Antimicrobial Stewardship Strategy:
Strategic microbiology results reporting

The use of strategic and selective culture and susceptibility reporting and inclusion of interpretive comments to help clinicians better understand culture results and direct appropriate and cost-effective antimicrobial prescribing.

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Priority Level: **B**

Difficulty Level: **3**

Program Stage:

- Early
- Intermediate
- ✓ Advanced

For more information on these criteria and how they were developed, please see the Antimicrobial Stewardship Strategy Criteria Reference Guide.

Description

This is an overview and not intended to be an all-inclusive summary. As a general principle, patients must be monitored by the health care team after changes to therapy resulting from recommendations made by the antimicrobial stewardship team.

The reporting of microbiology results can have a significant influence on antimicrobial selection; in this way, the microbiologist and microbiology laboratory can play an important role in antimicrobial stewardship. The use of strategic and selective culture and susceptibility reporting, as well as provision of interpretive comments, can help clinicians choose appropriate cost-effective therapy and better understand culture results. Cascade reporting is one type of selective microbiologic reporting, and is covered as a separate strategy (see *Cascading microbiology susceptibility reporting*).

The addition of comments on microbiology laboratory reports has been used to draw attention to a certain action (e.g., preferred use of a beta-lactam over vancomycin for methicillin-susceptible *Staphylococcus aureus*; addition of an aminoglycoside to ampicillin or vancomycin to treat serious enterococcal infections) or to provide interpretation of a result (e.g., result likely represents contamination; therapy likely not required).

The reporting of susceptibility results may be selective to encourage optimal therapy, such as not reporting susceptibility results for *Enterobacter* species to cephalosporins, or not reporting rifampin susceptibility for *Staphylococcus aureus* to avoid its use as monotherapy.

Additional examples of strategic or selective reporting include the following:

- Suppression of fluoroquinolone results on susceptibility reports for children.
- Suppression of first- and second-generation cephalosporin susceptibility for isolates from cerebrospinal fluid (not indicated for central nervous system infections).
- Suppression of the susceptibility of macrolides and clindamycin for *Staphylococcus aureus* isolated from blood cultures (these agents are bacteriostatic and are not recommended for *Staphylococcus aureus* bacteremia).
- Comments about potential culture contaminants (e.g., coagulase negative staphylococcus or cornyneforms as normal skin flora, contaminated urine culture when growth of three or more organisms).
- Comments about the number of days it took an organism to grow or growth in enriched broth media only, to aid in interpretation of significance as pathogen versus contaminant.
- Not reporting susceptibilities on surveillance cultures.

Decisions about strategic reporting should be made collaboratively by the microbiologist and the antimicrobial stewardship team. It is important to ensure that any comments added to the reports are written clearly to reduce the chance of misinterpretation by the end user.

Advantages

- Gives clinicians guidance for appropriate prescribing based on culture results.
- Decreases risk of inappropriate/reactive prescribing (e.g., treating asymptomatic bacteriuria or skin flora contamination of a sample).
- Can direct prescribers to narrower agents to which the isolate is susceptible.

Disadvantages

- Potential to misguide prescribers, as information provided will apply to the majority but may not be applicable in specific cases (e.g., “no significant growth” does not mean no growth and may be clinically relevant in a patient who received antimicrobials before the culture was taken).

Requirements

- Cooperation/collaboration with the microbiology laboratory to develop and review comments and criteria for when they should appear on the culture report.
- Information technology infrastructure and/or laboratory human resources to add comments to reports based on criteria.
- Education of prescribers and pharmacists to ensure that the implications of the reporting methods and the interpretations of the comments on microbiology reports are understood.
- Initial and ongoing education for laboratory technologists to address questions or concerns about reporting methods and comments on microbiology reports.

Associated Metrics

- Audit of prescribing practices relative to the comment or strategy implemented (important to assess whether prescribing is concordant with recommendations and also the safety of the intervention).

Useful References

Select articles to provide supplemental information and insight into the strategy described and/or examples of how the strategy was applied; not a comprehensive reference list. URLs are provided when materials are freely available on the Internet.

