

Table SI. Metagenomic next-generation sequencing results.

| A, Bronchoalveolar fluid sample | | |
|--------------------------------------|--------------------|--------------------------------|
| Organism | Reads accumulation | Reads per million mapped reads |
| <i>Pseudomonas</i> | 58,766 | 2108.4 |
| <i>Pseudomonas aeruginosa</i> | 26,021 | 933.58 |
| <i>Schaalia</i> | 45,257 | 1623.73 |
| <i>Schaalia odontolytica</i> | 44,778 | 1606.54 |
| <i>Schaalia meyeri</i> | 113 | 4.05 |
| <i>Schaalia georgiae</i> | 55 | 1.97 |
| <i>Schaalia cardiffensis</i> | 36 | 1.29 |
| <i>Schaalia vaccimaxillae</i> | 4 | 0.14 |
| <i>Schaalia hyovaginalis</i> | 3 | 0.11 |
| <i>Schaalia turicensis</i> | 1 | 0.04 |
| <i>Schaalia canis</i> | 1 | 0.04 |
| <i>Neisseria</i> | 31,493 | 1129.9 |
| <i>Neisseria mucosa</i> | 6,736 | 241.67 |
| <i>Neisseria elongata</i> | 4,768 | 171.07 |
| <i>Neisseria subflava</i> | 3,466 | 124.35 |
| <i>Neisseria flavescens</i> | 1,629 | 58.45 |
| <i>Neisseria macacae</i> | 909 | 32.61 |
| <i>Neisseria meningitidis</i> | 301 | 10.8 |
| <i>Neisseria sicca</i> | 262 | 9.4 |
| <i>Neisseria gonorrhoeae</i> | 240 | 8.61 |
| <i>Neisseria cinerea</i> | 89 | 3.19 |
| <i>Neisseria lactamica</i> | 68 | 2.44 |
| <i>Neisseria bacilliformis</i> | 50 | 1.79 |
| <i>Neisseria polysaccharea</i> | 34 | 1.22 |
| <i>Neisseria wadsworthii</i> | 5 | 0.18 |
| <i>Neisseria animaloris</i> | 4 | 0.14 |
| <i>Neisseria canis</i> | 3 | 0.11 |
| <i>Neisseria weaveri</i> | 3 | 0.11 |
| <i>Neisseria zoodegmatis</i> | 1 | 0.04 |
| <i>Neisseria oralis</i> | 1 | 0.04 |
| <i>Acinetobacter</i> | 21,008 | 753.72 |
| <i>Acinetobacter baumannii</i> | 13,941 | 500.17 |
| <i>Porphyromonas</i> | 16,016 | 574.62 |
| <i>Porphyromonas somerae</i> | 13,082 | 469.36 |
| <i>Porphyromonas endodontalis</i> | 2,383 | 85.5 |
| <i>Porphyromonas gingivalis</i> | 98 | 3.52 |
| <i>Porphyromonas asaccharolytica</i> | 6 | 0.22 |
| <i>Porphyromonas gulae</i> | 1 | 0.04 |
| <i>Porphyromonas uenonis</i> | 1 | 0.04 |
| <i>Veillonella</i> | 9,356 | 335.67 |
| <i>Veillonella parvula</i> | 4,108 | 147.39 |
| <i>Veillonella tobetsuensis</i> | 1,074 | 38.53 |
| <i>Veillonella dispar</i> | 375 | 13.45 |
| <i>Veillonella atypica</i> | 284 | 10.19 |

