

tained by the method of differential centrifugation identical with that used for the virus of vaccinia, contained no structures which resembled elementary bodies. The present observations indicate that the elementary body of vaccinia has a morphological structure similar in some respects to that of bacteria^{7, 8} and different from that of plant viruses.⁹

Summary. The pictorial data obtained by means of the electron microscope show a remarkable regularity in the morphology of elementary bodies of vaccinia. The virus particles apparently have an internal structure and some sort of limiting membrane.

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Experiments on Transfer of Cutaneous Sensitivity to Simple Compounds.

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In the course of experiments to passively transfer skin sensitivity to simple compounds an attempt was made to induce sensitivity by injecting peritoneal exudates from sensitized animals. Guinea pigs were rendered sensitive to picryl chloride in the manner previously described,¹ using conjugates (guinea pig stromata treated with picryl chloride) in conjunction with intraperitoneal injections of killed tubercle bacilli. To produce exudates, killed tubercle bacilli (or tuberculin) were injected intraperitoneally about 3 weeks from the beginning of the treatment, when substantial tuberculin hypersensitivity was established.

On injecting such exudates intraperitoneally into normal animals, the recipients in most of the experiments were seen to develop sensitivity to picryl chloride; when then a drop of an oil solution of the substance was put on the skin, erythematous reactions, mostly of high color, were apparent on the next day. The phenomenon was found to be due not to the clarified fluid but to the sediment obtained upon centrifugation. Among the possible explanations, an active

⁸ (a) Mudd, S., and Lackman, D. B., *J. Bact.*, 1941, **41**, 415; (b) Morton, H. E., and Anderson, T. F., *Proc. Soc. Exp. Biol. and Med.*, 1941, **46**, 277.

⁹ (a) Anderson, T. F., and Stanley, W. M., *J. Biol. Chem.*, 1941, **139**, 339; (b) Kausche, G. A., Pfankuch, E., and Ruska, H., *Naturwissenschaft.*, 1939, **27**, 292.

¹ Landsteiner, K., and Chase, M. W., *J. Exp. Med.*, 1941, **73**, 431.

sensitization through residual antigenic material in the peritoneal exudates seems rather improbable because a transfer was possible also with the exudate of animals in which the injection of dead tubercle bacilli and picryl stromata was made under the skin of the neck (using as a vehicle "Aquaphor" (Duke Laboratories) and paraffin oil, according to a method devised by Freund²). This is further supported by the appearance of the sensitivity after a short interval, namely, 2 days after injection of sufficient material, and fading of the reactivity within a few days. Finally, there is preliminary evidence that moderate heating sufficient to kill the exudate cells abolishes the effect. Consequently one would be inclined to assume that the sensitivity is produced by an activity in the recipient of the surviving cells, if not by antibodies carried by these. Positive results were obtained with about 1.5 cc of sediment, which were given in 3 portions on successive days or all at one time; with the present procedure this necessitates the use of quite a number of donors.

Definite results have been obtained with an acylchloride, o-chlorobenzoyl chloride; the majority of experiments have been made with citraconic anhydride, one of the acid anhydrides shown by Jacobs, *et al.*,^{3, 4} to produce a new and particular form of reaction (in animals), namely, urticaria-like reactions often with pseudopods appearing immediately after a scratch-test. Positive transfer in human beings had been mentioned briefly by Kern⁵ with serum from a patient sensitive to phthalic anhydride, suggesting further experimental study (*vide* Jacobs). We found that sera from highly sensitive guinea pigs which have received intensive treatment with intracutaneous injections of oil solutions of citraconic anhydride contain an antibody which upon intraperitoneal injection into normal guinea pigs render them sensitive. Upon scratch tests made through a drop of a solution of this incitant in dioxane,³ the recipients gave reactions similar to the immediate ones seen in actively but not highly sensitized guinea pigs. However, upon intracutaneous injection of potent sera (amounts of 0.15 to 0.05 cc were used) into normal albino guinea pigs, intense reactions were elicited within a few minutes in scratch tests made on the prepared site, consisting in swelling and a pinkish coloration, most often with pseudopods

² Freund, J., *Proc. Soc. Exp. Biol. and Med.*, in press. We are indebted to Dr. Freund for the information.

³ Jacobs, J. L., Golden, T. S., and Kelley, J. J., *Proc. Soc. Exp. Biol. and Med.*, 1940, **43**, 74.

⁴ Jacobs, J. L., *Proc. Soc. Exp. Biol. and Med.*, 1940, **43**, 641.

⁵ Kern, R. A., *J. Allergy*, 1939, **10**, 164.

and extending over an area up to 3 cm in diameter. The color receded within an hour or so, whereas the swelling persisted for several hours more; the next day the reaction was no longer present. Such reactions occurred in the sensitized sites also when the scratch test was made elsewhere on the normal skin or an oil solution was injected subcutaneously. Furthermore, reactions, even stronger ones (*e. g.*, 5 cm x 4 cm), were obtained at the prepared sites upon subcutaneous injection of a conjugate made with citraconic anhydride and guinea pig serum. The prepared areas were commonly tested after one or two days but are still well reactive after 3 days. Whether the immediate skin reaction described is attributable to an anaphylactic antibody^{6, 7} is being investigated. The essential facts are recapitulated in Table I.

TABLE I.

Treatment of donor pigs	Material injected for passive trans.	Site of inj.	Method of testing	Type of reaction
Pierylated g.p. stromata and killed tb. bacilli i.p.	Peritoneal exudate induced with killed tb. bacilli 3 wks later	i.p.	Oil sol. of pieryl chloride on surface of skin	24 hr—erythematous reaction
Same	Supernatant from exudate	i.p.	Same	None
Same	1.5 cc cells from exudate	i.p.	Same	24 hr—erythematous reaction
Same	As above but heated to 48° 15 min.	i.p.	Same	None
Prolonged treatment with citraconic anhydride	Serum	i.p.	Scratch test with citraconic anhydride	Immediate urticarial reaction, at times with pseudopods
Same	Serum	intra-cut.	Scratch test locally or at a distance	Immediate urticarial reaction with pseudopods

⁶ Landsteiner, K., and Jacobs, J., *J. Exp. Med.*, 1936, **64**, 625.

⁷ Landsteiner, K., and Chase, M. W., *J. Exp. Med.*, 1937, **66**, 337.