removing the lateral tissue tension; investigations which are under way at the present time will show whether or not they exert an injurious influence upon the surface epithelium. Foreign bodies in combination with a specific substance carried to the connective tissue cells exert therefore a formative stimulus of extraordinary intensity. It would be premature to connect these facts in any definite manner with hypotheses which have been put forward in order to explain cell division (as for instance, changes in surface tension caused by changes in the permeability of the cell membranes). If we consider that, as I have previously shown, an apparently identical combination of stimuli acts in a specifically different manner upon the uterine mucosa of the rabbit and of the guinea-pig, the difficulty of such an undertaking becomes apparent. Concerning the rôle played by the ovum in the formation of the placenta, we may conclude from these experiments that it is purely mechanical and that it can be imitated by the contact action of non-specific foreign bodies. The quantity of newly formed placenta is, however, much greater under the influence of the foreign body, because the latter comes into contact with a much larger area of the mucosa, the influence of the ovum being considerably more localized.

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The adsorption of the venom of Heloderma suspectum.[1]

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Heloderma suspectum is naturally immune against subcutaneous injection of its own venom. We endeavored to contribute to an analysis of the mechanism of this immunity through a study of the conditions that determine the fixation of the venom by suspension of various organs and of inorganic and organic substances *in vitro*. Such investigations also promised to become of importance for an understanding of the difference in the toxic action of the venom in various animals. The following are the principal results we obtained.

1. Carmine and charcoal both adsorb a relatively large quan-

[1] This investigation has been conducted under a grant from the Carnegie Institution.

tity of venom, but comparing the adsorbing power of equal volumes of carmine and charcoal, charcoal is found to adsorb considerably more venom than carmine. The fixation of venom on charcoal is very strong and no dissociation of the adsorbed substance is found to take place after injection of the charcoal containing the adsorbed venom into the animal body. Addition of a small amount of weak acid to the venom-charcoal mixture does not influence markedly the adsorption process, while addition of alkali interferes with the adsorption, diminishing the quantity of the adsorbed venom, and causing the adsorption to be less firm. The addition of blood serum of the rabbit or dog also reduces markedly the adsorption of venom, while lecithin does not influence adsorption of venom by charcoal. Kaolin adsorbs considerable quantities of venom but less than charcoal, and the union between kaolin and the venom is easily broken up, when the mixture is injected into the body. Aluminium oxide, if free from alkali, adsorbs a large quantity of venom, but the combination is a loose one and is easily broken up in the body. Emulsified olive oil does not adsorb any venom. Lecithin adsorbs a definite but not very large proportion of venom. Filtration of venom through a Berkefeld filter is necessary in order to free after previous centrifugation the supernatant fluid from fine particles of lecithin that had adsorbed a certain quantity of the venom. Lecithin adsorbs considerably less than charcoal. After injection into the animal body dissociation of the venom takes place very readily. Addition of cholesterin to lecithin causes an additional adsorption of venom, but in this case also the combination is a very loose one.

Adsorbing Power of the Organs of various Animals for the Venom of Heloderma. — As in the case of adsorbing substances mentioned above the degree of adsorption of the venom by suspension of organs was tested by injecting the supernatant fluid as well as the residue. Only in a few cases filtration through a Berkefeld filter was made use of. Usually brain, liver, kidney, in some cases also ova, erythrocytes and blood serum were tested.

The following animals were examined: *Heloderma*, turtle, pigeon, frog, guinea-pig, rabbit, dog. The results are as follows: on the whole the suspension of organs adsorbs less venom than does charcoal. The brains of the various species have relatively the

least adsorptive power of the organs examined; especially the brain of *Heloderma* has hardly any adsorbing power. On the other hand some other organs of *Heloderma*, namely, liver and kidney, have more adsorbing power than the organs of any other animal. Next in the order of adsorbing power come the organs of the turtle and these are followed by the liver and kidney of the pigeon, frog and guinea-pig, while dog and rabbit organs have least adsorbing power.

Certain differences seem to exist in the firmness with which the adsorbed venom is fixed to various organs. The kidney of *Heloderma* seems to hold the venom more firmly than the liver of the same animal. Of the greatest interest, however, appears to us the fact that the organs of *Heloderma* adsorb a larger quantity of their own venom than the organs of any other animal which we examined. While the blood of the *Heloderma* does not contain any antitoxin and, as Dr. E. P. Corson White has shown in our laboratory, no complement fixation takes place on mixing venom and blood serum of *Heloderma*, the liver and kidney of *Heloderma* show a definite specific relation to the venom of *Heloderma*, possessing a relatively great power of binding it. With some degree of justification it may be suggested that this specific relation is one of the factors concerned in the natural immunity of *Heloderma* against its own venom, such a union preventing the venom from a combination with certain parts of the nervous system. Furthermore, inasmuch as the adsorbing power of the brain is very slight, while on the other hand venom exerts its lethal action through its influence upon certain parts of the brain, we may assume that very small quantities of the venom when combined with brain substance are sufficient to kill the animal.

We wish to direct attention to the possibility that organs of those animals that are more closely related to *Heloderma*, as, for instance, the turtle, adsorbed more venom than more distinctly related animals, as the dog and rabbit. This, however, is merely brought forward as a suggestion and it must be left to further work to confirm or invalidate it.