

On the Transfer of 1,5-Vinyl-2-thiooxazolidone from the Rumen to the Milk

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When the method for microdetermination of goitrogenous 1,5-vinyl-2-thiooxazolidone (VTO) was further developed in this laboratory, it was found that this compound disappears from the milk even at low temperatures*. This disappearance takes place in different milk samples with varying speed. If the milk is heated immediately after milking, no disappearance occurs even within several days at low temperature. Also at room temperature retention is then fairly good for one day. Kreula and Kiesvaara will present the analytical method for determination of VTO both in cruciferous plants and in milk in this journal.

Taking the above observations on the retention of VTO in milk into consideration, we have made numerous feeding experiments with cows fed with green turnip rape, green rape, and marrow kale. The results showed that VTO is transferred to the milk in very small amounts¹. When a cow was fed with 15 kg of marrow kale twice a day, 5 µg of VTO per litre was found

in the milk (daily milk production 6 l). Altogether 0.05 % of the total amount of VTO formed in marrow kale (2.2 mg of VTO per kg fresh plants) was transferred to the milk. In another experiment in which 10 kg of green rape (28 mg of VTO per kg fresh plants) was once fed per cow to a group of four cows (milk production 12 h after the feeding was 5 l per cow), 27 µg of VTO per litre was found in the milk. Also in this case 0.05 % of the total VTO in fodder was transferred to the milk.

When 500 mg of crystalline VTO was fed to a cow, and the cow was milked 2, 6.5, 10.5, 24, and 48 h after feeding, the following amounts of VTO were found in the milk (Table 1).

The experiment showed that VTO is very rapidly transferred from the rumen to the milk. In milk samples taken 24 h after feeding, VTO could not be found with certainty in the milk. Of the 500 mg crystalline VTO fed, about 0.05 % was found in the milk. It is remarkable that the same percentage of VTO is transferred to the milk, on the one hand when the cow is fed with green plants which contain the glycoside from which VTO is formed in the rumen, and on the other hand when feeding crystalline VTO.

In another feeding experiment 1.6 g of the precursor (glycoside of 2-hydroxy-3-butenylisothiocyanate compound isolated from rape seeds) of VTO was fed to a cow. Only traces of VTO could be found in the milk. The results show that the glycoside is not appreciably hydrolyzed in the rumen without the enzyme present in cruciferous plants. The quantitative, or almost quantitative, enzymatic hydrolysis of the glycoside in the rumen by the influence of the enzyme present in

* Later it has been noticed that the VTO reappears in the milk on treatment with H₂S.

Table 1. Transfer of VTO from rumen to milk when the cow is fed with 500 mg of crystalline VTO. The feeding took place immediately after morning milking, and the cow was then milked after the hours given in the table.

	Before VTO feeding	After 2 h	6.5 h	10.5 h	24 h	48 h
VTO content of milk µg/l	0	190	35	17	possibly traces	0
VTO trans- ferred to milk, % of total fed	—	0.035	0.013	0.006		
			0.054			

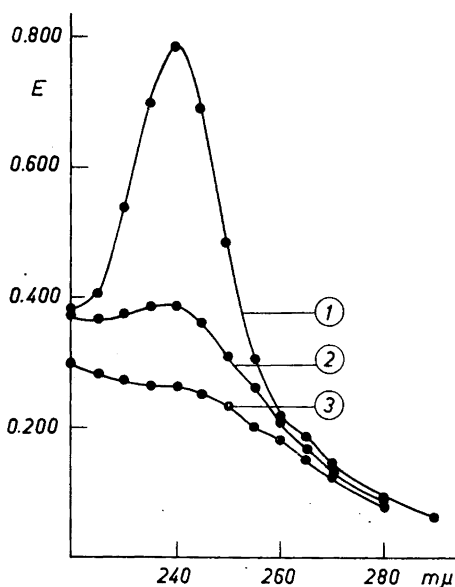


Fig. 1. UV-spectra of VTO in cow's milk after feeding of 500 mg of crystal VTO. The curves show the relative values after 2 h (1), 6.5 h (2), and 48 h (3).

the plants in question is supported by these results.

The earlier performed feeding experiment with 0.5 kg of crushed moistened rape seeds, whereby so large an amount of VTO as 4.5 g could be formed in the seeds, gave a negative result as to the transfer of VTO to the milk¹. The result probably partly depended on that the milk came to stand unheated for several hours before the analysis. Another cause may, however, be the physiologically abnormally large amount of VTO which could be formed in the rape seeds fed. This unfavourable effect was shown by the fact that the cow lost her appetite for some days after the feeding. A new experiment with 100 g of crushed moistened rape seeds in which 900 mg of VTO could be formed, showed that 12 h after feeding the milk sample contained 100 μ g of VTO per litre. 0.07 % of the total amount of VTO formed in the crushed seeds was thus transferred to the milk.

On the basis of the experiments performed, it can be said that about 0.05 % of the VTO present in the fodder, or formed in it during chewing and in the rumen, regularly seems to be transferred to the milk. When feeding cows on farms with green cruciferous plants, the amount of VTO can hardly exceed 100 μ g of VTO per litre of milk. It is therefore not very likely that the cruciferous plants in the feeding of cows could increase the VTO content of the milk to such a degree that the milk could cause disturbances in the functioning of the thyroid gland of man. The problem requires a thorough elucidation, however. Investigations on the presence of substances which possibly disturb the functioning of the thyroid gland, in plants used by man and animals, as well as on their mode of action, are in progress in this laboratory.

1. Communication at the meeting of Societas Biochemica, Biophysica et Microbiologica Fenniae on October 27, 1958. *Suomen Kemistilehti A* **32** (1959) 45.
2. Virtanen, A. I., Kreula, M. and Kiesvaara, M. *Acta Chem. Scand.* **12** (1958) 580.

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Correction to "Hydrolysis of Carboxylic Acid Esters of Thiocholine and its Analogues" *

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In Table 7, p. 1503, first line from above for B_{OH^-} 2 760 \pm 350 read B_{OH^-} 2 890 \pm 350 and for E 12.6 kcal read E 13.2 kcal.

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* *Acta Chem. Scand.* **12** (1958) 1492.