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Varicella Seroprevalence and Molecular Epidemiology of Varicella-Zoster Virus in Argentina, 2002

Gustavo H. Dayan,* María S. Panero,2 Roberto Debbag,3 Ana Urquiza,4 Marta Molina,5 Susana Prieto,6 María del Carmen Perego,7 Graciela Scaglotti,8 Diana Galimberti,9 Guillermo Carroli,10 Cristina Wolff,11 D. Scott Schmid,12 Vladimir Loparev,12 Dalya Guris,1 and Jane Seward1

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There is limited data on immunity against varicella-zoster virus (VZV) in adults in different parts of Argentina, and it is not known which VZV strains are circulating in Argentina. The objectives of this study were as follows: (i) to evaluate seroprevalence of varicella among adults, assessing the accuracy of clinical history and determining the sociodemographic factors associated with seropositivity; and (ii) to determine the VZV strains circulating in Argentina. A cross-sectional serological survey enrolling 2,807 women aged 15 to 49 years attending public health-care settings in four cities in Argentina (i.e., Buenos Aires, Salta, Mendoza, and Rosario) and one rural area was conducted from August to November 2002. Specimens for identification of VZV strains were obtained from vesicular lesions from 13 pediatric patients with varicella from different areas of the country. PCR amplification was used for genotyping. The overall seroprevalence of varicella antibodies was 98.5% (95% confidence interval, 98.0 to 98.9), ranging from 97.2% in central Buenos Aires to 99.3% in southern Buenos Aires and Salta. Varicella seroprevalence increased with age. Crowding and length of residence in the same place were associated with seropositivity. The positive predictive value of varicella history for immunity to varicella was 99.4%; however, the negative predictive value was 2.5%. The European genotype was identified in all viral specimens. In Argentina, seroprevalence in women more than 15 years old was high regardless of the area of residence. Negative or uncertain varicella history was not a good predictor of immunity. VZV genotype was stable in all areas of the country.

Varicella is a highly contagious, exanthematous disease caused by the alphaherpesvirus varicella-zoster virus (VZV), which is typically associated with epidemics among children (40). Although varicella is self-limiting, it may result in complications and death in healthy children. Higher morbidity and mortality occurs among adults (15, 33). The risk of complications may be increased in pregnant women (8) and neonates (7).

The epidemiology of varicella varies in tropical and temperate climates. In temperate climates, varicella occurrence is largely limited to childhood. For example, in the United States, more than 90% of varicella cases occur in persons less than 15 years old (39). However, in tropical and subtropical climates, a higher proportion of primary cases are seen in adolescents and young adults (22, 35). In Argentina, a country with a variety of climates, including a subtropical climate in the northern region, there is limited data on immunity against VZV in adults in different parts of the country (12). Additionally, VZV strains circulating in Argentina are unknown. From August to November 2002, a seroprevalence study was conducted to assess rubella and measles seroprevalence among women of child-bearing age (WCBA) (i.e., aged 15 to 49 years). This study provided an opportunity to describe VZV epidemiology in this age group. In addition, clinical specimens were collected from pediatric varicella patients for VZV genotyping.

The objectives of this study were as follows: (i) to evaluate seroprevalence of varicella in different areas of Argentina, assessing socioeconomic and demographic factors associated with seropositivity and the accuracy of clinical history of the disease; and (ii) to determine the VZV strains circulating in Argentina.

MATERIALS AND METHODS

Population. The seroprevalence survey was a cross-sectional study and consisted of 2,807 women aged 15 to 49 years attending public health-care settings in four cities (Buenos Aires, Salta, Mendoza, and Rosario) and one rural area (Valle de Uco area in Mendoza province) in Argentina. These sites are located in different areas of the country (i.e., eastern [Buenos Aires], central [Rosario], western [Mendoza], and northwestern [Salta]) (Fig. 1). From the health-care perspective, Buenos Aires is traditionally divided into three main zones, because of its size and differences in demographic characteristics; therefore, each zone was considered a separate research site. A convenient sample of public health-
Laboratory methods. The serum specimens for the seroprevalence study were obtained from residual sera collected for routine testing during pregnancy (e.g., syphilis) and were transported on dry ice to the CDC. Immunoglobulin G (IgG) antibodies. Initial testing to detect VZV-specific IgG antibody was performed using a direct whole-virus VZV enzyme-linked immuno-}

