

**Department of Microbiology
Aerobic Staphylococci Work-up**

Gross Appearance	Body Site	Slide Coag or Latex	Wet Prep	Preliminary Report	Set Up	Results	Final Report	Billing
BAP = Opaque glistening white to pale yellow	All sites when indicated by Q score for work-up or MRSA screen.	+	-	<i>S. aureus</i>	Phoenix AST		<i>S. aureus</i> & AST *see Note 1	URB1 or ORGB1 ASB1
	Multiple sets of blood cultures positive with staph or Normally sterile body sites with staph being the sole isolate.	-	-	Staph species	Phoenix AST KB FOX & SXT PYR: if + then set up tube coag (TC), ornithine, and base decarboxylase	PYR + TC - ORN + BASE -	Rounds consultation <i>S. lugdunensis</i> & AST Report Phoenix OX/FOX result Enter SXT in Epicenter	ORGB1 ASB1 KBB1
						PYR -		
	Sterile body site, staph not seen in direct smear, and culture is mixed	-	-	Staph coag-neg			Staph coag-neg No AST	ORGB1
	Nonsterile body site and staph is seen in direct smear and no <i>S. aureus</i> grows in culture	-	-	Staph coag-neg	Phoenix AST KB FOX & SXT PYR: if + then set up tube coag (TC), ornithine, and base decarboxylase	PYR + TC - ORN + BASE -	Rounds consultation <i>S. lugdunensis</i> & AST Report Phoenix OX/FOX result Enter SXT in Epicenter	ORGB1 ASB1 KBB1
						PYR -		
	Cath tip > 15 col	-	-	Staph coag-neg			Staph coag-neg & [C15] No AST	ORGB1
Cath tip < 16 col	-	-	Staph coag-neg			Staph coag-neg & [C14] No AST	ORGB1	
CHROM = light pink to rose	Urine significant count	-	-	<i>S. sapro</i>	Phoenix AST KB FOX & SXT		<i>S. sapro</i> & AST (enter FOX & SXT in Epicenter)	URB1 ASB1 KBB1
CHROM = cream	Urine significant count	-	-	Staph coag-neg	Phoenix AST KB FOX & SXT		Staph coag-neg & AST (enter FOX & SXT in Epicenter)	URB1 KBB1 ASB1
Bright yellow	All sites	-	-	Staph species	TC (tube coag) smear OF Glucose	TC - tetrads oxidizer/nonoxidizer	<i>Micrococcus</i>	ORGB1
						fermenter	Staph coag-neg	ORGB1

*Note 1 MRSA is automatically flagged as a significant isolate in the computer. MRSA should be called to inpatient unit and faxed to Epidemiology. MRSA isolates with a VA MIC ≥ 4 should be brought up on Rounds. For *S. aureus* isolates with a VA MIC = 2 or 4, perform E-test confirmation. If E-test MIC = 2 or 4, consult Rounds. MIC values of 2 or 4 should be reported.

Department of Microbiology
Aerobic Streptococci Work-up (α-hemolytic)

Body Site	Test	Results	Preliminary Results	Set Up	Results	Final Report	Billing
Respiratory	Bile Solubility	+	<i>Strep pneumoniae</i>	Phoenix AST		<i>S. pneumoniae</i> & AST (enter Pen MIC value in LIS under oral and parenteral)	ORGB1 ASB1
		-				Mixed flora	
		?		Optochin (P disk) & Phoenix AST	P disk zone ≥14 mm	<i>S. pneumoniae</i> & AST (enter Pen MIC value in LIS under oral and parenteral)	ORGB1 ASB1
				P disk zone < 14 mm	Mixed Flora		
Other body sites	Bile Solubility	+	<i>Strep pneumoniae</i>	Phoenix AST		<i>S. pneumoniae</i> & AST (enter Pen MIC value in LIS under oral and parenteral)	ORGB1 ASB1
	Bile Solubility PYR	- +	<i>Enterococcus</i>	If site is a normally sterile body fluid, set up 6.5% NaCl, Control Broth, BE, Phoenix AST	Broth control + 6.5% NaCl + BE +	<i>Enterococcus</i> & AST *see Note 2	Urine: URB1 Other: ORGB1 AST: ASB1
					Neg control broth, NaCl, or BE = not <i>Enterococcus</i>	Rounds consultation	
	Bile Solubility PYR	- -	Alpha-hemolytic strep	If site is a normally sterile body fluid, set up 6.5% NaCl, Control Broth, BE. Perform Phoenix AST if normally sterile body site <u>or</u> if seen in direct smear and within Q score of non-sterile site.	Broth control + 6.5% NaCl - BE -	Viridans Strep & AST if applicable	URB1/ORGB1 & ASB1 if applicable
					Broth control + 6.5% NaCl + BE -	Rounds consultation	
					Broth control + 6.5% NaCl - BE +	Viridans Strep & AST if applicable	URB1/ORGB1 & ASB1 if applicable
Broth control + 6.5% NaCl + BE +					Rounds consultation		

