**CLINICAL MICROBIOLOGY - SHORT COMMUNICATION** 





# Molecular characterization of extended-spectrum β-lactamase-producing *Klebsiella pneumoniae* from a Malaysian hospital

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### Abstract

Multidrug-resistant (MDR) and extended-spectrum  $\beta$ -lactamase (ESBL)-producing *Klebsiella pneumoniae* associated with nosocomial infections have caused serious problems in antibiotic management with limited therapeutic choices. This study aimed to determine the genotypic and phenotypic characteristics of *K. pneumoniae* strains isolated from a tertiary hospital in Malaysia. Ninety-seven clinical *K. pneumoniae* strains were analyzed for antimicrobial susceptibility, all of which were sensitive to amikacin and colistin (except one strain), while 31.9 % and 27.8 % were MDR and ESBL producers, respectively. PCR and DNA sequencing of the amplicons indicated that the majority of MDR strains (26/27) were positive for *bla*<sub>TEM</sub>, followed by *bla*<sub>SHV</sub> (24/27), *bla*<sub>CTX-M-1</sub> group (23/27), *bla*<sub>CTX-M-9</sub> group (2/27), and *mcr-1* (1/27). Thirty-seven strains were hypervirulent and PCR detection of virulence genes showed 38.1 %, 22.7 %, and 16.5 % of the strains were positive for *K1*, *wabG*, and *uge* genes, respectively. Genotyping by pulsed-field gel electrophoresis (PFGE) and multilocus sequence typing (MLST) showed that these strains were genetically diverse and heterogeneous. Sequence types, ST23, ST22, and ST412 were the predominant genotypes. This is the first report of colistin-resistant *K. pneumoniae* among clinical strains associated with *mcr-1* plasmid in Malaysia. The findings in this study have contributed to the effort in combating the increase in antimicrobial resistance by providing better understanding of genotypic characteristics and resistance mechanisms of the organisms.

Keywords ESBL · Klebsiella pneumoniae · Multidrug resistance · MLST · PFGE

# Introduction

Extended-spectrum  $\beta$ -lactamases (ESBLs) are enzymes produced by Gram-negative bacteria to confer resistance to aminopenicillins, cephalosporins (first-, second-, third-, and fourth-generation), and aztreonam which are inhibited by clavulanic acid [1, 2]. Members of TEM, SHV, and CTX-M

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groups are the common families of  $\beta$ -lactamases which are found in *Escherichia coli*, *K. pneumoniae*, and other *Enterobacteriaceae* worldwide [1, 2]. These resistance determinants are usually plasmid-encoded. Among the ESBL enzymes, CTX-M type has been increasingly reported [1, 3]. In Malaysia, Palasubramaniam et al. (2005) reported an association of *bla*<sub>SHV-5</sub> ESBL gene in *K. pneumoniae* with a nosocomial outbreak, followed by several other reports [4–6].

Carbapenems have been used as the last-line antimicrobial drugs to treat serious infections caused by ESBL-producing *Enterobacteriaceae*; however, the emergence of carbapenemase-producing *Enterobacteriaceae* worldwide have left clinicians with very limited therapeutic antibiotic options [6, 7]. Therefore, early detection of ESBL- and carbapenemase-producing pathogens is the first step towards better infection control management [8]. ESBL-producing *K. pneumoniae* causing nosocomial infections such as pneumonia, urinary tract infections, septicemia, and soft tissue is a worldwide problem [1, 2]. The clonal complex 258

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(CC258), which is the predominant sequence type 258 (ST258), and single-locus variants of ST258 such as ST340, ST437, ST11, and ST512 have been reported to produce ESBLs [9].

Since the increase in carbapenemase-producing *K*. *pneumoniae* worldwide, colistin and tigecyclin have been used for treating infections caused by these resistant organisms [10, 11]. Unfortunately, the overuse of colistin has also resulted in increased colistin-resistant strain worldwide [10]. The main cause of resistance to colistin and tigecyclin is lipopolysaccharide (LPS) modification and is associated with mutations in *mgrB* and the two-component systems, *pho*PQ and *pmr*AB [12].

The plasmid-mediated colistin resistance due to *mcr-1* resistance gene was first reported by Liu et al. (2016) from food animals and patients recently in China which is followed by several reports in animals and humans worldwide [13-15].

In addition, several virulence factors have been detected in *K. pneumoniae* such as capsular serotypes, *magA*, *K2*, *rmpA* (the mucoid phenotype regulator) genes, *kfu* (responsible for an iron uptake system), *wabG* (responsible for biosynthesis of the outer core lipopolysaccharide), *uge* (responsible for biosynthesis of the capsule and smooth lipopolysaccharide), and *all*S which is associated with allantoin metabolism [16]. These virulence factors are associated with the ability to cause severe community-acquired infections such as liver abscesses, pneumonia, and meningitis in young healthy hosts and the ability to cause metastatic infections [16].

There is a need to have a more comprehensive data on the presence of ESBLs, virulence genes, and antimicrobial susceptibility trends of clinical *K. pneumoniae* strains in Malaysia to improve treatment options for a wide range of infections caused by this pathogen. Therefore, the objective of this study was to determine the antimicrobial susceptibility, resistance genes, virulence genes, and genetic diversity of clinical strains of *K. pneumoniae* isolated from a hospital in Johor Bahru, Malaysia.

## Materials and methods

Ninety-seven non-repeat clinical *K. pneumoniae* strains previously isolated from patients (males, n = 62 and female, n = 35) admitted to the hospital from September to December 2014 were analyzed. These strains were archived laboratory cultures previously collected from the hospital. There is no personal information about patients. The only information are sources and gender. The strains were cultured from blood (n = 25), bronchoscopic aspirates (BBA) (n = 24), wound tissue (n = 9), swab sample (n = 10), urine (n = 8), pus (n = 6), poc (n = 3), sputum (n = 8), fluid (n = 2), slough (n = 1), and bone (n = 1). Identification of *K. pneumoniae* was performed by PCR using specific primers [17]. The species were confirmed by PCR targetting the *mdh* housekeeping gene (http:// bigsdb.web.pasteur.fr/klebsiella/primers\_used.html). All strains were cultured in Luria-Bertani broth and kept in 50% glycerol at -20 °C. The PCR amplicons were purified and sequenced for validation of their identity.

The susceptibility of the *K. pneumoniae* strains to 16 antimicrobial agents, including cefoperazone (30 µg), ciprofloxacin (5 µg), ampicillin (10 µg), aztreonam (30 µg), piperacillin/tazobactam (10 µg), imipenem (10 µg), amikacin (30 µg), ceftazidime (30 µg), gentamycin (10 µg), colistin (10 µg), tetracycline (30 µg), cefotaxime (30 µg), sulbactam-cefoperazone (150 µg), amoxicillin-clavulanate (20/10 µg), meropenem (10 µg), and cefixime (5 µg) (Oxoid Limited Basingstoke, Hampshire, England) were determined by the disk diffusion method according to the Clinical and Laboratory Standard Institute (CLSI) guidelines [18].

ESBL production was confirmed using disk diffusion method as described in the CLSI guideline [18] and *E. coli* strain ATCC 25922 and *K. pneumoniae* ATCC 700603 were used as quality control. Modified Hodge Test (MHT) was carried out to detect carbapenemase production in *K. pneumoniae* strains according to the CLSI guideline [19] and ATCC® BBA-1705 and ATCC® BBA-1706 were used as positive and negative controls, respectively. The minimum inhibitory concentration (MICs) for ceftazidime, amoxicillinclavulanate, cefotaxime, meropenem, and imipenem (BioMerieux) was determined by E-test according to the CLSI guidelines and broth microdilution method (for colistin-resistant strain; KP2014C56) was performed for colistin. *E. coli* ATCC 25922 was used as a quality control strain [18].

Genomic DNA of all MDR *K. pneumoniae* strains were extracted by using DNA extraction kit (Yeastern Biotech Co., Ltd.) and subjected to PCR detection of  $\beta$ -lactamase genes including  $bla_{\text{TEM}}$ ,  $bla_{\text{SHV}}$ ,  $bla_{\text{CTXM-1}}$  group,  $bla_{\text{CTXM-2}}$  group,  $bla_{\text{CTX-M-9}}$  group,  $bla_{\text{OXA-1}}$ , and  $bla_{\text{OXA-9}}$ ; carbapenem resistance genes  $bla_{\text{KPC}}$ ,  $bla_{\text{NDM}}$ ,  $bla_{\text{VIM}}$ ,  $bla_{\text{IMP}}$ , and  $bla_{\text{OXA-48}}$ ; and colistin resistance genes mcr-1, mcr-2, mcr-3, mcr-4, and mcr-5 [13, 20, 21]. All PCR products were sequenced to validate their identity and the strains with the confirmed amplicons were used as positive controls for subsequent PCR analysis.

String test was performed for all 97 *K. pneumoniae* strains to distinguish hypervirulent *K. pneumoniae* (hvKP) from classical *K. pneumoniae* (cKP) [22]. Genomic DNA of all 97 *K. pneumoniae* strains were used for PCR detection of virulence genes including *K*1, *K*2, *uge*, *wabG*, *fimH*, *magA*, *rmpA*, and *kfu* [23]. Positive PCR-amplified products were sequenced to validate their identity and the strains with the correct amplicons were used as positive controls for subsequent PCR analysis.

Plasmid DNA from ESBL-producing K. pneumoniae strains were extracted using the alkaline lysis method which contains DNase (10 mg/mL) to avoid chromosomal DNA in the extracted plasmid. [24], followed by electrophoresis on a 1.5% agarose gel for 4.5 h at 80 V (3.2 V/cm). A 1 kb DNA ladder and lambda DNA/HindIII (Promega, Madison,WI USA) were used as DNA markers and plasmid extraction also was performed by using plasmid extraction kit (Qiagen), this experiment was repeated 3 times to confirm the results. The plasmid linearization and confirmation of the plasmid sizes were performed by S1 nuclease PFGE and lambda DNA; low-range DNA markers and E. coli V517 strain were used as standard reference [25]. PCR detection of selected  $\beta$ lactamase genes (bla<sub>SHV</sub>, bla<sub>TEM</sub>, bla<sub>CTXM-1</sub> group, and  $bla_{CTXM-9}$  group) and colistin resistance gene (mcr-1) was performed using extracted plasmid DNA. The PCR products were sequenced to confirm their identity [25, 26].

Transfer of ESBL and *mcr-1* genes by conjugation was performed in Luria-Bertani broth using nalidixic acid– resistant *E. coli* DH5 $\alpha$  as the recipient strain and conjugation experiment was repeated 5 times to confirm the results. Transconjugants were selected on LB agar supplemented with nalidixic acid (100 mg/mL) and cefotaxime (2 mg/L) or colistin (1 mg/L) (Sigma Aldrich) [25, 26]. PCR detection of selected  $\beta$ -lactamase genes (*bla*<sub>SHV</sub>, *bla*<sub>TEM</sub>, *bla*<sub>CTXM-1</sub> group, *bla*<sub>CTXM-9</sub> group, and *mcr-1*) was performed using plasmid DNA extracted from transconjugants. The plasmid linearization was performed by S1 nuclease PFGE and lambda DNA; low-range DNA markers were used as the standard reference [25].

