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Observations upon Allergic Reactions Produced with Various Bacilli of the Acid-Fast Group.

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The two representative pathogenic bacilli of the acid-fast group are *B. tuberculosis* and *B. leprae.*

The phenomena of allergic reactions in tuberculosis have been well established clinically and experimentally. The experimentalists have obtained various forms of such reactions and have arrived at divergent opinions concerning their relationship to aggravation of or protection against the disease. Thus, Dembinski,[1] Rolland,[2] Krause and Willis,[3] and Clawson[4] consider that despite the allergic state present or produced experimentally by inoculation with *B. tuberculosis,* the resistance to subsequent infection is greatly exalted. On the other hand, Selter,[5] Rich, Jenning and Downing[6] regard the sensitized state as a precipitating factor of increased susceptibility. Pagel[7] states that there is no parallelism between tuberculin-supersensitivity and immunity.

In connection with leprosy, the use of leprolin has, in general, been especially applied to this disease. Cummins and Williams[8] carried out some combined tests with tuberculin and leprolin upon human subjects and considered that there existed some group-sensitivity.

It is to be noted, however, that but little, if any, of the results of experimentation has been published relative to presence or absence of specific allergic reactions produced by various members of this extensive group either in regard to infection with *B. tuberculosis* or *B. leprae.*

The work of Harris and Lanford,[9,10] Lewis and Aronson,[11] and

1 Dembinski, B., *Ann. de l'Inst. Past.*, 1899, **13**, 426.

2 Rolland, J., Etude sur le phenomene de Koch et la reinfection tuberculeuse, Paris, G. Steinheil, 1914.

3 Krause, A. K., and Willis, H. S., *Tubercle,* London, 1925, **6**, 438.

4 Clawson, B. J., *Arch. Path.*, 1936, **22**, 99.

5 Selter, H., *Deut. med. Woch.*, 1925, **51**, 933.

6 Rich, A. R., Jenning, F. B., and Downing, L. M., *Bull. Johns Hopkins Hosp.*, 1933, **33**, 172.

7 Pagel, Walter, *J. Path. and Bact.*, 1937, **44**.

8 Cummins, S. L., and Williams, E. M., *British Med. J.*, 1934, **1**, 702.

9 Harris, W. H., and Lanford, J. A., *J. Inf. Dis.*, 1913, **13**, 301.

10 Harris, W. H., and Lanford, J. A., *J. Med. Res.*, 1916, **34**, 157.

11 Lewis, P. A., and Aronson, J. D., *J. Exp. Med.*, 1923, **38**, 219.

Cooke[12] has shown that serological methods do not afford a satisfactory means of differentiation of various strains or members of the acid-fast group. Such results have been attributed to the supposedly common lipoidal coat affording the acid-resistant factor.

Although the specific identification of most of the members of this extensive group is readily accomplished by pathogenicity, cultural and other tests, the differentiation of certain of these strains is especially important in connection with cultures recovered from leprous lesions.

In the present preliminary work, we have endeavored to ascertain if allergic reactions obtained by employing certain of the acid-fast bacilli were of a group or differential character. The acid-fast species employed were *B. leprae,* chrome (Duval), *B. leprae,* non-chrome (Kedrowski), *B. tuberculosis,* human type, and *B. smegmatis* (Moeller). Cultures were grown upon glycerin agar slants and saline suspensions of these, were diluted so as to contain approximately one billion bacilli per cc. They were then killed by autoclaving at 1 atmosphere pressure for 15 minutes. These suspensions were employed for the primary sensitizing and testing injections. Upon 12 guinea pigs and 17 rabbits approximately 100 tests have been made. The guinea pigs used primarily did not present much testing area and the color of the skin detracted from the readings. White rabbits were found preferable, inasmuch as reactions showing redness and tumefaction could be more readily discerned. The area of the chest and abdomen of this animal, also, afforded better space for multiple testing. A series of rabbits was given a subcutaneous sensitizing dose of 2 cc of each microörganismal species respectively, of the above described suspensions. After a period of 21 days the abdomen and thorax were shaved and all animals were tested endermally with .04 cc of the 4 separate allergens. At the same time control animals were similarly tested. Within 48 hours there had developed in the sensitized animals, markedly elevated and reddened nodules in certain of the tested areas. The controls at this time showed no appreciable response. The composite results of such tests are shown in Table I.

In the reactions noted, it was apparent that each allergen showed some degree of relative specificity for the animal homologously sensitized. Later, the differentiation became somewhat obscured and the control developed small nodules. The allergens were then diluted 1-100 and 1-1000 and the same animals tested with these dilutions. Again there were definite evidences of specific reactions which endured for some time.

[12] Cooke, J. V., *J. Inf. Dis.*, 1919, **25**, 452.

TABLE I.
Endermal Allergic Reactions.

Sensitized Animals	Allergens			
	B. lepræ Chrome (Duval)	*B. lepræ* (Kedrowsky)	*B. smegmatis* (Moeller)	*B. tuberculosis* (Human)
Rabbit A				
B. lepræ Chrome (Duval)	++++	++	±	+
Rabbit B				
B. lepræ (Kedrowsky)	—	+++	++	—
Rabbit C				
B. smegmatis (Moeller)	±	+	+++	—
Rabbit D				
B. tuberculosis (Human)	- -	±	—	++
Control rabbit	—	—	—	—

++++ = Nodular reaction, approximately 15 mm diameter.
+++ = " " " 10 " "
++ = " " " 7 " "
+ = " " " 3 " "
All showed corresponding degrees of redness, oedema and necrosis.

These experiments were repeated with more white rabbits which were sensitized and after 24 days together with controls, were tested endermally with the higher dilutions of bacterial allergens. Similar differential reactions were obtained in this series as in the former group, with practically negative results in the control animals. A delayed smaller nodule formation was attributed to foreign protein retained in the skin.

These results indicate that this method may prove of service in identification of some one or more strains of *B. leprae* as such. With improvement in the preparation of the testing allergen and the inclusion of an allergen prepared from bacilli of a leprous nodule, a causal relationship may be emphasized.