

CENTER FOR DISEASE CONTROL

# RUBELLA

SURVEILLANCE

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ATLANTA, GA. 30333



# PREFACE

Summarized in this report is information received from state and local health departments and other pertinent sources. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities.

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## INTRODUCTION:

In June 1969, a live attenuated rubella virus vaccine was licensed for use in the United States. Subsequently, two other rubella vaccines have been licensed. Thus, rubella vaccine has become available 28 years after the recognition of the etiologic relationship between rubella and congenital rubella syndrome in 1941, 7 years after the isolation of rubella virus in 1962, and 4 years after the first reports of the attenuation of rubella virus. Because considerable experience with these vaccines has accumulated since licensure, it is appropriate to review the available surveillance data.

## RECENT TRENDS

### A. Source of Data

In January 1966, rubella and congenital rubella syndrome were officially added to the list of notifiable diseases by the Conference of State and Territorial Epidemiologists. Before this, some states maintained rubella surveillance and voluntarily reported cases to the Center for Disease Control. However, before 1966, congenital rubella syndrome was not reported.

In this report, the data prior to 1966 are those transmitted voluntarily by the states. Since 1966 the data have been submitted to the CDC in the Weekly Telegraphic Report of Notifiable Diseases and on Congenital Rubella Syndrome Case Report forms. Additional information characterizing rubella by age and sex was specifically solicited from state and municipal health departments where rubella has been consistently reported over the past decade.

There exists, at present, considerable variability in the completeness of rubella reporting, as well as in the type and accuracy of the information reported. The variability and the potential bias due to use of data collected from selected areas demand that the surveillance data presented in this report be interpreted with caution. Although not quantitatively accurate, these data do depict trends and patterns of rubella occurrence in the United States.



**TABLE 1**  
**REPORTED CASES OF RUBELLA BY STATE, 1960 - 1969**

| AREA                      | 1969          | 1968          | 1967          | 1966          | 1965           | 1964           | 1963           | 1962          | 1961          | 1960          | 0             | 0             | 0             | 0             |
|---------------------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>UNITED STATES</b>      | <b>55,549</b> | <b>48,446</b> | <b>46,888</b> | <b>46,975</b> | <b>100,842</b> | <b>448,796</b> | <b>60,431†</b> | <b>37,265</b> | <b>43,810</b> | <b>50,958</b> | <b>58,585</b> | <b>58,585</b> | <b>58,585</b> | <b>58,585</b> |
| No. States Reporting      |               | (47)          | (47)          | (44)          | (36)           | (35)           | (32)           | (32)          | (33)          | (31)          | )             | )             | )             | )             |
| <b>NEW ENGLAND</b>        | <b>4,130</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Maine                     | 417           | 629           | 856           | 421           | 953            | 7,463          | 953            | 514           | 1,436         | 1,451         | 1,515         | 1,515         | 1,515         | 1,515         |
| New Hampshire             | 109           | 92            | 214           | 133           | 163            | 1,331          | 453            | 57            | 217           | 163           | 333           | 333           | 333           | 333           |
| Vermont                   | 121           | 91            | 227           | 130           | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Massachusetts             | 1463          | 3,608         | 1,429         | 2,056         | 2,839          | 37,105         | 11,739         | 3,766         | 6,443         | 5,562         | —             | —             | —             | —             |
| Rhode Island              | 289           | 1,397         | 384           | 283           | 234            | 11,399         | 1,324          | 129           | 313           | 138           | —             | —             | —             | —             |
| Connecticut               | 1,731         | 3,039         | 1,910         | 2,245         | 1,719          | 40,737         | 3,945          | 1,338         | 2,748         | 3,750         | —             | —             | —             | —             |
| <b>MIDDLE ATLANTIC</b>    | <b>3,505</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| New York                  | 1,996         | 4,389         | 2,258         | 2,631         | 2,505          | 61,624         | 8,158          | 4,246         | 4,465         | 8,816         | —             | —             | —             | —             |
| New Jersey                | 627           | 1,680         | NN            | —             | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Pennsylvania              | 882           | 208           | 179           | 114           | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| <b>EAST NORTH CENTRAL</b> | <b>12,898</b> |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Ohio                      | 1,320         | 2,099         | 771           | 1,254         | 2,348          | 19,194         | 2,953          | 979           | 1,607         | 3,621         | —             | —             | —             | —             |
| Indiana                   | 2,385         | 912           | 669           | 2,345         | 1,911          | 13,037         | 1,972          | 1,406         | 1,371         | 1,937         | —             | —             | —             | —             |
| Illinois                  | 1,786         | 3,355         | 1,621         | 2,935         | 4,850          | 29,685         | 2,108          | 2,030         | 3,438         | 1,723         | —             | —             | —             | —             |
| Michigan                  | 4,127         | 1,908         | 2,338         | 3,040         | 9,937          | 18,922         | 1,637          | 1,091         | 1,224         | 2,028         | —             | —             | —             | —             |
| Wisconsin                 | 3,280         | 2,980         | 3,340         | 5,446         | 9,570          | 96,583         | 4,731          | 4,365         | 5,418         | 4,841         | —             | —             | —             | —             |
| <b>WEST NORTH CENTRAL</b> | <b>4,088</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Minnesota                 | 245           | 69            | 97            | 124           | 1,910          | 3,232          | —              | —             | 1             | —             | —             | —             | —             | —             |
| Iowa                      | 2,541         | 2,053         | 1,896         | 1,952         | 3,798          | 18,481         | 1,727          | 416           | 482           | 438           | —             | —             | —             | —             |
| Missouri                  | 580           | 142           | 350           | 61            | 39             | 573            | 155            | 158           | —             | —             | —             | —             | —             | —             |
| North Dakota              | 256           | 238           | 181           | 205           | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| South Dakota              | —             | —             | 3             | 2             | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Nebraska                  | 352           | 32            | 153           | —             | 13             | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Kansas                    | 114           | 128           | 16            | NN            | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| <b>SOUTH ATLANTIC</b>     | <b>7,645</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Delaware                  | 211           | 150           | 84            | 55            | 111            | 802            | 135            | 144           | 276           | 38            | —             | —             | —             | —             |
| Maryland                  | 865           | 366           | 615           | 404           | 248            | 3,583          | 299            | 258           | 391           | 211           | —             | —             | —             | —             |
| District of Columbia      | 166           | 14            | 9             | 15            | 16             | 455            | 149            | 17            | 50            | 44            | —             | —             | —             | —             |
| Virginia                  | 1,598         | 644           | 675           | 961           | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| West Virginia             | 2,417         | 904           | 639           | 1,037         | 2,091          | 6,774          | 1,438          | 960           | 748           | 314           | —             | —             | —             | —             |
| North Carolina            | 19            | —             | NN            | —             | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| South Carolina            | 301           | 259           | 231           | 284           | —              | †††            | —              | —             | —             | —             | —             | —             | —             | —             |
| Georgia                   | —             | —             | 784           | 493           | 285            | 497            | 85             | 315           | 34            | 140           | —             | —             | —             | —             |
| Florida                   | 2,068         | 1,491         | 1,174         | 1,447         | 892            | 8,661          | 1,008          | 501           | 732           | 834           | —             | —             | —             | —             |
| <b>EAST SOUTH CENTRAL</b> | <b>3,156</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Kentucky                  | 1,187         | 861           | 2,141         | 1,960         | 1,190          | 18,027         | 2,158          | 914           | 2,034         | 1,696         | —             | —             | —             | —             |
| Tennessee                 | 1,635         | 1,135         | 1,367         | 2,578         | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Alabama                   | 136           | 464           | 191           | 122           | 169            | 3,574          | 88             | 57            | 60            | 45            | —             | —             | —             | —             |
| Mississippi               | 198           | 9             | —             | —             | 1,167          | 6,784          | —              | —             | 2             | —             | —             | —             | —             | —             |
| <b>WEST SOUTH CENTRAL</b> | <b>6,504</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Arkansas                  | 199           | 4             | 114           | 14            | 428            | 1,025          | 370            | 59            | 168           | 218           | —             | —             | —             | —             |
| Louisiana                 | 39            | 62            | NN            | —             | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Oklahoma                  | 1,852         | 93            | 558           | NN            | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Texas                     | 4,414         | 2,923         | 640           | 140           | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| <b>MOUNTAIN</b>           | <b>3,064</b>  |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Montana                   | 108           | 96            | 200           | 376           | 2,526          | 2,367          | 898            | 1,011         | 747           | 783           | —             | —             | —             | —             |
| Idaho                     | 94            | 130           | 72            | 119           | 1,088          | 462            | 82             | 116           | 87            | 52            | —             | —             | —             | —             |
| Wyoming                   | 103           | 14            | 5             | 239           | —              | 25             | —              | —             | —             | —             | —             | —             | —             | —             |
| Colorado                  | 1,423         | 892           | 1,885         | 785           | 1,973          | 11,817         | 1,219          | 1,729         | 1,803         | 1,549         | —             | —             | —             | —             |
| New Mexico                | 312           | 134           | 309           | 113           | 272            | 351            | 109            | 26            | 41            | 142           | —             | —             | —             | —             |
| Arizona                   | 861           | 700           | 1,168         | 2,619         | 2,076          | 6,653          | 1,608          | 1,732         | 1,751         | 1,493         | —             | —             | —             | —             |
| Utah                      | 158           | 110           | 71            | 80            | 1,489          | 588            | 85             | 111           | 110           | 143           | —             | —             | —             | —             |
| Nevada                    | 5             | —             | 425           | 30            | 22             | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| <b>PACIFIC</b>            | <b>10,559</b> |               |               |               |                |                |                |               |               |               |               |               |               |               |
| Washington                | 1,943         | 1,851         | 3,377         | 3,435         | 25,258         | 11,119         | 5,526          | 5,152         | 3,176         | 4,230         | —             | —             | —             | —             |
| Oregon                    | 743           | 625           | 986           | 1,174         | 12,956         | 4,190          | 2,114          | 3,318         | 2,298         | 4,167         | —             | —             | —             | —             |
| California                | 6,174         | 4,890         | 9,539         | 2,847*        | —              | —              | —              | —             | —             | —             | —             | —             | —             | —             |
| Alaska                    | 543           | 289           | 381           | 112           | 451            | 747            | 1,127          | 152           | 89            | 331           | —             | —             | —             | —             |
| Hawaii                    | 1,156         | 287           | 356           | 159           | 3,345          | 929            | 78             | 198           | 50            | 60            | —             | —             | —             | —             |

NN — Report not required by State Health Dept.

