

CONGENITAL DEAFNESS AND OTHER DEFECTS FOLLOWING GERMAN MEASLES IN THE MOTHER

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NEW light has recently been thrown on the etiologic factors involved in certain congenital malformations by three series of cases reported from Australia, in which virus infections, particularly German measles occurring early in pregnancy, seemed to be definitely related to the congenital defects.

In 1941, Gregg¹ reported a series of 78 cases of congenital cataract in infants whose mothers had had German measles early in pregnancy. Congenital heart disease was also present in 44 of these infants. Later Swan² and his co-workers confirmed the findings of the earlier study and reported a series of 49 cases of rubella during all stages of pregnancy, in 25 of which the rubella occurred in the first two months. Of a total of 31 children with congenital malformations, there were 17 with congenital cardiac lesions, 14 with congenital eye defects, 1 with mongolism, several with microcephaly, hypospadias and mental retardation and 7 deaf-mutes. Many of the infants had several defects. In a later paper Swan³ reported 10 more cases of congenital malformations in infants whose mothers had had rubella in the early months of pregnancy. Reese⁴ was the first American to report on this subject, and he noted 3 cases of congenital cataract and congenital heart disease in infants whose mothers had had rubella early in pregnancy. In 1944

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1. Gregg, N. M.: Congenital Cataract Following German Measles in Mother, *Tr. Ophth. Soc. Australia* **3**:35, 1941.

2. Swan, C.; Tostevin, A. L.; Moore, B.; Mayo, H., and Black, G. H. B.: Congenital Defects in Infants Following Infectious Diseases During Pregnancy, with Special Reference to Relationship Between German Measles and Cataract, Deaf-Mutism, Heart Disease and Microcephaly, and to Period of Pregnancy in Which Occurrence of Rubella Is Followed by Congenital Abnormalities, *M. J. Australia* **2**:201-210 (Sept. 11) 1943.

3. Swan, C.; Tostevin, A. L.; Mayo, H., and Black, G. H. B.: Further Observations on Congenital Defects in Infants Following Infectious Diseases During Pregnancy, with Special Reference to Rubella, *M. J. Australia* **1**:409-413 (May 6) 1944.

4. Reese, A. B.: Congenital Cataract and Other Anomalies Following German Measles in the Mother, *Am. J. Ophth.* **27**:483-487 (May) 1944.

Erickson⁵ reported 11 more cases, of which he wrote: "Most of the babies were small and had considerable feeding difficulties. None of the babies were cyanotic and their cardiac physical findings made it seem likely that the defect was a patent interventricular septum. In no case was there a family history of congenital eye or cardiac anomalies." All 11 had congenital ocular defects, 9 had congenital cardiac defects, 2 were mentally retarded and 1 had severe anemia resembling erythroblastosis fetalis. Rones⁶ reported 4 more cases of infants with ocular defects. In the 2 cases in which rubella occurred in the second month of pregnancy, the infants had cataracts, while in the 2 cases in which it occurred in the third month, they had congenital glaucoma.

These and other reports which have appeared in the literature have stimulated me to go over the data which have been collected at the Clarke School for the Deaf to see if there were any mothers of these pupils who had had German measles during the early months of pregnancy. Letters were written to the mothers of all the children, with omission only of those cases in which there was a definite history of infection in the child (those in which the child had had cerebrospinal meningitis and a few cases in which there was a definite history of speech before the onset of mumps with a history of profound deafness following the mumps) and those cases in which there was a definite history of deafness in the family. In other words, I wrote to the mothers when there was any doubt as to the cause of the deafness and to all mothers with only 1 child if his deafness was the only instance of deafness in the family so far as I had been able to determine. Many of these cases had already been classified in the records as hereditary or probably hereditary, but there was still some doubt in my mind as to the cause of of the deafness.

Table 1 shows the results of my inquiries:

TABLE 1.—*Incidence of German Measles During Pregnancies of Mothers of Deaf Children*

Number of Mothers Receiving Letters	Number of Replies	Number with German Measles During Pregnancy	Number with Other Virus Disease During Pregnancy
129	116	10	2

Table 2 shows in detail the data concerning the 10 children whose mothers had German measles during pregnancy.

5. Erickson, C. A.: Rubella Early in Pregnancy Causing Congenital Malformations of Eyes and Heart, *J. Pediat.* **25**:281-283 (Oct.) 1944.

6. Rones, B.: The Relationship of German Measles During Pregnancy to Congenital Ocular Defects, *M. Ann. District of Columbia* **13**:285-287 (Aug.) 1944.

