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Pharmacokinectical Study of Enrofloxacin in Sheep

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SUMMARY

Enrofloxacin was injected subcutaneously to five sheep as a single dose of 5mg/kg b.w. Blood samples were collected periodically over 24 hours period and analysed by a microbiological method.

Results indicated that the peak plasma concentration of 1.30 + 0.09 ug/ml was achieved two hours after the drug administration. The average biological elemination half-life from plasma was 2.42 + 0.27 hour, the apparent volume of distribution was 2.00 + 0.18 l/kg and clearance of the drug was 9.80 + 0.61 ml/kg/min.

INTRODUCTION

Enrofloxacin (Baytril)® is a new antimicrobial agent of the quinolone carboxylic acid derivative (4). Members of this group has been known to act by impairing the bacterial gyrase, an enzyme which play a role in the replication of DNA (2).

Enrofloxacin was developed exclusively for use in veterinary medicine for the treatment of infections caused by gram(-) and gram (+) bacteria as well as mycoplasma in various animal species (6). The drug can be administered by parentral and oral route. Tissue and serum concentrations of enrofloxacin was determined in different animal species after administration of the drug orally and parenterally (7).

In our clinics this drug has been introduced recently for the treatment of bacterial infections in animals and poultry. Few studies in this department have proved its clinical value in poultry (5). resistance to

enrofloxacin was clear specially *in vitro* (1), therfore in the present study the levels of the drug and its attatinable level duration in plasma was estimated in order to find the relation between the attainable level and the duration of activity of the drug against pathogenic bacteria.

MATERIALS AND METHODS

Five sheep clinically healthy of awasi breed aged 6-7 months weighing from 20 to 30 kg were used in this experiment. They were housed in concrete stalls, water, green and concentrate food were available *ad libitum*.

The sheep were injected enrofloxacin (Baytril® 2.5%, injection, Bayer, Leverkausen) subcutaneously into the side of the neck at a single dose of 5 mg/kg body weight. Blood samples were withdrawn from a jugular vein by heparinized syringes before administration of the drug and after 0.5, 1, 2, 4, 6, 8, 12 and 24 hours of administration. Plasma was obtained by centrifugation of the samples and kept at -20 °C until analysed by the method described by the Agricultural analytical Chemistry, Lilly Research Laboratories based on the microbiological method (3).

The concentration of the drug was calculated from semi-log plot and the pharmacokinetic parameters were calculated according to (8).

RESULTS

The concentrations of enrofloxacin in sheep plasma after S.C administration are presented in Table 1. Figure 1 shows the disappearance curve of the drug which is presented as means and standard errors of the mean.

The peak plasma concentration of enrofloxacin was achieved after 1-2 hours of its adminstration and ranged from 1.11-1.30 ug/ml, thereafter the concentrations were dropped. No antibacterial activity was detected in the samples after 24 hours of the drug adminstration.

Table 1: Plasma concentrations (ug/ml), biological half-life (t 1/2,h), apparent volume of distribution (Vd,1/kg) and clearance (cl, ml/kg/min) of enrofloxacin in sheep following a single S.C. injection of 5 mg/kg b.w.

Animal No.	Weight (Kg)	Hours following injection										
		0.5	1	2	4	6	8	12	24	t1/2	Vd	cl
1	20	0.87	1.58	1.26	0.36	0.08	0.08	0.07	0.00	2.24	2.19	11.34
2	25	0.43	0.67	1.46	1.11	0.71	0.08	0.08	0.00	2.04	1.74	9.83
3	28	0.07	1.07	0.95	0.75	0.51	0.24	0.08	0.00	2.89	2.60	10.42
4	28	0.07	1.34	1.26	1.11	1.11	1.11	0.99	0.00	1.61	1.42	10.18
5	30	0.07	0.87	1.54	1.46	1.11	1.11	0.18	0.00	3.30	2.07	7.23
$\bar{X}$		0.30	1.11	1.30	0.96	0.70	0.52	0.28	0.00	2.42	2.00	9.80
SE+		0.14	0.14	0.09	0.16	0.17	0.21	0.15	0.00	0.27	0.18	0.61

