

Pyogenic and non-pyogenic streptococcal bacteraemias, England, Wales, and Northern Ireland: 2003

Key points:

- This report contains data from 2003, derived from routine laboratory reports of streptococcal bacteraemia* together with enhanced surveillance of group A streptococci derived from a combination of routine laboratory reporting and isolate referrals to the Health Protection Agency's Streptococcus and Diphtheria Reference Unit (SDRU)†.
- Reports of streptococcal bacteraemias from laboratories in England, Wales, and Northern Ireland in 2003 all increased from 2002: group A 1870, group B 1182, group C 257, group G 698, and non-pyogenics 3791. These continuing yearly increases are probably explained by improved ascertainment and the 2003 programme of enhanced surveillance for group A streptococci.
- Rates of both pyogenic and non-pyogenic streptococcal bacteraemia reports in males exceeded those for females across almost all age groups.
- An increasing proportion of reports were accompanied by susceptibility data in 2003 when compared to the previous two years, but reporting rates for antibiotic susceptibility results are still low for a number of streptococcal groups.
- Overall, there is not much change in resistance patterns for all mentioned streptococcal species groups compared to the previous year.
- As in 2001 and 2002, no penicillin resistance in pyogenic streptococci was confirmed in 2003.
- Erythromycin resistance in group C streptococci has increased from approximately 7% to 8% in 2001 and 2002, to 13% in 2003.
- Resistance to erythromycin has remained fairly constant in groups A, B, and G streptococci.
- High rates of tetracycline resistance were observed in group B streptococci (approximately 75%) as seen in other studies. This high rate remains, so far, unexplained, as pregnant/nursing women and children are not prescribed tetracycline.

*With the exception of *Streptococcus pneumoniae* which is reported separately.

†Enhanced surveillance of group A streptococci commenced January 2003.

Pyogenic streptococci Group A streptococci

Enhanced surveillance of severe invasive group A streptococcal infections was introduced in January 2003 (1). Group A streptococcal infections increased from 839 and 921 cases in 2001 and 2002, respectively, to 1870 in 2003 (an increase of 103% between 2002 and 2003) (2,3) (table 1). The rate of bacteraemia due to group A streptococci in England, Wales, and Northern Ireland in 2003 was 3.5 per 100,000 population, ranging from 2.8/100,000 in the East of England region to 6.3/100,000 in Yorkshire and Humberside (table 2). Resistance to penicillin was not found, while resistance to erythromycin (nationally) was between 3% and 4% over the three year period (table 3). Although the prevalence of resistance to tetracycline appeared to increase, from 10% in 2001, to 12% and 16% in 2002 and 2003, respectively, approximately half the reports

obtained in 2003 lacked data for tetracycline (tables 3 and 4).

Group B streptococci

Reports for bacteraemia due to group B streptococci have increased consistently for the past three years (table 1). Group B streptococcal bacteraemias were concentrated in the under 1 year age group, with rates of 57 and 54 per 100,000 population, for males and females respectively (figure 1). A total of 340 cases (229 early-onset disease and 111 late-onset disease) in infants aged under 90 days were reported during 2003 (table 5). The incidence rate per 1000 live births was 0.55 overall with a rate of 0.37 for early-onset and a rate of 0.18 for late-onset disease (table 5). Although the proportion of reports accompanied by susceptibility data increased between 2001 and 2003, there were, nonetheless, a substantial number of

