Public Health England

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UK Standards for Microbiology Investigations

Review of users' comments received by Working group for microbiology standards in clinical bacteriology

B 44 Investigation of orthopaedic implant associated infections

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Recommendations are listed as ACCEPT/ PARTIAL ACCEPT/DEFER/ NONE or PENDING

1st Consultation 09/08/2013 – 01/11/2013

Version of document consulted on – B 44dk+

Proposal for changes

Comment number	1		
Date received	28/10/2013	**Lab name**	Oxford
Section	Several		
Comment			

a. Please delete Dr Ivor Byren and Dr Tony Berendt from acknowledgements section (unless they have contributed separately).

b.

i. Risk factors for Infection: suggest patient factors not patient co-morbidities.

ii. Diagnosis: put Plain X-rays are performed to look for early loosening, fracture or other pathology.

iii. Diagnosis: Put a joint aspirate for cell count, culture and histology (using ultrasound....)

c. Percutaneously biopsy (heading) should be percutaneous biopsy.

d. Intra-op biopsies - put to aid surgical decision making.

e. Automation: can quote Minassian abstract below.

f. Duration of culture: although we discussed and thought 5 days culture would be OK, we have locally decided on 10 days for now subject to evaluation again in the future. The Minassian data is fairly convincing for shortening but colleagues want to be cautious as clinical stakes are high. This may be sensible to recommend in this guidelines too? Say 7-10 days or up to 10 days. Reference for Minassian is below.
This duration would have to also be inserted in the soft tissue homogenate section and table 2.5.3 if this is what you decide.

g. Footnotes: d) I would say use separate sterile instruments for all samples as it applies across the board for PJI.

The SMI looks very good.

Evidence

BACTEC for diagnosis of prosthetic joint infections: easy, cheap and fast Angela Minassian, Robert Newnham, Elizabeth Kalimeris, Philip Bejon, Bridget Atkins, Ian CJW Bowler. Abstract, IDSA ID Week, San Francisco 2013.

http://www.icaaconline.com/php/icaac2013abstracts/data/papers/2013/H/2013_H-1000.htm

Financial barriers

No.

Health benefits

No.	
Recommended action	a. **ACCEPT** Text updated. b. i. **ACCEPT** Text updated. ii. **ACCEPT** Text updated. iii. **ACCEPT** Text updated. c. **ACCEPT** Text updated. d. **ACCEPT** Text updated. e. **ACCEPT** Abstract will be included in the references. Final paper has been published. Recommendation up to 5 days. Minassian AM, Newnham R, Kalimeris E, Bejon P, Atkins BL, Bowler IC. Use of an automated blood culture system (BD BACTEC) for diagnosis of prosthetic joint infections: easy and fast. BMC Infect Dis 2014;14:233. f. **PARTIAL ACCEPT** Following discussion at the working group, 5 day incubation was agreed. g. **NONE** Flowchart updated post consultation footnote no longer included.

2nd Consultation 15/09/2014 – 13/10/2014

Version of document consulted on – B 44dv+

Proposal for changes

Comment number	1		
Date received	22/09/2014	**Lab name**	Bone Infection Unit, Oxford
Section	Explanted prosthesis		

Comment
Would delete. It may reduce the number of tissue samples required to 3-4 as there is no evidence for this and in fact we have some preliminary data, presented at the European Bone and Joint Infection Society in Sept 14, to show that diagnostic sensitivity would be reduced if you reduce the number of specimens, even if done in combination with sonication.
Evidence
Oral presentation at EBJIS 2014 F031 Sonication for diagnosis of non-prosthetic-joint orthopaedic infections Brent AJ, Dudareva M, Colledge R, Figtree M, Newnham R, Bejon P, Woodhouse A, Taylor A, McNally MA, Atkins BL.
Do you receive and process swabs for the investigation of orthopaedic implant associated infections? Please comment.
Swabs not indicated.
Which method of homogenisation do you use (eg glass beads, vortex etc)? Please record details below.
Glass (Ballotini) bead.
Do you, or would you, prefer the use of continuous monitoring blood culture bottles, or cooked meat broth for enrichment? Please comment.
Continuous monitoring.

