International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

A Review of Cancer Nano therapy Based on Curcumins

Corresponding Author:
Kotkar Abhishek P.*, Navale Sonali U*., Kute Samej D., Sangale sanket, Samadhan Sanjay K
Dr. Ithape Institute of pharmacy, Sangamner.
Department of pharmacy

ABSTRACT:
Turmeric, or Curcuma longa, is a plant that produces the polyphenol curcumin (Diferuloylmethane). Due to its numerous therapeutic benefits, such as its anti-oxidant, analgesic, anti-inflammatory, and antibacterial qualities, curcumin has been widely utilized in Ayurvedic medicine for millennia. Curcumin has recently been discovered to have anti-cancer properties through its impact on a number of biological processes related to mutagenesis, oncogene expression, cell cycle regulation, apoptosis, and carcinogenesis.

KEYWORDS:
Curcumin, Anticancer, Structure activity relationship. Cellular pathway, Mechanism of action.

INTRODUCTION :

A number of anticancer substances with various mechanisms of action have been isolated from plant sources, including Taxus brevifolia, Catharanthus roseus, Betula alba, Cephalotaxus species, Erythroxylum previllei, Curcuma longa, and numerous more, in addition to chemically manufactured anticancer medicines. The most significant of these is curcumin, which was originally isolated from the turmeric plant in a pure crystalline form in 1870. Curcumin is found in the rhizomes of Curcuma longa I., or turmeric.

PHARMACOGNOSTIC ACCOUNT:

Synonym: Saffron Indian, Haldi, Curcuma, Rhizoma cur-cumae.
Biological source:Turmeric is the dried rhizome of Curcuma longa linn. (syn. Curcuma domestca valeton).
Family: Zingiberaceae.
Chemical constituent: Curcuminoids (5%), Essential oil (6%), Curcumin 1 (6%), Zingiberene (25%), Cineole, Borneol, Alpha- phellandrene, Sabinene, Turmerone.
Uses: Aromatic, Anti-inflammatory, Stomachic, Uretic, Stimulant, Carminative, Cold and Cough.
Marketed products: Kasturi Turmeric Powder.
Chemical test:
The color turns crimson when turmeric powder or concentrated sulfuric acid is applied.
Turmeric powder turns reddish-violet when alkali solution is added.

A paper that contains turmeric extract and borax solution yields an agreeable color. With 8.2 million deaths and almost 14 million new cases recorded in 2012, malignancies caused by curcumin and its derivatives have been identified as the world's biggest causes of death. Over the next 20 years, these cases are predicted to increase by almost 70%. Around 60% of new cases of cancer worldwide each year. There are cases in Central and South America, Asia, and Africa. According to the study, literature review, and reports that have been seen, 70% of all deaths are caused by cancer.Since ancient times,
Zingiberaceous plants have been utilized in traditional Chinese and Indian medicine as spices and medications. Has sparked interest in using it to treat cancer.

Polymeric nanoparticle: Numerous human cancer cell line and animal carcinogenesis models have shown the strong anti-cancer effects of curcumin, a yellow polyphenol that is derived from the rhizome of turmeric (Curcuma longa). Drug delivery methods based on nanoparticles may be able to overcome the drawbacks of poor solubility by making hydrophobic substances like curcumin dispersible in aqueous media.

Liposomes:

Liposomal nanoparticle delivery of curcumin, a broad-spectrum anticancer medication, has been investigated for the treatment of osteosarcoma (OS). Since curcumin is insoluble in water, cyclodextrin encapsulation followed by liposome encapsulation provides an efficient delivery method. Liposomes coated with curcumin and cyclodextrin show great promise as delivery systems for the treatment of malignancies originating from various tissues. Increased Bcl-xL protein suppression Numerous research have looked into how curcumin and its derivatives can interact with various molecular targets to decrease a variety of carcinomas. Numerous research have looked into how curcumin and its derivatives can interact with various molecular targets to decrease a variety of carcinomas.

IN VITRO AND IN VIVO STUDIES:

Prostate, colorectal, breast, pancreatic, brain, head, and neck cancers are among the many cancer types for which curcumin has demonstrated extremely encouraging outcomes in inhibiting the growth and multiplication of cancer cells. The following is a summary of curcumin's and its derivatives' anticancer activity in several cancer types based on information from animal and in vitro research using various cancer cell lines.

