protein 1 (UCP1) expression in white adipose tissue, promoting lipid oxidation and thermogenesis, a desirable target for anti-obesity drugs [5]. Other xanthophylls (e.g., lutein, zeaxanthin, neoxanthin, beta-cryptoxanthin) have shown to reduce adipocyte differentiation and lipid accumulation in cell models by activating pathways linked to energy metabolism and adipocyte browning [6]. Studies on Carotenoids, including xanthophylls, have modulated the gut microbiome, which is increasingly implicated in obesity through effects on energy harvest, inflammation, and metabolic health [7]. Despite of large body of evidence on the positive effect of xanthophylls in the obesity management, it is premature to call xanthophylls the future of obesity therapy, for the reasons that, firstly, most human studies reported so far are small, short-term, or incorporate complex supplement combinations (e.g., fucoxanthin + pomegranate seed oil). There remains a lack of large, well-powered clinical studies isolating xanthophyll effects on hard clinical endpoints like sustained weight loss, metabolic outcomes, or morbidity/mortality. Secondly, Xanthophylls' absorption and metabolic fate vary greatly between individuals, influenced by factors like dietary fat, gut microbiota, and genetic differences, thus further complicating standardized dosing and effectiveness in diverse populations. Thirdly, even where benefits are shown, the magnitude of weight or fat reduction is generally modest compared to lifestyle or pharmacological interventions.

In my opinion, although Xanthophylls, with their antioxidant capacity, metabolic effects, and safety profile prove as promising candidates for adjunctive roles in obesity management, calling xanthophylls "the future" of obesity therapy overstates current evidence. They are likely to be part of a multifaceted strategy, potentially enhancing the dietary patterns rich in carotenoid-containing foods (e.g., leafy greens, sea vegetables, and colorful produce), supplement regimens targeting metabolic health and combined lifestyle and pharmacological treatments. Further, larger, rigorous human trials, dose-optimization research, and long-term safety data will determine whether xanthophylls can become promising adjuncts or not to clinically validated therapies.

Submitted: 29 January, 2026 | **Accepted:** 28 May, 2026 | **Published:** 29 May, 2026

***Corresponding author(s):** Mukundaswamy Chethankumar, Postgraduate Department of Biochemistry, JSS College of Arts, Commerce and Science (Autonomous), Ooty Road, Mysuru 570025, Karnataka, India, Tel: +91-8884345956

Citation: Chethankumar M, (2026) Are Xanthophylls Truly The Future Therapy For Obesity Management In Humans?. SM J Biol 9(1): 1028.

REFERENCES

1. Ojulari OV, Lee SG, Nam JO. Therapeutic Effect of Seaweed Derived Xanthophyl Carotenoid on Obesity Management; Overview of the Last Decade. Int J Mol Sci. 2020; 21: 2502.
2. Hashemi D, Fard MV, Mohammadhasani K, Barati M, Nattag h-Eshtivani E. Carotenoids Improve Obesity and Fatty Liver Disease via Gut Microbiota: A Narrative Review. Food Sci Nutr. 2025; 13: e70092.
3. Kakutani R, Hokari S, Nishino A, Ichihara T, Sugimoto K, Takaha T, et al. Effect of Oral Paprika Xanthophyll Intake on Abdominal Fat in Healthy Overweight Humans: A Randomized, Double-blind, Placebo-controlled Study. J Oleo Sci. 2018; 67: 1149-1162.
4. Abidov M, Ramazanov Z, Seifulla R, Grachev S. The effects of Xanthigen in the weight management of obese premenopausal women with non-alcoholic fatty liver disease and normal liver fat. Diabetes, Obesity & Metabolism. 2010; 12: 72-81.
5. Gammone MA, D'Orazio N. Anti-obesity activity of the marine carotenoid fucoxanthin. Mar Drugs. 2015; 13: 2196-2214.
6. Sekiya M, Suzuki S, Ushida Y, Suganuma H. Neoxanthin in young vegetable leaves prevents fat accumulation in differentiated adipocytes. Biosci Biotechnol Biochem. 2021; 85: 2145-2152.
7. Hashemi D, Fard MV, Mohammadhasani K, Barati M, Nattagh-Eshtivani E. Carotenoids Improve Obesity and Fatty Liver Disease via Gut Microbiota: A Narrative Review. Food Sci Nutr. 2025; 13: e70092.