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Effect of Gold Nanoparticles on Serum Lipid Profilein Albino Mice

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Abstract: Triglycerides and lipoproteins are threat features for Cardio Heart Disease. The word "nano" is derived from the Greek word "nanos" which means slight and it is used as introduce for one billionth part (10-9). Conferring to American Society for Testing and Materials. Nanoparticles are those atoms which have two or more than two dimensions and are in the magnitude range of 1-100 nm. lipid profile was measured by enzymatic method with using diagnostic kit from (BioMareuix, France). Gold nanoparticles were synthesized by chemical reduction, typically performed by reducing HAuCl4 in aqueous solutions using inorganic reducing agent. The results revealed a significant impact of gold nanoparticles on total cholesterol, LDL, HDL, triglycerides and VLDL. The gold nanoparticles have cardio-protective and cardio-risk impact. Because it can increase the level of good cholesterol (HDL) and bad cholesterol (LDL).

Keywords: Gold Nanoparticles, Total Cholesterol, LDL and HDL

Introduction

Triglycerides and lipoproteins are threat features for Cardio Heart Disease. It has been confirmed that low concentration of HDL cholesterol and the elevated levels of serumtriglycerides (TG), total cholesterol (TC), very-low-density lipoprotein (VLDL), LDL cholesterol and greater than normal level of body mass index (BMI) are ominously accompanying with Cardio Heart Disease (De Backer *et al*., 2003). Dyslipidemia is one of the topmost five key risk features leading to cardiovascular disorders. It is regarded by high triglycerides, LDL cholesterol and decreased HDL cholesterol. In the item of several disorders like DM, CHD, other diseases of CVD (George and Ludvik, 2000). Lipid irregularitiesominouslyplay a role in the amplified risk of cardiovascular disease and other illness in diabetics. chylomicrons (CM) and VLDL are main causes of fatty acid resource to the heart (Haffner *et al*., 1998). Females and Males look to be similarly inclined to the special effects of risk factors such as low levels of plasma HDL cholesterol accompany with increasing plasma LDL cholesterol, hypertension (Johnson *et al*., 2004; O'Brien *et al*., 2003; Radhika *et al*., 2009).

The word "nano" is derived from the Greek word "nanos" which means small and it is used as the prefix for one billionth part (Di Guglielmo *et al*., 2010; Kim and Jon, 2012). Rendering to American Society for Testing and Materials (Khan *et al*., 2014), nanoparticles are those particles which have two or more than two dimensions and are in the size range of 1-100 nm (Khan *et al*., 2014; Alanazi *et al*., 2010). These particles have distinct and improved chemical and physical properties as matched to their bulk materials owing to their great sensitive and quantum size influence and wide-open surface area as a result of precise microelectronic structures. These particles devise been broadly used in several fields such as photochemical, electronics, chemistry and biomedicine (Alanazi *et al*., 2010). Inorganic nanoparticles and blend of inorganic nanoparticles with organic materials to form hybrids take soleelectrical, optical, chemical and physical properties which sort them different and more appropriate than hefty size materials (Di Guglielmo *et al*., 2010). Nanoparticles are showed to be hopeful multi-functional stand since they can be used for numerous therapeutic and imaging functions (Kim and Jon, 2012). These kinds of stands can be manufactured by alteredinorganic or hybrid of organic, inorganic and organic materials but midst altogether these inorganic stands are of maximum significant for simultaneous therapy and diagnosis (Khlebtsov and Dykman, 2010) because of their tranquil adjustment, (Tedesco *et al*., 2010) extraordinary medication loading capability and stability (Mendoza *et al*., 2010; Hartono *et al*., 2010).

Materials and Methods

A total number of 20 adult healthy male albino mice weighing (27±2 g) obtained from the Institute of Embryo Researches and Infertility Treatment, AL-Nahrain University and used throughout this study. The mice were randomly divided into 2 groups of 10 animals each. Group 1: Served as the Control and received 0.1 mL of distilled water intraperitoneal injection daily for 5 days. Group 2: Received 0.1 mL of GNPs Au nanoparticles intraperitoneal injection daily for 5 days. The measurement of serum (total cholesterol, HDL, LDL done by using diagnostic kit (BioMareuix, France).

Preparation of Aqueous Gold Nanoparticle

Chemicals

Research chemicals were supplied by HIMEDIA company-India and MERCK Company-Germany.

