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THE INFLUENCE OF THE THYROID GLAND ON HYPERSENSITIVITY REACTIONS IN ANIMALS

II. The Influence of Thyroidectomy on Experimental Encephalitis in Guinea-pigs

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The part which the endocrine organs play in hypersensitivity reactions has for several decades been a matter of interest to a number of research workers. In the first place the adrenals and the thyroid gland were thought to play an important rôle, but also other endocrine organs were supposed to interfere with the allergic and anaphylactic process. Administration of ACTH or cortisone was found *inter alia* to inhibit tuberculin-type cutaneous responses in animals as well as in man (1, 2, 3, 4), to some extent suppress skin responses of the eczematous type (5, 6), and to suppress local anaphylaxis (7), while thyroid hormone systematically administered enforced the anaphylactic trend (8, 9), enhanced skin responses of the eczematous type (10), increased vascular anaphylactic reactions (11), and also, removal of the thyroid gland depressed anaphylactic and histamine responses in experimental animals (12).

In preceding papers I have given an account of observations on the influence of the thyroid gland upon the eczematous response in guinea-pigs and upon the histamine-aerosol reaction. In the course of these studies as well as of others (which will be published later) concerning anaphylactic reactions

and thyroid activity, I became interested in the question of whether supersensitivity reactions developing without demonstrable circulating antibodies were affected by thyroidectomy. The so-called allergic encephalitis seemed to be such a condition where it had not been possible with certainty to demonstrate circulating antibodies or to bring about passive transfer of the supersensitivity.

In 1932 it had been shown by Hurst that subcutaneous or intramuscular injection of heterologous brain tissue will produce paralysis in the extremities of rabbits. Subsequently several workers demonstrated that homologous brain tissue has the same effect in various animals (Freud et al., Morrison, Rivers et al., Ferraro and Jervis, Kabat et al., Morgan, Hill). Most of these authors considered that an allergic mechanism was involved, although, as was mentioned above, the presence of antibodies could not be established beyond doubt.

METHODS

6 guineapigs weighing 400–600 g. were intraperitoneally injected with 1 mC. of the isotope I^{131} . After 9–12 weeks the I^{131} uptake was measured after injection of 20 μ C. using the method previously described (12). In addition, repeated histamine-aerosol tests were carried out, which, if the animal withstood the histamine-aerosol for at least 6 minutes (see also Nilzén, 12), were taken to indicate adequate extinction of thyroid activity. When there was no or negligible uptake of I^{131} , and when the animal withstood the histamine-aerosol for at least 6 minutes, homologous brain tissue was subcutaneously injected into the nuchal region. The brain tissue was prepared with addition of tubercle bacilli and Arlacell, the procedure being as follows: 4.3 g. brain of a normal guineapig was pulped with 43 ml. normal saline. 20 ml. pulp was homogenised to a whipped-cream consistence with 20 ml. Arlacell suspension (1 part Arlacell emulsion + 9 parts liquid paraffin *tenue*). To this mixture was added 20 ml. tubercle-bacilli suspension (100 mg. killed tubercle bacilli in 80 ml.

TABLE 1

Animal no	Date of brain injection	Date of death	
5	7 April	20 April	
6	"	—	Thyreoid-
42 b	"	22 April	ectomised
63	"	20 "	animals
83	"	24 "	
86	"	24 "	
1	7 April	21 April	
2	"	21 "	
3	"	23 "	Control
4	"	25 "	animals
5	"	25 "	
6	"	19 May	

paraffin), the result being a semiliquid cream. Each guineapig was subcutaneously injected with 3 ml. of this mixture, i.e. received 0.1 g. brain tissue.

RESULTS

As is seen from table 1, 5 out of 6 isotope-treated guineapigs died. All animals died after 1–6 hours' paralysis of the hind extremities. Among the 6 control animals 5 died within the same period. The 6th control animal, having survived for 6 weeks following the injection of brain tissue, also died with paralysed hindlegs. The 6th isotope-treated guineapig is still alive 5 months after the injection.

In the dead animals histological examination of the brain disclosed the same picture as described by Hill and hence not requiring discussion.

CONCLUSION

Even though thyroid activity be reduced to a minimum or completely suppressed, experimental encephalitis, as has been

shown, cannot be prevented in guineapigs. On the other hand, various other hypersensitivity reactions such as local and systemic anaphylactic conditions, are abolished by thyroidectomy, and circulating antibodies are restrained. Whether this difference in the mode of reaction is due to the encephalitis being other than allergic in nature, cannot be stated. However, it should be pointed out that thyroidectomy does not interfere with the experimental eczematous response in guineapigs, where the allergic aetiology is indisputable.

SUMMARY

By injecting homologous brain tissue plus adjuvant, experimental encephalitis was produced in, on the one hand, normal guineapigs and, on the other, guineapigs treated with the isotope I^{131} . No difference in the rates of animals developing encephalitis emerged between the normal guineapigs and those with depressed thyroid activity.

REFERENCES

1. *Stoerk, H. C.*: Federation Proc., 9, 345, 1950.
2. *Harris, S. & Harris, T. N.*: Proc. Soc. Exper. Biol. & Med., 74, 186, 1950.
3. *Derbers, V. J., Dent, J. H., Weaver, N. K. & Vaughan, D. D.*: Proc. Soc. Exper. Biol. & Med., 75, 423, 1950.
4. *Long, J. B. & Favour, C. B.*: Bull. John Hopkins Hosp., 87, 186, 1950.
5. *Sulzberger, M. B., Witten, V. H. & Zimmermann, E. H.*: Acta Dermat.-venereol. (suppl. 29), 1952.
6. *Nilzén, Å.*: J. Invest. Dermatol., 18, 7, 1952.
7. *Germuth, F. G. & Ottinger, B.*: Proc. Soc. Exper. Biol. & Med., 74, 186, 1950.
8. *Blom, T.*: Zeitschr. f. Immunitätsf., 83, 373, 1934.
9. *Eickhoff, W.*: Virchows Arch. f. Path. Anat., 303, 481, 1939.
10. *Nilzén, Å. & Hussey, F.*: J. Invest. Dermatol., 22, 503, 1954.
11. *Kjems, E.*: Acta Pathol. Microbiol. Scand., 31, 18, 1952.
12. *Nilzén, Å.*: Acta Allergologica, 7, 231, 1954.
13. *Hurst, E. W.*: J. Hyg., 32, 33, 1932.

14. *Freund, J. & McDermott, K.*: Proc. Soc. Exper. Biol. & Med., 49, 548, 1942.
15. — & *Bonato, M. V.*: 48, 325, 1944.
16. *Rivers, T. M. & Schawentker, F. F.*: J. Exper. Med., 61, 689, 1935.
17. *Ferraro, A. & Jervis, G. A.*: Arch. Neurol. and Psychiat., 43, 195, 1940.
18. *Kabat, E. A., Wolf, A. & Bezer, A. E.*: J. Exper. Med., 85, 117, 1947.
19. *Morgan, I. M.*: Ibid., 85, 131, 1947.
20. *Hill, K. R.*: Bull. John Hopkins Hosp., 84, 302, 1949.

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