

permanently to alter the reactivity of a section of skin. When repeated injections were made into an area already inflamed, there was less effect than usual, apparently because the endothelium was incapable of taking up more of the antigen. After healing, however, the reactions resumed their former intensity. The potency of the filtrates was somewhat diminished by boiling for one hour. We were unable to neutralize it with immune serum of an agglutinin titer 1:40. No deterioration has been noted in filtrates kept at ice box temperatures for 6 months.

The skin test is not limited to any strain of organism. Filtrates of most of the gram negatives from the pharynx of the rabbit will produce it, though certain of the avirulent ones lost this capacity after cultivation for several months on artificial media. Antigens from the virulent Rockefeller strain (R.D.) were active for all groups tested; however, the intensity of skin reaction is not a criterion of virulence, since strains of relatively harmless *B. lepi-septicum* isolated from a certain group of rabbits, produced filtrates even more potent for those particular animals than those obtained from the more invasive organism. Broth controls were uniformly negative.

There is apparently considerable antigenic relationship between many gram negatives of different biological groups, inasmuch as rabbits react to filtrates of *B. influenzae*, *B. coli* and meningococcus organisms, to which they could not have been directly sensitized. Likewise, humans who react to filtrates of these organisms also react to those of *B. lepi-septicum*.

¹ Mackenzie, G. M., and Hanger, F. M., *J. Immunol.*, 1927, xiii, 41.

² Webster, L. T., *J. Exp. Med.*, 1924, xxxix, 843.

³ Bull, C. G., and McKee, C. M., *Am. J. of Hyg.*, 1927, vii, 110.

⁴ Webster, L. T., *J. Exp. Med.*, 1926, xlviii, 573.

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Phagocytic Activity of Capillary Endothelium of Skin and Probable Relation to Focal Immunity.

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Bacteria and many colloidal substances injected intravenously rapidly disappear from the blood stream. This is due chiefly to the phagocytic activity of the reticulo-endothelial system of the liver,

spleen, lungs and bone marrow, where the foreign particles may be demonstrated within the cells. The endothelium of other organs such as the kidney, muscle and skin, normally lack this function. Experiments are here reported which demonstrate a temporary phagocytic activity of the capillary endothelium of the skin, following injury of various sorts. This activity appears almost immediately after the trauma and disappears within an hour, and constitutes, perhaps, the initial stage of inflammation.

A rabbit that had previously been found allergic to certain bacterial filtrates was selected. Sterile filtrate of *B. leprosepticum* (0.2 mil.) was injected intradermally at hourly intervals along the previously shaved side of the animal. After 5 or more hours, erythema appeared at the sites first injected, while the more recently injected ones showed nothing after the absorption of the filtrate. Diluted India ink (2.5 mil. of Higgins waterproof and 2.5 mil. of normal saline) was then injected intravenously. Almost at once, the site of the most recent intradermal test became dark in color, while the normal skin and the older injection sites remained unchanged. Twenty-four hours later, no erythema was present in the injected sites where ink had been deposited, but wherever no deposition had taken place erythema had developed. Microscopic examination of the skin shows ink particles filling the endothelial lining of the capillaries and the reticular cells, but none in the tissue spaces or wandering cells. This ink deposit persists during the animal's lifetime. The reaction is not specific. Plain broth, washed bacterial suspensions and simple trauma, such as scarification, will often produce it, but rarely as intensely as an active filtrate. Repeated trials show that the most active phagocytosis occurs in areas stimulated about 15-30 minutes before the ink injection. The reaction rarely occurs after 1 hour.

A few experiments have been done where the India ink was diluted with distilled water instead of normal saline. In these animals there was apparently considerable laking of cells, for the sites became bright red and there was no evidence of ink phagocytosis. Attempts have been made to demonstrate similar phagocytosis for bacteria by using tubercle bacillus and staphylococcus instead of ink, but apparently the reaction is confined to foreign bodies in solution, or in a very finely divided state.

Up to the present time, we have failed to elicit the phenomenon in the capillaries of muscle or kidneys. This requires further study for the experiments were done under ether anesthesia, which usually inhibits the reaction.

The reaction can only be elicited in rabbits capable of giving positive skin tests to bacterial protein. We have shown in another series of experiments that it is these strong reactors who resist infection when virulent *B. lepi-septicum* organisms are injected intradermally, while the negative reactors usually succumb to a rapidly spreading infection. It appears that this prompt activity of the endothelial cells is related to the focal immunity of the animal.

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Some Results of the Application of High Pressures to the Heart.

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Localized pressure applied to muscle or nerve is commonly employed to depress, or abolish function in these tissues. In the present experiments our purpose is to observe the effects of high pressure upon the heart when applied in a manner so as to give equal compression throughout the organ.

A special compression chamber has been constructed which is capable of withstanding pressures of 80 atmospheres, and is large enough to admit a small optically recording membrane manometer with a frog, or turtle heart attached. The heart and optical manometer are completely filled with Ringer's solution and mounted in the compression chamber which is also completely filled with the solution. In this manner the heart is surrounded inside and out with the Ringer's solution, and the pressure when applied to the heart is through this liquid medium.

Since the source of pressure in our experiments is nitrogen gas, provision is made also, for the liquid system of the compression chamber to be continuous through a small bore tube to a reservoir of about 100 cc. capacity. The reservoir is partly filled with Ringer's solution, and from the top of it a small tube leads to a high pressure nitrogen tank. In one end of the compression chamber a small window, backed with heavy plate glass, provides a way for recording the movements of the manometer system produced by the contractions of the heart.

When pressure of about 60 atmospheres is applied to a normal beating heart, an increase of nearly twofold is produced immediately