anosorbent assay (ELISA) developed at the CDC. The cutoff values for the test results were established empirically and were as follows: an adjusted optical density (OD) of <0.050 was negative, an OD of 0.050 to 0.165 was equivocal, and an OD of >0.165 was positive. Measured against the “gold standard” fluorescent antibody to membrane antigen (FAMA) assay, the whole-cell ELISA had a sensitivity of 88% and a specificity of 96%. Specimens with negative or equivocal test results (results for which some specific reactivity suggested the presence of small amounts of VZV antibody but which fell outside the statistical limits [cumulative variation of assay results plus 3 standard deviations]) were retested using the more sensitive glycoprotein ELISA (gpELISA) method developed at the CDC using purified VZV glycopeptides (supplied courtesy of Merck & Co, West Point, Pa.). The cutoff values for the gpELISA were as follows: an OD of <0.50 was negative, an OD of 0.50 to 2.0 was equivocal, and an OD of >2.0 was positive. The sensitivity and specificity of this test were 99 and 98%, respectively, compared to the FAMA assay.

For genotyping purposes, a sterile swab was used to swab the base of unroofed vesicular lesions. Specimens were placed in sterile tubes and shipped to the CDC. Total DNA was isolated from each specimen by using NucleoSpin tissue kits (Clontech Laboratories, Inc., Palo Alto, Calif.) and recovered in a final volume of 200 μl in a solution of Tris-HCl (pH 8.0) (10 mmol/liter). To identify VZV-positive specimens, fluorescence resonance energy transfer (FRET)-based real-time PCR targeting VZV open reading frame ORF62 was performed on specimens using LightCycler (Roche) as previously described (26). Evaluation of PstI and BglI sites in ORF38 and ORF54 was done with fluorescent probes (20). PCR amplification of the ORF22 target region was performed by using 100 ng of total DNA or 5 μl of DNA extracted from skin lesions of chicken pox patients. The PCR forward primer p22R1f (5'-GGG TTT TGT ATG AGC GTT GG-3'), positions 37837 to 37856) and the reverse primer p22R1r (5'-CCC CCG AGG TTC GTA ATA TC-3'; positions 38338 to 38356) were designed to amplify a 447-bp fragment (positions 37837 to 38264) of VZV ORF22. DNA amplification reactions were performed with a GeneAmp PCR System 9700 (Applied Biosystems) in 50-μl reaction volumes, using AmpliTaq Gold PCR Master Mix (0.025 U of GoldTaq DNA polymerase enzyme, 1× PCR buffer II, 2.5 mM MgCl2, a 200 μM concentration of each deoxynucleotide triphosphate, a 0.2 μM concentration of each primer, and 1 to 5 μl of VZV DNA extract). Sequence variation observed at four polymorphic loci in the amplicon of European strain Dumas (GenBank accession number 9625875) and Japanese OKA parental strain (14) (GenBank accession number 26665422) was used to assign genotype (25). Full homology to the OKA strain characterizes the VZV Japanese genotype, and strains with complete identity in the designated region to the Dumas strain characterize the European genotype. The third genotype, called mosaic, carries both Japanese and European genotype mutations.

Statistical analysis. Data were entered and analyzed using EPI Info 2000 (10). For statistical analysis, negative and equivocal results were grouped together and classified as negative. VZV seropositivity in the different sites was reported as percentages with 95% confidence intervals. The chi-square test (or the Fisher exact test if an expected value in any cell was less than five) was used to test the association between VZV seroprevalence and sociodemographic variables among the study sites. The Cochran-Armitage trend test was used to assess seroprevalence trends among age groups. In addition, logistic regression analysis was performed to identify independent predictors of varicella seropositivity. Statistical significance was set at a P value of <0.05.

Using the presence of varicella IgG antibodies as the gold standard for immunity, the sensitivity, specificity, positive predictive value, and negative predictive value of self-reported history of varicella were calculated. For this analysis, those with negative or uncertain history of varicella were considered history negative. The proportion of seropositive individuals who reported a positive history of disease was defined as the sensitivity of self-reported history, and the proportion of seronegative participants who did not report prior disease (i.e., history negative) was defined as the specificity. The positive predictive value of history was defined as the proportion of history-positive women who were seropositive, and the negative predictive value was defined as the proportion of history-negative women who were seronegative.

RESULTS

Seroprevalence study. Differences in demographic characteristics of the study population (n = 2,807) were observed for the different areas of Argentina sampled (Table 1). A lower percentage of people living more than 5 years in the same place was observed in Buenos Aires and the rural area. House-
holds with more than two persons per bedroom were more frequent in Salta and Mendoza. Households with a monthly income of $75 (United States dollars) were also more frequent in Salta.

