

Determination of curcumin based ophthalmic formulations

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Abstract

The study aimed to optimize and evaluate a curcumin based ophthalmic formations. Curcumin is phytochemical for its medical properties. Its usage is less due to its bioavailability in nature. Curcumin is also derived from turmeric which beneficial in several ailments. Nanotechnology is increasingly considered to be the technology of the future. The nanoparticles are used in enhancing the bioavailability of curcumin in drug delivery. In situ gelling system of curcumin was formulated to treat gastric ulcers. The pH of 7-8 makes it to unstable. Curcumin acts as an anti-inflammatory and anti-oxidant. Pyridones are known to have assortment of natural exercises like antitumor, antibacterial, mitigating and antimalarial activities. Pyridones is also extracted from curcumin.

Keywords: curcumin, piperin, *in situ gel*, Laila impex, tween, pyridones, HTLV-1, diferutorly methane.

INTRODUCTION

Drug delivery to the eye is hampered by anatomical factors, including the corneal epithelium, the blood aqueous barriers etc. The solution present in the precorneal area. Curcumin commonly called as diferutoryl methane is a hydrophobic polyphenol derived from rhizome. It has been widely used in many activities like antioxidant, anti-inflammatory, antimicrobial etc. the bioavailability of curcumin was found to be the difficult for translating the beneficial effects of it. Formulations were employed to increase the aqueous solubility of curcumin for bioavailability of it [Anjana *et al*]. The effective method for delivering the drug was based on nanotechnology formulations. Formulations were employed to increase the aqueous solubility of curcumin for its bioavailability [Anjana, *et al*]. Glaucoma involves the loss of retinal ganglion. Curcumin (1,7 bis- (4-hydroxy-3 methoxyphenol) -1,6 heptadiene 3,5 dione) is the polyphenol extracted from turmeric. Intra-gastric administration of curcumin for 6 weeks results in the reduction of retinal microglial death which is due to hyper tension. The dose is 800 mg/day. High oral dosage may lead to gastrointestinal side effects [Benjamin *et al*]. curcumin is soluble in water, ethanol, acetic acid and in acetone. Curcumin will also use to treat diabetic retinopathy. Albumin (BSA-NPs) has done a vital job for combing the multifarious drugs [Benjamin *et al*]. BSA-NPs was considered as a carrier for delivery to the eye. In situ gelling system is one of the excellent strategies to increase the ocular surface retention time [Jie Lou *et al*]. the pH of the curcumin is 7.5 – 8.5. curcumin is used to treat retina and cornea neovascularization. Curcumin used to inhibit the proliferation of lens epithelial and retinal pigment epithelium [Yuwei Duan *et al*]. Curcumin has been viewed to have antioxidant, anti-inflammatory, and antimutagenic properties [Ammon *et, al*]. curcumin inhibits the growth of Epsin- barr- virus [Raajan *et.al*]. In clinical trials the oral bioavailability of curcumin is very low, serum level was not achieved until dose of 3.6 g [Jing Cui *et al*]. curcumin is a principal curcuminoid of Indian curry and has known for its antitumor (Ran *et al*), antioxidant, antiinflammatory (Takahashi et al, Kuhad et al, Michaelidou and H-Litina) and antiarthritic properties (Patil et al) [Bahjat *et al*]. The American Food and Drug

Administration classifies curcumin is generally safe and it has no side effects. Curcumin is also known as the Indian curry. It has been used in India for more than 60 years has a medicine, cosmetics, dye etc. curcumin is non-toxic to human up to 8000bmg for day.

Sample

The screened pyridones were joined by the reaction of curcumin and amines.

Procedure

These blends similarly as curcumin were evaluated for crucial estimation of the in vitro tumor blocking development against a leading group of tumor cell lines involving CD4 human T-cells containing a joined Human T-Leukemia Virus type 1(HTLV-1), CD4 human extraordinary lymphoblastic leukemia, human splenic B-lymphoblastoid cells, human extreme B lymphoblastic leukemia, human skin melanoma, human breast adenocarcinoma, human lung squamous carcinoma, human hepatocellular carcinoma, human prostate carcinoma, human prepuce fibroblasts and human lung fibroblasts, using microculture measure (MTT) system (Tang et al., 2010). This procedure relies upon the metabolic lessening of 3-(4,5-methylthiazol-2-yl)- 2,5-diphenyltetrazolium bromide (MTT). The cell lines of tumor subpanels were agonized inside five obsessions (0.01-100 µg mL⁻¹) of each attempted compound for 48 h. Sub-nuclear descriptors for the considered blends, logP, Hydration imperativeness (ΔH), Refractivity (Ref) and Polarizability (POL) were resolved using HyperChem 8.5 program, after geometry improvement with the semi precise RM1 Hamiltonian [Bahjat et al].

Sample collection

Curcumin was obtained from Laila impex, tween, soya bean, etc.

The solubility tests

Solubility for the curcumin with different surfactants and oils was tested by ultrasonication. The samples are individually tested for its ability to solubilize maximum amount of curcumin.

Final products

The clear solution is obtained by cooling the samples. The formulation is applicable only if the products has more solubility and stability.

The concentration contents

The concentration of curcumin and surfactant was weighted. Water is added.

Procedure

Sonication was obtained without any particular matters. Water addition gives the formation of nano emulsions. For phase separation the formulations were centrifuged. The refractive index of the formulations was determined by refract metre. The capillary viscometer is used to find the formulation viscosity [Anjana, D et al].

Sample

Curcumin was obtained from shaghar Aladdin international corporation.