*Note 2: For isolates identified as VRE, perform additional testing to rule out *E. gallinarum* or *E. casseliflavus/flavescens*. These species are intrinsically resistant to vancomycin and not associated with epidemiologic outbreaks. These organisms typically produce vancomycin MIC values between 2 and 16 µg/mL. They are generally motile and most isolates of *E. casseliflavus/flavescens* produce a distinct yellow pigment, which can be observed by collecting growth on a swab. Consult on Rounds. VRE is automatically flagged as a significant isolate in the computer. If isolate ID is *E. faecalis/faecium*, call VRE to inpatient unit.

Department of Microbiology
Aerobic Streptococci Work-up (β -hemolytic)

Body Site	Test	Results	Preliminary Results	Set Up	Results	Final Report	Billing	
Respiratory	Group A latex	+				Group A Strep AST comment [BSAS]	ORGB1	
		-				Mixed flora		
Throat	Group A latex	+				β -Strep Group A isolated & AST comment [BSAS]	ORGB1	
		-				No Group A Strep isolated		
Genital	Group B latex	+		KB if Pen allergic		Group B Strep isolated & AST comment [BTSBS] AST if pen allergic	ORGB1 KBB1 if done for Pen allergic	
		-				No Group B Strep isolated		
All other sites	A & B latex PYR if latex -	A +				Group A Strep & AST comment [BSAS]	Urine: URB1 Other: ORGB1	
		B +				Group B Strep & AST comment [BTSBS]	Urine: URB1 Other: ORGB1	
		A - B - PYR +	<i>Enterococcus</i>	If site is a normally sterile body fluid: Control Broth 6.5% NaCl BE AST	Broth control + 6.5% NaCl + BE + Neg control broth, NaCl, or BE = not <i>Enterococcus</i>	<i>Enterococcus</i> & AST *see Note 2 Rounds consultation	Urine: URB1 Other: ORGB1 AST: ASB1	
		A - B - PYR -	β -hemolytic strep not group A or B	If site is a normally sterile body fluid: 6.5% NaCl Control Broth BE	Broth control + 6.5% NaCl - BE - Broth control + NaCl + / BE - or NaCl - / BE +	Beta-hemolytic strep not group A or B Rounds consultation	Urine: URB1 Other: ORGB1	

*Note 2: For isolates identified as VRE, perform additional testing to rule out *E. gallinarum* or *E. casseliflavus/flavescens*. These species are intrinsically resistant to vancomycin and not associated with epidemiologic outbreaks. These organisms typically produce vancomycin MIC values between 2 and 16 $\mu\text{g/mL}$. They are generally motile and most isolates of *E. casseliflavus/flavescens* produce a distinct yellow pigment, which can be observed by collecting growth on a swab. Consult on Rounds. VRE is automatically flagged as a significant isolate in the computer. If isolate ID is *E. faecalis/faecium*, call VRE to inpatient unit.

