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Primary Evaluation of Anticancer Activity of Nanocurcumin® Against Human Breast Cancer Cell Line, SkBr3

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Abstract

Breast cancer is a predominant ailment mostly impairing woman. Against the triple negative breast cancer xenografts, the curcumin in polymeric micelle form showed increased bioavailability, cytotoxicity and longer half-life, observed in *in vitro* studies (Cridge et al., 2013). In this study, in vitro anticancer activity of Nanocurcumin® was evaluated against human breast cancer.

Key words: Breast cancer, SkBr3 cell line, Nanocurcumin®

1. Introduction

Breast cancer is most common type of cancer amongst women. Such type of malignancy is highly aggressive and resistant to chemotherapy (Carey et al., 2010). The anticancer activity of curcumin impregnated nanoparticles showed significant result against triple negative breast cancer (MDA-MB-231 cell line) (Yallapu at al., 2012). The encapsulated nanocurcumin made up of electroporation technique showed efficient anticancer activity against MCF-7 breast cancer cells (Lin et al., 2014).

Researchers (Vogel et al., 1815) were first attempted to purify curciminoids. Thereafter the diferuloylmethane structure was established (Milobedzka, et al., 1910). The chemical structure was confirmed in 1937 (Roughleyet al., 1937). Workers (Payton et al., 2007) further confirmed the solution structure. Curcumin is a mixture of three compounds, namely diferuloylmethane (77%), demethoxycurcumin (18%) and bisdemethoxycurcumin (5%) (Basnet et al., 2010) (Fig.1 and 2).

Curcuminoids are readily soluble in organic solvents (dimethylsulfoxide, ethanol, acetone etc.), but practically insoluble in water.

In physiological conditions curcuminoids could occur in enol and di-keto form and coexist in equilibrium manner (Fig. 3). The keto form prevails in solid, neutral and acidic conditions and donates H-atoms; on the other side the enolic form predominates in alkaline conditions (pH≥ 8) and the phenolic part of the molecule performs as an important fragment for donating the electron (Jovanovic et al., 1999).

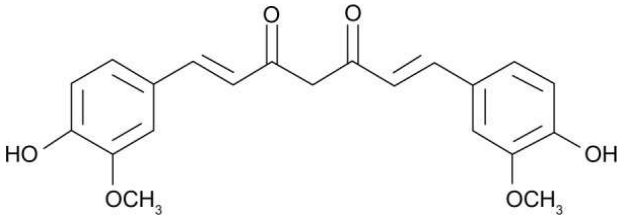

Figure 1. Chemical structure of curcumin.

Curcumin is a member of linear diarylheptanoid class whose chemical structure is elucidated as 1, 6-heptadiene-3, 5-dione-1, 7-bis-(4-hydroxy-3-methoxyphenyl)-(1E, 6E). The structure is overall symmetrical having alternatively arranged single (-C-C-) and double bonds (-C=C-). It is comprised of two phenolic rings (carrying two methoxy and two hydroxyl groups) that are linked via two α, β-unsaturated carbonyl groups.

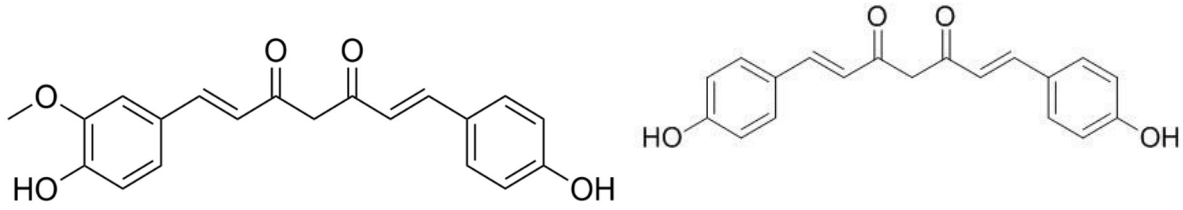

Figure 2. Structure of demethoxycurcumin and bisdemethoxycurcumin.