Type of Cancer	Type of study	No.of patient	Dose of curcumin	End Points	Results
BPH	Pilot Product evaluation study	61	1 g/dayfor 24 weeks	Signs & symptoms of life	Reduce d signs & symptoms improved quality of life
Breast	Phase 1 clinical trial	14	0.5 – 8g/ dyafor 7day plus doceta xel	Maximal tolerated dose of curcumin toxicity, safety, efficiency, 1 evels of VEGF & tumor markers	No cancer progres sion partial respons in some patinet , iow frequen cy oftoxic effect

Clinical studies al studies:

Antioxidant activity: In addition to the studies carried out in human cell cultures or in animal models, there have been several clinical studies carried out in human subjects to evaluate the efficacy and safety of treatment with curcumin in different types of cancer either alone or in combination with other chemotherapy agents. The curcuminoids' chemical structure gives them their antioxidant properties. The spice may help reduce neuroinflammation linked to degenerative diseases like Alzheimer's disease because curcuminoids, which are made up of two methoxylated phenols joined by two a, B unsaturated carbonyl groups that exist in a stable enol form, have been shown in additional studies in microglial cells (brain) macrophage analogs to reduce NO generation and protect neural cells from oxidative stress after curcumin treatment. Curcumin's immunomodulatory action.

A lot of data points to the inflammatory pathway problem as a major factor in the development of cancer. The plant and its constituent CUR may have therapeutic use in the treatment of inflammatory oxidative and immunological dysregulation disorders, as demonstrated by the anti-inflammatory, antioxidant, and immunomodulatory effects of curcumin longa and CUR. Several immunological mediators interact with curcumin to produce its immunomodulatory effects.

Curcumin for breast cancer:

In developed nations, breast cancer is a highly prevalent cancer that frequently affects women. It is the second most frequent cause of cancer-related mortality worldwide. Chemical substances or molecules that have the ability to block NF-kB may be used to cure cancer. It is thought that curcumin partially inhibits the NF-signaling pathway to influence breast cancer cell proliferation and invasion.

Curcumin for lung cancer:

Lung cancer is the most common cause of cancer-related death in the world with a fiveyear survival rate of fewer than 15%. The inhibition of COX-2, EGFR, NF-kB, and the PI3K/Akt signaling pathway demonstrates curcumin's therapeutic efficacy in lung cancer.

Curcumin for hematological malignancies:

According to Yi-Rong Chen et al., curcumin may work by interfering with signaling molecules such as AP-1 and NF-kB, which in turn impacts the mitogen-activated protein kinase 1/JNK (MAPKKKI-JNK) pathway. They hypothesized that curcumin might interfere with the signaling molecule or molecules at the same level or proximally upstream of the MAF kinasekinases (MAPKKKs) level, hence influencing the JNK pathway.

Antioxidant:

The molecular structure of curcuminoids gives them their antioxidant properties. The two methoxylated phenols that make up curcuminoids are joined by two a, B unsaturated carbonyl groups that occupy a stable enol state. Further research in microglial cells (analogs of brain macrophages) showed that NO production was decreased and neural cells were protected. After curcumin treatment, the spice may help reduce neuroinflammation linked to degenerative diseases like Alzheimer's disease by reducing oxidative stress.

Pharmacokinetics and Bioavailability:

The spice may help lower the neuroinflammation linked to degenerative diseases like Alzheimer's disease by lowering oxidative stress after curcumin treatment.One of a medication molecule's most important pharmacokinetic characteristics is its bioavailability. The solubility, stability, metabolism, and degradation of pharmacological molecules are the primary determinants of this behavior. The administration route is followed by drug bioavailability: intramuscular, intravenous, subcutaneous, oral, rectal, and inhalation

Mechanism of action:

Inducing apoptosis and preventing tumor growth and invasion by blocking many cellular signaling pathways are the primary modes of action via which curcumin demonstrates its distinct anticancer efficacy.

CONCLUSION:

The active component of Curcuma longa extract, curcumin, has been the subject of extensive research in recent decades due to its anti-inflammatory, antioxidant, anticancer, and antiandrogenic properties. Both in vitro and in vivo, curcumin has demonstrated significant anticancer effects against a variety of cancer types, including colorectal, pancreatic, prostate, breast, and head and neck cancers.

REFERENCES:

1. Gupta A.P., Pandotra P., Sharma R., Kushwaha M., Gupta S. Studies in Natural Products Chemistry. Elsevier, Amsterdam, The Netherlands: Chapter 8- Marine Resource: A Promising Future for Anticancer Drugs, 2013; 40: 229-325.