Department of Microbiology
Aerobic Streptococci Work-up (non-hemolytic)

Body Site	Test	Results	Preliminary Results	Set Up	Results	Final Report	Billing
Genital	Group B latex	+		KB if Pen allergic		Group B Strep isolated & AST comment [BTSBS] AST if pen allergic	ORGB1 KBB1 if done for pen allergic
		-				No Group B Strep isolated	
Other body sites except respiratory	PYR	+	<i>Enterococcus</i>	If site is a normally sterile body fluid: Control Broth 6.5% NaCl BE AST	Broth control + 6.5% NaCl + BE +	<i>Enterococcus</i> & AST *see Note 2	Urine: URB1 Other: ORGB1 AST: ASB1
					Neg control broth, NaCl, or BE = not <i>Enterococcus</i>		
		-	Non-hemolytic strep	If site is a normally sterile body fluid, set up Control Broth, 6.5% NaCl, BE. Perform AST if normally sterile body site <u>or</u> if seen in direct smear and within Q score of sterile site.	Broth control + 6.5% NaCl - BE -	Viridans Strep & AST if applicable	URB1/ORGB1 & ASB1 if applicable
					Broth control + 6.5% NaCl + BE -	Rounds consultation	
					Broth control + 6.5% NaCl - BE +	Viridans Strep & AST if applicable	
		-	Non-hemolytic strep	Looks like Group B strep colony If site is a urine, set up Group B latex	B +	Group B Strep & AST comment [BTSBS]	Urine: URB1 Other: ORGB1
					B -	Viridans Strep	Urine: URB1 Other: ORGB1
-		If site is any other non sterile body site		Viridans Strep	Urine: URB1 Other: ORGB1		

*Note 2: For isolates identified as VRE, perform additional testing to rule out *E. gallinarum* or *E. casseliflavus/flavescens*. These species are intrinsically resistant to vancomycin and not associated with epidemiologic outbreaks. These organisms typically produce vancomycin MIC values between 2 and 16 µg/mL. They are generally motile and most isolates of *E. casseliflavus/flavescens* produce a distinct yellow pigment, which can be observed by collecting growth on a swab. Consult on Rounds. VRE is automatically flagged as a significant isolate in the computer. If isolate ID is *E. faecalis/faecium*, call VRE to inpatient unit.

Department of Microbiology
Neisseria species Work-up

Gross Appearance	Body Site	Oxidase	Gram Stain	CarboFerm	Growth on MTM	Final Report	Billing	
Small, grey translucent	Genital Vaginal Cervical Urethral	–				No <i>N. gonorrhoeae</i> isolated		
		+	GNR			No <i>N. gonorrhoeae</i> isolated		
		+	GNDC	More than just GLUC +	+	Rounds consultation		
		+	GNDC	Glucose + Maltose – Lactose – Sucrose –	+	Rounds consultation <i>N. gonorrhoeae</i> Report to DOH	ORGB1	
		+	GNDC	Glucose + Maltose – Lactose – Sucrose –	–	Rounds Consultation		
	Non-genital	–	GNDC			+/-	Rounds Consultation	
		+	GNR				Perform NFID	
		+	GNDC	Glucose + Maltose – Lactose – Sucrose –		+/-	Rounds consultation <i>N. gonorrhoeae</i> Report to DOH	ORGB1
		+	GNDC	Glucose + Maltose + Lactose – Sucrose –		+	<i>N. meningitidis</i> Rounds consultation Call patient care area, physician, and epidemiology. Send isolates from sterile sites to DOH.	ORGB1
		+	GNDC	Any other combination other than above		+/-	Rounds Consultation	

Department of Microbiology
***Moraxella* species Work-up**

Gross Appearance	Body Site	Oxidase	Gram Stain	Other Tests	Results	Report	Billing
Dry, wrinkled yellow or white	Respiratory	+	GNDC	Catarrhalis Disk	+	<i>M. catarrhalis</i> & AST comment [MCATAS]	ORGB 1
		+	GNDC	Catarrhalis Disk	-	Mixed flora	
	Other sites	+	GNDC ?	Penicillin disk elongation test	Cell elongation at P disk	Rounds Consultation	
		+	GNDC	CarboFerm	Glucose – Maltose – Lactose – Sucrose – Butyrate +	Rounds Consultation <i>M. catarrhalis</i> & AST comment [MCATAS]	ORGB 1
Smooth transparent	All sites	+	GNCB	If catalase + and non-motile set up: OFGL		Rounds Consultation for other <i>Moraxella</i> spp.	

