WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 5, 2043-2049. Review Article ISSN 2277– 7105

PHARMACOKINETICS OF CURCUMIN: PROBLEMS AND PROMISES

Madhusudhana Kamath*

Division of Ayurevda, Centre for Integrative Medicine and Research, Manipal Academy of Higher Education Manipal, Karnataka India, 576104.

Article Received on
20 March 2020,

Revised on 08 April 2020,
Accepted on 28 April 2020

DOI: 10.20959/wjppr20205-17314

***Corresponding Author**
Dr. Madhusudhana Kamath
Division of Ayurevda, Centre for Integrative Medicine and Research, Manipal Academy of Higher Education Manipal, Karnataka India, 576104.

ABSTRACT

Turmeric is one of the most commonly used in India. Turmeric (Curcuma longa) is most commonly used for its biological and pharmacological properties. Turmeric most commonly used spice, food preservative as well as a colouring agent in kitchens like India, serve that it possesses anti-cancer property, useful in eosinophilia, in wound management etc. It Curcumin is the core curcuminoid of the corm of turmeric. This yellow matter, present mainly throughout the plant, especially in the rhizomes. In this paper, an effort has made to discuss Pharmacokinetics of curcumin.

INTRODUCTION

Curcumin is the core curcuminoid of the corm of turmeric botanically known as Curcuma longa L., belongs to family Zingiberaceae, and Turmeric contains between 1.5 and 3% of curcumin. Curcumin, a polyphenol removed from Turmeric in 1815, has gained attention from scientists worldwide for its biological activitiesTurmeric was used since 4, 000 years ago in India, According to scholars Prasad and Aggarwal opinion turmeric might reach China and west Africa around 1200 BC, Susruta's treatise Sushruta Samhita mentions the role of turmeric in food poisoning. Turmeric is useful in discontinuation of the skin and membrane and repair of this[1,2,3] In some severe conditions (i.e. Large full-thickness skin defects), complete re-epithelialization takes a long time[4,5,6,7] Hence, wide-range of studies conducting on various stages of wound healing like wound dressing to wound healing.

Turmeric is Botanically known as Curcuma *longa Linn.= C. Domestica Valeton* Turmeric. In Sanskrit, it is mentioned as Haridra; it is known as Kurkum to Arabs and as Haldi and Halada

to Hindi, Bengali, Maharashtrian and Gujrati regions and as Manjal to Tamils, Pasupu to Telugus and as Arishina to Kannada people. It is a perennial herb, 2–3 ft. High with a short stem and tufted leaves; the rhizomes, which are short and thick, Turmeric is used for various purposes, such as spicey agent, as a colouring material and as traditional medicine, as a sign of sacredness, as s cosmetic agent etc. This yellow matter, present mainly throughout the plant, especially in the rhizomes.[8] Turmeric is a mild digestant, a stimulant and a carminative as it contains aromatic constituents. Turmeric is one of the environment's best potent healers. Turmeric has been used since 2500 years in India.

Turmeric (Curcuma longa) is most commonly used for its biological and pharmacological properties. Turmeric most commonly used spice, food preservative as well as a colouring agent in kitchens like India, China and South-East Asia. It has been used as granny's medicine for several ailments like cough, diabetics, Liver disorders, rheumatic joint pain and sinusitis. While in the molecular level it is useful in nephritis, cancer, diabetes, and for IBS[9,10,11] For the last few decades, extensive work has been done to establish the Curcumin (diferuloylmethane), It is one of the main yellow coloured bioactive actives of a constituent of the turmeric. It medicinally as it is one of the antioxidants possess anti-inflammatory, anti-carcinogenic, anti-diabetic, antipathogenic, anti-venom, as well as hypercholesteremia activities. As it is carcinogenic oxidative stress-related pathogenesis like Diabetes.

