Performance Measured Using Some Parameter With Handling of Drug Chitosan Microsphere

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Abstract: -This research worktargeted the preparation and characterization of vancomycin chitosan microspheres by internal gelation processusing sodium Tripolyphosphate (TPP) and KOH as cross-linked agents. The chitosan-KOH microspheres were reliable,spherical with a regular shape, while the chitosan-TPP microspheres had brain-like properties.Cumulative percentage release increased with the increase in drug concentration up to 1.5% (w/v) and the n decreases at 2% (w/v) as listed in table 1, maximum at drug conc. 1.5% (w/v), 86.05%.

Keyword:Metformin, drug, chitosan, TPP, polymer concentration

I. INTRODUCTION

Bioactive proteins and peptides are a rapidly growing class oftherapeutic agents. Though only a few are currently marketed,there are hundreds under clinical test. Most of them, however,are administrated by venially or parenteral injection because their bio availabilities via orally administration are generally verylow. They are easily degraded by photolytic enzymes in thegastrointestinal (GI) tract and are impermeable to the intestinalmucosa due to their hydrophilic characteristics and large molecularsize. Injection administration of proteins has to be given frequently because their half-life times in vivo are generally nomore than several hours.

For the encapsulation of protein drug in chitosan microsphere,on the other side, it is a mainproblem how to controlthe chemical existence of protein, and release the protein steadily.

Usually, the W/O emulsion was developed at the initial, then thechitosan droplet containing protein drug was headed by glutaraldehyde.This processcontained two obvious drawbacks aslike: (1) glutaraldehyde could perform withamino group of protein or peptide to deploy denaturation of drugand also create crosslinking between proteins to form solutionof proteins; (2) glutaraldehyde also could crosslink theprotein into microspheres. This not only takes the denaturationof drug but also develop it difficult to discharge drug from microspheres.

Therefore, people mainlydeveloped blank microspherecross-linked by glutaraldehyde at the initial, then upload the proteininto microsphere by adsorption. However, loading capability isdown and the burst effect is higher by the adsorption process.

II. CHITOSAN

Chitosan is a weak base and is insoluble in waterand organic solvents, however, it is soluble in diluteaqueous acidic solution (pH < 6.5), which can convertthe glucosamine units into a soluble form R–NH3+[4]. It gets precipitated inalkaline solution or with polyamines and forms gel at lower pH. It also acts as flocculants for the treatmentof waste water [5].

Commercially, chitosan is available in the formof dry flakes, solution and fine powder. It has anaverage molecular weight ranging between 3800and 2,000,000 and is from 66 to 95% de-acetylated [6]. Particle size, density, viscosity, degreeof de-acetylation, and molecular weight are importantcharacteristics of chitosan which influence theproperties of pharmaceutical formulations based onchitosan.

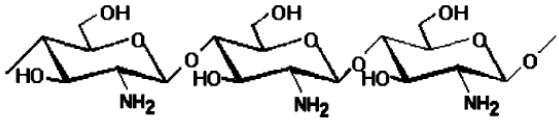

Figure 1 Structure of chitosan

III. CROSSLINKING AGENT

Tripolyphosphate (TPP) has the following synonyms: Sodium triphosphate; Tropospheric acid, pentasodium salt; Sodium Tripolyphosphate (STPP); pentasodium triphosphate;Pentasodium Tripolyphosphate. TPP is non-toxic and multivalent anion that formscrosslinks by ionic interaction between positively charged amino groups of chitosan andmultivalent negatively charged TPP molecules.

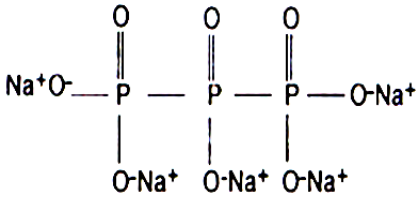

Figure 6:Chemical structure of sodium Tripolyphosphate

Uses:

1. The United States Food and Drug Administration lists STPP as "basically detected assafe", along with salt, vinegar, and baking powder.
2. STPP is a solid inorganic compound use d in a large variety of household cleaningproducts, mainly a s a builder, but also in human foodstuffs, animal feeds, industrialcleaning processes and ceramics manufacture.
3. Chemical functions of STPP includes: sequestration of "water hardness", enablingsurfactants to function effectively; pH buffering; dirt emulsification and prevention ofdeposition; hydrolysis of grease; and dissolving-dispersing dirt particles.