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|---------------------------------------|-------|--------|
| <i>Veillonella denticariosi</i> | 28 | 1 |
| <i>Veillonella seminalis</i> | 1 | 0.04 |
| <i>Streptococcus</i> | 8,487 | 304.5 |
| <i>Streptococcus mitis</i> | 1,174 | 42.12 |
| <i>Streptococcus sanguinis</i> | 490 | 17.58 |
| <i>Streptococcus oralis</i> | 458 | 16.43 |
| <i>Streptococcus cristatus</i> | 395 | 14.17 |
| <i>Streptococcus australis</i> | 363 | 13.02 |
| <i>Streptococcus pneumoniae</i> | 261 | 9.36 |
| <i>Streptococcus vestibularis</i> | 157 | 5.63 |
| <i>Streptococcus gordonii</i> | 147 | 5.27 |
| <i>Streptococcus parasanguinis</i> | 108 | 3.87 |
| <i>Streptococcus pseudopneumoniae</i> | 80 | 2.87 |
| <i>Streptococcus infantis</i> | 70 | 2.51 |
| <i>Streptococcus intermedius</i> | 65 | 2.33 |
| <i>Streptococcus salivarius</i> | 58 | 2.08 |
| <i>Streptococcus anginosus</i> | 49 | 1.76 |
| <i>Streptococcus milleri</i> | 46 | 1.65 |
| <i>Streptococcus peroris</i> | 37 | 1.33 |
| <i>Streptococcus sinensis</i> | 28 | 1 |
| <i>Streptococcus constellatus</i> | 20 | 0.72 |
| <i>Streptococcus thermophilus</i> | 12 | 0.43 |
| <i>Streptococcus suis</i> | 5 | 0.18 |
| <i>Streptococcus pyogenes</i> | 5 | 0.18 |
| <i>Streptococcus mutans</i> | 4 | 0.14 |
| <i>Streptococcus dysgalactiae</i> | 3 | 0.11 |
| <i>Streptococcus equinus</i> | 3 | 0.11 |
| <i>Streptococcus equi</i> | 3 | 0.11 |
| <i>Streptococcus porcinus</i> | 2 | 0.07 |
| <i>Streptococcus urinalis</i> | 2 | 0.07 |
| <i>Streptococcus minor</i> | 1 | 0.04 |
| <i>Streptococcus pasteurianus</i> | 1 | 0.04 |
| <i>Prevotella</i> | 4,880 | 175.08 |
| <i>Prevotella intermedia</i> | 1,109 | 39.79 |
| <i>Prevotella melaninogenica</i> | 770 | 27.63 |
| <i>Prevotella nigrescens</i> | 616 | 22.1 |
| <i>Prevotella aurantiaca</i> | 334 | 11.98 |
| <i>Prevotella nanceiensis</i> | 244 | 8.75 |
| <i>Prevotella oris</i> | 224 | 8.04 |
| <i>Prevotella shahii</i> | 153 | 5.49 |
| <i>Prevotella jejuni</i> | 153 | 5.49 |
| <i>Prevotella multiformis</i> | 98 | 3.52 |
| <i>Prevotella pallens</i> | 70 | 2.51 |
| <i>Prevotella scopos</i> | 52 | 1.87 |
| <i>Prevotella enoeca</i> | 45 | 1.61 |
| <i>Prevotella micans</i> | 41 | 1.47 |
| <i>Prevotella buccae</i> | 24 | 0.86 |
| <i>Prevotella fusca</i> | 17 | 0.61 |

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| <i>Prevotella marshii</i> | 15 | 0.54 |
| <i>Prevotella denticola</i> | 15 | 0.54 |
| <i>Prevotella timonensis</i> | 6 | 0.22 |
| <i>Prevotella oralis</i> | 5 | 0.18 |
| <i>Prevotella dentalis</i> | 3 | 0.11 |
| <i>Prevotella multisaccharivorax</i> | 3 | 0.11 |
| <i>Prevotella oulorum</i> | 3 | 0.11 |
| <i>Prevotella disiens</i> | 2 | 0.07 |
| <i>Prevotella loescheii</i> | 1 | 0.04 |
| <i>Prevotella bryantii</i> | 1 | 0.04 |
| <i>Prevotella bivia</i> | 1 | 0.04 |
| <i>Prevotella buccalis</i> | 1 | 0.04 |
| <i>Prevotella dentasini</i> | 1 | 0.04 |
| <i>Mycoplasma</i> | 3,780 | 135.62 |
| <i>Mycoplasma orale</i> | 2,439 | 87.51 |
| <i>Mycoplasma salivarium</i> | 1,316 | 47.22 |
| <i>Mycoplasma hominis</i> | 2 | 0.07 |
| <i>Campylobacter</i> | 2,940 | 105.48 |
| <i>Campylobacter concisus</i> | 1,521 | 54.57 |
| <i>Campylobacter showae</i> | 784 | 28.13 |
| <i>Campylobacter rectus</i> | 390 | 13.99 |
| <i>Campylobacter gracilis</i> | 101 | 3.62 |
| <i>Campylobacter curvus</i> | 22 | 0.79 |
| <i>Campylobacter lari</i> | 1 | 0.04 |
| <i>Campylobacter ureolyticus</i> | 1 | 0.04 |
| <i>Campylobacter iguaniorum</i> | 1 | 0.04 |
| <i>Lautropia</i> | 2,462 | 88.33 |
| <i>Lautropia mirabilis</i> | 2,462 | 88.33 |
| <i>Haemophilus</i> | 2,360 | 84.67 |
| <i>Haemophilus parainfluenzae</i> | 1,974 | 70.82 |
| <i>Haemophilus haemolyticus</i> | 94 | 3.37 |
| <i>Haemophilus influenzae</i> | 47 | 1.69 |
| <i>Haemophilus pittmaniae</i> | 42 | 1.51 |
| <i>Haemophilus parahaemolyticus</i> | 20 | 0.72 |
| <i>Haemophilus paraphrohaemolyticus</i> | 9 | 0.32 |
| <i>Haemophilus quentini</i> | 4 | 0.14 |
| <i>[Haemophilus] ducreyi</i> | 2 | 0.07 |
| <i>Haemophilus sputorum</i> | 1 | 0.04 |
| <i>Fusobacterium</i> | 2,309 | 82.84 |
| <i>Fusobacterium periodonticum</i> | 1,164 | 41.76 |
| <i>Fusobacterium nucleatum</i> | 648 | 23.25 |
| <i>Fusobacterium necrophorum</i> | 3 | 0.11 |
| <i>Abiotrophia</i> | 2,233 | 80.12 |
| <i>Abiotrophia defectiva</i> | 2,233 | 80.12 |
| <i>Tannerella</i> | 2,018 | 72.4 |
| <i>Tannerella forsythia</i> | 2,018 | 72.4 |
| <i>Klebsiella</i> | 1,834 | 65.8 |
| <i>Klebsiella pneumoniae</i> | 1,321 | 47.39 |

