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STUDIES ON THE INDUCTION OF ALLERGIC PHOTODERMATITIS IN NEWBORN GUINEA PIGS

By

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In previous works, only adult guinea pigs have been used as experimental animals in studies of contact photodermatitis (2, 3, 7). The influence of the age of animals on such sensitization and on experimentally induced contact dermatitis is still not fully known; as regards the latter, the immunological reactions of newborn animals as well as those of animals at the foetal stage, however, have been found to deviate from the immunological reactions of adult animals. *Freund* demonstrated in 1928 (1) that guinea pigs less than one month old, infected with tuberculosis would respond with negative or weak reactions to intracutaneously injected tuberculin. *Salvin et al.* (6) used different allergens to sensitize newborn guinea pigs and found that these animals actually might develop a hypersensitivity of the delayed type, but it failed to manifest in the skin, which has been interpreted to be caused by a deficiency associated with the skin. Furthermore adult animals may acquire an immunotolerance to allergens to which they had been exposed either during the foetal stage or immediately after birth (5).

The object of this study was to examine whether it may be possible to induce allergic contact photosensitivity in the newborn guinea pig and, if not, whether the failure may be explicable as a deficiency associated with the skin *per se* of

the newborn animal, or whether these animals may, at a later stage, acquire an immunotolerance towards the applied allergen.

MATERIAL AND METHODS

(1) *Method used for the Sensitization*

The technique used has been described by *Harber et al.* (2) and includes two stages. At the primary stage the hypersensitivity is induced by applying the allergen, a 2 per cent solution of 3,3',4,5 tetrachlorosalicylanilide (TCSA) in acetone to the shaven and depilated nuchal region; 30 minutes later the same region was successively exposed to fluorescent sunlamp tubes FS 20 T 12 (Westinghouse), emission 285–350 nm, in doses of $1 \cdot 10^7$ erg./sq. cm., and black light tubes FS 20 T 12 (General Electric), emission 320–450 nm, in doses of $3 \cdot 10^8$ erg./sq. cm. This process was repeated three times within one week. Subsequently 20–25 days later the animals were challenged by applying a 1.0 per cent TCSA in alcohol solution to the shaven and depilated lumbar region. One half of the area was covered by a cloth to avoid exposure to the light and served as a control for eventual induced contact dermatitis. The other half was 30 minutes later irradiated with black light tubes (through window glass which filtered rays below 320 nm) in doses of $9 \cdot 10^7$ erg./sq. cm.

The results were read 24 and 48 hours post exposure. Positive reactions were recorded as such only when they appeared in the irradiated area as an acute inflammation of the skin such as erythema, edema and/or ulceration.

(2) *Animals*

3 groups of male albino Hartely strain guinea pigs were used in this experiment. (See Table 1).

EXPERIMENTAL DESIGN AND RESULTS

(1) **Primary Sensitization:** Newborn guinea pigs as well as adult animals were sensitized in accordance with the above procedure. No animals from group I or II were sensitized, while 12/17 animals in group III showed a remarkable rate of sensitization. The animals in group III were sensitized with a view to demonstrate the possibility of developing allergic photocontact sensitization to TCSA in adult guinea pigs; therefore this group has not been used later in this experiment.

(2) **Re-Challenge:** Two months and a half after the first

TABLE 1

Table Shows Number, Average Weight, Average Age of Animals and Results of Sensitization at the Three Stages of the Experiment.

Group no	Number of animals	Primary sensitization				Re-challenge			Re-sensitization		
		Average age (days), at	Average weight (gram), at	Challenge		Average weight (gram), at	Results of		Average weight (gram), at	Challenge	
				+	—		+	—		+	—
I	5	4	97	—	5	400	—	5	675	—	5
II	11	8	120	—	11	400	—	11	675	4	7
III	17	90- 120	433	12	5	Discontinued				—	

+ * = Number of animals sensitized.

— ** = Number of animals not sensitized

application of the allergen the animals in groups I and II were rechallenged. This test failed to reveal any positive reactions.

(3) Re-Sensitization: Four months after rechallenge the animals in groups I and II were exposed to repeated sensitization and challenge. Only four animals in group II and none in group I were sensitized. (See Table 1).

CONCLUSION

The negative results obtained at the primary sensitization of newborn animals in group I and II are compatible with those obtained in previous investigations in which contact allergens were used (1, 4, 6). *Salvin et al.* (6) demonstrated in a study of several series of newborn guinea pigs in the age groups 1 to 14 days that sensitization is not acquired until after the 9th day of life. Rechallenge of same groups two months and a half later according to which contact photodermatitis had not yet developed, is not inconsistent with the postulation that

the animals may have been sensitized at the time of their birth, but such sensitization could not manifest itself at the skin. If this was true, the animal ought to respond with a positive reaction at that stage when the skin is expected to be fully developed and animals have become adults. The challenge after the repeated sensitization six months and a half after the first exposure showed that contact photosensitization had developed only in four out of the 11 animals in group II and not in any of the younger ones in group I. The fact that the remaining (12) animals in groups I and II were still not sensitized was interpreted that these animals have possibly acquired a certain immunotolerance to the applied allergen.

It may be concluded that the immunological response in newborn animal deviates from those in adult animals. This factor should be taken into consideration in similar experiments.

SUMMARY

Allergic contact photosensitivity to 3,3',4,5 tetrachlorsalicylanilide (TCSA) could not be induced in newborn guinea pigs whereas 12 out of 17 adult animals acquired such sensitivity. This feature shows that the immunological reaction of the newborn guinea pigs deviates from that of the adult animal. Immunotolerance to the allergen had apparently developed in most of the newborn animals since a resensitization of these animals when becoming adults brought out that only four out of 16 had become sensitized to the allergen applied.

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