PFGE typing was carried out according to Lim et al. (2009) with minor modification [5]. In brief, equal volumes of the standardized cell suspensions ( $OD_{610} = 0.6$ ) and 1% Seakem Gold agarose were mixed gently and allowed to solidify to form agarose plugs. The plugs were lysed with cell lysis buffer (50 mM Tris, 50 mM EDTA (pH = 8), 1% sarcosine, 1 mg/mL)proteinase K (Promega, Madison, WI, USA)) and incubated for 4 h at 54 °C. The lysed plugs were then washed twice with sterile double distilled water and six times with TE buffer. The DNA agarose plugs were digested with 10 U of XbaI (Promega. Madison, WI USA) for 24 h at 37 °C and electrophoresed by using a CHEF-Mapper (BioRad, USA) with pulse times of 2.25-54.2 s at 6 V/cm for 24 h. Analysis of the PFGE banding patterns based on the unweighted pair group method was carried out using the BioNumerics 6.0 software; the DNA marker, Salmonella serotype Braenderup H9812 has been incorporated in the gel (first, middle, and last lanes) for linearization purpose with tolerance of 1.5.

Genotyping of 97 *K. pneumoniae* strains was determined by multilocus sequence typing (MLST) analysis. MLST was performed with seven housekeeping genes (*tonB*, *rpoB*, *pgi*, *phoE*, *infB*, *mdh*, and *gapA*). Alleles and sequence types were allocated by using the MLST database (http://bigsdb.web. pasteur.fr/perl/bigsdb/bigsdb.pl?db=pubmlst\_klebsiella\_ seqdef\_public).

eBURST V3 (http://eburst.mlst.net) analysis using the most stringent definition, where the STs were identical or shared at least six alleles, was used to detect clonal complex or BURST groups (BGs) among the STs in this study and the *K. pneumoniae* MLST database. The STs were then categorized as BG founders, single-locus variants (SLVs), double-locus variants, and singletons [27].

### **Results and discussion**

All 97 K. pneumoniae were susceptible to amikacin and colistin except for one strain (KP2014C56) that showed resistance to colistin. This strain, from a swab sample of an infected wound, was detected as MDR and ESBL-producing (multiple drug-resistant to aztreonam, sulbactam-cefoperazone, tetracvcline, ampicillin, ceftazidime, cefotaxime, cefixime, and amoxicillin-clavulanate), hypervirulent, and harbored resistance genes *bla*<sub>CTXM-15</sub>, *bla*<sub>TEM-1</sub>, *bla*<sub>SHV-11</sub>, and *mcr-1*, and virulence genes K1 and wabG. This strain had a unique pulstotype and belonged to ST65. In Malaysia, this is the first report of colistin-resistant K. pneumoniae among clinical strain associated with plasmidial mcr-1, which was recently reported in zoonotic K. pneumoniae from swine farms [20]. Polymyxin E (colistin) is effective against multidrug-resistant and carbapenemase-producing Gram-negative bacteria, but recently, colistin-resistant Enterobacteriaceae including K. pneumoniae has been reported worldwide [10, 12, 28]. The clinical K. pneumoniae strains from Greece (10.5-20%), Singapore (6.3%), South Korea (6.8%), and Canada (2.9%) showed highest resistance rate to colistin [10].

The percentages of antibiotic resistance for 97 K. pneumoniae strains are as follows: ampicillin (83.5%), cefotaxime (31.9%), tetracycline (30.9%), cefixime (29.8%), cefoperazone (27.8%), aztreonam (27.8%), ceftazidime (25.7%), amoxicillin-clavulanate (19.5%), tazobactam (11.3%), gentamycin (11.3%), sulbactam cefoperazone (8.2%), ciprofloxacin (7.2%), meropenem (6.1%), imipenem (2%), and colistin (1%). A majority of the K. pneumoniae strains (81/97) were resistant to ampicillin. There were 31 strains (31.9%) which showed resistance to more than three classes of antibiotics (qouinolone, monobactam, β-lactam, cephalosporin, polymyxin, aminoglycoside, tetracycline) and categorized as multidrug-resistant (MDR). Five strains showed carbapnem resistance based on AST and MIC results; KP2014C15 based on result of the disk diffusion method and MHT tests, 27 (27.8%) K. pneumoniae strains were ESBL producers and no carbapenemase-producing K. pneumoniae was detected.

These rates were higher than the rates reported in previous study which was carried out in 2000–2004 from another urban

general hospital (cefixime = 20.2%, cefotaxime = 18.1%, cefoperazone = 7.3%, and ceftazidime = 8%) [29]. However, it was lower than another study that was carried out in 2009 from five different hospitals in Peninsular Malaysia [5]. This could be due to different locations of the hospitals that serve different patient population. The current study only reported the resistance from a hospital in southern Malaysia while majority of the strains from previous studies were isolated from the central region.

The minimum inhibitory concentration (MIC) of cefotaxime and ceftazidime ranged from 16 to 256  $\mu$ g/mL and from 8 to 256  $\mu$ g/mL, respectively. Five strains of *K*. *pneumoniae* showed resistance to meropenem. All strains showed intermediate susceptibility and resistance to amoxicillin-clavulanate. Only one was resistant to colistin (16  $\mu$ g/mL).

Multidrug-resistant and ESBL-producing *Enterobacteriaceae* of certain clonal complexes such as ST258 of *K. pneumoniae* have been disseminated worldwide [30]. The presence of virulence genes and drug resistance in these clonal strains of *K. pneumoniae* complicates treatment particularly among immunocompromised individuals [7, 31]. Previously, Low et al. (2017) reported the occurrence of carbapenem-resistant *K. pneumoniae* strains in another tertiary Malaysian hospital [6]. However, in this study, no carbapenemase-producing *K. pneumoniae* and no carbapenem resistance gene was detected.

Analysis of the DNA sequence of all the amplicons of ESBL-encoding genes in the 31 MDR *K. pneumoniae* strains showed that the majority (26/31) were positive for  $bla_{\text{TEM}}$ , all of which were identified as  $\beta$ -lactamase producer of TEM-1 enzyme. TEM-1 is a common  $\beta$ -lactamase among *Enterobacteriaceae* family [1]. This was followed by  $bla_{\text{SHV}}$  (24/31) which comprised of 9  $bla_{\text{SHV-11}}$ , 7  $bla_{\text{SHV-12}}$ , 6  $bla_{\text{SHV-28}}$ , and 2  $bla_{\text{SHV-61}}$ . Twenty-three MDR strains were  $bla_{\text{CTX-M-1}}$  group (11  $bla_{\text{CTX-M-15}}$ , 7  $bla_{\text{CTX-M-1}}$ , 5  $bla_{\text{CTX-M-28}}$ ), two MDR had  $bla_{\text{CTX-M-9}}$  and one MDR colistin-resistant strain had *mcr-1*. No amplification was observed for  $bla_{\text{CTX-M-2}}$  group,  $bla_{\text{OXA-1}}$ ,  $bla_{\text{OXA-9}}$ ,  $bla_{\text{KPC}}$ ,  $bla_{\text{NDM}}$ ,  $bla_{\text{VIM}}$ ,  $bla_{\text{IMP}}$  and  $bla_{\text{OXA-48}}$  genes.

The CTX-M groups have been reported as predominant ESBL enzymes worldwide [1]. CTX-M-15 is one of the most common CTX-M-type ESBLs among the *Enterobacteriaceae* family. Nosocomial infections caused by CTX-M-15-producing *K. pneumoniae* have dramatically increased in recent years [1]. In Malaysia and other Asian countries, CTX-M-15 is the major ESBL enzyme reported [5, 32, 33].

According to antimicrobial susceptibility test and minimum inhibitory concentration results, five strains of *K. pneumoniae* showed resistance to meropenem ranged from 4 to 8  $\mu$ g/mL (KP2014C15, KP2014C37, KP2014C62, KP2014C96, and KP2014C99) and only one strain (KP2014C96) showed resistance to imipenem (8  $\mu$ g/mL). **Fig. 1** Cluster analysis of PFGE profiles for 97 *K. pneumoniae* strains used in this study. <sup>a</sup>Bronchoscopic aspirates (BBA). <sup>b</sup>Cefoperazone (CFP), aztreonam (ATM), amikacin (AMK), sulbactam cefoperazone (SCF), meropenem (MEM), cefixime (CFM), amoxicillin-clavulanate (AMC), ciprofloxacin (CIP), ampicillin (Amp), tazobactam (TZP), imipenem (IMP), ceftazidime (CAZ), colistin (CT), cefotaxime (CTX), gentamycin (GEN), and tetracycline (TET). <sup>c</sup>Female (F) or male (M)

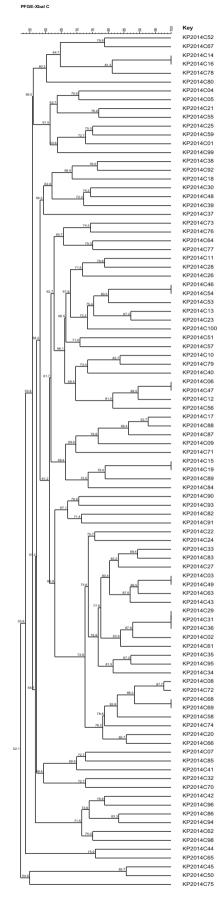
However, these 5 strains were MHT negative and carbapenemase genes were not detected. This finding suggested that the carbapenem resistance was due to different mechanisms and the possible mechanisms will be determined in future.

Thirty-seven strains (38.1%) were hypervirulent as they were positive for the string test, and all had the virulence gene, K1. Among 97 clinical strains, 22 (22.7%) and 16 (16.5%) were positive for *wabG* and *uge* genes, respectively. No *fimH*, *magA*, *rmpA*, *kfu*, and *K2* gene was detected.

Liu et al. (2018) reported the occurrence of virulence genes K1 (34.4%), K2 (20.8%), rmpA1 (79.2%), rmpA2 (70.8%), and magA (80.2%) among hvKP in China [13]. Lin et al. (2014) also reported the occurrence of rmpA (100%), *iuc* (96%), and *kfu* (11.5%) in *K. pneumoniae* strains from Singapore, Hong Kong, and Taiwan [33].

Plasmid analysis showed that all 27 ESBL-producing K. pneumoniae strains had plasmids with sizes ranging from 1500 to 20,000 bp; PCR detection of selected  $\beta$ lactamase and colistin genes (bla<sub>SHV</sub>, bla<sub>TEM</sub>, bla<sub>OXA-1</sub>, bla<sub>CTXM-1</sub>, and mcr-1) using extracted plasmid DNA as templates showed 21 strains had  $bla_{\text{TEM}}$  in plasmids, 18 strains had *bla*<sub>SHV</sub>, 15 strains had *bla*<sub>CTXM-1</sub>, and one strain had mcr-1 (KP2014C56), that this strain had 4 plasmids with sizes of 2500, 6000, 8000, and 20,000 bp that harbored bla<sub>CTXM-15</sub>, bla<sub>TEM-1</sub>, bla<sub>SHV-11</sub>, and mcr-1. Conjugation was carried out for all ESBL-producing and nalidixic acid-sensitive K. pneumoniae strains which harbored plasmids and ESBLs associated. Nineteen out of 27 were ESBL-encoding transconjugants. Plasmid analysis of the transconjugants confirmed that plasmids with sizes of 1500, 2500, 3000, 6000, 8000, 10,000, and 20,000 bp were transferred from the donors to the recipient, with each donor transferring between 2 and 4 plasmids to the recipient. Conjugation was carried out for colistinresistant and nalidixic acid-sensitive K. pneumoniae strain (KP2014C56) which harbored plasmids, colistin, and ESBL genes. This strain was detected as colistinresistant transconjugants. Plasmid analysis of the transconjugants confirmed that 3 plasmids with sizes of 2500, 8000, and 20,000 bp were transferred from the donors to the recipient which contained  $bla_{\text{CTXM-15}}$ ,  $bla_{\text{TEM-16}}$  $_{1}$ ,  $bla_{SHV-11}$ , and mcr-1.

