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LOCALIZED ALLERGIC REACTION IN THE CORNEA OF GUINEA-PIGS

By

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Since *Wessely* in 1911 pointed out that repeated injection of protein intracorneally into a sensitized animal produced an anaphylactic keratitis, several experiments have been carried out to produce a corneal immunity as a result of a local or general sensitization.

On the other hand investigations of a localized antibody production in the cornea have been few. *Thompson* and *Olsen* demonstrated its presence at the cornea earlier and at a greater amount than elsewhere in the organism after intracorneal injection of allergene. This might be due to a greater ability of the corneal tissue to produce antibodies, but perhaps this phenomenon might be related to a lack of rapid diffusion as a result of the anatomical structure of the corneal parenchyma. Owing to these circumstances antibodies might reach a concentration unattainable in other tissues with normal diffusion.

Thus it seems likely that in this respect too particular circumstances are found in the patho-physiological reaction of the corneal tissue. Moreover as a test-object the cornea holds an exceptional position, as the reactions expanding in the tissue are observable directly under the microscope while taking place.

In the previous experiments on the allergic reaction of the corneal tissue full-antigens have always been employed,

i.e. the antigen factor connected with some protein compound.

However, developed from the ectoderm, the cornea may be regarded as an organ of the skin and in this capacity might be expected to react with the same sensitizing agents as the skin. During experimental research on the patogenesis of the allergic eczemas of the skin, sensitizing agents have been made which without any connection with protein by direct application on the skin have been able to produce a certain sensitization. This work is concerned with derivations from the dinitrochlorbenzene-group. There are several isomers of dinitrochlorbenzene but according to *Haxthausen* the compound most suitable for sensitization of the skin and therefore employed in the experiments here reported is 2-4-dinitrochlorbenzene which for short has been designated DNCB.

TECHNIQUE

The test for established sensitization is performed with a 1 % alcoholic solution of DNCB.

0.02 ml. of this solution is injected intracorneally, as centrally as possible into the cornea. As test-animals medium-sized albino guinea-pigs are used. The period of sensitization is fixed as 20 days. All examinations of the allergic reactions have been performed in vivo by means of slit-lamp microscopy. As positive reaction is regarded a keratitis developing centrally on the cornea within the first 24 hours after the injection, whereas uncharacteristic reactions developing later are not taken into account.

SCHEDULE OF EXPERIMENTS

In order to prove that the reaction in the cornea is localized crossed experiments are performed.

- A) An attempt to produce localized allergic reaction on an unsensitized animal by
 - 1) intracorneal injection,
 - 2) intraperitoneal injection 20 days later,

3) repeated intracorneal injection if no reaction on 2) in the course of 3 days.

B) An attempt to elicit an allergic reaction in the cornea of a cutaneously sensitized animal by

1) intracorneal injection 20 days after the sensitization,

2) repeated intracorneal injection if no reaction on 1), this performed 15 days later.

FIRST SERIES OF EXPERIMENTS A

4 guinea-pigs are sensitized locally with DNCB.

Date	no.	
21/II	1043	DNCB is injected into the left cornea. Into the right acting as a control-eye, 0.02 ml. of a 0.9 % NaCl solution with an ad mixture of 5 % alcohol is injected.
	1038	
	2080	
	262	
22/II		No reaction in the eyes.
23/II		No reaction in the eyes.
1)		
8/12	1038	No reaction. 0.02 ml. DNCB is injected into both corneae.
	262	
9/12	1038	Large central keratitis on the left eye of both animals.
	262	No reaction on the right eye.
2)		
8/12	1043	10 ml. of a 0.5 % solution of DNCB is injected intraperitoneally.
	2080	
9/12	1043	No reaction.
	2080	
10/12	1043	No reaction.
	2080	
3)		
31/I	2496	0.02 ml. DNCB is injected into the right cornea.
	2820	

Date	no.	
	263	0.02 ml. of the 5 % alcoholic NaCl solution is injected into the left corneae.
	2497	
	2520	
	2115	
15/2	all	No reaction in the eyes.
16/2	all	No reaction in the eyes.
17/2	all	No reaction in the eyes.
		10 ml. of a 0.5 % solution of DNCB is injected intraperitoneally.
18/2	all	No reaction.
19/2	all	No reaction.
24/2	all	No reaction. 0.02 ml. DNCB is injected intracorneally into both eyes.
25/2	2115	Keratitis of the right eye.
	2496	Keratitis of the right eye.
	263	Keratitis of the right eye.
	2820	No reaction neither in the right or the left corneae.
	2497	Keratitis of the right eye.
	2520	No reaction neither in the right or the left corneae.
25/2	all	No change.

COMMENT

It appears from this that it seems to be possible to produce a localized allergic reaction in the cornea by injection of DNCB intracorneally. It was only possible to elicit the allergic reaction by a reinjection locally into the cornea, while an attempt to elicit the reaction by means of intraperitoneal injection did not succeed. By a primary reinjection into the cornea a reaction was produced in the eyes of both animals. By repeated intracorneal injection into animals reinjected intraperitoneally (3) a reaction was elicited in 4 out of 6 cases. Thus out of a total of 8 guinea-pigs locally reinjected 6 reacted with a keratitis in the sensitized cornea, while 2 eyes of

sensitized animals did not react. In none of the 8 cases did a reaction develop in the unsensitized eye. Thus it seems justified to regard the reaction as positive.

SECOND SERIES OF EXPERIMENTS B

2 guinea-pigs are sensitized cutaneously:

Date no.

14/3 E A 5 % solution of DNCB is painted on a shaved 1 sq.cm. area of the abdominal skin of both animals.

10/4 both Repainted with DNCB.

11/4 both Allergic reaction on the abdominal skin. Injection of 0.02 ml. DNCB intracorneally into the left and the control-solution into the right cornea of both animals.

1)

12/4 both No reaction.

13/4 both No reaction.

2)

24/5 347 Both animals are sensitized cutaneously on the abdominal skin 2 weeks ago. Both are painted on the abdomen with DNCB.
340

25/5 both Allergic reaction on the abdominal skin.

28/5 both 0.02 ml. DNCB solution is injected intracorneally into the right eye, and the control-solution into the left.

29/5 both No reaction.

30/5 both No reaction.

10/6 both No reaction. 0.02 ml. of DNCB is injected into both corneae.

24/6 347 Keratitis of the right eye. No reaction in the left corneae.

340 Keratitis of the right eye. No reaction in the left corneae.

COMMENT

From these experiments it appears that it was possible to produce an allergic reaction on the abdominal skin but it was not possible to elicit any reaction in the cornea after intracorneal injection into a cutaneously sensitized animal. As the cornea did not react it must have remained unsensitized. Reinjection 15 days later elicited the reaction. Thus in this case it was possible to elicit a local allergic reaction independent of a general allergy previously present.

CONCLUSION AND SUMMARY

Dinitrochlorbenzene is injected intracorneally into guinea-pigs in order to investigate the possibility of producing a localized allergic reaction. Out of 8 test-animals 6 reacted with a central keratitis in the sensitized cornea, while 2 eyes revealed no reaction. In none of the 8 cases a reaction developed in the unsensitized cornea, for which reason the reaction is regarded as positive.

That the allergic reaction is localized appears from the fact that neither was it possible to produce a local reaction in a locally sensitized cornea by means of an intraperitoneal injection, nor to elicit a local reaction by local injection into generally (cutaneously) sensitized animals.

The non-vascular corneal parenchyma, in many ways differing from other tissues also in this respect seems to behave differently from the rest of the organism.

REFERENCES

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