Isolation of *Neisseria meningitidis* from the Genito-Urinary Tract and Anal Canal

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During the first 3 months of 1975, a striking increase has been noted in the incidence of *Neisseria meningitidis* in cultures from the genito-urinary tract and anal canal of both males and females being screened for gonorrhea. The data for recovery of these organisms from these sites are presented and reviewed.

Neisseria meningitidis is often thought of exclusively as the etiologic agent of meningococcal meningitis and meningococcemia. A specific serogroup, group Y, has been associated with primary meningococcal pneumonia (1, 2, 10).

A survey of the literature over the past 35 years reveals an extremely sparse number of documented instances in which meningococci have been isolated from the genito-urinary tract and only a single report of *N. meningitidis* from the anal canal (16). Murray, in 1939, cited orchitis and epididymitis as complications in meningococcus infections and implied the occurrence of genital infection in the absence of meningitis (15). In 1942, Carpenter and Charles reported the isolation of group I meningococci from the genito-urinary tract of seven patients with symptoms of gonococcal infection (2). All seven isolates were confirmed biochemically and serologically (2). Keys et al. (12) described two cases in which meningococci were isolated from the blood, joint, and endocervix in one case, and from the endocervix only in a second patient for whom rash and arthritis were prominent features. The authors suggested that the patients may have had a primary infection of the endocervix with dissemination to cutaneous tissue and joints. In 1971, Gregory and Abramson reported on the isolation of *N. meningitidis* from the vagina of a 5-year-old girl (8). More recently, Lewis and Alexander (13) reported the isolation of meningococci from the genital tract of three female patients. The organism was confirmed in two cases but no association of the organism with actual disease was established.

Table 1 summarizes the literature to date.

In New York City, a large screening program for gonorrhea has been in effect since mid-1972, the culture work being centralized in our laboratory. The great majority of these cultures are taken from the genito-urinary tract and are examined for the presence of *Neisseria gonorrhoeae*. In 1973, *N. meningitidis* was recovered

from the genito-urinary tract of one of these patients and from four patients in 1974. In this same time period, two strains of *N. meningitidis* which had been isolated from the cervix and urethra of two hospitalized patients were referred to our laboratory for confirmation.

Recently, however, the number of meningococcal isolates from the genito-urinary tract and especially from the anal canal has increased markedly. During the first trimester of 1975, 32 strains of *N. meningitidis* and four of *Neisseria lactamica* have been recovered from patients attending a number of facilities involved in gonorrhea screening.

This paper reviews our findings with respect to this increased incidence of *N. meningitidis* in cultures from these sites.

MATERIALS AND METHODS

The primary isolation medium. The medium used in the gonorrhea screening program is NYC medium. Its formulation was previously described (3, 5). Briefly it consists of a proteose-peptone corn starch agar-buffered base to which is added a supplemental nutrient mixture containing a lysed erythrocyte suspension, horse plasma, yeast dialysate, dextrose, and the following antibiotics: vancomycin hydrochloride, colistin, amphotericin B, and trimethoprim lactate.

Identification of strains. *N. gonorrhoeae* and *N. meningitidis* were first identified by colonial morphology, Kovacs oxidase test, and microscopy examination (Gram stain).

Characteristic colonies of *N. meningitidis* were further identified by sugar fermentation reactions on NYC fermentation media (4) with dextrose, maltose, sucrose, and fructose.

Cultures were also tested for the presence of β -D-galactosidase on *o*-nitrophenyl- β -D-galactopyranoside medium prepared according to the formulation of Lowe (14). In addition all strains were inoculated on Trypticase soy agar and incubated at room temperature and at 35 C in candle extinction jars for 40 h.