Plasmid analysis and transconjugation experiments showed that all 27 ESBL-producing strains harbored plasmids and most of the ESBL genes were plasmid-encoded



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Amp.TeAmp.Amp.TeAmp.Amp.Amp.Amp.Amp.Amp.Amp.Amp.Amp.Amp.			м		
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CALCTNORMAND.MEMFTEM-1.91/V-91HAmpMHHAmpMHHAmpFHHAmpFHHCTAM-1.TELOTAMANDFHHCTAM-1.TELOTAMANDFCTAM-1.TEM-1.SHV-28HCTPA-1.TELOTAMANDFCTAM-1.TEM-1.SHV-28HCTPA.1.TELOTAMAND,CAC.TELOTAMANDFCTAM-1.TEM-1.SHV-28HCTPA.1.TEM-1.SHV-19GPA-1.TEM-1.SHV-12VVCTPA.1.TEM-1.SHV-15CTAM-1.TEM-1.SHV-12VVCTPA.1.TEM-1.SHV-15FCTAM-1.TEM-1.SHV-12VCTPA.1.TEM.1.SHV-15FK1. Uge, web3K1. Uge, web3AmpGCTAM-1.TEM-1.SHV-13K1. Uge, web3AmpGCTAM-1.TEM-1.SHV-14K1. Uge, web3CTPA.1.TEM.1.SHV-15FK1. Uge, web3CTPA.1.TEM.1.SHV-15K1. Uge, web3K1. Uge, Web3CTPA.1.TEM.1.SHV-15FK1. Uge, Web3CTPA.1.TEM.1.SHV-15K1. Uge, Web3K1. Uge, Web3CTPA.1.TEM.1.SHV-15K1. Uge, Web3K1. Uge, Web3CTPA.1.TEM.1.SHV-15K1. Uge, Web3					
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CITX-TE_CFM_AMCFCTAM -17EM -1.5HV-28K1CIPA -175.8GP, T2P Amp, CAZ TE_CTX-CPM_AMCMCTAM -17EM -1.5HV-28K1CIPA -175.8GP, T2P Amp, CAZ TE_CTX-CPM_AMCMCTAM -17EM -1.5HV-28WCIPA -175.8GP, T2P Amp, CAZ TE_CTX-CPM_AMCMCTAM -17EM -1.5HV-28WCIPA -175.8GP, T2P Amp, CAZ TE_CTX-CPM_AMCMCTAM -1.5TEM -1.5HV-21WCIPA -175.8GP, T2P Amp, CAZ TE_CTX-CPM_AMCMCTAM -1.5TEM -1.5HV-28K1.1Ug, wa8CAmpMTEM -1.5HV-28K1.1Ug, wa8CAmpMTEM -1.5HV-28K1.1Ug, wa8CCIPA -175.4GP, SC, T2P Amp, CAZ TE_CTX.IMP, CFMFK1.1Ug, wa8CCIPA -175.4GP, SC, T2P Amp, CAZ TE_CTX.IMP, CFMFK1.1Ug, wa8CCIPA -175.4GP, SC, T2P Amp, CAZ TE_CTX.IMP, CFMFCTAM -1.5EM -1.5HV-11, MCC 1CIPA -175.4GP, CAZ, TE_CTX.IMP, CFMFCTAM -1.5EM -1.5HV-11, MCC 1ATMACFCTAM -1.5EM -1.5HV-11, MCC 1K1, wa8CCIPA -175.4GP, T2P Amp, CAZ TE_CTX.IMP, CFMFCTAM -1.5EM -1.5HV-11, MCC 1ATMAC CAZ TE_CTX.CIPM_AMCMCTAM -1.5EM -1.5HV-11, MCC 1ATMAC CATE_CTX.CIPM_AMCMCTAM -1.5EM -1.5HV-11, MCC 1ATMAC CAZ TE_CTX.CIPM_AMCMCTAM -1.5EM -1.5HV-11, MCC 1ATMAC CALLFCTAM -1.5EM -1.5HV-11ATMAC CATE_CTX.CIPM_AMCAMCTAM -1.5EM -1.5HV-11ATMAC CATE_CTX.CIPM_AMCAMCTAM -1.5EM -1.5HV-11ATMAC CATE_CTX.CIPM_AMCAMCTAM -1.5EM -1.5HV-11ATMAC CATE_CTX.CIPM_AMCAMCTAM -1.5EM -1					K1 wabG
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CPF ATM OP ALT CITX CFM AMCMCTAM 15 TEM 1 SIN 24MCPF ATM SC TX TE CTX CFM AMCMCTAM 15 NIV 24MCPF ATM SC TX PAND, CAZ TE CTX CFM AMCMCTAM 25 NIV 24CPF ATM SC TX PAND, CAZ TE CTX CFM AMCMCTAM 15 NIV 24AnnoMCTAM 15 NIV 24MCPF ATM CAZ TE CTX CFM AMCMNNIV 28AnnoMCTAM 15 NIV 24NIV 28NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 28NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 28NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 14NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 14NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 14NIV 28CPF ATM CAZ TE CTX CFM AMCMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 15 NIV 14NIV 28CPF ATM CAZ CTX CFM AMC CTXMCTAM 1				CTXM-1.TEM-1.SHV-28	К1
OFF ATM Amp. GAZ CTX.TE.CFM.AMCPCTMA 1.TEM-1yap. wabCOFF ATM CIP.TZP.CAZ.TE.CTX.CFM.AMCFCTMA 28.TEM-1.SIN-12yap.OFF ATM CIP.TZP.CAZ.TE.CTX.CFM.AMCFK1AmpKK1yap. wabCAmpKK1yap. wabCOFF ATM CAZ.TE.CTX.CFM.AMCKK1yap. wabCOFF ATM CAZ.TE.CTX.CFM.AMCKK1yap. wabCOFF ATM CAZ.TE.CTX.CFM.AMCKCTMA 1.TEM-1.SIN-12Yap. wabCOFF ATM CIP.TZP.Amp.CAZ.TE.CTX.MPC.MAKCTMA 1.TEM-1.SIN-12Yap. wabCOFF ATM CIP.TZP.Amp.CAZ.TE.CTX.CFM.AMCKCTMA 1.TEM-1.SIN-12Yap. wabCAmpCTMA 1.TEM-1.SIN-12Yap. wabCYap. WabCYap. WabCOFF ATM CIP.TZP.Amp.CAZ.CTX.CFM.AMCKCTMA 1.TEM-1.SIN-11Yap. WabCOFF ATM CIP.TZP.Amp.CAZ.CTX.CFM.AMCMCTMA 1.TEM-1.SIN-12Yap. WabCOFF ATM CIP.TZP.Amp.CAZ.CTX.CFM.AMCMCTMA 1.TEM-1.SIN-14Yap. WabCOFF ATM CAZ.TE.CTX.CFM.AMCMCTMA 1.TEM-1.SIN-14Yap. WabCOFF ATM CAZ.TE.			м		K1. uge, wabG
AmpMupper spaceupper spaceCFPATM.SCF.T2P.Amp.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-11UPAmpNCTXM-15.TEM-1.SHV-11NAmpNTEM-1.SHV-28NAmpNTEM-1.SHV-28NCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-11NCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-11NCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-11NCFMATM.OPT EC.Z.Z.TC.CFM.AMCNCTXM-15.TEM-1.SHV-11NCFMATM.Amp.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-11NAmpNCTXM-15.TEM-1.SHV-11NNCFMATM.OPT.PZ.PAmp.CAZ.TE.CTX.MEM.AMCNCTXM-15.TEM-1.SHV-11NCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-12NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-12NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-12NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-12NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-14NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-14NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-14NNCFPATM.CAZ.TE.CTX.CFM.AMCNCTXM-15.TEM-1.SHV-14NNCFPATM.CAZ.TE.CTX.CFM.AMCNNNNNCFPATM.CAZ.TE.CTX.CFM.MEMACNNNNNCFPA			F		,
CFPATM.CPT.ZPC.AZ.TE.CTX.CPM.AMCFCTXM-23.TEM-1.SHV-12CFPATM.CPC.ZPC.AZ.TE.CTX.CPM.AMCKCTXM-15.TEM-1.SHV-21AmpFK1.uge, wabCAmpKTEM-1.SHV-28CFPATM.CAZ.TE.CTX.CFM.AMCMCTXM-15.TEM-1.SHV-12CFPATM.CPT.SC.T.ZP.Amp.CAZ.TE.CTX.IMP.CAMCMCTXM-15.TEM-1.SHV-12CFPATM.CPT.SC.CTX.CFM.AMC, CTFK1.uge, wabCCFPATM.CPT.SC.CAZ.TE.CTX.IMP.CAMCFK1.uge, wabCCFPATM.CPT.SC.CAZ.TE.CTX.IMP.CAMCFK1.uge, wabCCFPATM.CPT.SC.CAZ.TE.CTX.IMP.CAMCFK1.uge, wabCCFPATM.CPT.SC.CAZ.TE.CTX.CMCMAMCFK1.uge, wabCCFPATM.CPT.ZPAmp.CM.CAZ.CTX.CFM.AMCFK1.uge, wabCCFPATM.CPT.ZPATM.CM.CAZ.CTX.CFM.AMCFK1.uge, wabCCFPATM.CPT.ZPATM.CM.CAZ.CTX.CFM.AMCFK1.uge, wabCCFPATM.CPT.ZPATM.CM.CAZ.CTX.CMC.FM.AMCMCTXM-15.TEM-1.SHV-11CFPATM.CPT.ZPATM.CM.CAZ.CTX.CMC.FM.AMCMCTXM-15.TEM-1.SHV-11CFPATM.CPT.ZCTX.MEM.CFM.AMCMCTXM-15.TEM-1.SHV-11CFPATM.CPT.ZCTX.CMC.FM.AMCMCTXM-15.TEM-1.SHV-11CFPATM.CPT.ZCTX.CMLEM.CFM.AMCK1UggAmpK1UggWabCCFPATM.CPT.ZCTX.CMLEM.AMCK1K1.ugg, wabCCFPATM.CPT.ZCTX.CMLEM.AMCK1K1.ugg, wabCAmpK1CTXM-15.TEM-1.SHV-21K1.ugg, wabCAmpK1K1.ugg, wabCK1.ugg, wabCAmpK1K1.ugg, wabCK1.ugg, wabCAmpK1.ugg, wabCK1.ugg, wabC<			м		uge, wabG
AmpMAmpKAmpKAmpKCPATMCQTE_CTX_CFM_AMCKCPATMCPP SCT_TZP Amp.CAZ_TE_CTX.MPCMCKCPATMCPP SCT_TZP Amp.CAZ_TE_CTX.MPCMCCCPATMA.OPE_CAZ_CTX_CFM_AMCMCPATMA.OPE_CAZ_CTX_CFM_AMCMCPATMA.OPE_CAZ_TE_CTX.MPCMACCAmpCCPATMA.OPE_CAZ_TE_CTX.MPCMACMAmpKAmpKCPATMCPP_TZPAmp_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAmp_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAmp_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAmp_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAmp_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATMCPP_TZPAMP_CAZ_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMACKCPATM_CAR_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMCKCPATM_CAR_CTX_CFM_AMACKCPATM_CAR_CTX_CFM_AMACKCPATM_CAR_CTX_CFM_AMACKAmpKAmpKCPATM_CAR_CTX_CFM_AMACKAmpKAmpKCPATM_CAR_CTX_CFM_AMAC			F	CTXM-28,TEM-1,SHV-12	
AmpAmpFF1CFP_ATM_CAZ_FE_CTX_CFM_AMCMTEM-1.SHV-28M1, uge, webCiCFP_ATM_CIP_ECAZ_CTX_CFM_AMCFK1, ugeCFP_ATM_CIP_ECAZ_CTX_CFM_AMCFCTX04-1.5TEM-1.SHV-11K1, ugeCFM_ATM_Amp_CAZ_TE_CTX_MEM_AMCFCTX04-1.5TEM-1.SHV-11K1, webCiATMSCF_CAZ_TE_CTX_CFM_AMC,OTFCTX04-1.5TEM-1.SHV-11, MCL-1K1, webCiAmpMCTX04-1.5TEM-1.SHV-11, MCL-1K1, webCiK1, webCiAmpMCTX04-15, TEM-1.SHV-11, MCL-1K1, webCiK1, webCiCFP_ATM_CIP_TZP_Amp_CAZ_CTX_CFM_AMCMCTX04-15, TEM-1.SHV-12K1, webCiCFP_ATM_CIP_TZP_Amp_CAZ_CTX_CFM_AMCMTEM-1.SHV-12K1, webCiCFP_ATM_CIP_TZP_Amp_CAZ_TE_CTX_CFM_CFM_MMWebCiWebCiAmp_CMTEM-1.SHV-12K1, ugeAmp_CIPMugeWebCiWebCiAmp_CIPMUgeWebCiK1, ugeAmp_CIPMUgeK1, ugeWebCiAmp_CIPMUgeK1, ugeAmp_CIPMUgeK1, ugeAmpMK1, ugeK1, ugeAmp_CIPMUgeK1, ugeAmp_CIPMK1, ugeAmp_CIPMK1, ugeAmp_CIPMK1, ugeAmp_CIPMK1, ugeAmp_CIPMK1, ugeAmp_CIPMK1, ugeAmp_CIPMCTXM-15, TEM-1.SHV-12Amp_CIPMCTXM-23, TEM-1.SHV-		CFP,ATM,SCF,TZP,Amp,CAZ,TE,CTX,CFM,AMC	м	CTXM-15,TEM-1,SHV-11	uge
AmpFFF1, uge, wak6AmpMNN1, uge, wak6AmpMCTXM-15, TEM-1, SHV-12N1, ugeCFMATM CPF TEP Amp, CAZ TE, CTX, MPA AMOCMCTXM-15, TEM-1, SHV-11AmpAmpTEM-15, SHV-11NAmpMTEM-15, SHV-11, SHV-11NAmpMTEM-15, SHV-11, SHV-11, MCD, LNAmpMNNAmpMNNAmpMNNCFP ATM CAZ, TE, CTX, CFM, AMC, OFMNCFP ATM CAZ, CTX, CFM, AMC, MEMMCTXM-15, TEM-1, SHV-12NCFP ATM, CAZ, CTX, CFM, AMC, MEMMCTXM-15, TEM-1, SHV-12NCFP ATM, CAZ, TE, CTX, CFM, AMCMCTXM-15, TEM-1, SHV-12NCFP ATM, CAZ, TE, CTX, MEM, CFM, AMCMCTXM-15, TEM-1, SHV-12NCFP ATM, CAZ, TE, CTX, MEM, CFM, AMCMCTXM-15, TEM-1, SHV-12NAmp, TEMCTXM-15, TEM-1, SHV-12NNAmp, TEMCTXM-15, TEM-1, SHV-12NNAmp, CAZ, TE, CTX, MEM, CFM, AMCMCTXM-15, TEM-1, SHV-12NAmp, CAZ, TE, CTX, MEM, CFM, AMCMCTXM-15, TEM-1, SHV-12NAmpMCTXM-15, TEM-1, SHV-13NNAmpMCTXM-15, TEM-1, SHV-14NNAmpMCTXM-15, TEM-1, SHV-14NNAmpMCTXM-23, TEM-1, SHV-14NNAmpMCTXM-15, TEM-1, SHV-14NN		Amp	м		