Recommended action	**ACCEPT** Sentence removed.

Comment number	2		
Date received	10/10/2014	**Lab name**	Royal Liverpool University Hospital
Section	4.5: Culture and Investigation		

Comment

a. We were particularly interested in the recommendation to use either standard enrichment broth or blood culture system as enrichment. Our current practice is to use Robinsons Broth however we feel this is time consuming and labour intensive compared to using a blood culture system. However we were concerned that our current blood culture bottles would not be compatible with inoculation of homogenised tissue.

b. We appreciate the recommendation to use a hand lens to assay small-colony variants but feel this is challenging given the move to automation (we are using a Kiestra system).

Do you perform cell counts on synovial fluid? If so, do you think a dilution step should be added to the cell count method in this SMI? Please comment.

Yes if required but not routinely. We do not feel a routine dilution step would be beneficial.
Do you receive and process swabs for the investigation of orthopaedic implant associated infections? Please comment.
Yes, but in conjunction with other tissue samples (ie the swab is not the sole sample received for diagnosis of PJI).
Which method of homogenisation do you use (eg glass beads, vortex etc)? Please record details below.
We use Ballotini glass beads for hard tissue and disposable pestle and mortar for soft tissue infection.
Do you, or would you, prefer the use of continuous monitoring blood culture bottles, or cooked meat broth for enrichment? Please comment.
We currently use Robinsons cooked meat broth but are interested and keen to explore the potential to move to a continuous monitoring system - see notes above.

Recommended action	a. **PARTIAL ACCEPT** The following text has been added: *'Sterile, needleless syringes and blood transfer devices are commercially available which may be used for the aseptic transfer of sample homogenate into blood culture bottles.'* b. **ACCEPT** Text changed to 'under magnification'.

Comment number	3		
Date received	15/10/2014	**Lab name**	PHE HCAI & AMR Dept, CIDSC
Section	Risk Factors for Infection, Pathogenesis and microbiology, Diagnosis, Sample types		
Comment			

a. Risk factors

i. The benefit of laminar air flow systems in theatre has become somewhat controversial given results of recent studies. As such, we would recommend removing or replacing this with a more general statement on the importance of controlling the theatre environment.

ii. English national surveillance could helpfully be cited here alongside the SSI rates (or ECDC data which includes UK data):
Public Health England. Surveillance of surgical site infection in NHS hospitals in England 2012/13. Public Health England **2013**. Available at: https://www.gov.uk/government/publications/surgical-site-infections-ssi-

surveillance-nhs-hospitals-2012-to-2013 iii. The excess risk according to NNISS risk score (now NHSN) could be described according to the components of the score for ease of reading by individuals unfamiliar with it (ie duration of surgery, degree of wound contamination and patient's preoperative health). The following more recent UK paper could also be cited to illustrate the impact of these factors on SSI risk: Lamagni T. Epidemiology and burden of prosthetic joint infections. *J Antimicrob Chemother* 2014 69 (9): i5-i10 doi: 10.1093/jac/dku247. iv. Please note the NHSN risk score encompasses patient and surgical factors (not just patient as described in the SMI). v. The importance of surveillance as a means to prevention could be added to this section or elsewhere, along with the NICE guideline and accompanying Quality Standards for prevention of SSI. National Institute for Health and Clinical Excellence (2008) Surgical Site Infection: Prevention and Treatment of Surgical Site Infection. London: NICE. https://www.nice.org.uk/guidance/cg74 National Institute for Health and Clinical Excellence (2013) Quality Standards for Surgical Site Infection QS49 http://publications.nice.org.uk/surgical-site-infection-qs49/list-of-quality-statements b. Pathogenesis and microbiology PJI can arise from post-op contamination of the wound also. c. Diagnosis Whilst perhaps self-evident, you might wish to consider making specific recommendation that clinical samples are ideally taken prior to antibiotic treatment. d. Sample types *Duration of culture* There may be a typo here "cultures" vs "cultured".	
Recommended action	a. i. **PARTIAL ACCEPT** Text updated, reference to laminar flow removed. ii. **ACCEPT** Reference to PHE Surveillance of surgical site infections in NHS hospitals in England 2013/2014 included. iii. **ACCEPT** Text updated. iv. **PARTIAL ACCEPT** Lamagni 2014 reference added to text.

