Premarital HAI Screening for Rubella Antibodies

JACK ZACKLER, M.D., HYMAN G. ORBACH, Ph.D., and SHERWIN H. RUBENSTEIN, M.S.

IN response to the increased public awareness of German measles and the introduction of an effective vaccine, the Chicago Board of Health in April 1970 implemented a program of continuing serologic surveillance of a premarital female population whose serum samples are submitted for the routine VDRL test for syphilis.

The decision to initiate this program was determined after the statistically significant results of a survey of rubella antibody titers in women planning to be married, men, and children of both sexes were evaluated. The results of the profile study indicated that a sufficient percentage of the participants—11.9 percent of the females and 8.2 percent of the males over 15 years of age and 77.5 percent of children prior to a massive immunization program—lacked evidence of past infection with rubella virus. The sizable pool of susceptible women indicated the need for a large-scale screening program to determine premarital exposure to rubella.

The authors are with the City of Chicago Board of Health. Dr. Zackler is assistant commissioner, Dr. Orbach is director of laboratories, and Mr. Rubenstein is chief, virology section, division of laboratories. Dr. Zackler is also associate professor, Chicago Medical School, and Dr. Orbach is assistant professor, University of Illinois Medical School. Tearsheet requests to Jack Zackler, M.D., Board of Health, Chicago Civic Center, Chicago, Ill. 60602.

Methods

Specimen collection. All serums taken from women and sent to the Chicago Board of Health for premarital VDRL testing are routinely transferred to the virology laboratory to be tested for rubella antibody.

Rubella hemagglutination inhibition (HAI) testing. The modified microtiter rubella hemagglutination inhibition test (*A*), a modification of the method of Stewart and co-workers (*1*) is used throughout the program. All serums are kaolin adsorbed before further dilutions for determinations. Back titering of the rubella antigen is employed with all test runs to insure uniformity of antigen concentration per determination. Serums are diluted 10 to 640.

Reporting of results. A self-explanatory letter is sent to the physician of each woman for whom a rubella HAI test is performed. This letter is succinct and informative, and it includes a cautionary paragraph dealing with the rubella vaccine.

Results and Discussion

Tables 1–3 summarize the results of 5,764 hemagglutination inhibition tests for rubella antibody. The specimens tested in this program arrived in the laboratory in a totally random fashion and are assumed to indicate the levels of immunity to rubella of Chicago women planning to be married.

The numerical distribution of titers by age and race of women whose immunity was determined is shown in table 1. Five-year ranges were selected to classify premarital age groups.

The largest percentage of women for whom titers of 10 or greater could not be elicited were 25–29 years old (table 2). Of the white women within this

Table 1. Numerical distribution of titers [1] by age group (years) and race

Age and race	<10	10	20	40	80	160	320	640	Total[2]
15–19:									
White	153	112	273	391	223	54	7	1	1,214
Black	32	20	85	117	56	18	3	0	331
20–24:									
White	280	209	543	700	349	118	21	9	2,229
Black	26	32	88	127	64	32	3	2	374
25–29:									
White	109	89	26	233	111	42	7	2	619
Black	14	9	26	46	28	9	2	1	135
30–34:									
White	37	39	109	110	34	13	7	0	349
Black	4	6	27	29	18	3	0	0	87
35–39:									
White	18	26	73	66	36	4	2	0	225
Black	2	11	20	23	5	2	0	0	63
40–44:									
White	4	8	40	22	10	3	1	1	89
Black	0	1	3	7	3	0	2	0	16
45–49:									
White	1	3	2	7	3	0	0	0	16
Black	0	0	1	1	0	1	0	0	3
50 and over:									
White	0	1	3	4	2	0	0	0	10
Black	0	2	1	1	0	0	0	0	4

[1] Expressed as reciprocal.
[2] White 4,751; black 1,013; total 5,764.