Strains presenting characteristic colonial mor-

TABLE 1. Summary of previously reported *N. meningitidis* infections of the genito-urinary tract and anal canal

Author	Year	Material cultured	Diagnosis	Confirmation of strains
Murray (15)	1939		Orchitis Epididymitis	
Carpenter and Charles (2)	1940-41	Vaginal, cervical, or urethral	Chronic cervicitis	Biochemical and serologic
			Ant. urethritis	Biochemical and serologic
			Ant. urethritis	Biochemical and serologic
			Ant. urethritis and epididymitis	Biochemical and serologic
			Ant. urethritis	Biochemical and serologic
Keys et al. (12)	1971	Blood, joint, and endocervix Blood, throat, skin, endocervical	Ant. urethritis	Biochemical and serologic
			Ant. urethritis	Biochemical and serologic
			Ant. urethritis	Biochemical and serologic
Gregory and Abramson (8)	1971	Vaginal exudate	Rash and arthritis Cutaneous lesion of index finger, arthritis	Biochemical and serologic Biochemical and serologic
Schroeter (16)	1971	Anal canal	Vaginitis	Biochemical and serologic
Lewis and Alexander (13)	1974	Vaginal and cervical	Rectal gonorrhoeae	
		Vaginal and cervical	Routine culture	Biochemical
		Vaginal and cervical	Routine culture	No confirmation
		Vaginal and cervical	Rape victim	Biochemical

phology, growth, and fermentation patterns were further tested serologically, by slide agglutination, with meningococcal antisera groups A, B, C, D, and Slaterus X, Y, Z, in our laboratory. Sera were obtained from the Center for Disease Control, Atlanta, Ga. Nontypable strains were referred to H. A. Feldman (Syracuse, N.Y.) who tested for serogroups W-135 and 29-E in addition to those stated above. The non-typable strains were also tested by Feldman for sulfadiazine sensitivity. All confirmed strains of *N. meningitidis* were quick frozen in sheep defibrinated blood and stored at -70°C .

RESULTS

On NYC medium colonies of *N. meningitidis* presented a characteristic appearance, which was helpful in differentiating them from colonies of *N. gonorrhoeae* (Fig. 1). After 20 h of incubation, *N. meningitidis* colonies were large, greyish, and mucoid and in some instances produced a slight reddish tint in the surrounding medium. After 40 h they were still more mucoid, with a characteristic dull, olive hue, and the surrounding medium was discolored. *N. lactamica* resembled *N. meningitidis* in colonial morphology, but in general the color

was more yellowish and the pigmentation was restricted to the colony.

N. gonorrhoeae colonies were much smaller and not so mucoid. They were translucent and produced no change in the medium surrounding them. As the growth of most saprophytic *Neisseria* was inhibited on NYC medium, the differences in the colonial morphology of *N. lactamica*, *N. meningitidis*, and *N. gonorrhoeae* made a preliminary differentiation of the organisms possible.

After tentative confirmation by the oxidase test and Gram-stain morphology, strains of *N. meningitidis* and *N. lactamica* displaying such characteristic colonies were further tested for biochemical and physiological properties and finally confirmed by serology.

All strains of *N. meningitidis* fermented dextrose and maltose and were sucrose, fructose, and *o*-nitrophenyl- β -D-galactopyranoside negative. They failed to grow, or showed only inhibited growth, on Trypticase soy agar incubated at 35°C and did not grow on plates kept at room temperature. Strains of *N. lactamica* fermented dextrose and maltose, failed to ferment

FIG. 1. Colonies of *N. meningitidis* (large) and *N. gonorrhoeae* ($\times 40$).

fructose and sucrose, and were *o*-nitrophenyl- β -D-galactopyranoside positive. They grew on Trypticase soy agar at 35 C and some showed inhibited growth at room temperature.

The strains of *N. meningitidis* and *N. lactamica* isolated from the urogenital tract and anal canal during the years 1973, 1974, and the first trimester of 1975 are shown in Table 2. Thirty-five (81.4%) strains were isolated from patients attending social hygiene clinics, and four (9.3%) came from maternal and infant care centers or family planning clinics. In addition, we received four (9.3%) strains from hospital laboratories, two for isolation and identification and two for confirmation.

In 1974, six strains were isolated from males and females. One was *N. lactamica*, recovered from the endocervix. *N. meningitidis* strains were isolated from the urethra of three males, whereas isolates from 2 females were recovered from cervical specimens.

