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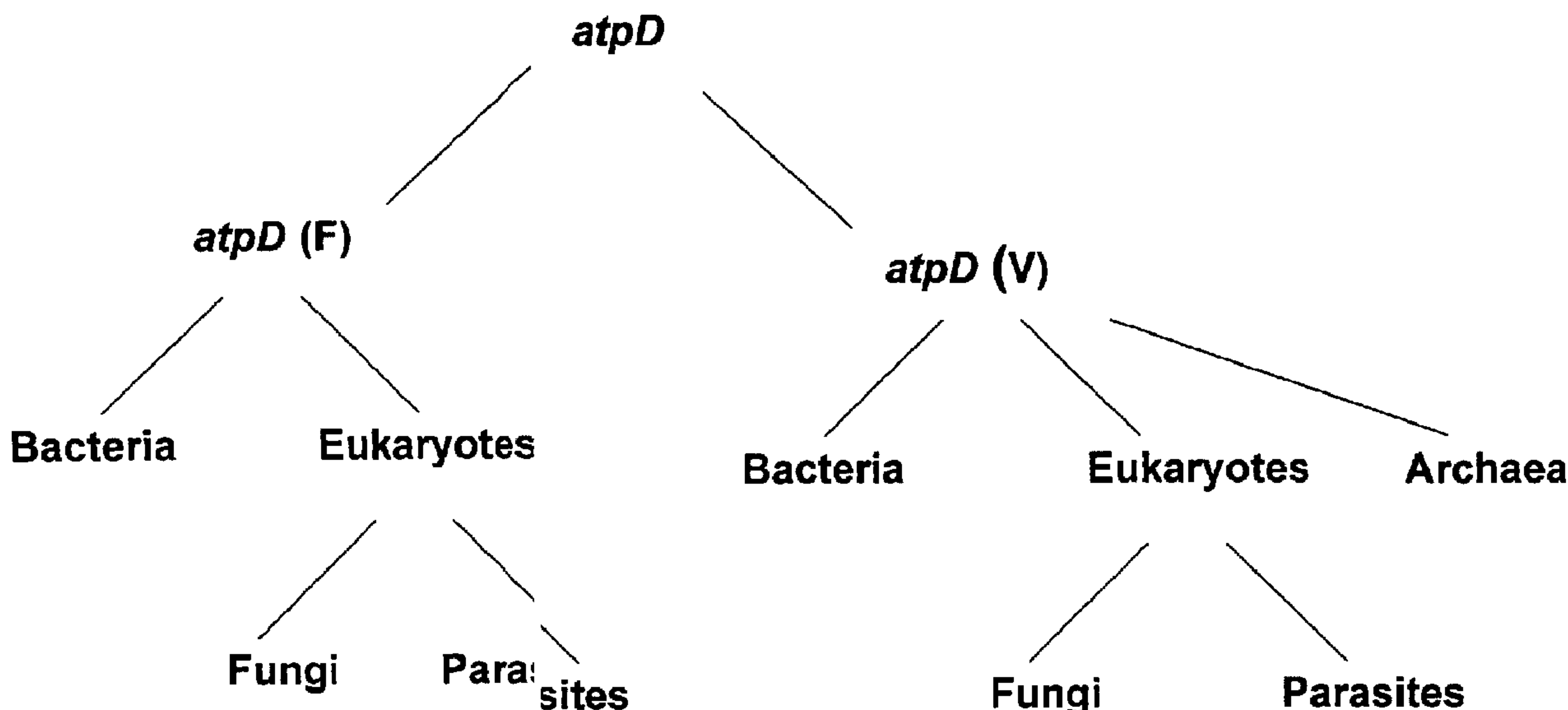
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(71) Demandeur/Applicant:
GENEOHM SCIENCES CANADA INC., CA

(72) Inventeurs/Inventors:
BERGERON, MICHEL G., CA;
BOISSINOT, MAURICE, CA;
HULETSKY, ANN, CA;
MENARD, CHRISTIAN, CA; ...

