

THE CONTENT OF ACETYLCHOLINE-LIKE SUBSTANCES AND CHOLINESTERASE IN THE TISSUES OF THE ASCARIS

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To date, acetylcholine and cholinesterase have been found in the tissues of all free-living invertebrates which possess a developed nervous system. They have been found in a series of animals which lead a parasitic form of life. M.P.A. Chance and T. E. Mansour [6] established the presence of real cholinesterase in the trematode *Fasciola hepatica*. N. M. Artemov and R. N. Lurye [1] discovered acetylcholine and cholinesterase in the tissues of cat cestodes. N. M. Artemov [1] found cholinesterase in parasitic crustacea. In the ascaris, E. Baldwin and V. Moyle [5] could not find acetylcholine or cholinesterase, and expressed the opinion that they were absent.

However, acetylcholine was recently discovered in the tissues of the ascaris by M. Helen [7].

The method we used to register the spontaneous movements of whole ascarides [2, 3] allowed us to establish their extremely high sensitivity to acetylcholine, especially after the preliminary action of proserine.

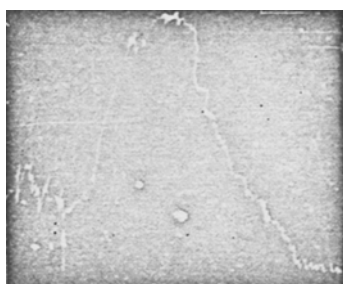


Fig. 1. Tetanic contraction of an ascaris in a solution of proserine, caused by acetylcholine in a dilution of 10^{-20} . The arrow shows the moment the preparation was injected.



Fig. 2. Slight debilitation of an ascaris body, caused by a total solution of another ascaris in a dilution of 1:100. The arrow shows the injection as in Fig. 1.

The ascarides responded by a sharp body contraction when acetylcholine in a dilution of up to 10^{-11} or proserine in a dilution of up to 10^{-9} was applied to their lips or caudal ends. After the preliminary action of proserine in

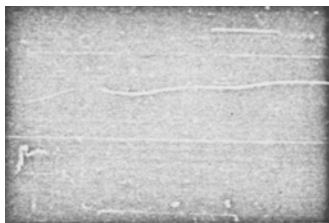


Fig. 3. Contracture of the dorsal muscle of a leech, caused by a total solution of an ascaris previously immersed in a solution of proserine in a dilution of 10^{-12} . Arrow the same as in the other figures.

an inactive concentration (10^{-25}), acetylcholine caused an answering reaction in the ascaris in dilutions of 10^{-20} - 10^{-22} (see Fig. 1). Ascarides in which the lips and tails had been removed, and also ascarides in solutions of novocaine, stopped reacting to acetylcholine and proserine [4].

Skin-muscle preparations of ascarides reacted to acetylcholine in a dilution of 10^{-6} , and to proserine in a dilution of 10^{-5} .

In order to determine the presence of acetylcholine and cholinesterase in the ascaris more exactly, we tested the effect of a total solution of an ascaris and of an extract from ascaris skin-muscle sheaths on the isolated dorsal muscles of a leech, and also on live ascarides. These preparations had no visible influence on the dorsal muscles of the leech, and caused only a slight debilitation in the ascaris (Fig. 2).

Consequently, the ascaris extracts did not contain specific acetylcholine-like substances.

We also used a total solution of an ascaris and extracts from the ascaris skin-muscle sheath, which were prepared after the live ascarides had been immersed in a solution of proserine for 2 hours previously (dilution 10^{-12}). Such preparations diluted up to 10^{-3} caused sharp contractures of the dorsal muscles of the leech and tetanic contractions of the ascaris in a dilution of 10^{-4} (Fig. 3-4).

In order to detect cholinesterase, we added different amounts of the ascaris tissue extracts to acetylcholine in a dilution of 10^{-7} . Five hours after preparation, these solutions were tested on the proserine-processed dorsal muscles of a leech. The total ascaris solution completely inactivated acetylcholine in a dilution of 1:10, the extract from the cerebral ganglia in dilutions up to 1:1,000 and the lip extracts in dilutions up to 1:10⁻⁵. One can conclude from these experiments that cholinesterase is present in the tissues of the ascaris, primarily in the sensory endings, but also in the nerve cells.

SUMMARY

Registration of spontaneous movements of whole ascarids have shown that the nerve endings of their lips and tails are highly sensitive to acetylcholine. Previously applied proserine considerably increases their sensitivity. Biological tests on the dorsal muscles of the leech and on ascarids proved the presence of acetylcholine-like substances and cholinesterase in ascarids.



Fig. 4. Tetanic contraction of an ascaris, caused by a total solution of another ascaris, previously immersed in a solution of proserine in a dilution of 10^{-12} . Arrow the same as in other figures.

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