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| <i>Klebsiella variicola</i> | 8 | 0.29 |
| <i>Klebsiella quasipneumoniae</i> | 8 | 0.29 |
| <i>Klebsiella michiganensis</i> | 1 | 0.04 |
| <i>Rothia</i> | 1,739 | 62.39 |
| <i>Rothia mucilaginosa</i> | 1,419 | 50.91 |
| <i>Rothia dentocariosa</i> | 173 | 6.21 |
| <i>Rothia aeria</i> | 59 | 2.12 |
| <i>Alloprevotella</i> | 1,698 | 60.92 |
| <i>Alloprevotella tanneriae</i> | 1,624 | 58.27 |
| <i>Staphylococcus</i> | 1,643 | 58.95 |
| <i>Staphylococcus epidermidis</i> | 1,549 | 55.57 |
| <i>Staphylococcus aureus</i> | 43 | 1.54 |
| <i>Staphylococcus hominis</i> | 6 | 0.22 |
| <i>Capnocytophaga</i> | 1,468 | 52.67 |
| <i>Capnocytophaga sputigena</i> | 469 | 16.83 |
| <i>Capnocytophaga gingivalis</i> | 337 | 12.09 |
| <i>Capnocytophaga ochracea</i> | 298 | 10.69 |
| <i>Capnocytophaga leadbetteri</i> | 186 | 6.67 |
| <i>Capnocytophaga granulosa</i> | 94 | 3.37 |
| <i>Capnocytophaga haemolytica</i> | 4 | 0.14 |
| <i>Megasphaera</i> | 1,128 | 40.47 |
| <i>Megasphaera micronuciformis</i> | 1,126 | 40.4 |
| <i>Aggregatibacter</i> | 1,022 | 36.67 |
| <i>Aggregatibacter actinomycetemcomitans</i> | 522 | 18.73 |
| <i>Aggregatibacter segnis</i> | 392 | 14.06 |
| <i>Aggregatibacter aphrophilus</i> | 64 | 2.3 |
| <i>Actinomyces</i> | 956 | 34.3 |
| <i>Actinomyces massiliensis</i> | 75 | 2.69 |
| <i>Actinomyces graevenitzi</i> | 64 | 2.3 |
| <i>Actinomyces gerencseriae</i> | 64 | 2.3 |
| <i>Actinomyces viscosus</i> | 25 | 0.9 |
| <i>Actinomyces johnsonii</i> | 22 | 0.79 |
| <i>Actinomyces oris</i> | 12 | 0.43 |
| <i>Actinomyces naeslundii</i> | 10 | 0.36 |
| <i>Actinomyces timonensis</i> | 6 | 0.22 |
| <i>Actinomyces bowdenii</i> | 2 | 0.07 |
| <i>Actinomyces urogenitalis</i> | 1 | 0.04 |
| <i>Clostridiales incertae sedis</i> | 835 | 29.96 |
| <i>Clostridiales Family XIII. Incertae Sedis</i> | 834 | 29.92 |
| <i>Mogibacterium</i> | 534 | 19.16 |
| <i>Mogibacterium diversum</i> | 317 | 11.37 |
| <i>Mogibacterium pumilum</i> | 123 | 4.41 |
| <i>Mogibacterium timidum</i> | 50 | 1.79 |
| <i>[Eubacterium] nodatum</i> | 1 | 0.04 |
| <i>Corynebacterium</i> | 826 | 29.64 |
| <i>Corynebacterium matruchotii</i> | 313 | 11.23 |