(54) Titre : GENES A FORT POUVOIR DE CONSERVATION ET LEUR UTILISATION POUR PRODUIRE DES SONDES D'ACIDE NUCLEIQUE SPECIFIQUES A L'ESPECE, SPECIFIQUES AU GENE, SPECIFIQUES A LA FAMILLE, SPECIFIQUES AU GROUPE ET UNIVERSELLES ET DES SONDES D'AMPLIFICATION, EN VUE DE DETECTER ET D'IDENTIFIER RAPIDEMENT DES MICRO-ORGANISMES ALGAIRES, ARCHEENS, BACTERIENS, FONGIQUES ET PARASIT

(54) Title: HIGHLY CONSERVED GENES AND THEIR USE TO GENERATE SPECIES-SPECIFIC, GENUS-SPECIFIC, FAMILY-SPECIFIC, GROUP-SPECIFIC AND UNIVERSAL NUCLEIC ACID PROBES AND AMPLIFICATION PRIMERS TO RAPIDLY DETECT AND IDENTIFY ALGAL, ARCHAEOAL, BACTERIAL, FUNGAL AND PARASITICAL MICROORGANISMS FROM CLINICAL SPECIMENS FOR DIAGNOSIS



(57) Abrégé/Abstract:

Four highly conserved genes, encoding translation elongation factor Tu, translation elongation factor G, the catalytic subunit of proton-translocating ATPase and the RecA recombinase, are used to generate a sequence repertory or bank and species-specific, genus-specific, family-specific, group-specific and universal nucleic acid probes and amplification primers to rapidly detect and identify algal, archaeal, bacterial, fungal and parasitological microorganisms from specimens for diagnosis. The detection of associated antimicrobial agents resistance and toxin genes are also under the scope of the present invention.

(72) **Inventeurs(suite)/Inventors(continued)**: OUELLETTE, MARC, CA; PICARD, FRANCOIS J., CA; ROY, PAUL H., CA

(74) **Agent**: GOUDREAU GAGE DUBUC

ABSTRACT

Four highly conserved genes, encoding translation elongation factor Tu, translation elongation factor G, the catalytic subunit of proton-translocating ATPase and the RecA recombinase, are used to generate a sequence repertory or bank and species-specific, genus-specific, family-specific, group-specific and universal nucleic acid probes and amplification primers to rapidly detect and identify algal, archaeal, bacterial, fungal and parasitical microorganisms from specimens for diagnosis. The detection of associated antimicrobial agents resistance and toxin genes are also under the scope of the present invention.

What is claimed is:

1. A method for generating a repertory of nucleic acids of *tuf*, *fus*, *atpD* and/or *recA* genes from which are derived probes or primers, or both, useful for the detection of one, more than one related microorganisms, or substantially all microorganisms of a group selected from algae, archaea, bacteria, fungi and parasites, which comprises the step of:

- amplifying the nucleic acids of a plurality of determined algal, archaeal, bacterial, fungal and parasitical species with any combination of the primer pairs defined in SEQ ID NOs.: 543, 556-574, 636-655, 664, 681-683, 694, 696-697, 699-700, 708, 812-815, 911-917, 919-922, 935-938, 1203-1207, 1212-1213, 1221-1229, 1605-1606, 1974-1984, 1999-2003, 2282-2285.

2. A method for generating a repertory of nucleic acid sequences, which comprises the steps of:

- reproducing the method of claim 1, and
- adding the step of:
 - sequencing said nucleic acids.

3. A method for generating sequences of probes, or primers, or both, useful for the detection of one, more than one related microorganisms, or substantially all microorganisms of a group selected from algae, archaea, bacteria, fungi and parasites, which comprises the steps of:

- reproducing the method of claim 2, and
- adding the steps of:
 - aligning a subset of nucleic acid sequences of said repertory,
 - locating nucleic acid stretches that are present in the nucleic acids of strains or representatives of said one, more than one related microorganisms, or substantially all microorganisms of said group, and not present in the nucleic acid sequences of other microorganisms, and

- deriving consensus nucleic acid sequences useful as probes or primers from said stretches.

4. A bank of nucleic acids comprising the repertory of nucleic acids obtained from the method of claim 1.

5. A bank of nucleic acid sequences comprising the repertory of nucleic acid sequences obtained from the method of claim 2.

6. A method for generating sequences of probes, or primers, or both, useful for the detection of one, more than one related microorganisms, or substantially all microorganisms of a group selected from algae, archaea, bacteria, fungi and parasites, which comprises the steps of:

- aligning a subset of nucleic acid sequences of the bank as defined in claim 5,
- locating nucleic acid sequence stretches that are present in the nucleic acid sequences of strains or representatives of said one, more than one related microorganisms, or substantially all microorganisms of said group, and not present in the nucleic acid sequences of other microorganisms, and
- deriving consensus nucleic acid sequences useful as probes or primers from said stretches.

