

## Curcumin and Its Emerging Role in Pain Modulation and Pain Management

Mechanicsville, VA, USA

Shailendra Kapoor, MD

### TO THE EDITOR

I read with great interest the article by Han et al, in a recent issue of your esteemed journal [1]. Interestingly, it was found that curcumin is rapidly emerging as a potent agent with significant anti-nociceptive properties.

For instance, curcumin decreases post surgical allodynia after surgical procedures such as laparoscopic cholecystectomy [2]. Curcumin exerts its anti-nociceptive effect by acting on dorsal root ganglia, while also subsequently decreasing CX3CR1 expression [3]. The function of Curcumin acts via the Mu and Delta opioid receptors [4]. The 5-HT (1A) receptors are an important necessity for curcumin induced inhibition allodynia. This is evident from the fact that 5-HT (1A) antagonists, such as WAY-100635, attenuate the anti-nociceptive effects of curcumin. Curcumin was also found to mitigate the capsaicin induced transient receptor potential of vanilloid 1 in pain hypersensitivity [5].

Curcumin also has a mitigating effect on diabetic neuropathic pain. This is clearly evident since it inhibits TNF- $\alpha$ , thereby ameliorating thermal hyperalgesia when co-administered with insulin in streptozotocin induced diabetic animal models [6]. Simultaneously, curcumin has a dose dependent attenuating effect on the release of nitric oxide,

which further decreases the strength of the nociceptive stimuli [7]. In addition, curcumin prevents the development of diabetic neuropathy when co-administered with agents such as gliclazide [8]. The dual combination has an accentuating effect on serum C-peptide levels, which increases the threshold level to mechanical hyperalgesia. Similarly, curcumin inhibits IL-1 $\beta$  release, thereby improving neuronal function in alcoholic neuropathy [9].

Curcumin also has a mitigating effect on pain associated depression. For instance, Arora et al have recently reported that curcumin administration reduces reserpine induced pain and depression by reversing the changes in serotonin and substance P levels induced by reserpine [10]. In certain animal models, such as the facial pain model, curcumin exhibits pain ameliorating, synergistic effects when administered alongside NSAIDs [11].

Clearly, curcumin has significant anti-nociceptive properties. Further large scale studies are needed in humans to fully elaborate and harness the pain mitigating effects of curcumin.

### REFERENCES

1. Han YK, Lee SH, Jeong HJ, Kim MS, Yoon MH, Kim WM. Analgesic effects of intrathecal curcumin in the rat formalin

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Correspondence to: Shailendra Kapoor, MD  
Mechanicsville, VA, USA

Tel: +1-8656785678, Fax: +1-8656071014, E-mail: shailendrakapoor@yahoo.com

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- test. *Korean J Pain* 2012; 25: 1–6.
2. Agarwal KA, Tripathi CD, Agarwal BB, Saluja S. Efficacy of turmeric (curcumin) in pain and postoperative fatigue after laparoscopic cholecystectomy: a double-blind, randomized placebo-controlled study. *Surg Endosc* 2011; 25: 3805–10.
  3. Zheng J, Zheng C, Cao H, Li J, Lian Q. Curcumin down-regulates CX3CR1 expression in spinal cord dorsal horn and DRG in neuropathic pain rats. *Zhongguo Zhong Yao Za Zhi* 2011; 36: 2552–6.
  4. Zhao X, Xu Y, Zhao Q, Chen CR, Liu AM, Huang ZL. Curcumin exerts antinociceptive effects in a mouse model of neuropathic pain: descending monoamine system and opioid receptors are differentially involved. *Neuropharmacology* 2012; 62: 843–54.
  5. Yeon KY, Kim SA, Kim YH, Lee MK, Ahn DK, Kim HJ, et al. Curcumin produces an antihyperalgesic effect via antagonism of TRPV1. *J Dent Res* 2010; 89: 170–4.
  6. Sharma S, Chopra K, Kulkarni SK. Effect of insulin and its combination with resveratrol or curcumin in attenuation of diabetic neuropathic pain: participation of nitric oxide and TNF- $\alpha$ . *Phytother Res* 2007; 21: 278–83.
  7. Sharma S, Kulkarni SK, Agrewala JN, Chopra K. Curcumin attenuates thermal hyperalgesia in a diabetic mouse model of neuropathic pain. *Eur J Pharmacol* 2006; 536: 256–61.
  8. Attia HN, Al-Rasheed NM, Al-Rasheed NM, Maklad YA, Ahmed AA, Kenawy SA. Protective effects of combined therapy of gliclazide with curcumin in experimental diabetic neuropathy in rats. *Behav Pharmacol* 2012; 23: 153–61.
  9. Kandhare AD, Raygude KS, Ghosh P, Ghule AE, Bodhankar SL. Therapeutic role of curcumin in prevention of biochemical and behavioral aberration induced by alcoholic neuropathy in laboratory animals. *Neurosci Lett* 2012; 511: 18–22.
  10. Arora V, Kuhad A, Tiwari V, Chopra K. Curcumin ameliorates reserpine-induced pain-depression dyad: behavioural, biochemical, neurochemical and molecular evidences. *Psycho-neuroendocrinology* 2011; 36: 1570–81.
  11. Mittal N, Joshi R, Hota D, Chakrabarti A. Evaluation of antihyperalgesic effect of curcumin on formalin-induced orofacial pain in rat. *Phytother Res* 2009; 23: 507–12.