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| <i>Corynebacterium propinquum</i> | 122 | 4.38 |
| <i>Corynebacterium accolens</i> | 96 | 3.44 |
| <i>Corynebacterium segmentosum</i> | 89 | 3.19 |
| <i>Corynebacterium macginleyi</i> | 10 | 0.36 |
| <i>Corynebacterium pseudodiphtheriticum</i> | 7 | 0.25 |
| <i>Corynebacterium striatum</i> | 5 | 0.18 |
| <i>Corynebacterium aurimucosum</i> | 5 | 0.18 |
| <i>Corynebacterium diphtheriae</i> | 4 | 0.14 |
| <i>Corynebacterium timonense</i> | 1 | 0.04 |
| <i>Corynebacterium riegelyi</i> | 1 | 0.04 |
| <i>Corynebacterium simulans</i> | 1 | 0.04 |
| <i>Corynebacterium argentoratense</i> | 1 | 0.04 |
| <i>Stenotrophomonas</i> | 776 | 27.84 |
| <i>Stenotrophomonas maltophilia</i> | 731 | 26.23 |
| <i>Granulicatella</i> | 770 | 27.63 |
| <i>Granulicatella adiacens</i> | 553 | 19.84 |
| <i>Granulicatella elegans</i> | 209 | 7.5 |
| <i>Dialister</i> | 625 | 22.42 |
| <i>Dialister pneumosintes</i> | 256 | 9.18 |
| <i>Leptotrichia</i> | 566 | 20.31 |
| <i>Leptotrichia wadei</i> | 169 | 6.06 |
| <i>Leptotrichia buccalis</i> | 124 | 4.45 |
| <i>Leptotrichia shahii</i> | 8 | 0.29 |
| <i>Gemella</i> | 537 | 19.27 |
| <i>Gemella morbillorum</i> | 278 | 9.97 |
| <i>Gemella sanguinis</i> | 194 | 6.96 |
| <i>Gemella haemolysans</i> | 40 | 1.44 |
| <i>Gemella cuniculi</i> | 2 | 0.07 |
| <i>Arachnia</i> | 496 | 17.8 |
| <i>Pseudopropionibacterium propionicum</i> | 367 | 13.17 |
| <i>Enterobacter</i> | 439 | 15.75 |
| <i>Enterobacter cloacae complex</i> | 410 | 14.71 |
| <i>Enterobacter cloacae</i> | 328 | 11.77 |
| <i>Enterobacter kobei</i> | 9 | 0.32 |
| <i>Enterobacter chengduensis</i> | 2 | 0.07 |
| <i>Enterobacter ludwigii</i> | 2 | 0.07 |
| <i>Enterobacter asburiae</i> | 1 | 0.04 |
| <i>Enterobacter hormaechei</i> | 1 | 0.04 |
| <i>Enterobacter mori</i> | 2 | 0.07 |
| <i>Enterobacter bugandensis</i> | 1 | 0.04 |
| <i>Parvimonas</i> | 403 | 14.46 |
| <i>Parvimonas micra</i> | 403 | 14.46 |
| <i>Treponema</i> | 372 | 13.35 |
| <i>Treponema denticola</i> | 113 | 4.05 |
| <i>Treponema maltophilum</i> | 68 | 2.44 |
| <i>Treponema medium</i> | 62 | 2.22 |

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|---|-----|-------|
| <i>Treponema vincentii</i> | 56 | 2.01 |
| <i>Treponema socranskii</i> | 25 | 0.9 |
| <i>Treponema putidum</i> | 15 | 0.54 |
| <i>Treponema lecithinolyticum</i> | 8 | 0.29 |
| <i>Treponema phagedenis</i> | 2 | 0.07 |
| <i>Treponema pedis</i> | 1 | 0.04 |
| <i>Selenomonas</i> | 303 | 10.87 |
| <i>Selenomonas infelix</i> | 34 | 1.22 |
| <i>Eikenella</i> | 165 | 5.92 |
| <i>Eikenella corrodens</i> | 165 | 5.92 |
| <i>Oribacterium</i> | 126 | 4.52 |
| <i>Oribacterium sinus</i> | 73 | 2.62 |
| <i>Lancefieldella</i> | 121 | 4.34 |
| <i>Lancefieldella parvula</i> | 105 | 3.77 |
| <i>Lancefieldella rimae</i> | 15 | 0.54 |
| <i>Olsenella</i> | 120 | 4.31 |
| <i>Olsenella uli</i> | 88 | 3.16 |
| <i>Cardiobacterium</i> | 109 | 3.91 |
| <i>Cardiobacterium hominis</i> | 94 | 3.37 |
| <i>Cardiobacterium valvarum</i> | 12 | 0.43 |
| <i>Peptostreptococcus</i> | 104 | 3.73 |
| <i>Peptostreptococcus stomatis</i> | 97 | 3.48 |
| <i>Peptostreptococcus anaerobius</i> | 4 | 0.14 |
| <i>Solobacterium</i> | 103 | 3.7 |
| <i>Solobacterium moorei</i> | 103 | 3.7 |
| <i>Filifactor</i> | 80 | 2.87 |
| <i>Filifactor alocis</i> | 80 | 2.87 |
| <i>Candidatus Absconditabacteria</i> | 67 | 2.4 |
| <i>unclassified Candidatus Absconditabacteria</i> | 67 | 2.4 |
| <i>Slackia</i> | 58 | 2.08 |
| <i>Slackia exigua</i> | 58 | 2.08 |
| <i>Morococcus</i> | 50 | 1.79 |
| <i>Morococcus cerebrosus</i> | 50 | 1.79 |
| <i>Kingella</i> | 43 | 1.54 |
| <i>Kingella denitrificans</i> | 37 | 1.33 |
| <i>Kingella oralis</i> | 4 | 0.14 |
| <i>Kingella kingae</i> | 2 | 0.07 |
| <i>Pauljensenia</i> | 42 | 1.51 |
| <i>Pauljensenia hongkongensis</i> | 42 | 1.51 |
| <i>Anaeroglobus</i> | 40 | 1.44 |
| <i>Anaeroglobus geminatus</i> | 40 | 1.44 |
| <i>Dolosigranulum</i> | 38 | 1.36 |
| <i>Dolosigranulum pigrum</i> | 38 | 1.36 |
| <i>Catonella</i> | 26 | 0.93 |
| <i>Catonella morbi</i> | 26 | 0.93 |
| <i>Streptomyces</i> | 26 | 0.93 |
| <i>Streptomyces cattleya</i> | 26 | 0.93 |

