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**Use of curcumin and its nanopreparations in the treatment of inflammatory bowel disease**

Meng ZW *et al*. Application of CUR nanopreparations in IBD

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**Abstract**

Inflammatory bowel disease (IBD) is a nonspecific inflammatory disease of the intestine that includes Crohn’s disease and ulcerative colitis. Because IBD is difficult to heal and easily relapses, it could worsen patient quality of life and increase economic burdens. Curcumin (CUR) is a bioactive component derived from the rhizome of turmeric (Curcuma longa). Many basic and clinical studies have shown that CUR can efficiently treat IBD by decreasing the activity of proinflammatory cytokines by communicating with transcription factors and signaling molecules. However, due to the limitations of being almost insoluble in aqueous solutions and having low oral bioavailability, it is important to select appropriate pharmaceutical preparations.

**Key Words:** Curcumin; Inflammatory bowel disease; Bioavailability; Nanotherapeutics;

Nuclear factor-κB pathway; C-Jun amino-terminal kinases; Extracellular-signal-regulated kinases; Stress-activated protein kinases

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**Core Tip:** Curcumin (CUR) can efficiently decrease the activity of proinflammatory cytokines by communicating with transcription factors and signaling molecules. It is a new area of research that may be promising in the future to treat patients with inflammatory bowel disease, especially in patients with ulcerative colitis. How to improve the bioavailability of CUR *in vivo* was also discussed.

**TO THE EDITOR**

With great interest, we have read the article by Zheng *et al*[1], who found that curcumin (CUR) regulated mTh/mTfh cell homeostasis by inhibiting the c-Jun amino-terminal kinases (JAK) 1/STAT3/SOCS signaling pathway, thus alleviating dextran sulfate sodium (DSS) induced pathological injury in the colon. Various studies have shown that CUR can also efficiently decrease the activity of proinflammatory cytokines by communicating with other transcription factors and signaling molecules. For example, CUR inhibits the activation of transcription factors, multiple protein kinases, and antiapoptotic proteins and modulates various inflammatory cytokines by suppressing the inflammatory transcription factor nuclear factor-κB[2]. Khan *et al*[3] reported the inhibitory effects of CUR on JNKs, extracellular-signal-regulated kinases, and stress-activated protein kinases. These inhibitory effects involve decreasing the expression and release of proinflammatory mediators, such as tumor necrosis factor (TNF)-α and adhesion molecules. Current research indicates that CUR has high medicinal value, including anti-inflammatory, antioxidant, antitumor, antiapoptotic, antifibrotic, immunoregulatory and other effects, and can be used to treat a variety of diseases[4].

Although CUR has few adverse effects and is highly safe for use, it still has several disadvantages. CUR is hardly soluble in water solution due to its lipophilic properties and low bioavailability after oral administration[5]. Therefore, it is particularly important to choose a combination of CUR and other treatments or a modified CUR formula to treat ulcerative colitis (UC). First, Xu *et al*’s evaluation of the in vivo therapeutic effects on DSS-induced UC in mice revealed that dexamethasone (DEX)-loaded hydroxyethyl starch-CUR nanoparticles could enhance the efficacy of free DEX and significantly alleviate the lesions caused by UC[6]. Second, A nanocarrier of CUR coated with tannic acid and genipin crosslinked human serum albumin was prepared into CUR nanoparticles by Luo *et al*[7]. The synthetic nanoparticles prolonged the colonic adhesion of CUR and improved its absorption in Caco-2 cells. In addition, a study demonstrated that oral administration of turmeric-derived nanoparticles containing a specific preparation could ameliorate colitis in mice and accelerate colitis resolution by regulating the expression of proinflammatory cytokines, including TNF-α, interleukin (IL)-6, and IL-1β, and the antioxidant gene *HO-1*[8].

Notably, CUR nanomaterials have been tested not only in preclinical animal models but also in human clinical trials for the treatment of various diseases[9]. Further clinical studies on the possible benefits and associated risks of CUR nano preparations in patients with IBD are also warranted in the future[10].

