The Effect of High Potassium Intake on Rabbits[1]

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Grass tetany is a disorder which has been observed in both cattle and sheep grazing wheat pastures in the Southern Plains winter wheat area. During certain years, the occurrence has been frequent and mortality rates as high as 0.5 per cent in cattle and 8.0 per cent in sheep have been reported (7) in affected herds.

The biochemical nature of the disorder is still not understood despite nearly 25 years of work in this country and abroad. The common clinical symptoms found in affected animals are hyperirritability and muscular incoordination (5). Blood changes reported have been a hypomagnesia and occasionally elevated serum inorganic phosphorus (1, 3, 6, 8).

Various explanations have been advanced to account for this abnormality. Growing cereal grasses are characterized by a high nitrogen and potassium content. Caldwell and Hughes (3) suggested this latter fact as a possible explanation for grass tetany. They advanced the hypothesis that an imbalance between the mono- and di-valent ions of the nervous tissue was induced by the high potassium intake.

Workers at the Pan Tech Field Station near Amarillo, Texas, had observed symptoms resembling grass tetany in rabbits being fed on wheat pasture exclusively. It seemed possible that the effect of a high-potassium diet might be studied by feeding rabbits dehydrated cereal grasses. It was with this in mind that the experiments reported here were undertaken.

Experimental

Twenty white New Zealand weanling female rabbits weighing an average of 1.6 kg. were divided into five lots. They were housed in metal cages with screened floors. A dehydrated cereal grass product (Cerophyll Laboratories, Kansas City, Missouri) and water were provided *ad libitum*. The potassium supplement was composed of an alkaline-ash mixture of potassium salts as follows: potassium chloride, 40 per cent of total potassium; potassium bicarbonate, 20 per cent; potassium sulfate, 10 per cent; and potassium acetate, 30 per cent.

Each lot of four rabbits received 600 grams of dehydrated cereal grasses daily. Three different batches of dehydrated cereal grasses were used during the experimental period. They were of very similar composition

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TABLE I

Composition of Dehydrated Cereal Grasses Used in Feeding Trials.

Sample No.	Dry Matter	Ash	Protein	Ether Extract	Crude Fiber	N.F.E.	Ca	P	K	Na
1	90.48	17.2	22.8	6.3	15.9	37.8	0.96	0.37	3.03	0.48
2	91.10	11.9	23.0	3.8	14.9	46.4	0.49	0.39	2.80	0.57
3	93.44	12.6	24.9	4.7	15.2	42.6	0.51	....	2.90	0.59

as shown in Table I. During most of the trial, sufficient water was added to the feed to form a thick mass; this was found to be necessary to prevent gross waste of feed by the older animals. During the sixth and seventh weeks, three of the lots (3, 4, and 5) received a mixture of potassium salts in addition to the cereal grass. This salt mixture was added in sufficient quantity to increase the level of potassium in the total diet to 5.0 per cent. The animals were observed daily throughout the trial and were weighed once each week. The average weight is given for the various lots in Table II.

TABLE II

Average Weekly Weight (Grams) of Rabbits Fed Dehydrated Cereal Grasses and Dehydrated Cereal Grasses Plus Potassium Salts

Lot No.	Initial Weight	1st	2nd	3rd	4th	5th	6th	7th
1	1727	1758	1949	1884	2268	2353	2609	2690
2	1695	1754	1836	1753	2258	2495	2639	2783
3*	1498	1664	1814	1700	2170	2269	2450	2666
4*	1471	1601	1774	1640	2118	2301	2480	2569
5*	1477	1625	1716	1629	2078	2293	2383	2452
Av. 1 and 2	1709	1756	1893	1818	2263	2424	2624	2737
Av. 3, 4, and 5*	1477	1625	1768	1656	2122	2288	2438	2562

* These lots fed high potassium diet during 6th and 7th weeks of the trial.

Results and Discussion

The dehydrated cereal grasses used in this trial had approximately the same composition (Table I) as samples of wheat grass collected in the southwest wheat region. During the first five weeks, on a diet of approximately 3.0 per cent potassium, the rabbits displayed no symptoms of hyperirritability. Growth during this phase of the study seemed to be about normal except during the third week. A change in method of feeding (wetting the dehydrated cereal grass) was made two days before the third weekly weighing. With the large weight gains the following week (Table II) it is believed that this change in feeding method may account for the weight losses of the third week.

During the feeding of the high potassium diet to lots 3, 4, and 5, weight gains (Table II) were approximately the same for all lots. Attempts to excite the rabbits with loud noises, shrill whistling, and sudden movement failed.

Blood analyses (Table III) showed no obvious differences between control and high potassium lots. All the constituents of which analyses were made were within normal limits.

TABLE III

Average Composition of Blood Plasma of Rabbits Fed Dehydrated Cereal Grasses and Cereal Grasses Plus Potassium Salts. (All values in mg.%)

Lot No.	Treatment	Ca	Mg	P	K	Na
1	Control	12.1	3.05	4.04	34.1	276
2	Control	11.5	3.26	4.33	35.3	273
3	High potassium	10.5	3.41	4.38	35.6	273
4	High potassium	10.8	3.20	4.13	34.6	274
5	High potassium	11.2	2.62	3.69	34.6	277
Average, control lots		11.8	3.16	4.19	34.7	275
Average, high potassium lots		10.8	3.08	4.07	34.9	275

Summary

Hyperirritability and other gross abnormalities characteristic of grass tetany were not observed in rabbits fed dehydrated cereal grasses or dehydrated cereal grasses plus a mixture of potassium salts as the sole ration for a period of several weeks. Weight gains were essentially normal on a ration of wheat grass and were unaffected by the addition of potassium salts to a level of approximately 5.0 per cent potassium in the diet. No significant changes in the ionic composition of the blood plasma resulted from feeding such high potassium diets.

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