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ABSTRACT

RESULTS AND DISCUSSION

Objectives: To assess quality and to determine the overall accuracy of antimicrobial susceptibility testing in Russian laboratories.

Methods Eighteen laboratories performed the following QA tests: 1) Test control strains of *E.coli* ATCC 25922 and *S.aureus* ATCC 25923 once each day for 10 working days; 2) test strains granted by WHO/CDC: K.pneumoniae WHO-1, S.aureus WHO-2. Efaecium WHO-3 and Enteric WHO-5 only once to defined sets of antimicrobials; 3) Identification of Enteric WHO-5.

Results: Participating laboratories used different media (Russian AGV-media and Mueller-Hinton) and antimicrobial disks from different producers both domestic and imported. Interpretation of the results they performed according to "Methodical Rules" by Ministry of Health of the USSR dated 1983 and NCCLS 1995-96 recommendations

Results of testing of E.coli ATCC 25922 and S.aureus ATCC 25923 to different antimicrobials were within the NCCLS range in 30-94% and 41-91% respectively. Smaller zone diameters were obtained in 6-64% and 4-53% and larger - in 0-7% and 1-44% respectively.

Testing of WHO strains to different antimicrobials showed that agreement in the interpretation of results was attained in 33-100% for K.pneumoniae WHO-1, 67-100% for Saureus WHO-2, 20-92% for E.faecium WHO-3 and 0-100% for Enteric WHO-5. Correct identification of Enteric WHO-5 (Enterobacter cloacae) was performed in 10/17 centres

Conclusion: The above results elucidate the problems with the internal quality control in most Russian laboratories. Personnel education and procedures standardisation are needed for the improvement of the present situation.

INTRODUCTION AND PURPOSE

The impact of antimicrobial susceptibility testing (AST) on effective antibacterial therapy is of increasing importance. The results of AST in vitro serve as a basis for administration of optimal antibiotic regimen for current patient, for empirical choice of the drugs for the treatment of definite type of infection and for creating of hospital formulary.

Strict standartisation of the testing procedure and regular performing of quality control tests are essential for achieving of repeatable clinically relevant results. The purpose of the current study was to assess the quality and b determine the overall accuracy of AST in Russian microbiology laboratories

The participating laboratories used different media (Russian AGV-media and Mueller-Hinton) and antimicrobial disks from different producers both domestic and imported Interpretation of the results was performed according to "Methodica Rules" by Ministry of Health of the USSR 1983 and NCCLS 1995-96 recommendations.

The results of testing of E.coli ATCC 25922 and S.aureus ATCC 25923 to different antimicrobials were within the NCCLS range in 30-94% and 41-91% respectively Smaller zone diameters were obtained in 6-64% and 4-53% and larger - in 0-7% and 1-44% respectively. The results are presented in the tables 1-2

From our point of veiw there are three main causes explaining the prevalence of smaller zone diameters of quality control strains: 1) Low content of β-lactam antibiotics in sensitivity disks due to the poor stability of these drugs especially in case of improper storage; 2) Unacceptable high C a²⁺, Mg²⁺ and thimidine contents in Russian AGV-medium that leads to false resistance to aminoglycosides, quinolones and anti-folates; 3) Non-standardised (heavy) inoculum used

The high frequency of larger S.aureus ATCC 25923 zones around oxacillin disk could be due to oxacillin 10 mcg disks used in some of the participating laboratories.

Testing of WHO/CDC strains to different antimicrobials showed that agreement in the interpretation of results with those of CDC was attained in 33-100% for K pneumoniae WHO-1 67-100% for S aureus WHO-2 20-92% for E faecium WHO-3 and 0-100% for Enteric WHO-5. The results are presented in the tables 2-6.

The obtained results of testing of WHO/CDC quality control strains with unknown susceptibility patterns confirm that testing of clinical strains in Russian laboratories in routine practice produce a lot of errors. There is a trend to over-detection of the antimicrobial resistance, whereas false-susceptible results are relatively rare

The main reason of the majority of problems with AST is that the only official document regulating the AST procedure in Russia is the "Methodical Rules" by Ministry of Health of the USSR revised last time in 1983.