	v. **ACCEPT** Text updated and references added. vi. **ACCEPT** Text updated and references added. b. **ACCEPT** Text updated. c. **ACCEPT** Text updated in section 2.2. d. **ACCEPT** Text updated.

Comment number	4		
Date received	23/10/2014	**Lab name**	The Royal London Hospital
Section	See below		
Comment			

a. Percutaneous joint aspiration (P9)

Change to: Acute prosthetic joint infection occurring within six weeks of surgery, as agreed (strong consensus) at the proceedings of the international consensus meeting on periprosthetic joint infections are as follows:

b. Percutaneous biopsy (P9)

Change to: multiple biopsies can be performed.

c. Sampling (P10)

Change to: In centres where sonication is available, the prosthesis, or its components thereof, can be sent to the laboratory in a sterile watertight container.

d. Sample processing (P10)

It is surprising that the evidence is limited regarding comparisons and validation of tissue processing. Have all the studies been examined. Reference 27 is rather narrow. Are there any other studies other than ref 28 regarding glass beads in a broth to determine contamination?

e. Microscopy and culture (P10)

Details on performance characteristics would be useful for quantification.

f. Duration of culture (P11)

On balance this seems A reasonable approach as the lab may otherwise end up with prolonged incubation for non-infected prosthetic samples.

i. However where is the evidence for direct culture for these tissues? Many labs and indeed some literature suggest keeping plates for 5 days. Pragmatically a combination of plate culture and enrichment broths can increase yield and also shed light for determining clinical significance eg for propionibacteria. ii. Is there other evidence for 5 days other than ref 36 and 38? g. Nucleic acid amplification techniques (NAATs) (P12) Is there a better example of a fastidious organism? It is not a common cause of prosthetic joint infections but causes septic arthritis endocarditis in children. h. Contamination (P13) Change to: Repetitive subculture from the enrichments broth during incubation may lead to contamination; the use of continuous monitoring blood culture bottles reduces the risk of contamination. i. Effect of antibiotic use (P13) 'Patients should be off antibiotics for at least two weeks.' What is the evidence for this? j. Specimen processing/procedure (P16) In this section, we couldn't find a method for sonication. Should sonication occur in theatre or in the lab? k. 4.3.1 Pre-treatment (P17) 'As an alternative to enrichment broth, samples may be cultured in an automatic continuous monitoring blood culture system for up to 5 days.' Maybe 14 days in some situations as discussed on page 11. l. 4.3.2 Specimen processing (P17) i. 'This is best done 24hr after the primary plates have been examined once, to decide if decontamination of the sample is required.' Length of incubation not mentioned eg 5 days in a moist environment. ii. 'As an alternative to enrichment broth, samples may be cultured in an automatic continuous monitoring blood culture system for 5 days.' Need to mention extending 14 days in some situations.	
Recommended action	a. **ACCEPT** Text updated. b. **ACCEPT** Text updated. c. **ACCEPT** Text updated. d. **ACCEPT** A literature search was undertaken. No additional