— No cases reported.

† Includes data for Maine from State Report.

†† Hawaii not included in U.S. total.

\* Vol. reports prior to 11/66.

... Data not available

††† Included in measles.

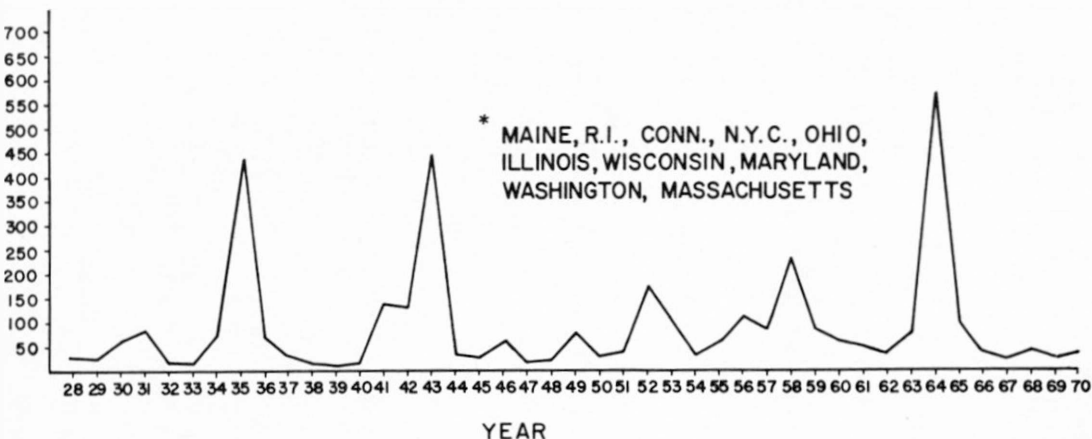
*Source: Reported Incidence of Notifiable Diseases in the United States;  
Annual Supplement for respective year.*

## B. Reported Rubella

Table 1 displays reported cases of rubella from states for the period 1960-69. Reporting for the 10 years has been inconsistent and sporadic. The table shows those states not reporting and the variability in reporting during specific years from states within the same geographic region with similar demographic characteristics.

FIGURE 1

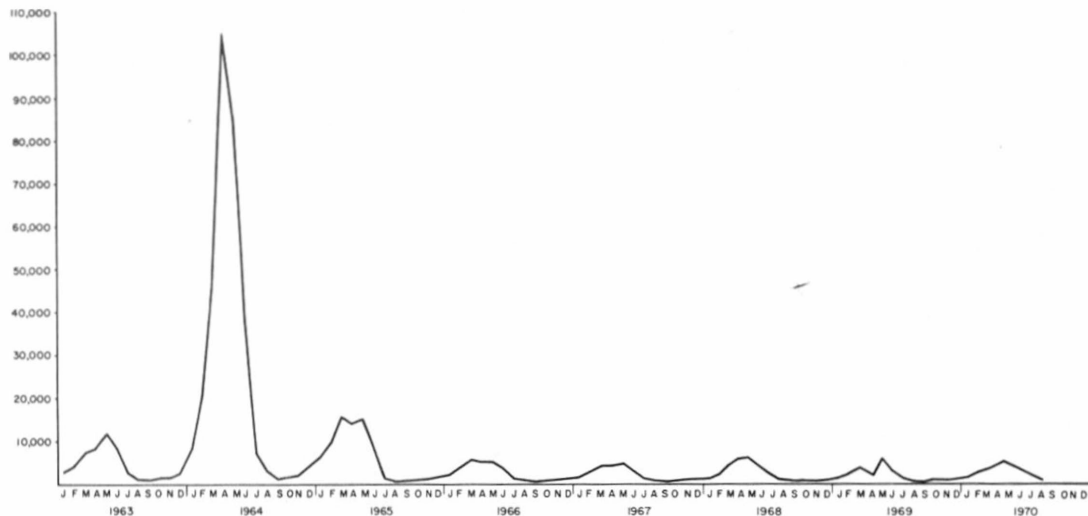
### RUBELLA INCIDENCE - TEN SELECTED AREAS, U.S.A., 1928-1970



Rubella incidence in 10 selected areas has varied considerably (Figure 1). This figure suggests that major epidemics occurred throughout the country in 1935, 1943, and 1964. Further, high incidence was reported in 1952 and 1958. These periods of increased rubella activity have occurred at 6- to 9-year intervals. This moderately long and somewhat irregular cyclicity contrasts strikingly with the regular 2-year periodicity observed for rubeola in the United States before widespread use of measles vaccine.

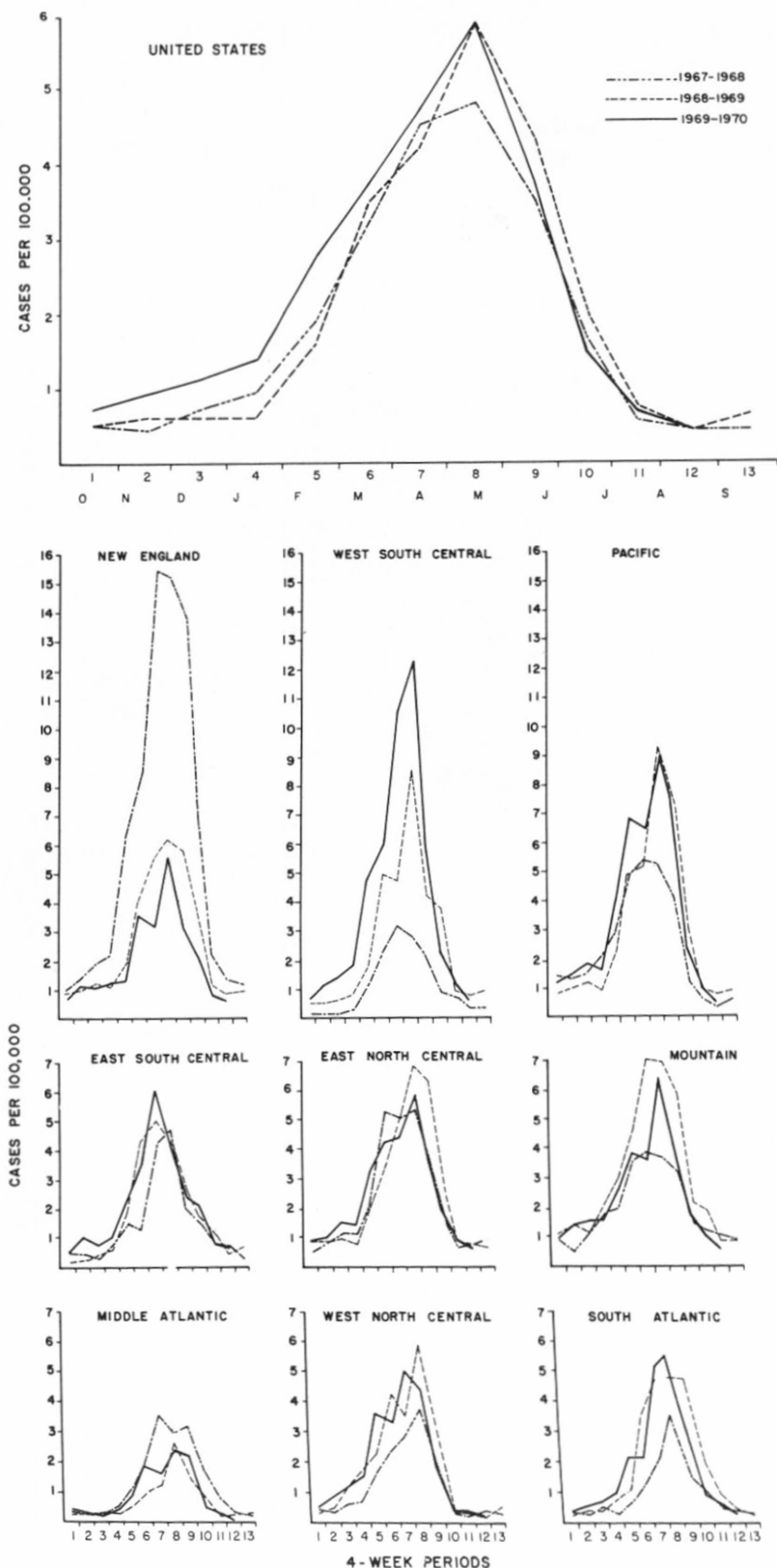
The reported cases by month of onset for 24 selected states (Figure 2) show the seasonal variation in disease incidence. The number of reported cases, in epidemic and non-epidemic years, increases in early winter, peaks in the spring, and falls to a low point in late summer and autumn. These data suggest that rubella activity has been at about the same level since the disease was made notifiable.

FIGURE 2  
REPORTED RUBELLA CASES BY MONTH OF ONSET, 24 SELECTED STATES, JANUARY 1963- AUGUST 1970



The uniformity of the seasonal pattern of rubella in the different regions of the United States is shown in Figure 3 and Table 2. The pattern seen in the individual regions is similar to that noted nationally. Except in the West South Central region, no major increase in rubella activity has occurred during the current epidemiologic year compared with the past two epidemiologic years (Figure 3). Increased reported cases from Texas account in large measure for the high case rates calculated for the West South Central region.

**FIGURE 3**  
**RUBELLA CASE RATES, BY 4-WEEK PERIODS,**  
**EPIDEMIOLOGIC YEARS\*, 1967-68; 1968-69; 1969-70**



\*THE RUBELLA EPIDEMIOLOGIC YEAR IS THE 52 WEEKS BEGINNING WITH THE FIRST REPORTING WEEK IN OCTOBER.