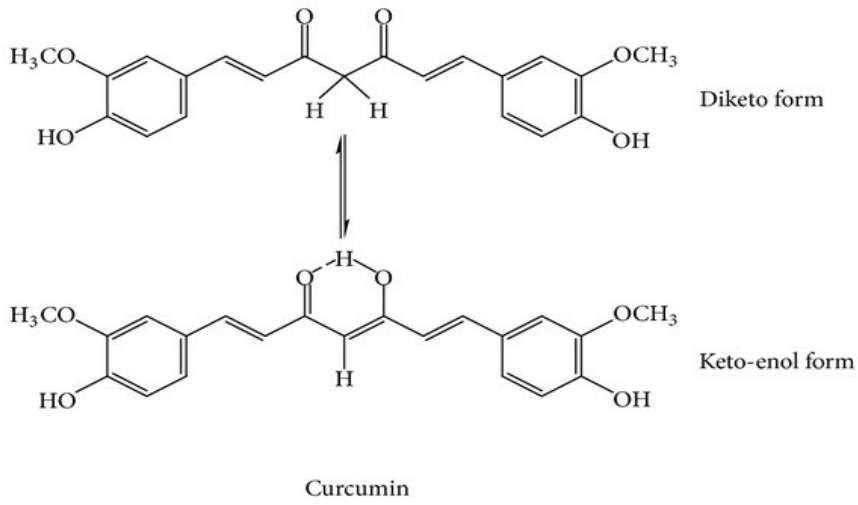

Figure 3. Tautomerism of curcumin under physiological conditions. Under acidic and neutral conditions, the bis-keto form (top) predominates, whereas the enolate form is found above pH 8.

Curcuminoids are naturally occurring low molecular weight bioactive agent that has a long history of using as a nutritional spice, colouring agent, and food preservative especially in Southeast Asian countries. It has wide range of pharmacological activities that includes anticancer, antiviral, antifungal, antioxidant, antiangiogenic and anti-inflammatory properties (Chattopadhyay et al., 2004; Maheshwari et al., 2006; Aggarwal et al., 2009).

2. Materials and Methods

Nanocurcumin® is registered product of Biotex Life Solution Pvt Ltd, Hyderabad, India. Microscopically we have examined the Cancer cells, its population and shape and size to specify the observations.

3. Results and Discussion

The intensity of Size Distribution of Nanocurcumin® is 10nm (Fig. 1 and 2). This is formulated with curcumin and a drug delivery system by a proprietary process which is a fully water-soluble preparation.The viability of cell line was assessed under microscope. Nanocurcumin® treated cells showed (Fig. 4) a visible difference in cell death in comparison to SkBr3 control cells (Fig. 3) which was kept as it is under the same condition.

Improvement of bioavailability, curtailing the deterioration of curcumin during the time of metabolism, enhancement of delivery capacity into the tumor cells and increasing the systemic elimination time are the important purposes to formulation of nanoparticles of curcumin. The

nanoparticles could easily deliver the formulated curcumin into the target site. The nanocurcumin dissolved in water, showed more stability, bioavailability against curative and therapeutic action thereof.

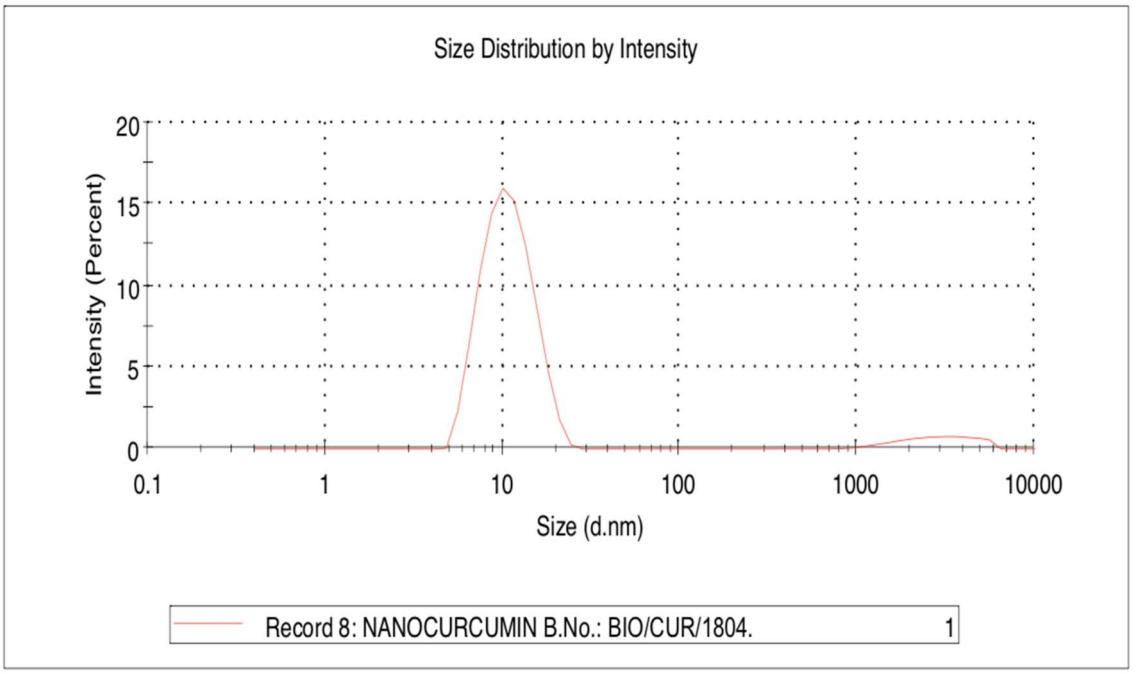

Figure 4. Size distribution (by intensity) of Nanocucumin®.