- Cunney RJ, Smyth EG. The impact of laboratory reporting practice on antibiotic utilisation. Int J Antimicrob Agents. 2000;14(1):13-9.
- Leis JA, Rebick GW, Daneman N, Gold WL, Poutanen SM, Lo P, et al. Reducing antimicrobial therapy for asymptomatic bacteriuria among noncatheterized inpatients: a proof-of-concept study. Clin Infect Dis. 2014;58(7):980–3. Available from*:* http://cid.oxfordjournals.org/content/58/7/980.long

  Provides a good example of how strategic reporting can influence prescribing and the associated audit to ensure no harm.
- Kuper KM, Boles DM, Mohr JF, Wanger A. Antimicrobial susceptibility testing: a primer for clinicians. Pharmacotherapy 2009;29(11):1326–43.

  Describes the common antimicrobial susceptibility tests used in the clinical microbiology laboratory and reviews how subtle differences in testing methods and technique can influence reported results.

Tools and Resources

- Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing; twenty-fifth informational supplement. Wayne, PA: CLSI; 2015. CLSI document M100-S25.
- Quality Management Program—Laboratory Services. Consensus practice recommendations—antimicrobial susceptibility reporting on bacteriology. Toronto, ON: QMP-LS QView. c2011.

Samples/Examples

- Example 1: Sunnybrook Health Sciences Centre Department of Microbiology - Reporting Possible Contaminants in Blood Cultures
- Example 2: Sunnybrook Health Sciences Centre Department of Microbiology - Antibiotic Susceptibility Testing Glossary of Codes

- Example 3: Markham Stouffville Hospital Corporation - Examples of Microbiology Reports Containing Strategic Result Reporting Comments

These documents have been generously shared by various health care institutions to help others develop and build their antimicrobial stewardship programs. We recommend crediting an institution when adopting a specific tool/form/pathway in its original form.

Examples that contain clinical or therapeutic recommendations may not necessarily be consistent with published guidelines, or be appropriate or directly applicable to other institutions. All examples should be considered in the context of the institution's population, setting and local antibiogram.

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Links with Other Strategies

- Cascading microbiology susceptibility reporting

Disclaimer

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: Strategic microbiology results reporting. Toronto, ON: Queen's Printer for Ontario; 2016.

For further information

Antimicrobial Stewardship Program, Infection Prevention and Control, Public Health Ontario.

Email: asp@oahpp.ca

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Example 1: Sunnybrook Health Sciences Centre Department of Microbiology - Reporting Possible Contaminants in Blood Cultures

Sunnybrook HEALTH SCIENCES CENTRE Site Distribution: SB Copy Location:	Department of Microbiology **Microbiology**	MIC-5.5.5.3.1 Version: 1.4 Page 1 of 2 Effective: 2012/08/20 E-Authorized by: Medical Chief, Microbiology

Reporting Possible Contaminants in Blood Cultures

Possible contaminants may include coagulase negative staphylococci, viridans streptococci, aerobic spore-forming bacilli, *Corynebacterium* species, *Propionibacterium* species, and *Micrococcus* species.

Note: For Paediatric blood cultures *Bacillus cereus* must be ruled out when an aerobic spore-forming bacilli is isolated.

Result Reporting

1. One set received:

For coagulase negative staphylococcus and viridans streptococcus :

……isolated after….days. Only one blood culture set received.
Possible contaminant. Further work up will be done on specific request.
(Text Code: **ONED**)

For other organisms :

……..isolated after….days. Only one blood culture set received.
Possible contaminant.
(Text Code: **ONEC**)

2. Two or more strains from one set only (based on colonial morphology):

For all organisms:

……isolated after….days. 2 types. Possible contaminants.
(Text Code: **TWOC**)

3. Two or more sets received (One set positive out of two or three):

For all organisms:

……isolated after….days from one blood culture set only. Possible contaminant.
(Text Code: **ONEO- PSBC**)

