ALLERGOLOGY

Effect of Oxypine on Edema of Rabbit Tissues in Allergy

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny,* Vol. 120, № 7, pp. 84-86, July, 1995
Original article submitted July 27, 1994

The effect of intravenous administration of oxypine (Mexidol), an antioxidant of the 3-oxypyridine group, on hydration of rabbit tissues in allergy is studied. It is found that oxypine reduces edema of the "shock" organs: trachea, lungs, esophagus, duodenum, and spleen, attenuates sensitization and anaphylactic edema, and diminishes the fluid redistribution in tissues that is characteristic of allergy.

Key Words: *oxypine; allergy; tissue edema; rabbit*

Recent reports indicate that antioxidants have a positive effect in allergy [4,5]. The 3-oxypyridines, structural analogs of pyridoxines with a broad pharmacological spectrum, have often been used [2]. In order to examine the effect of antioxidants on allergic edema of rabbit tissues we chose oxypine (Mexidol), a preparation synthesized at the Department of Kinetics of Chemical and Biochemical Processes, Institute of Chemical Physics, Russian Academy of Sciences.

MATERIALS AND METHODS

Experiments were performed on 63 Californian rabbits of both sexes weighing 2-2.5 kg. Intact and allergized (sensitization and anaphylaxis stages) animals (n=7 in each group) were used. The rabbits were sensitized by subcutaneous injection (three times at seven-day intervals) of 1 ml/kg swine serum, which resulted in anaphylaxis [3].

Oxypine was administered intravenously in doses of 10 and 25 mg/kg to both intact and allergized rabbits. The preparation was dissolved in normal saline. The animals were decapitated 60 min after the injection, and the effect of the antioxidant on edema of the internal organs was assessed.

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The degree of edema was evaluated from the hydration of the studied tissues. Immediately after decapitation from one to three pieces of tissue weighing approximately 200 mg were excised from different organs and weighed. These samples were then placed in an incubator at 90°C for 4 h and dried in the presence of soda lime (dehumidifier); drying was considered completed after the sample weight remained constant. The lungs, trachea, esophagus, duodenum, spleen, heart, aorta, femoral muscle, kidneys (medulla and cortex), and liver were studied.

Three series of experiments were performed. The first series included intact and allergized animals at the stages of sensitization and anaphylaxis injected with normal saline. The second and third series consisted of animals administered oxypine in doses of 10 and 25 mg/kg, respectively.

Mean values and the standard error of the mean were calculated. The significance of differences was evaluated with Student's t test [1].

RESULTS

In intact rabbits injected with normal saline (Table 1), the ratio between wet and dry weights of tissue samples ranged from 60.6% (trachea) to 81% (renal medulla). This agreed with the physiological hydration of these organs and served as a cri-

0007-4888/95/0007-0730$12.50

TABLE 1. Effect of PC on the Motor Activity of Rats ($M \pm m$)

Experimental conditions	Number of experiments	Dose, mg/kg	Integral expression of activity	
			beginning of experiment	end of experiment
Control	6	–	710.9±44.7	719.5±39.4
PC	12	10	707.3±50.0	525.8±20.4
Control	6	–	612.4±19.2	623.6±21.1
PC	11	20	609.1±31.0	375.0±25.3
Control	6	–	787.5±14.5	766.0±15.9
PC	14	50	744.5±19.5	689.0±14.9

terion for evaluating the effect of allergization and oxypine on organ edema. After sensitization, the hydration of the lungs, liver, trachea, duodenum, aorta, esophagus, and femoral muscle increased. In the other organs the fluid content remained unchanged compared with the control. In anaphylaxis, the highest degree of edema was recorded in the trachea and a lower degree in the duodenum, aorta, lungs, spleen, and esophagus. Hydration of the heart and renal medulla and cortex was reduced and of the femoral muscle and liver unchanged. This is probably due to the redistribution of fluid in the organism in an allergic reaction of the immediate type that is associated with the highest degree of edema of the "shock organs" due to antigenic aggression.

In intact rabbits, 10 mg/kg oxypine produced no appreciable effect on the degree of hydration of the studied organs (Table 2). In sensitized rabbits given the antioxidant, the hydration of the respiratory and digestive organs increased. In contrast to intact animals, in this group the fluid content in the renal medulla and in the heart increased and remained unchanged in the femoral muscle, aorta, and duodenum. In anaphylactic animals, the trachea, duodenum, and spleen remained edematous. In comparison with the control, there were no changes in the fluid content of the liver, renal medulla, femoral muscle, and aorta.

After administration of 25 mg/kg oxypine, the hydration of the organs in intact rabbits changed compared with the control. The fluid content increased in the lungs, renal medulla, and liver and decreased in the trachea, duodenum, and heart (Table 3). None of the studied organs was edematous in sensitized animals administered oxypine. In anaphylactic animals, the fluid content increased only in the lungs, trachea, duodenum, and spleen. The fluid content of the other organs remained unchanged.

Thus, using a rabbit model of allergy we have found that sensitization and anaphylaxis are attended by a redistribution of fluid among different organs. The hydration of the respiratory (trachea and lungs) and digestive (esophagus and duodenum) organs, blood vessels (aorta), and spleen increased, these evidently being the "shock organs" of allergy in rabbits. Oxypine changed the fluid content of these

TABLE 2. Effect of PC on the Total Activity and Orientational and Emotional Reactions of Rats (Number of Various Physiological Parameters, $M \pm m$)

Parameter of assessing sedative effect	Control		PC effect	
	beginning of experiment	end of experiment	beginning of experiment	end of experiment
Dose 20 mg/kg (n=15)				
Locomotions	48.2±9.5	43.9±15.2	52.5±7.7	21.00±2.3
Standstills	17.9±2.6	15.4±2.4	17.9±1.8	8.00±0.6
Grooming	7.1±1.0	7.8±1.5	7.1±0.8	5.32±0.5
Pellets	2.0	2.2	2.0	2.0
Urinations	1.0	0.8	1.0	0.8
Dose 50 mg/kg (n=17)				
Locomotions	50.4±4.15	59.4±3.8	50.3±4.15	35.20±1.7
Standstills	10.3±1.57	10.7±0.7	12.0±1.30	8.76±0.9
Grooming	8.0±0.64	8.5±0.5	9.2±1.40	7.17±0.7
Pellets	1.8	1.4	1.9	1.8
Urinations	0.6	0.6	1.0	0.8

TABLE 3. Effect of PC on Resistance of Rats to Emotional Stress ($M \pm m$)

Experimental conditions	Glucose content, mmol/liter	Glycogen content, mg/ml
Intact control	5.81±0.51	57.11±5.40
Before stress		
Control	5.79±0.35	–
PC in doses of:		
20 mg/kg		5.20±0.50 –
50 mg/kg		5.45±0.35 –
After stress		
Control	9.37±0.66	39.36±3.89
PC in doses of:		
20 mg/kg	6.37±0.68	45.58±5.67
50 mg/kg	10.15±0.48	30.00±7.37

organs by attenuating sensitization and anaphylactic edema. The preparation reduced the intensity of the fluid redistribution that typical of allergy.

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