**TABLE 2**  
**REPORTED RUBELLA CASES BY 4-WEEK PERIODS, 1969**

| AREA                      | 4-WEEK PERIODS |              |              |              |               |              |              |              |              |              |              |              |              | Total<br>1969 |
|---------------------------|----------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
|                           | 1/25           | 2/22         | 3/22         | 4/19         | 5/17          | 6/14         | 7/12         | 8/9          | 9/6          | 10/4         | 11/1         | 11/29        | 1/3/70       |               |
| <b>UNITED STATES</b>      | <b>1,582</b>   | <b>3,334</b> | <b>7,014</b> | <b>8,591</b> | <b>11,802</b> | <b>9,234</b> | <b>4,428</b> | <b>1,721</b> | <b>1,085</b> | <b>1,222</b> | <b>1,333</b> | <b>1,668</b> | <b>2,535</b> | <b>55,549</b> |
| <b>NEW ENGLAND</b>        | <b>139</b>     | <b>243</b>   | <b>474</b>   | <b>666</b>   | <b>764</b>    | <b>698</b>   | <b>438</b>   | <b>152</b>   | <b>97</b>    | <b>109</b>   | <b>82</b>    | <b>114</b>   | <b>154</b>   | <b>4,130</b>  |
| Maine                     | 13             | 18           | 31           | 30           | 104           | 77           | 46           | 37           | 17           | 13           | 7            | 11           | 13           | 417           |
| New Hampshire             | 6              | 10           | 15           | 16           | 11            | 16           | 7            | —            | 1            | 3            | 4            | 10           | 10           | 109           |
| Vermont                   | 6              | 4            | 12           | 20           | 32            | 22           | 4            | 3            | 6            | 4            | 2            | 4            | 2            | 121           |
| Massachusetts             | 56             | 109          | 193          | 316          | 246           | 209          | 135          | 38           | 19           | 30           | 22           | 49           | 41           | 1,463         |
| Rhode Island              | 2              | 12           | 35           | 44           | 31            | 45           | 28           | 16           | 19           | 21           | 5            | 19           | 12           | 289           |
| Connecticut               | 56             | 90           | 188          | 240          | 340           | 329          | 218          | 58           | 35           | 38           | 42           | 21           | 76           | 1,731         |
| <b>MIDDLE ATLANTIC</b>    | <b>87</b>      | <b>204</b>   | <b>338</b>   | <b>442</b>   | <b>976</b>    | <b>492</b>   | <b>262</b>   | <b>124</b>   | <b>107</b>   | <b>87</b>    | <b>132</b>   | <b>117</b>   | <b>137</b>   | <b>3,505</b>  |
| New York City             | 40             | 66           | 116          | 195          | 235           | 165          | 123          | 71           | 48           | 30           | 33           | 30           | 41           | 1,193         |
| Upstate New York          | 22             | 55           | 73           | 105          | 161           | 110          | 86           | 31           | 33           | 33           | 42           | 32           | 20           | 803           |
| New Jersey                | 18             | 57           | 141          | 115          | 103           | 60           | 33           | 5            | 10           | 10           | 27           | 26           | 22           | 627           |
| Pennsylvania              | 7              | 26           | 8            | 27           | 477           | 157          | 20           | 17           | 16           | 14           | 30           | 29           | 54           | 882           |
| <b>EAST NORTH CENTRAL</b> | <b>293</b>     | <b>821</b>   | <b>1,373</b> | <b>1,962</b> | <b>2,686</b>  | <b>2,474</b> | <b>1,024</b> | <b>345</b>   | <b>267</b>   | <b>244</b>   | <b>324</b>   | <b>400</b>   | <b>685</b>   | <b>12,896</b> |
| Ohio                      | 38             | 48           | 138          | 158          | 426           | 150          | 140          | 39           | 19           | 23           | 28           | 35           | 78           | 1,320         |
| Indiana                   | 51             | 147          | 245          | 600          | 565           | 365          | 82           | 42           | 42           | 38           | 58           | 67           | 83           | 2,385         |
| Illinois                  | 19             | 61           | 147          | 137          | 324           | 670          | 198          | 62           | 9            | 17           | 35           | 26           | 81           | 1,786         |
| Michigan                  | 128            | 288          | 360          | 601          | 814           | 769          | 381          | 98           | 131          | 75           | 122          | 145          | 215          | 4,127         |
| Wisconsin                 | 57             | 277          | 483          | 466          | 557           | 520          | 223          | 104          | 66           | 91           | 81           | 127          | 228          | 3,280         |
| <b>WEST NORTH CENTRAL</b> | <b>251</b>     | <b>344</b>   | <b>666</b>   | <b>526</b>   | <b>908</b>    | <b>503</b>   | <b>204</b>   | <b>84</b>    | <b>34</b>    | <b>109</b>   | <b>87</b>    | <b>122</b>   | <b>250</b>   | <b>4,088</b>  |
| Minnesota                 | 4              | 14           | 17           | 25           | 104           | 37           | 5            | —            | 2            | 9            | 2            | 19           | 7            | 245           |
| Iowa                      | 135            | 307          | 363          | 390          | 624           | 353          | 21           | 15           | 17           | 48           | 49           | 62           | 157          | 2,541         |
| Missouri                  | 91             | 1            | 108          | 11           | 72            | 50           | 149          | 47           | 3            | 29           | 4            | 8            | 7            | 580           |
| North Dakota              | 9              | 13           | 66           | 37           | 23            | 13           | 21           | 10           | 6            | 8            | 24           | 15           | 11           | 256           |
| South Dakota              | —              | —            | —            | —            | —             | —            | —            | —            | —            | —            | —            | —            | —            | —             |
| Nebraska                  | 3              | 9            | 100          | 52           | 82            | 47           | 4            | 10           | 6            | 14           | 1            | 6            | 18           | 352           |
| Kansas                    | 9              | —            | 12           | 11           | 3             | 3            | 4            | 2            | —            | 1            | 7            | 12           | 50           | 114           |
| <b>SOUTH ATLANTIC</b>     | <b>212</b>     | <b>350</b>   | <b>1,040</b> | <b>1,559</b> | <b>1,402</b>  | <b>1,433</b> | <b>599</b>   | <b>323</b>   | <b>140</b>   | <b>106</b>   | <b>113</b>   | <b>157</b>   | <b>211</b>   | <b>7,645</b>  |
| Delaware                  | 61             | 30           | 25           | 35           | 22            | 12           | 7            | 5            | —            | 5            | 1            | 4            | 4            | 211           |
| Maryland                  | 8              | 70           | 139          | 279          | 153           | 105          | 30           | 27           | 20           | 9            | 8            | 10           | 7            | 865           |
| District of Columbia      | —              | 1            | —            | 45           | 62            | 20           | 9            | 1            | 10           | 4            | 3            | 1            | 10           | 166           |
| Virginia                  | 8              | 31           | 142          | 247          | 298           | 458          | 200          | 73           | 18           | 13           | 18           | 37           | 55           | 1,598         |
| West Virginia             | 69             | 101          | 281          | 483          | 401           | 509          | 186          | 142          | 59           | 41           | 45           | 54           | 46           | 2,417         |
| North Carolina            | —              | —            | —            | —            | —             | —            | —            | —            | —            | 2            | 5            | 8            | 4            | 19            |
| South Carolina            | 16             | 33           | 23           | 110          | 41            | 31           | 19           | 5            | 4            | 9            | 4            | 3            | 3            | 301           |
| Georgia                   | —              | —            | —            | —            | —             | —            | —            | —            | —            | —            | —            | —            | —            | —             |
| Florida                   | 50             | 84           | 430          | 360          | 425           | 298          | 148          | 70           | 29           | 23           | 29           | 40           | 82           | 2,068         |
| <b>EAST SOUTH CENTRAL</b> | <b>73</b>      | <b>242</b>   | <b>553</b>   | <b>647</b>   | <b>541</b>    | <b>354</b>   | <b>197</b>   | <b>143</b>   | <b>72</b>    | <b>81</b>    | <b>73</b>    | <b>82</b>    | <b>98</b>    | <b>3,156</b>  |
| Kentucky                  | 24             | 99           | 247          | 299          | 216           | 114          | 75           | 34           | 20           | 23           | 11           | 5            | 20           | 1,187         |
| Tennessee                 | 46             | 96           | 166          | 292          | 300           | 233          | 104          | 104          | 46           | 53           | 53           | 71           | 71           | 1,635         |
| Alabama                   | 2              | 33           | 15           | 37           | 10            | 4            | 5            | 4            | 3            | 2            | 9            | 5            | 7            | 136           |
| Mississippi               | 1              | 14           | 125          | 19           | 15            | 3            | 13           | 1            | 3            | 3            | —            | 1            | —            | 198           |
| <b>WEST SOUTH CENTRAL</b> | <b>146</b>     | <b>308</b>   | <b>947</b>   | <b>900</b>   | <b>1,605</b>  | <b>791</b>   | <b>718</b>   | <b>161</b>   | <b>130</b>   | <b>169</b>   | <b>121</b>   | <b>193</b>   | <b>315</b>   | <b>6,504</b>  |
| Arkansas                  | —              | —            | —            | 2            | 1             | —            | 196          | —            | —            | —            | —            | —            | —            | 199           |
| Louisiana                 | 2              | 5            | 2            | 15           | 6             | 5            | —            | 1            | —            | 1            | 2            | —            | —            | 39            |
| Oklahoma                  | 34             | 28           | 327          | 262          | 854           | 220          | 3            | —            | —            | 16           | 26           | 33           | 49           | 1,852         |
| Texas                     | 110            | 275          | 618          | 621          | 744           | 566          | 519          | 160          | 130          | 152          | 93           | 160          | 266          | 4,414         |
| <b>MOUNTAIN</b>           | <b>170</b>     | <b>226</b>   | <b>365</b>   | <b>541</b>   | <b>530</b>    | <b>442</b>   | <b>160</b>   | <b>151</b>   | <b>73</b>    | <b>73</b>    | <b>91</b>    | <b>102</b>   | <b>140</b>   | <b>3,064</b>  |
| Montana                   | 6              | 11           | 10           | 6            | 2             | 3            | 5            | 5            | —            | 7            | 18           | 14           | 21           | 108           |
| Idaho                     | 7              | 12           | 4            | 14           | 31            | 9            | 2            | 2            | —            | —            | 1            | 6            | 6            | 94            |
| Wyoming                   | —              | 3            | 49           | 6            | 9             | 3            | 3            | 1            | 2            | 5            | 1            | 6            | 15           | 103           |
| Colorado                  | 42             | 76           | 217          | 319          | 302           | 240          | 72           | 37           | 27           | 21           | 12           | 10           | 48           | 1,423         |
| New Mexico                | 15             | 15           | 22           | 74           | 54            | 47           | 21           | 20           | 9            | 12           | 7            | 12           | 4            | 312           |
| Arizona                   | 84             | 99           | 52           | 110          | 117           | 128          | 52           | 69           | 30           | 19           | 30           | 40           | 31           | 861           |
| Utah                      | 15             | 6            | 11           | 12           | 15            | 12           | 5            | 17           | 5            | 9            | 22           | 14           | 15           | 158           |
| Nevada                    | 1              | 4            | —            | —            | —             | —            | —            | —            | —            | —            | —            | —            | —            | 5             |
| <b>PACIFIC</b>            | <b>211</b>     | <b>596</b>   | <b>1,258</b> | <b>1,348</b> | <b>2,390</b>  | <b>2,047</b> | <b>826</b>   | <b>238</b>   | <b>165</b>   | <b>244</b>   | <b>310</b>   | <b>381</b>   | <b>545</b>   | <b>10,559</b> |
| Washington                | 66             | 134          | 236          | 305          | 346           | 316          | 38           | 9            | 17           | 75           | 110          | 126          | 165          | 1,943         |
| Oregon                    | 31             | 59           | 79           | 56           | 132           | 133          | 57           | 36           | 10           | 26           | 39           | 33           | 52           | 743           |
| California                | 93             | 342          | 852          | 836          | 1,643         | 1,193        | 509          | 97           | 80           | 86           | 115          | 161          | 167          | 6,174         |
| Alaska                    | 3              | 27           | 34           | 34           | 32            | 144          | 30           | 26           | 7            | 12           | 24           | 44           | 126          | 543           |
| Hawaii                    | 18             | 34           | 57           | 117          | 237           | 261          | 192          | 70           | 51           | 45           | 22           | 17           | 35           | 1,156         |
| Puerto Rico               | 2              | 3            | 12           | 7            | 20            | 48           | 244          | 22           | 21           | 5            | 12           | —            | 5            | 401           |