This document advocates use of Russian AGV-medium for testing, composition of which differs considerably from Mueller-Hinton agar and does not meet WHO requirements for cations and thimidine contents, etc.

These guidelines include only disk-diffusion procedure of 23 "old" antimicrobials for non-fastidious bacteria only. No recommendations have been developed for dilution tests and screening of specific types of resistance (MRSA, penicillin-resistance in pneumococci, ESBL-production in gram-negative bacteria).

Tables 1-2. Distribution (%) of the results (zone diameters) of ATCC strains with respect to NCCLS (1998) acceptable ranges (Normal - % of results withinNCCLS range, Low - % of zone diameter results smaller than NCCLS range, High % of zone diameter results larger than NCCLS range).

			E.coli ATCC 2592			S.aureus ATCC 25923				
Antimicrobial	N	Low, %	Normal, %	High, %	Antimicrobial	N	Low, %	Normal, %	High	
Ampicillin	126	49	48	3	Penicillin	137	53	45	2	
Carbenicillin	96	64	30	6	Oxacillin	165	15	41	44	
Cefazolin	52	54	46	0	Cefazolin	20	45	55	0	
Cefotaxime	69	28	72	0	Erythromycin	137	2	91	7	
Sentamicin	101	27	73	0	Gentamicin	123	4	80	16	
Ciprofloxacin	75	24	76	0	Ciprofloxacin	122	19	81	(
Tetracyclin	89	6	94	0	Tetracyclin	112	10	83	7	
Co-trimoxazole	102	30	58	2	Vancomycin	136	29	70	1	

Tables 3-6. Agreement (%) and the rates of errors (%) of the results of WHO/CDC QAstrains interpretation (by sensitivity category) with respect to CDC results interpretation

	K.pneumoniae WHO-1					Enteric (E.cloacae) WHO-5				
Antimicrobial	Agreement, %		Errors,%		Antimicrobial	Agreement, %	Errors,%			
		Minor	Major	Very major			Minor	Major	Very major	
Ampicillin	100	0	0	0	Ampicillin	100	0	0	0	
Cefotaxime	46	27	0	27	Cefotaxime	100	0	0	0	
Gentamicin	50	12	38	0	Gentamicin	93	0	7	0	
Ciprofloxacin	60	40	0	0	Ciprofloxacin	80	20	0	0	
Co-trimoxazole	54	23	0	23	Cotrimoxazole	73	0	27	0	
Chloramphenicol	33	67	0	0	Chloramphenicol	0	30	70	0	

		aureus WHK					E.faecium WHO-3			
Antimicrobial	Agreement, %		Errors,%		Antimicrobial	Agreement, %	Errors,%			
		Minor	Major	Very major			Minor	Major	Very major	
Penicillin	100	0	0	0	Penicillin	92	0	ó	8	
Oxacillin	79	7	0	14	Ampicillin	54	8	38	0	
Gentamicin	84	0	16	0	Gentamicin (High)	20	20	60	0	
Ciprofloxacin	79	14	7	0	Ciprofloxacin	50	25	0	25	
Vancomycin	92	0	8	0	Vancomycin	92	8	0	0	
Chloramphenicol	67	24	8	0	Chloramphenicol	46	54	0	Ó	

MATERIALS AND METHODS

Eighteen Russian microbiology laboratories were asked to perform the following QA tests

- 1. Test control strains of E.coli ATCC 25922 and S.aureus ATCC 25923
- to defined sets of antimicrobials once each day for 10 working days;
- 2. Test strains granted by WHO/CDC: K.pneumoniae WHO-1. S.aureus WHO- Efaecium WHO-3 and Enteric WHO-5 to defined sets of antimicrobials once only;
- 3. To perform identification of Enteric WHO-5.

CONCLUSION

- The above results elucidate the problems with the internal quality control in most Russian laboratories.
- Personnel education and procedures standardisation are needed for the improvement of the present situation.
- There is an urgent demand for National guidelines for AST in Russia, harmonised with the international practices (WHO, NCCLS, SFM, DIN, BSAC, etc. ???)

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