7. A method for generating probes, or primers or both, useful for the detection of one, more than one related microorganisms, or substantially all microorganisms of a group selected from algae, archaea, bacteria, fungi and parasites, which comprises the steps of:

- reproducing the method of claim 3 or 6, and
- adding the step of:
 - synthesising said probes or primers upon the nucleic acid sequences thereof.

8. A nucleic acid used for universal detection of any one of alga, archaeon, bacterium, fungus and parasite which is obtained from the method of claim 7.

9. A nucleic acid used for universal detection as set forth in claim 8, which has a nucleic acid sequence of at least 12 nucleotides capable of hybridizing with said any one of alga, archaeon, bacterium, fungus and parasite and with any one of SEQ ID NOs.: 543, 556-574, 636-655, 658-661, 664, 681-683, 694, 696, 697, 699, 700, 708, 812-815, 911-917, 919-922, 935-938, 1203-1207, 1212-1213, 1221-1229, 1605-1606, 1974-1984, 1999-2003, 2282-2285.

10. A nucleic acid used for the specific and ubiquitous detection and for identification of any one of a algal, archaeal, bacterial, fungal and parasitital species, genus, family and group, which is obtained from the method of claim 7.

11. A nucleic acid as set forth in claim 10 having any one of the nucleotide sequences which are defined in SEQ ID NOs.:

539, 540	for the detection and/or identification of <i>Mycobacteriaceae</i> family
541, 542, 544, 2121	for the detection and/or identification of Pseudomonads group
545, 546	for the detection and/or identification of <i>Corynebacterium</i> sp.
547, 548, 1202	for the detection and/or identification of <i>Streptococcus</i> sp.
549, 550, 582, 583, 625, 626, 627, 628,	for the detection and/or identification of <i>Streptococcus agalactiae</i>
1199 ¹¹⁰⁰	
551, 552, 2166, 2173, 2174, 2175, 2176, 2177, 2178, 2179	for the detection and/or identification of <i>Neisseria gonorrhoeae</i>
553, 575, 605, 606, 707, 1175, 1176	for the detection and/or identification of <i>Staphylococcus</i> sp.
554, 555, 2213	for the detection and/or identification of <i>Chlamydia trachomatis</i>

576, 631, 632, 633, 634, 635, 1163, 1164, 1167, 2076, 2108, 2109	for the detection and/or identification of <i>Candida</i> sp.
577, 1156, 1160 2073	for the detection and/or identification of <i>Candida albicans</i>
578, 1166, 1168, 2074	for the detection and/or identification of <i>Candida dubliniensis</i>
579, 2168	for the detection and/or identification of <i>Escherichia coli</i>
580, 603, 1174, 1236, 1238, 2289, 2290, 2291	for the detection and/or identification of <i>Enterococcus faecalis</i>
581	for the detection and/or identification of <i>Haemophilus influenzae</i>
584, 585, 586, 587, 588, 1232, 1234, 2186	for the detection and/or identification of <i>Staphylococcus aureus</i>
589, 590, 591, 592, 593	for the detection and/or identification of <i>Staphylococcus epidermidis</i>
594, 595	for the detection and/or identification of <i>Staphylococcus haemolyticus</i>
596, 597, 598	for the detection and/or identification of <i>Staphylococcus hominis</i>
599, 600, 601, 695, 1208, 1209	for the detection and/or identification of <i>Staphylococcus saprophyticus</i>
602, 1235, 1237, 1696, 1697, 1698, 1699, 1700, 1701, 2286, 2287	for the detection and/or identification of <i>Enterococcus faecium</i>
604	for the detection and/or identification of <i>Enterococcus gallinarum</i>
620, 1122	for the detection and/or identification of <i>Enterococcus casseliflavus</i> , <i>E. flavescens</i> and <i>E. gallinarum</i>
629, 630, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092	for the detection and/or identification of <i>Chlamydia pneumoniae</i>

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636, 637, 638, 639, for the detection and/or identification of at least the
640, 641, 642 following:

