RESEARCH ARTICLE

Synthesis and Characterization of Co-polymer of (Albumin-PVP) as Carriers for Different Antibiotics

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ABSTRACT

In this work, a new drug polymer was prepared from the reaction of Albumin with polyvinylpyrrolidone (PVP) and maleic anhydride and substitution with different antibiotics. It is used to treat several bacterial infections. Modifications of drug delivery to redirect the antibiotic of the circulation and target it to cells, tissues, or organs where infection happens might lessen the chance for the Fluor quinolone to travel to bone and cartilage. This plasma protein can transmit medicines like ibuprofen, warfarin, naproxen chlorpromazine, and Binding of the composites to change albumin, their targeting influence, and circulation time. Study the properties physical of polymer-drug was characterized via hydrogen nuclear magnetic resonance (HNMR), Fourier transform infrared spectroscopy (FTIR). The controlled release rates of polymer-drug were studied in several values of pH of four days at 37ºC and the thermal stability of drug-polymer.

Keywords: Albumin, Antibiotic, Co-polymer, PVP.

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INTRODUCTION

Albumin is the most abundant protein in plasma, and human plasma represents more than half of the protein.[1,2] Albumin is being studied in a wide range because it is a protein transporter in drug delivery. Albumin is considered a strong protein because of its stability at the acidic function.[3,4] It bears high temperatures up to (60ºC) for long periods up to ten hours or more without any side effects and is not affected by natural factors and solvent concentrations with high concentrations. Albumin is one of the most important drugs used to treat cancer.[5] After its development, albumin capsules were used as an anti-inflammatory to deliver drugs. Many researches were studied for the treatment of cancer diseases by using nano-albumin. Albumin nanoparticles loaded with aspirin were prepared via the cohesion process. The particle size range is 47 to 191 nm by an albumin/aspirin ratio of 0.06 to 1.00. Aspirin is released from nanoparticles at a constant range and over long periods with a total cumulative release of about 50% for 20 hours.[6,7] Albumin is commonly utilized as a carrier drug. The drug is either coupled to single albumin particles or treated to produce albumin nanoparticles with sizes over 100 nm.[8,9] Normally, albumin is denatured and recombined by a drug, producing a monodisperse polymer carry 23 to 30 (Figure 1). Albumin is often a carrier drug and not only because of its abundance in the body.

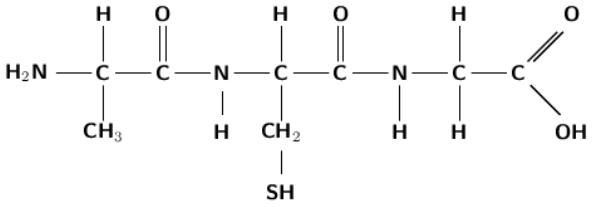

Figure 1: Chemical structure of Albumin

Albumin is used in human serum as a chemical found in the turmeric plant. It is usually a safe medicine and has also been used extensively for centuries as a spice. For example, one of its qualities is antioxidant, anti-inflammatory, and anti-amyloid. Its use has become important in recent periods due to its importance. It was found that curcumin contains a powerful ant. There are several types of albumin due to its frequent use.[12] However, its frequent use in large quantities causes unwanted side effects.[13] Colloidal substances such as gelatin are poorly stretched in size and may cause allergic reactions. Examples of colloidal PEs are dextran and hydroxyethyl starch. Human serum albumin (HSA) is one of the classes of natural colloidal substances taken from the blood of a person, after it is naturally produced by the liver, about (50%) of the total plasma protein.[14] It was found that HSA increases the risk in patients with severe burns and that more HSA is in patients with increased vascular permeability.[15-18]

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MATERIAL

Wholly chemical was of grade reagent and utilized as received. bovine albumin serum (B.S.A, Sigma, >97%) maleic anhydride (Fluka, >98%), dimethyl sulfoxide (DMSO, Ajax, 98%), ammonium persulphate (Sigma-Aldrich, >99%), amoxicillin, 4-aminoantipyrin, salbutamol, trimethoprim) HNMR spectra were limited by utilizing a Bruker A.C.F300 (300 MHz) spectrometer, which utilized C.D.Cl3 as solvent. wolloy shifts chemical was chosen in mg/L (δ) relative to tetramethylsilane (δ = 0 mg/L), referenced to the shifts chemical of residual resonances of the solvent.

