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THE CELLULAR EXUDATE OF HUMAN CUTANEOUS INFLAMMATION INDUCED BY PROSTAGLANDINS E_1 AND $F_{1\alpha}$

J. Søndergaard and P. Wolf-Jürgensen

From the Department of Dermatology, University of Copenhagen, Rigshospital, Copenhagen, Denmark

Abstract. The cellular exudate elicited after intradermal injection of prostaglandins E_1 and $F_{1\alpha}$ was studied by the skin window technique, during 56 hours in 24 patients. The cellular sequence and number of cells were identical in prostaglandin E_1 and $F_{1\alpha}$ induced reactions and did not differ from those of simultaneous control experiments. The cellular sequence was similar to that of non-immune inflammation, i.e. dominated initially by polymorphonuclear leucocytes. After 12 hours the number of mononuclear cells increased to values above the number of polymorphonuclears, but again, towards the end of the period there was a preponderance of polymorphonuclears. The counts of eosinophils and basophils were not increased. In accordance with previously published evidence, the results indicate that the cellular exudate following intradermal injection of prostaglandins E_1 and $F_{1\alpha}$ is of the same nature as the exudate seen in non-specific inflammation.

The prostaglandins (PG) are highly potent vasodilators in human skin (4, 7). Intradermal injection of prostaglandin E_1 causes an inflammatory reaction with histological and biochemical changes similar to those observed in granulation tissue (8). Recently, prostaglandins E and F have been recovered from skin perfusates in patients with allergic contact dermatitis (9, 3). However, prostaglandin-like material has also been detected in exudate from non-immune inflammatory reactions (10, 11, 1). The cellular exudate evaluated by the "skin-window" technique affords a means of distinguishing between immune reactions and non-immune inflammatory reactions (12).

By using the skin window technique, we have examined the cellular exudate in cutaneous reactions induced by intradermal injections of prostaglandins E_1 and $F_{1\alpha}$.

MATERIAL AND METHODS

Twenty-four patients with localized non-inflammatory skin conditions not affecting the arms were studied. The skin window technique used has been described previously (6, 13). Epidermal tissue approximately one cm^2 in size, was scraped from the flexor aspect of the forearm in each case. Coverslips were placed on the denuded areas and changed every 3 hours for 56 hours.

5 μg prostaglandin in 0.1 ml 0.154 M NaCl was injected intradermally, below the excoriations, immediately before applying the first coverslip. Prostaglandin E_1 was injected in 12 patients and prostaglandin $F_{1\alpha}$ in 12 other patients. For controls, 0.1 ml of 0.154 M NaCl was simultaneously injected in the opposite arm. After removal, the coverslips were dried and stained by the May-Grünwald-Giemsa method and a differential count performed.

RESULTS

The cellular exudate following intradermal injection of prostaglandins E_1 and $F_{1\alpha}$ was composed of polymorphonuclear leucocytes and macrophages. No difference in the sequence or number of cells was seen after injection of the two types of prostaglandins. Fig. 1 gives the average values representing the sequence of cells counted over 56 hours in 12 experiments following intradermal injection of 5 μg PGE_1. Similar results were obtained in 12 other patients after intradermal injection of 5 μg $PGF_{1\alpha}$ (Fig. 2). In both series, the migrating cells were mainly polymorphonuclear leucocytes during the first 12 hours; thereafter the number of mononuclears increased and made up the greater part. Towards the end of the period, again, there was a preponderance of polymorphonuclears. The cellular exudates did not differ morphologically, either in the two groups, or in the sequence of cells from the simultaneous control experiments performed on the opposite arms of the 24 patients (Fig. 3). The average number of eosinophils and basophils did not exceed 0.5 % in the two groups. Similar low values of

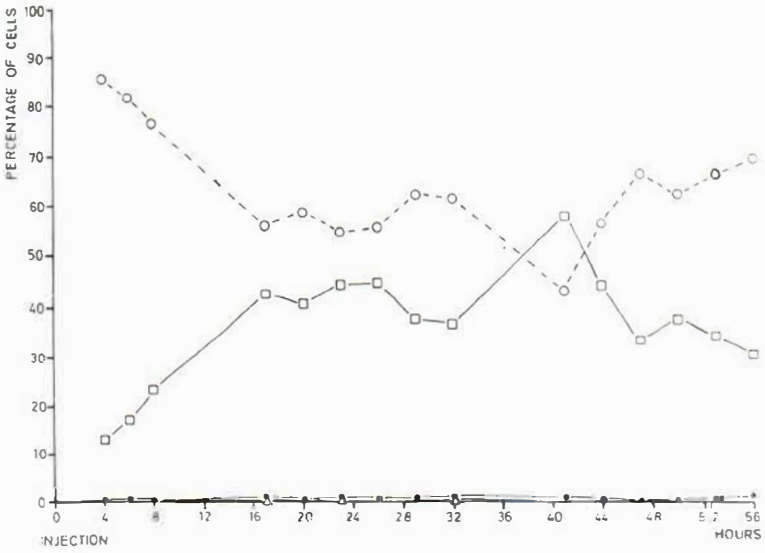

Fig. 1. Skin windows following injection of prostaglandin E_1. Average values of 12 patients. □—□, Macrophages; ○--○, neutrophils; ●—●, eosinophils; △—△, basophils.

eosinophils and basophils were found in the saline control experiments.