Abiotrophia adiacens, *Abiotrophia defectiva*, *Acinetobacter baumannii*, *Acinetobacter lwoffii*, *Aerococcus viridans*, *Bacillus anthracis*, *Bacillus cereus*, *Bacillus subtilis*, *Brucella abortus*, *Burkholderia cepacia*, *Citrobacter diversus*, *Citrobacter freundii*, *Enterobacter aerogenes*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Enterococcus avium*, *Enterococcus casseliflavus*, *Enterococcus dispar*, *Enterococcus durans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Enterococcus flavescens*, *Enterococcus gallinarum*, *Enterococcus mundtii*, *Enterococcus raffinosus*, *Enterococcus solitarius*, *Escherichia coli*, *Gemella morbillorum*, *Haemophilus ducreyi*, *Haemophilus haemolyticus*, *Haemophilus influenzae*, *Haemophilus parahaemolyticus*, *Haemophilus parainfluenzae*, *Hafnia alvei*, *Kingella kingae*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Legionella pneumophila*, *Megamonas hypermegale*, *Moraxella atlantae*, *Moraxella catarrhalis*, *Morganella morganii*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Pasteurella aerogenes*, *Pasteurella multocida*, *Peptostreptococcus magnus*, *Proteus mirabilis*, *Providencia alcalifaciens*, *Providencia rettgeri*, *Providencia rustigianii*, *Providencia stuartii*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas stutzeri*, *Salmonella bongori*, *Salmonella choleraesuis*, *Salmonella enteritidis*, *Salmonella gallinarum*, *Salmonella typhimurium*, *Serratia liquefaciens*, *Serratia marcescens*, *Shigella flexneri*, *Shigella sonnei*, *Staphylococcus aureus*, *Staphylococcus capitis*, *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus hominis*, *Staphylococcus lugdunensis*, *Staphylococcus saprophyticus*, *Staphylococcus simulans*, *Staphylococcus warneri*, *Stenotrophomonas maltophilia*, *Streptococcus acidominimus*, *Streptococcus agalactiae*, *Streptococcus anginosus*, *Streptococcus bovis*, *Streptococcus constellatus*, *Streptococcus cricetus*, *Streptococcus cristatus*, *Streptococcus dysgalactiae*, *Streptococcus equi*, *Streptococcus ferus*, *Streptococcus gordonii*, *Streptococcus intermedius*, *Streptococcus macacae*, *Streptococcus mitis*, *Streptococcus mutans*, *Streptococcus oralis*, *Streptococcus parasanguinis*, *Streptococcus parauberis*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Streptococcus rattii*, *Streptococcus salivarius*, *Streptococcus sanguinis*, *Streptococcus sobrinus*, *Streptococcus uberis*, *Streptococcus vestibularis*, *Vibrio cholerae*, *Yersinia enterocolitica*, *Yersinia pestis*, *Yersinia pseudotuberculosis*.

656, 657, 271, for the detection and/or identification of *Enterococcus* sp.

1136, 1137

701, 702 for the detection and/or identification of *Leishmania* sp.

- 703, 704, 705, 706, 793 for the detection and/or identification of *Entamoeba* sp.
- 794, 795 for the detection and/or identification of *Trypanosoma cruzi*
- 796, 797, 808, 809, 810, 811 for the detection and/or identification of *Clostridium* sp.
- 798, 799, 800, 801, 802, 803, 804, 805, 806, 807 for the detection and/or identification of *Cryptosporidium parvum*
- 816, 817, 818, 819 for the detection and/or identification of *Giardia* sp.
- 820, 821, 822 for the detection and/or identification of *Trypanosoma brucei*
- 823, 824 for the detection and/or identification of *Trypanosoma* sp.
- 825, 826 for the detection and/or identification of *Bordetella* sp.
- 923, 924, 925, 926, 927, 928 for the detection and/or identification of *Trypanosomatidae* family
- 933, 934 for the detection and/or identification of *Enterobacteriaceae* group
- 994, 995, 996, 997, 998, 999, 1000, 1001, 1200, 1210, 1211 for the detection and/or identification of *Streptococcus pyogenes*
- 1157, 2079, 2118 for the detection and/or identification of *Candida parapsilosis*
- 1158, 1159, 2078, 2110, 2111 for the detection and/or identification of *Candida glabrata*
- 1160, 2077, 2119, 2120 for the detection and/or identification of *Candida tropicalis*
- 1161, 2075, 2112, 2113, 2114 for the detection and/or identification of *Candida krusei*
- 1162 for the detection and/or identification of *Candida guilliermondii*
- 1162, 2080, 2115, 2116, 2117 for the detection and/or identification of *Candida lusitaniae*
- 1165 for the detection and/or identification of *Candida zeylanoides*
- 1201 for the detection and/or identification of *Streptococcus pneumoniae*