Instruments

UV-Vis spectroscopy (Shimadzu, Japan), Atomic force microscope (AFM); (SPM AA 3000, USA); Transmission electron microscope (TEM); (Philips CM 100, Holland) and Zeta potential analyzer (Brook haven ,USA) are used for the characterization of AuNPs.

Preparation of Aqueous Gold Nanoparticles

About 0.25 gm of poly acrylic acid was dissolved in 250 mL distilled water and the solution was heated up to the range 60-70°C. The pH of solution was adjusted to 7-8 by adding few drops of 5% sodium hydroxide solution. To this mixture 3.6 mL of 10 mM $HAuCl_4.3H_2O$ (99%, HIMEDIA, India) were added drop wise with continues stirring. After 20 min the color of the solution was changed from pale yellow to ruby-red color, indicating the formation of AuNPs.

Characterization of Gold Nanoparticles

AuNPs were characterized by UV-Vis spectroscopy (Shimadzu, Japan), Zeta potential analyzer (Brook haven, USA), Atomic Force Microscope (AFM) - (SPM AA 3000, USA), Transmission Electron Microscope (TEM) and (Philips CM 100, Holland)

Results and Discussion

The exposure period of 5 days, the special effects of intraperitoneal administration of 0.1ml of Gold Nano-Particles on the blood serum of rats were estimated through the measurement of several biochemical parameters such as Triglycerides, cholesterol, HDL, LDL and VLDL.

In this study, the (Triglycerides, total cholesterol, HDL, LDL and VLDL)values increased with the administration of 0.1 mL of Gold Nano-Particles (79.88±1.3), (54.98±1.68), (43.69±1.15), (48.38±2.04), (18.38±1.26) respectively compared with the control as shown in Table (1).

Table 1: The mean ±SD of Lipid Profile for the studied groups

Parameters	Mean ±SD Control Group (N=10)	Mean ±SD Treated Group (N=10)	p-value
<0.01	79.88±1.32	68.42±1.65	Total Cholesterol
<0.01	54.98±1.68	41.48±2.28	Triglyceride
<0.01	43.69±1.15	32.78±2.20	HDL
<0.01	48.38±2.04	37.88±1.58	LDL
<0.01	18.38±1.26	11.32±1.86	VLDL

This study proposes that the liver might be to some extent injured with the administration of GNPs and the GNPs have a straight influence on the liver task that come to an agreement with study done by Toth (2005).

In comparison to controls, rats exposed to gold nano-particles displayed higher HDL-cholesterol concentrations in plasma until day 5. The evidence for GNP -induced disruptions in lipid metabolism is shown in the increase of cholesterol, HDL and LDL levels and increase in triglycerides. The various forms of lipids cannot liquefy in the blood and essential transported to/and from the cells by low-density and high-density lipoproteins. High-density lipoprotein cholesterol (HDL-C) have a tendency to transport cholesterol away from the arteries retain to the liver. Consequently, in elevation serum cholesterol level can be accomplished owing to hepatic dysfunction (Le and Walter, 2007). HDL permits fats like triglycerides and cholesterol to be transported surrounded by the water-based bloodstream. HDL units are capable to take away cholesterol from inside artery atheroma and transport it back to the liver for secretion or re-consumption, which is the chief goal for calling that cholesterol carried inside HDL particles (HDL-C) “good cholesterol” (even though the statement that it is closely matching o cholesterol in LDL particles).

Those with advanced levels of HDL-C appear to have rarer difficulties with cardiovascular diseases despite the fact those with low-slung HDL-C cholesterol levels surge the amount of heart disease (Graham *et al*., 2007). Once LDL particles are inside the blood vessel walls and oxidized by free radicals, they see minnocuous. In forgoing studies, it has been described that the administration of additional metals such as lead and cadmium to experimental animals affects lipid metabolism (Rogalska *et al*., 2009).

Conclusion

The gold nanoparticles have cardio-protective and cardio-risk impact. Because it can increase the level of good cholesterol (HDL) and bad cholesterol (LDL).

Author’s Contributions

Ammal Esmaeel Ibrahim, Shatha M Hasan and Taha Shawi Morad: Data-analysis and contributed to the writing of the manuscript.

Dhelal A Shabeeb: Research plan and organized the study.

Shatha M Hasan: Mouse work.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and there are no ethical issues involved.

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