

Effect of cinnamon in lowering blood glucose biology essay

[Science](#), [Biology](#)



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ABSTRACT

Cinnamon the dry bark of *Cinnamomum* spp., has been extensively used as a spice and traditional herbal medicine for centuries. It is a rich source of polyphenolics which have a positive effect on blood glucose and insulin signaling. It is also effective in controlling serum lipids. This experimental trial is planned to investigate the effectiveness of cinnamon in lowering blood glucose and lipid profile in alloxan induced diabetic mice. In this study 25 mice will be divided into 5 groups each of 5 rats i. e (G1): normal control mice, (G2): control diabetic mice injected with alloxan (70mg/Kg), (G3): 10gm/100gm diet of cinnamon powder will be administered to diabetic mice, (G4): 15gm/100gm diet of cinnamon powder will be administered to diabetic mice and (G5): 20gm/100gm diet of cinnamon powder will be administered to diabetic mice. After 1 month blood glucose and lipid profile will be evaluated in all the groups. Cinnamon would also be subjected to proximate analysis and the results will be analyzed statistically by applying appropriate statistical techniques. Introduction: Diabetes is globally the most widespread metabolic disorder whose occurrence is mounting at an alarming rate in both developed and developing countries and it is expected that the total number of diabetic people will rise from 171 million in 2000 to 336 million in 2030

(Wild et al, 2004). Diabetes mellitus is characterized by abnormalities in the metabolism of carbohydrate, lipid and lipoprotein which increases blood glucose levels (Chait and Brunzell, 1996). The beta cells of the pancreas fabricate a hormone insulin which is necessary for the utilization and storage of carbohydrates and fats. Diabetics do not effectively produce or respond to insulin, without effective insulin action hyperglycemia occurs and lead to short term and long term complications (Jawa and Fonseca, 2006; Haidara, 2006). The chronic hyperglycemia of diabetes is coupled with long-term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels (ADA, 2009). Diabetic patients experience a wide range of vascular complications, such as atherosclerosis, coronary heart disease, diabetic nephropathy and neuropathy due to hyperglycemia and hyperlipidemia which are two vital characters of diabetes mellitus (Sheetz, 2002). Diabetes mellitus is linked to profound alterations in plasma lipid and lipoprotein profile which are considered as risk factors for coronary heart disease (Betteridge J, 2002). There is amplified occurrence of lipid abnormalities in person with type 2 diabetes which is the contributing factor to the higher rates of coronary and vascular diseases. Elevated triglyceride and low density lipoprotein (LDL) levels are powerful risk predictors of coronary heart diseases which tend to increase in diabetic patients. In fact, control of serum lipids can reduce a person's risk of cardiovascular complications by 20% to 50% (ADA, 2010; ADA, 2009 and Deshpande, 2008). The quality of life in diabetic patients can be improved and symptomatic complications related to diabetes can be prevented by effectively controlling the blood glucose level (Bell, 2001). For the treatment

of diabetes numerous oral hypoglycemic synthetic drugs in conjunction with insulin are available (Mannucci et al., 2004). However, these agents are expensive and put forth some severe side effects. Efforts in the recognition of helpful antihyperglycemic agents have been concentrated on natural food products used in folk medicine (Sarma and Das, 2009; Osadolor et al., 2011 and Nyunai et al., 2011). Spices are a significant part of human diet and are frequently used in food preparations in order to enhance taste and flavor. They not only boost the taste and flavor of food but also exhibit a number of physiological and pharmacological effects (Nakatani, 2000). Spices are admirable antioxidants, which protect the body from the attacks of free radicals. It contains Phyto nutrients, which may prevent the mutation of healthy cells into cancerous cells (Zak, 2006). Among the spices, cinnamon (Darchini) is a very admired spice throughout the world belongs to the family Lauraceae and genus *Cinnamomum*. This genus comprises hundreds of species and most of them are aromatic (Jayaprakasha et al., 2002). The word cinnamon has actually been derived from the Greek word Kinnamon which means "sweet wood". Among the two main varieties of cinnamon, one is *Cinnamomum verum* or *Cinnamomum zeylanicum*, also known as 'true cinnamon' and the other is *Cinnamomum cassia* also referred to as 'Chinese cassia' (Willis, 1973). The bark of *C. zeylanicum* contain three of the main components of the essential oil which are trans-cinnamaldehyde, eugenol, and linalool which represent 82.5% of the total composition (Chericoni et al., 2005). The major component of *C. zeylanicum* bark oil, trans-cinnamaldehyde accounts for approximately 49.9% to 62.8% of the total amount (Singh et al., 2007 and Simi et al., 2004). Cinnamaldehyde, cinnamic

acid, cinnamyl alcohol and coumarin are the characteristic components of *C. cassia* bark. High contents of cinnamaldehyde (13.01–56.93 mg/g) are present in *C. cassia* bark (He et al., 2005). The bark of cinnamon either as small pieces or as powder is used as a spice or condiment. It is extensively used in medicine as a cardiac stimulant. It is also used as stomachic, germicide and carminative in the treatment of diarrhea, gastric debility, flatulence, nausea and vomiting (Purohit and Vyas, 2004). Cinnamon contains biologically active substances that have demonstrated insulin-mimetic properties. *In vitro* and *in vivo* studies have shown that cinnamon enhances uptake of glucose by activating insulin receptor kinase activity, autophosphorylation of the insulin receptor and glycogen synthase activity (Jitomir and Willoughby, 2009). Methyl hydroxy chalcone polymer (MHCP) is a water soluble poly-phenol compound, an active ingredient present in cinnamon which has an insulin like properties. It instigates insulin, triggers its receptors and work synergistically with insulin. Cinnamon also reduces cholesterol level and improves lipid metabolism (Jarvill and Karjee, 2003). Cinnamon extracts are reported to have beneficial effects on people with normal and impaired glucose tolerance, the metabolic syndrome, type 2 diabetes, insulin sensitivity and insulin resistance (Cao et al., 2010). The dietary cinnamon has the ability to decrease lipid levels by inhibiting the activity of hepatic 3-hydroxy-3 methylglutryl CoA (HMG-CoA) reductase (Lee et al., 2003). Cinnamon extract seems to have a moderate effect in reducing fasting plasma glucose concentration in diabetic patients with poor glycemic control (Mang et al., 2006). It was found that cinnamon bark extract improves glucose metabolism in fructose fed rats (Kannappan et al., 2006). It