1233	for the detection and/or identification of <i>Staphylococcus</i> sp. other than <i>S. aureus</i>
1329, 1330, 1331, 1332, 2167, 2281	for the detection and/or identification of <i>Klebsiella pneumoniae</i>
1661, 1665	for the detection and/or identification of <i>Escherichia coli</i> and <i>Shigella</i> sp.
1690, 1691, 1692, 1693, 2169	for the detection and/or identification of <i>Acinetobacter baumannii</i>
1694, 1695, 2122	for the detection and/or identification of <i>Pseudomonas aeruginosa</i>
1971, 1972, 1973	for the detection and/or identification of <i>Cryptococcus</i> sp.
2081, 2082, 2083	for the detection and/or identification of <i>Legionella</i> sp.
2084	for the detection and/or identification of <i>Legionella pneumophila</i>
2093, 2094, 2095, 2096	for the detection and/or identification of <i>Mycoplasma pneumoniae</i>
2106, 2107	for the detection and/or identification of <i>Cryptococcus neoformans</i>
2131, 2132, 2133	for the detection and/or identification of <i>Campylobacter jejuni</i> and <i>C. coli</i>
2134, 2135, 2136	for the detection and/or identification of <i>Bacteroides fragilis</i>
2170	for the detection and/or identification of <i>Abiotrophia adiacens</i>
2171	for the detection and/or identification of <i>Gemella</i> sp.
2172	for the detection and/or identification of <i>Enterococcus</i> sp., <i>Gemella</i> sp., <i>A. adiacens</i>
2180, 2181, 2182	for the detection and/or identification of <i>Bordetella pertussis</i> .

12. A method for detecting the presence in a test sample of a microorganism that is an alga, archaeum, bacterium, fungus or parasite, which comprises:

- a) putting in contact any test sample *tuf* or *atpD* or *recA* nucleic acids and nucleic acid primers and/or probes, said primers and/or probes having

been selected to be sufficiently complementary to hybridize to one or more *tuf* or *atpD* or *recA* nucleic acids that are specific to said group of microorganisms;

b) allowing the primers and/or probes and any test sample *tuf* or *atpD* or *recA* nucleic acids to hybridize under specified conditions such as said primers and/or probes hybridize to the *tuf* or *atpD* or *recA* nucleic acids of said microorganism and does not detectably hybridize to *tuf* or *atpD* or *recA* sequences from other microorganisms; and,

c) testing for hybridization of said primers and/or probes to any test sample *tuf* or *atpD* or *recA* nucleic acids.

13. The method of claim 12 wherein c) is based on a nucleic acid target amplification method.

14. The method of claim 12 wherein c) is based on a signal amplification method.

15. The method of any one of claims 12 to 14 wherein said primers and/or probes that are sufficiently complementary are perfectly complementary.

16. The method of any one of claims 12 to 14 wherein said primers and/or probes that are sufficiently complementary are not perfectly complementary.

17. A method for the specific detection and/or identification of a microorganism that is an algal, archaeal, bacterial, fungal or parasitical species, genus, family or group in any sample, using a panel of probes or amplification primers or both, each individual probe or primer being derived from a nucleic acid which has a nucleotide sequence of at least 12 nucleotides in length capable of hybridizing with the nucleic acids of said microorganism and with a nucleic acid having any one of the nucleotide sequences defined in SEQ ID NOs.:

539, 540 for the detection and/or identification of *Mycobacteriaceae* family

541, 542, 544, 2121 for the detection and/or identification of *Pseudomonads* group

545, 546	for the detection and/or identification of <i>Corynebacterium</i> sp.
547, 548, 1202	for the detection and/or identification of <i>Streptococcus</i> sp.
549, 550, 582, 583, 625, 626, 627, 628, 1199	for the detection and/or identification of <i>Streptococcus agalactiae</i>
551, 552, 2166, 2173, 2174, 2175, 2176, 2177, 2178, 2179	for the detection and/or identification of <i>Neisseria gonorrhoeae</i>
553, 575, 605, 606, 707, 1175, 1176	for the detection and/or identification of <i>Staphylococcus</i> sp.
554, 555, 2213	for the detection and/or identification of <i>Chlamydia trachomatis</i>
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577, 1156, 1160 2073	for the detection and/or identification of <i>Candida albicans</i>
578, 1166, 1168, 2074	for the detection and/or identification of <i>Candida dubliniensis</i>
579, 2168	for the detection and/or identification of <i>Escherichia coli</i>
580, 603, 1174, 1236, 1238, 2289, 2290, 2291	for the detection and/or identification of <i>Enterococcus faecalis</i>
581	for the detection and/or identification of <i>Haemophilus influenzae</i>
584, 585, 586, 587, 588, 1232, 1234, 2186	for the detection and/or identification of <i>Staphylococcus aureus</i>
589, 590, 591, 592, 593	for the detection and/or identification of <i>Staphylococcus epidermidis</i>
594, 595	for the detection and/or identification of <i>Staphylococcus haemolyticus</i>
596, 597, 598	for the detection and/or identification of <i>Staphylococcus hominis</i>

