

area at the time of introduction of reacting factors into the blood stream.

Summary. A number of experiments are described which demonstrate that local inhibition of the Schwartzman phenomenon can be achieved by treating the prepared skin area with a variety of substances immediately prior to the intravenous injection of reacting factors or by clamping off a portion of the prepared skin area for one hour after the intravenous injection. It is believed that these agents produce their effects by creating a local ischemia which shields the prepared skin tissue from the injurious agents circulating in the blood stream.

5796

Effects of Diet and Fasting on Plasma Phosphatase.

AARON BODANSKY AND HENRY L. JAFFE.

From the Laboratory Division, Hospital for Joint Diseases, New York.

Increased plasma phosphatase has been reported by Kay¹ and others in v. Recklinghausen's disease, in Paget's disease, in active rickets and in other pathological bone conditions. These results were confirmed by ourselves in our clinical material. Kay suggested that increased plasma phosphatase in these conditions was due to leakage of the enzyme from bone at more than the normal rate. However, in view of the presence of large amounts of phosphatase in other tissues than bone (kidneys, intestinal mucosa) it seems that variations in plasma phosphatase might be due to other causes, and that the state of nutrition of an animal might influence the plasma phosphatase in bone diseases found clinically or produced experimentally. The latter possibility had to be considered by us in studies of plasma phosphatase changes in experimental hyperparathyroidism, in view of the diminished appetite which is observed in animals treated with parathormone for long periods.^{2, 3} (In other experimentally produced conditions asso-

¹ Kay, H. D., *J. Biol. Chem.*, 1930, **89**, 249.

² Jaffe, H. L., and Bodansky, A., *J. Exp. Med.*, 1930, **52**, 669; Jaffe, H. L., Bodansky, A., and Blair, J. E., *Arch. Path.*, 1931, **11**, 207.

³ Bodansky, A., Jaffe, H. L., and Blair, J. E., *J. Biol. Chem.*, 1930, **88**, 629; Bodansky, A., and Jaffe, H. L., *J. Exp. Med.*, 1931, **53**, 591.

ciated with anorexia, malnutrition, stationary weight and loss of weight, the same possibility exists.)

In a preliminary study of phosphatase variations in experimental hyperparathyroidism in guinea pigs⁴ it appeared indeed that fasted control animals of the same age and kept under the same conditions as fed controls and as the hyperparathyroid animals showed a lower plasma phosphatase than the fed controls. Three fasted controls showed plasma phosphatase values of 3.9, 7.5, and 5.6 units per 100 cc. (*average 5.7*). Two fed controls showed plasma phosphatase of 8.7 and 11.3 units per 100 cc. (*average 10.0*). The data on a group so small required confirmation.

The blood was drawn from the heart in the guinea pigs and rats, and from the jugular vein in the dogs. Oxalated plasma was used for the determination of the phosphatase. We adhered to the use of oxalated plasma because our earlier data were obtained on oxalated plasma. It may be noted, however, that oxalate, in the proportions used to prevent coagulation, inhibits phosphatase activity. Heparinized plasma and serum show higher phosphatase content than oxalated plasma. Serum treated with like amounts of oxalate shows a phosphatase activity similar to that of oxalated plasma and about 10% lower than serum not so treated.⁵ We reduced the incubation period to 1 hour because of the high phosphatase content of our material. In other respects the details of our method were followed, as previously published.⁶

Effect of fasting on plasma phosphatase in guinea pigs. Two groups of young guinea pigs in good state of nutrition and weighing approximately 300-400 gm. were tested at 2 different times. In each of these groups the animals to be fasted were kept together with the others until the removal of food. We found it desirable to "condition" our animals alike before the tests. The results are shown in Table I.

Influence of the diet on plasma phosphatase in rats. Several litters of young rats were so divided that animals from each litter were represented in a group receiving the Sherman diet and in another group receiving a diet of ground fresh lean meat supplemented with calcium carbonate, cod liver oil, and tomato juice. The weights of these rats ranged from 60-105 gm. at the beginning of the experiment. Most of them gained during the following month 100-150%

⁴ Bodansky, A., and Jaffe, H. L., *Proc. Am. Soc. Biol. Chem.*, Montreal, Canada, April 8-11; *J. Biol. Chem.*, 1931, **92**, 16.

⁵ Bodansky, A., to be published.

⁶ Bodansky, A., *PROC. SOC. EXP. BIOL. AND MED.*, 1931, **28**, 760.

TABLE I.
Effect of Fasting on Plasma Phosphatase in Guinea Pigs.
 Plasma phosphatase content is stated in units per 100 cc.

