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Increased Acetylcholine Sensitivity of Muscle by Acetone Magnification of the Rectus Test.

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It has been shown by Meng[1] that ketones and related substances sensitize the rectus muscle of the toad to acetylcholine (Ac). This sensitization is not correlated with inhibition of cholinesterase, and it is of the same degree whether the muscle is normal, eserinized or denervated. Hence the site of sensitization by these agents is said to be on the muscle. In connection with a study on the cholinesterase, we have found that acetone potentiates strikingly the action of Ac. The rectus muscle of the toad was recorded according to the standard technic.[2]

Fig. 1 compares the action of eserine and acetone on 2 recti of the same toad, showing the more striking potentiation by the latter.

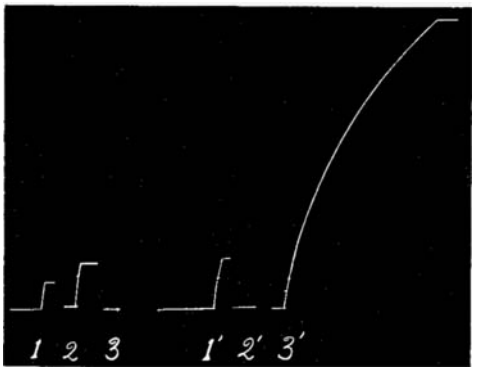

FIG. 1.
Comparing the sensitization of Ac by Es and acetone on the two recti of the same toad.

1. 1.38 γ Ac
2. 10 γ Es + 1.38 γ Ac } On right rectus
3. 10 γ Es

1' 1.38 γ Ac
2' 0.05 cc acetone } On left rectus
3' 1.38 γ Ac + 0.05 cc acetone

Muscle bath = 8 cc. Each contraction recorded for 3 min.

Note that neither eserine nor acetone alone produced any contraction, while addition of Ac which by itself elicited only a weak response, caused a very marked contraction. The action of acetone could be repeated in succession if it was given each time. The concentration of acetone used had no influence on the cholinesterase as was shown by the fact that addition of known amount of Ac to the acetone-treated and control muscle mince showed comparable degree of hydrolysis.

Feng and Lee[3] have demonstrated that acetone can reproduce practically all the diverse actions of eserine on the skeletal N-M system. In the present experiment, we have shown the synergistic action of acetone and Ac, or probably the action of the former on the surface membrane favoring more ready penetration of the latter to the contractile elements of the muscle. Incidentally, we have made practical use of this striking response of Ac plus acetone in two ways: First, as an additional collateral test for qualitative identification of Ac. It is comparable to the leech test.[4] Secondly, as a quantitative assay for Ac in the range of 0.05 to 0.5 γ. Usually 0.05 to 0.5 γ Ac given to a bath of 8 cc will not touch the rectus muscle of the toad. If it is given with acetone, a significant contraction will be produced. This magnifying action of acetone makes it very useful for quantitative assay of Ac in the weak concentration defined. It is necessary that same amount of acetone must be added to the standard and unknown.

[1] Meng, C. W., *Chin. J. Physiol.*, 1941, **16**, 291.

[2] Chang, H. C., and Gaddum, J. H., *J. Physiol.*, 1933, **79**, 255.

[3] Feng, T. P., and Li, T. H., *Chin. J. Physiol.*, 1941, **16**, 317.

[4] Minz, B., *Arch. exp. Path. Pharmak.*, 1932, **168**, 292.