EXPERIMENTAL

To prepare graft polymer of (Maleic anhydride-VP) a Maleicanhydride (0.3 mol, 30.0 g) was suspended of toluene in 150 mL and the mixing take to 80°C and mixed with N-polyvinylpyrrolidon dissolved in 15 mL of DMSO a few drops of ammonium persulfate as an initiator then stirred about 2 hours at 75°C. The white viscous product polymer was washed with diethyl ether and dried at room temperature. Albumin in 7 mL (0.5 µmol, 33 mg) of (PBS), (pH 7.4) buffer was mixed and cerium (1V) ammonium sulfate dihydrate as a catalyst and 3 (0.180 mmol, 0.025 g) as an initiator for 3.5 hours at 111°C. The process was employed: to a previously flamed tube equipped by a bar magnetic stirring, the degassed monomer, catalyst, and initiator were additional in the order mentioned After the polymerization, the mixing was diluted by THF precipitated into an extra quantity of methanol cold. The polymer was isolated via filtration and dry in a vacuum oven at room temperature.

B-substitution of Maleic Anhydride- Co-PVP-Albumin with Amino and Hydroxyl Drug:

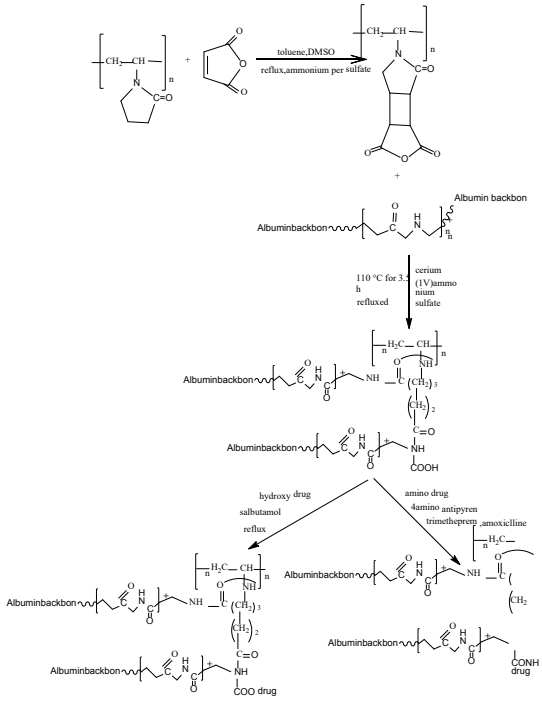
About 3 mg of poly (Maleamic co PVP-Albumin) dissolved in 10 mL of dimethylsulfoxide (DMSO) a few drops of thionyl chloride then refluxed the mixture about 10 minutes, (1.5 gm) of (4-amino antipyren) dissolved in 5 mL of DMSO mixed with polymer the mixture refluxed about 2 hours the result polymer drug washed by ethanol absolute and then dried at room temperature. Other drugs (salbutamol, trimetheprem, amoxicllin) are prepared in the same procedure.

Measurement of Drug Release Rate from Polymer Conjugated:-

A 0.5 g of the polymer protein curcumin carrying solution nanoparticle was dialyzed in 200 mL of PBS at 37°C, (pH = 7.4) buffer. The samples taken out of the membrane tube at several time points over the four days, were dry and re-dissolved in dimethylformamide (DMF). The sample was then analyzed through UV-vis spectrophotometry and found calibration curve at best absorbance.

