mimetic acting poisons. (2) Epinephrine produced pure relaxation in *R. erinaceae* and *R. stabuliforis;* contraction or relaxation in *R. diaphenes.* The greatest sensitivity was found in the last species, which gave an increase in tone in as high a dilution as one in one hundred million. (3) Pilocarpine produced contraction in all species, but it usually required a concentration higher than 1 in 100,000 to obtain this effect. The segments were often non-reactive to the drug. (4) Atropine relaxed the segment contracted by means of pilocarpine. It required an equal quantity of each to produce an equal degree of antagonism. (5) Post-Pituitary solution (fresh) 1 to 1 million and 1 to 100,000 produced relaxation in *R. erinaceae,* thus simulating epinephrine in this species; one-tenth of a unit of obstetrical post-pituitary solution (Swann-Myers) produced contraction, whilst pitocin, Kamm, and fresh post-pituitary solution were inactive in *R. stabuliforis.* (6) Histamine, 1 to 1 million and 1 to 100,000, stimulated tone and contractility in *R. erinaceae and stabuliforis.* (7) Ergotoxine, 1, to 100,000 had no effect on *R. erinaceae.* (8) Potassium chloride 1 to 300, caused an increase in tone and contractility in *R. erinaceae.*

EFFECTS OF CERTAIN BARBITURATES ON THE HEART OF ELASMOBRANCHS

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A study of the relative depressant effects of nembutal, amytal, luminal and veronal, was made on the isolated heart preparation (sino auriculo-ventricular) of the spiny dogfish (*Squalus acanthias*) and the barndoor skate (*Raia stabuliforis*). The heart preparation was suspended in a balanced saline solution which was constantly oxygenated and whose temperature was maintained at 10° C.

The balanced saline was made up according to the following formula: sodium chloride, 15 grams; urea, 20 grams; potassium chloride and sodium chloride, each 400 milligrams; magnesium chloride, 1 gram; sodium bicarbonate, 500 milligrams; sodium acid phosphate, 100 milligrams; distilled water to make 1,000 cc. When freshly distilled water was used (Barnstead still), the pH of this solution was 7.55.

Graphic records, obtained by means of a light heart lever, were then taken from the isolated, rhythmically beating heart preparation, and after a maximum rhythm was attained, 50 milligrams of each of the above named barbiturates (as the sodium salt) was added to each 100 cc. of the saline solution bathing the heart preparation. In this manner, it was found that stoppage in diastole was caused promptly by nembutal, amytal and luminal; whereas the rhythm persisted for relatively long periods after veronal. In a series of experiments, the average time required for stoppage after nembutal was 7.5 minutes; amytal, 9 minutes; luminal, 11 minutes, and more than 68 minutes for veronal. As a further check of nembutal and veronal, a comparison was made on the heart of the barndoor skate.

In this animal the heart is large enough to be divided into halves, and when mounted in saline in separate chambers under identical conditions, the two halves will beat synchronously. Graphic records, taken from preparations thus arranged, showed that the 50 mgm. dose of nembutal stopped the heart in 2 minutes; whereas veronal had little or no effect after several hours.

The above order of the depressant activity of the barbiturates closely parallels their toxicity, as found by the author, for intact animals (rats). This suggests that the central actions of the barbiturates may not alone be of fundamental importance in the treatment of overdosage from the barbiturates and that veronal is probably best suited for use as a cerebral sedative in certain clinical heart conditions.

MORPHOLOGY OF THE PECTORAL ARCHITECTURE IN FISH

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In spite of the fact that the question of the morphology of the appendages has received the critical attention of investigators for a great number of years, much remains to be done in this subject. In connection with work on the higher vertebrates it became necessary for me to investigate the situation in fish, with greater attention paid to the nerve-muscle-skeleton interrelationship than has heretofore been accorded.

During the summer of 1932 I took the opportunity to establish neurologically the segmental relationship of the muscles of the paired appendages in a number of fish. Besides precise dissections of fresh specimens of several forms of fish, the dogfish (*Squalus*), cod (*Gadus*), and pollack (*Gadus*) were anaesthetized with chloretone, and after the nerves of the fins were exposed, these were subjected to a properly controlled faradic current. There was considerable variation in the response of the different muscle divisions, although such variation followed a fairly uniform pattern. This method of approach, of course, removes any chance for error in the proper interpretation of muscle derivation.

Nerve stimulation amplifies as well as verifies the knowledge gained from precise dissections, and indicates that there is pronounced dissimilarity in the secondarily basic pattern of the fin muscles. In other words the fin muscles, although relatively simple in plan, are of characteristically dissimilar arrangement in some of the major groups of fishes, indicating that these groups are derived from different sorts of the most primitive finned vertebrates. Furthermore it is indicated without reasonable doubt that the primary muscle divisions were divided not into extensor (elevator) and flexor (depressor) groups of appendageous muscles, but were based on a protractor and a retractor series of myomeric divisions.