Of the total 2,807 participants in Argentina, specimens were available for 2,803 (99.9%). The overall seroprevalence of varicella antibodies was 98.5% (95% confidence interval, 98.0 to 98.9), ranging from 97.2% in central Buenos Aires to 99.3% in Buenos Aires and Salta (Table 2). No negative or equivocal specimens retested using the more-sensitive gpELISA were found to be positive. No significant differences were found between rural and urban areas or areas with subtropical climates, such as Salta, and other areas with temperate climates (Table 2).

Seroprevalence was more than 97% in all age groups, reaching 100% for women 35 years and older (Table 3). Although most women were seropositive, a tendency for higher seropositivity in the higher age groups was observed ($P = 0.005$ by the Cochran-Armitage trend test). Women living for more than 5 years in the same place were more likely to be immune to varicella than women who had lived less than 5 years in the same place (Table 3). Living in a household with more than two people per bedroom and having more than four previous pregnancies were also factors associated with higher seroprevalence against varicella (Table 3). In the multivariate analysis, age, living in the same place for more than 5 years, and crowding remained significant factors (Table 4). Living in southern Buenos Aires was marginally associated with seropositivity.

A self-reported varicella history was available for 2,202 participants; reports of positive history varied from 40.9 to 65.8% in the study sites (Table 1). The sensitivity and specificity of

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**TABLE 1. Characteristics of the 2,807 women studied in Argentina in 2002**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Buenos Aires</th>
<th>Rosario</th>
<th>Mendoza</th>
<th>Salta</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Northern ($n = 405$)</td>
<td>Central ($n = 390$)</td>
<td>Southern ($n = 407$)</td>
<td>Mendoza ($n = 402$)</td>
<td>Salta ($n = 411$)</td>
</tr>
<tr>
<td>Age group (yr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15–19</td>
<td>86.6</td>
<td>19.7</td>
<td>20.2</td>
<td>20.6</td>
<td>19.7</td>
</tr>
<tr>
<td>20–24</td>
<td>22.2</td>
<td>24.4</td>
<td>19.7</td>
<td>20.2</td>
<td>20.1</td>
</tr>
<tr>
<td>25–29</td>
<td>20.4</td>
<td>28.2</td>
<td>20.8</td>
<td>19.8</td>
<td>20.4</td>
</tr>
<tr>
<td>30–34</td>
<td>16.1</td>
<td>16.7</td>
<td>19.9</td>
<td>20.5</td>
<td>19.7</td>
</tr>
<tr>
<td>35–49</td>
<td>22.7</td>
<td>12.8</td>
<td>19.9</td>
<td>19.3</td>
<td>19.2</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 yr living in the same place</td>
<td>36.2</td>
<td>37.9</td>
<td>35.6</td>
<td>6.4</td>
<td>24.9</td>
</tr>
<tr>
<td>≥5 yr living in the same place</td>
<td>61.5</td>
<td>59.7</td>
<td>64.4</td>
<td>89.9</td>
<td>75.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.3</td>
<td>2.3</td>
<td>0.0</td>
<td>3.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Crowding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 persons per bedroom</td>
<td>67.1</td>
<td>60.8</td>
<td>70.5</td>
<td>53.8</td>
<td>46.5</td>
</tr>
<tr>
<td>&gt;2 persons per bedroom</td>
<td>32.1</td>
<td>39.0</td>
<td>29.0</td>
<td>45.4</td>
<td>53.3</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.8</td>
<td>0.3</td>
<td>0.5</td>
<td>0.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Household monthly income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;75 US $</td>
<td>16.1</td>
<td>18.2</td>
<td>36.9</td>
<td>41</td>
<td>35.3</td>
</tr>
<tr>
<td>≥75 US $</td>
<td>81.4</td>
<td>80.3</td>
<td>63.1</td>
<td>58.5</td>
<td>64.5</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.5</td>
<td>1.5</td>
<td>0.0</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Health insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18.9</td>
<td>11.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>No</td>
<td>81.1</td>
<td>89.0</td>
<td>98.0</td>
<td>89.6</td>
<td>78.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>No. of pregnancies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;4</td>
<td>86.2</td>
<td>85.1</td>
<td>88.5</td>
<td>79.3</td>
<td>74.9</td>
</tr>
<tr>
<td>≥4</td>
<td>13.8</td>
<td>14.9</td>
<td>11.5</td>
<td>20.7</td>
<td>25.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary incomplete</td>
<td>6.4</td>
<td>10.0</td>
<td>3.2</td>
<td>16.8</td>
<td>4.9</td>
</tr>
<tr>
<td>Primary complete</td>
<td>45.4</td>
<td>54.1</td>
<td>54.8</td>
<td>56.5</td>
<td>54.0</td>
</tr>
<tr>
<td>Secondary complete</td>
<td>33.4</td>
<td>25.6</td>
<td>36.9</td>
<td>19.3</td>
<td>18.9</td>
</tr>
<tr>
<td>Tertiary or university complete</td>
<td>14.3</td>
<td>10.3</td>
<td>5.1</td>
<td>7.4</td>
<td>12.2</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Varicella history</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>57.4</td>
<td>55.1</td>
<td>65.8</td>
<td>52.6</td>
<td>61.4</td>
</tr>
<tr>
<td>Negative or does not know</td>
<td>42.6</td>
<td>44.9</td>
<td>34.2</td>
<td>47.2</td>
<td>38.6</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
</tr>
</tbody>
</table>
The high percentage of immunity among adults found in this survey suggests that in Argentina, varicella occurs during childhood. The high seroprevalence rates found are comparable to those observed in the United States (19). Similar seroprevalence rates have been reported in other temperate climates, such as Switzerland, where 96.5% of adolescents aged 13 to 15 years were immune (17), or Belgium with a reported seroprevalence of 97.2% among individuals aged 15 to 19 years (38). Similar results were described in Germany.