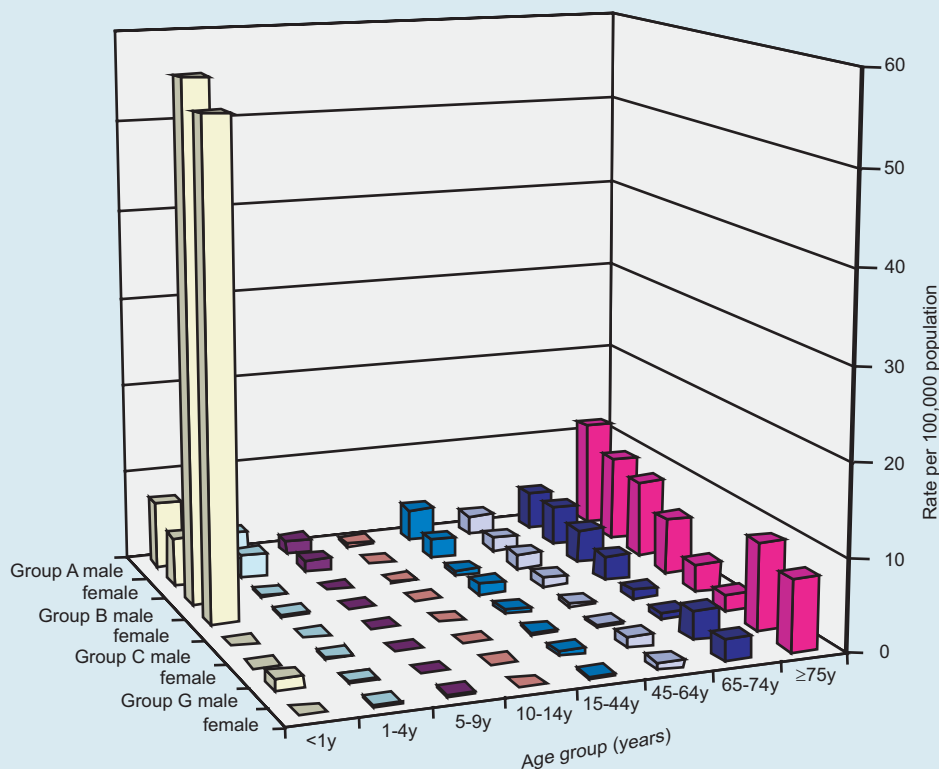
Table 1 Laboratory reports of streptococcal bacteraemia, England, Wales, and Northern Ireland: 2003				
<i>Streptococcus</i> spp*		2001	2002	2003
Pyogenic streptococci				
	group A streptococci	839	921	1870 [†]
	group B streptococci	898	991	1182
	group C streptococci	154	206	257
	group G streptococci	542	580	698
	Total	2433	2698	4007
'anginosus group'				
	<i>Streptococcus anginosus</i>	140	137	140
	<i>Streptococcus constellatus</i>	96	131	163
	<i>Streptococcus intermedius</i>	68	60	55
	' <i>Streptococcus milleri</i> group'	101	143	197
	<i>Streptococcus</i> group F	24	37	36
	Total	429	508	591
'bovis group'				
	<i>Streptococcus bovis</i>	138	185	175
	<i>Streptococcus bovis</i> biotype I	20	7	17
	<i>Streptococcus bovis</i> biotype II	12	12	14
	<i>Streptococcus equinus</i>	13	9	10
	<i>Streptococcus alactolyticus</i>	1	2	2
	Total	184	215	218
'mitis group'				
	<i>Streptococcus mitis</i>	10	20	26
	<i>Streptococcus mitior</i>	–	3	5
	<i>Streptococcus oralis</i>	227	239	295
	' <i>Streptococcus mitis</i> group'	461	483	624
	Total	698	745	950
'mutans group'				
	<i>Streptococcus mutans</i>	30	41	42
	Total	30	41	42
'salivarius group'				
	<i>Streptococcus salivarius</i>	121	168	155
	<i>Streptococcus vestibularis</i>	17	19	26
	Total	138	187	181
'sanguinis group'				
	<i>Streptococcus gordonii</i>	14	19	19
	<i>Streptococcus sanguinis</i>	7	14	4
	<i>Streptococcus parasanguinis</i>	23	46	61
	' <i>Streptococcus sanguinis</i> group'	179	198	215
	Total	223	277	299
Other streptococci				
	<i>Streptococcus acidominimus</i>	33	34	45
	<i>Streptococcus suis</i>	1	1	2
	<i>Streptococcus uberis</i>	5	5	3
	'anaerobic streptococcus'	40	43	38
	<i>Streptococcus</i> spp	856	1016	1422
	Total	935	1099	1510
Genera closely related to streptococci				
	<i>Abiotrophia</i> spp	4	3	11
	<i>Aerococcus</i> spp	–	–	77 [‡]
	<i>Gemella</i> spp	–	–	75 [‡]
	<i>Leuconostoc</i> spp	19	14	27
	<i>Pediococcus</i> spp	1	2	4
	Total	24	19	194
Grand total		5094	5789	7992

*Pyogenic streptococci have been grouped according to traditional Lancefield serological groupings; non-pyogenic streptococci grouped according to their biochemical and genetic properties and based on their current taxonomy.

[†]Commencement of enhanced surveillance - January 2003.

[‡]Data given for 2003 only.

All laboratory reports described refer to isolations of streptococci from blood culture, with or without related cerebrospinal fluid (CSF).