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|---|----|------|
| <i>Pseudoleptotrichia</i> | 15 | 0.54 |
| <i>Pseudoleptotrichia goodfellowii</i> | 15 | 0.54 |
| <i>Bacteroides</i> | 14 | 0.5 |
| <i>Bacteroides heparinolyticus</i> | 5 | 0.18 |
| <i>Bacteroides fragilis</i> | 2 | 0.07 |
| <i>Bacteroides pyogenes</i> | 2 | 0.07 |
| <i>Bacteroides zooglooformans</i> | 2 | 0.07 |
| <i>Propionibacterium</i> | 10 | 0.36 |
| <i>Propionibacterium acidifaciens</i> | 8 | 0.29 |
| <i>Propionibacterium freudenreichii</i> | 1 | 0.04 |
| <i>Methanobrevibacter</i> | 10 | 0.36 |
| <i>Methanobrevibacter smithii</i> | 1 | 0.04 |
| <i>Tissierellaceae</i> | 8 | 0.29 |
| <i>Tissierella</i> | 1 | 0.04 |
| <i>Tissierella praeacuta</i> | 1 | 0.04 |
| <i>Cutibacterium</i> | 8 | 0.29 |
| <i>Cutibacterium acnes</i> | 6 | 0.22 |
| <i>Cutibacterium granulosum</i> | 2 | 0.07 |
| <i>Bulleidia</i> | 7 | 0.25 |
| <i>Bulleidia extracta</i> | 7 | 0.25 |
| <i>Eggerthia</i> | 7 | 0.25 |
| <i>Eggerthia catenaformis</i> | 7 | 0.25 |
| <i>Pantoea</i> | 4 | 0.14 |
| <i>Pantoea ananatis</i> | 3 | 0.11 |
| <i>Shuttleworthia</i> | 4 | 0.14 |
| <i>Shuttleworthia satelles</i> | 4 | 0.14 |
| <i>Clostridioides</i> | 4 | 0.14 |
| <i>Clostridioides difficile</i> | 4 | 0.14 |
| <i>Escherichia</i> | 3 | 0.11 |
| <i>Escherichia coli</i> | 3 | 0.11 |
| <i>Streptobacillus</i> | 3 | 0.11 |
| <i>Streptobacillus moniliformis</i> | 3 | 0.11 |
| <i>Alistipes</i> | 3 | 0.11 |
| <i>Alistipes shahii</i> | 1 | 0.04 |
| <i>Alistipes finegoldii</i> | 1 | 0.04 |
| <i>Enterococcus</i> | 3 | 0.11 |
| <i>Enterococcus faecalis</i> | 1 | 0.04 |
| <i>Peptoniphilus</i> | 3 | 0.11 |
| <i>Peptoniphilus asaccharolyticus</i> | 1 | 0.04 |
| <i>Moraxella</i> | 2 | 0.07 |
| <i>Moraxella osloensis</i> | 1 | 0.04 |
| <i>Salmonella</i> | 2 | 0.07 |
| <i>Salmonella enterica</i> | 2 | 0.07 |
| <i>Kosakonia</i> | 2 | 0.07 |
| <i>Kosakonia sacchari</i> | 1 | 0.04 |
| <i>Cupriavidus</i> | 2 | 0.07 |
| <i>Mobiluncus</i> | 2 | 0.07 |
| <i>Bifidobacterium</i> | 2 | 0.07 |