— No cases reported.

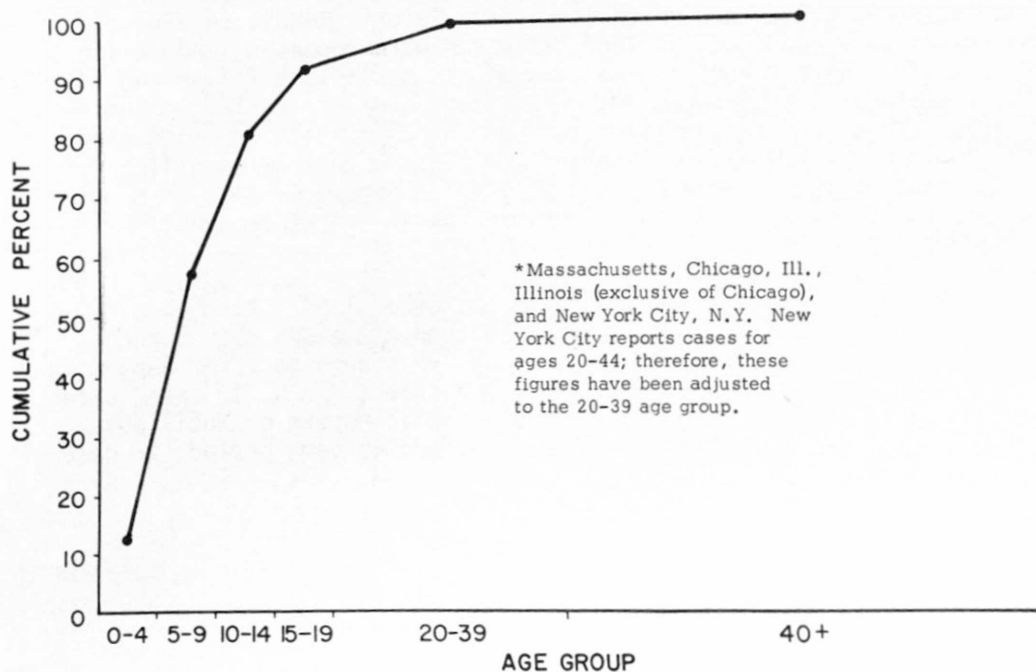
Source: Morbidity and Mortality Weekly Reports.

TABLE 3

REPORTED CASES OF RUBELLA BY AGE AND SEX  
FOR SELECTED AREAS\* -- 1963-1967

| AGE   | TOTAL   |      |        | MALE   |      |        | FEMALE |      |        |
|-------|---------|------|--------|--------|------|--------|--------|------|--------|
|       | Number  | %    | Cum. % | Number | %    | Cum. % | Number | %    | Cum. % |
| 0-4   | 16,373  | 13.5 | 13.5   | 8,218  | 14.3 | 14.3   | 8,155  | 12.9 | 12.9   |
| 5-9   | 52,078  | 43.1 | 56.6   | 25,660 | 44.5 | 58.8   | 26,418 | 41.8 | 54.7   |
| 10-14 | 28,403  | 23.5 | 80.1   | 13,483 | 23.4 | 82.2   | 14,920 | 23.6 | 78.3   |
| 15-19 | 14,527  | 12.0 | 92.2   | 7,446  | 12.9 | 95.1   | 7,081  | 11.2 | 89.5   |
| 20-39 | 8,100   | 6.7  | 98.9   | 2,541  | 4.4  | 99.5   | 5,559  | 8.8  | 98.3   |
| 40+   | 1,363   | 1.1  | 100.0  | 286    | 0.5  | 100.0  | 1,077  | 1.7  | 100.0  |
| TOTAL | 120,844 |      |        | 57,634 |      |        | 63,210 |      |        |

*FIGURE 4*  
CUMULATIVE PERCENT OF RUBELLA CASES BY AGE  
GROUPS FROM SELECTED AREAS\*- 1963-1967



The age distribution for reported cases of rubella is shown in Table 3. Most reported cases of rubella are from the 5-9 and 10-14 year age groups; in fact, approximately 66 percent of all reported cases occurred in these two age groups. The cumulative percent of reported cases by age indicates that 80 percent of reported cases had occurred by age 14, and 92 percent by age 20 (Figure 4). Nevertheless, significant numbers of cases were reported among young adults, particularly women.

Although much rubella is reported among preschool children and adults, cases are most frequent among young schoolage children. Furthermore, estimates of age-specific rubella virus infection rates are highest in the 5-9 and 10-14 year age groups. Thus, both morbidity reporting and serologic data suggest that children in the 5-14 year group play a major role in the propagation of disease in the community. Although not specifically demonstrated by epidemiologic studies, it is thought that rubella spreads primarily among the large group of susceptible children congregated in the elementary schools and that these children, in turn, transmit disease to preschool children and older individuals, particularly adults. Thus, although the age-specific infection rates and susceptibility patterns for rubella are somewhat different from those of rubeola, the hypothesized role of children in the spread of rubella is similar to that accepted for rubeola.

#### CONGENITAL RUBELLA SYNDROME SURVEILLANCE

The 1965 Conference of State and Territorial Epidemiologists made congenital rubella syndrome a notifiable disease. However, since then reporting has been incomplete. In 1966, 11 cases were reported in the Morbidity and Mortality Weekly Report (MMWR); in 1967, 10 cases were reported; in 1968, 14 cases were reported; and in 1969, 18 cases were reported. Because of the persistent failure of adequate reporting, the 1969 Conference of State and Territorial Epidemiologists re-emphasized the importance of congenital rubella syndrome surveillance. Accordingly, the Center for Disease Control established a National Registry for Congenital Rubella Syndrome (CRS) to provide epidemiological data and to measure the effect of vaccination programs.

The Registry began to function in September 1969. At that time, state epidemiologists were asked to complete a CRS case report form (see appendix) on every case of CRS diagnosed after September 1969. Between September 1, 1969, and June 1, 1970, 42 cases were reported to CDC on the Weekly Telegraphic Report of Notifiable Diseases and listed in the MMWR. During the same period, 26 case report forms, from 14 states, were returned.

The small number of returned forms does not adequately reflect the emphasis that is being placed on reporting CRS. Considerable time and effort have been expended in establishing effective surveillance systems in most states over the last several months. Though the results of these efforts are not reflected in the number of reports received to date, they should be in the next few years.

Of the 26 cases for which case report forms have been received, 10 were confirmed as CRS with serologic tests or by rubella virus isolation. Additionally, 11 cases had multiple defects compatible with the clinical diagnosis of CRS. Because in the other 5 cases only one defect was noted and laboratory testing was not confirmatory, definitive diagnosis of these cases cannot yet be established. Approximately 70 percent of the reported cases were diagnosed in the first month of life, and by 11 months of age, all had been diagnosed. Nine of the children died, all at less than 2½ months of age. In 13 of the 21 confirmed cases, a history compatible with first trimester maternal rubella was noted.

Because the only true measure of the impact of rubella vaccination programs is a fall in the incidence of congenital rubella syndrome, an attempt has been made to establish a crude baseline of the yearly incidence of this condition. State epidemiologists were asked to conduct a retrospective search for all cases of CRS born in their states between January 1, 1966, and September 1, 1969. So far, reports have been received from 45 of 53 reporting areas (Table 4). In 1966, 203 cases were reported; in 1967, 134 were reported; and in 1968, 138 were reported. This is approximately 10 times the incidence reported in the MMWR for these years.

Cases have been consistently found at the following sources: pediatric referral hospitals, schools for the deaf and blind, maternal and child welfare services, and state bureaus of vital statistics. Over 80 percent of the cases have been reported from the above sources. Consequently, it is recommended that these sources be included in any congenital rubella syndrome surveillance system.

