



## Pharmacokinetics of amoxicillin loaded sepia Nanoparticles in healthy rabbits

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### ABSTRACT

The main aim of the present study was to evaluate the Pharmacokinetic profiles amoxicillin nanoparticles after oral administrations in rabbits. The sepia nanoparticles were prepared by using the controlled gellification process. In this research work different drug and polymer ratios were used. The prepared sepia nanoparticles were used for the determination of pharmacokinetics parameters such as C<sub>max</sub>, T<sub>max</sub>, AUC, absorption rate constant, Elimination rate constant and biological half life. The, pharmacokinetics parameters results were obtained viz. C<sub>max</sub> (8.6 µg/ml), T<sub>max</sub> (39.25 hrs), AUC (130.58 µg / ml /hr), absorption rate constant (0.0069), Elimination rate constant (0.634) and biological half life (10.43 hrs). So by observing of all the pharmacokinetic parameters, we concluded that the prepared nanoparticles having the good pharmacokinetic profile.

**Keywords:** Pharmacokinetic parameters; absorption rate constant; amoxicillin; sepia nanoparticles; gellification method.

### INTRODUCTION

Amoxicillin is a broad spectrum antibacterial agent, but it exert a short half life values (Madamwar, et al., 2007 & Dharmendra Singh 2009), which demand frequent drug administration. Amoxicillin has been reported to be successfully used in various infections (Patel et al., 2007) i.e. used to treat the upper and lower tract infections, skin, soft tissue and GI tract infections. The polymer sepia obtained from sepia officinalis i.e. a Cuttle fish ink it is a marine mollusk. In stomach of mollosc, it secretes an ink like substance, which acts as a defense mechanism of the mollusk (Joshva D. Nosan chuk et al., 2006). It is a non toxic contain melanin particles used for the preparation (Potsch et al., 1997). In this study the prepared nanoparticles were subjected to pharmacokinetic evaluation such as C<sub>max</sub>, T<sub>max</sub>, t<sup>1/2</sup> etc. (Jawed Ali et al., 2005)

### MATERIALS AND METHODS

The amoxicillin loaded sepia nanoparticles are prepared by controlled gellification method (Kuller, et al., 2006). The drug and polymer concentration is 1:3. This concentration posses the best release characteristics and good entrapment of drug and the particle size is 500nm. The formulation contains the drug and poly-

mer concentration of 1:3 is subjected to pharmacokinetic studies.

### EXPERIMENTAL

#### Preparation of standard graph of amoxicillin (Microbiological Assay)

The microbiological assay was performed by using test organisms staphylococcus aureus. The strain was isolated from soil and allowed to grown in nutrient agar media (Joseph Nisha Mary, et al., 2006). For the preparation of stock solution, 100 mg amoxicillin was dissolved in 100ml of water. The standard concentration of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0µg/ml were obtained by suitably diluting the stock solution in series.

### PHARMACOKINETIC EVALUATION

Healthy rabbits weighing between 1.5- 2.0 kg obtained from animal house of Sri Padmavathi School of Pharmacy were maintained in the air conditioned room. The experimental protocol was approved by the institution ethical committee. Adult healthy rabbits were used for study (n=4) (Murthy et al., 2009). All animals were fasted for a period of 18 hours (over night fasted). The nanoparticles formulation of amoxicillin is placed in a small empty capsule and administered orally with 100ml of water for all 4 rabbits. Before the administration of the doses, a blood sample was collected (blank). 1ml of blood samples were collected at 15min, 30min, 1hour, 2hour, 8hour, 12hour, 24hour, 36hour, 48hour and 72hour after oral administration. The blood samples were centrifuged at 5000rpm and the serum was collected into dry tubes and all the samples

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were stored under refrigerated conditions prior to assay. The serum concentration of the drug were determined by microbiological method (Madhavan et al, 1998) described earlier. The various pharmacokinetic parameters such as C- max, T-max (AUC) elimination rate constant (ke), biological half life ( $t^{1/2}$ ), absorption rate constant (ka) were calculated.

## RESULT AND DISCUSSION

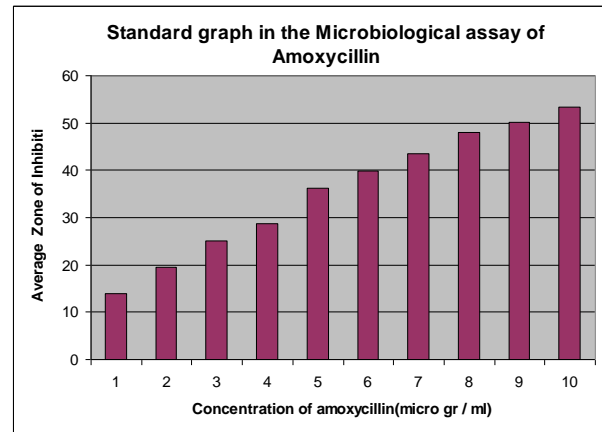
The below mentioned data (Table 1) explains the standard graph of the amoxicillin, which is obtained by preparing the series concentration of amoxicillin stock solution. The graph obtained was the concentration versus the zone of inhibition. The prepared amoxicillin nanoparticle was administered to the healthy rabbits. At regular time intervals the blood samples were withdrawn from the marginal ear vein. The data obtained were show in the Table 3. It shows that the drug released in controlled manner in a prolonged period of time. The other parameters such as absorption constant, elimination constant, etc. are given in Table 2.

**Table 1: Standard graph in the microbiological assay of Amoxicillin**

Concentration of Amoxicillin ( $\mu\text{g/ml}$ )	Average zone of inhibition (mm)
0.5	13.9
1.0	19.6
1.5	25.0
2.0	28.7
2.5	36.2
3.0	39.8
3.5	43.6
4.0	48.0
4.5	50.2
5.0	53.4

**Table 2: Pharmacokinetic Parameters of Amoxicillin Nanoparticles**

S.No	Parameters	Values
1	Absorption constant(ka)	-0.0069
2	Elimination constant(ke)	0.0634
3	Half life ( $t^{1/2}$ )	10.43hours
4	T max	39.25 hours
5	Apparent volume of distribution	3.76 lit.
6	C max	8.6 $\mu\text{g/ml}$
7	AUC	130.58 $\mu\text{g} / \text{ml} / \text{hr}$



**Figure 1: Standard graph in the microbiological assay of amoxicillin**

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**Table 3: The serum concentration of amoxicillin (mg/ml)**

Time	Animal 1	Animal 2	Animal 3	Animal 4	Mean $\pm$ Sem
15 min	1.85	1.70	1.72	1.87	1.78 $\pm$ 0.0873
30 min	1.93	1.87	1.90	1.90	1.90 $\pm$ 0.01225
1 hr	1.97	1.92	1.93	1.83	1.91 $\pm$ 0.02955
2 hr	2.10	1.97	2.05	2.20	2.08 $\pm$ 0.04813
4 hr	2.25	2.20	2.15	2.27	2.21 $\pm$ 0.02689
8 hr	2.47	2.35	2.23	2.52	2.39 $\pm$ 0.06486
12 hr	2.69	2.66	2.72	2.70	2.69 $\pm$ 0.01250
24 hr	2.75	2.69	2.75	2.81	2.75 $\pm$ 0.02449
36 hr	2.50	2.31	2.60	2.60	2.5 $\pm$ 0.068
48 hr	2.15	2.02	2.22	2.25	2.16 $\pm$ 0.05115
72 hr	1.90	1.92	2.0	1.89	1.92 $\pm$ 0.02496

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