Figure 1 Age-specific rates of pyogenic streptococcal bacteraemia reports, England, Wales, and Northern Ireland: 2003

reports for which key susceptibilities were not reported (tables 3 and 6). Resistance to penicillin was not found, while resistance to erythromycin, nationally, increased from 5% in 2001 to 7% in 2003. Inter-region variation in erythromycin resistance was difficult to evaluate due to marked variation in the level of reporting (tables 3 and 6). The prevalence of resistance to tetracycline was $\geq 70\%$ with the exception of the North West (61%) (table 6).

Group C streptococci

Reports for bacteraemia due to group C streptococci showed a year-on-year increase between 2001 and 2003 (table 1). The rate of bacteraemia due to group C streptococci in England, Wales, and Northern Ireland in 2003 was 0.47/100,000 population, ranging from 0.12/100,000 in Northern Ireland to 1.08/100,000 in Yorkshire and Humberside (table 2). Resistance to penicillin was not found, while resistance to erythromycin, nationally, increased from 7% to 8% in 2001 and 2002 to 13% in 2003 (tables 3 and 7).

Group G streptococci

Reports of bacteraemia due to group G streptococci increased consistently between 2001 and 2003 (table 1). The rate of bacteraemia due to group G streptococci in England, Wales and Northern Ireland in 2003 was 1.3 per 100,000 population, ranging from 0.6 in London to 1.9 in the West Midlands (table 2). Resistance to penicillin was not found, while

resistance to erythromycin, nationally, remained fairly constant between 14% and 15% over the three year period (tables 3 and 8).

Non-pyogenic streptococci (excluding *Streptococcus pneumoniae*)

Reports of bacteraemias due to non-pyogenic streptococci have also increased consistently for the past three years (table 1). Reporting rates in England, Wales and Northern Ireland in 2003 ranged from 0.33/100,000 in the 'salivarius group' to 1.75/100,000 population in the 'mitis group' (table 9). Distribution of non-pyogenic streptococcal bacteraemia reports by age group and gender show a concentration in the youngest and oldest age groups, and among males compared to females (figure 2). Although the proportion of reports accompanied by susceptibility data has increased, there remains a large number of reports for which key susceptibilities have not been reported (table 10). This makes for difficulty in analysis of trends and comparison with data from previous years.

Discussion

The trend towards an increase in the number of pyogenic and non-pyogenic streptococcal bacteraemia reported by laboratories in 2001 and 2002 (2,3), continued in 2003. For group A streptococci, whose

	Group A (95% CI)	Group B (95% CI)	Group C (95% CI)	Group G (95% CI)
North East	3.30 (2.63-4.09)	3.10 (2.45-3.87)	0.68 (0.39-1.08)	0.76 (0.46-1.18)
Yorkshire & Humberside	6.26 (5.59-7.00)	3.25 (2.77-3.79)	1.08 (0.81-1.41)	1.71 (1.36-2.11)
East Midlands	3.53 (2.99-4.15)	2.30 (1.87-2.81)	0.31 (0.16-0.53)	1.61 (1.25-2.04)
Eastern	2.75 (2.33-3.23)	2.69 (2.27-3.17)	0.46 (0.30-0.68)	1.40 (1.10-1.75)
London	2.95 (2.57-3.37)	1.31 (1.06-1.59)	0.30 (0.19-0.45)	0.60 (0.43-0.80)
South East	2.97 (2.61-3.38)	1.70 (1.43-2.02)	0.32 (0.21-0.47)	1.06 (0.84-1.31)
South West	4.09 (3.55-4.70)	2.50 (2.08-2.98)	0.63 (0.42-0.89)	1.77 (1.42-2.19)
West Midlands	3.71 (3.21-4.27)	2.60 (2.19-3.07)	0.53 (0.35-0.76)	1.89 (1.53-2.29)
North West	3.01 (2.61-3.45)	1.69 (1.39-2.03)	0.49 (0.34-0.69)	1.05 (0.82-1.33)
England	3.54 (3.37-3.71)	2.20 (2.08-2.34)	0.50 (0.44-0.57)	1.28 (1.19-1.39)
Wales	2.54 (1.99-3.18)	1.23 (0.86-1.71)	0.21 (0.08-0.45)	1.71 (1.27-2.26)
Northern Ireland	2.59 (1.88-3.48)	3.18 (2.39-4.15)	0.12 (0.01-0.43)	0.65 (0.32-1.16)
England, Wales, and Northern Ireland	3.45 (3.30-3.61)	2.18 (2.06-2.31)	0.47 (0.42-0.54)	1.29 (1.19-1.39)

Rates were calculated using mid-year 2002 resident population estimates for England, Wales and Northern Ireland. Regional analyses were performed using the English regional boundaries introduced in 2002. CI= Confidence interval.