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|---------------------------------------|--------------------|--------------------------------|
| <i>Bifidobacterium scardovii</i> | 1 | 0.04 |
| <i>Dermabacter</i> | 2 | 0.07 |
| <i>Dermabacter hominis</i> | 2 | 0.07 |
| <i>Serratia</i> | 1 | 0.04 |
| <i>Serratia fonticola</i> | 1 | 0.04 |
| <i>Actinobacillus</i> | 1 | 0.04 |
| <i>Actinobacillus ureae</i> | 1 | 0.04 |
| <i>Pasteurella</i> | 1 | 0.04 |
| <i>Pasteurella canis</i> | 1 | 0.04 |
| <i>Glaesserella</i> | 1 | 0.04 |
| <i>Glaesserella parasuis</i> | 1 | 0.04 |
| <i>Bordetella</i> | 1 | 0.04 |
| <i>Delftia</i> | 1 | 0.04 |
| <i>Delftia tsuruhatensis</i> | 1 | 0.04 |
| <i>Ralstonia</i> | 1 | 0.04 |
| <i>Sanguibacteroides</i> | 1 | 0.04 |
| <i>Sanguibacteroides justesenii</i> | 1 | 0.04 |
| <i>Eubacterium</i> | 1 | 0.04 |
| <i>[Eubacterium] cellulosolvens</i> | 1 | 0.04 |
| <i>Pseudoramibacter</i> | 1 | 0.04 |
| <i>Pseudoramibacter alactolyticus</i> | 1 | 0.04 |
| <i>Erysipelothrix</i> | 1 | 0.04 |
| <i>Erysipelothrix rhusiopathiae</i> | 1 | 0.04 |
| <i>Anaerococcus</i> | 1 | 0.04 |
| <i>Anaerococcus octavius</i> | 1 | 0.04 |
| <i>Kocuria</i> | 1 | 0.04 |
| <i>Kocuria rhizophila</i> | 1 | 0.04 |
| <i>Ureaplasma</i> | 1 | 0.04 |
| <i>Ureaplasma parvum</i> | 1 | 0.04 |
| <i>Malassezia</i> | 3 | 0.11 |
| <i>Malassezia restricta</i> | 2 | 0.07 |
| <i>Malassezia globosa</i> | 1 | 0.04 |
| B, Urine sample | | |
| Organism | Reads accumulation | Reads per million mapped reads |
| <i>Ureaplasma</i> | 1,710 | 75.37 |
| <i>Ureaplasma urealyticum</i> | 1,554 | 68.5 |
| <i>Ureaplasma parvum</i> | 14 | 0.62 |
| <i>Cutibacterium</i> | 91 | 4.01 |
| <i>Cutibacterium acnes</i> | 87 | 3.83 |
| <i>Corynebacterium</i> | 17 | 0.75 |
| <i>Corynebacterium simulans</i> | 6 | 0.26 |
| <i>Corynebacterium durum</i> | 1 | 0.04 |
| <i>Corynebacterium matruchotii</i> | 1 | 0.04 |
| <i>Corynebacterium gottigense</i> | 1 | 0.04 |
| <i>Corynebacterium jeikeium</i> | 1 | 0.04 |
| <i>Citrobacter</i> | 16 | 0.71 |
| <i>Citrobacter freundii complex</i> | 11 | 0.48 |

| | | |
|--------------------------------------|----|------|
| <i>Citrobacter freundii</i> | 7 | 0.31 |
| <i>Citrobacter braakii</i> | 2 | 0.09 |
| <i>Citrobacter amalonaticus</i> | 2 | 0.09 |
| <i>Citrobacter farmeri</i> | 1 | 0.04 |
| <i>Achromobacter</i> | 15 | 0.66 |
| <i>Achromobacter denitrificans</i> | 7 | 0.31 |
| <i>Achromobacter insolitus</i> | 3 | 0.13 |
| <i>Moraxella</i> | 11 | 0.48 |
| <i>Moraxella osloensis</i> | 11 | 0.48 |
| <i>Microbacterium</i> | 10 | 0.44 |
| <i>Microbacterium laevaniformans</i> | 5 | 0.22 |
| <i>Microbacterium oxydans</i> | 2 | 0.09 |
| <i>Microbacterium aurum</i> | 2 | 0.09 |
| <i>Afipia</i> | 8 | 0.35 |
| <i>Afipia broomeae</i> | 4 | 0.18 |
| <i>Afipia felis</i> | 2 | 0.09 |
| <i>Afipia birgiae</i> | 2 | 0.09 |
| <i>Micrococcus</i> | 8 | 0.35 |
| <i>Micrococcus luteus</i> | 7 | 0.31 |
| <i>Kocuria</i> | 8 | 0.35 |
| <i>Kocuria rhizophila</i> | 6 | 0.26 |
| <i>Kocuria palustris</i> | 1 | 0.04 |
| <i>Kocuria rosea</i> | 1 | 0.04 |
| <i>Escherichia</i> | 7 | 0.31 |
| <i>Escherichia coli</i> | 7 | 0.31 |
| <i>Serratia</i> | 6 | 0.26 |
| <i>Serratia liquefaciens</i> | 5 | 0.22 |
| <i>Serratia ficaria</i> | 1 | 0.04 |
| <i>Rhodococcus</i> | 6 | 0.26 |
| <i>Rhodococcus fascians</i> | 1 | 0.04 |
| <i>Massilia</i> | 5 | 0.22 |
| <i>Staphylococcus</i> | 5 | 0.22 |
| <i>Staphylococcus epidermidis</i> | 3 | 0.13 |
| <i>Staphylococcus haemolyticus</i> | 1 | 0.04 |
| <i>Staphylococcus hominis</i> | 1 | 0.04 |
| <i>Janibacter</i> | 5 | 0.22 |
| <i>Janibacter indicus</i> | 1 | 0.04 |
| <i>Janibacter terrae</i> | 1 | 0.04 |
| <i>Aeromonas</i> | 4 | 0.18 |
| <i>Aeromonas caviae</i> | 1 | 0.04 |
| <i>Mycoplasma</i> | 4 | 0.18 |
| <i>Mycoplasma hyorhinis</i> | 4 | 0.18 |
| <i>Ochrobactrum</i> | 3 | 0.13 |
| <i>Ochrobactrum anthropi</i> | 1 | 0.04 |
| <i>Paracoccus</i> | 3 | 0.13 |
| <i>Blastomonas</i> | 3 | 0.13 |
| <i>Blastomonas natatoria</i> | 1 | 0.04 |
| <i>Enterobacter</i> | 2 | 0.09 |

