Macedonian Pharmaceutical Bulletin, 72 (Suppl 1) 591 - 592 (2026)
Online ISSN: 1857-8969
DOI: 10.33320/maced.pharm.bull.2026.72.03.285
Short communication

Chromium picolinate and pancreatic endocrine function: current evidence and faps

Marko Bresliev, Kristina Shutevska Achevska, Zoran Zhivikj, Ana Marija Bajatovska, Tanja Petreska Ivanovska, Tatjana Kadifkova Panovska*

Faculty of Pharmacy, Ss. Cyril and Methodius University, Mother Tereza 47, 1000 Skopje, North Macedonia

Introduction

Chromium picolinate is a dietary supplement widely investigated for its potential effects on glucose metabolism and insulin sensitivity. Proposed mechanisms include modulation of insulin signaling, GLUT4 translocation, and peripheral glucose uptake (Georgaki et al., 2024; Hoffman et al., 2014). However, despite long-standing clinical and experimental interest, its therapeutic relevance and underlying mechanisms remain uncertain because findings vary across populations and study designs (Asbaghi et al., 2020; Georgaki et al., 2024). In particular, it remains unclear whether its reported metabolic effects involve direct modulation of pancreatic endocrine function or arise predominantly from peripheral insulin-sensitizing and redox-related actions. Examining this distinction may clarify an underexplored aspect of chromium picolinate's proposed role in glucose homeostasis.

Glycemic control

Chromium picolinate has been investigated as an insulin-sensitizing supplement, with some studies reporting improvements in fasting glucose, HbA1c, glucose tolerance, and insulin sensitivity, particularly in individuals with impaired glucose regulation or type 2 diabetes (Georgaki et al., 2024). Proposed explanations include enhanced insulin signaling and peripheral glucose uptake (Hoffman et al., 2014). However, evidence from systematic reviews and meta-analyses remains inconsistent, with outcomes influenced by baseline metabolic status, chromium formulation, dose, treatment duration, and study design (Asbaghi et al., 2020; Georgaki et al., 2024). These inconsistencies indicate that the metabolic effects of chromium picolinate are context-dependent and cannot be inferred from systemic glycemic outcomes alone.

Oxidative stress

Chromium supplementation has been associated with possible antioxidant and redox-modulating effects that may contribute to its metabolic actions beyond insulin signaling. In experimental diabetes, chromium picolinate improved glutathione status and antioxidant enzyme activities, including glutathione reductase, superoxide dismutase, and catalase, while attenuating lipid peroxidation (Sundaram et al., 2013). More recent in vivo chromium evidence suggests reduced pancreatic oxidative injury and β-cell apoptosis through modulation of the PI3K/Akt/Bcl-2 pathway (Xun et al., 2025). However, clinical findings remain inconsistent, with a meta-analysis showing increased glutathione but no significant overall effects on several other oxidative-stress biomarkers (Amini et al., 2023). Thus, redox regulation remains a

*taka@ff.ukim.edu.mk

plausible mechanism, although its relevant pancreatic cellular targets are insufficiently defined.

Pancreatic endocrine function

Pancreatic endocrine function is a potentially important but insufficiently defined component of chromium picolinate's metabolic actions. Although glucose homeostasis depends on coordinated pancreatic hormone secretion, most chromium studies have examined peripheral insulin sensitivity or whole-body glycemic outcomes rather than direct endocrine-cell responses. In diabetic animal models, chromium picolinate has been associated with preservation of pancreatic integrity and reduced β-cell injury, suggesting a possible protective effect (Huang et al., 2014; Xun et al., 2025). However, such in vivo findings cannot distinguish direct endocrine-cell actions from secondary effects of improved systemic metabolism. Current evidence is therefore stronger for systemic metabolic effects and pancreatic tissue protection than for direct modulation of endocrine-cell function or hormone secretion. Broader pancreatic endocrine mechanisms remain less characterized. Targeted mechanistic studies are needed to determine whether the pancreas represents a primary site of chromium picolinate action or responds secondarily to changes in the peripheral metabolic environment. Whether chromium picolinate directly influences pancreatic endocrine function, and whether redox-sensitive mechanisms are involved, remains an open question.

Conclusion

Chromium picolinate remains a metabolically relevant but mechanistically unresolved supplement. Although clinical and experimental findings suggest possible effects on insulin sensitivity, glycemic control, and redox balance, they do not establish whether pancreatic endocrine function is directly involved. Available in vivo evidence indicates potential pancreatic protection, but direct endocrine-cell actions and their relationship with redox-sensitive pathways remain insufficiently characterized. Clarifying these mechanisms may improve the interpretation of chromium picolinate's metabolic effects and help define its scientific and translational relevance.

References

Amini, M.R. et al., 2023. Effects of chromium on oxidative stress biomarkers: A meta-analysis. Int. J. Vitam. Nutr. Res. 93(3), 241–251. https://doi.org/10.1024/0300-9831/a000706

Asbaghi, O. et al., 2020. Effects of chromium supplementation on glycemic control in patients with type 2 diabetes: A systematic review and meta-analysis of randomized controlled trials. Pharmacol. Res. 161, 105098. https://doi.org/10.1016/j.phrs.2020.105098

Georgaki, M.N. et al., 2024. Chromium supplementation and type 2 diabetes mellitus: An extensive systematic review. Environ. Geochem. Health 46(12), 515. https://doi.org/10.1007/s10653-024-02297-5

Hoffman, N.J. et al., 2014. Chromium enhances insulin responsiveness via AMPK. J. Nutr. Biochem. 25(5), 565–572. https://doi.org/10.1016/j.jnutbio.2014.01.007

Huang, S. et al., 2014. The effect of chromium picolinate supplementation on the pancreas and macroangiopathy in type II diabetes mellitus rats. J. Diabetes Res. 2014, 717219. https://doi.org/10.1155/2014/717219

Sundaram, B. et al., 2013. Chromium picolinate attenuates hyperglycemia-induced oxidative stress in streptozotocin-induced diabetic rats. *J. Trace Elem. Med. Biol.* 27(2), 117–121. https://doi.org/10.1016/j.jtemb.2012.09.002

Xun, H. et al., 2025. Chromium mitigates the iron-induced glucose metabolism disorder via the PI3K/Akt/Bcl-2 signaling pathway: An in vivo study in Wistar rats. Biol. Trace Elem. Res. 204, 2954–2967. https://doi.org/10.1007/s12011-025-04867-9