2. Xu G., Chu Y., Jiang N., Yang J., Li F. The Three Dimensional Quantitative Structure Activity Relationships (3D-QSAR) and docking studies of curcumin derivatives as androgen receptor antagonists. Int. J. Mol. Sci, 2012; 13: 6138-6155. Doi: 10.3390/ijms13056138.
3. Yadav B., Taurin S., Rosengren R.J., Schumacher M., Diederich M., Somers-Edgar T.J… Larsen L. Synthesis and cytotoxic potential of heterocyclic cyclohexanone analogues of curcumin. Bioorg. Med. Chem, 2010; 18: 6701-6707. Doi: 10.1016/j.bmc.2010.07.063.
4. Cheng M.A., Chou F.-J., Wang K., Yang R., Ding J., Zhang Q., Li G., Yeh S., Xu D.,Chang C. Androgen receptor (AR) degradation enhancer ASC-J9® in an FDAapproved formulated solution suppresses castration resistant prostate cancer cell growth. Cancer Lett, 2018; 417: 182-191. Doi: 10.1016/j.canlet.2017.11.038.
5. 5.Wong R.S.Y. Apoptosis in cancer: From pathogenesis to treatment. J. Exp. Clin. Cancer Res, 2011; 30: 87. Doi: 10.1186/1756-9966-30-87. [PMC free article]
6. 6.Bauer J.H., Helfand S.L. New tricks of an old molecule: Lifespan regulation by p53. Aging Cell, 2006; 5: 437-440. Doi: 10.1111/j.1474-9726.2006.00228.x.
7. Wong R.S.Y. Apoptosis in cancer: From pathogenesis to treatment. J. Exp. Clin. Cancer Res, 2011; 30: 87. Doi: 10.1186/1756-9966-30-87.
8. Bauer J.H., Helfand S.L. New tricks of an old molecule: Lifespan regulation by p53. Aging Cell, 2006; 5: 437-440. Doi: 10.1111/j.1474-9726.2006.00228.x.
9. 9.Sun YS, Yang ZN, Zhao Z, et al.: Breast cancer risk factors and preventions. 10.7150/ijbs.21635 Int J Biol Sci, 2017; 13: 1387-97
10. 10. Redondo M. García-Aranda M.: Targets of protein kinases in breast cancer. 2017; 18: 2543.10.3390/ijms18122543; Int J Mol Sci
11. 11. García-Aranda M. Redondo M: Protein kinase targets in breast cancer. Int J Mol Sci, 2017; 18: 2543.10.3390/ijms18122543 rcin/bgm248 Bachmeier BE, Mohrenz IV, Marisela Vetal: Curcumin cytokines CXCL1 and 2 in cancer cells via NFkappaB Bachmeier BE, Mohrenz IV, Marisela Vetal: Curcumin cytokines CXCL1 and 2 in cancer cells via NFkappaB. Carcinogenesis, 2008; 29: 779-89. 10.1093/carcin/bgm248
12. Lee J, Im YH, Jung HH, et al.. Curcumin inhibits interferon- alpha induced NFkappaB and COX-2 in human A549 non-small cell lung cancer cells. Biochem Biophys Res Commun, 2005; 334: 313-8.10.1016/j.bbrc.2005.06.093
13. Defaveri J. Michelin OC, Catanco AJ, Novaes FT, Cataneo DC, Ruiz Junior RL: Histology, staging, therapy, and survival of lung cancer. 34: 595-600 in J Bras Pneumol, 2008. 10.1590/s1806-37132008000800009
14. 14.Novaes FT, Cataneo DC, Ruiz Junior RL, Defaveri J. Michelin OC, Catanco AJ: Lung cancer, histology, staging, treatment and survival. J Bras Pneumol, 2008; 34: 595600. 10.1590/s1806-371320080008
15. 15.Chen YR, Tan TH: Inhibition of the c-Jun N-terminal kinase (JNK) signaling pathway by curcumin. Oncogene, 1998; 17: 173-8, 10.1038/sj.onc.1201941
16. 16.Zhang Y, Chen P. Hong H, Wang L, Zhou Y, Lang Y: JNK pathway apoptosis and a3utophagy osteosarcoma MG63 cells. Exp Ther Med, 2017; 14: 593-9. 10.3892/etm.2017.4529
17. 17.[Accessed on July 2, 2012]; http://howmed.net/pharmacology/bioa vailability-ofdrugs/