

Circulatory Effects from Pentothal Sodium Administered Soon After Hemorrhage.*

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A death during sodium ethyl 1-methyl-butyl thiobarbituric acid (pentothal) intravenous anesthesia, given shortly after acute, inadequately treated hemorrhage prompted a study of its effects on circulation when given to animals during similar circumstances.

Method. Nineteen experiments were performed on 7 cats and 10 dogs. Arterial blood pressure determinations were recorded by cannulating a carotid or femoral artery during infiltration anesthesia. Control mean blood pressure readings averaged 127 mm Hg in both species. Hemorrhage was produced by direct arterial bleeding (averaging 6-8 minutes) until the mean arterial blood pressure level was reduced to an average of 70 mm Hg. Twenty-five to 30% of the estimated blood volume was withdrawn.

Freshly prepared 2% solutions of pentothal given intravenously at an average rate of 3.4 cc per minute were administered at a time averaging 24 minutes following bleeding. Sub-anesthetic amounts were used because in earlier experiments, not included in this study, the recommended anesthetic dose for normal dogs and cats when administered following hemorrhage caused prompt circulatory failure and death. All animals used had responded normally to the full anesthetic dose several days before being subjected to experiment. The usual dose of 25 mg/kg for dogs was reduced to an average of 11 mg/kg and cats were given 12 instead of the recommended 40 to 50 mg/kg. No preanesthetic medication was given.

An additional cat and 2 dogs were similarly prepared but received no pentothal. They were observed for 4 hours. After the initial fall following hemorrhage, no rapid fluctuations in blood pressure were observed for the control period.

Oxygen was administered by tracheotomy or endotracheal airway to 3 cats and 4 dogs preceding and during pentothal injection. Its use had no effect upon the results obtained.

Results. Following the administration of pentothal the animals exhibited 2 types of reaction. In all 7 cats and in 7 dogs the following sequence of events was noted. There was an initial rapid additional fall in blood pressure level to an average mean pressure of 29 mm Hg. This phase continued for 1 to 16 minutes. It was succeeded by a rise to an average of 65 mm Hg. in 1 to 12 minutes. Following this a secondary fall to the low level of 12 mm in 0.5 to 20 minutes occurred which caused the death of 4 cats and 3 dogs.

In 5 dogs, 3 exhibited an initial rapid fall in blood pressure to an average 50 mm Hg. which was succeeded by a phase during which blood pressure was elevated and maintained at an average of 105 mm Hg until the hypnotic effect wore off.

Two dogs with sustained blood pressure were given additional identical doses of pentothal when the clinical effect of the previous one had worn off. The reaction to each injection was identical to that preceding except that without warning one dog died following the third additional injection and the other after the fourth additional dose.

The pulse rate, increased after hemorrhage, slowed considerably in 13 of the animals, increased in 4, and was unaffected in 2 after pentothal was given. A decrease in pulse rate is not usually observed when pentothal is administered to animals with normal circulation.

Respirations were depressed after pentothal. They either became shallow, without increase in rate, or ceased completely.

Gross autopsies on the animals which succumbed revealed a markedly dilated heart due almost entirely to right-sided enlargement.

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The large veins were also greatly dilated.

Discussion. These few preliminary observations indicate that following hemorrhage the circulatory effects of pentothal sodium are unpredictable. In 14 of 19 experiments they were rapidly deleterious.

These observations on laboratory animals suggest that due consideration should be given the occurrence of recent hemorrhage when pentothal is to be used intravenously for anesthesia. There is a tendency from previous experimental work¹ to consider barbiturates desirable during traumatic operations. However, the impression that pentothal is safe and

even beneficial in "shocked" cases^{2,3,4} is not established and should be tempered.^{5,6}

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² Fordyce, C. Y., *Surg. Clin. No. Amer.*, 1942, **22**, 1483.

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Studies on Muscle and Nerve in Biotin-Deficient Rats.*

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Several investigators have reported that rats reared on biotin-deficient diets develop a motor syndrome which is characterized by abnormality of locomotion, varying degrees of paralysis and spasticity. Nielsen and Elvehjem¹ have shown that this condition can be prevented and cured by crystalline biotin. Shaw and Phillips² reported that the skeletal muscles of biotin-deficient rats showed histologic evidence of atrophy but the spinal cord and peripheral nerves appeared quite normal. This report is concerned with a study of the functional state of muscles and nerves of biotin-deficient animals and includes observations on the rate of neuromuscular regeneration in such a deficiency.

Methods. Albino rats were reared from weaning on the basal egg-white ration of Nielsen and Elvehjem.¹ After symptoms characteristic of biotin deficiency appeared, studies were carried out on the gastrocnemius muscles

and tibial nerves. In a number of animals the tibial nerve of one limb was crushed and the rate and extent of neuromuscular regeneration compared to that of control animals on an adequate diet. In the regeneration experiments the unoperated tissues of the contralateral limb served as controls. The strength of the muscles was determined by measuring the maximum isometric tension which developed in response to volleys of adequate stimuli applied directly to the muscle and to its motor nerve. The technics that were employed for denervation and strength measurements have been described in detail elsewhere.³ In addition, observations were made concerning muscle and body weight ratios, creatine, chloride, and water concentration in the muscles.

Results. Because of an unpredictable survival time, the regeneration studies were conducted on animals which possessed the characteristic biotin deficiency symptoms but had not yet reached the terminal spastic condition. The muscles and nerves of such animals (Table I) were found to regenerate at rates compar-

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