bar of osmotic pressure were, respectively, 0.576 ± 0.004, 0.570 ± 0.004, 0.568 ± 0.004, and 0.562 ± 0.005. These sensitivity values for the separate couples are averages for determinations at five osmotic pressures. The standard errors measure the accuracy of proportionality between output, in microvolts, and osmotic pressure. The coefficient of variability of the voltage readings for five replicates of each of the KCl concentrations was determined for each of the thermocouples; the over-all average of these 20 coefficients was 0.5 percent. The highest variability occurred at the highest osmotic pressure for which the average coefficient of variability for the four junctions was 1.1 percent.

The calibration of a hygrometer that makes use of evaporative cooling depends on atmospheric pressure. For a given osmotic solution in the sample chamber of the couples here described, the rate of change of sensitivity with change in atmospheric pressure is constant but increases as the osmotic pressure of the sample is increased. The increase in sensitivity for a 10-mbar decrease in barometric pressure is 0.00145, 0.00155, and 0.00160 μv, respectively, per bar of osmotic pressure, for standard osmotic solutions of 5, 10, and 20 bars. Correction for change of atmospheric pressure from the value at calibration will not often be needed, but barometer readings should be taken so that correction can be made if necessary.

The physical condition of water in soil is usually specified in terms of equivalent membrane pressures, largely because measuring techniques employing membranes are available. With thermocouples which can be accurately calibrated in terms of relative pressure near saturation, it seems clear that the thermodynamic functions of free energy and activity will be more generally used for describing soil-water-plant systems.

L. A. Richards
Gen Ogata

U. S. Salinity Laboratory,
U. S. Department of Agriculture,
Riverside, California

References

1. L. A. Richards, *Proc. Iowa Acad. Sci.* 45, 175 (1938).
2. R. P. Teele and S. Schuhmann, *J. Research Natl. Bur. Standards* 22, 431 (1939).

6 June 1958

Effects of Selenium and Vitamin E on White Muscle Disease

Reports of the pharmacodynamic interrelationship of selenium and vitamin E in liver necrosis of rats (*1*) and "exudative diathesis" of chicks (*2*) prompted the inclusion of this element in an experiment designed to study the factor or factors involved in the cause of white muscle disease, a myopathy in lambs and calves which results when legumes from certain areas are fed to the dams during gestation (*3, 4*). Since reports concerning the role of vitamin E in this disease are somewhat contradictory (*4, 5*), that vitamin was likewise included in this experiment.

Table 1. Scheme and results.

Ration supplement	Lambs	
	Affected	Not affected
Lot 1, control ration		
None	1	17
Lot 2, basal ration		
None	11	4
Lot 3, basal ration		
770 I.U. of α-tocopherol per ewe per week*	11	4
Lot 4, basal ration		
100 I.U. of α-tocopherol per ewe per day†	16	4
Lot 5, basal ration		
0.1 part of Se per million, calculated for the total ration‡	1	15

* Administered parenterally as *d*-α-tocopheryl polyethylene glycol 1000 succinate (*8*).
† Administered orally, as Myvamix (*8*), with the oats.
‡ Administered orally, as Na_2SeO_3, with the oats.

Lots of 12 ewes each were used in this experiment. The ration fed the control lot consisted of Ladino clover and alfalfa hay grown in relatively nonaffected areas, plus 0.25 lb of oats per ewe per day. The basal experimental ration consisted of Ladino clover hay from a severely affected area, plus 0.25 lb of oats per ewe per day. Supplements were given as indicated in Table 1. A preliminary trial indicated that vitamin E as injected maintained satisfactory blood levels in ewes.

The ewes were placed on the experimental regime 50 days after the bucks were placed with them, and the respective rations were continued for approximately 140 days, the termination being governed by the ages of the individual lambs. One of each pair of twins occurring in lots 1 and 2 was sacrificed soon after birth. These, and other lambs that died, in all lots, were necropsied. With a few exceptions, all of the others were necropsied at approximately 6 wk of age.

Analyses of the hays (*6*) fed in this experiment indicate levels of less than 0.1 part of selenium per million, the limit of the analytical method employed. Tocopherol levels in the hays and in the blood of both the dams and the lambs are being determined.

These results appear to indicate that selenium had a definite protective pharmacodynamic effect with respect to white muscle disease under the conditions of the experiment and suggest that a more comprehensive and critical investigation should be made of the role of this element in white muscle disease and other myopathies occurring in animals, including man (*7*).

O. H. Muth, J. E. Oldfield,
L. F. Remmert, J. R. Schubert
Departments of Veterinary Medicine, Dairy and Animal Husbandry, and *Agricultural Chemistry,*
Oregon Agricultural Experiment Station, Corvallis

References and Notes

1. K. Schwarz and C. M. Folts, *J. Am. Chem. Soc.* 79, 3293 (1957).
2. K. Schwarz, J. G. Bieri, G. M. Briggs, M. L. Scott, *Proc. Soc. Exptl. Biol. Med.* 95, 621 (1957); E. L. Patterson, R. Milstrey, E. L. R. Stokstad, *ibid.* 95, 617 (1957).
3. J. P. Willman, S. A. Asdell, Peter Olafson, *Cornell Univ. Agr. Expt. Sta. Bull. No. 603* (1934); J. E. Oldfield, W. W. Ellis, O. H. Muth, *J. Am. Vet. Med. Assoc.* 132, 211 (1958).
4. O. H. Muth, *J. Am. Vet. Med. Assoc.* 126, 355 (1955).
5. F. Whiting, J. P. Willman, J. K. Loosli, *J. Animal Sci.* 8, 234 (1949); J. W. Safford and Karl F. Swingle, *Am. J. Vet. Research* 16 (1955).
6. We acknowledge the assistance of W. W. Ellis, of the University of Wyoming, in determining the selenium content of the hays.
7. We thank Karl Folkers, of Merck and Company, for his advice and encouragement in connection with this experiment.
8. D. C. Herting, of Distillation Products Industries, kindly made available the Myvamix and the *d*-α-tocopheryl polyethylene glycol 1000 succinate used in these studies.

26 May 1958

Anaphylaxis in Passively Sensitized Guinea Pigs after Subcutaneous Eliciting Injection

Lethal anaphylaxis after a subcutaneous eliciting injection of homologous antigen has been reported relatively rarely. Recently it was shown that in actively sensitized guinea pigs an ultimately lethal but protracted anaphylactic shock can be regularly elicited by a subcutaneous injection of relatively large amounts of antigen (*1*). The signs of protracted shock include pruritus, dyspnea, bristling of fur, a fall in body temperature, and prostration. Symptoms first appear a few minutes after the eliciting injection (pruritus), but death may not occur until several hours have elapsed. At necropsy, the most consistent finding is stasis or hemorrhages of the intestine and stomach walls.

In the experiments to be described in this report, guinea pigs were passively sensitized by the intravenous route with graded amounts of guinea pig or rabbit antiovalbumin serum. Table 1 shows the results of subcutaneous injection of 50 mg of ovalbumin 19 to 20 hours after passive sensitization. In view of the lack