EFFECTS OF ADENOSINE AND OTHER PURINE DERIVATIVES ON THE SECRETION OF SALT AND WATER BY THE RECTAL GLAND OF *Squalus acanthias*

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Adenosine and some of its derivatives greatly modify a number of cellular functions. Among these is the transport of water and electrolytes across epithelial tissues (stomach, Amer. J. Physiol. 221: 421-426, 1971; intestine, Biochim. Biophys. Acta 255:663-674, 1972; cornea, J. Physiol. 221:29-41, 1972). So far the mechanism of these effects on transport has not been elucidated. We thought that it would be interesting to determine whether the rate of water and salt secretion by the rectal gland of the dogfish can be modified by adenosine and its derivatives. There are several advantages for selecting this organ for the study of transport regulation. For example, large changes in secretory rate by regulatory agents can be expected since it is already known that several agents can markedly enhance the low secretory rates observed in the isolated and perfused gland. Another potential advantage arises from the large size of the gland and its relatively homogeneous cell composition, providing abundant material for chemical analysis.

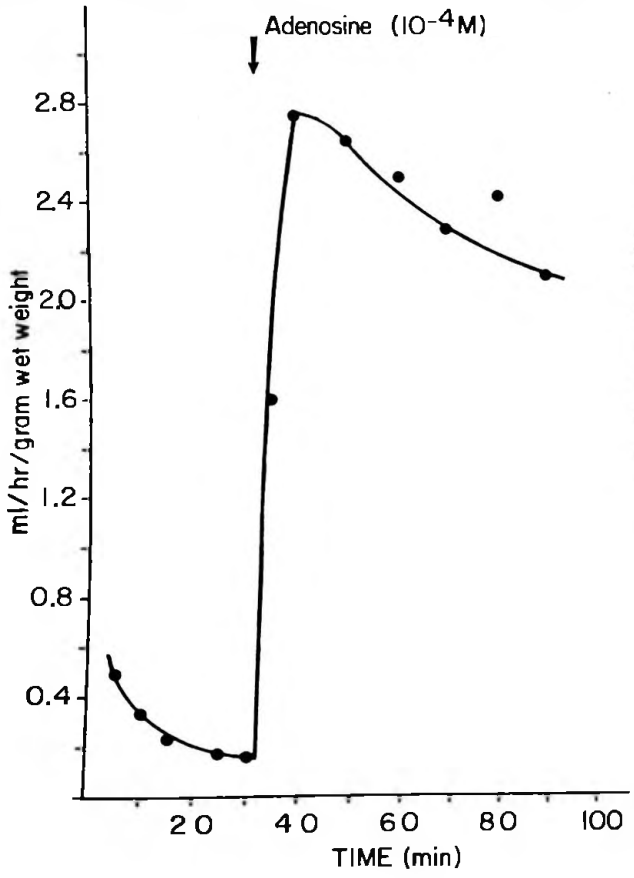

Figure 1. Effects of adenosine (10^{-4} M) on the volume of fluid secretion by the isolated rectal gland of the dogfish.