CPP_ATMLCAZ_TE_CTX_CPM_AMCMTEM-1.SHV-28K1, ugp, wabGCPA_ATMLCPP_CAZ_CTX_CPM_AMCFK1, ugpCPM_ATMLCPP_CAZ_CTX_CPM_AMCMCTXM-1.TEM-1.SHV-11AmpFTEXASUS_CTX_CPM_AMC, CTFATMLSOF_CAZ_TE_CTX_CPM_AMC, CTFK1, wabGAmpMFK1, wabGAmpMK1, wabGCPP_ATMLCPT_TZP_Amp_CAZ_CTX_CPM_AMCFK1, wabGCPP_ATMLCPT_TZP_Amp_CAZ_CTX_CPM_AMCFK1, wabGCPP_ATMLCPT_TZP_Amp_CAZ_CTX_CPM_AMCMCTXM-15, TEM-1, SHV-12K1, wabGCPP_ATMLCPT_TZP_Amp_CAZ_CTX_CPM_AMCMCTXM-15, TEM-1, SHV-12K1, wabGCPP_ATMLCPT_TZP_Amp_CAZ_TE_CTX_CPM_AMCMCTXM-15, TEM-1, SHV-12K1, wabGCPP_ATMLCAZ_CTX_CPM_AMC_MEMMCTXM-15, TEM-1, SHV-12K1, ugp, wabGAmp_TE_CN_AME_AMCMCTXM-15, TEM-1, SHV-11K1, ugp, wabGAmp_CTE_CTX_CPM_AMCFCTXM-15, TEM-1, SHV-12K1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCFK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCFK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCFK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMK1, ugp, wabGAmp_CTE_CTX_CPM_MEM_AMCMCTXM-1, TEM-1, SHV-13 </td <td></td> <td>Amp</td> <td>М</td> <td></td> <td>K1</td>		Amp	М		K1
Amp         M         K1, upp           CFPATNCIPS FL2Amp.CAZ.TE_CTX.MPL.CFM.         K1, upp           CFMATNCIPS FL2AZ_CTX.CFM.AMC         M         CTXM-15.TEM-1.SHV-12           Amp         ATM.SDF.CAZ_TE_CTX.MEM.AMC         F         K1, upp           Amp         CTXM-1.TEM-1.SHV-11         K1, wabG           Amp         M         CTXM-1.STEM-1.SHV-11         K1, wabG           Amp         M         CTXM-1.STEM-1.SHV-11, MCR_11         K1, wabG           CFPATMCIP_TP_Amp.CNLCAZ_CTX.CFM.AMC         M         CTXM-1.STEM-1.SHV-12         K1, wabG           CFPATM_CAT_TE_PAmp.CNLCAZ_CTX.CFM.AMC         M         CTXM-1.STEM-1.SHV-12         K1, wabG           CFPATM_CAT_TE_PTA_mp.CAZ_TE_CTX.CFM.AMC         M         CTXM-1.STEM-1.SHV-12         K1, wabG           CFPATM_CAT_TE_PTA_mp.CAZ_TE_CTX.CHACM.         M         CTXM-1.STEM-1.SHV-12         K1, wabG           CFPATM_CAT_TE_CTX.CHACM.CHAMAC         M         CTXM-1.STEM-1.SHV-11         K1, wabG           CFPATM_CAT_TE_CTX.CHACM.CHAMAC         M         CTXM-1.STEM-1.SHV-12         K1           Amp         M         CTXM-1.STEM-1.SHV-12         K1, wabG           Amp         M         CTXM-1.STEM-1.SHV-12         K1           Amp         M         CTXM-1.STEM-1.SHV-12			F		
CFP_ATM.CPT.SOF.TZP_AMP.CAZ.TE_CTX.MP.CPT.FK1.ugpCFM_ATM.Amp_CAZ.TE_CTX.CFM_AMCMCTXM-1.TEM-1.SHV-11AmpFCTXM-1.TEM-1.SHV-11, MCR.1ATM.SOF.CAZ.TE_CTX.CFM_AMC,CTFCTXM-1.TEM-1.SHV-11, MCR.1AmpMAmpKCFP_ATM.CIP.TZP_Amp_CN_CAZ_CTX.CFM_AMCFK1.wabGCFP_ATM.CIP.TZP_Amp_CAZ_CTX.CFM_AMCFK1.wabGCFP_ATM.CIP.TZP_Amp_CAZ_CTX.CFM_AMCMCTXM-15.TEM-1.SHV-12K1.wabGCFP_ATM.CAZ_TX.CRN_AMCMCTXM-15.TEM-1.SHV-12K1.wabGCFP_ATM.CAZ_CTX.CRN_AMCMCTXM-15.TEM-1.SHV-12K1.wabGCFP_ATM.CAZ_CTX.CN.CFM_AMCMCTXM-15.TEM-1.SHV-12K1.ugpAmp.TEMCTXM-15.TEM-1.SHV-12K1.ugpAmp.CAZ_CTX_CN.CFM_AMCMK1.ugpAmp.CAZ_TE_CTX.CMC.FM_AMCMK1.ugpAmp.CAZ_TE_CTX_CMM_CFM_AMCMK1.ugpAmp.CAZ_TE_CTX_CFM_MEM_AMCFK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugpAmpMK1.ugp		CFP,ATM,CAZ,TE,CTX,CFM,AMC	м	TEM-1,SHV-28	K1, uge, wabG
CPM_ATM_CEP_TE_CA2_CTX_CFM_AMACMCTXM-15_TEM-1_SHV-12K1AmpFCTXM-1_TEM-1_SHV-11K1AmpFCTXM-1_TEM-1_SHV-11K1AmpMFFAmpMFK1AmpMK1K1AmpMK1K1AmpMK1K1AmpMK1K1CFP_ATM_CP_TZP_Amp_CN_CA2_CTX_CFM_AMCMCTXM-15_TEM-1.SHV-12K1CFP_ATM_CP_2CTX_CFM_AMC_MEMMTEM-1_SHV-28K1CFP_ATM_CP_2CTX_CFM_AMC_MEMMCTXM-28_TEM-1.SHV-12K1CFP_ATM_CP_2CTX_CFM_AMC_MEMMCTXM-38_TEM-1.SHV-12K1CFP_ATM_CP_2CTX_CFM_AMC_MEMMCTXM-38_TEM-1.SHV-12K1Amp,TECTXM_TS_TEM-1K1ugeK1Amp_CPMCTXM-15_TEM-1K1ugeAmp_CPMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1UgeAmpMCTXM-15_TEM-1K1Uge					
CPM ATM Amp_CAZ,TE_CTX_MEM_AMCMCTXM-1,TEM-1,SHV-11ATM SCF_CAZ,TE_CTX_CFM_AMC_CTFCTXM-1,TEM-1,SHV-11,MCR-1K1, wabGAmpMFK1AmpMFK1, wabGCPP ATM_CP_TZP_Amp_CX_CAZ_CTX_CFM_AMCMCTXM-15,TEM-1,SHV-12K1, wabGCPP ATM_CP_CTX_CCM_CAZ_CTX_CFM_AMCMCTXM-15,TEM-1,SHV-12K1, wabGCPP ATM_CP_CCTX_CCM_CFM_AMCMCTXM-15,TEM-1,SHV-12K1, wabGCPP ATM_CP_CCTX_CON_CFM_AMCMCTXM-15,TEM-1,SHV-11K1, wabGCPP ATM_CP_CCTX_CON_CFM_AMCFCTXM-28,TEM-1,SHV-11K1, wabGCPP ATM_CP_CCTX_CON_CFM_AMCFCTXM-28,TEM-1,SHV-11K1, wabGAmp_CFMUgeMK1, wabGAmp_CCFMCTXM-15,TEM-1,SHV-12K1, wabGK1, wabGAmp_CCPMK1, wabGK1, wabGK1, wabGAmpMK1, wabGK1, wabGK1, wabGAmpMK1, wabGK1, wabGK1, wabGAmpMK1, wabGK1, wabGK1, wabGAmpMK1, wabGK1, wabGK1, wabGAmpMCTXM-15,TEM-1,SHV-12K1, wabGK1, wabGAmpMCTXM-15,TEM-1,SHV-13K1, wabGK1, wabGAmpMCTXM-15,TEM-1,SHV-14K1, wabGAmpMCTXM-15,TEM-1,SHV-28K1, wabGAmpMCTXM-15,TEM-1,SHV-14K1, wabGAmpMCTXM-15,TEM-1,SHV-14K1, wabGAmpM					K1, uge
AmpFCTXM-1,TEM-1,SHV-11,MCR-1K1, walsGAmpMFKAmpFKAmpFKAmpFKCFPATMCPTZPAmp,CMCAZ,CTX,CFM,AMCMCTXM-15,TEM-1,SHV-12K1, walsGCFPATMA,CPZ,CTX,CFM,AMC,MMMTEM-1,SHV-28K1, walsGCFPATMA,CPZ,CTX,CFM,AMC,MMMCTXM-15,TEM-12K1, walsGCFPATMA,CPZ,CTX,CFM,AMC,MMMCTXM-15,TEM-14K1, walsGCFPATMA,CPZ,CTX,CN,CFM,AMCMCTXM-28,TEM-1,SHV-12K1, walsGCFPATMA,CPZ,CTZ,CTX,CN,CFM,AMCMCTXM-15,TEM-1K1, walsGAmp,TEMCTXM-15,TEM-1K1, uge, walsGAmp,TEMCTXM-15,TEM-1K1, uge, walsGAmp,TEMK1, uge, walsGK1, uge, walsGAmpMK1, walsGK1, walsGAmpMK1, walsGK1, walsGAmpMK1, walsGK1, walsGAmpMK1, walsGAmp<					
ATM.SCF.GAZ,TE.CTX.CFM.AMC.CTFCTXM-1,TEM-1,SHV-11,MCR-1K1, wabGAmpMFKAmpFK1, wabGCFP.ATM.CP.TZP.Amp.CN.CAZ.CTX.CFM.AMCFK1, wabGCFP.ATM.CPZ.CTX.CFM.AMCFK1, wabGCFP.ATM.CPZ.CTX.CFM.AMCMCTXM-15,TEM-1,SHV-12K1, ugeCFP.ATM.CPZ.CTX.CPM.AMCMCTXM-1,TEM.1,SHV-12K1, ugeCFP.ATM.CPZ.CTX.CN.CFM.AMCMCTXM-15,TEM-1,SHV-11K1, ugeCFP.ATM.CPZ.CTX.CN.CFM.AMCFugeugeAmp.CPMK1, ugeK1, ugeAmp.CPMK1, ugeK1, ugeAmp.CPMK1, ugeK1, ugeAmp.TE.CN.MEM.AMCMK1, ugeK1, ugeAmp.TE.CTX.CFM.MEM.AMCMK1, ugeK1, ugeAmpMK1, ugeK1, ugeK1, ugeAmpMCTXM-17,TEM-1,SHV-11K1, ugeK1, ugeAmpMK1, ugeK1, ugeK1, ugeAmpMK1, ugeK1, ugeK1, ugeAmpMCTXM-15,TEM-1,SHV-11K1, ugeK1, ugeAmpMCTXM-15,TEM-1,SHV-11K1, ugeK1, ugeAmpMCTXM-15,TEM-1,SHV-11K1, ugeK1, ugeAmpMCTXM-				CTXM-1,TEM-1,SHV-11	
Amp         Amp         Amp         Amp           Amp         M           Amp         M           Amp         M           Amp         M           CFP_ATM_CPL_T2P_Amp_CN_CA2_CTX_CFM_AMC         M         CTXM-15.TEM-1.SHV-12         K1, wabG           CFP_ATM_CA2_CTX_CON_CAC_MEMA         M         CTXM-45.TEM-1.SHV-12         K1, wabG           CFP_ATM_CA2_CTX_CON_CON_CFM_AMC         M         CTXM-45.TEM-1.SHV-11         K1, ugo           Amp_TE         M         CTXM-45.TEM-1.SHV-12         K1, wabG           CFP_ATM_CA2_CTX_CON_CON_FM_AMC         M         CTXM-45.TEM-1.SHV-11         K1, ugo           Amp_TE         M         CTXM-45.TEM-1.SHV-11         K1, ugo           Amp_CAP         M         Uge         M           Amp         M         TXM-15.TEM-1.SHV-11         K1, ugo           Amp_CAP         M         Uge         M         M           Amp         M         TXM-15.TEM-1.SHV-12         K1, wabG           Amp         M         TXM-25.TEM-1.SHV-11         K1, ugo           Amp         M         TXM-25.TEM-1.SHV-12         K1, wabG           Amp         M         TXM-15.TEM-1.SHV-12         K1, wabG					Kd
AmpMAmpFCFP ATM.CP.TZP Amp.CN.CAZ.CTX.CFM.AMCMCTXM-15.TEM-1.SHV-12K1, wabGCFP ATM.CAZ.CTX.CCPM.AMC.MEMMCTXM-1.SHV-12K1, ugeGPP.ATM.CAZ.CTX.CN.CFM.AMCMCTAM.1.TEM-1.SHV-12K1, ugeAmp.TEMCTXM-15.TEM-1K1, ugeAmp.CAZ.CTX.CN.CFM.AMCMCTXM-15.TEM-1K1, ugeAmp.CAZ.TE.CTX.CN.CFM.FCTXM-15.TEM-1K1, ugeAmp.CIPMUgeUgeUgeAmp.CIPMK1, ugeUgeAmp.CIPMK1, ugeUgeAmp.CIPMK1, ugeK1, ugeAmp.CIPMK1, ugeK1, ugeAmpMK1, ugeK1, ugeAmpMK1, ugeK1, ugeAmpMK1, ugeK1, ugeAmpMK1, ugeWabGAmpMK1, ugeWabGAmpMK1, ugeK1, ugeAmpMK1, ugeWabGAmpMK1, ugeK1, uge, wabGAmpMK1, uge, wabGK1, uge, wabGAmpMCTXM-15,TEM-1,SHV-11K1, uge, wabGAmpMCTXM-15,TEM-1,SHV-12K1, uge, wabGAmpMCTXM-15,TEM-1,SHV-14K1, uge, wabGAmpMCTXM-15,TEM-1,SHV-14K1, uge, wabGAmpMCTXM-15,TEM-1,SHV-14K1, uge, wabGAmpMCTXM-15,TEM-1,SHV-14K1, uge, wabGAmpM				CTXM-1, TEM-1, SHV-11, MCR-1	K1, wabG
