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Brief Communication

MAMMARY EXCRETION OF LINCOMYCIN IN COWS

It has been shown that only the non-protein-bound and unionised fraction of partially ionised drug diffuses from blood plasma to milk and establishes equilibrium across the membrane. As the pH of milk is lower than that of blood plasma this means an unequal distribution between milk and blood plasma resulting in lower concentrations of acids in milk than in blood plasma while the concentrations of alkaline drugs are higher in milk than in blood plasma (*vide Rasmussen* 1966).

Lincomycin[1]) is shown to be excreted into milk from nursing mothers, but the excretory mechanism has not been examined (*Medina et al.* 1963). Lincomycin is an antibiotic with alkaline characters and a pK_a 7.6 (*Herr & Bergy* 1962), accordingly it should be excreted into milk in higher concentrations than found in blood plasma. Preliminary experiments on two goats justified this assumption and experiments on six cows (daily milk yield 3—21 kg) were performed. Constant levels of lincomycin in blood plasma were maintained by permanent intravenous infusion of doses of 4—7 mg/kg bdw. Lincomycin was estimated microbiologically by means of Sarcina lutea as described by *Hanka et al.* (1962). Ultrafiltration through cellophane membrane showed that 17—56 % of lincomycin in blood plasma and 0—39 % in milk was bound to the proteins.

Table 1. Concentrations of lincomycin in milk and blood plasma and ultrafiltrates of milk and blood plasma.

Experiment no.	Plasma µg/ml	Milk µg/ml	Ratio M/P	Ultrafiltrate of plasma µg/ml	Ultrafiltrate of milk µg/ml	Ratio M. Ultr./ P. Ultr.	Theoretical calculated Unionised in plasma %	Unionised in milk %	Ratio M. Ultr./ P. Ultr.
1	1.0	4.3	4.3	0.7	3.9	5.6	39	14	2.8
2	2.3	6.7	2.9	1.4	5.6	4.0	39	11	3.5
3	3.9	12.2	3.1	2.4	11.1	4.6	44	20	2.2
4	4.1	11.7	2.9	1.8	8.4	4.7	42	17	2.5
5	4.9	12.0	2.5	2.7	7.3	2.7	42	17	2.5
6	5.1	11.4	2.2	2.8	10.6	3.8	42	17	2.5
7	6.9	12.8	1.9	5.7	12.8	2.3	39	11	3.5

[1]) Lincomycinum NFN is kindly placed at our disposal by Upjohn, Kalamazoo Mich, U.S.A. through Upjohn, Copenhagen.

The results of seven experiments are tabulated in Table 1. The results are the average of the values obtained from 6 milk and 6 blood plasma samples simultaneously drawn during the experiments. The concentration of lincomycin in milk was found to be 1.9—4.3 times higher than in blood plasma (Ratio M/P), and after correction for protein-binding the ratio M.Ultr./P.Ultr. was elevated to 2.3—5.6. Compared to the theoretical calculated ratios from the formula

$$R = \frac{\text{M.Ultr.}}{\text{P.Ultr.}} = \frac{1 + 10^{(pK_a - pH_{milk})}}{1 + 10^{(pK_a - pH_{blood\ plasma})}}$$

there is a fairly good agreement, although the experimentally found ratios in most cases are higher than that theoretically expected probably because the ionisation of lincomycin with pK_a 7.6 is strongly influenced by even small variations in the pH of the milk.

As regards to parenteral treatment of mastitis the mammary excretion pattern of lincomycin seems to be favourable but the activity against the most common bacteria causing bovine mastitis have to be examined before the therapeutic value of lincomycin in the treatment of mastitis can be evaluated.

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