# MEDICAL MICROBIOLOGY

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The specialty of Medical Microbiology of Hong Kong Institute of Medical Laboratory Sciences Quality Assurance Programme (HKIMLSQAP) formerly Hong Kong Medical Technology Association Quality Assurance Programme was first introduced in 1990. It consists of two sections namely, bacterial identification and antimicrobial susceptibility testing. In order to assist participants in analysing their performance, a score was given to each result. In bacterial identification, scores of 2 or (4) were given for fully correct results, 1 or (3) for partially correct results, 0 for negative results and -1 for wrong results. For antimicrobial susceptibility testing, scores of 1 were given for correct results, 0 for incorrect results and NS for Not-scored results.

# I. Participants

There were 33 participants in year 2010.

	Hong Kong	Macau	Overseas
Government Laboratory	1	1	1
Public Hospital Laboratory	9	1	0
Private Laboratory	10	0	0
Private Hospital Laboratory	10	0	0

Table 1 shows the number and types of laboratories registered in 2010.

# II Survey Material Distribution

Sixteen survey samples were sent in four surveys. In each distribution, each participating laboratory was provided with four lyophilised samples (three for bacterial identification and one for antimicrobial susceptibility testing) together with the Result Return Form.

# i. Bacteriological Identification

Simulated specimens consisted of pure culture or mixtures of relatively fastidious organisms rarely encountered bacteria were sent for identification. Participants performed well with MM 1001 (*Streptococcus pyogenes*), MM 1004 (*Klebsiella pneumoniae*), MM 1005 (carbapenemase-producing *Klebsiella pneumoniae*), MM 1006

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(*Pseudomonas aeruginosa*), MM 1010 (*Bordetella bronchiseptica*), MM 1013 (ESBLproducing *Klebseilla pneumoniae*) and MM 1014 (*Neisseria gonorrhoeae*). The allcorrect percentage of 90% or above was noted.

- a. MM 1002 was a mixed culture of *Aeromonas hydrophila* and *Enterococcus faecalis*. Only 58% of participants were able to identify the species of both organisms. Others reported either a single pathogen or the genus of organisms. One participant reported an unexpected pathogen and was awarded a score of -1.
- b. MM 1007 was *Corynebacterium jeikeium* which might be difficult to identify. There were 69.7% of participants being able to obtain a full score in identifying this organism. One participant reported an unexpected pathogen and was given a score 1.
- c. MM 1009 was *Salmonella cholerasuis* with 81.8% of participants getting a full score, whereas 15% of the participants reported *Salmonella* Group C.
- d. MM 1011 was *Aggregatibacter actinomycetemcomitans*. There were 78.8% of participants correctly identified the organism.
- e. MM 1015 (*Neisseria cinerea*) was intended for educational purpose to alert participants that *N. cinerea* might be mis-identified as *N. gonorrhoeae*, which would create unnecessary anxiety, social and family disruption and potential medico-legal chaos. There were 69.7% of participants reporting the correct organism. However, five participants accounting to 15.2% reported *N. gonorrhoeae*. Full identification of the organisms can be accessed on-line on the homepage of Centre of Disease Control of USA websites (1,2).

Survey sample	Intended Results	Number of participants getting scores (%)						
		4	3	2	1	0	-1	Ν
MM 1001	Streptococcus pyogenes			33	0	0	0	0
MM 1002	Aeromonas hydrophila and Enterococcus faecalis	19 (58)	3 (9)	6 (18)	2 (6)	0	3 (9)	0
MM 1003	Klebseilla pneumoniae			31 (94)	2 (6)	0	0	0
MM 1005	Klebseilla pneumoniae (KPC)			33	0	0	0	0
MM 1006	Pseudomonas aeruginosa			30 (91)	0	2 (6)	1 (3)	0
MM 1007	Corynebacterium jeikeium			23 (69.7)	7 (21.2)	0	3 (9)	0
MM 1009	Salmonella choleraesuis			27 (81.8)	5 (15.2)	1 (3)	0	0
MM 1010	Bordetella bronchiseptica			32 (97)	0	0	1 (3)	0
MM 1011	Aggregatibacter actinomycetemcomitans			26 (78.8)	2 (6.1)	0	5 (15)	0
MM 1013	Klebseilla pneumoniae (ESBL)			32 (97)	0	1 (3)	0	0
MM 1014	Neisseria gonorrhoeae			31 (93.9)	0	0	2 (6)	0
MM 1015	Neisseria cinerea (Educational)			Not sco	red			33

Table 2 summarizes the details and the performance of participants in year 2010.

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# ii Antimicrobial Susceptibility Testing

Pure cultures were sent for antimicrobial susceptibility testing. The survey results were shown in Table 3. The methods and techniques used by participating laboratories were not shown as diverse susceptibility testing methods were used.