TABLE 2.—Data Concerning Children Whose Mothers Had Rubella During Pregnancy

Ped. Number	Sex	Birth Date	Duration of Pregnancy at Onset Rubella, Mo.	Congenital Hearing Defects	Congenital Eye Defects	Congenital Cardiac Defects	Other Defects
102	M	1/ 7/27	1	Profoundly deaf	Congenital blindness in left eye; right eye normal	Congenital malformation; probable patent interventricular septum	Rickets; probable mental retardation
342	F	1/ 2/36	1	Partially deaf	None	None	Mentally retarded
326	F	1/13/36	At beginning of 2d	Partially deaf	Convergence and congenital cataract	Patent ductus arteriosus or anomaly of the aortic valve cusps, possibly bicuspid with regurgitation	At 4 years weight 24 pounds (11 Kg.), height 36 in. (91 cm.); died of measles June 1941 after 3 days' illness
329	M	1/ 4/36	At beginning of pregnancy	Partially deaf	None	Systolic murmur transmitted throughout cardiac area, at 10 years	Hyperactive; at 6 years weight 30 pounds (13.6 Kg.), height 37.5 in. (95 cm.); at 10 years weight 44 pounds (20 Kg.), height 49 in. (124 cm.)
329	F	12/28/35	2	Profoundly deaf	Left internal strabismus	Patent interventricular septum; tachycardia and slight right ventricular preponderance	Mentally retarded; at 5 years weight 28 pounds (12.7 Kg.), height 37 in. (94 cm.); at 10 years weight 48 pounds (22 Kg.), height 49 in. (124 cm.)
347	F	10/ 4/35	2 or 3	Profoundly deaf	None	None	None
266	F	11/18/28 (Fraternal twin to next child)	4	Partially deaf; right ear better	None	None	Possible mental retardation; thyroidectomy 1948
266	F	11/18/28	4	Profoundly deaf; left ear better	None	None	Possible mental retardation
368	F	9/ 9/36	4	Partially deaf; left ear better	Right internal strabismus	None	Possible mental retardation
324	M	12/ 4/35	6	Profoundly deaf	None	None	Poor muscular coordination and awkward gait
240	M	1/13/31	6	Profoundly deaf	None	None	None

There is still some doubt as to the cause of the deafness in 2 of the children in table 2. As to pedigree 329, though the mother of the child did have German measles during the second month of pregnancy and the child's defects seem to fit the general picture, the mother had a deaf brother whose deafness was reported to have been caused by "many gatherings in his head as a baby and small child." However, his deafness may have been congenital, and the deafness of the child with pedigree 329 might have been inherited and not the result

TABLE 3.—*Mothers with a Virus Disease Other Than Rubella During Pregnancy*

Ped. No.	Sex	Birth Date	Duration of Pregnancy at Onset of		Congenital Hearing Defects	Congenital Ocular Defect	Congenital Cardiac Defect	Other Congenital Defects
			Influenza, Mo.					
322	F	11/20/26	1		Profoundly deaf	None	None	Mentally retarded
113	F	6/15/19	2		Profoundly deaf	None	None	Fragilitas ossium but no blue sclera

TABLE 4.—*Data Concerning Defective Children Whose Mothers Had no Virus Disease*

Ped. No.	Sex	Birth Date	Congenital Hearing Defects	Congenital Ocular Defects	Congenital Cardiac Defects	Other Congenital Defects
239	M	4/ 9/31	Profoundly deaf	None	None	Pyloric stenosis; hyperactive
362	M	5/ 6/38	Partially deaf	None	None	Congenital lack of right ear
366	M	9/24/35	Partially deaf	Weak eye muscle	Congenital heart murmur	Mentally retarded; at 7 years weight 35 pounds (16 Kg.), height 42 in. (107 cm.); at 10 years weight 45 pounds (20 Kg.), height 48.5 in. (123 cm.)
364	M	6/21/35	Profoundly deaf	Left internal strabismus	None	None
128	F	10/16/28	Profoundly	None	Congenital heart defect	Hyperactive; at 4 years weight 28 pounds (12.7 Kg.), height 36 in. (91 cm.); suggestion of ankle clonus

of the German measles which her mother had during early pregnancy. In pedigree 324, the boy would also have to be placed in a group with unknown causes of deafness. Although his mother had German measles during the sixth month of pregnancy, this period is regarded by many doctors as too late in the developmental history of the fetus to permit any profound disturbance by the virus of rubella, especially with respect to disturbances in the eye, ear or heart.

In pedigrees 240, 266 and 368 the onset of the German measles in the mother was in the fourth month or later, but we have been unable to find any other possible cause for the deafness.

In table 3 data are shown concerning the 2 cases in which the mother did not have German measles during pregnancy, but did have another virus disease, namely influenza,

Table 4 shows in detail the data concerning 6 cases in which the mother had no virus disease of any kind during pregnancy, yet the children present defects which are supposed to be caused by the mothers having German measles during pregnancy.

COMMENT

It should be noted that in analyzing the replies from the 10 mothers who had had German measles during pregnancy I found that 7 of these were mothers of present pupils and the other 3 were mothers of pupils who had left school some time ago. Of 67 mothers of former pupils who replied 3, or 4.4 per cent, stated that they had had German measles, and of the 49 mothers of present pupils who replied 7, or 14.5 per cent, had had German measles.

The fact that the second percentage is over three times the first might be interpreted as due to the fact that the mothers of present pupils remember details of their pregnancies better than those of former pupils who were born much longer ago or that German measles is becoming more virulent and is now causing defects whereas formerly it did not. Whichever fact is true, German measles must actually have occurred in many more mothers in the earlier group, but was regarded as of so little importance that it was not remembered.

CONCLUSIONS

It is suggested that rubella occurring early in pregnancy may be the cause of certain cases of congenital deafness that have formerly been unexplained. Ten such cases are reported in which the mother had German measles during pregnancy. The various defects found in the offspring are listed.

Two cases in which the mother did not have German measles but did have another virus disease, namely influenza, and 6 cases in which the mother did not have any virus disease during pregnancy but in which the child exhibited some of the same congenital defects are also listed. All children here reported are or have been pupils at the Clarke School for the Deaf.