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Brief Communication

THE MECHANISM OF EXCRETION OF DRUGS INTO MILK FROM UNTREATED GLANDS AFTER INTRAMAMMARY APPLICATION

It is often maintained that after intramammary application of penicillin the excretion of penicillin via the untreated glands takes place by direct diffusion from treated to untreated glands (vide *Hawkins et al.* 1962, *Jacobs & Pennings* 1969, *Rollins et al.* 1970). *Blobel* (1960) mentions the possibilities of both direct diffusion from gland to gland and the excretion via the blood.

The following experiments have been performed to elucidate the principles for excretion of drugs through the untreated mammary gland. Solutions of antipyrine, sulphanilamide or sulphadimidine in distilled water *(Rasmussen* 1966, pp. 40—48) were infused in one gland of a cow. After two resp. four hrs. blood samples (jugular vein) and single gland milk samples were drawn. The mammary glands were emptied completely. The concentrations of drugs in blood plasma and milk are listed in Table 1. The concentrations of residual drugs in milk from the treated glands vary considerably, while the concentrations in milk from the three untreated glands in each experiment are equal ($P > 0.05$). This indicates an excretion via the blood, as a direct diffusion across the supporting and connective tissue separating the glands should have given higher concentrations in the adjacent and parallel glands than in the diagonal where the direct tissue contact to the treated gland is far smaller.

The concentrations of antipyrine and sulphanilamide in the milk from untreated glands are similar to the concentrations in blood plasma ($P > 0.05$), while the concentration of sulphadimidine in milk from untreated glands is lower than in blood plasma ($P < 0.001$).

This observation is in accordance with the fact that only the unionized, non-protein-bound fraction of a drug diffuses through the biological membranes separating blood and milk. A partly

Table 1. The concentrations of drugs in milk and blood plasma from cows infused 5 g antipyrine, sulphanilamide or sulphadimidine in one gland.

	Hours after infusion	Concentration in milk from				Concentration in blood plasma µg/ml
		infused gland µg/ml	adjacent gland µg/ml	parallel gland µg/ml	diagonal gland µg/ml	
Antipyrine	2	2770	4.0	4.0	4.8	4.4
		210	7.2	5.2	6.0	7.2
		105	10.0	5.2	6.0	8.0
		370	7.5	8.0	7.7	7.9
		1235	5.4	6.0	5.0	5.5
		120	9.5	9.2	9.0	9.0
m.±s.e.m.			7.3±0.9	6.3±0.8	6.4±0.7	7.0±0.7
Sulphanil-amide	4	6240	2.5	2.7	2.7	2.7
		2700	6.5	5.9	5.9	6.4
		850	10.0	10.1	10.0	8.6
		450	9.3	10.0	10.0	8.3
		212	6.5	6.6	7.0	7.0
		1797	7.4	8.9	8.4	8.2
m.±s.e.m.			7.0±1.1	7.4±1.2	7.3±1.1	6.9±0.9
Sulpha-dimidine	2	17280	2.9	3.4	2.9	22.3
		4050	3.9	4.9	4.1	27.1
		60	4.0	4.6	3.9	20.5
		7407	3.4	3.3	4.2	23.3
		12605	5.5	5.3	6.2	37.0
		49	4.5	4.4	3.9	29.3
m.±s.e.m.			4.0±0.4	4.3±0.3	4.2±0.4	26.6±2.5

ionized acidic drug as sulphadimidine, therefore, appears in milk in a concentration lower than the concentration in blood plasma, while unionized compounds as antipyrine and sulphanilamide are equally distributed between the two media (*Rasmussen* 1964, 1966, 1971).

The results clearly indicate that antipyrine, sulphanilamide and sulphadimidine infused into a mammary gland are transported via the blood to the untreated glands.

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