IV. CURVE RELEASED

Table I: CAD data of cross linked chitosan-TPP microspheres prepared by varying drug-polymer concentration

S.No.	TIME(hr.)	CAD8	CAD9	CAD10	CAD11
1.	1	6.28	5.22	4.5	5.06
2.	2	5.61	5.5	4.11	5.33
3.	3	5.33	5.44	3.89	5.56
4.	4	4.89	5.17	4	5.56
5.	5	5.27	5.38	4.46	5.13
6.	6	5.18	5.4	4.58	5.17
7.	7	5.09	5.5	4.51	5.17
8.	8	4.96	5.27	4.33	5.08
9.	24	5.04	5.34	4.39	5.12

Table II: Cumulative percentage drug release da ta of cross linked chitosan-TPP microspheres prepared by varying drug conc.

S.No.	TIME(hr.)	B8	B9	B10	B11
1.	1	18.05	13.11	16.77	22.11
2.	2	16.11	13.81	15.31	23.3
3.	3	15.3	13.66	14.49	24.3
4.	4	14.04	12.98	14.9	24.3
5.	5	15.13	13.51	16.62	22.41
6.	6	14.87	13.56	17.06	22.6
7.	7	14.61	13.81	16.8	22.6
8.	8	14.24	13.23	16.13	22.2
9.	24	14.47	13.41	16.36	22.4