		No. of Animals	Phosphatase		
			Max.	Min.	Av.
Group 1	Fed	5	12.9	6.3	9.1
	Fasted 3 days	4	7.4	2.8	5.1
Group 2	Fed	4	12.5	11.2	11.7
	Fasted 3 "	3	7.8	7.4	7.6
	" 6 "	3	4.0	1.7	2.6

of their initial weight. The average plasma phosphatase of 8 rats receiving the meat diet was *87.1 units per 100 cc.* (maximum 106.2, minimum 65.0 units). The average plasma phosphatase of 7 rats receiving the Sherman diet was *65.9 units per 100 cc.* (maximum 80.1, minimum 58.0 units). Two "runts" who, however, gained about 150% in weight on the meat diet showed an average plasma phosphatase of *84.5 units*, and 3 "runts" who gained equally on the Sherman diet showed an average plasma phosphatase of *52.9 units*.*

Effect of fasting on plasma phosphatase of rats. Five rats from both groups in the above test were fasted for 96 hours. Their plasma phosphatase averaged *26.8 units per 100 cc.* (maximum 38.1, minimum 20.0 units).

Dogs. Our data were less conclusive, probably because the fasting periods were shorter (60 hours). Incomplete results indicate, however, that after about a week of stationary weight the plasma phosphatase falls, and that a period of good nutrition restores the plasma phosphatase to a higher level. Seven puppies (litter mates), about 2 months old at the beginning of the tests, were used.

Summary and Conclusions. Rats maintained for over a month on the Sherman diet showed a lower plasma phosphatase than those maintained on a meat diet. The plasma of fasted rats and guinea pigs had a much lower phosphatase content than the plasma of fed controls.

The variations of plasma phosphatase could not in these cases be attributed to any phenomena associated with the physical and chemical processes taking place in bone. Indeed, the assumption that plasma phosphatase changes are caused only by physical or chemical changes in the bone would lead to expect results contrary to those we actually obtained, because starvation for 3 to 6 days

* We consider it important to note in this connection that these rats were maintained in like conditions in our laboratory for over a month. A litter of young rats obtained from another source and used immediately, without being "conditioned" in our laboratory, showed an average plasma phosphatase of less than 20.0 units.

causes considerable non-specific bone resorption.⁷ It seemed more plausible that the physical and chemical processes associated with nutrition were closely linked with these changes in plasma phosphatase. It is possible, however, that the cessation of new bone formation in young animals (also observed during starvation) contributes to the lowering of plasma phosphatase. It must be noted in this connection that young, growing animals were used, and that our conclusions do not necessarily apply to adults.

5797

Viosterol Treatment in Experimental Hyperparathyroidism.*

HENRY L. JAFFE, AARON BODANSKY AND JOHN E. BLAIR.

From the Laboratory Division, Hospital for Joint Diseases, New York City.

Irradiated ergosterol (viosterol) has been employed therapeutically in clinical hyperparathyroidism (*Ostitis fibrosa cystica*, or v. Recklinghausen's disease) to supplement operative treatment. Snapper¹ referred to one case in which "vigantol" had to be given to promote the recalcification of the skeleton after removal of a parathyroid adenoma; he also mentions Regnier's mild case of clinical hyperparathyroidism in which considerable amelioration of the condition had been induced with "vigantol", ultraviolet light, and heat. However, Wilder and Johnson² stated that viosterol did not prevent the decalcification of the skeleton in experimental hyperparathyroidism in rats.

The protective and curative effects of small doses of irradiated ergosterol in disorders of calcium metabolism are well known, especially through its use in rickets. On the other hand, large and toxic doses may induce decalcification of the skeleton and a negative mineral balance (Shohl, Goldblatt and Brown,³ Soeur,⁴ and Taylor, Weld, Branion, and Kay.⁵)

⁷ Jaffe, H. L., and Bodansky, A., unpublished results.

* The generous cooperation of Eli Lilly and Company, who supplied most of the parathormone used in these experiments, is acknowledged.

¹ Snapper, I., *Ann. de Méd.*, 1931, **29**, 201.

² Wilder, R. M., Johnson, J. L., *Proc. Assn. Am. Phys.*, abstracted in *J. Am. Med. Assn.*, 1931, **96**, 1987.

³ Shohl, A. T., Goldblatt, H., Brown, H. B., *J. Clin. Invest.*, 1930, **8**, 505.

⁴ Soeur, R., *La Presse Méd.*, 1931, **53**, 1003, and *Arch. Int. de Méd. Expér.*, 1931, **6**, 365.

⁵ Taylor, N. B., Weld, C. B., Branion, H. D., Kay, H. D., *J. Can. Med. Assn.*, 1931, **25**, 20.