Department of Microbiology
Haemophilus species Work-up

Gross Appearance	Site	Gram Stain from CHOC	Set Up	Growth on BAP	XV	AST	Final Report	Billing
Small transparent colonies satelliting around staph streak or mucoid grey colonies on CHOC	Non-sterile sites	tiny pleomorphic GNR	XV disks cefinase	-	Both required	Cefinase -	<i>H. influenzae</i> Beta lactamase negative & [HFLUS]	ORGB1
				-	Both required	Cefinase +	<i>H. influenzae</i> Beta-lactamase positive & [HFLUS]	ORGB1
				-	Both not required		<i>Haemophilus</i> species not <i>influenzae</i>	ORGB1
				+			Rounds Consultation	
	Sterile sites	tiny pleomorphic GNR	XV disks cefinase	-	Both required	Cefinase - Set up KB on HTM	<i>H. influenzae</i> Beta-lactamase negative & AST	ORGB1 KBB1
				-	Both required	Cefinase + Set up KB on HTM	<i>H. influenzae</i> Beta-lactamase positive & AST	ORGB1 KBB1
				-	Both not required		Rounds Consultation <i>Haemophilus</i> sp. not <i>influenzae</i>	ORGB1
				+			Rounds Consultation	

Cultures for *Haemophilus ducreyi*

A. Gram stain

1. Gram negative pleomorphic coccobacilli with many single chains representing "schools of fish".

B. Culture

1. Examine plates incubated in CO₂ at day 2 and day 7.
2. Gram stain any growth on CHOC.
3. Bring up culture on Rounds.

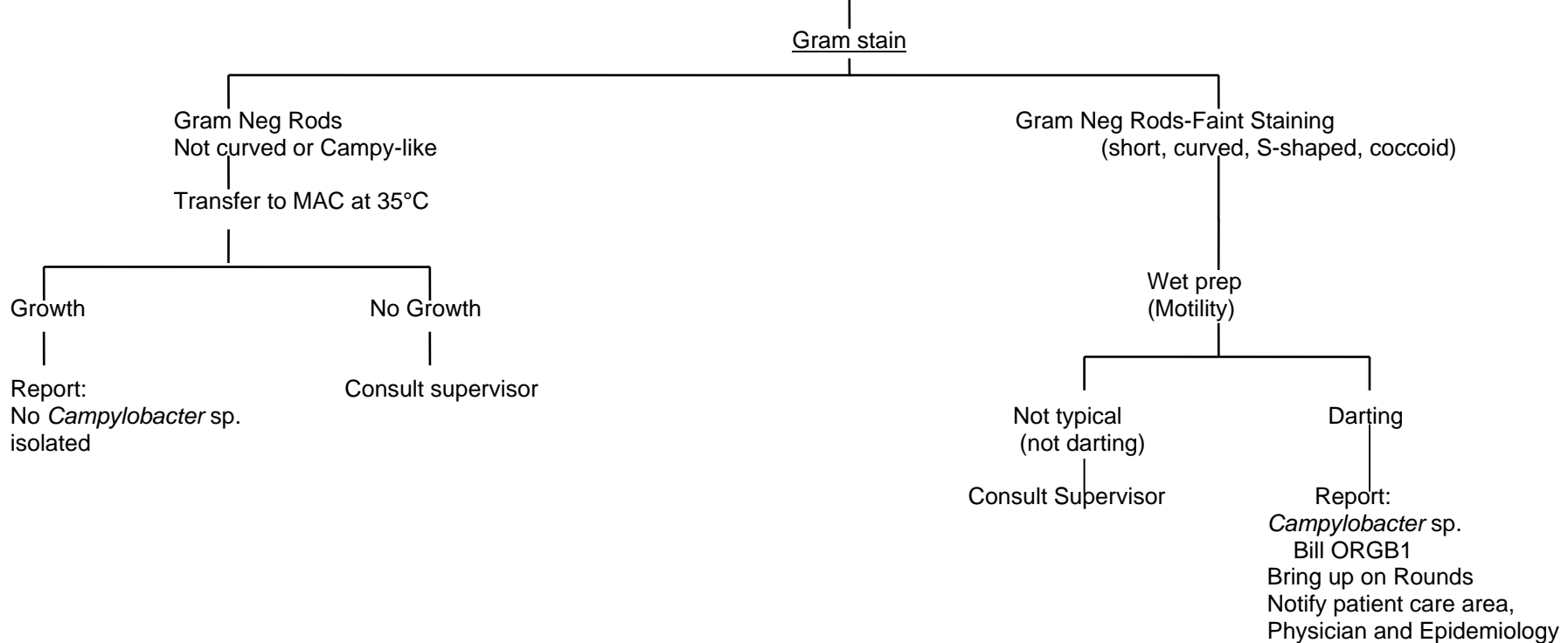
Department of Microbiology
Aerobic Gram-Negative Rods Work-up
(Other Than *Haemophilus* species)