	2001			2002			2003		
	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)
Group A streptococci									
penicillin	571	– (–)	268 (32)	732	– (–)	189 (21)	1357	– (–)	513 (27)
erythromycin	535	24 (4)	304 (36)	634	22 (3)	287 (31)	1282	53 (4)	588 (31)
tetracycline	274	28 (10)	565 (67)	389	48 (12)	532 (58)	975	152 (16)	895 (48)
Group B streptococci									
penicillin	584	– (–)	314 (35)	724	– (–)	267 (27)	858	– (–)	324 (27)
erythromycin	559	29 (5)	339 (38)	656	43 (7)	335 (34)	797	57 (7)	385 (33)
tetracycline	279	195 (70)	619 (69)	391	274 (70)	600 (61)	516	389 (75)	666 (56)
Group C streptococci									
penicillin	103	– (–)	51 (33)	139	– (–)	67 (33)	188	– (–)	69 (27)
erythromycin	90	6 (7)	64 (42)	127	10 (8)	79 (38)	162	21 (13)	95 (37)
tetracycline	52	16 (31)	102 (66)	74	23 (31)	132 (64)	104	32 (31)	153 (60)
Group G streptococci									
penicillin	357	– (–)	185 (34)	458	– (–)	122 (21)	561	– (–)	137 (20)
erythromycin	338	47 (14)	204 (38)	422	65 (15)	158 (27)	521	80 (15)	177 (25)
tetracycline	195	84 (43)	347 (64)	247	120 (49)	333 (57)	328	162 (49)	370 (53)

*Calculated as a proportion of isolates with susceptibility data provided.

†Calculated as a percentage of total reports.

numbers increased by 103% between 2002 and 2003, the increase may largely reflect the introduction of enhanced surveillance, which commenced in January 2003 (1) and is reported on in *CDR Weekly* – Volume 14 number 16 (4). It has been shown that voluntary routine laboratory reporting may underestimate rates of bacteraemia by up to one third (5), thus a proportion

of the increase in group A streptococcal bacteraemias seen in 2003 will be due to increased ascertainment as a consequence of the inclusion of isolates referred to the Health Protection Agency's Streptococcus and Diphtheria Reference Unit (SDRU) as well as the routine laboratory reports used in previous years.

For the non-pyogenic streptococci, the largest

Table 4 Antibiotic susceptibility data for group A streptococcal bacteraemia reports: England, Wales, and Northern Ireland: 2003										
	Penicillin			Erythromycin			Tetracycline			
	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	
North East	52	- (-)	31 (37)	60	- (-)	23 (28)	40	4 (10)	43 (52)	
Yorkshire & Humberside	220	- (-)	92 (29)	172	4 (2)	140 (45)	133	32 (24)	179 (57)	
East Midlands	111	- (-)	38 (26)	106	3 (3)	43 (29)	98	19 (19)	51 (34)	
Eastern	136	- (-)	13 (9)	127	8 (6)	22 (15)	107	15 (14)	42 (28)	
London	142	- (-)	75 (35)	142	7 (5)	75 (35)	95	12 (13)	122 (56)	
South East	157	- (-)	82 (34)	148	4 (3)	91 (38)	125	15 (12)	114 (48)	
South West	152	- (-)	51 (25)	145	10 (7)	58 (29)	122	20 (16)	81 (40)	
West Midlands	159	- (-)	38 (19)	160	7 (4)	37 (19)	92	7 (8)	105 (53)	
North West	152	- (-)	51 (25)	148	4 (3)	55 (27)	91	21 (23)	112 (55)	
England	1281	- (-)	471 (27)	1208	47 (4)	544 (31)	903	145 (16)	849 (48)	
Wales	55	- (-)	19 (26)	54	5 (9)	20 (27)	51	3 (6)	23 (31)	
Northern Ireland	21	- (-)	23 (52)	20	1 (5)	24 (55)	21	4 (19)	23 (52)	
England, Wales, and Northern Ireland	1357	- (-)	513 (27)	1282	53 (4)	588 (31)	975	152 (16)	895 (48)	

*Calculated as a proportion of isolates with susceptibility data provided.

†Calculated as a percentage of total reports.