	references were identified. e. **ACCEPT** Text regarding sensitivities and specificity included. References including information on sensitivity, specificity and positive and negative predicative values added. f. i. **PARTIAL ACCEPT** Direct plates were included following consensus decision by the Bacteriology Working Group. It was acknowledge that primary plates may not always be required. The following text has been added to section 4.3.2 in line with section 4.5.3: *'Primary plates may not be required in elective revisions, in high volume units and skilled multiple site sampling'.* ii. **ACCEPT** Additional references regarding 5 day incubation have been included. g. **NONE** The group felt that *Kingella kingae* was an appropriate example of a fastidious organism. h. **ACCEPT** Text updated. i. **PARTIAL ACCEPT** Cessation of antimicrobial therapy 14 days prior to surgery is discussed in various papers as best practice. Additional references have been added to the text and the text has updated to include a study by Trampuz et al 2013. *'One study comparing the culture of samples obtained by sonication of the prostheses and conventional periprosthetic-tissue culture has shown that sensitivity of both culture methods is reduced in patients receiving antimicrobial therapy within 14 days before surgery'* Trampuz A, Piper KE, Jacobson MJ, Hanssen AD, Unni KK, Osmon DR, et al. Sonication of removed hip and knee prostheses for diagnosis of infection. N Engl J Med 2007;357:654-63 j. **PARTIAL ACCEPT** Sonication is an optional method for processing of the prosthesis. Information is included in the introduction (sample processing section) which states: *'In centres where sonication is available, the prosthesis,*

	or its components thereof, can be sent to the laboratory in a sterile watertight container' k. **ACCEPT** Text updated. l. i. **PARTIAL ACCEPT** Link to B 40 – Investigation of *Mycobacterium* species added. ii. **ACCEPT** Text updated.

Comments received outside of consultations

Comment number	1		
Date received	04/03/2013	**Lab name**	Salford Royal Foundation Trust
Section			
Comment			
a. Fastidious anaerobic broth: It is stated that when broth becomes cloudy it should sub-cultured. Once they have been sub-cultured are they re-incubated for the full 5 days? b. Sub-culture plates from cloudy broths: if bacterial growth is indicated at 24hr/48hr is the incubation of broth discontinued. If no bacterial growth I would assume the broth continues its incubation period. c. Primary culture: If the primary culture plates indicate bacterial growth at 24/48hr would you subculture the broth and then discontinue its incubation period of 5 days or would it be re-incubated.			
Recommended action	a. **ACCEPT** Text updated for clarity: '*Broths should be examined periodically (ideally daily) and subcultured if there is evidence suggestive of growth. Terminal subcultures should be performed at 5 days'.* b. **NONE** Each line of investigation should continue until it is complete. c. **NONE** Each line of investigation should continue until it is complete.		

Comment number	2		
Date received	06/03/2013	**Lab name**	Belfast Trust
Section			
Comment			
What was the rationale behind suggestion to subculture a Sabouraud agar plate for 14 days? Unable to find a reference or a paper to support this.			
Recommended action	**PARTIAL ACCEPT** 14 day incubation of SAB agar/slopes is consistent with other recently issued UK SMIs and is based on recommendations of the UK Clinical Mycology Network. An additional reference has been included in the media table which concludes that an incubation of 2 weeks a sufficient incubation for the isolation of most yeasts and moulds from clinical samples. Bosshard PP. Incubation of fungal cultures: how long is long enough? Mycoses 2011;54:e539-e545.		

Comment number	3		
Date received	01/07/2013	**Lab name**	MSTAG
Section	a. General comments b. 2.4.1 c. 2.5.3 cooked meat broth or equivalent d. 2.5.3 subculture when cloudy or at day on plates as below e. 2.5.3 blood culture for CMBCS f. 2.5.3 g. 2.5.3 blood agar for anaerobes h. 2.5.3 i. 3.2.1 j. Appendix 1 k. Appendix 1 l. Appendix 2 m. Footnotes a n. Footnotes d		
Comment			
a. It was felt that there were more changes than detailed in the amendment section from the one issued last year.			

