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The Effect of Tape Stripping Treatment of Guinea Pig Skin on the Induction of Delayed Hypersensitivity

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ABSTRACT. The induction of CS to DNCB was impaired if DNP-EC was injected subcutaneously through the skin that was stripped with cellophane tape immediately before the antigen application. The suppressive effect of tape stripping on DNP-EC induced CS was abrogated when normal PM was mixed and injected subcutaneously with DNP-EC into stripped skin. By contrast, tape stripping treatment before BCG or OVA in FIA administration had not influence on development of these delayed hypersensitivity. Significance of these findings is discussed.

Key words : Tape stripping — Contact sensitivity — Tuberculin reaction — Jones-Mote reaction — Delayed hypersensitivity

Langerhans cells (LC) have recently been shown to be only epidermal cells that bear Fc and C3 receptors, and that express Ia antigens on their surface, supporting the hypothesis that LC are an equivalent of the monocyte-macrophage lineage. In order to investigate the role of epidermal LC in induction of contact sensitivity (CS), sensitization of CS has been attempted by application of hapten on the skin naturally or artificially depleted of epidermal LC.[1,2] It has been shown that ultraviolet light irradiation of animal skin results in a transient loss of LC from epidermis.[3,4] Another method that has been reported to divest epidermis of LC is repeated stripping with cellophane tape.[5-7] During the experiments using the tape stripping method, we found that it impaired the induction of CS by subcutaneous administration of haptenated epidermal cells.[8] The object of the experiment reported here is to determine whether the tape stripping treatment effect on induction of the other types of delayed hypersensitivity such as tuberculin and Jones-Mote reactions.

MATERIALS AND METHODS

Animals : Male inbred JYl strain guinea pigs weighing 250-450 g were purchased from the Kiwa Laboratory Animal Co.

Preparation of in vivo dinitrophenylated epidermal cells (DNP-EC) : Inbred JYl guinea pigs were painted on ear skin with 0.2 ml of 5% 2,4-dinitrochlorobenzene (DNCB)-ethanol solution, and ears were obtained from the animals 3 hours after painting. Epidermal cell suspensions were prepared according to a technique described previously.[9]

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Preparation of peritoneal macrophages (PM) : Normal JY1 guinea pigs were injected intraperitoneally with light mineral oil and peritoneal exudate cells were harvested 3 days later. Macrophages were collected from the exudate cells using fetal calf serum coated Petri dishes as described previously.[8]

Tape stripping treatment : The dorsal and venteral surfaces of both sides of the ears were stripped by repeated applications (20 times) of cellophane tape.

Sensitization and elicitation for contact and delayed sensitivities : 5×10^6 DNP-EC in PBS (0.01M phosphate buffer saline, pH 7.2) were injected subcutaneously through normal or stripped ears of JY1 guinea pigs immediately after stripping. Fourteen days after injection of DNP-EC, skin test was performed by the application of 0.01 ml of 0.1, 0.05 and 0.025% DNCB-ethanol solutions on the depilated flank. The contact reactions were read 24 hours later and evaluated as the total of all these readings in each animal.[10] The other groups animals were injected subcutaneously with 0.5 or 2 mg of dried BCG vaccine in PBS or 2 μg of ovalbumin (OVA) emulsified with an equal volume of Freund's incomplete adjuvant (FIA) immediately after stripping. Seven days after the injection, 0.1 ml of 0.1 μg of purified protein derivatives of tubercle bacilli (PPD) or 100 μg of OVA in PBS was injected intradermally into the depilated flank skin. The diameter of erythematous induration was measured in millimeters. OVA in FIA is considered to produce the Jones-Mote reaction and BCG develops tuberculin reaction.

RESULTS AND DISCUSSION

The induction of CS to DNCB was clearly impaired if DNP-EC was injected subcutaneously through the skin that was stripped with cellophane tape immediately before the antigen application (Table 1). The suppressive effect

TABLE 1. Suppressive effect of tape stripping treatment on the development of contact sensitivity to DNCB by subcutaneous injection of DNP-EC and effect of peritoneal macrophages on the suppression

Cells injected	Mixed cells	Treatment	Contact sensitivity to DNCB		
			Positive		Mean intensity
			0.1%	0.5%	
DNP-EC 5×10^6	none	none	7/7	3/7	1.1
DNP-EC 5×10^6	none	stripping	2/7	0/7	0.2
DNP-EC 5×10^6	PM 5×10^6	stripping	6/7	3/7	1.0

of tape stripping on DNP-EC induced CS was abrogated when 5×10^6 normal PM was mixed and injected subcutaneously with DNP-EC into stripped skin. This indicates that the function not only of epidermal LC but also of macrophages residing in the subcutaneous tissue is markedly disturbed by tape stripping. The treatment may affect the antigen presenting function of subcutaneous macrophages. By contrast, tape stripping treatment before BCG or OVA in FIA administration had not influence on development of these delayed type hypersensitivity (Table 2). It is suggested that BCG and OVA

in FIA produce more easily accumulation of macrophages into stripped skin from blood circulation than DNP-EC. Further studies must be done in this experimental area.

TABLE 2. The effect of tape stripping treatment on the development of delayed type hypersensitivity to PPD and OVA

Sensitized with	Treatment	Delayed reaction to
		0.1 μg PPD
2 mg BCG	none	11.6±0.7
	stripping	10.3±0.9
0.5 mg BCG	none	11.3±1.0
	stripping	10.0±1.3
negative control		0.8±1.1
		100 μg OVA
2μg OVA in FIA	none	25.1±3.2
	stripping	23.1±2.3
negative control		3.6±0.6

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