

the rapid increase in weight noticed in Group 10 during the first month need not necessarily be interpreted as showing growth of vitamin; and the positive results claimed by other workers must be questioned. The results, of course, need not be interpreted as meaning that there is no growth of vitamin during germination and greening, but merely to suggest that the methods employed are open to criticism.

Groups 5, 7 and 9 receiving a diet which included "A" (cod liver oil) and one form of corn but no "B" (yeast) began to gain markedly over 6, 8 and 10 on a diet including "B" and one form of corn but no "A" from the sixth week on. It would seem, therefore, fairly obvious that, comparatively speaking, the seeds (ungerminated, germinated and green) are richer in vitamin "B"; for in 5, 7 and 9 whatever "B" the rats get must come from the corn, just as in 6, 8 and 10 whatever "A" they get must come from the corn.

We are now engaged in comparing (a) effect of equal weights of dry material with (b) effect of the same number of seeds (ungerminated, germinated and green) and (c) effect of using weights obtained from the ratios

$$4 : \frac{4 \times 24.1}{21.6} : \frac{4 \times 13.5}{21.6}$$

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#### Sulfur metabolism. III.

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The addition of cystine, cysteine or their derivatives to the control rations of rabbits caused a prompt and marked increase in the amount of sulfur eliminated in the urine. When these sulfur compounds were withdrawn the elimination of sulfur dropped to the control level, and in some instances even below this. This decrease in sulfur took place in the first two days of the period following the cystine sulfur feeding, and in most cases

the first day. On the day following this marked depression of the sulfur elimination there was a distinct increase of sulfur in the urine. The cystine sulfur was not completely eliminated in the period during which it was fed, except in cases of phenyl acetyl benzyl cysteine. The increased sulfur output following the depression of sulfur elimination is considered as a lag. It would seem that the R-SH type of sulfur compound has some specific effect upon the mechanism of sulfur excretion. This effect is observed both with reduced sulfur and oxidized sulfur, but not with conjugated  $\text{SO}_4$ . In three cases, however, there was an increase in conjugated  $\text{SO}_4$ —namely 6 mg. for phenyl acetyl benzyl cystine and phenyl hydantoin cystine, and 10 mg. for acetyl benzyl cysteine. This “deferred lag” was unforeseen and must be taken into special account in our next series of this program. The excess elimination of sulfur in some of the tests may be charged to this “deferred lag”—but not altogether. In the case of phenyl acetyl benzyl cysteine the increased sulfur elimination exceeded the cystine sulfur added to the ration by one-half its amount. This could not come from any previously ingested R-SH added to the animal's normal ration. There seems to be positive evidence that ingestion of R-SH causes a sulfur elimination in addition to the sulfur immediately taken in so that the per cent of cystine sulfur as given in the table may include some endogenous reduced sulfur.

Phenyl hydantoin cystine was given to one rabbit in two test periods with an intervening control period of four days. In the first period there was a retention of the ingested sulfur amounting to 53 per cent of that administered, and in the second period there was an excess elimination amounting to more than four times the control value of the first day. In the four days between these two periods, and the days following the second period, there was an abrupt drop in urinary sulfur to a point below the normal. The total sulfur elimination for the two test periods and control days exceeds the total sulfur intake by 26 mg. If the depression in the control days were not considered it would be about three times this amount.

The elimination of these various compounds is summarized in the following table. The figures give that part of the sulfur which represents the cystine compounds. In cystine and cysteine most of the sulfur is eliminated in the oxidized form as noted

in our last contribution. Blocking the -SH group of these with a benzyl, caused somewhat less oxidation to take place. This was also true when the amino group was blocked with acetyl and phenyl acetyl groups. When both the amino and sulfhydrylate positions were blocked the oxidation was very much decreased, so that most of the cystine sulfur was excreted as of the type R-SH. It would seem from this table that in the oxidation of cystine the attack is most effective at the amino position and least (perhaps none) at the carboxyl.

SULFUR FROM CYSTINE COMPOUNDS.

	Fed	Eliminated			
		Total Cyst. S.		Total SO <sub>4</sub> S.	
	mg.	mg.	per cent	mg.	per cent
Cystine	321	297	93	264	89
Cysteine hydrochloride	258	265	102	207	78
Benzylcysteine	183	193	105	112	58
p-Cl Benzylcysteine	186	91	49	48	53
	186	174	94	111	64
Acetyl benzyl cysteine	153	181	118	105	58
Phenyl acetyl cystine	321	244	75	163	67
Phenyl acetyl benzylcysteine	117	185	158	60	32
Phenyl uramino cystine	315	277	88	114	41
Phenyl uramino cysteine	321	199	58	60	41
Phenyl uramino benzylcysteine	123	45	36	(depressed below control level)	
Phenyl hydantoin cystine	345	168	47	81	41
	174	329	189	83	25
Phenyl hydantoin benzylcysteine	125	82	65	0	0

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## I. Experimental rabbit snuffles.

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As part of a general experimental study of the epidemiology of certain bacterial infections of domestic animals, experiments have recently been made with rabbits with *Bact. leprosepticum*.