**Herpes simplex virus type 1 is the leading cause of genital herpes in New Brunswick**

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**INTRODUCTION:** Little is known about the role of herpes simplex virus (HSV) type 1 (HSV1) in the epidemiology of genital herpes in Canada. Data on herpes viral cultures for two consecutive years obtained from L'Hôpital Dr GL Dumont, which performs all the viral culture testing in New Brunswick, were reviewed. It was hypothesized that HSV1 was the main cause of genital herpes in New Brunswick.

**METHODS:** Samples of genital origin sent to the laboratory for HSV culture testing between July 2006 and June 2008 were analyzed. Samples from an unspecified or a nongenital source were excluded from analysis. Multiple positive samples collected from the same patient were pooled into a single sample.

**RESULTS:** HSV was isolated from 764 different patients. HSV1 was isolated in 62.6% of patients (male, 55%; female, 63.8%). HSV1 was isolated in 73.2% of patients 10 to 39 years of age and in 32% of patients ≥40 years of age. The difference in rates of HSV1 infection between the 10 to 39 years of age group and the ≥40 years of age group was statistically significant (P<0.001). In a similar Canadian study performed in Nova Scotia, HSV1 was recovered in 53.7% of positive cultures (male, 36.7%; female, 58.1%). The rates of HSV1 infection reported by this study and the present study were significantly different (P<0.001 for male, P=0.012 for female).

**CONCLUSION:** In New Brunswick, HSV1 is the dominant type of HSV isolated in samples collected from a genital site. Significant rate differences were demonstrated between the groups 10 to 39 years of age and ≥40 years of age.

Key Words: Canada; Genital herpes; Herpes simplex virus type 1

Herpes simplex virus (HSV) type 2 (HSV2) is the leading cause of genital ulcers worldwide (1), but either HSV type 1 (HSV1) or HSV2 may be the cause (2). The relative role of HSV1 in herpes simplex genital infections varies from 3.9% to 78% (3,4). Most studies have relied on herpes simplex type-specific serology in estimating the significance of HSV2 in causing sexually transmitted infections. However, HSV1 is commonly acquired as an orolabial infection, so antibodies against it cannot be conclusively linked to genital infections. Using methods such as viral culture or molecular assays, it is possible to ascertain the role of HSV1 in causing genital ulcers. In our experience, many samples of genital origin tested in our laboratory grew HSV1. Given that our laboratory has tested all samples from New Brunswick for HSV since 2006 and given the sparsity of Canadian data, we decided to analyze two years of sample results (July 2006 to June 2008), hypothesizing that HSV1 would be the dominant type of HSV identified in those samples.

**METHODS**

There are no privately operated laboratories in New Brunswick. L'Hôpital Dr GL Dumont, located in southeast New Brunswick, is the only viral testing laboratory in the province, and has provided HSV culture services since 1992. New Brunswick laboratories ceased referring samples for HSV culture outside the province during the spring of 2006, when New Brunswick had a population of 748,000 (5). A review of the number of samples referred from other laboratories before and after the spring of 2006 confirmed that all samples collected for herpes simplex direct testing were referred to the laboratory at L'Hôpital Dr GL Dumont after this period. Molecular testing of HSV on genital samples was not available routinely in New Brunswick at the time of the present study, and HSV type-specific serology is not performed in New Brunswick laboratories.

Samples submitted to the laboratory included the name, age and date of birth of the individual and the anatomical area collected for testing (eg, buttock). Most samples were also submitted with a unique identifying number (Medicare and/or hospital medical record number). It is not known if the samples were collected from a primary episode or a recurrence. Double counting was prevented by reviewing all positive samples. All positive samples collected from the same patient, either at the same or at different times, were pooled and counted as one sample.

Samples were collected with the Starplex Starswab Multitran Collection and Transport System (Starplex Scientific Inc, Canada) or...
Distribution of herpes simplex virus (HSV) type 1 (HSV1) and type 2 (HSV2) in samples collected from genital lesions for viral culture testing, according to age group and sex in New Brunswick between July 2006 and June 2008

<table>
<thead>
<tr>
<th>Age group, years</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women HSV1, n</td>
<td>6</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>HSV2, n</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total HSV1/HSV1+HSV2, %</td>
<td>100</td>
<td>80.5</td>
<td>90.5</td>
</tr>
<tr>
<td>Men HSV1, n</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>HSV2, n</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total HSV1/HSV1+HSV2, %</td>
<td>0</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

**RESULTS**

Between July 2006 and June 2008, 4263 sample results were included for analysis. HSV had been isolated in 1304 samples, from which 805 genital samples from 764 patients were positive for HSV. No samples were infected by both HSV1 and HSV2, either in samples collected from a single date or multiple dates. The available data did not allow determination of the number of rejected samples, samples with an atypical CPE or with an isolate that could not be typed. No sample negative for HSV by viral culture was retested by a molecular assay.

HSV1 was identified in 62.6% of all positive patients and was more frequent in females (63.8%) than in males (55%) (Table 1). Among patients with a positive genital sample, female patients were over-represented (635 female patients, 129 male patients), but the difference in the HSV1 discovery rates between male and female patients was not significant. No significant regional differences were seen in the rate of HSV1/HSV2 genital infections.

In comparison, in the ≥40 years of age group, the rate of occurrence of HSV1 dropped significantly. The difference in the rates of occurrence of HSV1 between the combined population of males and females for the age groups 10 to 39 years (77%) and ≥40 years (32%) was statistically significant (P<0.001 [6^]).