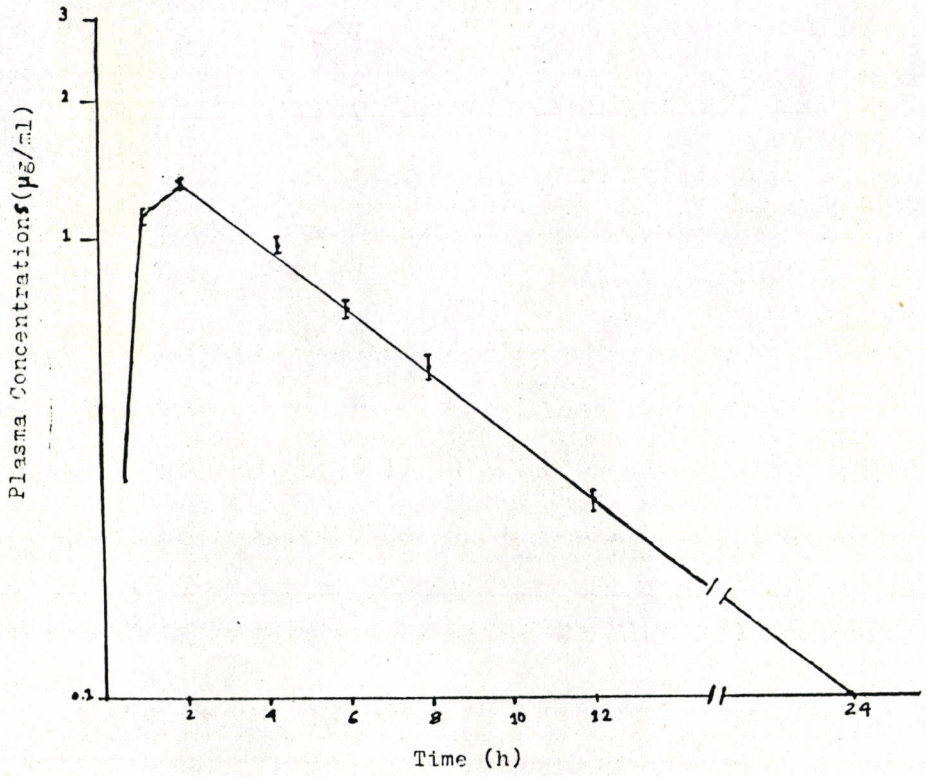

Fig.1. Blood disappearance curve of enrofloxacin(mean±SE) in sheep following a single S.C injection of 5 mg/kg.

The calculated biological half-lives of elemination from plasma and the apparent volume of distribution and clearance of the drug are presented in table 1.

DISCUSSION

The present study reveal that enrofloxacin is quickly absorbed when given subcutancously. The maximum plasma concentration was reached 2 hours after the drug administration. These results are comparable to those observed in calves when the drug was administered at a rate of 2.5-5 mg/kg body weight (7) which also suggests a good absorbtion of the drug in this species.

The mean concentration attained after 12 hours of the drug administration (0.28+0.15 ug/ml) is higher than the minimum inhibitory concentration (MIC) for most clinically important infectious agents such as E.coli, Salmonella, pasteurella, Klebsiella and Haemophilus that have MIC values ranged from 0.008-0.06 ug/ml (6). This mean that the drug offers an antibacterial activity for a period of at least 12 hours when given in such a dose.

The higher value of Vd in the present study indicates that enrofloxacin is distributed well to the infective tissues and control the infection. This result is in agreement with the finding of (7) who found that the concentration of enrofloxacin in the tissues of different animal species was higher than those in the serum.

The mean biological elemination half-life of the drug was (2.42+0.27 hours) which is relatively shorter than those in other domestic animals (7). This could be explained on the base of differences in the rate of metabolic degradation, however the value of t 1/2 of enrofloxacin in poultry was recorded to be in the range of 2-6 hours (7).

In conclusion, the dose of enrofloxacin used in the present study offer therapeutic concentration to most of

the sensative micro-organism for at least 12 hours after its administration.

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دراسة دوائية لعقار الانروفلوكساسين في الاغنام

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الخلاصة

اعطي الانروفلوكساسين حقنا تحت الجلد لخمسة اغنام كجرعة منفردة وبمعدل جرعة قدرها ٥ملغم/كغم من وزن الجسم. جمعت نماذج دم بأوقات متتالية خلال ٢٤ ساعة وتم تحليلها بطريقة مايكروبايولوجية.

أشارت النتائج الى أن معدل تركيز العقار وقدره ٣٠ر١+٩٠ر٠ مايكروغرام/مل بلغ ذروته بعد ساعتين من الاعطاء وقد بلغ معدل عمر النصف لاختفاء العقار في البلازما ٤٢ر٢+٢٧ر٠ ساعة وحجم الانتشار الظاهري بلغ ٠٠ر٢+١٨ر٠ لتر/كغم وتصفية العقار بلغ ٨٠ر٩+٦١ر٠مل/كغم/دقيقة.