- 599, 600, 601, 695, 1208, 1209 for the detection and/or identification of *Staphylococcus saprophyticus*
- 602, 1235, 1237, 1696, 1697, 1698, 1699, 1700, 1701, 2286, 2287 for the detection and/or identification of *Enterococcus faecium*
- 604 for the detection and/or identification of *Enterococcus gallinarum*
- 620, 1122 for the detection and/or identification of *Enterococcus casseliflavus*, *E. flavescens* and *E. gallinarum*
- 629, 630, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092 for the detection and/or identification of *Chlamydia pneumoniae*
- 636, 637, 638, 639, 640, 641, 642 for the detection and/or identification of at least the following:
Abiotrophia adiacens, *Abiotrophia defectiva*, *Acinetobacter baumannii*, *Acinetobacter lwoffii*, *Aerococcus viridans*, *Bacillus anthracis*, *Bacillus cereus*, *Bacillus subtilis*, *Brucella abortus*, *Burkholderia cepacia*, *Citrobacter diversus*, *Citrobacter freundii*, *Enterobacter aerogenes*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Enterococcus avium*, *Enterococcus casseliflavus*, *Enterococcus dispar*, *Enterococcus durans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Enterococcus flavescens*, *Enterococcus gallinarum*, *Enterococcus mundtii*, *Enterococcus raffinosus*, *Enterococcus solitarius*, *Escherichia coli*, *Gemella morbillorum*, *Haemophilus ducreyi*, *Haemophilus haemolyticus*, *Haemophilus influenzae*, *Haemophilus parahaemolyticus*, *Haemophilus parainfluenzae*, *Hafnia alvei*, *Kingella kingae*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Legionella pneumophila*, *Megamonas hypermegale*, *Moraxella atlantae*, *Moraxella catarrhalis*, *Morganella morganii*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Pasteurella aerogenes*, *Pasteurella multocida*, *Peptostreptococcus magnus*, *Proteus mirabilis*, *Providencia alcalifaciens*, *Providencia rettgeri*, *Providencia rustigianii*, *Providencia stuartii*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas stutzeri*, *Salmonella bongori*, *Salmonella choleraesuis*, *Salmonella enteritidis*, *Salmonella gallinarum*, *Salmonella typhimurium*, *Serratia liquefaciens*, *Serratia marcescens*, *Shigella flexneri*, *Shigella sonnei*, *Staphylococcus aureus*, *Staphylococcus capitis*, *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus hominis*, *Staphylococcus lugdunensis*, *Staphylococcus saprophyticus*, *Staphylococcus simulans*, *Staphylococcus warneri*, *Stenotrophomonas*

- maltophilia, Streptococcus acidominimus, Streptococcus agalactiae, Streptococcus anginosus, Streptococcus bovis, Streptococcus constellatus, Streptococcus cricetus, Streptococcus cristatus, Streptococcus dysgalactiae, Streptococcus equi, Streptococcus ferus, Streptococcus gordonii, Streptococcus intermedius, Streptococcus macacae, Streptococcus mitis, Streptococcus mutans, Streptococcus oralis, Streptococcus parasanguinis, Streptococcus parauberis, Streptococcus pneumoniae, Streptococcus pyogenes, Streptococcus ratti, Streptococcus salivarius, Streptococcus sanguinis, Streptococcus sobrinus, Streptococcus uberis, Streptococcus vestibularis, Vibrio cholerae, Yersinia enterocolitica, Yersinia pestis, Yersinia pseudotuberculosis.*
- 656, 657, 271, 1136, 1137 for the detection and/or identification of *Enterococcus* sp.
- 701, 702 for the detection and/or identification of *Leishmania* sp.
- 703, 704, 705, 706, 793 for the detection and/or identification of *Entamoeba* sp.
- 794, 795 for the detection and/or identification of *Trypanosoma cruzi*
- 796, 797, 808, 809, 810, 811 for the detection and/or identification of *Clostridium* sp.
- 798, 799, 800, 801, 802, 803, 804, 805, 806, 807 for the detection and/or identification of *Cryptosporidium parvum*
- 816, 817, 818, 819 for the detection and/or identification of *Giardia* sp.
- 820, 821, 822 for the detection and/or identification of *Trypanosoma brucei*
- 823, 824 for the detection and/or identification of *Trypanosoma* sp.
- 825, 826 for the detection and/or identification of *Bordetella* sp.
- 923, 924, 925, 926, 927, 928 for the detection and/or identification of *Trypanosomatidae* family
- 933, 934 for the detection and/or identification of *Enterobacteriaceae* group
- 994, 995, 996, 997, 998, 999, 1000, 1001, 1200, 1210, 1211 for the detection and/or identification of *Streptococcus pyogenes*
- 1157, 2079, 2118 for the detection and/or identification of *Candida parapsilosis*

