Individual susceptibility to neisserial infection?

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SUMMARY Specimens from genital, anorectal, and pharyngeal sites from 1671 men and 1419
women were cultured for Neisseria gonorrhoeae. Pharyngeal specimens were also cultured for
Neisseria meningitidis. N. gonorrhoeae was isolated from a genital site 2.7 times more often in
men and 1.8 times more often in women who also carried meningococci in their pharynx than
from those who did not; the meningococcus was isolated 3.4 times more often from men and 2.0
times more often from women with genital gonorrhoea than from those without. In both men
and women the association of each organism with the other was statistically significant (P<0.001) and
may be related to sexual behaviour rather than to individual susceptibility to neisserial infection.

Introduction

The gonococcus and the meningococcus, the two
most important human pathogens in the genus Neisseria, are closely related genetically (Kingsbury,
1967; Kingsbury et al., 1969) and antigenically (Tramont et al., 1974). If there are specific host
factors which increase the susceptibility of certain individuals to these organisms, their study could
increase our knowledge of the pathogenicity of gonococcal and meningococcal infections.

In an investigation by Willcox et al., (1977) of 150
cultures of throat exudates from patients
(predominantly male) who were examined at a clinic
for sexually transmitted diseases because they had a
history of orogenital intercourse, the meningococcus
was isolated nearly six times more often from those
with genital gonorrhoea than from those without. In
the same study the gonococcus was found 2.5 times
more often in those who carried the meningococcus
in the pharynx than in those who did not. These
workers suggested (Willcox et al., 1977) that
confirmation of these findings would support the
theory of individual susceptibility to the acquisition of
neisseriae.

This paper reports our findings on all patients,
male and female, from whom genital (and, in some
cases, anorectal) and pharyngeal specimens were
cultured during 1977.

Materials and methods

Specimens of genital and pharyngeal exudates
obtained from 1671 men and 1419 women attending
the Department of Venereology at the Royal
Infirmary, Edinburgh, during 1977 were cultured in
parallel for Neisseria gonorrhoeae. The pharyngeal
specimens were also cultured for Neisseria
meningitidis.

Urethral and pharyngeal specimens were taken
from all male patients in the study while anorectal
specimens were also taken for culture from
homosexual men. Urethral, cervical, anorectal, and
pharyngeal specimens were taken for culture from all
female patients in the study. These patients
comprised all known contacts of gonorrhoea.
Patients were not routinely asked about recent oral
contact, but if such a history was obtained they were
included in the study.

Material was inoculated directly on to modified
New York City medium (Young, 1978a) at the time
of the patient's initial examination. After
inoculation, plates were held at 36°C in a carbon
dioxide-enriched (10%) atmosphere and transferred
to the laboratory within four hours. Specimens were
processed, and N. gonorrhoeae and N. meningitidis
were identified by fluorescent antibody and rapid
carbohydrate utilisation tests (Young, 1978b).

Statistical analysis was made by the $\chi^2$ method
with Yates's correction.

Results

The results of cultures from the 1671 male and 1419
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female patients are shown in Tables 1 and 2 respectively.

The isolation of gonococci from genital sites is compared with that of meningococci in the pharynx of men and women in Tables 3 and 4 respectively; the isolation of meningococci from the pharynx compared with that of gonococci from genital sites is shown in Tables 5 and 6.

Table 1 Isolation of Neisseria gonorrhoeae from genital and anorectal sites and of Neisseria meningitidis from the pharynx of 1671 men

<table>
<thead>
<tr>
<th>Genital/anorectal sites</th>
<th>Pharyngeal culture results for N. meningitidis*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Culture results for N. gonorrhoeae</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>89</td>
</tr>
<tr>
<td>Negative</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>186</td>
</tr>
</tbody>
</table>

*χ²: 89·8; P<0·001

Table 2 Isolation of Neisseria gonorrhoeae from genital and anorectal sites and of Neisseria meningitidis from the pharynx of 1419 women

<table>
<thead>
<tr>
<th>Genital/anorectal sites</th>
<th>Pharyngeal culture results for N. meningitidis*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Culture results for N. gonorrhoeae</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>96</td>
</tr>
<tr>
<td>Negative</td>
<td>148</td>
</tr>
<tr>
<td>Total</td>
<td>244</td>
</tr>
</tbody>
</table>

*χ²: 32·4; P<0·001

Table 3 Isolation of gonococci from genital and anorectal sites in relation to that of meningococci in the pharynx of 1671 men

<table>
<thead>
<tr>
<th>Genital and anorectal gonorrhoea</th>
<th>Pharyngeal cultures No.</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococci-positive</td>
<td>186</td>
<td>89</td>
<td>47·9</td>
</tr>
<tr>
<td>Meningococci-negative</td>
<td>1485</td>
<td>262</td>
<td>17·6</td>
</tr>
<tr>
<td>Total</td>
<td>1671</td>
<td>351</td>
<td>21·0</td>
</tr>
</tbody>
</table>

