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Effect of Gold Nanoparticles on SW480 Cell by using Turkevich Method

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Abstract: This study was conducted to evaluate the efficiency of minutes gold nanoparticles on SW480 cell of developing cancerous cellular lines for different concentrations lap times. This study suggests that minutes gold nanoparticles a good candidate as a medical application against cancer and need additional studies. Our results obtained a protocol for generation of highly stable AuNPs that had an average diameter of 5 nm generated by SW480 cell line after exposure to various concentrations of AuNPs were high than of cells treated by AuNPs. The results suggest AuNP is an effective system to reduce stress in cells. The devices used for the results of synthesizing the gold nanoparticles with or without coating by nano the effect of its concentration and the effect of Hydrogen Chloride or Hydrochloric acid ($HAuCl_4$) and sodium chloride (NaCl) on the absorbance of surface plasmon resonance are: UV-visible spectroscopy, FTIR, Scanning Electron Microscope (SEM).

INTRODUCTION

Gold nanoparticles (AuNPs) have been used, since, ancient times to make stained glass but it was long assumed that the color of the gold suspension was a result of the chemicals used to prepare it[1, 2]. In 1857, Michael Faraday produced the first pure sample of gold colloid and discovered that its color is due to the size of the gold particles[3, 4]. Now a days, nanoparticles are extensively studied for the distinct properties that many materials exhibit on the nano-scale. The properties are most important to the AuNPs synthesized during this study are the plasmonic properties and the surface enhanced (FTIR) of the nanoparticles[5, 6]. The plasmonic properties of gold nanoparticles depend on the size and shape of the nanoparticles making the synthesis of specific sizes and shapes of nanoparticles an important area of research[7, 8]. Surface enhanced FTIR depends heavily on the local geometry of the nanoparticle[5]. Scanning Electron Microscopy (SEM) use electrons instead of light waves to generate magnified images[9, 10]. Use magnetic lenses to deflect the electron beam where the electrons are reflected from the surface of sample and the secondary electrons or X-rays emitted from the sample surfaces are detected by the detector[11,12].

MATERIALS AND METHODS

The gold nanoparticles were synthesized as a solution by chemical procedure known as Turkevich method. This method is simple and produced a spherical gold nanoparticles[13, 14]. The 150 μL chlorauric acid solution +50 mL deionized water (heat up to 100°C). The 500 μL trisodium citrate dehydrate solution (stir with heating at 100°C). Clear solution turns into red color indicating of gold nanoparticles.

Preparation of SW48 cell line for cytotoxicity assays: SW480 cell line was obtained as a gift from Dublin University in Ireland in frozen vial transmitted with dry ice in cool box. It was grown in 25 mL culture flask with growth medium containing 10% FBS and antibiotics, incubated at 37°C. The cell line cryovial was taken from fluid nitrogen compartment with alert and straight for wardly set into a beaker containing warmed sterile D.D.W at 37°C, until defrosting. The vial was expelled from the water and outside. Immediately, the cell suspension substance of the vial was pipette under air flow laminar stream hood into a 15 mL sterile tube that contains 10 mL of growth medium at 37°C.

Centrifugation was done at 800 rpm for 10 min and the supernatant was suctioned and tapped. The cells pellet was re-suspended into new complete growth media that contain 10% FBS at 37°C and moved into mL measure cell culture flask then incubated in the incubator at 37°C and the complete growth media was supplanted to the next day[15].

Characterized gold nanoparticles: Gold nanoparticles were measured the particle size light absorption measured by UV spectrophotometer at wavelength 400-800 nm. The devices used for the results of synthesizing the gold nanoparticles with or without coating by nano its concentration and the effect of Hydrogen Chloride or Hydrochloric acid (HCl) and Sodium Chloride (NaCl) on the absorbance of surface plasmon resonance are: UV-Visible spectroscopy, FTIR, Scanning Electron Microscope (SEM).

RESULTS AND DISCUSSION

UV-Visible spectroscopy for absorbance of surface plasmon resonance of gold nanoparticles: The volumes withdrawed from AuNPs stock solution 100 µL of molarity 0.354 µM, respectively and the volume of trisodium citrate dihydrate stock solution is 500 µL of molarity 35 mM. The volume stock solution ratio TCD/AuNPs. From the curves of Fig. 1a when the volume ratio is increased the surface plasmon resonance shift to the right or red shift occurred, the result agree with and shown Fig. 1b transmutation of AuNPs.

Scanning electron microscope for shape and size of gold nanoparticles: The SEM device shows a monodisperse and spherical shape, agree with Jingyue and Bernd[16] for the two solutions of 0.531 µM of chloroauric acid while the SEM device shows the size of gold nanoparticles of 0.531 µM. The sizes 5 nm for AuNPs as shown in Fig. 2.