1158, 1159, 2078, 2110, 2111	for the detection and/or identification of <i>Candida glabrata</i>
1160, 2077, 2119, 2120	for the detection and/or identification of <i>Candida tropicalis</i>
1161, 2075, 2112, 2113, 2114	for the detection and/or identification of <i>Candida krusei</i>
1162	for the detection and/or identification of <i>Candida guilliermondii</i>
1162, 2080, 2115 2116, 2117	for the detection and/or identification of <i>Candida lusitaniae</i>
1165	for the detection and/or identification of <i>Candida zeylanoides</i>
1201	for the detection and/or identification of <i>Streptococcus pneumoniae</i>
1233	for the detection and/or identification of <i>Staphylococcus</i> sp. other than <i>S. aureus</i>
1329, 1330, 1331, 1332, 2167, 2281	for the detection and/or identification of <i>Klebsiella pneumoniae</i>
1661, 1665	for the detection and/or identification of <i>Escherichia coli</i> and <i>Shigella</i> sp.
1690, 1691, 1692, 1693, 2169	for the detection and/or identification of <i>Acinetobacter baumannii</i>
1694, 1695, 2122	for the detection and/or identification of <i>Pseudomonas aeruginosa</i>
1971, 1972, 1973	for the detection and/or identification of <i>Cryptococcus</i> sp.
2081, 2082, 2083	for the detection and/or identification of <i>Legionella</i> sp.
2084	for the detection and/or identification of <i>Legionella pneumophila</i>
2093, 2094, 2095, 2096	for the detection and/or identification of <i>Mycoplasma pneumoniae</i>
2106, 2107	for the detection and/or identification of <i>Cryptococcus neoformans</i>
2131, 2132, 2133	for the detection and/or identification of <i>Campylobacter jejuni</i> and <i>C. coli</i>
2134, 2135, 2136	for the detection and/or identification of <i>Bacteroides fragilis</i>

- 2170 for the detection and/or identification of *Abiotrophia adiacens*
 2171 for the detection and/or identification of *Gemella* sp.
 2172 for the detection and/or identification of *Enterococcus* sp.,
Gemella sp., *A. adiacens*
 2180, 2181, 2182 for the detection and/or identification of *Bordetella pertussis*,

said method comprising the step of contacting the nucleic acids of the sample with said primers or probes under suitable conditions of hybridization or of amplification and detecting the presence of hybridized probes or amplified products as an indication of the presence of said specific algal, archaeal, bacterial, fungal or parasitical species, genus, family or group.

18. A method for the universal detection of any bacterium, fungus or parasite in a sample, using a panel of probes or amplification primers or both, each individual probe or primer being derived from a nucleic acid as defined in claims 8 or 9, the method comprising the step of contacting the nucleic acids of the sample with said primers or probes under suitable conditions of hybridization or of amplification and detecting the presence of any alga, archaeon, bacterium, fungus or parasite.

19. A method as set forth in claim 17 or 18, which further comprises probes or primers, or both, for the detection of at least one antimicrobial agent resistance gene.

20. A method as set forth in claim 17, 18 or 19, which further comprises probes or primers, or both, for the detection of at least one toxin gene.

21. A method as set forth in claim 19 or 20, wherein the probes or primers for the detection of said antimicrobial agent resistance gene or toxin gene have at least 12 nucleotides in length capable of hybridizing with an antimicrobial agent resistance gene and/or toxin gene selected from SEQ ID NOs.:

- 1078, 1079, 1085 for the detection and/or identification of the *E. coli* Shiga-like toxin 2 (*stx₂*) gene