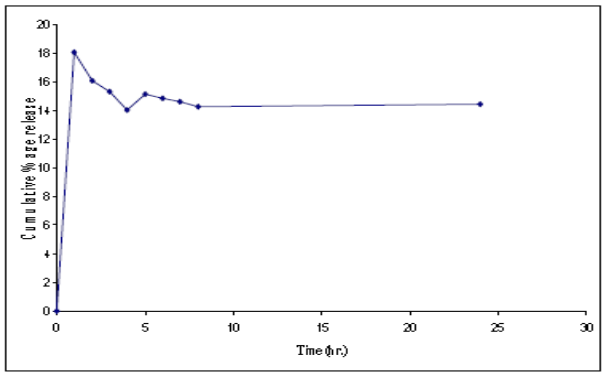

Figure 1: The drug release curve of B8

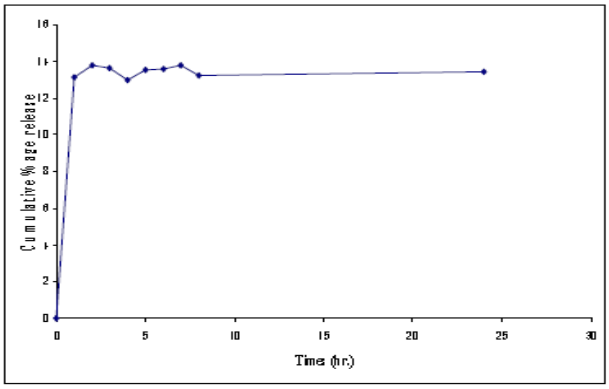

Figure 2: The drug release curve of B9

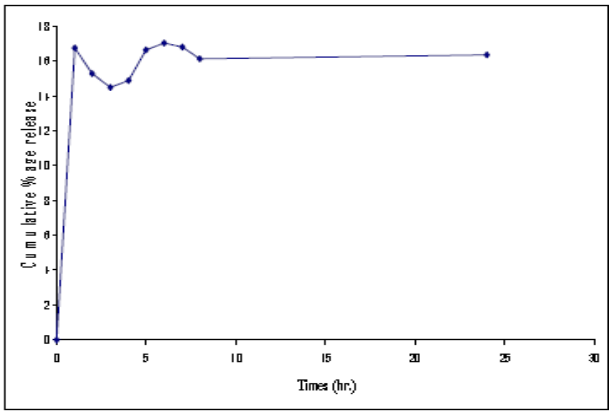

Figure 3: The drug release curve of B10

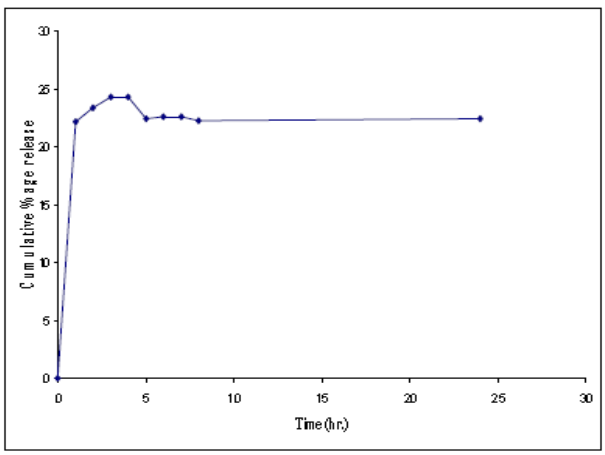

Figure 4: The drug release curve of B11

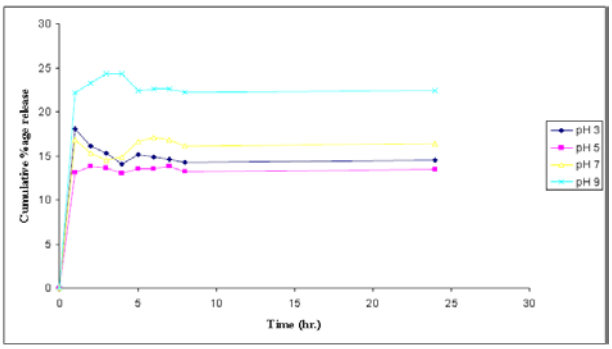

Figure 5: The comparative drug release curves of B8-B11

V. RESULT

The pH responsive release can be explained based on the charge density of beads,which is an important factor in electrostatic interaction and depends on solution pH, Inbuffer (pH1.2), protonation of phosphate ions causes hydrogen bonds to break, leading toweaker electrostatic interaction. This causes swelling and higher release in buffer (pH1.2),while in buffer (pH6.8) stronger attractive force between phosphate ions and chitosancaused slower release of drug. The change inpH of medium causes swelling (pH1.2) andlater dispelling (pH6.8) leading to bimodal drug release.

Cumulative percentage release increased with the increase in drug concentration up to1.5% (w/v) and the n decreases at 2% (w/v) as listed in table 1, maximum at drug conc.1.5% (w/v), 86.05%. Also, cumulative percentage release increased with the increase inpH from 3-9 at different drug: polymer ratio reported and wasmaximum at pH 9 in all the batches.

VI. CONCLUSION

Chitosan hasbeen shown to improve the dissolution rate of poorlysoluble drugs and thus can be observed for bioavailabilityimprovement of such drugs. Reacting chitosanwith controlled matter of multivalent anion outputsin crosslinking between chitosan molecules.The particle size of chitosan microspherescan be amplified approximately for the oral, nasal andparenteral delivery of drugs. Following oral administration,drug loaded chitosan microspheres dissolvein the gastric medium in the stomach, thus liberatingdrug initially.The entrapment efficiency increaseswith increase in chitosan concentration.Drugs are loaded by using the swelling propertiesof the microspheres in the drug mixture. Issue ofdrug from chitosan microspheres is based uponthe molecular weight of chitosan, concentration ofchitosan, drug content and density of crosslinking.

Various therapeutic agents such as anticancer, anti-inflammatory,antibiotics, antithrombotic, steroids,proteins, amino acids, ant diabetic and diuretics havebeen incorporated in chitosan microspheres to achievecontrolled release.

REFERENCES

[1] Takishima, J., Onishi, H., Machida, Y., 2002, Prolonged intestinalabsorption of cephradine with chitosan-coated ethylcellulosemicro particles in rats, Biol. Pharm. Bull, 25, 1498–1502.

[2] Wu, W.Y., Li, Y.G., Preparation of genistein-loaded chitosanmicrospheres,ZhongguoZhong Yao ZaZhi 27, 353–355, 2002

[3] Yoshino, T., Machida, Y., Onishi, H., Nagai, T., Preparationand characterization of chitosan microspheres containingdoxifluridine, Drug Dev. Ind. Pharm. 29, 417–427, 2003

[4] Chandy, T., Sharma, C.P., Chitosan—as a biomaterialbiomater. Artif, Cells Artif, Organs 18, 1–24, 1990

[5] Demarger-Andre, S., Domard, A., 1994. New properties of chitosanin lipid dispersions, In: Chitin World, Karnicki, Z.S., WojtasoPajak, A., Breziski, M.M., Bylowski, P.J. (Eds.), Bremerhauser,Germany, pp. 153–158

[6] Kas, H.S., 1997, Chitosan: properties, preparation and applicationto microparticulate systems. J. Microencapsul, 14, 689–711