

Sensitivity to antibiotics of gonococcal strains isolated from sailors at Rotterdam

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Decreasing sensitivity of gonococcal strains to penicillin and other antibiotics has been observed in most parts of the world. The incidence of such strains in various population groups in various localities has been reviewed in considerable detail by Willcox (1970).

Data concerning gonococcal sensitivities in infections in seamen are comparatively scanty. 41 strains of gonococci partially resistant to penicillin (0.1 to 0.2 u./ml. and above) were isolated from 82 infections in sailors treated in Amsterdam in 1960-61 (Bakker, Esseveld, and Leiker, 1960). Warren (1968) showed that, in Southampton in 1958 to 65, partially resistant gonococci were isolated in 17.1 per cent. of local infections but in 54.5 per cent. of infections contracted overseas.

Material and methods

Gonococci were isolated in culture from 201 mariners and 216 inhabitants of Rotterdam with other occupations and the sensitivity of the gonococcal strains was determined at the time of the first visit to the clinic. Specimens of urethral discharge were taken in Stuart's transport medium and then cultured on a selective medium of ascites agar with colomycin and vancomycin, and incubated for 48 hrs at 37°C. in an atmosphere rich in CO₂.

Sensitivity to penicillin was determined by the tube dilution method.

Sensitivity tests for other antibiotics were performed by the paper disc method. Minimum inhibitory concentrations (MIC) were determined; the criteria for decreased sensitivity were as follows:

Penicillin	MIC > 0.1 I.U./ml.
Streptomycin	MIC > 4 mg./ml.
Tetracycline	MIC > 0.2 mg./ml.
Chloramphenicol	MIC > 0.5-1.5 mg./ml.
Ampicillin	MIC > 0.03-0.05 mg./ml.

Results and discussion

In the 201 seamen decreased sensitivity of the gonococcus to penicillin was found in 70 per cent. of cases, to streptomycin in 62.7 per cent., to tetracycline in 9.5 per cent., and to chloramphenicol in 1 per cent. The corresponding percentages for the strains of

gonococci isolated from the 216 inhabitants of Rotterdam were 35, 35.6, 1.9, and 0.5 (Table I). The differences between the proportions of less sensitive organisms in both groups were thus statistically significant ($P < 0.05$) for each of the antibiotics tested. The possible causes of these differences in sensitivity of the gonococci in each group are considered below.

TABLE I *Sensitivity of gonococci in seamen and inhabitants of Rotterdam, 1968-69*

Decreased sensitivity to	Seamen		Non-seamen	
	No.	Per cent.	No.	Per cent.
Penicillin	141	70.1	77	35.6
Streptomycin	126	62.7	77	35.6
Tetracycline	19	9.5	4	1.9
Chloramphenicol	2	1.0	1	0.5
Ampicillin	0	0	0	0
Total of cases	201	100	216	100

The various geographical origins of the infecting strains could be a significant factor.

Table II shows the country of origin of the infection in the cases of 191 seamen. There is decreased sensitivity to penicillin in a significantly higher proportion of those who acquired their gonorrhoea outside Europe ($\chi^2 = 20.79$; $P < 0.05$). Another important factor may be selection through the effect of previous treatment on board ship or elsewhere. Most of the sensitive strains are likely to be eliminated by treatment on board, so that only those seamen with gonococcal infections due to less sensitive strains come to our clinic.

TABLE II *Sources of infection and sensitivity of gonococci in 191* seamen*

Source of infection	No. of cases	Strains less sensitive to penicillin
Far East	12	11
Africa	8	8
S. America	49	44
N. America	3	1
Total outside Europe	72	64 (88.9 per cent.)
Holland	44	25
Elsewhere in Europe	74	44
Total in Europe	118	69 (58.5 per cent.)

*In ten seamen the source of infection could not be determined

Table III shows that only 26.4 per cent. of the seamen who acquired their gonorrhoea outside Europe had not been treated before they visited our clinic, compared with 68.8 per cent. of those infected in Europe. This could well be the cause of the higher incidence of partially resistant strains among the patients infected overseas (Table II).