During the first trimester of 1975, a total of 36 *Neisseria* strains were isolated, of which 32 (88.9%) were confirmed as *N. meningitidis* and four (11.1%) as *N. lactamica*. Of the *N. meningitidis* strains 25 (78.1%) were isolated from males: 16 from the anal canal and nine from the

urethra. All four strains of the *N. lactamica* were isolated from the anal canal of males. The remaining seven (21.9%) of the 32 *N. meningitidis* strains were recovered from the cervix of females. Figure 2 depicts the frequency of isolation of *N. meningitidis* during the period of 1973, 1974, and the first trimester of 1975.

All of the 38 *N. meningitidis* strains isolated during the three time periods being reported were confirmed serologically, with the exception of five auto-agglutinating strains. The serologic groups are listed in Table 2. It can be seen that of the 38 strains there were nine (23.7%) of group B, nine (23.7%) of group C, seven (18.4%) of group Y, five (13.2%) of group 29-E, two (5.3%) of group W-135, and one (2.6%) of group Z. Fourteen strains of *N. meningitidis* confirmed serologically by Feldman were found to be sulfadiazine sensitive.

DISCUSSION

The sudden rise of meningococcal recovery in the genito-urinary tract and anal canal among patients attending various clinics in New York City during the first trimester of 1975 (Fig. 2) has focused our attention on its possible epidemiological significance.

The isolation of *N. meningitidis* from the genito-urinary tract has been reported previously on rare occasions (2, 6, 8, 12, 13, 15) whereas its recovery from the anal canal has been cited in the literature only once (16). During 1973 and 1974, while screening for *N. gonorrhoeae* at the rate of approximately 39,000 to 40,000 patients per month, to encounter a strain of *N. meningitidis* was extremely unusual. In the first 3 months of 1975 *N. meningitidis* cultures were observed with increasing frequency and more often in anal specimens isolated from male patients than in cultures obtained from the urogenital tract of males or females.

The *N. meningitidis* isolates were found to belong to various serologic groups, and their distribution was comparable to that found among pharyngeal carriers in a normal population (7). Some isolates belong to groups 29-E and W-135 which, to our knowledge, have not been reported in meningococcal disease. *N. lactamica* was also isolated from five patients (9).

It is of interest to note that the 32 strains of *N. meningitidis* were recovered in the seasonal period in which meningococcal meningitis is most prevalent. In addition, the isolation within this time frame coincides with a significant increase in strains of *N. meningitidis* from pharyngeal carriers (17 in the first trimester of 1975 as opposed to 25 for the entire year in 1974), as well as isolates from spinal fluids and

TABLE 2. Strains of *N. meningitidis* and *N. lactamica* isolated from the genito-urinary tract and anal canal

Year	No. of strains	Facility ^a	Sex	Sources	Serologic groups	Total	
						<i>N. meningitidis</i>	<i>N. lactamica</i>
1973	1	MIC	F	Cervix	29-E	1	0
1974	1	H ^b	M	Urethra	Z	5	1
	1	SHC	M	Urethra	B		
	1	SHC	M	Urethra	Y		
	1	H ^b	F	Cervix	<i>N. lactamica</i>		
	2	SHC	F	Cervix	29-E		
1975 ^c	2	SHC	M	Urethra	B	9	0
	3	SHC	M	Urethra	C		
	2	SHC	M	Urethra	Y		
	2	SHC	M	Urethra	Auto-agglutinating		
	4	SHC	M	Anal	B	16	4
	5	SHC	M	Anal	C		
	2	SHC	M	Anal	Y		
	2	SHC	M	Anal	W-135		
	1	SHC	M	Anal	29-E		
	4	SHC	M	Anal	<i>N. lactamica</i>		
	2	SHC	M	Anal	Auto-agglutinating		
	1	H	F	Cervix	B	7	0
	1	FPC	F	Cervix	B		
	1	FPC	F	Cervix	C		
	1	FPC	F	Cervix	Y		
	1	H	F	Cervix	Y		
	1	SHC	F	Cervix	29-E		
	1	SHC	F	Cervix	Auto-agglutinating		

^a SHC, Social hygiene clinic; H, hospital; FPC, family planning clinic; MIC, maternal and infant care clinic.