RESULT AND DISCUSSION

Poly-(N-vinyl-2-pyrrolidinone) is hygroscopic as powder white, forming hard films clear. The properties Physical are estimated on powder films. PVP is a bulky, nontoxic,[19] nonionic[11] polymers by functional groups[12] C-N, C=O, CH2. The molecule PVP has a strong component hydrophilic, considerable hydrophobic group. PVP is a great stabilizer. This work, including grafting of PVP and maleic anhydride, modification of PVP with maleic anhydride was carried out by grafted co-polymerization utilizing ammonium per sulfate as an initiator and ring-opening of maleic anhydride and PVP with amino groups of Albumin to produce a grafting of natural polymer amino group, its nucleophile attack as explained in the following Scheme 1. Drug co-polymer was prepared as drug delivery at a rate sustained, targeted drug delivery at precise sites to minimalize toxicity, and improved selectivity by needed properties (Figure 2–11). FTIR spectrum of compounds showed broader band at 3433, 3387, and 3305 cm^{-1}, which was assigned to OH group, the asymmetric and symmetric stretching bands of NH_2, and NH groups and at 1658 cm^{-1} due to CO-NH and the other bond was shown in Table 1. The spectrum ^1H NMR



Scheme 1: Reaction of N-vinyl-2-pyrrolidinone with maleic anhydride and substitution with amino drug and hydroxyl drug

Table 1: The FT-IR spectra data cm^{-1} of the prepared compounds (1-4)

Compd. No.	*υ(NH) amine*	*υ(C=O)*	*υ(N-H)*	*υ(C=N)*	*υ(C=C)*	*others*
C1	3421	1681	3309	1551	1527	υ(OH) 3259
C2	3460	1689	3286	1647	1600	-
C3	3267	1685	3475	1612	1612	υ(OCH3) 1346, 1311
C4	3476	1685	3286	1585	1508	υ(OCH3) 1384, 1361, 1303

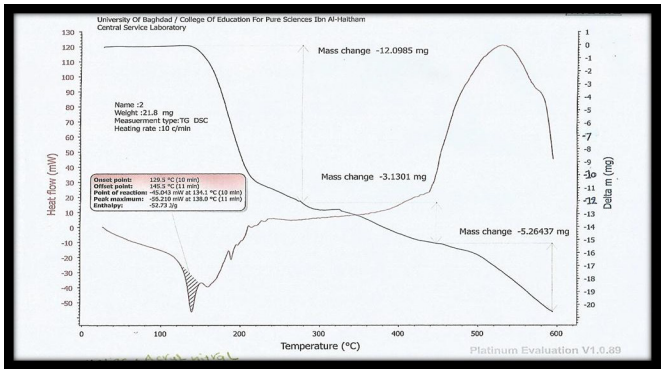


Figure 2: TG and DSC Thermo gram of Poly(PVP-maleic anhydride)

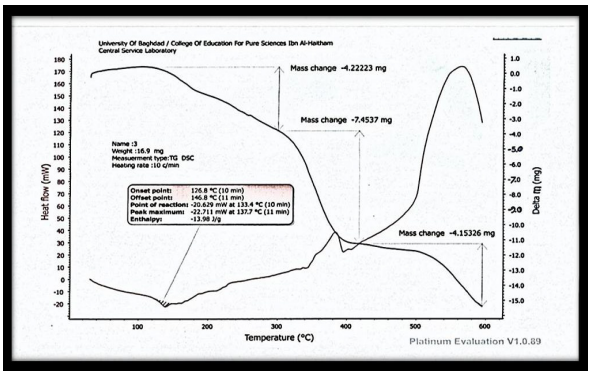


Figure 3: TG and DSC thermo gram of Poly (PVP-maleic anhydride-Albumin) with amoxicillin

