GENERAL GAME SESSION

A PRELIMINARY REPORT ON A FIELD METHOD USING DRUGS FOR CAPTURING DEER [1]

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The necessity for an effective method of capturing deer in southern Georgia has long existed. Due to a lack of heavy frost and a relatively heavy rainfall in this area, the usual box-trapping techniques employed in North Georgia and many of the eastern states have been unproductive. In over sixty counties in Georgia containing good deer habitat there is a definite need for restocking.

Experimental work was started at Athens in late 1954, using curare alkaloids and synthetic curare-like compounds. Paralysis in rabbits was obtained in 6-12 minutes with flaxedil [6] (approximately 1 mg./Kg. by intramuscular injection). Respiratory failure, however, was common, although tensilon [7] was given as an antidote. One-half mg./Kg. (.23 mg./lb.) of flazedil, by intramuscular injection on a dart, was given to a 74-pound (33.6 Kg.) goat without effect. Paralysis was obtained in 22 minutes on this same animal using .9 mg./Kg.

At this stage of the investigation circumstances required either the destruction of 300 deer from a coastal island, or a demonstration that they could be taken alive and removed. Two dart guns were constructed; one was powered by heavy rubber tubing and the other was a modified Crossman air gun with a .30 caliber barrel. The latter was equipped with a telescopic sight and has proved satisfactory up to about 40 yards. Dosage of 50 mg. of flaxedil on darts, a modification of the method described by Hall *et al.* (1953) used on captive deer, was tried on wild deer weighing about 100 pounds. These dosages in seven trials were not effective. Dosage levels of 70 mg. per dart were lethal to 4 deer, which succumbed to respiratory paralysis. Oxygen therapy was indicated, since artificial respiration was ineffective.

Experimental work using dogs was then initiated. Following paralysis induced by curare or flaxedil, tensilon was administered and oxygen perfusion was initiated. All dogs were lost in spite of both restorative procedures. This technique was not fully investigated, but the preliminary results were most discouraging. The toxicity of this group of compounds has limited their use to occasional operative procedures necessitating muscle relaxation; the use of curare for the achievement of flaccid paralysis is contra-indicated. A new approach to the problem appeared necessary.

Strychnine and its salts are known to produce complete inactivation through spastic paralysis. Antidoting their action with barbiturates has long been practiced and Goodman and Gilman (1941) state that barbiturates have protected laboratory animals against 35 times the minimum lethal dose. Experimental procedures using strychnine were begun with intramuscular injections of .5 mg./Kg.. (.23 mg./lb.) of the sulfate salt on five dogs. Inactivation was obtained in as short as 2.5 minutes and recovery after pentobarbital sodium therapy became routine. Thirty goats were then subjected to strychnine

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tetany and responded to pentobarbital sodium. Strychnine sulfate is readily available; however, in view of the limited solubility and subsequent delayed absorption, an investigation of the more soluble salts was deemed advisable. In addition to strychnine sulfate, strychnine hypophosphite,[8] strychnine arsenate,[8] strychnine camphorate, and strychnine levulinate were used. The latter two compounds were not available commercially and were synthesized in our laboratory. In 5 sulfate trials with goats, immobilization (tetany) was produced in from 3 to 9 minutes and all animals recovered. In 5 trials with arsenate, goats were inactivated in 3.5 to 9 minutes and all recovered. One trial with camphorate resulted in paralysis in 7 minutes with good recovery. Two out of 4 were lost using hypophosphite. The levulinate derivative is the most water soluble form of this group; therefore, eleven trials were made with doses varying from 25 mg. to 100 mg. on goats averaging about 70 pounds. Three goats were lost, while 1 at the 25 mg. level was unaffected; the other animals recovered satisfactorily. The minimal time for complete inactivation with levulinate was 90 seconds with recovery attained in 97 minutes.

Seven wild deer (*Odocoileus virginianus*) were taken using this method in the late summer and early fall of 1955 in 7 nights of field work on an island off the coast of Georgia. Following implantation of the dart, 6 deer were obtained in 8 minutes and 1 required as long as 12 minutes for inactivation. All but 1 recovered satisfactorily, and it died apparently from pentobarbital sodium sensitivity (respiratory embarrassment) while being moved to the base camp 64 minutes after therapy was started. Six deer were lost and found dead about 10 minutes or more after they had dropped, and 2 others had fallen in ponds and drowned. Best success has been attained with strychnine arsenate at the 100 or 150 mg. dose although the sulfate and levulinate derivatives have shown about the same effect.

In brief, the technique has been as follows: The powdered strychnine salt is weighed out and massed with a minimum of liquid glucose. This mixture is then applied as a heavy paste to a dart made from a 7/64-inch drill bit. All hunting has been at night using lights. Delivery of the dart is not a serious problem for a competent field man. The deer must be followed for about 10 minutes. An excellent trail dog on a leash was of no value due to wet conditions and the prevalence of many deer trails. "Walkie-talkies" were used during the last two days of field work and are considered to be of real aid. All shots must be made in relatively open, dry country. The dart is placed in the heavy muscles of the hind quarters. As soon as the deer falls immediate therapy with pentobarbital sodium (60 mg./cc.) should be begun. About 10-15 cc. are injected intravenously. Antidoting must be done symptomatically; *i.e.*, deep enough to nullify muscle tetany but not suppress respiration. Stimulants have been employed when respiratory embarrassment became evident. Milks (1949) has stated that strychnine following intravenous injection is lost rapidly through excretion and detoxification and that 50 per cent is lost from the blood within 5 minutes and all but traces within 40 minutes. He also states that it is 2 to 8 times less effective orally than by injection. As the deer begins to come out of anesthesia it should be stimulated with noise or tapping to see if there is muscle stiffening. If there is, small amounts (3-4 cc.) of pentobarbital sodium are given. If there is no reaction, the deer are crated. Animals captured by this method have been observed as long as 9 weeks and no complications are anticipated.

Although some deer may be lost and may succumb to the drug, there is no reason to feel that they constitute a hazard to other animals. Front and hind quarters from 2 deer that were lost and found dead later were test fed to 7 dogs which had been held 24 hours without food. All were allowed to eat their fill. Except in 1 five-pound dog which was fed the meat taken from the immediate vicinity of the dart, no ill effects were noted. The much lower toxicity of strychnine when taken orally rather than by injection accounts for the relative harmlessness of the meat taken from the above deer. Their use for human consumption, however, has not been investigated.

[8] Furnished through the courtesy of the New York Quinine and Chemical Works, Inc., 50 Church Street, New York 7, N. Y.