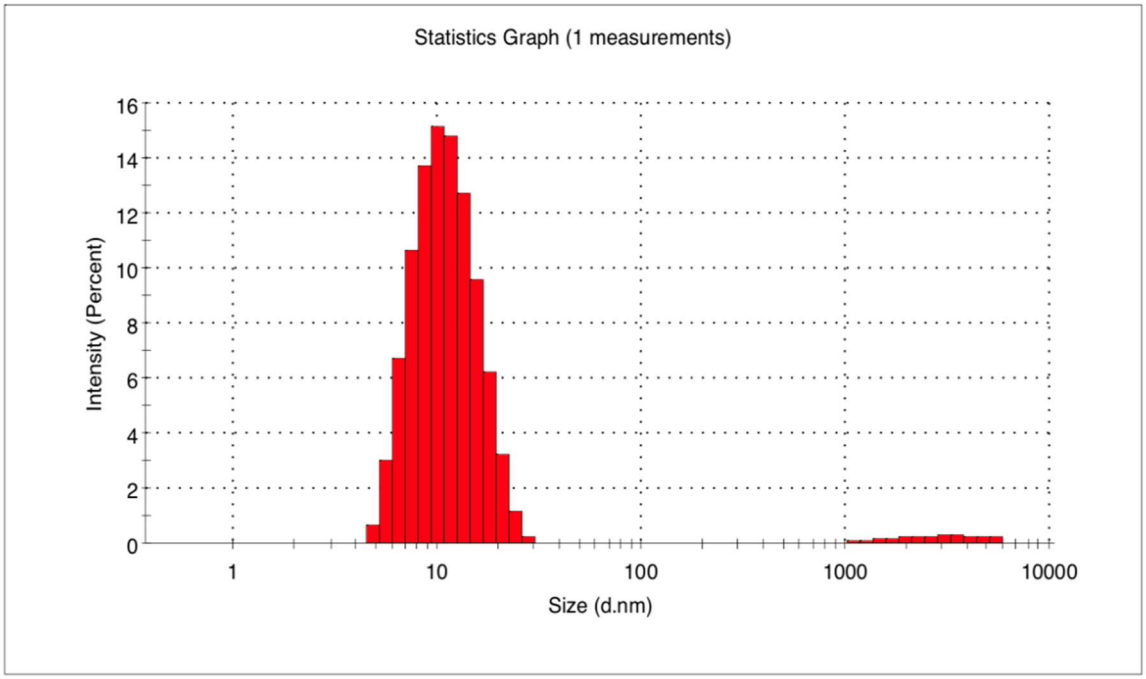

Figure 5. Size distribution (measurements) of Nanocucumin®.