### DISCUSSION

We found that more than 97% of women attending prenatal clinics in Argentina were immune to VZV by 15 to 19 years of age. We did not find significant differences in seroprevalence by geographical region or rural versus urban areas. Varicella seroprevalence increased with age. However, after adjusting for age, sociodemographic variables, such as crowding and length of residence in the same place, were associated with the presence of anti-VZV serum antibodies, although these effects were small, given the overall seroprevalence.

The high percentage of immunity among adults found in this survey suggests that in Argentina, varicella occurs during childhood. The high seroprevalence rates found are comparable and even higher than those observed in the United States (19). Similar seroprevalence rates have been reported in other temperate climates, such as Switzerland, where 96.5% of adolescents aged 13 to 15 years were immune (17), or Belgium with a reported seroprevalence of 97.2% among individuals aged 15 to 19 years (38). Similar results were described in Germany.
Dren in Brazil and England (9, 32). The lower immunity ob-

TABLE 5. Molecular genotyping of VZV in vesicular lesions of children in Argentina in 2002

<table>
<thead>
<tr>
<th>Site</th>
<th>Region</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Date (mo/day/yr) of onset</th>
<th>Date (mo/day/yr) of specimen</th>
<th>Patient type</th>
<th>VZV strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buenos Aires</td>
<td>Eastern</td>
<td>5</td>
<td>M</td>
<td>10/19/02</td>
<td>10/21/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>Eastern</td>
<td>3</td>
<td>M</td>
<td>10/19/02</td>
<td>10/21/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>Eastern</td>
<td>4</td>
<td>M</td>
<td>10/21/02</td>
<td>10/23/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>Eastern</td>
<td>3</td>
<td>M</td>
<td>10/17/02</td>
<td>10/18/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Corrientes</td>
<td>Northeastern</td>
<td>10</td>
<td>F</td>
<td>10/29/02</td>
<td>4/11/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Corrientes</td>
<td>Northeastern</td>
<td>3</td>
<td>M</td>
<td>10/31/02</td>
<td>11/4/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Corrientes</td>
<td>Northeastern</td>
<td>4</td>
<td>M</td>
<td>3/11/02</td>
<td>4/11/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Salta</td>
<td>Northwestern</td>
<td>13</td>
<td>F</td>
<td>5/11/02</td>
<td>7/11/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Salta</td>
<td>Northwestern</td>
<td>12</td>
<td>F</td>
<td>5/11/02</td>
<td>7/11/02</td>
<td>Hospitalized</td>
<td>European</td>
</tr>
<tr>
<td>Mendoza</td>
<td>Western</td>
<td>6</td>
<td>M</td>
<td>1/11/02</td>
<td>3/11/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Mendoza</td>
<td>Western</td>
<td>4</td>
<td>M</td>
<td>2/11/02</td>
<td>3/11/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Comodoro Rivadavia</td>
<td>Southern</td>
<td>5</td>
<td>M</td>
<td>11/14/02</td>
<td>11/15/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
<tr>
<td>Comodoro Rivadavia</td>
<td>Southern</td>
<td>6</td>
<td>F</td>
<td>11/21/02</td>
<td>11/22/02</td>
<td>Ambulatory</td>
<td>European</td>
</tr>
</tbody>
</table>

a M, male; F, female.

served in women living in households with less than two

persons per bedroom in Argentina is consistent with the results of

a study conducted in Lebanon, where coming from homes

with a smaller number of rooms and smaller families were
predictors of a lack of immunity to varicella (29). Although the
level of education was not related to immunity in our study,
low education was a risk factor for susceptibility to varicella in

Mexico (3).

