

ADENYLATE CYCLASE ACTIVITY OF HUMAN NASAL POLYPS DURING STIMULATION OF SEROTONIN BIOSYNTHESIS *in vitro*

L. S. Malykhina, G. A. Stepanova,
G. N. Popova, and N. A. Fedorov

UDC 616.211-006.5-008.931:577.152.27

The tissue of human nasal polyps possesses adenylate cyclase activity. After injection of reserpine (1 mg) into the tissue of nasal polyps, to activate serotonin biosynthesis in the tissue, a significant increase in adenylate cyclase activity was observed; during the first minutes of incubation of the polyp with reserpine, activity increased tenfold. The role of the adenylate cyclase system was confirmed in the initial stages of morphological and biochemical differentiation accompanying serotonin biosynthesis in human nasal polyps.

KEY WORDS: polyp; adenylate cyclase; serotonin; reserpine.

In view of data in the literature on the important role of the adenylate cyclase system during biochemical and morphological differentiation of certain types of cells [2, 6, 7, 9-11] it was decided to study the part played by adenylate cyclase in biochemical and morphological differentiation in surviving tissues of human nasal polyps during their incubation with reserpine, a powerful activator of serotonin synthesis in that tissue.

EXPERIMENTAL METHOD

A polyp removed from a patient's nose was sent from the clinic at 0-4°C. After preincubation for 30 min at 37°C, reserpine (1 mg/ml) was injected into the polyp and it was again incubated. Samples (200 mg) of polyp were taken after 2-45 min, homogenized after the addition of 2 ml 0.32 M sucrose, then frozen in liquid nitrogen and thawed at 30°C.

TABLE 1. Adenylate Cyclase Activity of Human Nasal Polyps after Incubation with Reserpine (1 mg/ml)

Patient's initial	Adenylate cyclase activity	
	intact polyp	incubation with reserpine
L.	232,5	570,0
Sh.	352,2	1110,0
K.	185,25	697,5
S.	667,0	1292,25
N.	675,0	1137,0
$M \pm m$	$422,5 \pm 115,0$	$961,4 \pm 81,0$ ($P < 0,05$)

Laboratory of Biochemistry, Central Institute of Hematology and Blood Transfusion, Ministry of Health of the USSR, Moscow. (Presented by Academician of the Academy of Medical Sciences of the USSR K. V. Bunin.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 81, No. 4, pp. 428-430, April, 1976. Original article submitted October 2, 1975.

©1976 Plenum Publishing Corporation, 227 West 17th Street, New York, N.Y. 10011. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission of the publisher. A copy of this article is available from the publisher for \$15.00.

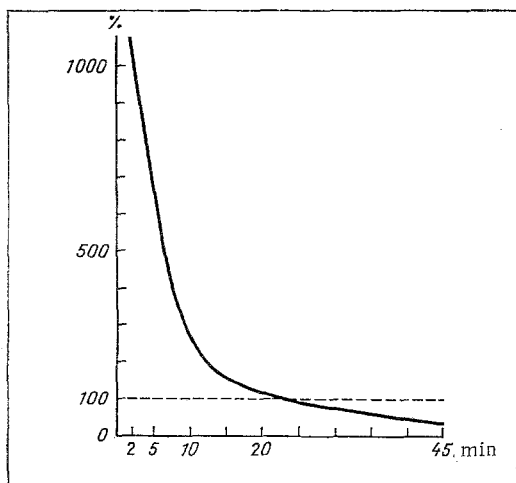


Fig. 1

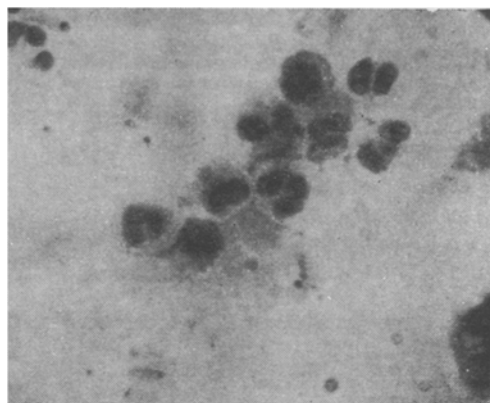


Fig. 2

Fig. 1. Adenylate cyclase activity in nasal polyps as a function of duration of incubation of polyp with reserpine (1 mg/ml). Abscissa, time of incubation (in min); ordinate, adenylate cyclase activity (activity in intact polyp taken as 100%).