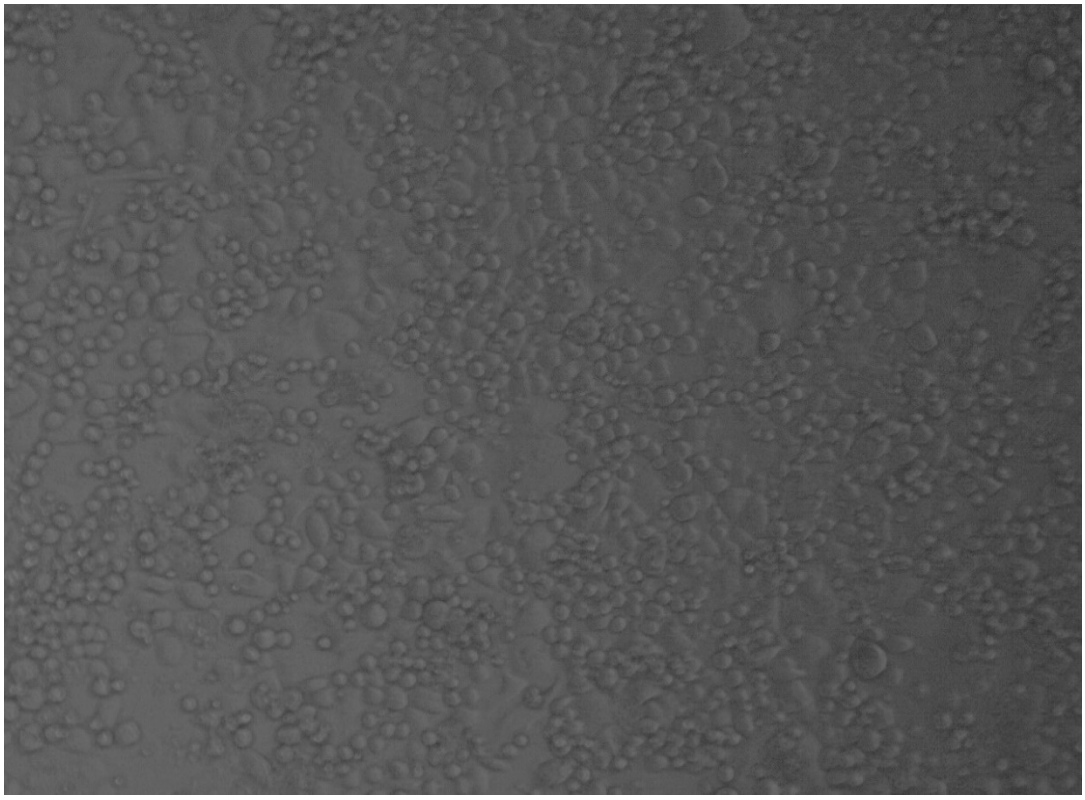

Figure 6. As such breast cancer cell line (SkBr3).

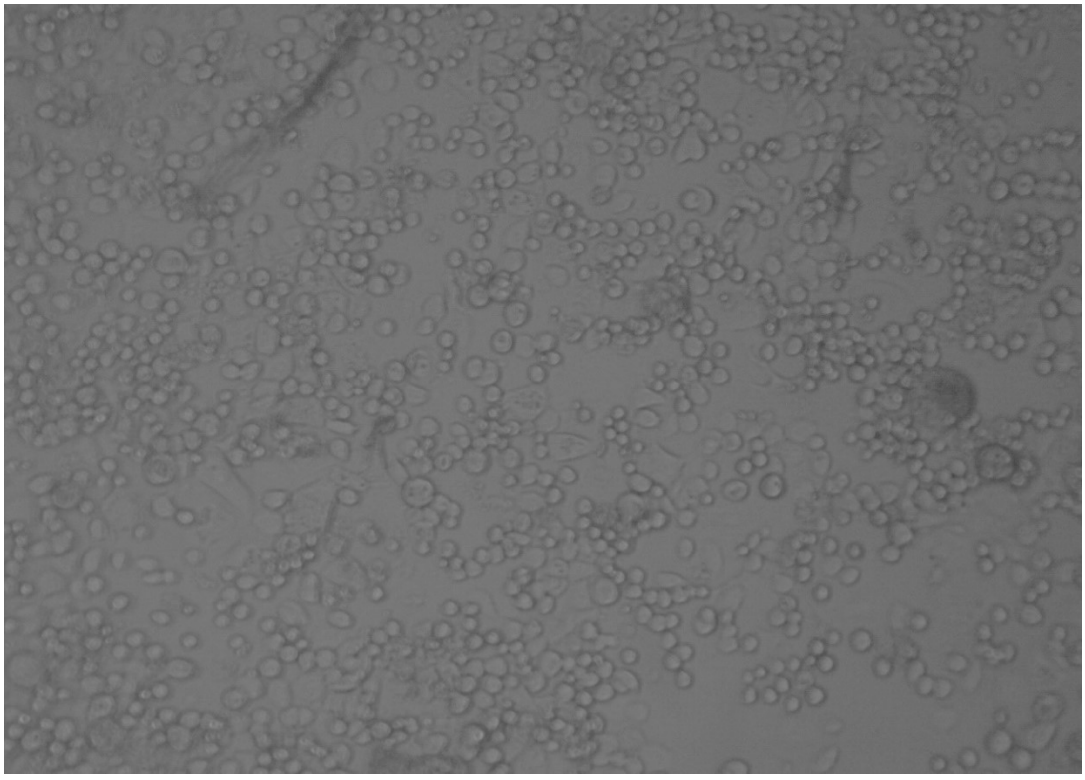

Figure 7. Breast cancer cell line treated with Nanocucumin® (SkBr3).

4. Conclusion

This microscopical preliminary study clearly showed that Nanocurcumin® possesses anticancer activity against human breast cancer cell line, SkBr3.

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