b. The laboratory would not always know if the sample was pre-or intra-operative. c. Inconsistent with B 42. d. It was felt that relying on “cloudiness” as a marker for sub-culturing was un-scientific. e. Pair of bottles or just one-paediatric for example (1 suggestion of anaerobic bottle only). How do you get tissue in bottles as most have sealed caps. f. If subculture @14 days and then onto Sab for further 14 days-this could lead to a 28 day TAT. g. No FAA on primary or subculture, inconsistent with other SMIs, it was felt that FAA be added as a minimum standard. h. Fungal culture section unclear. i. Culture reporting time, 16h-14d-not possible if Sab is on subculture and takes further 14 d. j. Gram-record presence of crystals-not thought to be a valid technique as this is carried out by polarising microscopy. k. Sab subculture has comment incubate in NO_2. l. A lot of the clinical details would not be known in the lab. m. “sensitivities”? should be susceptibilities. n. Not relevant to a laboratory SMI.	
Recommended action	a. **ACCEPT** The amendment table will be updated fully before issue. b. **NONE** This information should be requested via the user manual. c. **ACCEPT** Table updated to 5 day incubation. d. **ACCEPT** Text updated to *‘Subcultures should be examined periodically (ideally daily) and subcultured if there is evidence suggestive of growth. Terminal subcultures should be performed at 5 days’* e. **ACCEPT** Section 4.5.3 updated to reflect that both aerobic and anaerobic bottles are required. f. **NONE** This is correct. No action required. g. **ACCEPT** FAA added to standard media in section 4.5.3 and

	Appendix 1. h. **ACCEPT** Table updated. i. **ACCEPT** The following text has been added to section 5.2.1: ***'Note:** Due to extended incubation in certain situations, some final reports may not be available until >14 days'* j. **ACCEPT** Text removed. k. **ACCEPT** Table update to '*anaerobically*'. l. **NONE** This information should be requested via the user manual. m. **ACCEPT** Text updated. n. **NONE** Flowchart updated following consultation. Footnote no longer included.

Comment number	4		
Date received	02/08/2013	**Lab name**	BIA
Section	a. Introduction, management, paragraph 3. b. Section 2.7 c. Section 3.4		
Comment			
a. Care with terminology. As you describe, there is increasing evidence that in certain situations, prosthesis can be removed, debrided and a second prosthesis implanted. This can be referred to as a 2-stage procedure undertaken at the same operation. b. I think it is important to be explicit about critical need to perform rifampicin sensitivity (and to a lesser extent, a wider range of agents like linezolid) more or less routinely, particularly if 2-stage procedure at one operation is being considered. c. Consider reference to antimicrobial stewardship as well as clinical indications.			
Evidence			
a. I have heard the above terminology at conferences (eg Tony Berendt)			

b. CID 2013:56 1st Jan. Osmon DR et al. Diagnosis and management of prosthetic joint infection: Clin pract guidelines by IDSA.	
Recommended action	a. **ACCEPT** Text updated to include the possibility of a two stage procedure being completed in one operation. *'Revision arthroplasty involves the removal of a prosthetic joint and debridement followed by re-implantation. Re-implantation may or may not occur during the same operation.'* b. **ACCEPT** Text updated to 'Extensive antibiograms (including rifampicin) are required.' and reference assessed and added to section 4.7. In addition the following text from B42 – Investigation of bone and associated tissue has been inserted: *'It is important to include a wide range of antibiotics particularly for those patients who may require prolonged oral treatment with biofilm active drugs. These antibiotics are not usually included in the common first line antimicrobials tested in most laboratories. For Gram positive organisms these may include a teicoplanin MIC plus antibiotics such as rifampicin, tetracyclines, quinolones, co-trimoxazole, fusidic acid, linezolid, quinupristin/dalfopristin and others.'* c. **ACCEPT** Text updated to: *'Report susceptibilities as clinically indicated. Prudent use of antimicrobials according to local and national protocols is recommended.'*

Respondents indicating they were happy with the contents of the document

Overall number of comments: 1			
Date received	29/09/2014	**Lab name**	PHW