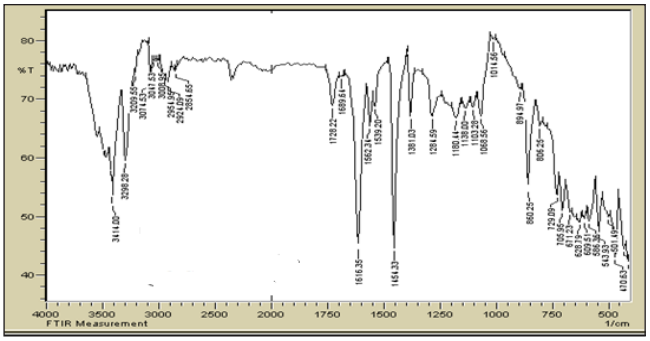


Figure 4: Poly (PVP-maleic anhydride-Albumin) with 4-amino antipyren

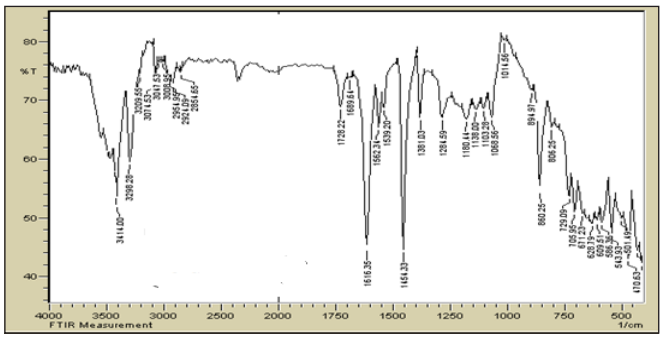


Figure 5: Poly (PVP-maleic anhydride-Albumin) with amoxicillin

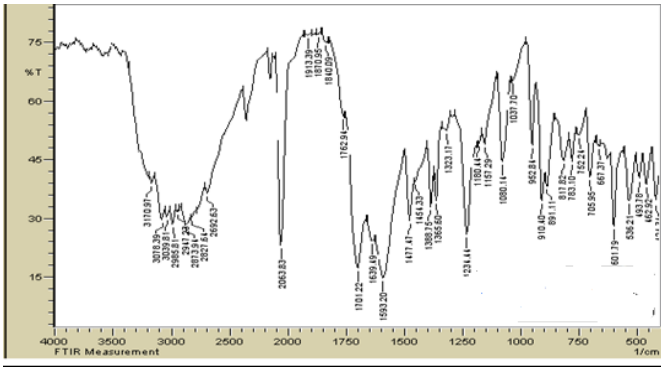


Figure 6: Poly (PVP-maleic anhydride-Albumin) with trimetheprum

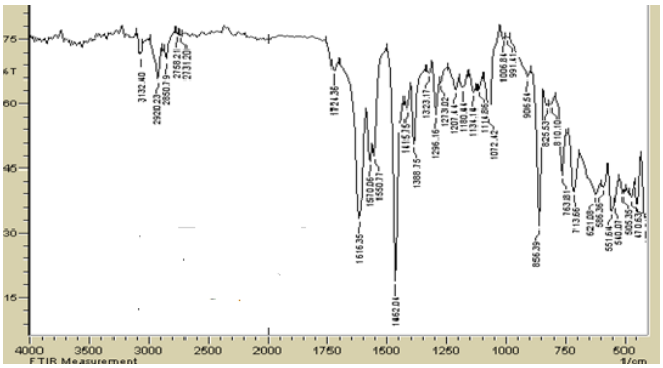


Figure 8: Poly (PVP-maleic anhydride-Albumin)