Clinically, curcumin has effective shrink the post-operative inflammation without any lethal effects. Rhizomes of Haridra possess wound healing property[12] along with it also having antimutagenic, anti-inflammatory properties[13] Curcumin, the phytochemical component in turmeric, 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, is a naturally occurring low molecular weight polyphenolic phytoconstituent[14] is used as a dietary spice and a topical ointment for the treatment of inflammation in India for centuries. Turmeric Curcumin may be a good potential agent for wound healing[15,16] It has been reported that Curcumin applied both orally and topically was effective in wound repair[17,18,19] Curcumin also enhances wound-healing as it is more potent antioxidant than Antioxidants like Vit C and E[20] as well as more potent anti-inflammatory one[21,22] in diabetic rats and mice, and H_2O_2-induced damage in human keratinocytes and fibroblasts.[23] It also helps in remodelling Matrix metalloproteinases (MMPs) may help in to treat NSAID inducing ulcers[24] Curcumin enhances wound healing in streptozotocin-induced diabetic rats and genetically diabetic mice[25] Here Curcumin improved homeostasis model assessment of

insulin resistance and glucose tolerance and elevated the plasma insulin level in dB/DB mice. It is observed that Curcumin meaningfully lowers plasma free fatty acid, cholesterol, and triglyceride concentrations while better the hepatic glycogen However this is the era of noncommunicable diseases like cardiovascular diseases, Li H et al published their study in Biotechnology Advances 2020, says experimental studies show that Curcumin is an important natural agent to prevent various most common cardiovascular diseases like cardiotoxicity, myocardial infarction, atherosclerosis etc, Curcumin showed no effect on the blood glucose, plasma insulin, and glucose regulating enzyme activities in db/+ mice. These results suggest that curcumin seemed to be a potential glucose-lowering agent and antioxidant in type 2 diabetic db/db mice, but did not affect non-diabetic db/+ mice.[26] Curcumin helps in stimulating mRNAs one of the suppressors of[27] and in benzo (a) pyrene (BP)-induced gastric tumours in mice.[28] They also showed that the mutagenic effect of Benzopyrene BP, in the mouse bone marrow cells, was suppressed by Turmeric.[29,30] Curcumin (diferuloylmethane) of turmeric (Curcuma longa) is one of the major bioactive constituents,despite the availability of multiple treatments, for burn wounds, such as surgery, autografts[31] skin lightening[3] and dietary Curcumin reaches the skin in mice[33] and it is useful in vitiligo[34,35,36] Combined radiation and wound injury (CRWI) occurs in nuclear attacks and severe nuclear accidents. It has been known for a long time that ionizing irradiation can delay skin wound healing and that the healing process is closely related to the radiation doses.[37] It reduces wound healing time by mainly two ways by boosted the rate of wound surface contraction, And augmented fusion of collagen, observed in mice exposed to gamma-radiation.[38]

It did not show a significant change in Serum lipids levels.[39] Result shows, this compound may have potential clinical applications as a novel intravaginal spermicidal agent for contraception and HIV prevention.[40] It is also useful in Keloid and hypertrophic scars commonly occur after injuries.[41]

DISCUSSION

Eirini Chainoglou PhD scholar and Prof Dimitra J Hadjipavlou-Litina of Aristotle University of Thessaloniki found that it is useful in Alzheimer's disease (AD) one of the neurodegenerative disease influencing the ageing residents. Nowadays, Curcuma used in several medications, It is observed that during the last era, the scientific folk has dedicated their research on the optimization of healing properties of Curcuma and piperin of Piperaceae

family. This review an effort to summarizes therapeutic, preventive, and diagnostic applications of curcumin. Curcumin is a bright yellow phytochemical derived from the rhizome of Curcuma longa. Since its initial extraction from this plant, curcumin is attaining great attention from the researchers of the medical field.

But unfortunately, evidence-based medicine(EBM) has failed to confirm the clear therapeutic effect. Finally, curcumin to establish neurodegenerative disorders. Finally, It is the right time to study the curcumin safety profile and therapeutic validation.

CONCLUSION

In conclusion, Even it is extracted from herb toxicity, we have to study antagonistic cellular, macromolecular variations, injury to an enzyme system, disturbance of protein amalgamation, manufacture of reactive chemicals in cells, DNA damage, change in biochemical function, or alteration of a physiological appliance.

This information helps in important for the estimation of an initial safe starting dose for the human trials. All non-clinical toxicological studies those are having the intention to support clinical research or marketing, must follow the Good laboratory practices (GCP). It includes tolerability of subject and it provides primary pharmacokinetic assessments.