Procedure

10mg of albumin was dissolved in 1.0 mL of water which is then desolated with 6.0 mL ethanol. Glutaraldehyde is used to harden the coacervates. The organic solvents present in the solutions are removed by rotary evaporator.

Efficiency of the formulations

The ultraviolet spectrophotometry evaluates the drug loading efficiency and encapsulated efficiency of the formulations. By transmission electron microscope the Cur-BSA-NRS was observed. The temperature was determined. The viscosity of the formulations was observed. Two millilitres of the formulations were placed into a dialysis tube.

Final product

The erosion behaviour study was conducted and then the samples are equilibrated at 34.5-degree C. in the final stage the viscosity values are obtained [Benjamin M et al].

Sample collected:

Curcumin, methanol, chloroform and citric acid is collected from the sigma-Aldrich chemical company.

Procedure

The cholesterol, lipids and curcumin are dissolved in methanol and chloroform. The culture medium is made of blood and plasma. To determine the stability of curcumin and liposomal curcumin the solutions are mixed with 2 mL PBS. The Samples are incubated at water bath at 37-degree C for 3hours. Free curcumin and liposomal curcumin were added to the culture medium. After mixing the samples are centrifuged at 8000rpm for 45 minutes.

Fraction amount

The amount of curcumin at 1minute incubation time was considered as 100 percent which allowed the amount of curcumin at 10,20,30, 60,180 minutes to be normalized when expressed as fraction of amount to be at 1minute [Changguo Chen et al].

Sample

Curcumin were obtained from sigma-Aldrich.

Preparation

The curcumin is formed by thin film dispersed method. In the initial process the curcumin, P123 is dissolved in the ethanol by the ultrasound. The evaporator removes the ethanol and reduces the pressure to maintain the uniform thin film. The film was dried under vacuum. The deionized water is added. Finally, the solutions are

centrifuged at 12000 rpm for few minutes. As a result of centrifuge, the unloaded drugs are separated.

Formulas

DL% = weight of drug in micelles/ weight of feeding carriers and drugs x 100%

EE% = weight of the drug in micelles/ weight of feeding drugs x 100%

Dispersion

Curcumin is uniformly dispersed with high DL% AND EE% [Yuwei Duan et al].

Table 1: Solubility of curcumin in oils and Surfactants Solubility

Oil	Solubility (%)	Surfactants	Solubility(%)
Soyabean oil	0.08	Tween 80	1.00
Peanut oil	0.04	Span 80	0.60
Olive oil	0.04	Cremophor EL	0.20
Castor oil	0.04	PEG 400	5.00
Coconut oil	0.04	Capmul PG 8	0.30
Almond oil	0.04	Capmul PG 12	0.25
Virgin coconut oil	0.06	Captex	0.05
Sunflower oil	0.04	Acconon MC 8/2	5.00
Sesame oil	0.04	Isopropyl Myristate	0.05

Chemical composition and pharmacological activity

The curcumin contains the mixture of diferuloylmethane, dimetossicurcumina and bis- dimetossicurcumina. It is used to treat digestive problems, dysentery etc. It prevents the formation of emboli to reduce the risk of heart-attack. It promotes the reconstruction of the tissues and prevent damages caused by the antitumor radiotherapy. It prevents the formation of cataract.

Curcumin nanocarriers

Due to anti-inflammatory, anti-oxidant properties of the curcumin they produce different cellular mechanisms. It produces different response to different cells. The main problem is that the curcumin absorbs low gastrointestinal absorption

RESULTS

The selection of materials for nano emulsion formulation is based on its pharmaceutical acceptance on ophthalmic applications. Surfactants should have the ability to decrease the surface tension of the liquid. The viscosity and refract index play a vital role ophthalmic formulation [Anjana et al].

Spectroscopic determination of curcumin concentration in nanocarriers can also be used to give indication of the extent of curcumin degradation. Curcumin formulation reduces the rate of drug release compered to free drugs in the nanocarriers. By the molar extinction the concentration of curcumin in each formulation can be determined. The encapsulated efficiency was calculated by

$$EE\% = ([C]_e / [C]_s)$$

Where, Cs-original concentration of curcumin added to the formulation.

Ce-concentration of curcumin detected spectroscopically within the nanocarriers [Benjamin et al].

High lipo-curcumin formulation is achieved when the PBS reached its highest stability level. Liposomal curcumin inhibits the growth of stimulated human lymphocyte and splenocyte proliferation [Changguo Chen et al].

The result of the antitumor activities is at the range of within the $>100-17\pm 1$, $>100-34\pm 2$ and $>100-57\pm 4$ for leukaemia lymphoma, solid tumour-derived cell lines and normal cell lines respectively.

Curcumin prepared by thin film dispersion method was found to be nano-sized shapes and uniformly dispersed.

Curcumin is not only considered as a spice sector but also it plays an important role in the treatment and prevention of many diseases and pathogens. It has been proven to be safe for the human and also solubility, stability and bioavailability is encapsulated after treated with nano polymers.

CONCLUSION

In the current study, the use of curcumin molecule in terms of safety and a multitude of medicinal activity have been well formulated and characterized for ocular application. The utilization of a nanoemulsion innovation has yielded in the steady plan of curcumin for ophthalmic application. Differs examines shows the different plans of curcumin. According to my knowledge the formulation of curcumin from nanoemulsion technology is the best method for improving the bioavailability of the curcumin. They are used as an anti-cancer and anti-oxidant properties which will be useful for several medical centers across the world.

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