ANTICATARACT EFFECTS OF ORAL MAGNESIUM TAURATE IN RAT MODEL OF GALACTOSE-INDUCED CATARACT

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Sincerely,

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CONTENT

ABSTRACT

Cataract, a condition characterized by loss of visual acuity, results from loss of lens transparency due to the denaturation of lens proteins, crystalline. magnesium deficiency coupled with increased intracellular calcium activates calpain, a protease that denatures crystalline. Dysfunction of membrane associated ATPases and increased lenticular oxidative stress are the underlying mechanisms. Since magnesium and taurine have been shown to delay the development of cataract, we evaluated the anticataract effects of magnesium taurate in galactose-induced cataract both *in vivo* and *in vitro*.

For *in vivo* study, forty-five rats of either sex weighing around 80-100g were randomly divided into three groups of 15 rats each. Group 1 received normal diet, group 2 received diet containing 30% galactose and orally administered vehicle and group 3 received diet containing 30% galactose with oral administration of magnesium taurate, 2.8mg/kg body weight, once daily for a period of 21 days. Progression of cataract was evaluated by weekly slit lamp examination was performed during this experimental period. On day 22, lenses were enucleated and were subjected to estimation of lenticular calcium and magnesium content, antioxidant parameters and histopathology. Blood was collected for serum calcium and magnesium estimation. For *in vitro* study, three groups of healthy enucleated rat lenses (n=10) were incubated in Dulbecco's Modified Eagle's Medium (DMEM) supplemented with penicillin, streptomycin and fetal bovine serum. In groups 2 and 3 lenses 30Mm galactose was added to the medium, additionally, magnesium taurate was added to the medium in group 3.

Results of both the *in vivo* and *in vitro* studies showed that treatment with magnesium taurate significantly delays the onset and progression of galactose-induced cataract in rats. Lenticular calcium

CHAPTER 1

INTRODUCTION

Cataract is defined as the clouding or opacity of the lens that leads to severe visual impairment (Khaw, Shah, Elkington, 2004). It is also one of the major causes of preventable blindness in the world (Taylor, 1993) that accounts for approximately 51% of world blindness (WHO, 2011). The prevalence of cataract increases with age; 65% of people aged 50-59 and those of age over 80 have lenticular opacities (Khaw *et al,* 2004).

There are several known systemic causes of cataract such as diabetes mellitus, galactosemia and hypoparathyroidism (Crick & Khaw, 2003). Besides that, ocular diseases including retinitis pigmentosa, prolonged uveitis, and acute angle closure glaucoma are also known to cause cataract (Crick & Khaw, 2003). Other causes of cataract include congenital such as caused by rubella infection of pregnant mothers, drug induced such as corticosteroid and amiodarone as well as mechanical or radiation-induced trauma to the eye (Malhotra, 2008).

The pathophysiology of senile cataract or age related cataract is multifactorial. However, the increased oxidative stress has been recognized as one of the major pathophysiological factor that not only interferes with structural and functional integrity of cellular proteins but also alters the membrane ionic transport. (Head, 2001) Reduced antioxidant capacity with aging predisposes to increased oxidative stress that leads to lenticular opacities by causing changes in the structure and functions of lens proteins.