Survey			Intended	Number of Laboratories			
Sample	Test Organism	Test Agent	gent Result Correct Incorrec Result (%) Result		Incorrect Result	Not Tested	
MM 1004	Klebseilla pneumoniae	Ampicillin	Resistant	33 (100)	0	0	
		Cefuroxime	Resistant	29 (88)	3	1	
		Gentamicin	Sensitive	33 (100)	0	0	
		Cefotaxime	Sensitive/Int*	30 (90.9)	0	3	
		Imipenem	Sensitive	32 (97)	0	1	
		Ceftazidime	Sensitive/Int	33 (100)	0	0	
MM 1008	Pseudomonas aeruginosa	Amikacin	Sensitive	31(94)	1	1	
		Piperacillin	Sensitive	24 (72.8)	3	6	
		Ceftazidime	Sensitive	31 (94)	1	1	
		Gentamicin	Sensitive	32 (97)	1	0	
		Tobramycin	Sensitive	20 (60.6)	1	12	
		Ciprofloxacin	Sensitive	32 (97)	1	0	
		Imipenem	Sensitive	30 (91)	2	1	
MM 1012	Haemophilus influenzae	Ampicillin	Resistant	23 (69.7)	8	2	
		Augmentin	Resistant	21(63.7)	11	1	
		Cefuroxime	Resistant	30 (91)	2	1	
		Chloramphenicol	Sensitive	29 (87.9)	1	3	
		Tetracycline	Sensitive	21 (63.7)	10	2	
		Cefotaxime	Sensitive	28 (84.9)	1	4	
		Beta-lactamase	Negative	25 (75.87)	1	7	
MM 1016	Enterococcus faecalis	Ampicillin	Sensitive	31 (93.9)	2	0	
		Vancomycin	Sensitive	28 (84.8)	5	0	
		High Gentamicin	Sensitive	23 (69.7)	1	9	
		High Streptomycin	Sensitive	16 (48.5)	0	17	

Table 3 shows the performance of 33 participants in susceptibility testing.

\* Intermediate

It was noted that tobramycin, high content gentamicin and high content streptomycin were not performed in the susceptibility testing of 36% (12), 27% (9) and 51.5% (17) participants, respectively.

MM 1012 was a strain of NBLAR *Haemophilus influenzae*. Seven participants accounting to 21% did not test for *beta*-lactamase production. Besides, the susceptibility testings of the organism with ampicillin, augmentin and tetracycline were suboptimal. The numbers of participants giving correct results were 69.7%, 63.7% and 63.7%, respectively.

#### III Performance Analysis

Inter-laboratory comparisons were based on results shown in Tables 2 and 3. A performance rating representing individual laboratory performance was calculated by using the formula shown below:

Cumulative score of the lab	minus	Mean cumulative score of all labs.
examining the same specimen		examining the same specimen
Standard deviation of the cumulativ	e score of al	l laboratories examining the same specimen

Thus laboratories with positive performance rating were doing better than average, laboratories with a performance rating of 0 were performing the same as average and laboratories with negative rating were performing worse than average. Laboratories with a performance rating of - 1.96 standard deviation below the mean were considered performing significantly worse than average.

# i. Bacteriological Identification

The performance of participants on the educational material was not scored. Among 363 results derived from the 11 survey specimens, 87.3% (317) of readouts being identical to the intended results were awarded a full score, 5.0% (18) being partially correct were granted a partial score, 2.8% (10) reporting negative result were offered a score of 0 and 3.6% (13) wrongly identifying organisms were given a score of -1. There was one participant with a performance rating being below -1.96.

#### ii. Antimicrobial Susceptibility Testing

Among 33 reports derived from four survey materials, 92.3% were correct whereas 7.7% were wrong. There was one participant with a performance rating being below - 1.96.

# **IV** Laboratory Performance Report

- i. Individual laboratory performance report was issued to each participant for the interlaboratory comparison. A laboratory performance report was shown as Appendix 1
- ii. Interpretative Quality Assurance Program (IQAP) was jointly organized by HKIMLSQAP and Hong Kong College of Pathologists. Clinical questions were set on two survey materials of each survey exercise for bacterial identification. It aims at monitoring the standard of practising pathologists. There were eight registrants in year 2010.

#### V References:

- 1. Division of STD Prevention, National Centre for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centres for Disease Control and Prevention. Retrieved 1 Feb 2011. http://www.cdc.gov/std/gonorrhea/lab/Ncin.htm for *Neisseria cinerea*.
- 2. Division of STD Prevention, National Centre for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centres for Disease Control and Prevention. Retrieved 1 Feb 2011. http://www.cdc.gov/std/gonorrhea/lab/Ngon.htm#GCGrwth for *Neisseria gonorrhoeae*.

# **Appendix 1**

# HONG KONG INSTITUTE OF MEDICAL LABORATORY SCIENCES QUALITY ASSURANCE PROGRAMME

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#### EVALUATION OF LABORATORY PERFORMANCE (2010)

#### Laboratory code: XXX

# **Bacterial identification:**

Total number of specimens investigated by your laboratory:	11
Your cumulative score for the above survey specimens:	24
Mean cumulative score of all laboratories examining same survey specimens:	20.85
The standard deviation of cumulative score of all laboratories:	4.45

Your cumulative score is XX standard deviations <u>above/below</u> the mean

#### Antibiotic susceptibility testing:

Total number of antibiotic susceptibility tests performed by your laboratory:	24
Your cumulative score for the above tests:	24
Your percentage of correct for the above tests:	100%
The mean percentage of correct among all laboratories:	91.96%
The standard deviation of the percentage of correct results among all laboratories	: 10.6
Your percentage of correct is <b>XX</b> standard deviations <b>above/below</b> the mean.	

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