Although some states have completed detailed searches for CRS cases, other states have submitted incomplete and preliminary data. Because of the tentative nature of these data and the considerable variability in diagnostic criteria, we caution against interpreting these figures as accurately representing the incidence of CRS during interepidemic years.

## BIOLOGIC SURVEILLANCE

Through June 30, 1970, 19,657,699 doses of rubella vaccine had been distributed in the United States. Of this amount, 12,419,363 doses were administered in public programs. The remaining 7,238,336 doses of vaccine were distributed for both private and public use.



**TABLE 4**  
**REPORTED CASES OF CONGENITAL RUBELLA SYNDROME**  
**RETROSPECTIVE SURVEY 1966-1969**

| AREA                      | 1966       | 1967       | 1968       | 1969*     |
|---------------------------|------------|------------|------------|-----------|
| <b>UNITED STATES</b>      | <b>203</b> | <b>134</b> | <b>138</b> | <b>87</b> |
| <b>NEW ENGLAND</b>        | <b>1</b>   | <b>2</b>   | <b>3</b>   | <b>2</b>  |
| Maine                     | 0          | 0          | 1          | 0         |
| New Hampshire             |            |            |            |           |
| Vermont                   | 0          | 0          | 0          | 1         |
| Massachusetts             |            |            |            |           |
| Rhode Island              | 1          | 1          | 1          | 1         |
| Connecticut               | 0          | 1          | 1          | 0         |
| <b>MIDDLE ATLANTIC</b>    | <b>13</b>  | <b>18</b>  | <b>50</b>  | <b>22</b> |
| New York City             | 3          | 5          | 24         | 8         |
| Upstate New York          | 3          | 6          | 6          | 0         |
| New Jersey                | 3          | 3          | 12         | 12        |
| Pennsylvania              | 4          | 4          | 8          | 2         |
| <b>EAST NORTH CENTRAL</b> | <b>23</b>  | <b>15</b>  | <b>12</b>  | <b>1</b>  |
| Ohio                      |            |            |            |           |
| Indiana                   | 13         | 9          | 6          | 1         |
| Illinois                  | 0          | 0          | 0          | 0         |
| Michigan                  | 10         | 6          | 6          | 0         |
| Wisconsin                 |            |            |            |           |
| <b>WEST NORTH CENTRAL</b> | <b>6</b>   | <b>2</b>   | <b>2</b>   | <b>0</b>  |
| Minnesota                 | 4          | 2          | 0          | 0         |
| Iowa                      |            |            |            |           |
| Missouri                  | 1          | 0          | 2          | 0         |
| North Dakota              | 1          | 0          | 0          | 0         |
| South Dakota              |            |            |            |           |
| Nebraska                  | 0          | 0          | 0          | 0         |
| Kansas                    |            |            |            |           |
| <b>SOUTH ATLANTIC</b>     | <b>49</b>  | <b>46</b>  | <b>24</b>  | <b>22</b> |
| Delaware                  | 0          | 0          | 0          | 1         |
| Maryland                  | 1          | 1          | 0          | 0         |
| District of Columbia      | 9          | 5          | 1          | 0         |
| Virginia                  | 7          | 4          | 2          | 3         |
| West Virginia             | 2          | 0          | 1          | 0         |
| North Carolina            | 1          | 4          | 1          | 5         |
| South Carolina            | 5          | 2          | 0          |           |
| Georgia                   | 3          | 2          | 7          | 0         |
| Florida                   | 21         | 28         | 12         | 13        |
| <b>EAST SOUTH CENTRAL</b> | <b>7</b>   | <b>3</b>   | <b>5</b>   | <b>0</b>  |
| Kentucky                  | 5          | 3          | 3          |           |
| Tennessee                 | 0          | 0          | 1          | 0         |
| Alabama                   | 2          | 0          | 1          |           |
| Mississippi               | 0          | 0          | 0          |           |
| <b>WEST SOUTH CENTRAL</b> | <b>25</b>  | <b>18</b>  | <b>16</b>  | <b>4</b>  |
| Arkansas                  | 4          | 0          | 0          |           |
| Louisiana                 | 8          | 7          | 7          | 3         |
| Oklahoma                  | 4          | 4          | 5          | 1         |
| Texas                     | 9          | 7          | 4          | 0         |
| <b>MOUNTAIN</b>           | <b>12</b>  | <b>13</b>  | <b>11</b>  | <b>3</b>  |
| Montana                   | 1          | 0          | 0          | 0         |
| Idaho                     | 0          | 0          | 0          | 0         |
| Wyoming                   | 0          | 0          | 0          | 0         |
| Colorado                  | 0          | 6          | 4          | 3         |
| New Mexico                | 3          | 3          | 2          | 0         |
| Arizona                   | 4          | 3          | 2          |           |
| Utah                      | 2          | 0          | 3          | 0         |
| Nevada                    | 2          | 1          | 0          | 0         |
| <b>PACIFIC</b>            | <b>67</b>  | <b>17</b>  | <b>15</b>  | <b>33</b> |
| Washington                | 28         | 8          | 5          | 0         |
| Oregon                    | 33         | 8          | 3          |           |
| California                | 0          | 1          | 6          | 33        |
| Alaska                    |            |            |            |           |
| Hawaii                    | 6          | 0          | 1          |           |

\*First 9 Months Only

## V. REPORTED REACTIONS ASSOCIATED WITH ADMINISTRATION OF RUBELLA VACCINE

### A. Joint Reactions

Following use of live rubella virus vaccine in public programs in the United States in early 1970, the CDC received numerous reports of arthralgia and arthritis occurring in children after receiving vaccine. It had been well established that joint reactions occurred rather commonly after vaccination of adult females and less frequently in children. Results from prelicensure trials suggested that the incidence of joint symptomatology in children was less than 5 percent, and that, in general, these reactions were mild. However, with extensive usage following licensure, many areas were alarmed by a greater frequency and severity of reactions than were expected.

In general, symptoms have been self-limited and most commonly have involved the small joints of the hands and knees. The pain, often more severe at night, has frequently been accompanied by tingling and numbness. In most cases, only joint pain has been noted; however in a small percentage, muscular tightness, limitation of motion, and joint swelling have been observed. Although usually only one or two joints are involved, occasionally pain in several joints has developed. These features have been observed to begin 1-8 weeks after vaccination and resemble those seen with natural rubella. In most cases, the duration has been 1-10 days; however, a few cases have persisted for several weeks or longer. Some children with these reactions have been hospitalized to be evaluated for rheumatic fever or rheumatoid arthritis.

In an attempt to define as accurately as possible the incidence of joint reactions following rubella immunization, many areas conducted surveys of vaccinated and unvaccinated populations on the incidence of such reactions. The following is a summary of provisional data from New Jersey, Erie County (Buffalo), New York, Utah and Oklahoma:

New Jersey: Results of surveys in 9 communities have been tabulated.

|  | <u>Vaccine Administered</u> |                      |
|--|-----------------------------|----------------------|
|  | <u>Duck Embryo</u>          | <u>Dog Kidney</u>    |
| Number of Communities Surveyed                       | 3                           | 6                    |
| Number of Persons Surveyed                           | 6,265                       | 7,493                |
| Forms Completed                                      | 5,022 (80.2%)               | 6,177 (82.4%)        |
| Received Vaccine in School                           | 3,705 (73.8%)               | 3,251 (52.6%)        |
| Reported Joint Reactions                             | 190 ( <u>5.1%</u> )         | 389 ( <u>12.0%</u> ) |
| Consulted Physician                                  | 30 ( 0.8% )                 | 98 ( 3.0% )          |
| Median Duration                                      | 3-4 days                    | 10 days              |
| Reported Joint Reactions<br>in Unvaccinated Children | <0.1%                       | <0.1%                |

Erie County (Buffalo), New York: Children attending two schools which conducted vaccination campaigns were surveyed by home visits two months after the campaign.

| <u>Vaccine</u>    | <u>No. Surveyed</u> | <u>No. with<br/>Joint Symptoms</u> | <u>Percent with<br/>Joint Symptoms</u> |
|-------------------|---------------------|------------------------------------|--|
| Dog Kidney        | 749                 | 154                                | 20.5%                                  |
| Duck Embryo       | 136                 | 8                                  | 5.9%                                   |
| None Administered | 82                  | 3                                  | 3.7%                                   |

Duration of Joint Symptoms  
Vaccine Administered

| <u>Duration (days)</u> | <u>Dog Kidney</u> | <u>Duck Embryo</u> |
|------------------------|-------------------|--------------------|
| 1-2                    | 29 (18.8%)        | 7 (87.5%)          |
| 3-4                    | 26 (16.9%)        | 1 (12.5%)          |
| 5-6                    | 11 ( 7.2%)        | --                 |
| 7-13                   | 27 (17.5%)        | --                 |
| 14-20                  | 18 (11.7%)        | --                 |
| 21-27                  | 11 ( 7.2%)        | --                 |
| 28-34                  | 8 ( 5.2%)         | --                 |
| Present at Survey      | 20* (13.0%)       | --                 |
| Unknown                | 4 ( 2.5%)         | --                 |
| Total                  | 154 (100.0%)      | 8 (100.0%)         |

\* Because 20 children had symptoms at the time of the survey, the average duration could not be calculated.

Utah: School surveys were conducted 43 days after a statewide vaccination campaign (a later date was precluded by the closing of schools for the summer). In other surveys extended to 60 days after vaccination, 10 percent or more of cases had onset of symptoms 43-60 days after vaccine administration.