REFERENCES

1. C.C. Yates, D. Whaley, R. Babu, J. Zhang, P. Krishna, E. Beckman, et al.The effect of multifunctional polymer-based gels on wound healing in full thickness bacteria-contaminated mouse skin wound models Biomaterials, 2007; 3977–3986.
2. H.N. Kim, Y. Hong, M.S. Kim, S.M. Kim, K.-Y. Suh Effect of orientation and density of nanotopography in dermal wound healing Biomaterials, 2012; 33: 8782–8792.
3. A.M. Harmon, W. Kong, C.S. Buensuceso, A.J. Gorman, T.R. Muench Effects of fibrin pad hemostat on the wound healing process in vivo and in vitro Biomaterials, 2011; 32: 9594–9601.
4. Z. Ruszczak Effect of collagen matrices on dermal wound healing Adv Drug Delivery Rev, 2003; 55: 1595–1611.
5. J. Hardwicke, E.L. Ferguson, R. Moseley, P. Stephens, D.W. Thomas, R. Duncan Dextrin–rhEGF conjugates as bioresponsive nanomedicines for wound repair J Control Release, 2008; 133: 275–283.

6. J. Hardwicke, R. Moseley, P. Stephens, K. Harding, R. Duncan, D.W. Thomas Bioresponsive dextrin–rhEGF conjugates: in vitro evaluation in models relevant to its proposed use as a treatment for chronic wounds Mol Pharm, 2010; 7: 699–707.
7. J. Hardwicke, B. Song, R. Moseley, D.W. Thomas Investigation of the potential of polymer therapeutics in corneal re-epithelialisation Brit J Ophthalmol, 2010; 94: 1566–1570
8. Gupta, R. K., and L. Balasubrahmanyam. "The turmeric effect." World PatentInformation, 1998; 20(3): 185-191.
9. Gupta, Subash C., et al. "Multitargeting by turmeric, the golden spice: From kitchen to clinic." Molecular nutrition & food research, 2013; 57(9): 1510-1528.
10. Jain SK. Dictionery of Indian Folk Medicine and Ethnobotany, 1991; 65-66.
11. CHEMEXCIL . Curcuma longa Linn (Haridra) in Indian Medicinal Plants - by Bhavan's Swami Prakashananda Ayurveda Research Centre, 1992; 111: 121-24.
12. Biswas, Tuhin Kanti, and Biswapati Mukherjee. "Plant medicines of Indian origin for wound healing activity: a review." The international journal of lower extremity wounds, 2003; 2(1): 25-39.
13. Vaidya, A. "Reverse pharmacological correlates of ayurvedic drug actions."Indian Journal of Pharmacology, 2006; 38(5): 311.
14. S. Singh From exotic spice to modern drug? Cell, 2007; 130: 765–768
15. Phan, Toan-Thang, et al. "Protective effects of curcumin against oxidative damage on skin cells in vitro: its implication for wound healing." Journal of Trauma and Acute Care Surgery, 2001; 51(5): 927-931.
16. Lindblad, William J. "Review Paper: Considerations for Determining if a Natural Product Is an Effective Wound-Healing Agent." The international journal of lower extremity wounds, 2008; 7(2): 75-81.
17. G.C. Jagetia, G. Rajanikant Role of curcumin, a naturally occurring phenolic compound of turmeric in accelerating the repair of excision wound, in mice whole-body exposed to various doses of γ-radiation J Surg Res, 2004; 120: 127–138.
18. D. Gopinath, M.R. Ahmed, K. Gomathi, K. Chitra, P. Sehgal, R. Jayakumar Dermal wound healing processes with curcumin incorporated collagen films Biomaterials, 2004; 25: 1911–1917.
19. Gong, ChangYang, et al. "A biodegradable hydrogel system containing curcumin encapsulated in micelles for cutaneous wound healing." Biomaterials, 2013; 34(27): 6377-6387.

