

Brief Communication

A LOW-SELENIUM PIG DIET BASED ON CASEIN FROM
SELENIUM-DEFICIENT COWS *

Composing experimental diets to groups of large animals for studies of deficiencies involves practical difficulties, mainly due to high costs of pure ingredients. This is especially so when the critical factor is ubiquitously present in general feedstuffs.

Studies on selenium deficiency in domestic animals are an example. The conditions are favourable, when it concerns herbivores, to which naturally occurring food plants, poor in selenium, can be used. It is more difficult in pigs, however, which need a supply of animal protein for adequate body growth and development. Animal protein is consistently rich in selenium. Selenium-deficient experimental diets for pigs, which have been described in the literature, seem to have been based on vegetable proteins rather exclusively.

We have taken advantage of naturally occurring selenium-deficient hay and cereals in Sweden (*Lindberg* 1968). They were fed to cows which produced a selenium-deficient milk casein. The latter was used as protein source in a vitamin E-deficient diet to pigs.

Samples of hay, oats and barley were obtained from an area (Närke) where crops are frequently deficient in selenium (*Lindberg*). Batches holding 5—8 µg selenium/kg were selected for feeding two cows, who were further supplemented with urea and a mineral mixture. The supply of selenium in excess of that in hay and cereals was found to be negligible. The cows have calved twice until now, and casein was isolated from their milk yield after the milk fat was removed. The casein was stored at —20°C until used.

The selenium content of casein gradually fell from 210 µg/kg d.s. (representative value of the herd from which the cows were obtained) to a more or less stable level of 50—30 µg/kg. Blood selenium of the cows fell at the same time from 46 and 40 ng/ml to 8 and 7 ng/ml, respectively. The pig diet which was fed ad lib. was composed of sugar (20 %), wheat starch (57 %), cellulose (3 %), casein (17 %), molecular-distilled cotton-seed oil (3 %)

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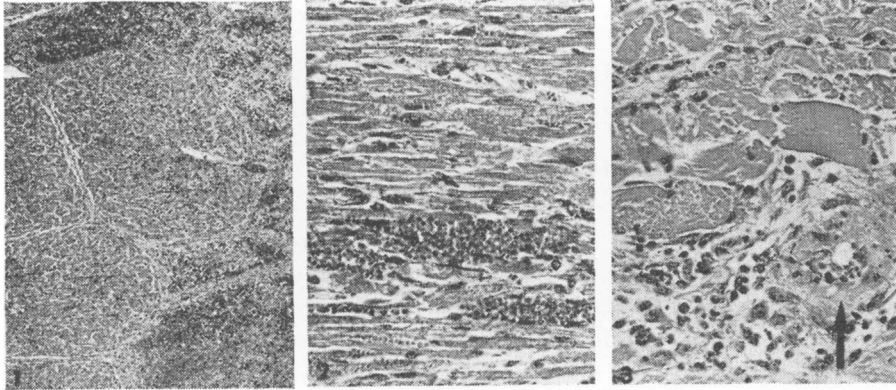


Figure 1. Pig No. 4. Total necrosis with extensive hemorrhages in several lobules. The liver cell injury keeps within the margins of the lobules. H and E, $\times 25$.

Figure 2. Pig No. 7. Myocardial degeneration, vascular engorgement and small hemorrhages are evident. H and E, $\times 160$.

Figure 3. Pig No. 6. Skeletal muscle degeneration. Myofibrillar fragmentation, myolysis and proliferation of interstitial cells are evident. Arterial hyalinosis is indicated by arrow. H and E, $\times 160$.

and mineral and vitamin mixture (except for E). The cotton-seed oil contained 83 mg total tocopherol/kg (56 % α -tocopherol and 44 % γ -tocopherol).

Two pregnant gilts (Swedish Land Race) were fed potatoes, groats and skimmed milk (*Obel* 1953) for the last three weeks before delivery and under lactation. Nine weaned piglets, which were born on April 21—22 and which seemed to be in perfect

Table 1. Blood selenium (*Lindberg* 1968), serum tocopherol (*Duggan* 1959), and SGOT (Sigma Technical Bull. No. 505) and SOCT (*Reichard* 1957) values in pigs receiving diet deficient in selenium (7—10 μ g/kg) and tocopherol (2—5 mg/kg).

Pig No.	Survival days	Blood Se, ng/ml		Serum tocoph. μ g/ml		SGOT, u.		SOCT, u.	
		8.6	18.6	8.6	18.6	8.6	18.6	8.6	18.6
1	18	33.5	17.0	1.87	0.28	18.0	540	0.6	1.2
2	19	30.5	16.5	1.62	—	18.0	660	1.8	2.4
3	19	36.5	21.0	1.28	0.29	15.0	440	2.4	51.0
4	12	23.5	19.0	1.54	0.28	38.0	270	3.6	2.4
5	16	28.0	16.0	1.54	0.51	21.0	500	2.6	10.2
6	killed	21.0	18.5	1.60	0.40	34.0	370	2.4	0.6
7	18	24.5	12.5	1.59	0.27	27.0	520	3.2	29.0
8	12	21.5	13.5	1.09	0.13	31.0	490	5.9	11.0
9	15	21.5	14.0	1.83	0.13	33.0	500	1.9	1.2

health, were started on the experimental diet on June 8. Their average body weight was then 14.1 kg (range 12.5—17.0 kg). The average daily gain from June 8 to June 18 was 0.21 kg.

Eight pigs died between June 20 and June 27, and the ninth pig was killed on July 5. All showed advanced liver necrosis (hepatosis dietetica) (Fig. 1), myocardial degeneration (mulberry heart) (Fig. 2), exudative diathesis, and all but one showed skeletal muscle degeneration (Fig. 3). Blood selenium, serum tocopherol, and serum GOT and OCT values are shown in Table 1. It is apparent that the experimental diet used in the present work produced a fast response of deficiency and disease. The diet is probably lower in selenium than diets used recently by other research workers in studies on hepatosis dietetica and associated changes in pigs (Ewan *et al.* 1969, Sharp *et al.* 1972). Casein is a high quality protein supplement for pigs, providing all amino acids which are essential for normal growth and development.

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