Vaccine Group

|  | <u>Dog Kidney</u> |                                    | <u>Duck Embryo</u> |                                    |
|--|-------------------|------------------------------------|--------------------|------------------------------------|
|  | <u>Vaccinated</u> | <u>Unvaccinated<br/>"Controls"</u> | <u>Vaccinated</u>  | <u>Unvaccinated<br/>"Controls"</u> |
| Number Surveyed                        | 2,459             | 603                                | 749                | 420                                |
| Joint Symptoms by<br>Questionnaire     | 315 (12.8%)       | 16 (2.7%)                          | 55 (7.3%)          | 10                                 |
| Phone Interview after<br>Questionnaire | 283               | 14                                 | 45                 | 6                                  |
| Joint Symptoms Verified<br>by Phone    | 220 ( 8.9%)       | 2 (0.3%)                           | 28 (3.7%)          | 666                                |

Oklahoma: Children attending 32 schools in Tulsa which conducted a rubella immunization program were surveyed. Questionnaires were sent out to 14,987 students; only 5,980 (39.9%) forms were returned.

| <u>Vaccine</u>    | <u>Forms<br/>Returned</u> | <u>Joint Symptoms<br/>Number</u> | <u>Percent</u> |
|-------------------|---------------------------|----------------------------------|----------------|
| Dog Kidney        | 2,004                     | 144                              | 7.2            |
| Duck Embryo       | 1,825                     | 105                              | 5.8            |
| None Administered | 2,151                     | 36                               | 1.7            |
|                   | <u>5,980</u>              |                                  |                |

At the time of this publication Cendehill vaccine had limited distribution and an accurate assessment of reactions following its administration could not be determined. However, preliminary data from New Jersey suggests that joint reactions following administration of Cendehill vaccine do occur in children and that rates are similar to those observed after duck embryo (HPV-77 DE 5) vaccine.

In summary, these preliminary data indicate that:

- (1) Joint symptoms following administration of rubella vaccine occur more frequently than previously estimated.
- (2) Following dog kidney vaccine the incidence rates are higher and the duration of symptoms longer.
- (3) Preliminary data indicate that incidence rates following Cendehill vaccine are similar to those following duck embryo vaccine.

#### 1. Neurological reactions temporally associated with administration of rubella vaccine

In the last 12 months, 9 reports of neurological reactions temporally associated with administration of rubella vaccine have been submitted to the CDC. These case reports are summarized in Table 5.

In addition to the serological data presented in Table 5, cerebrospinal fluid specimens submitted for virus isolation within 1 week after onset of illness from patients 2, 3, and 5 were negative for rubella vaccine virus or other etiologic agents. That seven of these patients had received duck embryo strain rubella vaccine can probably be explained by the greater distribution of this vaccine. Thus, no single clinical or epidemiologic characteristic appears to be consistently present except for the temporal relationship to vaccine administration.

RUBELLA VACCINE

| CASE NO. | AGE | SEX | VACCINE STRAIN | ONSET OF ILLNESS (days after vac.) | CLINICAL DATA  | RUBELLA SEROLOGY (HA)I<br>DAYS TITER |                                 |
|----------|-----|-----|----------------|------------------------------------|--|--------------------------------------|---------------------------------|
| 1.       | 3½  | F   | Duck Embryo    | 15                                 | High Fever<br>Ataxia<br>Complete Recovery  | +30<br>+45                           | 1:32<br>1:32                    |
| 2.       | 16  | F   | Duck Embryo    | 25                                 | High Fever<br>Arthralgias<br>Aseptic Meningitis<br>Complete Recovery   | 0<br>+30<br>+60                      | <1:10<br>1:64<br>1:128          |
| 3.       | 11  | F   | Duck Embryo    | 7                                  | "Transverse myelitis":<br>Quadripareisis<br>Spasticity, Right Leg<br>Left Hemianesthesia<br>Improving                                    | +10<br>+28                           | <1:8<br>1:64                    |
| 4.       | 4   | M   | Duck Embryo    | 3                                  | "Polyneuritis":<br>Ataxia<br>Paraparesis<br>Hyporeflexia<br>Improving  |                                      |                                 |
| 5.       | 11  | M   | Duck Embryo    | 17                                 | "Polyneuritis":<br>Hypesthesia, Paresthesia,<br>Paresis, Lower Extremities<br>Sensory Loss Below T4<br>Hyporeflexia<br>Complete Recovery | +19<br>+31                           | <1:10<br><1:10                  |
| 6.       | 14  | M   |                | 10-14                              | Headache, Fever<br>Aseptic Meningitis  | +23<br>+37<br>+43                    | 1:16 (IgM <1:4)<br>1:16<br>1:16 |
| 7.       | 2   | M   | Cendehill      | 8                                  | Right Facial Paralysis<br>Right Hand Weakness<br>Complete Recovery   | +14<br>+29                           | <1:10<br>1:80                   |
| 8.       | 8   | F   | Duck Embryo    | 23                                 | High Fever<br>Convulsion<br>Somnolence, Disorientation<br>Died, 1 week later   |                                      |                                 |
| 9.       | 9½  | F   | Duck Embryo    | 16                                 | "Transverse myelitis":<br>Paraplegia<br>Sensory Loss Below T3<br>Neurogenic Bladder<br>Stable  | +40                                  | 1:256                           |

## APPENDIX

MEDICAL RECORD. This form contains medical information the disclosure or release of which is restricted by 5 U.S.C. 552, (b) (6); 45 CFR Part 5.

DEPARTMENT OF  
HEALTH, EDUCATION, AND WELFARE  
PUBLIC HEALTH SERVICE  
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION  
NATIONAL COMMUNICABLE DISEASE CENTER  
IMMUNIZATION BRANCH  
ATLANTA, GEORGIA 30333

# CONGENITAL RUBELLA SYNDROME CASE REPORT

FORM APPROVED  
BUDGET BUREAU NO. 68-R1150

|  |   |                                |   |                  |
|--|---|--------------------------------|---|------------------|
| 1. CHILD'S NAME (last)   |   | (first)                        | (middle)  | NCDC CASE NUMBER |
| 2. ADDRESS (number, street, city, county, state, and zip code)                 |   |                                |   |                  |
| 3. DATE OF BIRTH   | 4. SEX<br><input type="checkbox"/> M <input type="checkbox"/> F | 5. BIRTH WEIGHT<br>_____ Grams | 6. RACE<br><input type="checkbox"/> White <input type="checkbox"/> Negro <input type="checkbox"/> Other |                  |
| 7. IS CHILD LIVING<br><input type="checkbox"/> Yes <input type="checkbox"/> No | 8. IF NO, DATE OF DEATH   |                                | 9. CAUSE OF DEATH   |                  |

## CLINICAL

| 10. MALFORMATIONS            | YES                           | NO | UNK | 11. NEONATAL MANIFESTATIONS | YES | NO | UNK |
|------------------------------|-------------------------------|----|-----|-----------------------------|-----|----|-----|
| CATARACTS                    |                               |    |     | LOW PLATELET COUNT          |     |    |     |
| HEARING LOSS                 |                               |    |     | PURPURA                     |     |    |     |
| MENTAL RETARDATION           |                               |    |     | ENLARGED SPLEEN             |     |    |     |
| CONGENITAL HEART DISEASE     |                               |    |     | ENLARGED LIVER              |     |    |     |
| CARDIAC DIAGNOSIS            |                               |    |     | LONG BONE RADIOLOCENCIES    |     |    |     |
| <input type="checkbox"/> Unk | Patent Ductus Arteriosus      |    |     | CONGENITAL GLAUCOMA         |     |    |     |
|                              | Peripheral Pulmonary Stenosis |    |     | OTHER (specify)             |     |    |     |
|                              | Other (specify)               |    |     |                             |     |    |     |

12. OTHER MALFORMATIONS  
☐ Yes ☐ No ☐ Unk If yes, specify \_\_\_\_\_

13. AGE CONGENITAL RUBELLA SYNDROME DIAGNOSED \_\_\_\_\_ Years \_\_\_\_\_ Months ☐ <1 Month

## MATERNAL HISTORY

|  |  |                       |                |
|--|--|-----------------------|----------------|
| 14. MOTHER'S NAME (last)   |  | (first)               | (middle)       |
| 15. RUBELLA-LIKE ILLNESS DURING PREGNANCY<br><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk | 16. IF YES, MONTH OF PREGNANCY<br>_____ <input type="checkbox"/> Unk | 17. CLINICAL FEATURES |                |
| 18. MOTHER IMMUNIZED WITH RUBELLA VACCINE<br><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk | 19. IF YES, DATE VACCINATED  | 20. MANUFACTURER      | 21. LOT NUMBER |

## LABORATORY

|   |                                      |
|---|--------------------------------------|
| 22. BLOOD SPECIMENS SUBMITTED TO (name of laboratory) |                                      |
| CHILD <input type="checkbox"/> None                   | MOTHER <input type="checkbox"/> None |
| DATE COLLECTED  | RUBELLA HI TITER                     |
|   |                                      |
|   |                                      |
|   |                                      |

23. RECORD VIRAL ISOLATION STUDIES (date, specimen, source, and result) AND OTHER BLOOD STUDIES (date, test, and result) BELOW

## APPRAISAL

|                                    |                                      |   |
|------------------------------------|--------------------------------------|---|
| 24.                                |                                      |   |
| <input type="checkbox"/> CONFIRMED | <input type="checkbox"/> PRESUMPTIVE | <input type="checkbox"/> NOT RUBELLA SYNDROME |
| INVESTIGATOR                       |                                      | DATE  |

## SEROLOGIC ASSISTANCE IN RUBELLA DIAGNOSIS

The rubella hemagglutination inhibition test, the most widely used technique for quantitating rubella antibodies, is a valuable diagnostic tool and an excellent means of expanding the surveillance system for rubella. The following is a listing of commonly encountered clinical problems relating to rubella in which serological testing can be helpful in diagnosis:

### 1. Confirmation of Acute Rubella Infection

#### Specimens Required:

Paired sera--first collected within 3 days after onset of illness, and a convalescent serum collected 1-2 weeks later.

#### Interpretation:

Only a 4-fold or greater rise in antibody titer is diagnostic of recent rubella infection. Stable, or falling titers indicate only past rubella infection at some undetermined time. In instances where stable rubella HI antibody titers are found, additional laboratory techniques such as CF or FA should be employed since antibody measurable by these latter two procedures appears later following the onset of rash than does the HI antibody.

### 2. Determination of Immune Status of Pregnant Women Exposed to Rubella

#### Specimens Required:

Single serum collected within 7 days after exposure.

If the first specimen contains no detectable rubella antibody, then a second serum should be collected 3-4 weeks after the exposure.

#### Interpretation:

The presence of any level of rubella antibody within the 7-day period after exposure indicates prior infection with rubella virus, and immunity to primary infection.