AmpFAmpFCFP AmpFCFP ATM CIP, TZP Amp, CAC, TZ, CTK, CFM, AMC, MEMMTEM-1, SHV-12CFP ATM, CAC, CTX, CN, CM, AMC, MEMMTEM-1, SHV-12CFP ATM, CAC, TZ, CN, CTM, AMCMTEM-1, SHV-12CFP ATM, CAC, TZ, CN, CTM, AMCMCTXM-1, TEM-1, SHV-11CFP ATM, CAC, TZ, CAN, CFM, AMCMCTXM-12, SHV-11CFP ATM, CIP, SCT, TZP Amp, CAZ, TE, CTX, CN, CFM, AMUgeAmp, CIPMUgeAmp, CIPMUgeAmp, CIPMK1, uge, unbGAmp, CIPMK1, uge, unbGAmp, CIPMK1, uge, unbGAmpMK1, uge, unbGAmpM					
CFP_ATM_CIP_ZP_Amp_CN_CAZ_CTX_CFM_AMCMCTXM-15,TEM-1,SHV-12K1, wabGCFP_ATM_CAZ_CTX_CN_CFM_AMCMCTAM-1,TEM-1,SHV-28K1, wabGCFP_ATM_CAZ_CTX_CN_CFM_AMCMCTAM-1,TEM-1,SHV-12K1, ugeAmp_TEMCTAM-1,TEM-1,SHV-11K1, wabGCFP_ATM_CAZ_TE_CTX_CN_CFM_AMCMCTAM-15,TEM-1,SHV-11K1, ugeAmp_CIPMCTAM-15,TEM-1WAmp_CIPMugeAmp_CIPMUgeAmp_TE_CN_MEM_AMCMK1, uge, wabGAmp_TE_CN_MEM_AMCFK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMWabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMCTXM-1,TEM-1,					
CFP AmpFK1, wabGCFP ATM, AMC, CTX, CFM, AMC, CMMCTAM-1, TEM-1, SHV-12K1, ugeCFP, ATM, Amp, CAZ, CTX, CN, CM, AMCMCTAM-1, TEM-1, SHV-11K1, ugeCFP, ATM, CIP, SCF, TZP, Amp, CAZ, TE, CTX, CN, CFM, AMUgeAmp, CIPMUgeUgeAmp, CIPMUgeUgeAmp, CIPMUgeUgeAmp, CIPMUgeUgeAmp, CIP, ATM, CAZ, TE, CTX, CMEM, CFM, AMCMUgeAmp, CIPMUgeUgeAmp, CIP, CM, UGE, AMCFK1, uge, wabGAmpMK1, uge, wabGK1, ugeAmpMK1, ugeWabGAmpMK1, ugeAmpMK1, ugeAmp				CTXM-15 TEM-1 SHV-12	K1 wabG
CFP ATM CA2, CTX, CFM, AMC MEMMTEM. 1. SHV-28K1Amp, TEMCTM. 4.1, TEM. 1. SHV-11K1, ugeAmp, TEMCTM. 4.28, TEM. 1. SHV-11K1, ugeCFP, ATM, CIP, SCF, TZP, Amp, CAZ, TE, CTX, CN, CFM, AMCMugeAmp, CIPMugeAmp, CIPMK1, uge, wabGAmp, CIPMK1, uge, wabGAmp, CIPMK1, uge, wabGAmp, TE, CN, MEM, AMCFK1, uge, wabGAmpMK1, uge, wabGAmpMWabGAmpK1, uge, wabGAmpMK1, uge, wabGAmpMWabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMCTXM-28, TEM-1, SHV-11AmpMCTXM-28, TEM-1, SHV-21AmpMCTXM-28, TEM-1, SHV-21Amp					
CFP ATM.Amp.CAZ.CTX.CN.CFM.AMCMCTXM-1,TEM-1,SHV-12K1.ugb wabGAmp.TECTXM-53,TEM.1,SHV-11K1.ugbWabGCFP.SCF.TZP Amp.CAZ.TE.CTX.MEM.CFM.AMCMCTXM-15,TEM-1K1.ugbAmp.CIPMCTXM-15,TEM-1K1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMK1.ugbK1.ugbAmp.CIPMCTXM-1,TEM-1,SHV-11K1Amp.CIPMK1.ugbK1.ugbAmp.CIPMCTXM-2,TE.CTX.CFM.MEM.AMCK1.ugbAmp.CIPMCTXM-2,TE.CTX.CFM.MEM.AMCK1.ugbAmp.TEAmp.CIPCTXM-1,TEM-1,SHV-21K1.ugbAmp.TEAmp.CIPK1.ugbK1.ugbAmp.TEMCTXM-1,TE			м	TEM-1,SHV-28	
AmpMailwabGGFP_ATM_CIP_SCP_TZP_Amp_CAZ_TE_CTX_CMEM_CFM_AMCGTXM-28,TEM-1,SHV-11K1, wabGCTXM-19, TEP_SCP_TZP_Amp_CAZ_TE_CTX_CMEM_CFM_AMCGTXM-15,TEM-1ugeAmp_CIPMugeAmp_TE_CN_MEM_AMCMK1, uge, wabGAmp_TE_CN_MEM_AMCFK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1, uge, wabGCFP_ATM_AMP_CAZ_TE_CT			м		K1, uge
CFP.SCF.TZP.Amp.CAZ.TE.CTX.MEM.CFM.AMCMCTXM-15,TEM-1K1, ugeAmp.CIPMugeAmp.TE.CM.MEM.AMCMK1Amp.TE.CM.MEM.AMCMK1, uge, wabGAmpMK1, uge, wabGAmpFK1, uge, wabGAmpFK1, uge, wabGAmpMK1, uge, wabGAmpFK1, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, ugeAmpMWabGAmpMWabGAmpMWabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMCTXM-15, TEM-1, SHV-13		Amp,TE	м		wabG
Amp.CIPMugeAmpM		CFP,ATM,CIP,SCF,TZP,Amp,CAZ,TE,CTX,CN,CFM,.	F	CTXM-28,TEM-1,SHV-11	K1, wabG
AmpMAmp,TE,CN,MEM,AMCMAmpMAmpMAmpFCFP,ATM,CAZ,TE,CTX,CFM,MEM,AMCFCFP,ATM,CAZ,TE,CTX,CFM,MEM,AMCFAmpMAmp<		CFP,SCF,TZP,Amp,CAZ,TE,CTX,MEM,CFM,AMC	м	CTXM-15,TEM-1	K1, uge
Amp.TE.CN.MEM.AMCMAmpK1.uge.wabGAmpFCFP.ATM.CAZ.TE.CTX.CFM.MEM.AMCFAmpMAmpK1.uabGAmpMAmpMAmpFAmpMAmpFAmpK1.uabGAmpMAmpK1.uabGAmpFAmpK1.uabGAmpMAmpK1.uabGAmpMAmpK1.uabGAmpMAmpK1Amp		Amp,CIP	М		uge
AmpMAmpFCPPATM_CAZ_TE_CTX_CFM_MEM_AMCFCPPATM_CAZ_TE_CTX_CFM_MEM_AMCFAmpMCFPATM_CAZ_TE_CTX_CFM_MEM_AMCMCFPATM_AMP_CAZ_TE_CTX_CFM_MEM_AMCMCFPATM_AMP_CAZ_TE_CTX_CFM_MEM_AMCMCFPATM_AMP_CAZ_TE_CTX_CFM_MEM_AMCMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMAmpMA		Amp	м		
AmpMK1, uge, wabGAmpFAmpCTXM-28, TEM-1, SHV-12K1AmpMK1, wabGAmpMK1, wabGAmpFK1, wabGAmpFK1, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1 <t< td=""><td></td><td></td><td></td><td></td><td></td></t<>					
AmpFCFP_ATM_CAZ_TE_CTX_CFM_MEM_AMCFAmpMAmpK1, wabGAmpFAmpAK1, wabGAmpMAmpAMCFP_ATM_CAZ_TE_CTX_CFM_MEM_AMCMCFP_ATM_Amp_CAZ_TE_CTX_CFM_MEM_AMCMCFP_ATM_Amp_CAZ_TE_CTX_CFM_MEM_AMCMAmpMAmpAM </td <td></td> <td></td> <td></td> <td></td> <td></td>					
CFP ATM, CAZ, TE, CTX, CFM, MEM, AMCFCTXM-28, TEM-1, SHV-12K1AmpMK1, wabGAmpFK1, wabGAmpFK1, wabGAmpFK1, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1AmpMK1AmpMK1AmpMK1AmpFK1, wabGAmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpCTXM-1, TEM-1, SHV-11K1CFPATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-1, TEM-1, SHV-28AmpMCTXM-15, TEM-1, SHV-28K1, wabGAmpMCTXM-15, TEM-1, SHV-28K1, wabGAmpMCTXM-15, TEM-1, SHV-28K1AmpMK1K1, wabGAmpMCTXM-15, TEM-1, SHV-28K1Amp, TEMCTXM-15, TEM-1, SHV-28K1Amp, TEMCTXM-15, TEM-1, SHV-28K1Amp, TEMCTXM-15, TEM-1, SHV-21K1Amp, TEMCTXM-15, TEM-1, SHV-21K1Amp, MEMCTXM-15, TEM-1, SHV-21K1Amp, ME					K1, uge, wabG
AmpMK1, wabGAmpFK1, wabGAmpAFK1, wabGAmpAFWabGAmpAMWabGAmpAMWabGAmpAMK1, uge, wabGAmpAMK1, uge, wabGAmpAMK1, uge, wabGAmpAMK1A					
AmpMAmpFK1, wabGAmpFK1, wabGAmpMK1, wabGAmpMWabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1AmpMK1, uge, wabGAmpMK1, uge, wabGAmpMCTXM-1, TEM-1, SHV-11CFP, ATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-15, TEM-1, SHV-23CFP, ATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-15, TEM-1, SHV-23AmpMCTXM-15, TEM-1, SHV-23K1, uge, wabGAmpMCTXM-15, TEM-1, SHV-23K1, uge, wabGAmpMCTXM-15, TEM-1, SHV-23K1, uge, wabGAmpMCTXM-15, TEM-1, SHV-23K1, uge, wabGAmp, TEMK1, uge, wabGK1, uge, wabGAmp, TEMCTXM-15, TEM-1, SHV-13K1, uge, wabGAmp, TECTR, ATM, SCF, AMP, CAZ, TE, CTX, CN, MEM, AMCMCTXM-15, TEM-1, SHV-13				CTXM-28, TEM-1, SHV-12	
AmpFK1, wabGAmpFK1, wabGAmpFK1, wabGAmpMWabGAmpMWabGAmpFK1, uge, wabGAmpFK1AmpMK1, uge, wabGAmpMK1, uge, wabGAmp,CAZ,TE,CTX,CFM,MEM,AMCMK1, uge, wabGAmp,CAZ,TE,GTX,CFM,MEM,AMCMK1, uge, wabGAmp,TEMK1, uge, wabGAmp,TEMK1Amp,TEMK1Amp,MEMFK1Amp,MEMFK1Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMFK1Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMFK1Amp,MEMMCTXM-15,TEM-1,SHV-61 </td <td></td> <td></td> <td></td> <td></td> <td>K1, wabG</td>					K1, wabG
AmpFK1, wabGAmpMK1, ugeAmpMwabGAmpMK1, uge, wabGAmpMK1, uge, wabGAmpFK1, uge, wabGAmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1, uge, wabGCFPATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-1, TEM-1, SHV-21AmpMCTXM-15, TEM-1, SHV-28AmpMCTXM-15, TEM-1, SHV-28AmpMCTXM-15, TEM-1, SHV-28AmpMCTXM-15, TEM-1, SHV-28AmpMK1, uge, wabGAmpMK1, uge, wabGAmpMCTXM-15, TEM-1, SHV-28AmpMCTXM-15, TEM-1, SHV-26AmpMCTXM-15, TEM-1, SHV-26AmpMCTXM-15, TEM-1, SHV-26AmpMCTXM-15, TEM-1, SHV-26 <t< td=""><td></td><td>-</td><td></td><td></td><td>K1 wahC</td></t<>		-			K1 wahC
AmpMK1.uge wabGAmpMwabGAmpMK1AmpFK1,uge, wabGAmpFK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpK1K1CFPATM,CAZ,TE,CTX,CFM,MEM,AMCMCTXM-1,TEM-1,SHV-11CFPATM,CAZ,TE,CTX,CFM,MEM,AMCMCTXM-15,TEM-1,SHV-28CFPATM,Amp,CAZ,TE,CTX,CFM,MEM,AMCMK1,uge, wabGAmpMCTXM-15,TEM-1,SHV-28AmpMK1, uge, wabGAmpMK1, uge, wabGAmp,TEMK1, uge, wabGAmp,TEMK1Amp,TEMK1Amp,TEK1K1Amp,MEMMCTXM-15,TEM-1,SHV-28CFPATM,SCFAMP,CAZ,TE,CTX,CN,CFM,MEM,IPMMCTXM-15,TEM-1Amp,MEMFK1Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpM					
AmpMwabGAmpMKAmpFK1AmpFK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpCTXM-1TEM-1.SHV-11K1CFPATM,CAZ,TE,CTX,CFM,MEM,AMCMCTXM-15,TEM-1.SHV-28AmpMCTXM-15,TEM-1.SHV-28AmpMK1, uge, wabGAmpMK1, uge, wabGAmpMK1Amp,CEK1, wabGAmpMK1Amp,MEMMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61Amp					
AmpMK1, uge, wbGAmpFK1, uge, wbGAmpFK1AmpMK1AmpMK1, ugeAmpMK1AmpMK1, ugeAmpMK1AmpMK1AmpMK1AmpMK1CFPATM,Amp,CAZ,TE,CTX,CFM,MEM,AMCMCTXM-1,TEM-1,SHV-11CFPATM,Amp,CAZ,TE,CTX,CFM,MEM,AMCMCTXM-1,TEM-1,SHV-28CFPATM,Amp,CAZ,TE,CTX,CFM,MEM,AMCFCTXM-15,TEM-1,SHV-28CFPATM,Amp,CAZ,TE,CTX,CFM,MEM,AMCFK1, uage, wabGAmpMK1, uage, wabGAmpMK1, uage, wabGAmp,TEMK1, uage, wabGAmp,TEMK1, uage, wabGAmp,TEMK1Amp,TEMK1Amp,AEK1K1Amp,MEMMCTXM-15,TEM-1,SHV-28CFP,ATM,SCF,Amp,CAZ,TE,CTX,CN,MEM,AMCMK1Amp,MEMFK1Amp,MEMMCTXM-15,TEM-1Amp,MEMMCTXM-15,TEM-1Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMMCTXM-15,TEM-1,SHV-61Amp,MEMFCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,SHV-61AmpMCTXM-15,TEM-1,		A	M		wabG