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Example 1: Sunnybrook Health Sciences Centre Department of Microbiology - Reporting Possible Contaminants in Blood Cultures (continued)

Sunnybrook HEALTH SCIENCES CENTRE Site Distribution: SB Copy Location:	Department of Microbiology **Microbiology**	MIC-5.5.5.3.1 Version: 1.4 Page 2 of 2 Effective: 2012/08/20 E-Authorized by: Medical Chief, Microbiology

Reporting Possible Contaminants in Blood Cultures

4. Different strains from each of two or more sets:

For all organisms:

……isolated after….days. Possible contaminant(s). This isolate is different from accession # .....
(Text Code: **PSBC - ISODF**)

5. Paediatric blood cultures

For all organisms:

……isolated after…….days. Possible contaminant(s). Further work up will be done only on specific request.
(Test Code: **ONEP**)

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Example 2: Sunnybrook Health Sciences Centre Department of Microbiology - Antibiotic Susceptibility Testing Glossary of Codes

Sunnybrook HEALTH SCIENCES CENTRE Site Distribution: SB Copy Location:	Department of Microbiology **Microbiology**	MIC-5.5.15.1.1.0 Version:13.0 Page 1 of 2 Effective: 2015/06/11 E-Authorized by: Medical Chief, Microbiology

Antibiotic Susceptibility Testing

Glossary of Codes

AMPC: This organism is resistant to all penicillins, beta-lactamase inhibitors and all cephalosporins.

ASTND: Unable to perform antibiotic susceptibility tests due to poor growth on all AST Media.

BHSP: Beta-haemolytic streptococci are empirically susceptible to Penicillin.

BORSA: This strain shows borderline oxacillin resistance. If advice on therapy is required, please contact the microbiologist.

CREP2: This organism is resistant to all penicillins, beta-lactamase inhibitors, all cephalosporins and carbapenems.

CORAST: Interpretations are based on achievable blood levels, not on achievable ocular levels.

CPO: This organism produces carbapenemase.

CSYNR: Gentamicin resistant result indicates it will not provide synergy with a Penicillin.

ENTFLG: The majority of Enterococcus faecalis are usually susceptible to Ampicillin.

ENTFLU: The majority of Enterococcus faecalis are usually susceptible to Ampicillin and Nitrofurantoin.

Free text: For Enterococcus species, other than E. faecalis and E.faecium:

Urines: Enterococcus species are usually susceptible to Ampicillin and Nitrofurantoin.
Others (including neonatal urines): Enterococcus species are usually susceptible to Ampicillin.

ESBLP2: This organism is resistant to all penicillins, beta-lactamase inhibitors and all cephalosporins.

GNARO: Resistance to all penicillins, beta-lactamase inhibitors and cephalosporins may develop during therapy with these agents.

IRFLU: This organism is intrinsically resistant to Fluconazole.

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Example 2: Sunnybrook Health Sciences Centre Department of Microbiology - Antibiotic Susceptibility Testing Glossary of Codes (continued)

Sunnybrook HEALTH SCIENCES CENTRE Site Distribution: SB Copy Location:	Department of Microbiology **Microbiology**	MIC-5.5.15.1.1.0 Version:13.0 Page 2 of 2 Effective: 2015/06/11 E-Authorized by: Medical Chief, Microbiology

Antibiotic Susceptibility Testing

LISTS: Listeria species are predictably susceptible to Ampicillin and Penicillin.

MOR2: Moraxella species are empirically susceptible to Penicillin.

MSEN: Moraxella (Branhamella) catarrhalis is predictably susceptible to cephalosporins, sulphamethoxazole/trimethoprim, erythromycin and ciprofloxacin.

NOCLSI: No clinical data available to assist in interpretation of MIC results. There is no current CLSI standard testing protocol for this organism and drug combination.

NOIVS: Susceptibility testing for this organism is unreliable. If advice on therapy is required contact the microbiologist.

PCSP: Pasteurella canis is empirically susceptible to Ampicillin and Penicillin

PMSP: Pasteurella multocida is empirically susceptible to Ampicillin and Penicillin.