20. S. Toda, T.Miyase, H. Arichi, HTanizawa, and Y. Takino, “Natural antioxidants. III. Antioxidative components isolated from rhizome of Curcuma longa L,” Chemical and Pharmaceutical Bulletin, 1985; 33(4): 1725–1728
21. Jacob, Asha, et al. "Mechanism of the anti-inflammatory effect of curcumin: PPAR-γ activation." PPAR research, 2007; 2008.
22. Dai, Mei, et al. "Chitosan-alginate sponge: preparation and application in curcumin delivery for dermal wound healing in rat." BioMed Research International, 2009.
23. Chattopadhyay, Ishita, et al. "Turmeric and curcumin: Biological actions and medicinal applications." Current science, 2004; 87(1): 44-53.
24. Swarnakar, Snehasikta, et al. "Curcumin regulates expression and activity of matrix metalloproteinases 9 and 2 during prevention and healing of indomethacin-induced gastric ulcer." Journal of Biological Chemistry, 2005; 280(10): 9409-9415.
25. Sidhu, Gurmel S., et al. "Curcumin enhances wound healing in streptozotocin induced diabetic rats and genetically diabetic mice." Wound Repair and Regeneration, 1999; 7(5): 362-374.
26. Seo, Kwon-Il, et al. "Effect of curcumin supplementation on blood glucose, plasma insulin, and glucose homeostasis related enzyme activities in diabetic db/db mice." Molecular nutrition & food research, 2008; 52(9): 995-1004.
27. Bao, Bin, et al. "Curcumin analogue CDF inhibits pancreatic tumor growth by switching on suppressor microRNAs and attenuating EZH2 expression." Cancer research, 2012; 72(1): 335-345.
28. Nagbhushan and Bhide SV.Antimutagenicity and anticarcinogenicity ofturmeric (Curcuma longa Linn). J Nutr Growth Cancer Inst, 1987; 73: 737-41.
29. Azuine MA, Kayal JJ, Bhide SV. Protective role of aqueous turmeric extracts against mutagenicity of direct acting carcinogens as well as benzo (a) pyrene-induced genotoxicity aand carcinogenicity. J Cancer Res Clin Oncol, 1992; 118: 447- 52.
30. Azuine MA, Bhide SV. Chemopreventive effect of turmeric against stomach and skin cancers induced by chemical carcinogens in Swiss mice. Nutrition and Cancer, 1992; 17: 77- 83.
31. Cheppudira, Bopaiah, et al. "Curcumin: a novel therapeutic for burn pain and wound healing." Expert opinion on investigational drugs, 2013; 22(10): 1295-1303.
32. Phan TT, See P, Lee ST, Chan SY. Protective effects of curcumin against oxidative damage on skin cells in vitro: its implication for wound healing. J Trauma, 2001; 51: 927-31.

33. Limtrakul P, Lipigorngoson S, Namwong O, Apisariyakul A, Dunn FW. Inhibitory effect of dietary curcumin on skin carcinogenesis in mice. Cancer Lett, 1997; 116: 197-203.
34. Schallreuter KU, Moore J, Wood JM, Beazley WD, Gaze DC, Tobin DJ, et al. In vivo and in vitro evidence for hydrogen peroxide (H2O2) accumulation in the epidermis of patients with vitiligo and its successful removal by a UVB-activated pseudocatalase. J Invest Dermatol Symp Proc, 1999; 4: 91-6.
35. Schallreuter KU, Wood JM, Lemke KR, Levenig C. Treatment of vitiligo with a topical application of pseudocatalase and calcium in combination with short-term UVB exposure: a case study on 33 patients. Dermatology, 1995; 190: 223-9.
36. Schallreuter, Karin U., and Hartmut Rokos. "Turmeric (curcumin): A widely used curry ingredient, can contribute to oxidative stress in Asian patients with acute vitiligo." Indian Journal of Dermatology, Venereology, and Leprology, 2006; 72(1): 57.
37. Shi, Chun-Meng, Yong-Ping Su, and Tian-Min Cheng. "Recent advances in the pathological basis and experimental management of impairedwound healing due to total-body irradiation." American Journal of Case Reports, 2005; 12(1): RA1-RA4.
38. Jagetia GC, Rajanikant GK: Role of curcumin, a naturally occurringphenolic compound of turmeric in accelerating the repair of excision wound, in mice whole-body exposed to various doses of gamma-radiation.J Surg Res, 2004; 120: 127–38.
39. Joshi, Jayashree, et al. "Early human safety study of turmeric oil (Curcuma longa oil) administered orally in healthy volunteers." Journal-Association Of Physicians Of India, 2003; 51: 1055-1060.
40. Rithaporn, Tara, Manoj Monga, and Mahadevan Rajasekaran. "Curcumin: a potential vaginal contraceptive." Contraception, 2003; 68(3): 219-223.
41. Phan, Toan-Thang, et al. "Dietary Compounds Inhibit Proliferation and Contraction of Keloid and Hypertrophic Scar-Derived Fibroblasts In Vitro: Therapeutic Implication for Excessive Scarring." Journal of Trauma and Acute Care Surgery, 2003; 54(6): 1212-1224.