Amp         F         K1, ugs, MCG           Amp         K1, ugs, MCG           Amp         M         K1           Amp         M         K1, ugs           Amp         M         K1, ugs           Amp         M         K1, ugs           Amp         M         K1, ugs           Amp         M         K1           Amp         M         K1           Amp         M         K1           CFP ATM, CAZ, TE, CTX, CFM, MEM, AMC         M         CTXM-1, TEM-1, SHV-21           CFP ATM, Amp, CAZ, TE, CTX, CFM, MEM, AMC         M         CTXM-15, TEM-1, SHV-28           Amp         M         CTXM-15, TEM-1, SHV-28         K1, uge, wabG           Amp         M         Amp         K1, uge, wabG           Amp, TE         M         K1, uge, wabG         K1           CFP, ATM, SCF, Amp, CAZ, TE, CTX, CN, CFM, MEM, JMM,         M         CTXM-15, TEM-1, SHV-28           CFP, ATM, SCF, Amp, CAZ, TE, CTX, CN, CFM, MEM, JMM		-	м		
AmpMK1AmpMK1, ugeAmpMK1, ugeAmpMK1AmpMK1AmpMK1CFPATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-1, TEM-1, SHV-11CFPATM, CAZ, TE, CTX, CFM, MEM, AMCMCTXM-1, TEM-1, SHV-28CFPATM, CAZ, TE, CTX, CFM, MEM, AMCFCTXM-15, TEM-1, SHV-28CFPATM, CAZ, TE, CTX, CFM, MEM, AMCFCTXM-15, TEM-1, SHV-28CFPATM, CAZ, TE, CTX, CFM, MEM, AMCFCTXM-15, TEM-1, SHV-28AmpMLuge, wabGCFPATM, Amp, CAZ, TE, CTX, CFM, MEM, AMCFK1, wabGAmp, TEMLuge, wabGAmp, TEMLuge, wabGCFP, ATM, SCF, Amp, CAZ, TE, CTX, CN, CFM, MEM, IPM,MCTXM-15, TEM-1Amp, MEMFCTXM-15, TEM-1Amp, MEMMCTXM-15, TEM-1Amp, MEMMCTXM-15, TEM-1Amp, MEMMCTXM-15, TEM-1, SHV-61Amp, MEMMCTXM-15, TEM-1, SHV-61Amp, MEMMCTXM-15, TEM-1, SHV-61Amp, MEMMCTXM-15, TEM-1, SHV-61AmpMCTXM-15, TEM-1, SHV-61AmpMCTXM-15, TEM-1, SHV-61AmpMCTXM-15, TEM-1, SHV-61AmpMLuge, MADAmpMLuge, SHV-12CFP, ATM, SCFTZP, Amp, CA2, TE, CTX, CN, MEM, AMCGAmpMLuge, SHV-12AmpMLuge, SHV-12AmpMLuge, SHV-12 </td <td></td> <td>Amp</td> <td>F</td> <td></td> <td>K1, uge, wabG</td>		Amp	F		K1, uge, wabG
Amp         M         K1, uge           Amp         M         K1, uge, wabG           CFP_ATM_CAZ,TE,CTX,CFM_MEM,AMC         M         CTXM-1,TEM-1,SHV-11         K1           CFP_ATM_CAZ,TE,CTX,CFM_MEM,AMC         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         GFP_ATM_Amp,CAZ,TE,CTX,CFM_MEM,AMC         F         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         M         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           CFM_ATM,TZP,CTX,CFM,MEM,AMC         M         CTXM-15,TEM-1,SHV-12         K1           CFP_ATM_MCAZ,CTX,CFM,MEM,AMC		Amp	F		K1
Amp         M           Amp         M           Amp         F           Amp         F           Amp         M           Amp         M           CFP,ATM,MAP,CAZ,TE,CTX,CFM,MEM,AMC         M         CTXM-1,TEM-1,SHV-11         K1           CFP,ATM,CAZ,TE,CTX,CFM,MEM,AMC         M         CTXM-28,TEM-1,SHV-28         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           Amp         M         K1, uge, wabG         K1, uge, wabG           Amp, TE         M         K1, uge, wabG         K1, uge, wabG           Amp,TE         M         K1         K1           Amp,TE         M         K1         K1           Amp,TE         M         K1         K1           Amp,MEM         F         CTXM-15,TEM-1         K1           Amp,MEM         G         CTXM-15,TEM-1         K1           Amp         G         CTXM-15,TEM-1,SHV-61         K1		Amp	м		K1
Amp         M           Amp         F           Amp         CFP_ATM_Amp_CAZ_TE_CTX_CFM_MEM_AMC         M         CTXM-1,TEM-1,SHV-11         K1           CFP_ATM_CAZ_TE_CTX_CFM_MEM_AMC         M         CTXM-2,TEM-1,SHV-28         K1,uge,wabG           CFP_ATM_Amp_CAZ_TE_CTX_CFM_MEM_AMC         F         CTXM-15,TEM-1,SHV-28         K1,uge,wabG           CFP_ATM_Amp_CAZ_TE_CTX_CFM_MEM_AMC         F         CTXM-15,TEM-1,SHV-28         K1,uge,wabG           Amp         M		Amp	м		K1, uge
AmpFAmpMCPPATM_AMp_CAZ,TE,CTX,CFM_MEMAMCMCTXM-1,TEM-1,SHV-11K1CFPATM_CAZ,TE,CTX,CFM_MEMAMCMCTXM-28,TEM-1,SHV-28K1,uge, wabGAmpMCTXM-15,TEM-1,SHV-28K1,uge, wabGCFPATM_AMp_CAZ,TE,CTX,CFM_MEMAMCFK1, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1, wabGAmpMK1, wabGAmp,TEMK1Amp,TEMK1CFM_ATM_TZP,CTX,CFM_AMCMK1Amp,TEMK1Amp,TEMK1Amp,TEMK1CFM_ATM_TZP,CTX,CFM_AMCMK1Amp,MEMFK1Amp_MEMCTXM-15,TEM-1K1Amp_MEMMCTXM-15,TEM-1Amp_MEMMCTXM-15,TEM-1,SHV-61Amp_MEMMCTXM-15,TEM-1,SHV-61AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpMK1AmpM		Amp	м		
Amp         M           CFP_ATM_ADCAZ_TE_CTX_CFM_MEM_AMC         M         CTXM-1,TEM-1,SHV-11         K1           CFP_ATM_CAZ_TE_CTX_CFM_MEM_AMC         M         CTXM-28,TEM-1,SHV-28         K1,uge,wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1,uge,wabG           CFP_ATM_MAP_CAZ_TE_CTX_CFM_MEM_AMC         F         CTXM-15,TEM-1,SHV-28         K1,uge,wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1,uge,wabG           Amp         M         K1,uge,wabG         K1,uge,wabG           Amp         M         K1,uge,wabG         K1,uge,wabG           Amp         M         K1,uge,wabG         K1,uge,wabG           Amp         M         K1         K1,uge,wabG           Amp,TE         M         K1         K1           Amp,TE         M         K1         K1           Amp,TE         M         CTXM-15,TEM-1         K1           Amp         F         K1         K1           Amp         M         CTXM-15,TEM-1         K1           Amp         M         CTXM-15,TEM-1,SHV-61         K1           Amp         GFP_ATM_SCFTZP_Amp_CAZ_TE_CTX_CN_MEM_AMC         GCTXM-15,TEM-1,SHV-61           Amp         <		Amp			
CFP_ATM,Amp,CAZ,TE,CTX,CFM,MEM,AMC         M         CTXM-1,TEM-1,SHV-11         K1           CFP_ATM,CAZ,TE,CTX,CFM,MEM,AMC         M         CTXM-28,TEM-1,SHV-28         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           CFP_ATM,Amp,CAZ,TE,CTX,CFM,MEM,AMC         F         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         CTXM-15,TEM-1,SHV-28         K1, uge, wabG           Amp         M         K1, uge, wabG           Amp         M         K1, uge, wabG           Amp,TE         M         K1           Amp,TE         M         K1           CFP,ATM,SCF,Amp,CAZ,TE,CTX,CN,CFM,MEM,IPM,         M         CTXM-15,TEM-1           Amp,MEM         F         K1           CFP,ATM,SCF,AMP,CAZ,TE,CTX,CN,CFM,MEM,IPM,         M         CTXM-15,TEM-1           Amp,MEM         F         K1           CFP,ATM,SCF,TZP,Amp,CAZ,TE,CTX,CN,MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp,MEM         F         K1         K1           Amp,MEM         F         K1         K1           Amp,MEM         F         K1         K1           Amp,MEM         F         CTXM-15,TEM-1,SHV-61         K1		Amp	F		
CFP_ATM_CAZ_TE_CTX_CFM_MEM_AMC         M         CTXM-28,TEM-1,SHV-28           Amp         M         K1, uge, wabG           CFP_ATM_Amp_CAZ_TE_CTX_CFM_MEMAMC         F         K1, wabG           Amp         M         K1, wabG           Amp         R         K1, wabG           Amp         F         K1, wabG           Amp         M         K1, wabG           Amp         M         K1, wabG           Amp         M         K1           Amp.TE         M         K1           Amp,TE         M         K1           Amp,TE         M         K1           Amp,TE         M         K1           Amp,TE         GFM_ATM_XCP_CAX_TE_CTX_CON_CFM_MEM_IPM         M         CTXM-15,TEM-1           Amp_MEM         F         K1         K1           Amp_MEM         F         K1         K1           Amp_MEM         F         K1         K1           Amp_MCACZ_TE_CTM_CON_CET_CTX_CON_MEM_AMC         M         CTXM-15,TEM-1,SHV-61         K1           Amp         G         CTXM-15,TEM-1,SHV-61         K1         K1           Amp         G         CTXM-15,TEM-1,SHV-61         K1         K1 <td></td> <td></td> <td></td> <td></td> <td></td>					