Gross Appearance BAP, and/or MAC	Oxidase	Indole	Preliminary Report	Set Up	Final Report	Billing
MAC = lactose positive flat, donut-shaped	–	+	<i>E. coli</i> & report direct AST results for Blood isolates	Phoenix AST	<i>E. coli</i> & Phoenix AST	Urine: URB1 Other: ORGB1 AST: ASB1 *See Note 3
MAC = lactose positive	–	–	Coliform & report direct AST results for Blood isolates	Phoenix ID/AST	Report Phoenix ID and AST	
MAC = lactose negative	+	+	GNR	Phoenix ID/AST	Report ID and AST may require Rounds consultation	
BAP = swarming MAC = lactose negative	–	–	<i>Proteus</i> species	Phoenix AST	<i>Proteus</i> sp. With AST	
BAP = swarming MAC = lactose negative	–	+	<i>Proteus vulgaris</i>	Phoenix AST	<i>Proteus vulgaris</i> & AST	
BAP = greenish pigment MAC = lactose negative	+		<i>Pseudomonas aeruginosa</i>	Phoenix AST KB for CF isolates	<i>Pseudomonas aeruginosa</i> with AST	
BAP = metallic sheen or grape-like odor MAC = lactose negative	+		<i>Pseudomonas aeruginosa</i>	Phoenix AST KB for CF isolates	<i>Pseudomonas aeruginosa</i> with AST	
MAC = lactose negative	+		Gram negative rod	Phoenix ID/AST or NF ID and AST	Report ID and AST <u>May require Rounds consultation</u> CF isolates identified as <i>B. cepacia</i> must be confirmed by tube ARG and LYS <i>B. cepacia</i> = ARG –, LYS +	
MAC = lactose negative Purplish colonies	–		Gram negative rod	Phoenix ID/AST If GNCB & non- motile and PHX fails to yield an ID set up OFGL & nitrate	Report ID & AST from Phoenix If offline ID, consult Rounds for reporting <i>Acinetobacter</i> species	
MAC = lactose negative	–		Gram negative rod	Phoenix ID/AST	Report ID and AST	
BAP = brick red pigment MAC = lact neg but red	–		<i>Serratia marcescens</i>	Phoenix AST	<i>Serratia marcescens</i> & AST	
BAP = growth MAC = no growth	+ or –		Gram negative rod	Phoenix ID/AST or NF ID and AST	Rounds consultation Report ID and AST	

*Note 3 If confirming ESBL or KPC for *Enterobacteriaceae* by disk diffusion, bill KBB1.