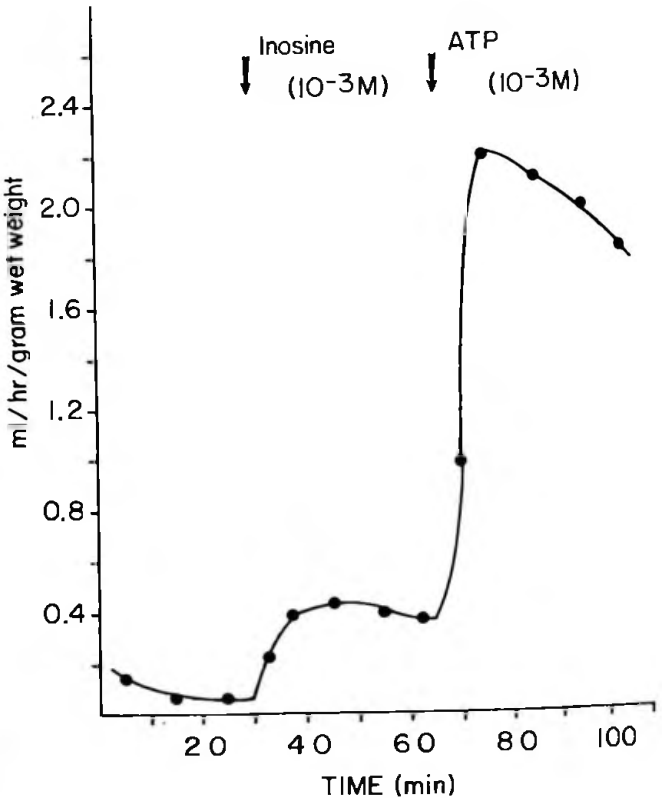

Figure 2. Effects of inosine (10^{-3} M) and ATP (10^{-3} M) on the volume of fluid secretion by the isolated rectal gland.

We isolated and perfused rectal glands of spiny dogfish (*Squalus acanthias*) following the procedure described by Hayslett and his coworkers (Amer. J. Physiol. 226:1188-1192, 1974).

Figure 1 illustrates an experiment in which we added adenosine to the perfusion fluid to reach a concentration of 10^{-4} M. The addition of adenosine rapidly increases the volume of rectal gland secretion, in this case reaching about 20 times the resting level. As the data summarized in Table 1 show, the increase in the rate of secretion caused by adenosine was already discernible when 1 x 10^{-6} M adenosine was employed. Maximum stimulation was observed with 10^{-4} M adenosine.

TABLE 1

Dose dependence of the effects of adenosine on the volume of fluid secretion (ml/hr/g wet weight)

Control	10^{-6} M	5 x 10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
0.032	0.062	-	2.17	3.95	3.78
0.040	0.073	0.56	-	2.38	2.46
0.041	-	0.81	1.43	4.66	-
0.035	0.069	-	0.85	1.72	-

Analysis of the fluid emerging from the secretory duct indicates that during the action of adenosine, the composition of the secreted fluid is barely modified. The Cl- content during the control period was 498.7 ± 62.1 mEq/liter (n=18), while during stimulation it was 501 ± 98.1 mEq/liter.

Figure 2 illustrates one of the experiments performed to test whether other adenosine derivatives would also increase the rate of secretion. Two points are clearly shown: First, while inosine had a stimulatory effect; the stimulation was minor when compared with the effects of adenosine. Indeed, 10^{-3} M inosine was necessary to produce effects similar to those obtained with 5 x 10^{-6} M adenosine. Second, ATP had large stimulatory effects; in the illustration, 10^{-3} M was used, but in other experiments we found that as little as 10^{-4} M produced a clear-cut but smaller stimulation. However, when 10^{-5} M were used, no effects were observed. Analysis of the secreted fluids collected in these experiments showed that, as in the case of adenosine, the Cl- and Na concentration during the action of the chemicals was nearly the same as those found during the resting condition.

Our results show that the rate of transport by the salt gland is markedly enhanced by both adenosine and ATP. The fact that the former is more effective than the latter, and that the effective concentrations of both agents are small compared with the levels of ATP in most cells, suggest that they do not constitute a direct source of energy for the transport process. One of several attractive possibilities is to suppose that as in other tissues (Ann. Rev. Biochem. 47:655-686, 1978) purine derivatives combine with specific receptors.

Such a possibility ought to be explored further since adenosine is an ubiquituous substance that could have an important role as a mediator in the regulation of salt and water metabolism in various epithelia. Supported by the New York Heart Association.

DISTRIBUTION OF ^{14}C-BENZO(a)PYRENE IN THE LOBSTER, *Homarus americanus*, AT VARIOUS TIMES AFTER A SINGLE INJECTION INTO THE PERICARDIAL SINUS

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Certain polycyclic aromatic hydrocarbons (PAH) that occur in high boiling fractions of crude and refined petroleum have been implicated as carcinogens, mutagens, cytotoxins, and immune suppressants