Table 5 Incidence of group B streptococcal bacteraemia in infants in England, Wales, and Northern Ireland: 2003							
Region	Live births 2002*	Total cases	Early-onset cases (0-6 days)	Late-onset cases (7-90 days)	Incidence per 1000 live births (95% CI)		
					Total	Early-onset	Late-onset
England & Wales	596,122	311	208	103	0.52 (0.47-0.58)	0.35 (0.30-0.40)	0.17 (0.14-0.21)
Northern Ireland	21,385	29	21	8	1.36 (0.91-1.95)	0.98 (0.61-1.50)	0.37 (0.16-0.74)
Total	617,507	340	229	111	0.55 (0.49-0.61)	0.37 (0.32-0.42)	0.18 (0.15-0.22)

*Incidence calculated using the number of live births in 2002 (data from ONS and Northern Ireland Statistics and Research Agency).

increase was for the 'mitis group', 28% between 2002 and 2003. This has been the largest of the non-pyogenic groups implicated in streptococcal bacteraemia in England and Wales for, at least, the last three years. In other parts of Europe, 'mitis group' organisms have also been shown to be the most numerous of the non-pyogenic streptococci in bloodstream infections (6).

An improvement in the number of reports of bacteraemia involving pyogenic streptococci that included antibiotic susceptibilities was seen in 2003 (89%, 76%, 77%, and 83% for groups A, B, C, and G, respectively) compared to 2002 (81%, 73%, 71%, and 81%) (3). These figures show, however, that there is

still a substantial proportion of susceptibility data not being submitted. Rates of resistance of pyogenic streptococci to erythromycin were in agreement with those found in the British Society for Antimicrobial Chemotherapy (BSAC) Bacteraemia Resistance Surveillance Programme in 2002 (7) for group B and group G streptococci; however, a higher rate was seen in group A streptococci in the BSAC programme (12% in 2002) than in the enhanced surveillance (4% in 2003). No group C data was publicly available for the BSAC programme. Rates of tetracycline resistance in the BSAC programme were consistently higher than those seen with routine laboratory reporting in both 2002 and 2003 of the routine laboratory reporting. BSAC

Table 6 Antibiotic susceptibility data for group B streptococcal bacteraemia reports, England, Wales, and Northern Ireland: 2003									
	Penicillin			Erythromycin			Tetracycline		
	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)
North East	43	- (-)	35 (45)	61	7 (11)	17 (22)	21	18 (86)	57 (73)
Yorkshire & Humberside	99	- (-)	63 (39)	75	3 (4)	87 (54)	52	40 (77)	110 (68)
East Midlands	79	- (-)	18 (19)	60	1 (2)	37 (38)	51	40 (78)	46 (47)
Eastern	142	- (-)	4 (3)	134	8 (6)	12 (8)	90	70 (78)	56 (38)
London	51	- (-)	45 (47)	48	6 (13)	48 (50)	30	24 (80)	66 (69)
South East	81	- (-)	56 (41)	75	7 (9)	62 (45)	54	38 (70)	83 (61)
South West	99	- (-)	25 (20)	94	8 (9)	30 (24)	80	64 (80)	44 (35)
West Midlands	113	- (-)	25 (18)	111	10 (9)	27 (20)	47	35 (74)	91 (66)
North West	95	- (-)	19 (17)	94	5 (5)	20 (18)	41	25 (61)	73 (64)
England	802	- (-)	290 (27)	752	55 (7)	340 (31)	466	354 (76)	626 (57)
Wales	26	- (-)	10 (28)	25	1 (4)	11 (31)	23	17 (74)	13 (36)
Northern Ireland	30	- (-)	24 (44)	20	1 (5)	34 (63)	27	18 (67)	27 (50)
England, Wales, and Northern Ireland	858	- (-)	324 (27)	797	57 (7)	385 (33)	516	389 (75)	666 (56)

*Calculated as a proportion of isolates with susceptibility data provided.

†Calculated as a percentage of total reports.

Table 7 Antibiotic susceptibility data for group C streptococcal bacteraemia reports: England, Wales, and Northern Ireland: 2003									
	Penicillin			Erythromycin			Tetracycline		
	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)
North East	7	- (-)	10 (59)	9	- (-)	8 (47)	-	- (-)	17 (100)
Yorkshire & Humberside	36	- (-)	18 (33)	22	1 (5)	32 (59)	19	7 (37)	35 (65)
East Midlands	12	- (-)	1 (8)	9	- (-)	4 (31)	7	4 (57)	6 (46)
Eastern	24	- (-)	1 (4)	20	5 (25)	5 (20)	16	3 (19)	9 (36)
London	15	- (-)	7 (32)	14	3 (21)	8 (36)	7	1 (14)	15 (68)
South East	14	- (-)	12 (46)	13	2 (15)	13 (50)	10	3 (30)	16 (62)
South West	26	- (-)	5 (16)	23	3 (13)	8 (26)	16	5 (31)	15 (48)
West Midlands	20	- (-)	8 (29)	22	4 (18)	6 (21)	15	6 (40)	13 (46)
North West	29	- (-)	4 (12)	25	2 (8)	8 (24)	9	2 (22)	24 (73)
England	183	- (-)	66 (27)	157	20 (13)	92 (37)	99	31 (31)	150 (60)
Wales	5	- (-)	1 (17)	5	1 (20)	1 (17)	5	1 (20)	1 (17)
Northern Ireland	-	- (-)	2 (100)	-	- (-)	2 (100)	-	- (-)	2 (100)
England, Wales, and Northern Ireland	188	- (-)	69 (27)	162	21 (13)	95 (37)	104	32 (31)	153 (60)