Absence of detectable rubella antibody at the time of exposure indicates susceptibility to rubella. The testing of a second serum 3-4 weeks after exposure will confirm whether or not rubella infection, apparent or inapparent, has resulted from the exposure.

### 3. Confirmation of Suspected Congenital Rubella Infection

#### Specimens Required:

Serum specimens from both the infant and mother (if infant is less than 6 months old, an additional serum should be obtained at 6-12 months of age).

Specimens for viral isolation are of limited value for diagnosis and management of rubella syndrome infants.

## Interpretation:

Congenital rubella infection can be confirmed serologically by demonstrating the persistence of antibody above and beyond that which is passively transferred from the mother. In general, the presence of rubella antibody in specimens submitted when the suspect case is 6-12 months old confirms the diagnosis. Above the age of 12 months the chance of antibody having resulted from natural post-natal rubella must be weighed against the likelihood of congenital origin. The degree of confidence in the serologic diagnosis therefore decreases with age above 1 year.

## Defining Need for Rubella Vaccination

### Specimens Required:

Single serum.

### Interpretation:

The presence of any level of HI antibody ( $>1:8$ ) indicates past rubella infection at some undetermined time, thus immunity to primary infection.

Absence of rubella HI antibody indicates susceptibility to rubella.

## Evaluation of Possible Post-rubella Vaccine Complications

### Specimens Required:

Paired sera--first serum obtained as soon as possible after onset of illness; a convalescent specimen collected 1-2 weeks later.

Specimens for viral isolation are essential for a complete laboratory evaluation of suspected rubella vaccine related illness. Specimens for viral isolation studies, if not tested within 24 hours, should be kept frozen at  $-60^{\circ}\text{C}$  (or on dry ice) until virus isolation tests can be carried out.

### Interpretation:

Minor qualitative and quantitative differences have been demonstrated between vaccine and wild virus induced rubella antibody. Using routine serologic techniques, however, such differentiation is generally not possible, and specimens should be referred to a reference laboratory for special tests (CF, differential FA, etc.).

Virus isolation with strain characterization of a rubella virus isolate is the most meaningful approach to evaluating rubella vaccine related illnesses. Strain characterization of rubella virus is available from a few specialty reference laboratories.



AVAILABILITY OF H.I. TESTING FOR RUBELLA BY STATE

| STATE            | LABORATORIES PERFORMING H.I. TEST FOR RUBELLA |                             |                                 | WILL STATE LAB<br>RUN H.I. TEST<br>ON PREMARITAL<br>BLOODS? |
|------------------|---|-----------------------------|---------------------------------|---|
|                  | State Health<br>Dept. Lab                     | Other Public<br>Health Labs | Other (univ.,<br>private, etc.) |   |
| REGION I         |   |                             |                                 |   |
| Connecticut      | yes   | no                          | yes                             | no  |
| Maine            | yes   | no                          | no                              | yes   |
| Massachusetts    | yes   | no                          | yes                             | yes   |
| New Hampshire    | no  | no                          | no                              | no  |
| Rhode Island     | yes   | no                          | yes                             | no  |
| Vermont          | yes   | no                          | yes                             | yes   |
| REGION II        |   |                             |                                 |   |
| New Jersey       | yes   | no                          | yes                             | yes   |
| New York         | yes   | yes                         | yes                             | yes   |
| Puerto Rico      | yes   | no                          | no                              | yes   |
| Virgin Islands   | yes   | no                          | no                              | yes   |
| REGION III       |   |                             |                                 |   |
| Delaware         | no  | no                          | yes                             | no  |
| District of Col. | yes   | no                          | yes                             | yes   |
| Maryland         | yes   | yes                         | yes                             | yes   |
| Pennsylvania     | yes   | yes                         | yes                             | no  |
| Virginia         | yes   | yes                         | yes                             | no  |
| West Virginia    | yes   | no                          | yes                             | no  |
| REGION IV        |   |                             |                                 |   |
| Alabama          | yes   | no                          | yes                             | yes   |
| Florida          | yes   | no                          | yes                             | yes   |
| Georgia          | yes   | no                          | yes                             | no  |
| Kentucky         | yes   | no                          | yes                             | yes   |
| Mississippi      | yes   | no                          | yes                             | no  |
| North Carolina   | yes   | yes                         | yes                             | yes   |
| South Carolina   | yes   | no                          | no                              | yes   |
| Tennessee        | yes   | no                          | yes                             | yes   |
| REGION V         |   |                             |                                 |   |
| Illinois         | yes   | yes                         | yes                             | yes*  |
| Indiana          | yes   | no                          | yes                             | no  |
| Michigan         | yes   | no                          | yes                             | no  |
| Minnesota        | yes   | no                          | yes                             | yes   |
| Ohio             | yes   | no                          | yes                             | yes   |
| Wisconsin        | yes   | yes                         | yes                             | no  |
| REGION VI        |   |                             |                                 |   |
| Arkansas         | yes   | no                          | no                              | yes   |
| Louisiana        | yes   | no                          | yes                             | yes   |
| New Mexico       | yes   | no                          | yes                             | no  |
| Oklahoma         | yes   | no                          | yes                             | yes*  |
| Texas            | yes   | yes                         | yes                             | yes   |

AVAILABILITY OF H.I. TESTING FOR RUBELLA BY STATE - Continued

| STATE           | LABORATORIES PERFORMING H.I. TEST FOR RUBELLA |                             |                                 | WILL STATE LAB<br>RUN H.I. TEST<br>ON PREMARITAL<br>BLOODS? |
|-----------------|---|-----------------------------|---------------------------------|---|
|                 | State Health<br>Dept. Lab                     | Other Public<br>Health Labs | Other (univ.,<br>private, etc.) |   |
| REGION VII      |   |                             |                                 |   |
| Iowa            | yes   | no                          | no                              | yes   |
| Kansas          | yes   | no                          | yes                             | yes   |
| Missouri        | yes   | no                          | yes                             | yes   |
| Nebraska        | no  | no                          | yes                             | no  |
| REGION VIII     |   |                             |                                 |   |
| Colorado        | yes   | no                          | no                              | yes   |
| Montana         | yes   | no                          | yes                             | yes   |
| North Dakota    | yes   | no                          | no                              | no  |
| South Dakota    | yes   | no                          | yes                             | yes   |
| Utah            | yes   | no                          | yes                             | no  |
| Wyoming         | yes   | no                          | no                              | yes   |
| REGION IX       |   |                             |                                 |   |
| Arizona         | yes   | no                          | yes                             | yes   |
| California      | yes   | yes                         | yes                             | no  |
| Hawaii          | yes   | no                          | yes                             | no  |
| Nevada          | no  | no                          | yes                             | no  |
| REGION X        |   |                             |                                 |   |
| Alaska          | no  | no                          | yes                             | no  |
| Idaho           | yes   | no                          | no                              | yes*  |
| Oregon          | yes   | no                          | yes                             | yes   |
| Washington      | yes   | yes                         | yes                             | yes*  |
| Guam            | no  | no                          | no                              | no  |
| Trust Territory | no  | no                          | no                              | no  |

\* assumed to be yes since no restrictions were returned with questionnaire.

The Public Health Service Advisory Committee on Immunization Practices developed the following recommendation in close collaboration with the Committee on the Control of Infectious Diseases, American Academy of Pediatrics which endorses the recommendation. (Reprinted from the Morbidity and Mortality Weekly Report, Vol. 19, No. 34, Week Ending August 29, 1970.)

## RUBELLA VIRUS VACCINE

### INTRODUCTION

Live, attenuated rubella virus vaccine\* appears to be a highly effective immunizing agent and the first suitable method of controlling rubella. Through June 1970, more than 19 million doses of vaccine have been distributed in the United States.

Rubella is generally a mild illness, but if the infection is acquired by a woman in the early months of pregnancy, it poses a direct hazard to the fetus. Preventing infection of the fetus is the principal objective of rubella control. This can best be achieved by eliminating the transmission of virus among children, who are the major source of infection for susceptible pregnant women. The live, attenuated rubella virus vaccine is safe and protective for children. Because of an undetermined risk of the vaccine virus for the fetus, the safety for pregnant women is not known.

### RUBELLA

Rubella is one of the common childhood exanthems. Most cases occur in school-age children particularly during the winter and spring. By early adulthood, approximately 80 to 90 percent of individuals in the continental United States have serological evidence of immunity.

Rubella is clinically variable, and its common features, such as post-auricular and sub-occipital lymphadenopathy and transient erythematous rash, are often overlooked or misdiagnosed. A mild febrile illness may not be recognizable as rubella, and moreover, inapparent infection often occurs, which further decreases the reliability of clinical history.

Transient polyarthralgia and polyarthritis may accompany or follow the illness. Joint symptoms occur frequently in adult women but are also observed occasionally in adult men and in children.

By far the most important complication of rubella is the frequent occurrence of fetal infection when a woman acquires rubella early in pregnancy, especially in the first trimester. Other complications of rubella such as involvement of the central nervous system or thrombocytopenia are rare.

### RUBELLA IMMUNITY

Immunity following rubella appears to be long lasting, even after mild illness or clinically inapparent infection. As with other viral diseases, re-exposure to natural rubella is sometimes accompanied by a booster-type antibody rise without clinical disease, indicative of asymptomatic reinfection. To date, these reinfections have not been shown to be of practical significance.

The only reliable evidence of immunity is a positive serological test. The hemagglutination-inhibition (HI) antibody determination is the test of choice for evaluating im-

munity. However, because of the variation among reagents and technical procedures, results of serological tests should be accepted only from laboratories of recognized competence that regularly perform these tests.

### LIVE RUBELLA VIRUS VACCINE

Live rubella virus vaccine is prepared in duck embryo, dog kidney, or rabbit kidney cell cultures. It is administered as a single subcutaneous injection. Differences in the frequency of reactions as well as immunogenicity have been reported with the available rubella vaccine preparations. Approximately 95 percent of susceptible vaccinees develop antibodies. Although titers are lower than those observed following natural rubella infection, vaccination affords protection against clinical illness following natural exposure.