Table 4 Isolation of gonococci from genital and anorectal sites in relation to that of meningococci in the pharynx of 1419 women

<table>
<thead>
<tr>
<th>Genital and anorectal gonorrhoea</th>
<th>Pharyngeal cultures No.</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococci-positive</td>
<td>244</td>
<td>96</td>
<td>39·3</td>
</tr>
<tr>
<td>Meningococci-negative</td>
<td>1175</td>
<td>256</td>
<td>21·8</td>
</tr>
<tr>
<td>Total</td>
<td>1419</td>
<td>352</td>
<td>24·8</td>
</tr>
</tbody>
</table>

Table 5 Isolation of meningococci from the pharynx in relation to that of gonococci from genital and anorectal sites in 1671 men

<table>
<thead>
<tr>
<th>Genital/anorectal cultures No.</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonococci-positive</td>
<td>351</td>
<td>89</td>
</tr>
<tr>
<td>Gonococci-negative</td>
<td>1320</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>1671</td>
<td>186</td>
</tr>
</tbody>
</table>

Table 6 Isolation of meningococci from the pharynx in relation to that of gonococci from genital and anorectal sites in 1419 women

<table>
<thead>
<tr>
<th>Genital/anorectal cultures No.</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonococci-positive</td>
<td>352</td>
<td>96</td>
</tr>
<tr>
<td>Gonococci-negative</td>
<td>1067</td>
<td>148</td>
</tr>
<tr>
<td>Total</td>
<td>1419</td>
<td>244</td>
</tr>
</tbody>
</table>

The gonococcus was isolated 2·7 times more often from men and 1·8 times more often from women who were pharyngeal carriers of meningococci than from those who were not (Tables 3 and 4). Conversely, meningococci were isolated from the pharynx 3·4 times more often from men and 2·0 times more often from women with gonorrhoea than from those without (Tables 5 and 6). The association of each organism with the other is highly significant, in both men (χ² 89·08; P<0·001) and women (χ² 32·4; P<0·001).

The incidence of pharyngeal gonorrhoea in our study was 5·4% (19/352) in women and 3·1% (11/351) in men with genital or anorectal gonorrhoea or both; this represents an incidence of 1·3% (19/1419) and 0·7% (11/1671) of all female and male patients respectively.

Discussion

Our results confirm the earlier finding (Willcox et al., 1977) that individuals who carry the meningococcus in the pharynx and who have been exposed to the risk of gonorrhoea are more likely to yield positive results to genital culture for N. gonorrhoeae and vice versa. Although in the earlier study (Willcox et al., 1977) the meningococcus was isolated approximately six times more often from patients with genital gonorrhoea than from those without, the corresponding factors in our study are lower, 3·4 for men and 2·0 for women. The former six-fold difference (Willcox et al., 1977) reflects a lower meningococcal carriage rate in the group without gonorrhoea (5·3%) and a higher rate in the group.
with genital gonorrhoea (31.3%) than the corresponding carriage rates in our study—7.4% and 13.9% in men and women without gonorrhoea and 25.4% and 27.3% in those with gonorrhoea respectively. Our finding that the gonococcus was isolated 2.7 times more often from men and 1.8 times more often from women who were pharyngeal carriers of the meningococcus than from those who were not, is in good agreement with the 2.5-fold difference quoted previously (Wilcox et al., 1977).

Thus, in our study each organism was isolated two to three times more frequently in the presence of the other. The factors responsible for this association are unknown. It has been reported (Foster and Labrum, 1976) that there is an increased risk of gonococcal infection in blood group B subjects, and other workers (Miler et al., 1977) confirmed this for white patients but not for West Indians. It was concluded (Miler et al., 1977) that such data must be carefully collected on well-defined ethnic groups over a range of samples before a definite conclusion on intrinsic susceptibility to gonococcal infection based on blood group differences can be made. Analysis of the results by blood group or ethnic group was not attempted in the present study.

Another possibility is that our results, and those of Wilcox et al. (1977), do not indicate that specific host factors are involved in individual susceptibility but rather reflect that the more frequent acquisition of both organisms is related to sexual behaviour. It has been suggested (World Health Organisation, 1978) that more frequent changes of sexual partner may have contributed to the increase in gonorrhoea found in many countries in recent years. Assuming that an intimate activity, such as kissing, is a common prelude to sexual intercourse, more frequent changes of partner might increase the chance of acquiring meningococci in the pharynx.

If the population examined in this study includes a group whose carriage of neisseriae merely reflects the association of intimate behaviour with the exchange of flora, then it might be worthwhile to investigate the carriage of other ‘marker’ organisms, for example, Streptococcus pyogenes and Haemophilus influenzae. If oropharyngeal carriage of these organisms indicates a similar correlation with genital gonorrhoea then the postulated host susceptibility factor for neisseriae is unlikely.

We thank Professor J. G. Collee for constructive criticism and helpful advice in the preparation of this paper.

References