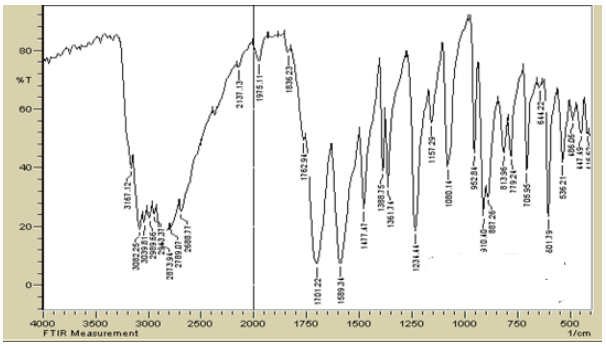


Figure 7: Poly (PVP-maleic anhydride-Albumin) with salbutamol

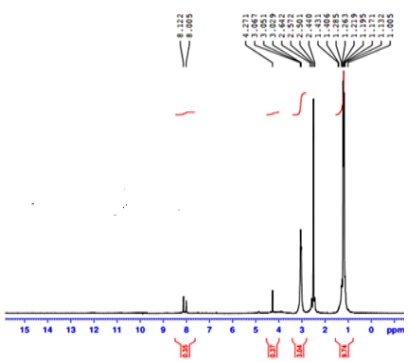


Figure 9: Poly(PVP-maleic anhydride-Albumin)

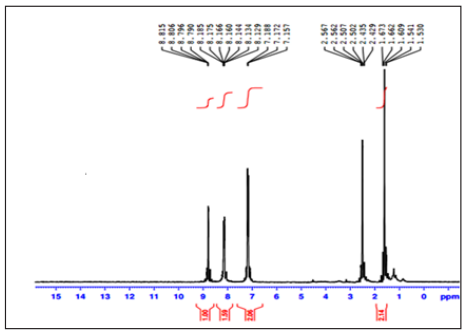


Figure 10: Poly (PVP-maleic anhydride-Albumin) with amoxicillin

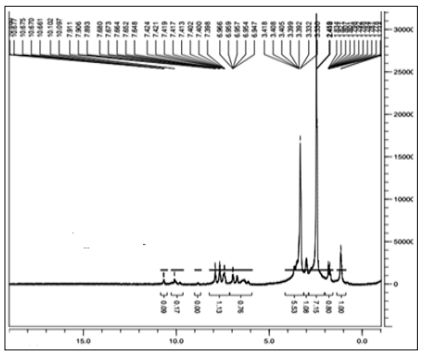


Figure 11: Poly(PVP-maleic anhydride-Albumin) with salbutamol

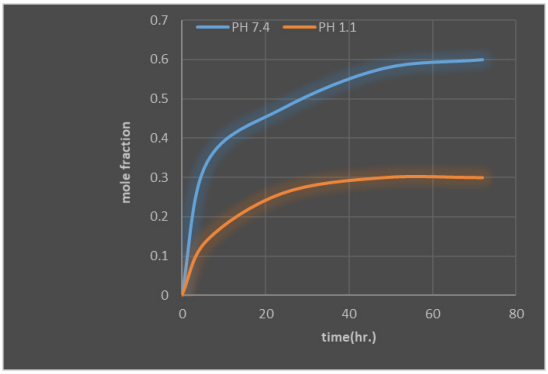


Figure 12: Drug release of copolymer of (Albumin–PVP-male amic)with trimetheprum

(δ-ppm) of the compound) appear signals at δ1.79 (3H-singlet) for CH_3, and δ4.48 (1H- singlet) for C-H pyrane. The aromatic protons (9H- multiplet) appeared at δ6.97–7.68, while the NH_2 was singlet at δ6.79. The spectrum showed the singlet signals at δ12.05 and δ9.28 were assigned for NH and OH protons, respectively. Moreover, other compound was showed in Figure 12.

CONCLUSION

The present study amis to achieving of some New Synthesis and Characterization of co polymer of (Albumin-PVP) as Carriers for different antibiotic and substituted with different drugs. Some of the synthesized compounds gave acceptable FT-IR, ^{1}H-NMR that matched data reported in the construct to references.

The drug release for synthesized polymers were estimated to recognize if these compounds will have medical application

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