Placental Transmission of Mumps and Streptococcus MG Antibodies. (18997)

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(Introduced by G. Shwartzman.)

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Mumps may occur at any age, but it is extremely rare in the neonatal period. This has been said to be probably due to the placental transmission of mumps antibodies(1). As a result of the recent development of specific serological tests(2,3) it has now become possible to obtain quantitative data concerning the permeability of the placenta to these substances.

The present communication embodies the results of testing maternal and cord blood for mumps-complement-fixing and agglutination-inhibiting antibody content. Twenty-five sets of sera were available for the former test, and 47 sets for the latter. A small proportion of the sera were from mothers who delivered prematurely. The results with these were essentially similar to those found with sera obtained from mothers who delivered at term. The results which follow represent consistent findings in 2 or more tests with each specimen.

Methods. The technic for the complement fixation was essentially that of the Kolmer test and has been described elsewhere(4). The antigen was a viral antigen prepared in Lederle Laboratories from allantoic fluid infected with the Habel strain of mumps. The agglutination-inhibition technic previously described(4) is based on the fact that mumps virus agglutinates chicken cells and that mumps convalescent serum in high dilution inhibits specifically this agglutination. For these tests the antigen was prepared in our own laboratory from allantoic fluid infected with the Enders strain of mumps virus. The

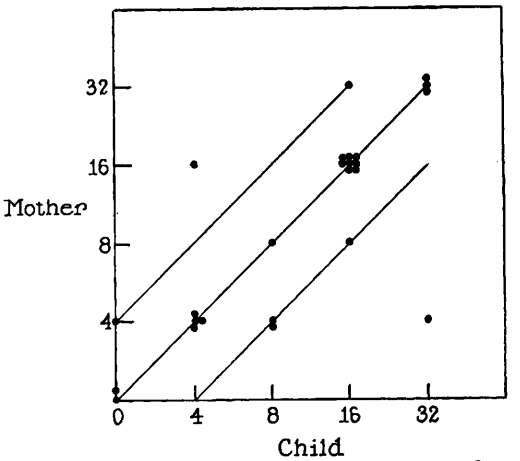

FIG. 1. Comparison of mumps complement fixation titers in maternal and cord bloods.

streptococcus MG agglutination test consisted of making serial dilutions of serum in saline and adding to each a standard suspension of heat-killed organisms. The agglutination readings were made after 24 hours at room temperature(5). In each instance both maternal and cord bloods were tested at the same time.

Results. With the complement fixation test 23 of the 25 mothers (approximately 90%) had antibody titers of 1:4 or above. In 18 sets both sera had exactly the same titer, and in 5 sets there was a difference of only a single dilution (Fig. 1). Thus, within the limits of technical error, in 23 of 25 instances at the time of delivery, the antibody content in the placental blood was quantitatively that of the mother.

With the agglutination-inhibition test, the results were similar but more marked. Forty-seven sets of sera were tested. In 41 both specimens had identical titers. The remaining

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3. Robbins, F. C., Kilham, L., Levins, J. H., and Enders, J. F., *J. Immunol.*, 1949, v61, 235.

4. Florman, A. L., and Kutch, J. H., *J. Immunol.*, 1949, v63, 281.

5. Thomas, L., Mirick, G. S., Curnen, E. C., Ziegler, J. E., Jr., and Horsfall, F. L., Jr., *J. Clin. Invest.*, 1945, v24, 227.

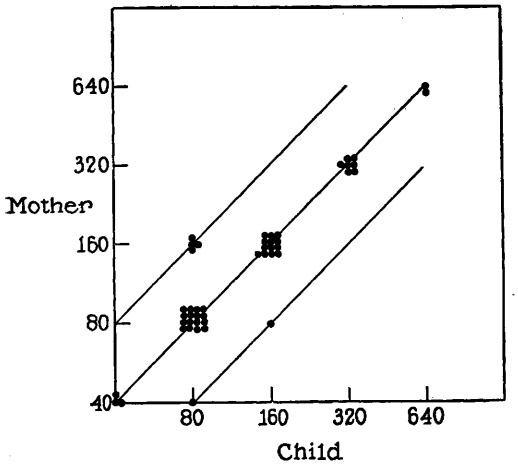

FIG. 2. Comparison of mumps agglutination-inhibition titers in maternal and cord bloods.

6 varied only by a single dilution (Fig. 2). Therefore, with the agglutination-inhibition test, again within the limits of technical error, there was complete agreement between maternal and placental antibody levels.

The transmission of these 2 mumps viral antibodies from mother to child without loss is similar to what is known to be true for diphtheria and tetanus antitoxins(1). These results confirm an earlier report by Maris, Enders, Stokes, and Kane(6) concerning the transmission of mumps complement fixing antibody to 5 infants.

These observations are in contrast to what was found with 25 sets of sera when they were tested for the presence of Streptococcus MG agglutinins. Streptococcus MG is an indifferent streptococcus, first described by Thomas, Mirick, Curnen, Ziegler, and Horsfall(5) which is serologically related to the *Streptococcus salivarius*. It was originally recovered from the lungs of patients dying of primary atypical pneumonia. Agglutinins for it have been found in relatively high titer in the blood of slightly less than one-half of patients convalescing from primary atypical pneumonia(7). It has been found in low titer in the sera of a number of apparently normal individuals. It was therefore selected for comparison with mumps antibodies since it probably also represents a naturally acquired antibody, though to a bacterium rather than to a virus.

There were 20 mothers who had detectable Streptococcus MG agglutinins. In 16 of these 20 sets of sera (approximately 80%) there was a 4-fold or greater *decrease* in titer between maternal and cord blood (Fig. 3). Unfortunately in no instance was the maternal titer greater than 1:16. Consequently it was not possible to show more dramatic differences. This relatively low level of agglutinin may leave some question as to its significance. Nevertheless, it is clear that unlike the mumps antibodies it is not readily transmitted across the placenta.

Our results with the streptococcus MG are not unlike what was found by Hodes, Ziegler, and Zepp(8) when they studied the placental transmission of pneumococcus Type I antibodies. They examined sera from convalescent mothers and from mothers who had been vaccinated with the pneumococcus polysaccharide. In all the mothers the antibody content at the time of delivery was considerably greater than in the infant cord blood.

Discussion. The high incidence of mumps complement fixing antibody in maternal blood, even though only 11 of the 25 mothers tested definitely recalled having had the disease, is

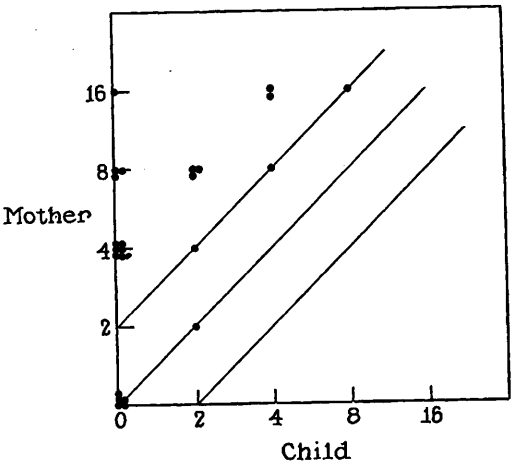

FIG. 3. Comparison of streptococcus MG agglutinin titers in maternal and cord bloods.

6. Maris, E. P., Enders, J. F., Stokes, J., Jr., and Kane, L. W., *J. Exp. Med.*, 1946, v84, 323.

7. Florman, A. L., and Weiss, A. B., *J. Lab. and Clin. Med.*, 1945, v30, 902.

8. Hodes, H. L., Ziegler, J. E., Jr., and Zepp, H., personal communication.

consistent with the earlier findings of Enders and his coworkers as to the incidence of positive reactors among adult urban populations(6).

A comparison of the agglutination-inhibition and complement fixing titers in 20 mothers on whom both tests were done, showed an independence of the level of antibody as measured by each test. That is, some of the sera having the lowest agglutination-inhibition titers had the highest complement fixing titers, and vice versa. This is in agreement with what Florman and Kutch(4) showed to support the contention that the mumps antibodies measured by the complement fixation and agglutination-inhibition tests were distinct and different.

It cannot actually be determined at the present time whether the mumps viral antibodies are smaller in aggregate size than the streptococcus antibodies. However, if they were, it would offer a possible explanation for some of the greater passive resistance of newborn infants to different viral and bacterial infections.

Summary. Quantitative data are presented to show that both the mumps viral complement fixing and agglutination-inhibiting antibodies are transmitted from mother to child without any significant loss in titer. In contrast, titrations for streptococcus MG agglutinins show in most of the instances at least a 4-fold diminution of the maternal titer in the cord blood. There was no difference in results when specimens were from premature or full term infants.

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Growth of *Actinomyces bovis*: Quantitative Cultural Methods. (18998)

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Actinomyces bovis has been grown on a wide variety of media under various cultural conditions. In determining the extent of growth under these cultural conditions, no quantitative technics have been employed. Macroscopic observations with general descriptions of colonial appearance have provided the standards. No methods have been described for using small quantitative inocula. One of the difficulties is that typical rough and intermediate forms(1), when first isolated from parasitic sources in man and animals, appear as non-uniform granules. In addition, many workers transfer undetermined and large numbers of cells with the belief that this technic enhances the possibility of continued growth. Too, the original rough and intermediate forms frequently become smooth after prolonged artificial cultivation.

In order to study the growth requirements of *A. bovis*, it became necessary to develop quantitative methods for determining the size of the inoculum and the amount of growth. Accordingly, experiments were initiated: (a) to preserve the original rough form for an extended period, (b) to obtain maximum growth in liquid media, and (c) to measure the exact amount of growth in various liquid media.

Materials. Three rough isolates from human cases of actinomycosis were used: 43395, which was obtained through the courtesy of Dr. Elizabeth S. Hazen, New York State Department of Health; and AN 11 and AN 14 (from cervico-facial actinomycosis) from Dr. T. Rosebury, College of Physicians and Surgeons, Columbia University. These isolates were grown at pH 7.0 at 37°C in a liquid medium of the following composition: (casitone-yeast extract medium)

casitone (Difco)	15 g
yeast extract (Difco)	5
glucose	5
sodium chloride	2.5
cysteine hydrochloride	.75
sodium thioglycolate	.3
water to make 1000 ml	

1. Rosebury, T., Epps, L. J., and Clark, A. R., *J. Inf. Dis.*, 1944, v74, 131.