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|--|----|------|
| <i>Enterobacter cloacae complex</i> | 1 | 0.04 |
| <i>Klebsiella</i> | 2 | 0.09 |
| <i>Klebsiella pneumoniae</i> | 1 | 0.04 |
| <i>Kosakonia</i> | 2 | 0.09 |
| <i>Morganella</i> | 2 | 0.09 |
| <i>Morganella morganii</i> | 2 | 0.09 |
| <i>Neisseria</i> | 2 | 0.09 |
| <i>Empedobacter</i> | 2 | 0.09 |
| <i>Empedobacter falsenii</i> | 2 | 0.09 |
| <i>Lactiplantibacillus</i> | 2 | 0.09 |
| <i>Lactiplantibacillus plantarum</i> | 2 | 0.09 |
| <i>Rothia</i> | 2 | 0.09 |
| <i>Rothia mucilaginoso</i> | 1 | 0.04 |
| <i>Rothia kristinae</i> | 1 | 0.04 |
| <i>Dietzia</i> | 2 | 0.09 |
| <i>Dietzia maris</i> | 1 | 0.04 |
| <i>Raoultella</i> | 1 | 0.04 |
| <i>Raoultella planticola</i> | 1 | 0.04 |
| <i>Pluralibacter</i> | 1 | 0.04 |
| <i>Pluralibacter gergoviae</i> | 1 | 0.04 |
| <i>Lautropia</i> | 1 | 0.04 |
| <i>Lautropia mirabilis</i> | 1 | 0.04 |
| <i>Fusobacterium</i> | 1 | 0.04 |
| <i>Fusobacterium periodonticum</i> | 1 | 0.04 |
| <i>Prevotella</i> | 1 | 0.04 |
| <i>Prevotella buccae</i> | 1 | 0.04 |
| <i>Lactococcus</i> | 1 | 0.04 |
| <i>Lactococcus lactis</i> | 1 | 0.04 |
| <i>Loigolactobacillus</i> | 1 | 0.04 |
| <i>Lactobacillus coryniformis</i> | 1 | 0.04 |
| <i>Aerococcus</i> | 1 | 0.04 |
| <i>Enterocloster</i> | 1 | 0.04 |
| <i>Enterocloster citroniae</i> | 1 | 0.04 |
| <i>Peptoniphilus</i> | 1 | 0.04 |
| <i>Peptoniphilus duerdenii</i> | 1 | 0.04 |
| <i>Schaalia</i> | 1 | 0.04 |
| <i>Schaalia odontolytica</i> | 1 | 0.04 |
| <i>Arachnia</i> | 1 | 0.04 |
| <i>Pseudopropionibacterium propionicum</i> | 1 | 0.04 |
| <i>Meyerozyma</i> | 48 | 2.12 |
| <i>Meyerozyma guilliermondii</i> | 47 | 2.07 |
| <i>Purpureocillium</i> | 39 | 1.72 |
| <i>Purpureocillium lilacinum</i> | 39 | 1.72 |
| <i>Malassezia</i> | 8 | 0.35 |
| <i>Malassezia restricta</i> | 8 | 0.35 |
| <i>Yarrowia</i> | 6 | 0.26 |
| <i>Yarrowia lipolytica</i> | 5 | 0.22 |

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|---|--------------------|--------------------------------|
| <i>Debaryomyces</i> | 3 | 0.13 |
| <i>Debaryomyces hansenii</i> | 3 | 0.13 |
| <i>Aspergillus</i> | 2 | 0.09 |
| <i>Aspergillus glaucus</i> | 2 | 0.09 |
| <i>Schizophyllum</i> | 1 | 0.04 |
| <i>Schizophyllum commune</i> | 1 | 0.04 |
| <i>Wallemia</i> | 1 | 0.04 |
| <i>Wallemia mellicola</i> | 1 | 0.04 |
| <i>Polyomaviridae</i> | 86,875 | 3829.21 |
| <i>Betapolyomavirus</i> | 86,875 | 3829.21 |
| Human polyomavirus 2 (<i>JC polyomavirus</i>) | 86,692 | 3821.14 |
| <i>JC polyomavirus</i> | 5,121 | 225.72 |
| <i>JC polyomavirus</i> type 3 | 4 | 0.18 |
| <i>JC polyomavirus</i> type 3A | 4 | 0.18 |
| C, Blood sample | | |
| Organism | Reads accumulation | Reads per million mapped reads |
| <i>Fusobacterium</i> | 3 | 0.09 |
| <i>Fusobacterium mortiferum</i> | 1 | 0.03 |
| <i>Fusobacterium nucleatum</i> | 1 | 0.03 |
| <i>Fusobacterium periodonticum</i> | 1 | 0.03 |
| <i>Neisseria</i> | 2 | 0.06 |
| <i>Neisseria elongata</i> | 2 | 0.06 |
| <i>Alloprevotella</i> | 2 | 0.06 |
| <i>Alloprevotella tanneriae</i> | 1 | 0.03 |
| <i>Klebsiella</i> | 1 | 0.03 |
| <i>Aggregatibacter</i> | 1 | 0.03 |
| <i>Aggregatibacter segnis</i> | 1 | 0.03 |
| <i>Campylobacter</i> | 1 | 0.03 |
| <i>Campylobacter concisus</i> | 1 | 0.03 |
| <i>Schaalia</i> | 1 | 0.03 |
| <i>Schaalia odontolytica</i> | 1 | 0.03 |
| <i>Cutibacterium</i> | 1 | 0.03 |
| <i>Cutibacterium acnes</i> | 1 | 0.03 |
| <i>Ureaplasma</i> | 1 | 0.03 |
| <i>Ureaplasma urealyticum</i> | 1 | 0.03 |
| <i>Polyomaviridae</i> | 1 | 0.03 |
| <i>Betapolyomavirus</i> | 1 | 0.03 |
| Human polyomavirus 2 (<i>JC polyomavirus</i>) | 1 | 0.03 |