Amp         M         K1, uge, wabG           CFP ATM, MD, CAZ, TE, CTX, CFM, MEM, AMC         F         CTXM-15, TEM-1, SHV-28           Amp         M         CTXM-15, TEM-1, SHV-28           Amp         F         K1, uge, wabG           Amp         F         K1, uge, wabG           Amp         F         K1, uge, wabG           Amp         M         K1, uge, wabG           Amp         M         K1           Amp, TE         M         K1           Amp, TE         M         K1           CFP, ATM, SCF, Amp, CAZ, TE, CTX, CN, CFM, MM, IPM         M         CTXM-15, TEM-1           Amp, TE         F         K1           Amp, MEM         G         CTXM-15, TEM-1           Amp, MEM, SCFTZP, Amp, CAZ, TE, CTX, CN, MEM, AMC         G         CTXM-15, TEM-1, SHV-12           CFP, ATM, SCFTZP, Amp, CAZ, TE, CTX, CN, MEM, AMC         G         CTXM-15, TEM-1, SHV-61           Amp         G         CTXM-15, TEM-1, SHV-61         K1           Amp         F         CTXM-15, TEM-1, SHV-61         K1           Amp         F         K1         K1           Amp         F         K1         K1           Amp         F         K1					K1
CFP_ATM,Amp,CAZ,TE,CTX,CFM,MEM,AMC         F         CTXM-15,TEM-1,SHV-28           Amp         M         K1, wabG           Amp,Amp         M         K1, wabG           Amp,Amp         M         K1, wabG           Amp         M         K1, wabG           Amp,Amp         M         K1, wabG           Amp,Amp,TE         M         K1           Amp,TE         M         K1           Amp,TE         M         K1           CFM,ATM,TZP,CTX,CFM,AMC         M         K1           Amp,TE         CF         K1           Amp,MEM         F         CTXM-15,TEM-1           CFP,ATM,SCF,Amp,CAZ,TE,CTX,CN,CFM,MEM,IPM,         M         CTXM-15,TEM-1           Amp,MEM         F         CTXM-15,TEM-1           Amp,MEM         F         CTXM-15,TEM-1           Amp,MEM         F         CTXM-15,TEM-1,SHV-61           Amp         GTXM-15,TEM-1,SHV-61         CTXM-15,TEM-1,SHV-61           Amp         F         CTXM-15,TEM-1,SHV-61           Amp         F         CTXM-15,TEM-1,SHV-61           Amp         F         CTXM-15,TEM-1,SHV-61           Amp         F         CTXM-15,TEM-1,SHV-61           Amp				CTXM-28,TEM-1,SHV-28	
Amp         M         K1, wabG           Amp         F         K1, uge, wabG           Amp, TE         M         K1           Amp, TE         M         K1           CFM,ATM,TZP,CTX,CFM,AMC         M         K1           Amp, TE         M         K1           CFM,ATM,TZP,CTX,CFM,AMC         M         K1           Amp,TE         F         K1           Amp,TE         CFP,ATM,SCF,Amp,CAZ,TE,CTX,CN,CFM,MEM,IPM,         M         CTXM-15,TEM-1           Amp,MEM         F         CTXM-26,SHV-12         CFP,ATM,SCFTZP,Amp,CAZ,TE,CTX,CN.MEM,AMC         CTXM-15,TEM-1,SHV-61         L           Amp         M         CTXM-15,TEM-1,SHV-61         F         L           Amp         M         CTXM-15,TEM-1,SHV-61         L         L           Amp         M         L				OTHER STEN & OUNCOD	K1, uge, wabG
Amp         F         K1, uge, wabG           Amp         M           Amp, Ter         M           Amp, Ter         M           Amp, Ter         M           CFM, ATM, T2P, CTX, CFM, AMC         M           Amp, Ter         F           Amp, Ter, CTX, CFM, AMC         M           Amp, Ter, CTX, CFM, AMC         M           Amp, Ter, CTX, CFM, AMC         M           Amp, Ter, CTX, CFM, MEM, IPM         M           Amp, MEM         CTXM-15, TEM-1           Amp, MEM, CFTZP, Amp, CAZ, TE, CTX, CN, MEM, AMC         M         CTXM-15, TEM-1, SHV-61           Amp, MEM, CFTZP, Amp, CAZ, TE, CTX, CN, MEM, AMC         F         CTXM-15, TEM-1, SHV-61           Amp         F         CTXM-15, TEM-1, SHV-61				CTXW-15,TEM-1,SHV-28	Kd
Amp         M           Amp,TE         M           Amp,TE         M           Amp         K1           CFM_ATM,T2P,CTX,CFM,AMC         M           Amp,TE         F           Amp,TE         K1           Amp,TE         C           Amp,TE         C           Amp,TE         C           Amp,TE         C           Amp,CC,CTX,CFM,MEM,PM         M           CFP,ATM,SCF,Amp,CAZ,TE,CTX,CN,CFM,MEM,PM         M           CTXM-15,TEM-1         C           Amp,MEM         F           CFP,ATM,SCFTZP,Amp,CAZ,TE,CTX.CN.MEM,AMC         F           Amp         M           Amp         M           Amp         F		-			
Amp,TE         M           Amp         M         K1           Amp         M         K1           CMATM_T2P,CTX,CFM,AMC         M         K1           Amp,TE         F         K1           Amp         CFP.ATM,SCA,Amp,CAZ,TE,CTX,CN,CFM,MEM,IP         M         CTXM-15,TEM-1           Amp,MEM         F         CTXM-55,TEM-12         CTXM-55,TEM-12           Amp,MEM         F         CTXM-15,TEM-1,SHV-61         CTXM-15,TEM-1,SHV-61           Amp         M         CTXM-15,TEM-1,SHV-61         CTXM-15,TEM-1,SHV-61					KT, uge, wabG
Amp         M         K1           CFM_ATM_TZP_CTX_CFM_AMC         M         K1           Amp.TE         F         K1           Amp         CFP_ATM_SCF_AMP_CAZ_TE_CTX_CN_CFM_MEM_PM         M         CTXM-15,TEM-1           Amp_MEM         F         CTXM-28,SHV-12         CFP_ATM_SCFTZP_Amp_CAZ_TE_CTX_CN_MEM_AMC         GTXM-28,SHV-12         CFP_ATM_SCFTZP_Amp_CAZ_TE_CTX_CN_MEM_AMC         GTXM-15,TEM-1,SHV-61         L           Amp         Amp         GTXM-15,TEM-1,SHV-61         L         L           Amp         F         L         L         L					
CFM_ATM_TZP,CTX,CFM_AMC         M           Amp,TE         F         K1           Amp         F         CFP_ATM_SCF_AMP_,CAZ_TE_,CTX_CN_CFM_MEM_IPM_         M         CTXM-15,TEM-1           CFP_ATM_SCF_AMP_,CAZ_TE_,CTX_CN_CFM_MEM_IPM_         M         CTXM-15,TEM-1         CF           AMD,AEL         GFP_ATM_SCF_AMP_,CAZ_TE_,CTX_CN_MEM_AMC         M         CTXM-26,SHV-12         CF           AMP         M         CTXM-15,TEM-1,SHV-61         CM         CTXM-15,TEM-1,SHV-61         CM           Amp         M         CTXM-16,TEM-1,SHV-61         CM         CM         CM           Amp         GF         CTXM-16,TEM-1,SHV-61         CM         CM         CM           Amp         GF         CTXM-16,TEM-1,SHV-61         CM         CM         CM           Amp         GF         CM         CM         CM         CM           Amp         GF         CM         CM         CM         CM           Amp         GF         CM         CM         CM         CM					К1
Amp,TE         F         K1           Amp         F         K1           Amp         CPXATM,SCF,Amp,CAZ,TE,CTX,CN,CFM,MEM,PM         M         CTXM-15,TEM-1           Amp,MEM         F         C           ATM,CAZ,CTX,CFM,MEM,AMC         M         CTXM-28,SHV-12           CFP,ATM,SCF,ZTP,Amp,CAZ,TE,CTX.CN.MEM,AMC         M         CTXM-15,TEM-1,SHV-61           Amp         M         CTXM-15,TEM-1,SHV-61           Amp         M         F           Amp         F         C           Amp         K1, wabG         K1, wabG					
Amp         F           CFP_ATM,SCF.Amp,CAZ,TE,CTX,CN,CFM,MEM,IPM         M         CTXIM-15,TEM-1           Amp,MEM         F            ATM,CAZ,CTX,CFM,MEM,AMC         M         CTXM-28,SHV-12           CFP_ATM,SCFTZP_Amp,CAZ,TE,CTX.CN.MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp         M         Amp           Amp         F         Amp           Amp         F         K					K1
CFP_ATM,SCF_Amp,CAZ,TE,CTX,CN,CFM,MEM,IPM.         M         CTXM-15,TEM-1           Amp,MEM         F           ATM,CAZ,CTX,CFM,MEM,AMC         M         CTXM-28,SHV-12           CFP_ATM,SCFTZP_Amp,CAZ,TE,CTX.CN.MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp         M            Amp         F         CTXM-15,TEM-1,SHV-61           Amp         F         CTXM-15,TEM-1,SHV-61           Amp         F					
Amp,MEM         F           ATM,CAZ,CTX,CFM,MEM,AMC         M         CTXM-28,SHV-12           CFP,ATM,SCFTZP,Amp,CAZ,TE,CTX.CN.MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp         M         Amp           Amp         F         F			м	CTXM-15,TEM-1	
ATM,CAZ,CTX,CFM,MEM,AMC         M         CTXM-28,SHV-12           CFP,ATM,SCFTZP,Amp,CAZ,TE,CTX.CN.MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp         M         Amp           Amp         F         CTXM-15,TEM-1,SHV-61					
CFP_ATM,SCFTZP,Amp,CAZ,TE,CTX.CN.MEM,AMC         F         CTXM-15,TEM-1,SHV-61           Amp         M           Amp         F		ATM,CAZ,CTX,CFM,MEM,AMC		CTXM-28,SHV-12	
Amp         M           Amp         F           Amp         F           Amp         M           Amp         M           Amp         F			F		
Amp         F           Amp         M           Amp         F         K1, wabG					
Amp M Amp F K1,wabG		Amp	F		
Amp F K1, wabG		Amp	F		
Amp F		Amp			K1, wabG
		Amp	F		