Department of Microbiology
***Campylobacter* Work-up**

Oxidase & Catalase Positive Growth on
Campylobacter media at 42°C



Helicobacter pylori

Gram stain: slender spirally curved gram-negative rods

1. Examine plates incubated in a Campy environment at 35°C at day 3 and day 7.
2. Gram stain any growth on the plates.
3. Bring up culture on Rounds.
Oxidase: positive
Urea: positive (very rapid)

Department of Microbiology
Aerobic Gram-Positive Rods Work-up

Gross Appearance BAP	Hemolysis	Gram stain of plate	Motility	Catalase	Prelim. Report	Set-Up	Results	Final Report	Billing
Large, flat, dull, rough, gray, "medusa head"	–	Uniform large gram positive rods with squared off ends	–	+	Rounds consultation				
Large, flat, dull, rough gray green, ground glass	β	Uniform large gram positive rods with squared off ends	+/-	+	<i>Bacillus</i> species	If ? Gram +/- set AST To help induce spore production, inoculate urea, CHROMagar, and reincubate older plates. Spore stain	Formation of spores	<i>Bacillus</i> species not <i>anthracis</i>	ORGB1
Large, flat, dull, smooth, gray	–	Uniform large gram positive rods (may be gram negative)	+	+	<i>Bacillus</i> species	If ? Gram +/- set AST To help induce spore production, inoculate urea, CHROMagar, and reincubate older plates. Spore stain	Formation of spores	<i>Bacillus</i> species not <i>anthracis</i>	ORGB1
							No spores	Rounds consultation	
Small sometimes dry dull, white opaque	–	Short gram positive rods (diphtheroids) in palisading arrangements	–	+	<i>Corynebacterium</i> species	If sterile site or multiple sets of Blood Cx, set up Etests. Set up API CORYNE for ID only if requested.		<i>Corynebacterium</i> species Rounds if API set	ORGB1 MICB for E-test
Urine isolate: Pinpoint, convex, smooth, and whitish gray	–	Short gram positive rods (diphtheroids) in palisading arrangements	–	+		For Urine isolates: Urea agar	Rapid positive (< 2 h)	<i>Corynebacterium urealyticum</i>	URB1
Very small colonies which may require 48 h for growth	– Or α	Gram positive coccobacilli (may be diphtheroids)	–	–	Gram positive rod	TSI	H ₂ S +	<i>Erysipelothrix rhusiopathiae</i>	ORGB1
							H ₂ S –	Rounds consultation	
Small flat white or gray	β	Gram positive rods (short rods to cocci)	Tumbling at 22°C Slow or – at 35°C	+	Gram positive rod	BE	+	Rounds <i>Listeria monocytogenes</i> Report to DOH	ORGB1
							–	Rounds consult	
Very small opaque	α	Long thin gram positive rods	–	–		Vancomycin disk	R	<i>Lactobacillus</i> spp. & [LACBSS]	URB1

Department of Microbiology
Aerobic Gram-Positive Rods Work-up



(consult Rounds for non-urine isolates)							S	<i>Lactobacillus</i> -like species	No ID charge
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References

- A. Finegold, S.M., Baron, E.J. 1986. Bailey and Scott's Diagnostic Microbiology, 7th ed., C.V. Mosby Co., St. Louis, pp. 404, 525.
- B. Murray, P.R., Baron, E.J., Pfaller, M.A., Tenover, F.C., Tenover, R.H. 1999. Manual of Clinical Microbiology, 7th ed., ASM Press, Washington, DC, pp. 272, 288, 298, 319-341, 349, 362, 443-446, 459-474, 502, 512, 518-519, 544, 595, 608, 717.

Document Control History

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History of Changes: 06/25/2012 Removed acetate from *Moraxella* spp. workup. 10/10/2013 Added comment for *S. aureus*, "For *S. aureus* isolates with a VA MIC = 2 or 4, perform E-test confirmation. If E-test MIC = 2 or 4, consult Rounds. MIC values of 2 or 4 should be reported." Updated billing code MICB1 to ASB1 for applicable organisms tested on the Phoenix instrument. Added, "or Latex" to the slide coag column on Staphylococci work-up. Updated workup for *Corynebacterium* to perform AST if from sterile site or multiple blood culture sets. 05/08/2014 Added workup for *C. urealyticum* urine isolates. 06/24/2014 Added Vancomycin Disk Test for identification of *Lactobacillus* isolates from urine cultures and added susceptibility comment. 04/30/2015 Updated for Viridans strep... "Perform Phoenix AST if normally sterile body site or if seen in direct smear and within Q score of non-sterile site."