Table SII. Antibiotic resistance genes

| Resistance gene | Resistant family | Main mechanism | Possible species name |
|-----------------|--|--------------------------------|--------------------------------|
| <i>Mex</i> | Penicillins | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Omp</i> | Penicillins | Reduced antibiotic penetration | <i>Klebsiella pneumoniae</i> |
| <i>Mex</i> | Penicillanes | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>OXA</i> | Penicillanes | Antibiotic inactivation | <i>Acinetobacter baumannii</i> |
| <i>Omp</i> | Penicillanes | Reduced antibiotic penetration | <i>Klebsiella pneumoniae</i> |
| <i>Mex</i> | Tetracyclines | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Omp</i> | Cephalosporin | Reduced antibiotic penetration | <i>Klebsiella pneumoniae</i> |
| <i>Mex</i> | Fluoroquinolones | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>abe</i> | Fluoroquinolones | Antibiotic efflux | <i>Acinetobacter baumannii</i> |
| <i>Emr</i> | Aminoglycosides | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Mex</i> | Aminocoumarin | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Mex</i> | Carbapenems | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>OXA</i> | Carbapenems | Antibiotic inactivation | <i>Acinetobacter baumannii</i> |
| <i>Omp</i> | Carbapenems | Reduced antibiotic penetration | <i>Klebsiella pneumoniae</i> |
| <i>Mex</i> | Sulfonamides | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Mex</i> | Peptides | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>abe</i> | disinfecting agents and intercalating dyes | Antibiotic efflux | <i>Acinetobacter baumannii</i> |
| <i>abe</i> | Triclosan | Antibiotic efflux | <i>Acinetobacter baumannii</i> |
| <i>Mex</i> | Diaminopyrimidine | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Mex</i> | Monocyclic lactams | Antibiotic efflux | <i>Pseudomonas aeruginosa</i> |
| <i>Omp</i> | Monocyclic lactams | Reduced antibiotic penetration | <i>Klebsiella pneumoniae</i> |

1. *OXA*: This gene encodes class D carbapenemase, which has strong hydrolysis activity to oxacillin, low hydrolysis activity to imipenem, and weak hydrolysis activity to ceftazidime, cefotaxime and aztreonam. Except *OXA-23*, other enzymes can be inhibited by tazobactam and clavulanic acid. The *OXA* gene is located on a plasmid or chromosome, or in a type I integron gene cassette, and can be transferred to the different bacteria.

2. *Omp*: (outer membrane protein) is the main structural component in the outer membrane of gram-negative bacteria. Outer membrane porins genes included *OmpK35*, *OmpK36* and *OmpK37*. Poor protein is missing or decreased in expression, corresponding to antibacterial Drugs cannot enter the bacteria by diffusion through the cell membrane, which causes the bacteria to develop resistance.

3. *Emr*: This gene is a relatively simple efflux pump, belonging to the small multidrug family (small multidrug resistance, SMR), and is also one of the most well-studied multi-drug resistant efflux pumps. It can express resistance to monovalent cations and lipophilic cations such as erythromycin, sulfathiazole sodium, tetracycline, sulfadiazine sodium, ethidium bromide and crystal violet.

4. *Abe*: Abe gene mainly includes AbeM and AbeS types. AbeM efflux pump may cause drug resistance to fluoroquinolones. Bioinformatics analysis shows that it is multi-drugged with aeruginosa. Similar to the efflux pump PmpM, it is a hydrogen ion coupled efflux pump.

5. *Mex*: This efflux pump gene belongs to resistance-nodulation-cell-division (RND) family. Its expression is mainly regulated by the *mexR*, *nalC* and *nalD* genes, and relies on the transmembrane proton gradient to drive the excretion of drugs to the outside of the cell, which reduces the drug concentration in the bacteria, which leads to a decrease in drug sensitivity. Among of them, the efflux pump MexAB-OprM is one of the most important mechanisms of *Pseudomonas aeruginosa* resistance to carbapenems, and it is also the most common efflux pump system in the efflux pump family.