**DISCUSSION**

In 1992, our laboratory started providing HSV viral culture services, and from our observations we suspected that HSV1 was the dominant strain of HSV from samples of genital origin. Until recently, we were unable to prove this observation; however, since the spring of 2006 we have processed viral cultures from all New Brunswick hospitals and now have gathered enough data to confirm this hypothesis. A detailed review of the number and type of samples received since June 2006 make us confident that we have gathered all samples collected for HSV detection in New Brunswick. Double counting was ruled out because all positive samples collected in duplicate from a single patient were reviewed by one of the authors (RO) and counted as a single sample.

Viral culture was used as a surrogate for incident infection. We were unable to determine if the isolated HSV was from a primary or a recurrent episode. The present study may have underestimated the role of HSV1 in episodes of genital herpes because the median recurrence rate for patients with HSV2 is much greater than that for patients with HSV1 infection (6). On the other hand, there is a marked predominance of HSV1 isolates in patients presenting to their primary care provider with a first, symptomatic genital herpes infection (7). How these two observations affect our results is difficult to estimate.

HSV1 is the main cause of genital herpetic lesions in New Brunswick, for both men and women, and predominantly affects patients <40 years of age. This observation confirms the results of a Canadian study by Forward and Lee (8) concluded eight years ago in Nova Scotia. The age groups differ slightly because the study by Forward and Lee included patients ≥216 years of age; however, the number of patients in our cohort of nine to 15 years of age was negligible (six patients). Women constituted the bulk of the cases in our cohort, accounting for 83.2% of all cases of genital herpes. The cohort of women 15 to 39 years of age was our largest group of patients infected with HSV1 (55.1%). This was also the case in the study by Forward and Lee (79.3%). The lower rate of HSV1 in older patients in our study may represent a lower incidence of HSV1 in this age group due to different sexual practices, but may also reflect the tendency of HSV1 to reactivate less frequently in comparison with HSV2. We cannot exclude the possibility that patients with recurrent genital herpes may not have presented to their care provider for diagnosis because they were already aware of their condition. This may explain the relatively low number of patients tested for genital herpes in the present study. Older patients infected with genital herpes in the present study may then be primary symptomatic cases, while younger patients may represent recurrent infections.

HSV1 is transmitted through contact with a person who is shedding virus at a peripheral site, a mucosal surface or in genital or oral secretions. Aerosol and fomite spread are unusual means of...
transmission (9). Change in sexual practices are often cited, but few studies have examined the sexual repertoire of adults according to age groups. Although oral sex is reported to be frequent in adolescents and young adults, we found only one study reporting the frequency of these practices in older adults (10). This study confirmed that persons practicing fellatio and cunnilingus are significantly younger than those who do not practice them.

The present study had several limitations. The samples were submitted with limited clinical data and it was not known if the samples were collected from a primary episode or a recurrence. The detection method used (viral culture), although very specific, is not the most sensitive. The use of a molecular method would have increased the recovery of HSV (11). Whether the use of a molecular method would have altered the ratio of HSV1/HSV2 is unknown.

We compared our data with those presented in Forward and Lee's study (8), after adjusting our age groups. Overall, the rate of occurrence of HSV1 was lower in male patients from Nova Scotia (New Brunswick: 55% versus Nova Scotia 36.7%, P<0.02). The rates for female patients were also different (New Brunswick: 63.8% versus Nova Scotia 58.1%, P=0.034). As in the study by Forward and Lee, female patients were over-represented, constituting approximately 80% of all patients tested for all age groups in both studies.

Although some differences exist, our study confirms Forward and Lee's findings that in Atlantic Canada, HSV1 is the main cause of genital herpes. Based on these two studies, however, HSV1 occurrence rates are lower in Nova Scotia than in New Brunswick.

The study by Forward and Lee (8) and the present study differed in several ways. Forward and Lee's study used a single cell line (A549) kept for seven days in a stationary culture tube. We used four cell lines kept for 10 days, including the Mink lung cell line. The Mink lung cell line is reported to be more sensitive than Vero and MRC-5 for the recovery of HSV in culture (12). We used a spin-amplified microplate cell culture assay that was also reported to increase the recovery of viruses (13,14). Whether differences in culture methods preferentially affected the recovery of HSV1 compared with HSV2 is unknown.

The two studies are separated by eight years, and a change in sexual practices over time cannot be excluded. Fellatio and cunnilingus are reported to be more common in younger age groups (15), being perceived as safer than intercourse and as a means of averting pregnancy (16). Such a change would favour the transmission of HSV1 in this population. Forward and Lee's study and the present study indirectly support this observation. Furthermore, most adolescents have no HSV1 antibodies (17), making them susceptible to a primary genital infection with this organism. Whether the susceptibility to HSV1 primary genital infection has varied over time (eg, 1998 to 2001 versus 2006 to 2008) or location (Nova Scotia versus New Brunswick) is unknown. Access to medical care may have differed between Nova Scotia and New Brunswick, and also during the two study periods.

No other published studies based on direct detection concerning the role of HSV1 in genital herpes in Canada were found, although regional differences were mentioned (18). The relative importance of HSV1 in genital herpes varies considerably in other areas of the world (Table 2). Most published studies include a greater proportion of female patients, similar to the present study. Although not meant to be exhaustive, the review of the published studies in the present report found HSV2 to be the main cause of genital herpes.

**CONCLUSION**

In New Brunswick, HSV1 is the dominant type of HSV detected in samples collected from genital sites. Significant rate differences are seen between the 10 to 39 years of age and the ≥40 years of age groups. Our data confirm the findings of a similar study conducted in Nova Scotia (8). We encourage other Canadian laboratories to reassess the role of HSV1 in the etiology of HSV genital lesions.

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**REFERENCES**


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