*Calculated as a proportion of isolates with susceptibility data provided.

†Calculated as a percentage of total reports.

	Penicillin			Erythromycin			Tetracycline		
	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)	No. with susceptibility data	Resistant (%*)	No Information (%†)
North East	15	- (-)	4 (21)	17	3 (18)	2 (11)	8	6 (75)	11 (58)
Yorkshire & Humberside	58	- (-)	27 (32)	43	8 (19)	42 (49)	30	20 (67)	55 (65)
East Midlands	61	- (-)	8 (12)	55	10 (18)	14 (20)	44	23 (52)	25 (36)
Eastern	73	- (-)	3 (4)	67	11 (16)	9 (12)	43	11 (26)	33 (43)
London	31	- (-)	13 (30)	30	6 (20)	14 (32)	14	5 (36)	30 (68)
South East	63	- (-)	22 (26)	59	8 (14)	26 (31)	44	21 (48)	41 (48)
South West	75	- (-)	13 (15)	66	11 (17)	22 (25)	55	29 (53)	33 (37)
West Midlands	82	- (-)	18 (18)	87	15 (17)	13 (13)	35	23 (66)	65 (65)
North West	58	- (-)	13 (18)	56	3 (5)	15 (21)	22	9 (41)	49 (69)
England	516	- (-)	121 (19)	480	75 (16)	157 (25)	295	147 (50)	342 (54)
Wales	39	- (-)	11 (22)	37	5 (14)	13 (26)	27	12 (44)	23 (46)
Northern Ireland	6	- (-)	5 (45)	4	- (-)	7 (64)	6	3 (50)	5 (45)
England, Wales, and Northern Ireland	561	- (-)	137 (20)	521	80 (15)	177 (25)	328	162 (49)	370 (53)

*Calculated as a proportion of isolates with susceptibility data provided.

†Calculated as a percentage of total reports.

	'Anginosus Group'		'Bovis Group'		'Mitis Group'		'Salivarius Group'		'Sanguis Group'	
		(95% CI)		(95% CI)		(95% CI)		(95% CI)		(95% CI)
North East	1.23	(0.84-1.75)	0.64	(0.39-1.03)	3.22	(2.56-4.01)	0.28	(0.11-0.57)	0.68	(0.39-1.08)
Yorkshire & Humberside	1.55	(1.22-1.93)	0.44	(0.28-0.67)	1.69	(1.34-2.09)	0.18	(0.08-0.34)	0.56	(0.37-0.81)
East Midlands	1.40	(1.07-1.81)	0.43	(0.25-0.67)	1.28	(0.96-1.67)	0.36	(0.20-0.59)	0.45	(0.27-0.70)
Eastern	1.07	(0.81-1.38)	0.39	(0.24-0.59)	1.40	(1.10-1.75)	0.39	(0.24-0.59)	0.90	(0.67-1.20)
London	0.80	(0.61-1.03)	0.20	(0.11-0.34)	1.14	(0.91-1.41)	0.19	(0.10-0.32)	0.22	(0.12-0.35)
South East	0.68	(0.52-0.89)	0.29	(0.18-0.43)	1.34	(1.10-1.62)	0.32	(0.21-0.47)	0.41	(0.28-0.58)
South West	1.51	(1.19-1.90)	0.54	(0.36-0.79)	1.77	(1.42-2.19)	0.44	(0.28-0.67)	0.73	(0.51-1.00)
West Midlands	1.24	(0.96-1.58)	0.45	(0.29-0.67)	2.39	(2.00-2.85)	0.41	(0.26-0.63)	0.75	(0.54-1.03)
North West	1.07	(0.83-1.34)	0.44	(0.30-0.63)	2.99	(2.59-3.44)	0.55	(0.39-0.76)	0.59	(0.42-0.81)
England	1.11	(1.02-1.21)	0.40	(0.34-0.46)	1.82	(1.71-1.95)	0.35	(0.30-0.41)	0.56	(0.50-0.63)
Wales	0.79	(0.50-1.18)	0.45	(0.24-0.76)	0.93	(0.61-1.35)	0.07	(0.01-0.25)	0.48	(0.26-0.80)
Northern Ireland	0.94	(0.54-1.53)	0.53	(0.24-1.01)	1.12	(0.67-1.75)	0.35	(0.13-0.77)	0.41	(0.17-0.85)
England, Wales, and Northern Ireland	1.09	1.01-1.18	0.40	0.35-0.46	1.75	1.64-1.87	0.33	0.29-0.39	0.55	0.49-0.62