SSAPU: Staphylococcus saprophyticus is empirically susceptible to urinary concentrations of Nitrofurantoin, sulphamethoxazole/trimethoprim and fluoroquinolones.

STANP: Streptococcus anginosus group are usually susceptible to Penicillin.

SUSM: Susceptibility interpretation based on meningeal infection.

SUSNM: Susceptibility interpretation based on non-meningeal infection.

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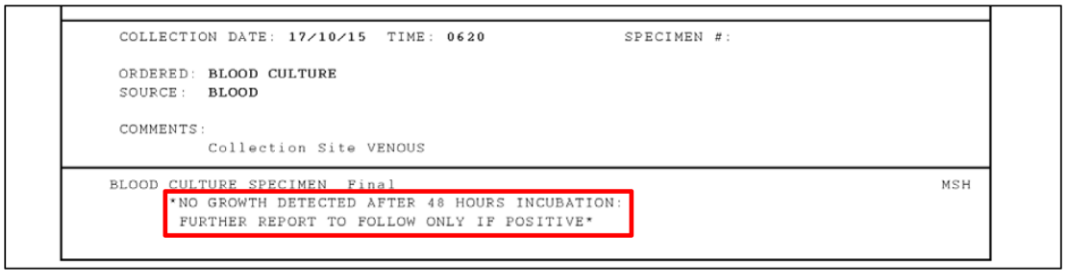
Example 3: Markham Stouffville Hospital Corporation - Microbiology Reports Containing Strategic Result Reporting Comments

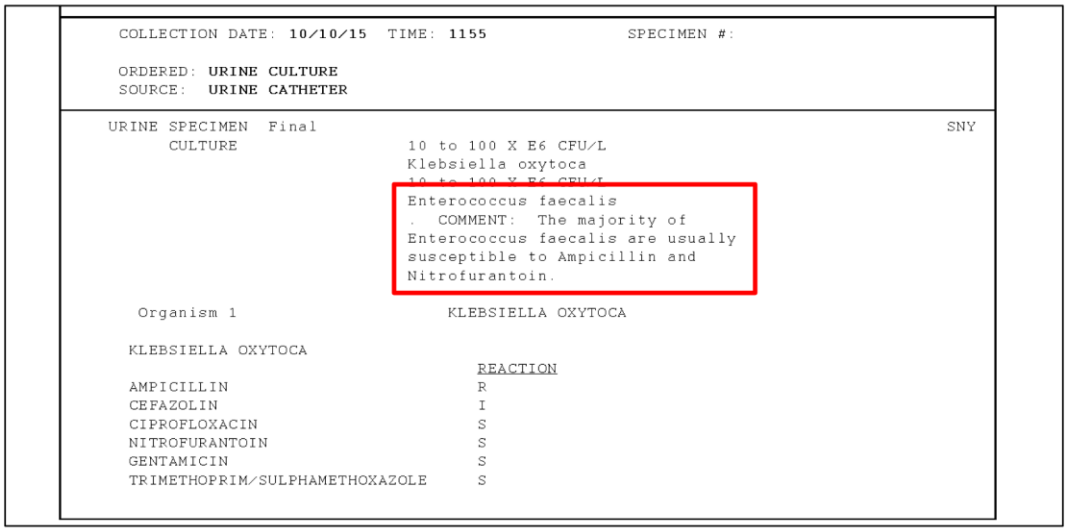


COLLECTION DATE: **17/10/15** TIME: **0620** SPECIMEN #:

ORDERED: **BLOOD CULTURE**
SOURCE: **BLOOD**

COMMENTS:
Collection Site VENOUS

BLOOD CULTURE SPECIMEN Final MSH
*NO GROWTH DETECTED AFTER 48 HOURS INCUBATION:
FURTHER REPORT TO FOLLOW ONLY IF POSITIVE*



COLLECTION DATE: **10/10/15** TIME: **1155** SPECIMEN #:

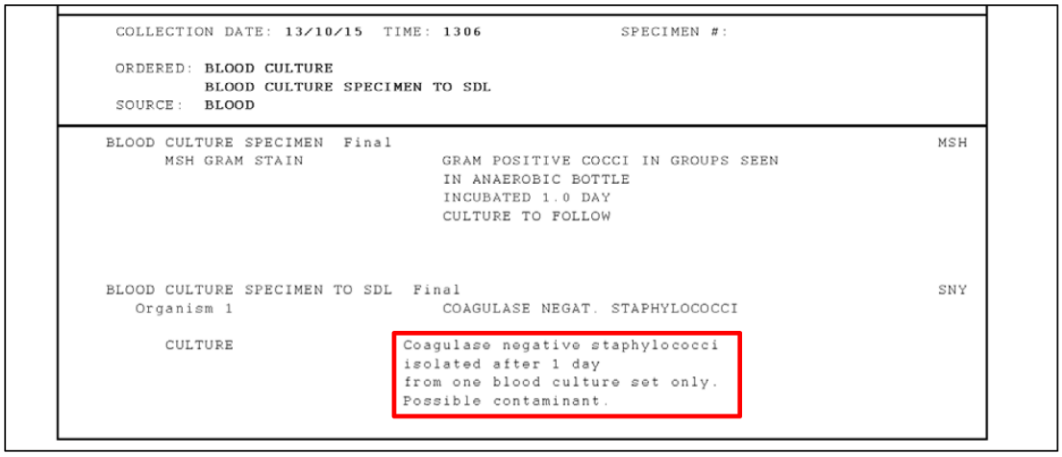
ORDERED: **URINE CULTURE**
SOURCE: **URINE CATHETER**

URINE SPECIMEN Final SNY
CULTURE 10 to 100 X E6 CFU/L
Klebsiella oxytoca
10 to 100 X E6 CFU/L
Enterococcus faecalis
. COMMENT: The majority of
Enterococcus faecalis are usually
susceptible to Ampicillin and
Nitrofurantoin.

Organism 1 KLEBSIELLA OXYTOCA

KLEBSIELLA OXYTOCA

	REACTION
AMPICILLIN	R
CEFAZOLIN	I
CIPROFLOXACIN	S
NITROFURANTOIN	S
GENTAMICIN	S
TRIMETHOPRIM/SULPHAMETHOXAZOLE	S



COLLECTION DATE: **13/10/15** TIME: **1306** SPECIMEN #:

ORDERED: **BLOOD CULTURE**
BLOOD CULTURE SPECIMEN TO SDL
SOURCE: **BLOOD**

BLOOD CULTURE SPECIMEN Final MSH
MSH GRAM STAIN GRAM POSITIVE COCCI IN GROUPS SEEN
IN ANAEROBIC BOTTLE
INCUBATED 1.0 DAY
CULTURE TO FOLLOW

BLOOD CULTURE SPECIMEN TO SDL Final SNY
Organism 1 COAGULASE NEGAT. STAPHYLOCOCCI

CULTURE Coagulase negative staphylococci
isolated after 1 day
from one blood culture set only.
Possible contaminant.