has been reported that the use of cinnamon did not significantly alter fasting blood glucose (Blevins et al., 2007). The intake of spice mixture (10, 30 or 50 mg/day per rat) was found to improve plasma lipid profile in fructose fed rats (Rajamani et al., 2005). Objectives: The project at hand has been planned: To study the effectiveness of cinnamon in lowering blood glucose and lipid profile in diabetic mice. Review of literature: Jarvill-Taylor et al. (2001) investigated that methylhydroxy chalcone polymer (MHCP), an active compound from cinnamon functions as insulin mimetic in 3T3-L1 adipocytes. It was found that treatment with MHCP stimulated glucose uptake and glycogen synthesis to a similar level as insulin. It also activated glucose synthase and inhibited enzyme for glycogen synthesis. These results proposed that MHCP is an effective mimetic of insulin and may be useful for glucose utilization in the cell. Khan et al. (2003) studied the effect of cinnamon on 60 diabetic people, divided randomly into six groups. Three groups were given cinnamon and three placebo capsules for 40 days. The results depicted that intake of 1, 3 or 6 g of cinnamon/day reduced serum glucose and also reduced risk factors associated with diabetes, but no significant changes were seen in placebo groups. Qin et al. (2003) conducted a study to evaluate the effect of cinnamon extract on insulin action and possible changes in insulin signaling which occurred in skeletal muscle in rats. This study suggested that cinnamon extract increased glucose uptake, improved insulin action and enhanced insulin signaling pathway in skeletal muscles. Lee et al. (2003) designed a study to investigate the influence of 4-hydroxycinnamate (4-(OH)-C) on lipid metabolism in rats fed with a high cholesterol diet. The findings indicated that hepatic cholesterol and

triglycerides levels were significantly decreased by 4-hydroxycinnamate supplement. Verspohl et al. (2005) analyzed the anti-diabetic effect of cinnamomum cassia and cinnamomum zeylanicum. The extracts of both types of cinnamon were fed to rats to evaluate blood glucose and plasma insulin level under various conditions. It was concluded that cinnamomum cassia extract had a direct anti diabetic role than cinnamomum zeylanicum extract. Raza et al. (2005) examined the effect of cinnamon on total cholesterol, HDL cholesterol and LDL cholesterol levels in 75 human subjects (50 hyper cholesterolemic patients and 25 normal healthy subjects) and concluded that HDL level significantly remained elevated and LDL level lowered in both groups after treatment, thus exerting protective effect against cardiovascular diseases. Kim et al. (2006) studied the effect of cinnamon cassia extract in type 2 diabetic mice. The cinnamon extract was administered at different doses for six weeks. The mice were divided into five groups of ten. The group I mice received placebo only whereas groups II-IV were fed with 50, 100, 150 and 200 mg/Kg of cinnamon extract respectively once a day for six weeks. The results suggested that cinnamon lowers the blood glucose level and increased HDL-cholesterol level whereas concentration of triglycerides and total cholesterol decreased. Suppakitporn et al. (2006) investigated the effect of cinnamon cassia powder on serum lipid profile in type 2 diabetic patients. Sixty patients were selected and randomized either 1. 5 g cinnamon cassia powder or placebo and found that intake of cinnamon cassia powder/day did not significantly alter serum lipid profile. Babu et al. (2007) reported that administration of cinnamaldehyde at different doses (5, 10, 20 mg/kg body weight) to streptozotocin (STZ)-

induced male diabetic wister rats for 45 days significantly decreased plasma glucose concentration in dose dependent manner as compared to control rats. Baker et al. (2008) performed a meta analysis of randomized controlled trials of cinnamon to determine its impact on blood glucose and lipid parameters. Upon meta-analysis, it was found that the use of cinnamon lowers lipid levels but did not significantly alter fasting blood glucose(FBG) in type 1 or type 2 diabetic patients. Soheir et al. (2010) determined the anti-diabetic effect of cinnamon powder (CP) and cinnamon aqueous extract (CAE) in type 2 diabetic rats. For 5 weeks cinnamon was administered at different doses (5, 10 and 15 g/100gm diet of CP and 5, 10 and 15% of CAE at 2 ml/kg of rat body weight). They found that CP and CAE have lowering effect on blood glucose and lipid levels and 15% CAE used is the most efficient material. Saima et al. (2011) performed an experiment on alloxan induced diabetic rats to determine the effect of cinnamon extract on blood glucose and lipid profile. The rats were divided into three groups of ten. For six weeks, group A was given 200 mg/Kg body weight of cinnamon extract and group B was provided with 400 mg/Kg body weight of cinnamon extract. This study demonstrated that cinnamon at a dose of 400 mg showed better results in lowering blood glucose and lipid profile as compared to 200 mg of cinnamon extract. Material and method: Area of research: