

Gamma globulin, administered to a group of orthopedically disabled children in a hospital school, failed to prevent or modify measles in a proportion of the cases.

Effect of Gamma Globulin on Measles

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THE INCIDENCE of complications with or following measles has led to various attempts at modification or prevention (1,2). At present, the use of gamma globulin is considered the most effective means of preventing measles (3,4). Since it is important in some instances to prevent this illness and in others to modify it, much effort has been directed recently toward establishing an optimum dosage (5,6).

Current recommendations call for the administration of gamma globulin by the intramuscular route in a dosage of approximately 0.02 cc. per pound of body weight for modification and of 0.1 cc. per pound of body weight for prevention of measles (7-9). At least one worker has presented evidence that 0.02 cc. per pound of body weight is excessive since this "modifying" dosage frequently appears to prevent the disease completely (10).

The effectiveness of gamma globulin in preventing or modifying the course of measles was studied during an epidemic in the spring of 1954 at the Illinois Children's Hospital School, Chicago.

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The study included 92 permanent resident children at this institution. At the time of this report, the shortest period of residency in this hospital school was 2 and the longest 8 years.

The diagnostic categories included 35 children with cerebral palsy, 26 children with residual paralysis following poliomyelitis, 5 children with paraplegia following trauma, 2 children with paraplegia following transverse myelitis, 3 with paraplegia due to spina bifida, 5 with muscular dystrophy, and 16 with other disorders. The children in general represented the more severe forms of these conditions. Approximately one-third of the students are almost or totally helpless. In this latter group illness of any kind or complications thereof would be serious.

The review of the status of the children at the time of this study showed that of the 92 children, 16 had no history of exanthemata; 66 had a definite history, and 10 had a questionable history of measles (table 1).

The age range for the group was 5 to 20 years. The average age was 12 years; 82 were white, and 10 were Negroes; 52 were males and 40 females. The patients were observed under the condition of this study from March 1, 1954, to May 15, 1954.

For the study the children were divided into three groups:

Group 1 comprised 58 children in good physical condition who had a positive history of

Table 1. Immunity status of 92 children according to diagnosis

Diagnosis	Number of patients	History of previous measles	Questionable history of previous measles
Brain injury (cerebral palsy)-----	35	25	2
Postpoliomyelitis-----	26	23	0
Paraplegia-----	10	8	2
Muscular dystrophy-----	5	3	2
Other-----	16	7	4
Total-----	92	66	10

measles. These children were considered immune, and gamma globulin was not administered to them (11).

Group 2 consisted of 24 children in good physical condition who by history were considered susceptible. "Modifying" doses of gamma globulin were given to this group (12).

Group 3 included 10 children for whom measles, or its complications, was considered dangerous. This group was protected by the administration of "preventive" doses of gamma globulin, irrespective of a previous history of measles.

Group 3 consisted of:

Two students with previous history of measles, both manifesting severe respiratory difficulties following paralytic poliomyelitis.

Two students with indefinite history of measles; both had progressive central nervous system degenerative disease.

Six students with no history of measles—3 severe dystonic athetoid cerebral palsy cases, 2 muscular dystrophy cases, and 1 spastic paraplegia case with primary tuberculous infection.

The first case of measles in this epidemic developed March 5, 1954, in a child who was isolated in his room from the onset of the symptoms (except for part of one day) 3 days prior to the appearance of a rash. It was later learned that during a visit with relatives he was in contact with a child who subsequently developed measles. Immediately after the rash appeared in this first case, the child's entire residential floor was quarantined in an attempt to prevent the spread of the disease. Gamma globulin was administered to all those for whom it was indi-

cated on the fourth day of probable exposure.

During the following week several new measles cases appeared, but none occurred on the residential floor originally quarantined. As soon as the new cases were diagnosed, the 24 students in group 2 presumed susceptible because of no known previous attacks of measles were moved to a single residential floor. The group 1 students with natural immunity and the group 3 children with immunity passively conferred by gamma globulin continued as usual their activities of school, treatment, and home visits. For those quarantined, schooling and the various types of treatment were carried on in their quarters.

Six of the ten students in group 3 subsequently developed measles. One had an onset 11 days, two 12 days, one 17, one 18, and one 38 days after gamma globulin administration. Four children had mild and 2 had moderate cases. There were no significant sequelae to the infection. Thus, of the 10 persons for whom measles was presumed to be dangerous, 6 contracted the disease in spite of administration of the accepted "protective" dose.

The 2 children afflicted with moderate cases of measles also developed German measles 30 and 45 days, respectively, after the onset of their measles. Two others who did not have measles developed German measles approxi-

Table 2. The effect of preventive doses of gamma globulin according to disease category

Diagnosis	Number of patients receiving preventive dose of gamma globulin	Number of patients receiving gamma globulin and subsequently developing measles	Percentage of patients developing measles
Brain injury-----	3	1	33
Postpoliomyelitis-----	2	1	50
Muscular dystrophy---	2	2	100
Other:			
Pelizaeus-Merzbacher	1	0	0
Amyotonia congenita	1	1	100
Congenital lower motor paralysis, unknown etiology--	1	1	100
Total-----	10	6	60

mately 6 weeks after gamma globulin administration. One of these students, with progressive central nervous system degeneration (Pelizaeus-Merzbacher syndrome), appeared to deteriorate rapidly following relatively mild German measles.

A breakdown of patients developing measles after a "protective" dose of gamma globulin given at least 11 days prior to onset of symptoms is shown in table 2. The gamma globulin failures were distributed among a wide range of degenerative diseases.

Of the 24 students who received "modifying" doses of gamma globulin, 19 developed measles, and in 8 of these German measles developed subsequently. Four of the 19 had severe cases of measles and 4 others had complications of some sort.

Of the 58 students with positive histories of measles, 20 students developed measles, 4 German measles, and 3 had both. Three had some type of complications.

Summary and Conclusions

An epidemic of measles followed by an epidemic of German measles occurred in a residence school for 92 orthopedically disabled children, 16 having no previous history of exanthemata. The possibility of progression of basic conditions or of seriousness of sequelae prompted an attempt to prevent the disease in 10 pupils by the administration of 0.1 cc. gamma globulin per pound of body weight intramuscularly on the fourth day after exposure; 24 others received 0.02 cc. per pound of body weight to modify the illness; 58 students, who had positive histories of measles, received no gamma globulin and, therefore, were not quarantined.

Six children developed measles at least 11 days after receiving a "preventive" dose of gamma globulin. Of these, 4 had mild and 2 had moderate measles, but none had complications from this disease. One child suffered rapid progression of the basic condition following a subsequent attack of German measles.

A previous history of measles was of no value

in deciding who should receive gamma globulin, since 20 students with such histories developed measles, 4 German measles, and 3 both. Three had complications of some type.

Gamma globulin in the dosage currently recommended for prevention of measles failed to protect 6 out of 10 children to whom it was administered. Gamma globulin in "modifying" dosage apparently failed to modify the disease in 4 out of 19 students to whom this dosage was administered. There was no evidence that gamma globulin prevented or modified German measles.

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