tion, and the detection of weak radiation is made possible. Traces of C^{14}, for example, are distinctly indicated, although weaker radiation (*1*) is not detected.

By means of a suitable connector at the end of handle C the probe is attached to the meter or scaler with co-axial cable, up to 20 feet long. In the authors' experience, the high potential supplied by an AC-operated type radiation meter requires very little change in value to enable the new tube to work on its plateau (ca. 800 volts for commercial tubes of this type).

In one application, this probe was attached to a Herbach and Rademan meter to which, in turn, had been added a simple audioamplifier and loud-speaker, obviating the necessity of looking at the meter while testing for stray radioactivity. The frequency of occurrence of the audible clicks is a measure of the intensity of the radiation passing through the probe. In another application, the described probe was attached to a standard scaler of 64, where it worked equally well.

Reference

1. Libby, W. F. *Ind. eng. Chem.* (Anal. ed.), 1947, **19**, 2-6.

Use of the Hydra for Pharmacological Study

Stata Norton and Edwin J. de Beer

The Wellcome Research Laboratories, Tuckahoe, New York

The hydra responds to touch by a withdrawal of its tentacle from the point of contact. This process presumably involves its primitive nervous system, which consists of a simple nerve network without a central organization such as a brain. The hydra, therefore, should have possibilities as a test object for the study of certain drugs which act on nerve mechanisms. For instance, local anesthetics, which act on the peripheral portions of the nervous system, would be expected to abolish the tactile response, whereas central depressants, such as hypnotics, would not. These ideas were confirmed in the following experiments.

Individual specimens of *Hydra oligactis* were placed in glass dishes containing 5 ml. of glass-distilled water. Within 15 minutes, the hydra attached itself to the bottom of the dish. The drug to be tested was then added to the water, and changes in shape, in spontaneous movements, and in response to vigorous tactile stimulations with a glass rod were noted at 1-minute intervals.

In agreement with the above postulates, it was found that each of the three local anesthetics tested (cocaine, procaine, and pontocaine) abolished the response to tactile stimulation; and, as was expected, the general hypnotics, Dial and Evipal, failed to inhibit this reaction. The local anesthetics also frequently caused the hydra to become detached from the dish. Perhaps this was a further manifestation of peripheral nerve depression. The abolition of tactile response by the local anesthetic was not due to the death of the hydra, for it was possible to restore the sense of touch by replacing the local anesthetic solution with fresh water.

Certain quantitative relationships were also observed for the local anesthetics. The minimum effective dilutions for pontocaine, cocaine, and procaine were, respectively, 1:25,000, 1:5,000, and 1:1,000. The drugs were therefore effective in the ratio 25:5:1, which is similar to that recorded for higher animals. Table 1 shows that the time required for the onset of tactile anesthesia increased as the concentration of cocaine decreased. A similar relationship was found for procaine. These results are again comparable to those obtained on common laboratory animals.

TABLE 1

Effect of Varying Concentrations of Cocaine on Time of Onset of Anesthesia in the Hydra

Concentration (mg./ml.)	Onset of anesthesia (min.)
0.2	Partial anesthesia
0.25	20
0.4	25
0.4	30
0.4	28
0.4	37
0.4	11
0.5	3
0.5	8
1.0	2
1.0	2
1.0	11
1.0	4
2.0	Disintegration

All of the drugs mentioned produced changes in the size and shape of the hydra. The local anesthetics regularly caused an initial contraction which was soon followed by a return to the original size. The only effect of the barbiturates was to produce a persistently shortened and thickened hydra.

The actions of certain other drugs on the hydra were also observed. The analgesic, morphine, which is believed to act centrally, produced no visible effect. Curare, after an initial contraction, produced great elongation, often to two or three times the original length. A tendency to form spirals or curls was noted. There was no loss of tactile sense or of spontaneous movements. Papaverine-treated hydrae first contracted and then regained normal size, but became rigid with complete loss of spontaneous movements, of response to touch, and of response to acetylcholine. The action of the latter drug by itself was limited to an initial contraction and was difficult to assess, since many things, *i.e.* salt solutions, cold, water movement, etc., caused brief contractions of the hydra. Although these may be qualitatively similar, the possibility remains that different drugs may produce contractions differing quantitatively in extent and duration.

The hydra also appears to have interesting potentialities for the analysis of the toxic actions of certain drugs. Protoplasmic poisons such as strong cocaine solutions were quite destructive to the hydra. A series of amidines, which were known to produce necrosis in higher animals, actually disintegrated the hydra within a matter of minutes. On the other hand, drugs which exert their lethal actions in higher organisms by affecting such organizations as the respiratory center, were relatively harmless. For example, neither morphine nor the very toxic curare killed the hydra, even in high concentrations.