Rates were calculated using mid-year 2002 resident population estimates for England, Wales and Northern Ireland.

Regional analyses were performed using the English regional boundaries introduced in 2002.

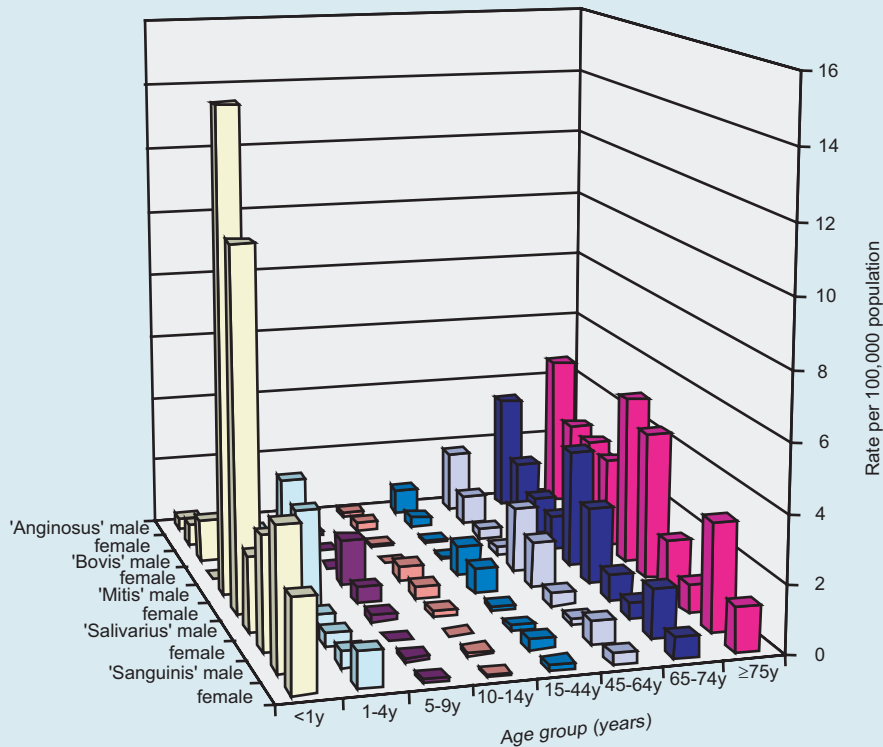
CI= Confidence interval.

rates of tetracycline resistance in 2002 were 21%, 83% and 65% for group A, B, and G streptococci, respectively, compared to 16%, 75%, and 49% in routine reporting. The high rate of tetracycline resistance seen in group B streptococci has been seen in previous years, and other studies, but remains, so far, unexplained and warrants

further investigation, as pregnant/nursing women and children are not prescribed tetracycline.

Group A streptococcal bacteraemias are known to have occurred in injecting drug users in England and Wales, primarily young male adults (8). In 2003, the rate of group A bacteraemias for those adults in the

Figure 2 Age-specific rates of non-pyogenic streptococcal bacteraemia reports, England, Wales, and Northern Ireland: 2003



15 to 44 years age group was greater than in the 45 to 64 years age group, with a greater incidence in males than females. Also of interest is the incidence of group B streptococcal bacteraemia in females aged from 15 to 44 years, which was twice that of their male counterparts in the same age group, and higher than that of females aged between 45 and 64 years. This increase possibly relates to the carriage of these organisms in the genital tract of women of child-bearing age. The incidence of group B streptococcal bacteraemia was by far the greatest in infants aged under 1 year. A recent publication in the *Lancet* (9) highlights the importance of group B streptococcal disease in infants aged under 90 days, citing incidence rates which are generally higher than those seen here. It may be that the rates presented in table 7 are an underestimation of the true incidence of the disease due to the voluntary nature of the reporting, as discussed previously.