Antibody levels have declined very little during the 4-year period of observation of children who were among the first to be immunized with rubella vaccine. Long-term protection is likely, but its exact duration can be established only by continued observation.

Rubella-like symptoms of rash and lymphadenopathy occur occasionally after vaccination. Complaints related to the joints and distal portions of the extremities have been the most common. Arthralgia and arthritis have been reported in as many as 15 percent of vaccinated children. The small joints are most commonly involved and discomfort is most prominent at night. Less frequently, children may develop pain and paresthesias in the arms and hands or pain in the popliteal fossa with or without joint involvement. These reactions occur more frequently following use of the more immunogenic canine renal cell vaccine. These symptoms begin between 2 and 8 weeks following vaccine administration and may persist for as long as 2 weeks. Though brief recurrences have occurred, no permanent residuae have been reported. It is felt that these symptoms are consistent with manifestations of natural disease.

In susceptible women, reactions of arthralgia and arthritis are much more frequent and more likely to be severe. Not enough susceptible men have been studied to show whether they experience comparable reactions as frequently as women.

Vaccinees may shed relatively small amounts of virus from the pharynx for brief periods between the first and fourth weeks after inoculation. For this reason, transmission of vaccine virus to susceptible contacts is considered theoretically possible. In studies involving deliberate exposure of vaccinees to several thousand susceptible uninoculated persons, only a few contacts developed antibodies. Investigation of the circumstances indicated that most of these seroconversions could be accounted for by the occurrence of natural rubella or experimental error. In a few instances, seroconversion was thought to be compatible with vaccine virus transmission. However, in view of the

\*The official name is Rubella Virus Vaccine, Live.

sizable negative experience and the recognized background of unrelated seroconversions, it is difficult to interpret the significance of each individual report of possible vaccine virus spread. Though further documentation is necessary, the probability of such spread is exceedingly low. Thus, the potential hazard to pregnant women is considered to be of such a low order of magnitude that use of vaccine in community programs or in children whose mothers are pregnant is not contraindicated.

Vaccinees exposed to rubella often develop increases in antibody titers without clinical symptoms. These reinfections, which are more frequent in individuals with low antibody titers, occur more commonly in vaccinees than in naturally immune persons. Investigations conducted to date indicate that these reinfections are virologically abbreviated in that viremia has not been detected and virus excretion in the pharynx appears to be significantly diminished in amount and duration. There is no evidence indicating that reinfected vaccinees can transmit virus to susceptible contacts. Likewise, the absence of demonstrable viremia during reinfection suggests that women with vaccine-induced immunity if exposed to rubella during pregnancy would be unlikely to transmit virus to the fetus. However, further study is needed to document the precise clinical and epidemiologic significance of reinfection.

## RECOMMENDATIONS FOR VACCINE USE

Live rubella virus vaccine is recommended for boys and girls between the age of 1 year and puberty. Vaccine should not be administered to infants less than 1 year old because of possible interference from persisting maternal rubella antibody.

In the continental United States, children in kindergarten and elementary school deserve priority for vaccination because they are commonly the major source of virus dissemination in the community. A history of rubella illness is not reliable enough to exclude children from immunization.

Vaccination of adolescent or adult males is of lower priority. The vaccine may be useful in preventing or controlling outbreaks of rubella in circumscribed population groups.

**Pregnant women should not be given live rubella virus vaccine.** It is not known to what extent infection of the fetus with attenuated virus might take place following vaccination, or whether damage to the fetus could result. Therefore, routine immunization of adolescent girls and adult women should not be undertaken because of the danger of inadvertently administering vaccine to pregnant women.

Women of child-bearing age may be considered for vaccination only when the possibility of pregnancy in the following 2 months is essentially nil; each case must be considered individually. This cautious approach to vaccinating postpubertal females is indicated for two reasons: First, because of the theoretical risk involved in vaccination of pregnant women; and second, because significant congenital anomalies occur in approximately 3 percent of all births, and their fortuitous appearance after vaccine had been given during pregnancy could lead to serious misinterpretation.

If vaccination of a woman of child-bearing age is contemplated, the following steps are indicated:

- 1) The woman should be tested for susceptibility to rubella by the HI test (See *Rubella Immunity*).
- 2) If immune, she should be assured that vaccination is not necessary.
- 3) If susceptible, she may be vaccinated only if it is ascertained that she is not pregnant and if she understands that it is imperative for her to avoid becoming pregnant for the following 2 months. (To ensure this, a medically acceptable method for pregnancy prevention should be followed. This precaution also applies to women in the immediate post-partum period.) Additionally, she should be informed of the frequent occurrence of joint involvement (see above).

There is no evidence that live rubella virus vaccine given after exposure will prevent illness. There is, however, no contraindication to vaccinating children already exposed to natural rubella.

There is no contraindication to vaccination of individuals with pre-existing antibody.

## Precautions in Using Live Rubella Virus Vaccine

**Pregnancy:** Live rubella virus vaccine is contraindicated. (See *Recommendations for Vaccine Use*.)

**Altered Immune State:** Attenuated rubella virus infection might be potentiated by severe underlying diseases, such as leukemia, lymphomas, or generalized malignancy, and when resistance has been lowered by therapy with steroids, alkylating drugs, antimetabolites, or radiation. Such patients should not be given live rubella virus vaccine.

**Severe Febrile Illness:** Vaccination should be postponed until the patient has recovered.

**Hypersensitivity of Vaccine Components:** Rubella vaccine should theoretically not be given to children clearly sensitive to the tissue substrates or other components of the vaccine. To date, there have been no documented reports of serious hypersensitivity reactions to rubella vaccine.

## Simultaneous Administration of Live Rubella Virus Vaccine and Other Live Virus Vaccines.

Simultaneous administration of live rubella virus vaccine and other live virus vaccines is not recommended as a routine practice until results of controlled clinical investigations are available. Until then, it is recommended that rubella vaccination be separated by at least 1 month from administration of other live virus vaccines.

## SURVEILLANCE

Careful surveillance of rubella infection is particularly important with the general use of vaccine. Emphasis should be placed upon improved diagnosis and reporting of rubella, of the congenital rubella syndrome, and of complications of the disease and the vaccine. Competent laboratory investigation of all infants with birth defects suspected of being due to rubella is essential. It will likewise be important to observe patterns of vaccine use and determine its effectiveness.

## SEROLOGIC TESTING FOR RUBELLA – A WARNING

*The Public Health Service Medical Laboratory Services Advisory Committee issued the following statement on serologic testing for rubella.*

Serologic tests for rubella are primarily used to determine: (1) the immune status of individuals in a given population; (2) the immune status of pregnant women who have been exposed to rubella; and (3) the etiology of cases of exanthematous disease. In the first instance, results of tests are used for epidemiological and immunization planning purposes; in the second and third instances, results are used to provide information for making medical management decisions in situations of some urgency.

At the present time the hemagglutination inhibition (HI) test is the technique most widely used for measuring rubella antibodies. This test is a complex procedure which must be performed by well trained, experienced individuals. In addition, a thorough knowledge of the immune response is essential for the proper interpretation of test results. Because of actions which may be taken on the basis of laboratory results, the need for accuracy is great, and certain problems associated with the HI test must be recognized.

The HI test for rubella is not a standardized technique, and several modifications of the basic procedure are in use. Methods for removing nonspecific inhibitors in serum specimens may not be completely effective, or they may remove specific antibody, leading to false positive or false negative results. Reagents obtained from different

sources are not uniform in quality or in suitability for all modifications of the HI test. Since the products from each manufacturer are for use in a specific HI procedure, intermixing reagents from different sources can lead to problems in test performance. Further, the wide variability of erythrocyte suspensions has considerable bearing on the sensitivity of the test. Because of the lack of uniformity in testing procedures and reagents, interpreting laboratory results is a sophisticated undertaking, and, of necessity, may vary from one laboratory to another.

In view of the problems associated with this serologic procedure, HI tests for rubella should not be attempted in a laboratory carrying out the tests on an infrequent basis. Such a laboratory cannot maintain the necessary skills and controls, and, in urgent cases involving therapeutic abortion, pressures may lead to failure to repeat tests or to perform more difficult supplemental tests, such as complement fixation, fluorescent antibody, and serum neutralization tests, or IgM determinations which may be necessary for accurate interpretation.

The laboratory asked to carry out HI tests for rubella only infrequently or to perform supplemental tests for which it is not qualified should refer diagnostic materials to a State health department or other competent reference laboratory.

## STATE EPIDEMIOLOGISTS

Key to all disease surveillance activities are those in each State who serve the function as State epidemiologists. Responsible for the collection, interpretation and transmission of data and epidemiological information from their individual States, the State epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

|                      |                                     |
|----------------------|-------------------------------------|
| Alabama              | Frederick S. Wolf, M.D.             |
| Alaska               | Donald K. Freedman, M.D.            |
| Arizona              | Philip M. Hotchkiss, D.V.M.         |
| Arkansas             | John A. Harrel, Jr., M.D.           |
| California           | James Chin, M.D.                    |
| Colorado             | C. S. Mollohan, M.D.                |
| Connecticut          | James C. Hart, M.D.                 |
| Delaware             | Floyd I. Hudson, M.D.               |
| District of Columbia | William E. Long, M.D.               |
| Florida              | E. Charlton Prather, M.D.           |
| Georgia              | John E. McCroan, Ph.D.              |
| Hawaii               | Lloyd C. Guthrie, M.D.              |
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| Illinois             | Norman J. Rose, M.D.                |
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| New York City        | Vincent F. Guinee, M.D.             |
| North Carolina       | Martin P. Hines, D.V.M.             |
| North Dakota         | Kenneth Mosser                      |
| Ohio                 | John R. Ackerman, M.D.              |
| Oklahoma             | R. LeRoy Carpenter, M.D.            |
| Oregon               | Morris Chelsky, M.D.                |
| Pennsylvania         | W. D. Schrack, Jr., M.D.            |
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| Virginia             | H. E. Gillespie, M.D.               |
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| West Virginia        | N. H. Dyer, M.D.                    |
| Wisconsin            | H. Grant Skinner, M.D.              |
| Wyoming              | Herman S. Parish, M.D.              |