D2-Dopamine receptor-mediated stimulation of inositol trisphosphate formation in chick retina

Jolanta B. Zawilska[1,2], Barbara Krzemieniewska[1], Daria Orszulak-Michalak[2] and Jerzy Z. Nowak[1]

[1]Institute of Biogenic Amines, Polish Academy of Sciences, 3 Tylna St., 90-950 Łódź, Poland, [2]Department of Pharmacodynamics, Medical University of Łódź, 1 Muszyński St., 90-151 Łódź, Poland

INTRODUCTION AND METHODS. Inositol-1,4,5-trisphosphate (IP_3) is an important second messenger which mobilizes intracellular calcium stores (1). It has been demonstrated that in various tissues, including the retina, stimulation of several receptor types activates hydrolysis of membrane phospholipids with concomitant formation of IP_3 (1-3). Data on effects of dopamine (DA) on IP_3 production are scarce and contradictory, and to our knowledge, lacking for avian retina. Some authors reported that activation of a D_2 subtype of DA receptors (a member of a D2-DA receptors family) can stimulate IP_3 formation, while others did not observe any effect of DA and agonists of DA receptors on phosphoinositide breakdown (2,4,5). This work was aimed at examining effects of DA-ergic compounds on IP_3 level in chick retina. Male white leghorn chicks (kept from the day of hatching under 12 h light:12 h dark illumination cycle) were decapitated during the 2nd h of the dark phase. Effects of DA-ergic drugs on IP_3 formation were examined in an eye cup preparation. IP_3 levels were measured in extracts of retinal supernatants using a specific IP_3 [^{3}H] radioreceptor assay kit (Du Pont NEN, Boston, USA). Data are expressed as mean ± SEM values (n=7-10/group). For statistical evaluation of results ANOVA was used followed by Student-Newman-Keuls test.

RESULTS AND DISCUSSION. Incubation of chick eye cups with 0.1 μM of bromocriptine (BRC) and quinpirole (QNP), agonists of D2-DA receptors, increased the IP_3 level of the retina by 142% and 108%, respectively. (±)-1-Phenyl-2,3,4-tetrahydro-(1H)-3-benzazepine-7,8-diol (SKF 38393; 1 μM), an agonist of D1-DA receptors, was ineffective. The stimulatory effect of QNP on IP_3 formation in chick retina was significantly attenuated by D2-DA receptors antagonists, clozapine (CLOZ) and raclopride (RACL), 0.1 μM each (Fig. 1). To our knowledge, this is the first demonstration showing that stimulation of D2-DA receptors activates formation of IP_3 in chick retina. The physiological significance of this phenomenon is yet to be established.

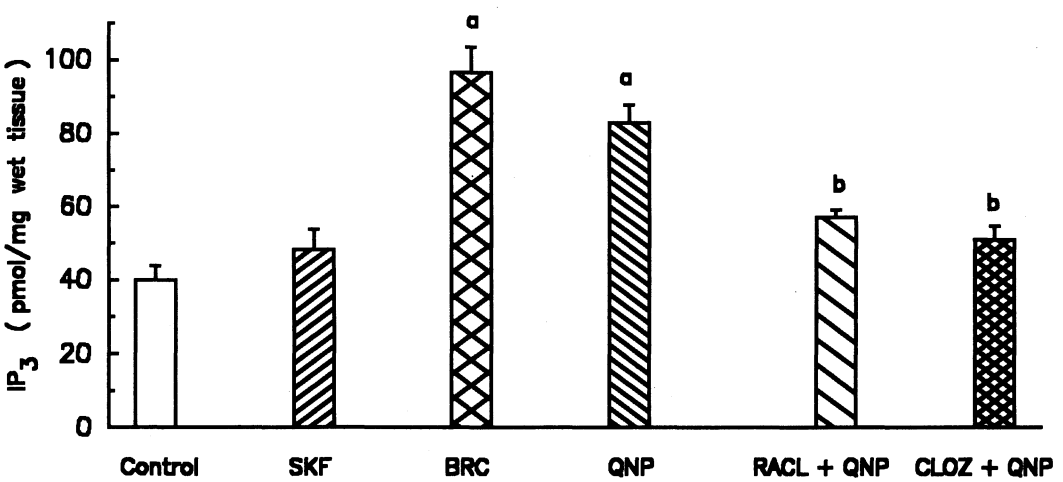

Fig. 1. Effect of DA-ergic drugs on IP_3 level in chick retina. [a]P<0.05 *vs* Control, [b]P<0.05 *vs* Quinpirole.

1. Berridge M.J., Irvine R.F. (1989) Nature 341: 197-205.
2. Osborne N.N., Ghazi H. (1990) Prog. Retinal Res. 9: 101-134.
3. Calvet G.A., Ventura A.L.M. (1995) J. Neurochem. 64: 1064-1070.
4. Tang L., Todd, D., Heller A., O'Malley K.L. (1994) J. Pharmacol. Exp. Ther. 268: 495-502.
5. MacKenzie R.G., VanLeeuwen D., Pugsley T.A., Shih Y.-H., Dematoss S., Tang L., Todd R.D., O'Malley K.L. (1994) Eur. J. Pharmacol. 266: 79-85.

Supported by the KBN research grant No. 0540/P2/04/93.

Accepted 18 September 1996