

"Note on the Disintegration of Rabid Brain Substance." By J. O. WAKELIN BARRATT, Research Student, Jenner Institute of Preventive Medicine. Communicated by LORD LISTER, O.M., F.R.S. Received July 10, 1903.

(From the Bacteriological Department of the Institute.)

Although no organism causally related to rabies has been demonstrated in the tissues of animals dying of this infection, nevertheless it has long been inferred that the virus consists of an organism, since it is capable of indefinite increase when passed from animal to animal.

It is obvious that, if the virus of rabies is an organism, disintegration of the material in which it is contained will, if sufficiently minute, lead to its destruction.

In order to test this conclusion, the brain of a rabbit which had died of rabies was broken up in a disintegrator\* for 11 hours with sand, cooling being effected by a stream of liquid carbon dioxide in the outer jacket of the apparatus. The disintegrated material inoculated upon two rabbits communicated rabies in each instance.

More thorough disintegration was next attempted. The later form of disintegrator employed by MacFadyen and Rowland in their recent work on micro-organisms was made use of, and the process carried out at the temperature of liquid air. In this apparatus sand is dispensed with, the brittleness of the material ground at this temperature rendering its use unnecessary.

Portions of the brains of rabbits dying of rabies, following upon inoculation with "virus fixe," were thus disintegrated and the product so obtained, mixed with nine parts of normal saline solution, was used for sub-dural injection. Proceeding in this way it was found that disintegration for five minutes failed to abolish the virulence of the material, that disintegration for half to one hour was usually sufficient to abolish it (10 out of 13 experiments), while disintegration for longer periods (up to three hours) always led to its complete abolition.

This result suggested a mechanical destruction of the virus of rabies during disintegration. Before this conclusion could be adopted, however, it was necessary to ascertain whether any substance was produced or set free during disintegration, which was in itself capable of destroying "virus fixe," since it is known that immunising substances are formed by animals infected with, or immunised against, rabies.†

\* 'Journ. of. Physiol.,' 1901-2, vol. 27, p. 53.

† Cp. R. Kraus u. R. Maresch, "Ueber die Bildung von Immunsustanzen gegen das Lyssavirus bei natürlich empfänglichen und unempfindlichen Thieren," 'Zeitschr. f. Hygiene u. Infectiouskrankheiten,' 1902, vol. 31, pp. 526—539.

Accordingly an emulsion, made by adding disintegrated rabid brain substance to 10 parts of physiological salt solution, was intimately mixed with a virulent brain pulp in the proportion of five parts of the former to one of the latter, and the mixture allowed to stand at the room temperature for 24 hours, it having previously been ascertained that a 1-in-60 emulsion of "virus fixe" in physiological salt solution retains its virulence for this period of time. Intra-cerebral injection of the mixture of disintegrated and virulent brain substance, practised upon rabbits, was followed by rabies, thus showing the absence of a rabicide substance in disintegrated rabid brain.

It might seem not improbable that the virus would be destroyed by so low a temperature as that of liquid air. But it has been ascertained by Dr. A. MacFadyen that exposure of rabid brain substance to the temperature of liquid air for three months fails to deprive it of its virulence.

From the above facts it seems difficult to arrive at any other conclusion than that the infective agent in rabies is deprived of virulence by mere mechanical violence, a result which could only be explained on the hypothesis that the virus is of the nature of a living organism.

Brain substance disintegrated by the method above referred to, and mixed with physiological salt solution in the proportion of 1 in 10, when injected intra-cerebrally into a rabbit in doses of 0.1 c.c. and upwards, often causes convulsions terminating in recovery or death according to the dose. An equal amount of a 1-in-10 brain pulp, made by trituration in a mortar, similarly injected, is usually without effect. Convulsions are producible whether the cerebral substance used is healthy or rabid, fresh or kept for some time previously in glycerine. Hence these convulsive phenomena, whatever be their explanation, have no bearing on the nature of rabies.

As regards the main issue raised in this research, the experiments appear to furnish strong confirmation of the view that the virus of rabies is organised in its nature.<sup>1</sup>

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