Antioxidant and Anti-Inflammatory Potential of Chromium Picolinate Mediated Zinc Oxide Nanoparticle

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Authors’ contributions

This work was carried out in collaboration among all authors. Idea and study was conceptualized by authors LA and SR collection of the literature and drafting the manuscript was by authors CMA and LA. All authors read and approved the final manuscript.

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Short Research Article

ABSTRACT

Aim: To study the anti-inflammatory and antioxidant activity of chromium Picolinate mediated Zinc oxide nanoparticles.

Introduction: Chromium is required by the body in a noticeable amount, even though it’s mechanism and required dietary allowance is not known clearly. It is found in supplements. It is expected to enhance insulin production and weight loss. Zinc oxide also has its own beneficial role in various biomedical applications. In the present study the antioxidant and anti-inflammatory potential of the chromium picolinate mediated Zinc oxide nanoparticle is evaluated. Nanoparticles are of great interest nowadays in research and study. The outcomes of using metal nanoparticles were fascinating as color pigments in luster and glass technology.

Materials and Methods: DPPH assay for antioxidant activity and Protein denaturation assay was performed for anti-inflammatory activity.

Results and Discussion: Chromium Picolinate mediated Zinc oxide nanoparticles showed good anti-inflammatory and antioxidant activity at higher concentration against standard.

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1. INTRODUCTION

The structure of chromium Picolinate is that it is attached to three molecules of picolinic acid. It has been considered a micronutrient for mammals since 3-4 decades. Recent studies indicate that it has a crucial role in carbohydrate and lipid metabolism. It is an alternative form of chromium which could be comparatively easily absorbed by our body. Due to this, it is available in supplement forms [1]. The problem with chromium is that the deficiency of chromium in our body cannot be easily identified like any other deficiency and so it can only be monitored through supplements to determine the correct chromium status of an individual [2]. Many studies have suggested that 2-3 months of chromium supplementation has no significant effect on the diabetic patients [3]. As chromium is involved in the metabolism of fats, lipids and carbohydrates, it is believed that it has effects on eating behavior and so it is an ongoing research to know about the weight loss efficiency of chromium. It was concluded that there was an appreciable unbelievable outcome which was not clear still [4]. Zinc oxide nanoparticles have a great efficiency due to their small size and large surface area and are widely used in various fields [5]. Its size ranges from hundreds of nanometers to tens of micrometers. Zinc oxide films and nanoparticles together have applications in the industries like photocatalysis, photochemistry, luminescent devices etc [6]. It is involved in insulin receptor activation and increases the activity of insulin [6,7]. It is associated with the metabolism of carbohydrates, lipids and proteins. The deficiency of Chromium leads to growth retardation, decreased glucose tolerance. Trivalent inorganic Cr is digested and absorbed about 3% [8]. Chromium picolinate acts as a source for the supplementation of chromium. It proves to reduce hyperglycemia, stabilize blood glucose levels [9]. Chromium is available in both organic and inorganic forms. Even though predominant form being organic, it is digested and absorbed only in 9% [10]. The size of the nanoparticles is more than enough for it to get easily absorbed in the mucosa. Various reports have suggested that nanosized particles are easily absorbed [11]. Dabda and Labhasetwar demonstrated that nanoparticles due to their small size are absorbed more efficiently than other forms of drug [12]. The factors that play an important role are size, shape, morphology, electronic, physical, chemical, optical properties [13]. The major advantages of zinc oxide is that it is cheap, nontoxic, abundantly available, and the ability to prepare compound [14].

2. MATERIALS AND METHODS

2.1 Chromium Picolinate Extract Preparation

Chromium picolinate is taken which is in powder form, then it is mixed with surfactant qualinind and then kept in the stirrer for a long time nearly 3 to 5 readings have been taken.

2.2 Evaluation of Antioxidant Activity

DPPH radical scavenging assay was performed to monitor the antioxidant potential of plant crude extract. DPPH is a stable lipophilic free radical, nitrogen entered with purple colour. The anti oxidant can donate an electron to DPPH radical and the change in the absorbable at 517nm will follow. Colour changes to pale yellow gradually. 50% methanol, DPPH solution and Zn nanoparticles were added ranging from 10-50 microliters. It was then kept in a dark place for 10 minutes and the reading was noted based on the photometric analysis.

2.3 Evaluation of Anti Inflammatory Activity

The synthesized compounds are screened for anti-inflammatory activity by using inhibition of albumin denaturation assay. The standard drug and test compounds were dissolved in a minimum amount of dimethyl formamide (DMF) and diluted with phosphate buffer (0.2 M, pH 7.4). Final concentration of DMF in all solutions was less than 2.5%. Test solution (1 mL) containing different concentrations of drug was mixed with 1 mL of 1 mm albumin solution in phosphate buffer and incubated at 27 ° ± 1 °C in BOD incubator for 15 min. Denaturation was induced by keeping the reaction mixture at 60 ° ± 10 °C in water bath for 10 min. After cooling, the turbidity was measured at 660 nm (UV-Visible Spectrophotometer). Percentage of inhibition of denaturation was calculated from control where no drug was added. The diclofenac sodium was used as a standard drug.
3. RESULTS AND DISCUSSION

The graph represents the antioxidant activity of chromium picolinate compounds. As represented above, the lowest concentration (10 microlitres) has achieved 81% efficiency and as gradually the concentration increases, the highest concentration (50 microlitres) reached 87% which is close to that of the standard. Therefore, it shows to have potential antioxidant property.

Fig. 1. Graph showing antioxidant activity of chromium picolinate mediated zinc nanoparticle

Fig. 2. Graph showing anti-inflammatory activity of chromium picolinate mediated Zinc nanoparticle
The graph represents the anti-inflammatory activity of chromium picolinate compounds. As indicated above, the lowest concentration 10 microliters have achieved 60% whereas the highest concentration 50 microliters shows equipotent effect to that of the standard. Therefore, it shows to have potential anti-inflammatory activity.

4. CONCLUSION

The current study shows it is evident that chromium picolinate mediated Zinc oxide nanoparticles is an efficient antioxidant and anti-inflammatory drug. Hence it can be used for further research and has an application of being a potential compound.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

9. Berner TO, Murphy MM, Slesinski R. Determining the safety of chromium tripicinate for addition to foods as a nutrient supplement. Food and Chemical Toxicology. 2004;42:1029–1042.