Table 2. Percentage [1] distribution of titers, [2] by age group (years) and race

Age and race	<10	10	20	40	80	160	320	640
15–19:								
White	12.6	9.2	22.5	32.2	18.4	4.4	0.6	0.1
Black	9.7	6.0	25.7	35.3	16.9	5.4	.9	0
20–24:								
White	12.6	9.4	24.4	31.4	15.7	5.3	.9	.4
Black	7.0	8.6	23.5	34.0	17.1	8.6	.8	.5
25–29:								
White	17.6	14.4	4.2	37.6	17.0	6.8	1.4	.3
Black	10.4	6.7	19.3	34.1	20.7	6.7	1.5	.7
30–34:								
White	10.6	11.2	31.2	31.5	9.7	3.7	2.0	0
Black	4.6	6.9	31.0	33.3	20.7	3.4	0	0
35–39:								
White	8.0	11.6	32.4	29.3	16.0	1.8	.9	0
Black	3.2	17.5	31.7	36.5	7.9	3.2	0	0
40–44:								
White	4.5	9	44.9	24.7	11.2	3.4	1.1	1.1
Black	0	6.3	18.7	43.7	18.7	0	12.5	0
45–49:								
White	6.3	18.7	12.5	43.7	18.7	0	0	0
Black	0	0	33.3	33.3	0	33.3	0	0
50 and over:								
White	0	10	30	40	20	0	0	0
Black	0	50	25	25	0	0	0	0

[1] Percentages rounded off to nearest 10th of a percent.
[2] Expressed as reciprocal.

Table 3. Summary of all serums tested, by race and number of persons in study groups

Titer [1]	Number of serums		Percent [2] of serums		Total serums	Total percent [2]
	White	Black	White	Black		
<10	602	78	12.6	7.5	680	11.7
10	487	81	10.2	7.7	568	9.8
20	1,069	251	22.5	24.1	1,320	22.7
40	1,533	351	32.2	33.7	1,884	32.5
80	768	174	16.1	16.7	942	16.2
160	234	65	4.9	6.2	299	5.1
320	45	10	.9	.9	55	.9
640	13	3	.2	.2	16	.2

[1] Expressed as reciprocal.
[2] Percentages rounded off to the nearest 10th of a percent.

grouping, 17.6 percent demonstrated no evidence of seroconversion to rubella, while 10.4 percent of the black women were seronegative. With increasing age the percentage of seronegative women decreased, an observation consistent with the findings of Sever and co-workers (*2*) and Skinner (*3*).

Table 3 is a synoptic view of the total number of serums tested. More than 11 percent of all women in all age groups did not demonstrate HI antibody. However, the percentage of black women failing to demonstrate seroconversion was only 7.5 percent as compared with 12.6 percent of the white women. Whether this finding represents the efficacy of immunization programs or is the result of natural infection is unknown.

While the findings of this program are specifically related to the women planning to be married in the city of Chicago, we believe that the implementation of national routine rubella hemagglutination inhibition testing service for women submitting specimens would greatly aid in the elimination of rubella-induced birth defects. Such a service would enable seronegative women to obtain immunity through vaccination before pregnancy.

Although it is not very practical to suggest that a seronegative woman avoid all rubella exposure, information about a woman's immune status may be important in the medical management of a pregnancy should exposure to or clinical symptoms of rubella occur. Of motivating and operational value has been the statement of Bowes and co-workers (*4*) that programs for rubella antibody screening provide "a convenient way to inform patients of their rubella immunity . . . and will prevent anxiety and confusion in future pregnancies for seronegative women and alert seronegative women to avoid obvious rubella exposure."

REFERENCES

(*1*) Stewart, G. L., et al.: Rubella-virus hemagglutination-inhibition test. N Engl J Med 576: 554–557, May 9, 1967.

(*2*) Sever, J. L., Schiff, G. M., and Huebner, R. J.: Frequency of rubella antibody among pregnant women and other human and animal populations. Obstet Gynecol 23: 153–159, February 1964.

(*3*) Skinner, W. E.: Routine rubella antibody titer determinations in pregnancy. Obstet Gynecol 33: 301–305, March 1969.

(*4*) Bowes, W. A., Jr., Gibson, J. L., Leibovitz, A., and Palin, W. J.: Rubella antibody screening in a prenatal clinic using the indirect fluorescent method. Obstet Gynecol 35: 7–11, January 1970.

EQUIPMENT REFERENCE

(*A*) Courtland duracyte rubella diagnostic test system. Scientific Products Division, Abbott Laboratories, North Chicago, Ill.