DISCUSSION

Intradermal injection of prostaglandin E_1 in human skin produces a reaction characterized by a weal and a long-lasting erythema (7), whereas prostaglandin $F_{1\alpha}$ is less potent in this respect (5). The results of the present study indicate that the cellular exudate following intradermal injections of PGE_1 and $PGF_{1\alpha}$ did not differ in sequence or in number of cells, nor did it differ from that of non-immune inflammation. The total number of cells cannot be evaluated by the skin window technique. The results are in accord with the histological and biochemical changes found in PGE_1-induced cutaneous reactions. Søndergaard, Helin & Paulli Jørgensen (8) found a non-specific dermal infiltrate in human skin following intradermal injections of PGE_1 and biochemical changes of acid glycosaminoglycans similar to those observed in granulation tissue.

The cellular exudate in delayed inflammatory reactions contains characteristically a high percentage of basophils appearing in reactions more

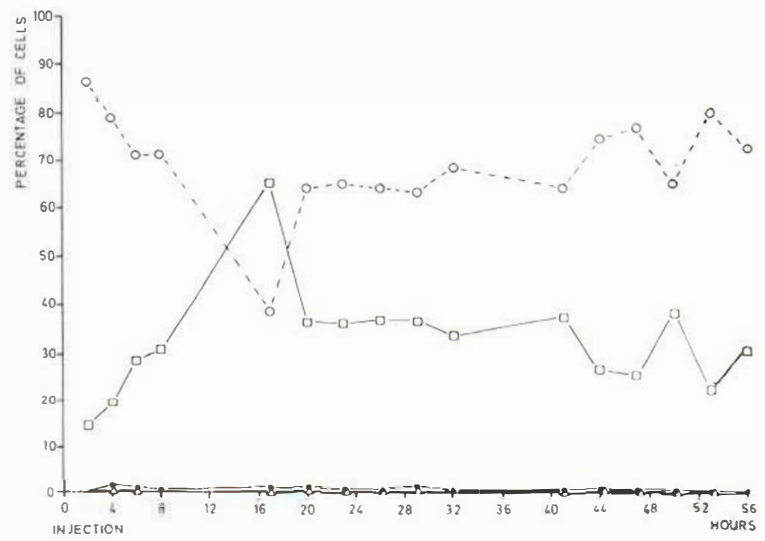

Fig. 2. Skin windows following injection of prostaglandin $F_{1\alpha}$. Average values of 12 patients. □—□, Macrophages; ○--○, neutrophils; ●—●, eosinophils; △—△, basophils.

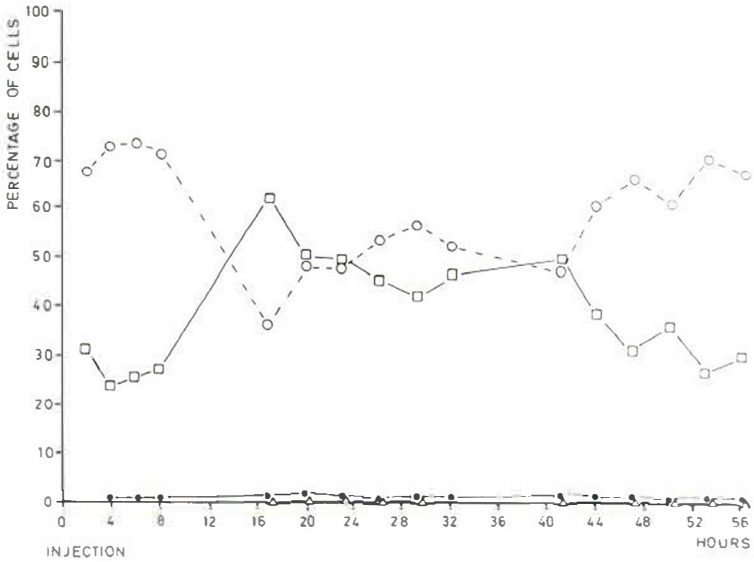

Fig. 3. Skin windows following injection of saline. Average values of 24 patients.
□—□, Macrophages; ○- -○, neutrophils; ●—●, eosinophils; △—△, basophils.

than 24 hours old (12). The low number of basophils during 56 hours in the present study supports the view that the inflammatory exudate is of non-immune nature. Prostaglandin-like material has recently been detected in non-immune cutaneous inflammatory lesions by Søndergaard & Greaves (10), and Änggård & Jonsson (1).

The low number of eosinophils was to be expected, despite the fact that PGE_1 releases skin histamine (7). One of the authors has previously reported that intradermal injection of histamine only increased the number of eosinophils in the cellular exudate to 1–2% (14). By contrast, in immediate-type inflammatory reactions the number of eosinophils is high within the first hours after challenge of the skin by specific antigen in sensitized individuals (2).

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J. Søndergaard, M.D.
Department of Dermatology
Rigshospital
Blegdamsvej 9
DK-2100 Copenhagen
Denmark