FTIR measurement: The AuNPs synthesized by TENSOR 27 (Germany company) were subjected to FTIR analysis to identify the biomolecules involved in stabilizing the nanoparticles in solution. The AuNPs synthesized by mushroom extract yielded strong bands at 3413.37 and 2066.89 cm^{-1} in Fig. 3. The band at 3500-3400 cm^{-1} is for bond of O-H stretching, the bands at 3.413 cm^{-1} correspond to carbonyl and hydroxyl functional groups in alcohols and phenol derivatives and the band at 2000-2500 cm^{-1} is for bond of C≡C

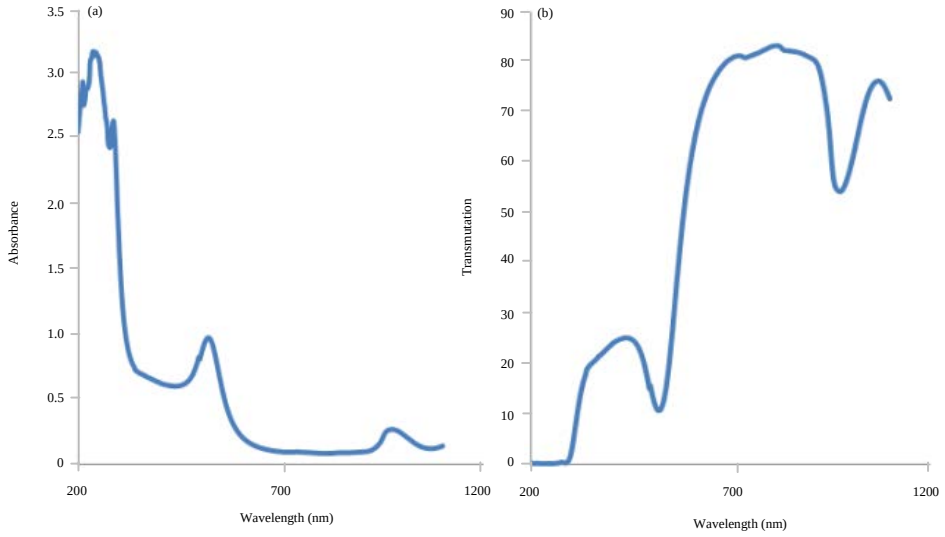

Fig. 1(a, b): (a) The SPR absorbance of AuNPs and (b) Transmutation of AuNPs

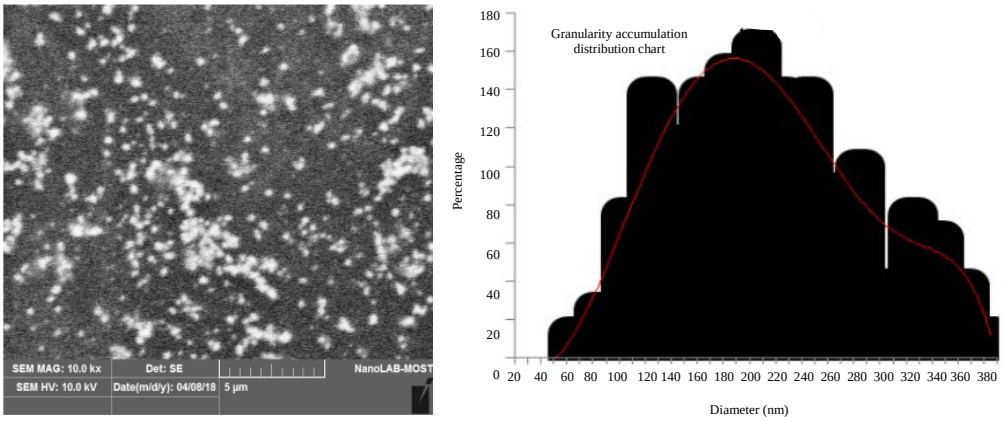

Fig. 2: SEM for 0.531 µM of AuNPs

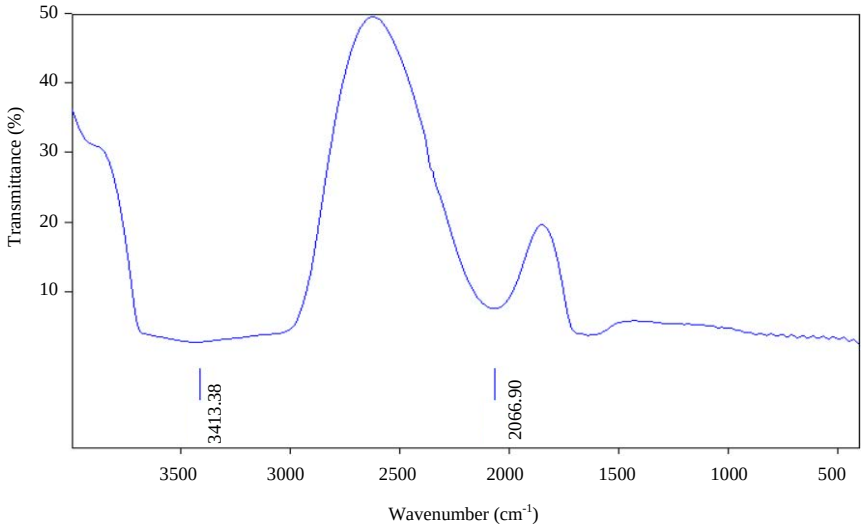

Fig. 3: FTIR measurement

stretching and C ≡ N. It is well known that proteins can bind to AuNPs either through free amine groups or cytokine residues in the proteins[17].