**REFERENCES**

1 **Zheng LX**, Guo KE, Huang JQ, Liu MH, Deng BL, Liu DY, Zhou BG, Zhou W, Zhong YB, Zhao HM. Curcumin alleviated dextran sulfate sodium-induced colitis by recovering memory Th/Tfh subset balance. *World J Gastroenterol* 2023; **29**: 5226-5239 [PMID: 37901446 DOI: 10.3748/wjg.v29.i36.5226]

2 **Buhrmann C**, Brockmueller A, Mueller AL, Shayan P, Shakibaei M. Curcumin Attenuates Environment-Derived Osteoarthritis by Sox9/NF-kB Signaling Axis. *Int J Mol Sci* 2021; **22** [PMID: 34299264 DOI: 10.3390/ijms22147645]

3 **Khan H**, Sureda A, Belwal T, Çetinkaya S, Süntar İ, Tejada S, Devkota HP, Ullah H, Aschner M. Polyphenols in the treatment of autoimmune diseases. *Autoimmun Rev* 2019; **18**: 647-657 [PMID: 31059841 DOI: 10.1016/j.autrev.2019.05.001]

4 **Salehi B**, Stojanović-Radić Z, Matejić J, Sharifi-Rad M, Anil Kumar NV, Martins N, Sharifi-Rad J. The therapeutic potential of curcumin: A review of clinical trials. *Eur J Med Chem* 2019; **163**: 527-545 [PMID: 30553144 DOI: 10.1016/j.ejmech.2018.12.016]

5 **Lin Y**, Liu H, Bu L, Chen C, Ye X. Review of the Effects and Mechanism of Curcumin in the Treatment of Inflammatory Bowel Disease. *Front Pharmacol* 2022; **13**: 908077 [PMID: 35795556 DOI: 10.3389/fphar.2022.908077]

6 **Xu C**, Chen S, Chen C, Ming Y, Du J, Mu J, Luo F, Huang D, Wang N, Lin Z, Weng Z. Colon-targeted oral nanoparticles based on ROS-scavenging hydroxyethyl starch-curcumin conjugates for efficient inflammatory bowel disease therapy. *Int J Pharm* 2022; **623**: 121884 [PMID: 35661797 DOI: 10.1016/j.ijpharm.2022.121884]

7 **Luo R**, Lin M, Zhang C, Shi J, Zhang S, Chen Q, Hu Y, Zhang M, Zhang J, Gao F. Genipin-crosslinked human serum albumin coating using a tannic acid layer for enhanced oral administration of curcumin in the treatment of ulcerative colitis. *Food Chem* 2020; **330**: 127241 [PMID: 32540526 DOI: 10.1016/j.foodchem.2020.127241]

8 **Liu C**, Yan X, Zhang Y, Yang M, Ma Y, Zhang Y, Xu Q, Tu K, Zhang M. Oral administration of turmeric-derived exosome-like nanovesicles with anti-inflammatory and pro-resolving bioactions for murine colitis therapy. *J Nanobiotechnology* 2022; **20**: 206 [PMID: 35488343 DOI: 10.1186/s12951-022-01421-w]

9 **Ma Z**, Wang N, He H, Tang X. Pharmaceutical strategies of improving oral systemic bioavailability of curcumin for clinical application. *J Control Release* 2019; **316**: 359-380 [PMID: 31682912 DOI: 10.1016/j.jconrel.2019.10.053]

10 **Karthikeyan A**, Young KN, Moniruzzaman M, Beyene AM, Do K, Kalaiselvi S, Min T. Curcumin and Its Modified Formulations on Inflammatory Bowel Disease (IBD): The Story So Far and Future Outlook. *Pharmaceutics* 2021; **13** [PMID: 33918207 DOI: 10.3390/pharmaceutics13040484]

**Footnotes**

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