CMPT Clinical Microbiology Program

Innovation, Education, Quality Assessment, Continual Improvement

Challenge M091-1

May 2009

Throat swab: group G streptococcus

HISTORY

This sample simulated a throat swab from a 5 year old boy with pharyngitis.

The sample was sent to category A, B, and C laboratories. The expected result was that group G Streptococcus would be reported.

CMPT QA

The sample yielded 4+ group G streptococcus, and 4+ *Moraxella catarrhalis*. The culture was viable for 10 days.

SURVEY RESULTS

The challenge was suitable for grading as 93% (14/15) of the reference laboratories reported "group G streptococcus". One reference laboratory reported "no group A streptococcus" only.

The majority of laboratories (98%) processed the sample. Only 3 laboratories indicated the sample would not normally be processed. As shown in Table 1, 92% (95% A, 87% B and 86% C) of the reporting laboratories correctly identified the organism in the culture as group G streptococcus.

These results show a significant improvement from the last time this organism was sent out, M022-1, in which an average of 67% of the laboratories correctly reported group G streptococcus.

Of those laboratories reporting group G streptococcus, 33% also reported absence of group A streptococcus and 32% commented on the clinical significance of the isolate.

One laboratory obtained positive results for group G with the streptococcus antigen agglutination test but reported only "no group A streptococcus" without any other comment.

Two laboratory performed antigen agglutination testing for A, C and G groups with negative results; one of which reported *S. dysgalactiae* ssp *equisimilis*.

It is recommended that reference Streptococcal strains be used when performing quality control procedures for antigen agglutination kits to prevent false positive or negative results.

Two laboratories commented that is not in their current protocols to report other than for the presence or absence of group A streptococcus. However, one of the labs reported group G streptococcus for this challenge.

Grading

Maximum grade = 4

Laboratories that reported group G streptococcus were awarded a grade of 4.

Reporting beta hemolytic streptococcus only without further referring the sample was given a grade of 1.

Laboratories that mentioned they would refer the sample for further testing were awarded a grade of 4.

Laboratories reporting group A streptococcus were given a grade of zero.

Laboratories that tested for group G streptococcus and obtained negative results were graded zero.

Table 1: Results M091-1 group G streptococcus challenge

Reported results	A labs	B labs	C labs	%	Grade
group G streptococcus	**72**	**26**	**12**	**92**	**4**
group G streptococcus alone	51	18	5	61	**4**
group G streptococcus, no group A strept. +/- *A.haemolyticum*	21	8	7	31	**4**
no group A streptococcus isolated	**3**	**2**	**0**	**3**	**1**
no group A or C isolated	**0**	**1**	**0**	**1**	**1**
group A streptococcus	**0**	**1**	**0**	**1**	**0**
no group A, C or G streptococcus isolated	**1**	**0**	**0**	**1**	**0**
beta hemolytic streptococcus, not group A, refer +/- referred for C&G typing	**0**	**1**	**2**	**2**	**4**
S.dysgalactiae ssp equisimilis, no group A, B, C, D, F, G isolated	**1**	**0**	**0**	**1**	**0**
snnp	**1**	**0**	**1**	n/a	**ungraded**
Total	**78**	**31**	**15**		

snnp: specimen not normally processed

IDENTIFICATION

Streptococcus species from the pyogenic or beta-hemolytic group are further characterized by the presence of Lancefield antigens.

Culture isolation

Throat swabs are generally plated onto 5% blood agar, or on media selective for beta-hemolytic streptococci, in CO_2 for 24-48 hrs at 35°C [1] .Beta hemolytic streptococci of the pyogenic group (*S. pyogenes, S. agalactiae*, and *S. dysgalactiae* sbsp. *equisimilis*) form large (>0.5mm) beta-hemolytic colonies on sheep blood agar. In contrast, the beta-hemolytic strains of the *S. anginosus* group are small and appear as pinpoint colonies of <0.5mm.

Identification methods

S. pyogenes can be presumptively identified with bacitracin or Taxo A discs and/or testing for pyrolidonyl aminopeptidase (PYR) activity. *S. pyogenes* is susceptible to bacitracin and is PYR positive. Group C or G streptococci are resistant to bacitracin and are PYR negative.

Definitive identification includes the demonstration of the Lancefield group C or G by immunoassay. The Voges-Proskauer (VP) test can differentiate *S. anginosus* group, VP positive, from *S. dysgalactiae* subsp *equisimilis* (associated with pharyngitis), which is VP negative[1].

The CAMP test differentiates *S. dysgalactiae* subsp *equisimilis* (CAMP negative) from *S. canis* (CAMP positive), which is only rarely isolated from humans.