The non-pyogenic streptococci showed fewer similarities in resistance rates than the pyogenic groups when 2003 data was compared to 2002 data. Antibiotic susceptibility information was received for 66% to 73% of reports, depending on the group. This is a great improvement from 2002, where susceptibility data was received for between 44% and 63% of reports (3). The changes in resistance rates seen could therefore relate to the increase in susceptibility information reported for isolates in 2003 compared to 2002, which may be improving the accuracy of susceptibility information. Rates of penicillin resistance vary

between the non-pyogenic groups, ranging from 3% in the 'anginosus group' to 22% in the 'salivarius' group. Other studies undertaken in Europe grouping all non-pyogenic streptococci together have found penicillin resistance rates of approximately 29% (6,10). Rates of erythromycin resistance also vary between the non-pyogenic groups, ranging from 7% in the 'anginosus group' to 36% in the 'mitis group'. The aforementioned European studies reported erythromycin resistance rates between 26% and 27%, a rate which falls within the range reported here.

There were no penicillin-resistant group A, B, C, or G streptococcal bacteraemias confirmed in 2003. Laboratories are reminded that any pyogenic streptococcal isolates exhibiting a decreased sensitivity to penicillin or suspected resistance should be sent to the Health Protection Agency's Antibiotic Resistance Monitoring and Reference Laboratory (ARMRL) for confirmation. Any streptococci (both pyogenic and non-pyogenic) with suspected glycopeptide or linezolid resistance should also be referred for further investigation.

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Table 10 Antibiotic susceptibility data for non-pyogenic streptococcal bacteraemia reports, England, Wales, and Northern Ireland: 2001-2003

	2001				2002				2003			
	No. with susceptibility data	Resistant (%*)		No. Information (%†)	No. with susceptibility data	Resistant (%*)		No. Information (%†)	No. with susceptibility data	Resistant (%*)		No. Information (%†)
Anginosus' group												
penicillin	86	1	(1)	343 (80)	290	4	(1)	218 (43)	403	13	(3)	188 (32)
amoxycillin/ampicillin	58	–	(–)	371 (86)	167	3	(2)	341 (67)	240	1	(0.4)	351 (59)
erythromycin	80	2	(3)	349 (81)	256	21	(8)	252 (50)	355	26	(7)	26 (40)
tetracycline	48	6	(13)	381 (89)	137	22	(16)	371 (73)	207	34	(16)	383 (65)
Bovis' group												
penicillin	59	1	(2)	370 (86)	122	6	(5)	386 (76)	129	8	(6)	89 (41)
amoxycillin/ampicillin	54	1	(2)	130 (71)	106	2	(2)	109 (51)	102	–	(–)	116 (53)
erythromycin	52	13	(25)	132 (72)	106	19	(18)	109 (51)	113	15	(13)	105 (48)
tetracycline	26	20	(77)	158 (86)	59	36	(61)	156 (73)	67	38	(57)	151 (69)
Mitis' group												
penicillin	164	33	(20)	265 (62)	370	73	(20)	138 (27)	605	127	(21)	345 (36)
amoxycillin/ampicillin	125	7	(6)	573 (82)	255	12	(5)	490 (66)	409	34	(8)	541 (57)
erythromycin	152	43	(28)	546 (78)	340	123	(36)	405 (54)	564	204	(36)	386 (41)
tetracycline	66	22	(33)	632 (91)	166	39	(23)	579 (78)	320	91	(28)	630 (66)
Salivarius' group												
penicillin	41	11	(27)	388 (90)	78	14	(18)	430 (85)	119	26	(22)	62 (34)
amoxycillin/ampicillin	29	1	(3)	109 (79)	49	2	(4)	138 (74)	87	–	(–)	94 (52)
erythromycin	39	12	(31)	99 (72)	68	18	(26)	119 (64)	108	20	(19)	73 (40)
tetracycline	20	2	(10)	118 (86)	36	2	(6)	151 (81)	73	16	(22)	108 (60)
Sanguinis' group												
penicillin	58	9	(16)	371 (86)	148	35	(24)	360 (71)	204	39	(19)	95 (32)
amoxycillin/ampicillin	47	3	(6)	176 (79)	97	7	(7)	180 (65)	132	7	(5)	167 (56)
erythromycin	53	8	(15)	170 (76)	126	40	(32)	151 (55)	174	48	(28)	125 (42)
tetracycline	28	5	(18)	195 (87)	67	17	(25)	210 (76)	122	32	(26)	177 (59)

*Calculated as a proportion of isolates with susceptibility data provided

†Calculated as a percentage of total reports

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