

DIFFERENCES IN CHANGES IN CAPILLARY PERMEABILITY AND MANIFESTATIONS OF LOCAL ALLERGIC REACTIONS IN SENSITIZED RABBITS OF DIFFERENT SEXES

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Experiments on sensitized rabbits revealed differences in the changes in permeability of the skin capillaries and in the severity of the local allergic reaction depending on the sex of the experimental animals.

Although changes in permeability of skin capillaries were biphasic in character in rabbits of both sexes, somewhat more frequently in males, the phase of increased permeability was more marked in females than in males. Conversely, the phase of decreased permeability was more marked in males. The local allergic reaction (the Arthus phenomenon) developed more rapidly and more frequently and was more marked in males than in females.

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The importance of sex in the development of experimental allergic reactions has not been adequately studied. All investigators have studied capillary permeability in allergic reactions without allowing for the sex of the experimental animals [1, 3, 6-9].

In the present investigation differences in changes in capillary permeability and in manifestations of the local allergic reaction were studied in sensitized animals of both sexes.

EXPERIMENTAL METHOD

Experiments were carried out on 42 rabbits (21 females and 21 males) of different weights and breeds.

Capillary permeability in the intact skin in the direction tissue-vessels was studied by means of a modified intradermal fluorescein test [2, 4]. The area of skin where the capillary permeability was to be investigated was located in the region of the abdominal wall not less than 8-10 cm from the focus of inflammation. Capillary permeability was determined 7 times in each rabbit: twice before sensitization and 7, 14, 17, 22, and 27 days after the beginning of sensitization. Introduction of the modification reduced the relative value of the standard error to $\pm 5\%$, i.e., the modified intradermal fluorescein test was close in its accuracy to the radioactive indication method (standard error $\pm 3-4\%$). In contrast to the method described previously [4], the rate of absorption of fluorescein was determined in divisions of the colorimeter scale per 40 min, and not per hour.

The animals were sensitized by three injections of normal horse serum, given subcutaneously into the scrotum of the males and in the immediate vicinity of the external genitalia of the females. The serum was injected in a dose of 1 ml and the intervals between injections were 7 days [5].

TABLE 1. Statistical Significance of Increase and Decrease in Rate of Fluorescein Absorption from Intradermal Depot in Rabbits of Different Sexes at Various Times of Sensitization

Time of investigation	Males	Females
	$M \pm m$	
Before sensitization	16,8 \pm 1,22	15,8 \pm 0,9
7 days after beginning of sensitization	19,6 \pm 1,46 $t=1,47$ $P>0,1$	20,9 \pm 1,2 $t=3,64$ $P<0,001$
14 days after	17,6 \pm 1,93 $t=0,36$ $P>0,2$	26,0 \pm 1,8 $t=5,25$ $P<0,001$
17 days after	13,4 \pm 1,75 $t=1,62$ $P>0,1$	19,6 \pm 2,1 $t=1,65$ $P>0,1$
22 days after	10,4 \pm 1,43 $t=3,55$ $P<0,005$	20,9 \pm 1,9 $t=2,43$ $P<0,05$
27 days after	9,3 \pm 1,38 $t=4,16$ $P<0,001$	11,9 \pm 2,1 $t=1,7$ $P>0,05$

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TABLE 2. Character, Frequency, and Time of Onset of Local Allergic Inflammation in Sensitized Rabbits of Both Sexes

Rabbits investi- gated	Total number of rabbits tested	Frequency of inflammatory reaction	Time of appearance of inflammatory reaction		Character of inflamma- tory reaction			
			after second injection of serum	after third injection of serum	swelling of testes	necrosis of skin	ulceration	infiltra- tion of ab- dominal wall
Males	21	21	18	3	16	19	6	2
Females	21	9	3	6	—	4	3	6

Repeated investigations on healthy rabbits showed that the maximal amplitude of variations in capillary permeability in these animals did not exceed 3 colorimeter scale divisions.

Besides the study of capillary permeability, observations were also made on manifestations of the local allergic reaction (the Arthus phenomenon).

EXPERIMENTAL RESULTS

The mean indices of permeability obtained for the experimental rabbits at various times of sensitization are given in Table 1.

Capillary permeability first increased, and then decreased in the sensitized rabbits, both males and females, i.e., the changes in permeability were biphasic in character. However, the increase in permeability in the males was shorter in duration and was not statistically significant, while in the females it lasted longer and was significant. Conversely, the decrease in permeability at the end of the investigation lasted longer in the male rabbits and was more significant than in the females.

The changes in capillary permeability after sensitization showed a well-marked biphasic character (a first phase of increase and a second phase of decrease of permeability) in 16 of the 21 males and in 7 of the 21 females.

The observed difference in the changes in permeability was confirmed by the fact that in three males only a pathologically reduced capillary permeability was observed from the beginning of sensitization, while in 8 females only a marked increase in permeability was observed. A marked decrease in permeability from the beginning of sensitization was detected in only one female.

The mean amplitude of the variations in permeability in the sensitized males was 6.04, and in the females 8.57 colorimeter scale divisions (normally 1.45 divisions).

Hence, besides the similar, and to some extent regular sequence of changes in capillary permeability occurring in the sensitized rabbits of opposite sexes, there were also definite differences. On the one hand, the phase of increased permeability and pathological lability of permeability were more marked in the males, and definite biphasic changes in this function of the capillaries were more frequently observed.

The character, frequency, and time of onset of local allergic inflammation in sensitized rabbits of both sexes are given in Table 2. The much more frequent and earlier (relative to the beginning of sensitization) onset of allergic inflammation in males compared with females will be noted. Besides the frequency and time of onset, the character of the local allergic reaction also differed in character. In sensitized male rabbits necrotic changes in the skin were more common and more severe than in females. For example, the area of the necrotic focus in the skin in males varied from 0.14 to 31.74 (mean 9.14) cm². In females the area varied correspondingly from 0.24 to 2.76 (mean 1.26) cm².

Hence, in the sensitized experimental animals of the two sexes, obvious differences were found both in changes in permeability of the capillaries of the intact skin and in manifestations of the local allergic reaction. Further investigations undertaken in the same direction showed that in patients with active rheumatic fever a definite difference is observed in changes in capillary permeability depending on sex, and similar to those discovered experimentally. Sensitized rabbits of different sexes were also found to react differently to administration of some antirheumatic drugs (ACTH, amidopyrin). Consequently, differences revealed in the reactivity of sensitized rabbits depending on their sex are of some practical importance.

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