The accuracy of a past positive history of varicella was con-
firmed in our study. As in other studies, we found a very high
positive predictive value of varicella history (6, 13, 28, 29, 37).
However, we found a strikingly low predictive value of negative
history (i.e., 2.5%); therefore, a high percentage of women
with negative or uncertain history of varicella were immune.
Although some studies conducted among adults reported that
70 to 90% of adults with a negative or uncertain history of
varicella were VZV seropositive (2, 12, 13, 18), we found that
97.4% of participants with a negative or uncertain history of
varicella tested positive. This high percentage is due to an
unusually high percentage (approximately 50%) of women
who did not recall having had varicella. In our study, this
phenomenon may be explained by the fact that some women,
especially those with a low education level, may not have un-
derstood the question or recognized the disease; others may
have had varicella at such a young age they did not remember
it.

Our findings may be used to guide practitioner practices
aimed at preventing the occurrence of neonatal and maternal
morbidity related to VZV. At this time, there is no varicella
vaccination program for children or adults in place in Argen-
tina; however, the vaccine is available in the private sector. On
the basis of our findings, physicians may assume that WCBA
with a positive history are immune; however, most WCBA with
unknown or negative history of varicella will also be immune.
Therefore, it would be very difficult to detect truly VZV-sus-
sceptible WCBA based on a history of varicella, and women
with negative history should be tested to determine if they
should be vaccinated.

VZV is a very stable virus in terms of genomic structure, and
it has been postulated that VZV isolates are similar in the
same geographical area (21, 36). Our analysis of seven variable
mutations in four separate open reading frames (ORF22,
ORF38, ORF54, and ORF62) showed no variation of the VZV virus isolated from ambulatory and hospitalized patients from different parts of Argentina. A restriction fragment polymorphism method (20) modified for use with fluorescent probes showed the similarity of tested Argentinean isolates with Pst1 BglII strains circulating in North America and Eastern Australia by the LaRussa classification (21). According to a newly developed VZV genotyping method (25), samples from all areas in Argentina were genotyped as European VZV strains, which usually circulated in countries with temperate climates in Europe, North America, and eastern Australia. This is not surprising, because about 85% of the population in Argentina is of European origin, and there is much travel between Argentina and Europe. VZV in countries with tropical climates (Guinea Bissau, Zambia, Bangladesh, and southern India) in general have a BglII marker in ORF54 (4) and carry mosaic strains (25). Genetic diversity was observed within and between samples in the United Kingdom, Brazil (4), and United States (21), which has been attributed to the history of recent human migration from other parts of the world. The significant increase in the prevalence of certain strains in cases of varicella, in parallel with the increase in the immigrant population found in the United Kingdom, also reflects differences in molecular epidemiology in different countries (16). Therefore, circulation of VZV strains seems to be related not only to geographical location but also to migration from other countries. Our findings in Argentina seem to confirm this theory.

Our study has some limitations. First, the population surveyed was not randomly sampled; however, convenience sampling is unlikely to differentially sample seropositive and seronegative women. Second, our study included only the female population, and its results may not be generalized to the total population. Although some reports suggest that women have slightly higher rates of VZV susceptibility than men do (9, 23), which is attributed to a higher contact of women with children, significant differences by gender have not been found in most seroprevalence studies conducted in different parts of the world (3, 6, 17, 28, 31, 34).

This is the first study to show the serological and molecular epidemiology of varicella in different areas of Argentina. In conclusion, VZV genotype was stable in all areas of the country. The seroprevalence of anti-VZV antibodies was high in women in different areas of Argentina. We found a good correlation between varicella history and seropositivity; however, a high percentage of participants with negative or uncertain varicella history and a low predictive value of negative history were observed. These findings will have to be considered by physicians who want to improve their ability to counsel WCBA to prevent varicella infection during pregnancy and potentially congenital or perinatal rubella infection.

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