Source <sup>a</sup>BBA

BBA

Blood

Blood

Poc

BBA

Blood

Blood

Swab

Blood Tissue

Swab

Peritanea

Sputum

Urine

Blood BBA

BBA

Poc

Sputum Blood

Slough

Pus

Blood

Sputum Blood

Tissue

Swab

Swab

Blood

Pus Pus

BBA Swab

Blood

BBA

Tissue

Urine

Swab BBA

Sputum Pus

Blood

Blood

Blood Bone

Urine

Urine

Blood

Urine

Swab

Swab

Blood Blood

BBA

Swab

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BBA

BBA Blood

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BBA

BBA Sputum Pus

Blood

BBA

Blood

Urine

Tissue BBA

Blood

Tissue

BBA Swap Urine

BBA

Pus BBA

BBA

Poc

Sputum Tissue

Tissue Blood

Peritaneal

and 19 strains had conjugative plasmids. These results concurred with previous studies on clinical *K. pneumoniae* which showed that ESBL genes carried on plasmids are transmissible [5, 34, 35]. Plasmid is one of the ways for the spread of ESBLs and other antibiotic resistance genes among microorganisms. Casper et al. (2017) reported the presence of ESBL genes and the *mcr-1* gene on a unique plasmid [36].

All the 97 strains were subtyped into 89 distinct pulsotypes comprising 14-27 restriction fragments. The genetic similarity of the strains ranged from 52.1 to 100%. The PFGE dendrogram showed 13 clusters (A to N) and 63 unique pulsotypes at 85% similarity cut off (Fig. 1). There was no direct association between pulsotypes with source of isolation (sampling source, kind of infection, and gender), virulence genes, and antimicrobial resistance phenotypes. This was not surprising as the strains were collected from different patients at different time points. Strains with high genetic similarity showed several antimicrobial susceptibility profiles. For instance, two strains in cluster B with identical pulsotypes but different antimicrobial resistance phenotypes. The 27 ESBLproducing K. pneumoniae strains yielded 23 unique pulsotypes. Generally, genotyping of 97 K. pneumoniae clinical strains showed high genetic diversity and heterogeneity.

MLST analysis of the K. pneumoniae strains yielded 24 different STs based on genetic variation in seven housekeeping genes. ST23 (n = 20) was a common ST among these strains. Other strains belonged to ST22 (n = 7), ST412 (n = 7)7), ST845 (n = 6), ST37 (n = 5), ST685(n = 5) and ST336 (n = 5)5), ST1896 (*n* = 4), ST268 (*n* = 4), ST86 (*n* = 4), ST17 (*n* = 3), ST65 (n = 3), ST40 (n = 3), ST929 (n = 3), ST52 (n = 3), ST714 (n = 2), ST20 (n = 2), ST420 (n = 2), ST161 (n = 2), ST644 (n=2), and ST29 (n=2) and 3 unique STs such as ST426, ST592, and ST584. In comparison with the global K. pneumoniae MLST database by using eBURST V3, the Malaysian K. pneumoniae strains, ST22, ST23, ST17, ST20, and ST29, were international predicted founders. ST65 and ST37 were SLVs, while ST412, ST845, ST685, ST336, ST896, ST268, ST86, ST40, ST 929, ST52, ST714, ST420, ST161, ST644, ST426, ST592, and ST584 were singletons.

In conclusion, this study reports 31.9% MDR and 27.8% ESBL producers among 97 clinical *K. pneumoniae* strains. This is the first report of colistin resistance among clinical *K. pneumoniae* strains in Malaysia. No carbapenemase-producing *K. pneumoniae* strain was found, and  $bla_{SHV}$  and  $bla_{CTXM-1}$  were the predominant ESBL-encoding genes detected. PFGE typing showed diver subtypes circulating in the hospital. ST23, ST22, and ST412 and *wabG*, *uge*, and *K*1 were the predominant STs and virulence genes, respectively. These data indicated presence of diverse virulent MDR strains which might be useful for controlling and preventing the spread of antibiotic-resistant infections.

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#### **Compliance with ethical standards**

Conflict of interest The authors declare they have no conflict of interest.

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