TABLE III Treatment elsewhere of cases in 191 seamen before visit to clinic

Source of infection	Treated		Untreated	
	No.	Per cent.	No.	Per cent.
Outside Europe	53	73.6	19	26.4
Inside Europe	37	31.4	82	68.6
Total	90		101	

Analysis of such cases demonstrates the validity of this theory. Table IV shows that the previously treated cases of gonorrhoea among seamen yielded a significantly higher incidence of strains with decreased sensitivity ($\chi^2 = 28.99$; $P < 0.05$).

TABLE IV Percentage of gonococci less sensitive to penicillin in 90 previously treated cases, compared to those in 101 untreated cases in seamen

Seamen	Gonococcal strains				Total
	Decreased sensitivity		Sensitive		
	No.	Per cent.	No.	Per cent.	
Treated	80	88.9	10	11.1	90
Untreated	54	53.5	47	46.5	101

Table V compares the sensitivity of the gonococcal strains isolated from 101 seamen and 216 inhabitants of Rotterdam who had received no previous treatment. Among the seamen there is a significantly higher incidence of less sensitive strains ($\chi^2 = 8.62$; $P < 0.05$). Accordingly, the possibility remains that geographical differences in origin of the gonorrhoea account for the preponderance of partially resistant organisms.

TABLE V Percentage of gonococcal strains with decreased sensitivity to penicillin in 216 untreated cases in inhabitants of Rotterdam and in 101 untreated cases in seamen

Untreated cases		Decreased sensitivity to penicillin	
		No.	Per cent.
Inhabitants of Rotterdam	216	77	35.6
Seamen	101	54	53.5

Table VI shows the incidence of strains less sensitive to penicillin in the group of 101 untreated

seamen, classified into two groups: those infected in Europe and those infected outside Europe. The difference is not significant ($\chi^2 = 1.0406$; $P > 0.05$).

TABLE VI Sensitivity to penicillin and source of infection in 101 untreated cases in seamen

Source of infection	No. of cases	Less sensitive strains	
		No.	Per cent.
Outside Europe	19	12	63.2
Inside Europe	82	42	51.2

Summary

Gonococcal strains from cases of gonorrhoea in 201 seamen and 216 patients of other occupations in Rotterdam were investigated for sensitivity to penicillin and to four other antibiotics. For all the antibiotics tested, the proportion of less sensitive strains was significantly higher in the seamen.

A major cause of the difference between infections in seamen and in the indigenous population was the factor of selection by previous unsuccessful treatment in the cases in seamen. When this factor was excluded by a comparison of untreated cases in seamen and in the indigenous group, there was still a significant preponderance of partially resistant organisms in the cases in seamen. Further analysis of untreated cases in seamen failed to reveal a significant difference between infections acquired in Europe and those caught overseas.

References

- BAKKER, P. G., ESSEVELD, H., and LEIKER, D. L. (1960) *Ned. T. Geneesk.*, **104**, 65
 WARREN, R. M. (1968) *Brit. J. vener. Dis.*, **44**, 80
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Sensibilité aux antibiotiques des souches de gonocoques isolées chez des marins, à Rotterdam

SOMMAIRE

Des souches de gonocoques provenant de 201 marins et de 216 malades ayant d'autres occupations à Rotterdam furent étudiées quant à leur sensibilité à la pénicilline et à 4 autres antibiotiques. Pour tous les antibiotiques étudiés, la proportion de souches moins sensibles fut significativement plus élevée chez les marins.

Une cause majeure de différence entre les infections des marins et celles des indigènes fut la sélection que représente, chez les marins, les insuccès thérapeutiques antérieurs. Lorsque ce facteur fut éliminé, en comparant les cas non traités chez les marins avec les cas non traités chez les indigènes, on observa pourtant une prépondérance significative d'organismes partiellement résistants chez les marins. Une analyse supplémentaire des cas non traités chez les marins ne réussit pas à révéler une différence significative entre les infections contractées en Europe et celles contractées outre-mer.