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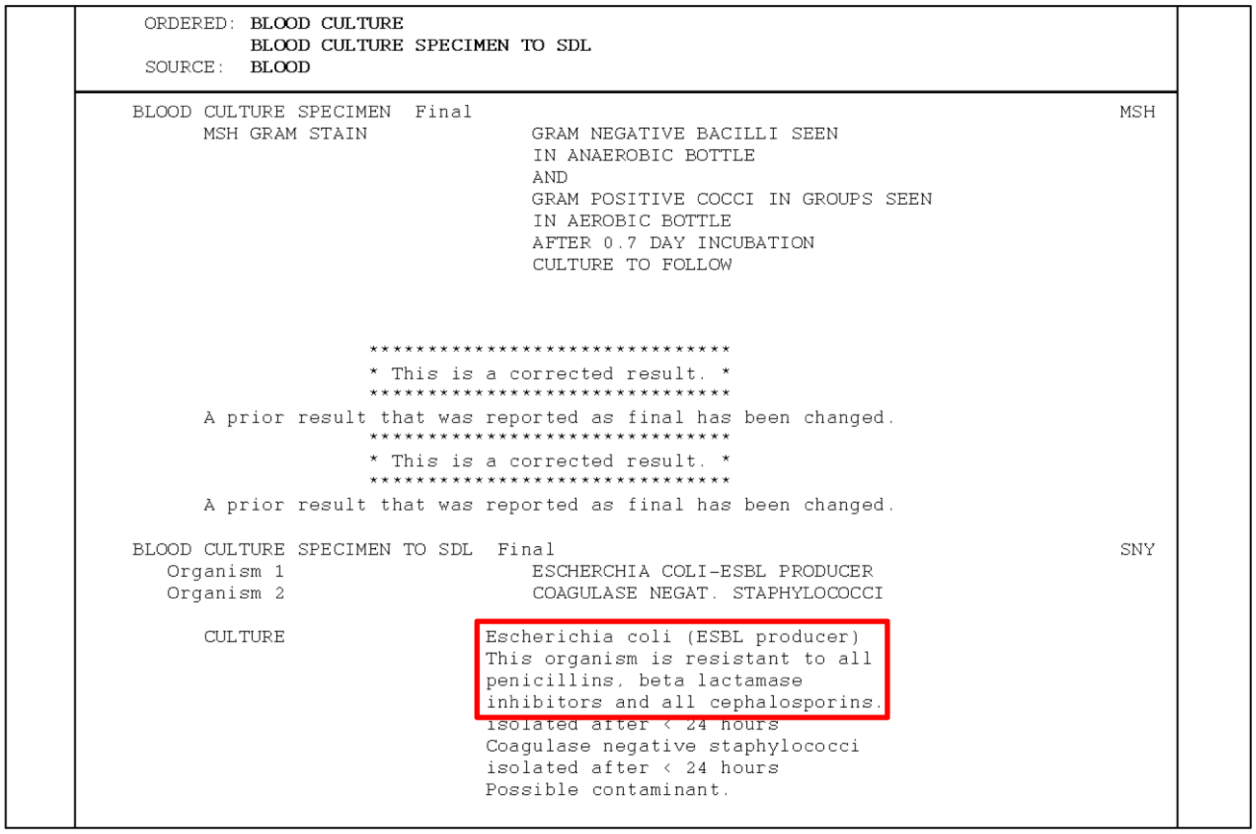
Example 3: Markham Stouffville Hospital Corporation - Microbiology Reports Containing Strategic Result Reporting Comments (continued)



```
ORDERED:  BLOOD CULTURE
          BLOOD CULTURE SPECIMEN TO SDL
SOURCE:   BLOOD

BLOOD CULTURE SPECIMEN  Final                                          MSH
     MSH GRAM STAIN              GRAM NEGATIVE BACILLI SEEN
                                 IN ANAEROBIC BOTTLE
                                 AND
                                 GRAM POSITIVE COCCI IN GROUPS SEEN
                                 IN AEROBIC BOTTLE
                                 AFTER 0.7 DAY INCUBATION
                                 CULTURE TO FOLLOW


                    ******************************
                    * This is a corrected result. *
                    ******************************
     A prior result that was reported as final has been changed.
                    ******************************
                    * This is a corrected result. *
                    ******************************
     A prior result that was reported as final has been changed.

BLOOD CULTURE SPECIMEN TO SDL  Final                                   SNY
   Organism 1                    ESCHERCHIA COLI-ESBL PRODUCER
   Organism 2                    COAGULASE NEGAT. STAPHYLOCOCCI

     CULTURE                  Escherichia coli (ESBL producer)
                              This organism is resistant to all
                              penicillins, beta lactamase
                              inhibitors and all cephalosporins.
                              isolated after < 24 hours
                              Coagulase negative staphylococci
                              isolated after < 24 hours
                              Possible contaminant.
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