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Dietary tyrosine intake, *HPD* rs10743187 polymorphism and colorectal cancer risk: a case-control study

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Abstract

Background: Colorectal cancer (CRC) is a leading malignancy worldwide, with diet as a recognized modifiable risk factor [1]. Tyrosine, a conditionally essential amino acid metabolized via the HPD enzyme pathway, may influence oxidative stress, immune modulation, and carcinogenesis-related signaling [2]. Epidemiological evidence linking dietary tyrosine to CRC risk remains scarce. This study investigated energy-adjusted dietary tyrosine intake and CRC risk, subsite-specific effects, and whether the *HPD* rs10743187 rs10743187 polymorphism modifies this association.

Methods: This hospital-based case-control study enrolled CRC patients and healthy controls from the Korean National Cancer Centre. Dietary tyrosine intake was assessed via a validated 106-item food frequency questionnaire and adjusted for total energy intake. Genotyping of *HPD* rs10743187 was performed using the Illumina MEGA-Expanded Array. Associations with CRC risk were evaluated via logistic regression, subgroup analyses, and gene–environment interaction tests.

Results: Cases had significantly lower energy-adjusted dietary tyrosine intake than controls (1,461.4 ± 252.9 vs. 1,568.4 ± 352.1 mg/day; $p < 0.001$), consistent across both sexes. In fully adjusted analyses, higher tyrosine intake was inversely associated with overall CRC risk in a dose-dependent manner: compared with Q1, the ORs (95% CI) for Q3 and Q4 were 0.70 (95% CI: 0.56–0.86) and 0.51 (95% CI: 0.40–0.64), respectively (p for trend < 0.001). The association was consistent in men (Q4: OR = 0.53, 95% CI: 0.39–0.70), women (Q4: OR = 0.41, 95% CI: 0.27–0.61), and across subsites: proximal colon (Q4: OR = 0.67, 95% CI: 0.48–0.94), distal colon (Q4: OR = 0.53, 95% CI: 0.38–0.75), and rectum (Q4: OR = 0.29, 95% CI: 0.19–0.43). The *HPD* rs10743187 polymorphism alone was not associated with CRC risk. However, a significant multiplicative interaction was detected in the overall population ($p = 0.04$) and in men ($p = 0.02$). Among AA genotype carriers, the protective effect was particularly pronounced (Q3 vs. Q1: OR = 0.49, 95% CI: 0.36–0.65), confirming that the *HPD* rs10743187 variant modifies the diet–CRC relationship.

Conclusion: Higher dietary tyrosine intake was consistently associated with reduced CRC risk across sexes and subsites, with the strongest protection observed for rectal cancer. The *HPD* rs10743187 polymorphism significantly modified this association, particularly in men, supporting a gene-diet interaction in CRC aetiology. These findings highlight the tyrosine metabolic pathway in CRC development and the potential for personalised dietary guidance based on genetic background. Prospective and mechanistic studies are warranted.

References

[1] Mo J, Luo J, Hendryx M. Food environment and colorectal cancer incidence and mortality rates. *J Hunger Environ Nutr*. 2021;17(3):397-408. doi:10.1080/19320248.2021.1893243.

[2] Chen Y, Wang C, Wu Y, Wang Y, Meng Y, Wu F, Zhang H, Cheng YY, Jiang X, Shi J, Li H, Zhao P, Wu J, Zheng B, Jin D, Bu W. Nutrient-delivery and metabolism reactivation therapy for melanoma. *Nat Nanotechnol*. 2024;19:1399-1408. doi:10.1038/s41565-024-01716-z.

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