ANTIMICROBIAL SUSCEPTIBILITY

Penicillin remains the drug of choice for the treatment of streptococcal infections due to beta-hemolytic streptococci.

Reports of penicillin resistant strains of beta-hemolytic streptococci have not been confirmed. However, there have been case reports of treatment failure with penicillin due to penicillin's lack of intracellular activity [9].

In the event of penicillin therapeutic failure, treatment with antibiotics having both extra and intra-cellular activity such as clarithromycin have been shown to be effective.[8]

Furthermore, macrolides are often given as alternative treatment for patients with penicillin allergies, which occurs in ~ 10% of patients.

The SENTRY Antimicrobial Surveillance Program evaluated the resistance rates of β-hemolytic streptococci to several drug classes including erythromycin and clindamycin during 2001[3]. The study showed all isolates were susceptible to β-lactams, linezolid, vancomycin, chloramphenicol and fluoroquinolones. Tetracycline was inactive against group B streptococcus. Only 14.8% of group B streptococcus strains were susceptible to tetracycline compared to 48.9% to 85.6% susceptibility rates for β-hemolytic groups A, C, G and F streptococci .

CLINICAL RELEVANCE

Group G streptococci may colonize the nasopharynx, skin and genital tract. The clinical spectrum of disease caused by group G streptococcus resembles infections caused by group A streptococcus (*S. pyogenes*). Both group A & G streptococci are associated with upper respiratory tract infections and invasive infections such as necrotizing fasciitis, STSS, bacteremia, and endocarditis[1].

Outbreaks of group C streptococci (GCS) and group G β-haemolytic streptococci (GGS) acute pharyngitis in children have been documented[5], but the importance of these organisms in causing endemic or sporadic pharyngitis is uncertain.

Cimolai *et al*[6] showed statistically significant association between large-colony-forming GCS and GGS in children with pharyngitis only when comparison was limited to moderate or heavy growth of these streptococci as determined by semiquantitative culture methods.

Zaoutis *et* al[7] showed a low prevalence of large-colony-forming GCS and GGS in a large cohort of children who presented with acute pharyngitis. The rate of isolation of these organisms in this setting is low (3%), which suggests GCS and GGS would represent an uncommon cause in the population of children studied.

The Committee recommends that all Proficiency Testing samples should be processed as routine samples even when there is a staff shortage or high workload.

Investigators in Australia reported a high carriage rate of GCS and GGS in an Aboriginal population that had a high rate of rheumatic fever, but a low incidence of group A streptococcal disease.

It was demonstrated *in vitro* that GCS and GGS have the potential to elicit an autoimmune response that may trigger acute rheumatic fever[4].

However, rigorous studies on preceding GCS and GGS infections in patients with rheumatic fever have not been performed. If such an association were found, the clinical significance of the low rate of large-colony-forming GCS and GGS would need to be re-evaluated.

REFERENCES

1. Murray, P.R., Baron, E. J., Jorgensen, J.J.,Landry ML,. and Pfaller, M.A., . Manual of Clinical Microbiology, 9th ed. ASM Press: Washington, DC, 2007.
2. IDSA GUIDELINES Practice Guidelines for the Diagnosis and Management of Group A Streptococcal Pharyngitis Clinical Infectious Diseases 2002;35:113–125
3. Douglas J. Biedenbach, Jennifer M. Stephen, and Ronald N. Jones. Antimicrobial susceptibility profile among β-haemolytic Streptococcus spp. collected in the SENTRY antimicrobial surveillance program—North America, 2001 Diag. Microb. and Inf. Dis.2003.Vol 46, (4), pp 291-294
4. Haidan A, Talay SR, Rohde M et al. Pharyngeal carriage of group C and group G streptococci and acute rheumatic fever in an Aboriginal population. Lancet 2000; 356: 1167–1169
5. Gerber MA, Randolph MF, Martin NJ et al. Community-wide outbreak of group G streptococcal pharyngitis. Pediatrics 1991; 87: 598–603.
6. Cimolai N, Morrison BJ, MacCullogh L, Smith DF, Hlady J. Beta-haemolytic non-group A streptococci and pharyngitis: a case control study. Eur J Pediatr 1991; 150: 776–779
7. Zaoutis T, Attia M, Gross R, Klein J.The role of group C and group G streptococci in acute pharyngitis in children. Clin Microbiol Infect. 2004 Jan;10(1):37-40
8. CMPT Critique M022-1 August 2002. Throat: Group G streptococci
9. S.H. Gillespie, Failure of penicillin in *Streptococcus pyogenes* pharyngeal infection. *Lancet* 352 (1998), pp. 1954–1956