Treatment of Vero cell: Vero cells line is a normal cells and treated with a different concentrations of gold nanoparticles. The purpose of this part of research to determine the best concentration of gold nanoparticles after exposure the Vero cells or less cytotoxicity.

The effect of gold nanoparticles concentration of size 5 nm on Vero cells: In Fig. 4 six different concentrations of gold nanoparticles of size 5 nm is used 1000, 500, 250, 125, 60 and 30 µg mL^{-1} at time 24 h. It shows that the concentration 1000 µg mL^{-1} has a high effect in killing the Vero cell where the percentage of cells inhibtion is 38.74% and this concentration can not be the lethal concentration of killing the normal cells, this agree in method with while the concentration 50 µg mL^{-1} can be considered a nontoxic concentration (97.6% a cell proliferation is occurred comparing to the other concentrations) while the rest concentrations have a less percentage of cells survival than 50 µg mL^{-1} (<100%). A different concentrations of gold nanoparticles of sizes 5 nm. The purpose of this is to determine the lethal concentration or the cytotoxicity.

In Fig. 5 six different concentrations of gold nanoparticles of size 5 nm is used 1000, 500, 250, 125, 60 and 30 µg mL^{-1} at time 48 h. It shows that the concentration 1000 µg mL^{-1} has a high effect in killing the Vero cell where the percentage of cells inhibtion is 59.21% and this concentration cannot be the lethal concentration of killing the normal cells, this agree in method with while the concentration 50 µg mL^{-1}

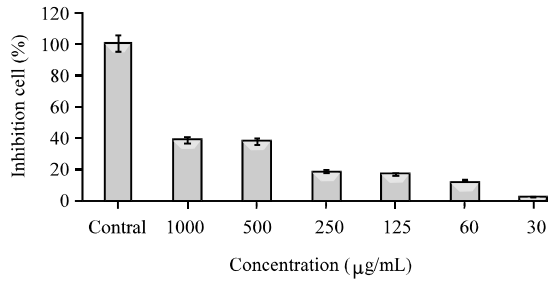

Fig. 4: The effect of gold nanoparticles concentration of size 5 nm on Vero cells at time 24 h

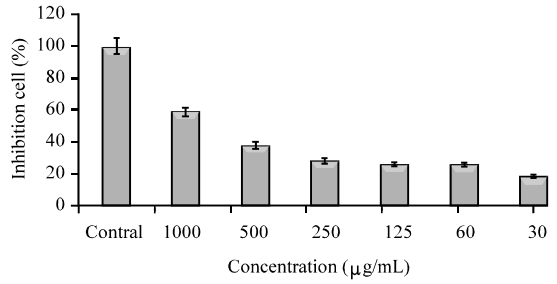

Fig. 5: The effect of gold nanoparticles concentration of size 5 nm on Vero cells at time 48 h

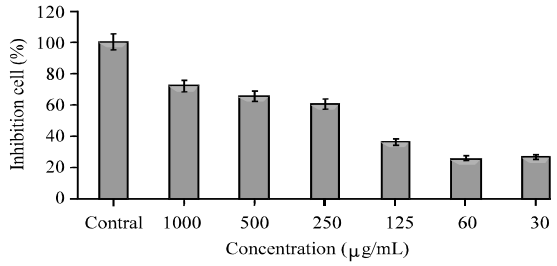

Fig. 6: The effect of gold nanoparticles concentration of size 5 nm on Vero cells at time 72 h

can be considered a nontoxic concentration (81.91% a cell proliferation is occurred comparing to the other concentrations) while the rest concentrations have a less percentage of cells survival than 50 μg mL^{-1} (<100%).

In Fig. 6, six different concentrations of gold nanoparticles of size 5 nm is used 1000, 500, 250, 125, 60 and 30 μg mL^{-1} at time 72 h. It shows that the concentration 1000 μg mL^{-1} has a high effect in killing the Vero cell where the percentage of cells inhibtion is 71.7% and this concentration can not be the lethal concentration of killing the normal cells, this agree in method with while the concentration 50 μg mL^{-1} can be considered a nontoxic concentration (73.3% a cell proliferation is occurred comparing to the other concentrations) while the rest concentrations have a less percentage of cells survival than 50 μg mL^{-1} (<100%).

CONCLUSION

Accordingly, TEM images are of higher resolution than SEM images[18, 19], the device used scanning electron microscope, model Quanta 450, Origon Company, USA.

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