Fig. 2. Eosinophil-like cells: figures of amitotic division of nucleus. Incubation of polyp (5 min, 37°C) with 1 mg/ml reserpine, 400 ×.

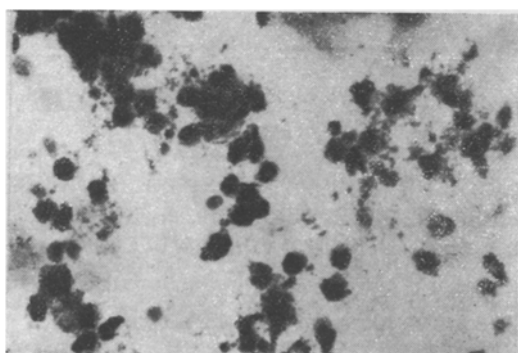


Fig. 3. Eosinophilic granules in cytoplasm of cells and in surrounding medium. Incubation of polyp (5 min; 37°C) with 1 mg/ml reserpine. 200 ×.

Adenylate cyclase activity was determined by Krishna's method [8] in Haslam and Lynham's modification [5]. Radioactivity was measured on a Nuclear Chicago Mark II scintillation counter.

EXPERIMENTAL RESULTS AND DISCUSSION

Altogether 20 experiments were carried out with polyps removed from eight patients. The results of the tests showed that the nasal polyp possesses adenylate cyclase activity. Incubation of nasal polyps for 10 min with reserpine led to a statistically significant increase in adenylate cyclase activity (Table 1).

The maximal increase in activity was observed during the first 2 min of incubation of the polyp with reserpine. The adenylate cyclase activity then fell

sharply, and after 45 min it was below its initial level (Fig. 1). Morphologically, activation of adenylate cyclase under these experimental conditions coincided in time with the formation of orthochromic mast cells (serotoninocytes) and with massive transformation of the original lymphocytes of the polyp into cells resembling eosinophils, manifested [1] as amitotic division of the nucleus (Fig. 2), and by the simultaneous appearance of eosinophilic granules in these cells (Fig. 3). The accumulation of eosinophils is connected with the presence of T lymphocytes in the tissue [3].

In the light of recent work, not all humoral and neurohumoral effects are brought about through cyclic 3',5'-AMP (cAMP). It has been shown, for example, that hormones such as acetylcholine, insulin, various steroid hormones, and certain prostaglandins have their own mediator, namely cyclic guanosine-3',5'-monophosphate (cGMP). It is considered that cGMP, together with cAMP, are the principal regulators of leukocyte function [4]. Cyclic GMP is evidently concerned in triggering cell processes that are opposite to those triggered by cAMP.

LITERATURE CITED

1. G. N. Popova, Arkh. Pat., No. 4, 22 (1972).
2. T. Barka and H. Moen, Life Sci., 14, 267 (1974).

3. A. Basten, M. Boyer, and P. Beeson, *J. Exp. Med.*, 131, 1271 (1970).
4. H. R. Bourne, L. M. Lichtenstein, K. L. Melmon, et al., *Science*, 184, 19 (1974).
5. R. J. Haslam and J. A. Lynham, *Life Sci.*, 11, 1143 (1972).
6. A. Hsie and C. Waldren, *J. Cell. Biol.*, 47, 92 (1970).
7. J. M. Krieder, M. Rosenthal, and N. Longe, *J. Nat. Cancer Inst.*, 50, 555 (1973).
8. G. Krishna, B. Weiss, and B. Brodie, *J. Pharmacol. Exp. Ther.*, 163, 379 (1968).
9. H. Masui and L. Carren, *Proc. Nat. Acad. Sci. USA*, 68, 3206 (1971).
10. J. Ramachandran, *Life Sci.*, 14, 993 (1974).
11. J. Shepard and K. Prasad, *Life Sci.*, 12, 431 (1973).