

THE PRECIPITIN REACTION OF ANTIPNEUMOCOCCUS SERA

III. THE RATIO OF PRECIPITIN TO PROTECTIVE ANTIBODY IN TYPE II

BY HARRY SOBOTKA, PH.D., AND MAE FRIEDLANDER, PH.D.

(From the Lucius N. Littauer Pneumonia Research Laboratory, Department of Bacteriology, University and Bellevue Hospital Medical College, New York University, New York)

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In the first paper of this series (1) it was stated that the precipitin index "offers a method for the standardization of pneumonia antibody." In a second paper (2) we concluded that "the ratio precipitin index/protective units in monovalent sera was found to lie between 2.8 and 4.8 for Type I and to be about ten times greater for Type III." The constancy of these quotients is limited by the lack of accuracy in the determination of the denominator *viz.* the amount of protective units as estimated by the uncertain mouse test.

The existence of a parallelism of the precipitin with the protective antibody in antipneumococcus sera (2) was corroborated by Heidelberger, Sia and Kendall (3) who analysed the maximum specifically precipitable protein in their attempts at a quantitative interpretation and explanation of precipitin phenomena and noticed "a definite parallel between maximum specific precipitation in Type I antipneumococcus sera and mouse protection."

The estimation of antipneumococcus antibody by precipitin tests has recently been facilitated by the rapid and convenient method proposed by Zozaya, Boyer and Clark (4). As the data of the authors mentioned are confined to Type I, and as our previous communication dealt with sera against Type I and III* only, it seemed desirable to record data on Type II precipitin and protection tests carried out during 1927-1928. Table I gives the precipitin indices and protective

* Erroneously quoted as I and II by (3).

units for eight Type II horses of the New York City Board of Health (Research Laboratories in Otisville, New York). The precipitin index was determined as previously described from the average of several combinations of antigen and antibody dilutions yielding a perceptible specific precipitation. The mouse protective units in the present as in our previous experiments were determined by the testing method of

TABLE I
Comparison of Precipitins and Protective Antibodies in Type II Sera

No. of horse	Precipitin index	Protective units	Ratio	Duration of treatment in months
1	768	100	7.7	12
2	384	80	4.8	21
3	384+	80	4.8	27
	448+	800	<1.0(?)	29
4	267+	80	3.3	27
	224+		2.8	
	192+		2.4	
5	362	200	1.8	27
	874+	800	1.1	29
6	768	400	1.9	29
	320	100	3.2	42
7	576	400	1.4	44
	184	{100	1.8	42
{80		2.3	44	
Average of last five horses.....			2.1	

+ indicates prozone in precipitin test.

the Research Laboratories of the Department of Health of New York City.

The figures in Table I show (1) that a similar parallelism holds for Type II as for the other types, (2) that the average ratio of about 2 is almost half that of Type I. In other words, in Type II only half the precipitin activity of that in Type I is associated with an equal amount

of protective action. Types II, I and III sera exhibit increasing precipitin activity per protective titer in the order named, perhaps due to the differences in the equivalent weight of their soluble specific carbohydrates. (3) The previous observation was repeated that the precipitins reach higher titers at a faster rate than the protective antibodies during the immunizing treatment. The subsequent increase in protective activity is manifested by the drop of the precipitin/protection ratio.

With due allowance for the irregularities caused by this time factor, precipitin methods will provide a practical means for the comparison of antisera. However, some of our concentrated preparations exhibited a higher relative precipitin content than original sera (2). Sabin (5), on the other hand, was able to prepare type-specific antibody concentrates, almost or entirely free from precipitin action towards soluble specific substance. Also, Freedlander (6) produced type-specific antipneumococcus serum of high protective titer devoid of precipitins. It should be emphasized, therefore, that the precipitins do not parallel the content of protective antibodies at all in antibody preparations other than unconcentrated horse sera.

SUMMARY

The ratio precipitin/protective antibody is given for several fresh antipneumococcus horse sera (Type II).

The application of the precipitin test here dealt with and that of similar ones, based on the conception of a parallelism between precipitin and protective antibody, is limited to unrefined horse sera.

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