^b Montefiore Hospital.

^c First trimester only.

FIG. 2. Frequency of recovery of *N. meningitidis* from the genito-urinary tract and anal canal during 1973, 1974, and the first trimester of 1975 (an average of 39,335 cultures were examined monthly throughout these periods). Symbols: ●, *N. meningitidis* isolates; ○, monthly volume of cultures.

blood cultures sent to our Special Bacteriology section for confirmation.

The marked increase in the isolation of *N. meningitidis* from the genito-urinary tract and anal canal will probably generate interest in these sites as a new epidemiological problem. Perhaps these findings should be of no surprise in view of changing sexual activities and social attitudes.

This laboratory is presently concerned with an epidemiological survey of patients from whom the strains were isolated as well as studies on the isolates from these anatomic sites.

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LITERATURE CITED

1. Artenstein, M. S. 1975. Meningococcus vaccine - yes; Gonococcus - no. *Hosp. Pract.* 10:37-43.
2. Carpenter, C. M., and R. Charles. 1942. Isolation of Meningococcus from the genitourinary tract of seven patients. *Am. J. Public Health* 32:640-643.
3. Faur, Y. C., M. H. Weisburd, and M. E. Wilson. 1973. A new medium for the isolation of pathogenic *Neisseria* (NYC Medium). II. Effect of amphotericin B and trimethoprim lactate on selectivity. *Health Lab. Sci.* 10:55-60.
4. Faur, Y. C., M. H. Weisburd, and M. E. Wilson. 1975. Carbohydrate fermentation plate medium for confirmation of *Neisseria* species. *J. Clin. Microbiol.* 1:294-297.
5. Faur, Y. C., M. H. Weisburd, M. E. Wilson, and P. S. May. 1973. A new medium for the isolation of pathogenic *Neisseria* (NYC Medium). I. Formulation and comparisons with standard media. *Health Lab. Sci.* 10:44-54.
6. Feldman, H. A. 1971. Meningococcus and Gonococcus: never the twain... well hardly ever. *N. Engl. J. Med.* 285:518-520.
7. Greenfield, S., P. R. Sheehee, and H. A. Feldman. 1971. Meningococcal carriage in a population of normal families. *J. Infect. Dis.* 123:67-73.
8. Gregory, J. E., and E. Abramson. 1971. Meningococci in vaginitis. *Am. J. Dis. Child.* 121:423.
9. Hollis, D. G., G. L. Wiggins, R. E. Weaver, and J. H. Schubert. 1970. Current status of lactose-fermenting *Neisseria*. *Ann. N.Y. Acad. Sci.* 174:444-449.
10. Irwin, R. W., W. K. Woelk, and W. L. Coudon. 1975. Primary meningococcal pneumonia. *Ann. Int. Med.* 82:493-498.
11. Jacobs, S. A., and C. W. Norden. 1974. Pneumonia caused by *Neisseria meningitidis*. *J. Am. Med. Assoc.* 227:67-68.
12. Keys, T. F., R. H. Hecht, and A. W. Chow. 1971. Endocervical *Neisseria meningitidis* with meningococcemia. *N. Engl. J. Med.* 285:505-506.
13. Lewis, J. F., and J. J. Alexander. 1974. Isolation of *Neisseria meningitidis* from the vagina and cervix. *J. Clin. Pathol.* 61:216-217.
14. Lowe, G. H. 1962. The rapid detection of lactose fermentation in paracolon organisms by the demonstration of beta-D-galactosidase. *J. Med. Lab. Tech.* 19:21.
15. Murray, E. G. D. 1939. Meningococcus infections of the male urogenital tract and the liability to confusion with gonococcus infection. *The Urol. Cutaneous Rev.* 43:739-741.
16. Schroeter, A. L. 1971. Gonorrhea: a 95% cure rate with single-dose antibiotic. *Med. Tribune* 12:1.