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1080, 1081, 1084, 2012	for the detection and/or identification of the <i>E. coli</i> Shiga-like toxin 1 (<i>stx_I</i>) gene
1082, 1083	for the detection and/or identification of <i>E. coli</i> Shiga-like toxins 1 and 2 (<i>stx</i>) genes
1086, 1087, 1088, 1089, 1090, 1091, 1092, 1170, 1239, 1240, 2292	for the detection and/or identification of the <i>vanA</i> resistance gene
1095, 1096, 1171, 1241, 2294, 2295	for the detection and/or identification of the <i>vanB</i> resistance gene
1111, 1112, 1113, 1114, 1115, 1116, 1118, 1119, 1120, 1121, 1123, 1124	for the detection and/or identification of the <i>vanAB</i> resistance genes
1103, 1104, 1109, 1110	for the detection and/or identification of the <i>vanC1</i> resistance gene
1105, 1106, 1107, 1108	for the detection and/or identification of the <i>vanC2</i> and <i>vanC3</i> resistance genes
1097, 1098, 1099, 1100, 1101, 1102	for the detection and/or identification of the <i>vanC1</i> , <i>vanC2</i> and <i>vanC3</i> resistance genes
1150, 1153, 1154, 1155	for the detection and/or identification of the <i>vanAXY</i> resistance genes
1094, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1192, 1193, 1194, 1195, 1196, 1197, 1214, 1216, 1217, 1218, 1219, 1220, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039	for the detection and/or identification of the <i>S. pneumoniae</i> <i>pbpla</i> gene

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1142, 1143, 1144, 1145	for the detection and/or identification of the <i>S. pneumoniae</i> <i>pbp2b</i> gene
1146, 1147, 1148, 1149	for the detection and/or identification of the <i>S. pneumoniae</i> <i>pbp2x</i> gene
1177, 1231	for the detection and/or identification of the <i>mecA</i> resistance gene
1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1333, 1334, 1335, 1340, 1341, 1936, 1937, 1940, 1942, 1943, 1945, 1946, 1947, 1948, 1949, 2040, 2041, 2042, 2043, 2250, 2251	for the detection and/or identification of the <i>gyrA</i> resistance gene
1301, 1302, 1303, 1304, 1305, 1306	for the detection and/or identification of the <i>gyrB</i> resistance gene
1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1336, 1337, 1338, 1339, 1342, 1343, 1934, 1935, 1938, 1939, 1941, 1944, 1950, 1951, 1952, 1953, 1955, 2044, 2045, 2046	for the detection and/or identification of the <i>parC</i> resistance gene
1322, 1323, 1324, 1325, 1326, 1327	for the detection and/or identification of the <i>parE</i> resistance gene
1344, 1345, 1346, 1347	for the detection and/or identification of the <i>aac(2')-Ia</i> resistance gene
1349, 1350	for the detection and/or identification of the <i>aac(3')-Ib</i> resistance gene
1352, 1353, 1354, 1355	for the detection and/or identification of the <i>aac(3')-IIb</i> resistance gene
1357, 1358, 1359, 1360	for the detection and/or identification of the <i>aac(3')-IVa</i> resistance gene
1362, 1363, 1364, 1365	for the detection and/or identification of the <i>aac(3')-VIa</i> resistance gene

1367, 1368, 1369, 1370	for the detection and/or identification of the <i>aac(6')-Ia</i> resistance gene
1372, 1373, 1374, 1375	for the detection and/or identification of the <i>aac(6')-Ic</i> resistance gene
1377, 1378, 1379, 1380	for the detection and/or identification of the <i>ant(3')-Ia</i> resistance gene
1382, 1383, 1384, 1385	for the detection and/or identification of the <i>ant(4')-Ia</i> resistance gene
1387, 1388, 1389, 1390	for the detection and/or identification of the <i>aph(3')-Ia</i> resistance gene
1392, 1393, 1394, 1395	for the detection and/or identification of the <i>aph(3')-IIa</i> resistance gene
1397, 1398, 1399, 1400	for the detection and/or identification of the <i>aph(3')-IIIa</i> resistance gene
1402, 1403, 1404, 1405, 2252	for the detection and/or identification of the <i>aph(3')-VIa</i> resistance gene
1407, 1408, 1409 1410	for the detection and/or identification of the <i>blaCARB</i> resistance gene
1412, 1413, 1414, 1415	for the detection and/or identification of the <i>blaCMY-2</i> resistance gene
1417, 1418	for the detection and/or identification of the <i>blaCTX-M-1</i> and <i>blaCTX-M-2</i> resistance genes
1419, 1420, 1421, 1422	for the detection and/or identification of the <i>blaCTX-M-1</i> resistance gene
1424, 1425, 1426, 1427	for the detection and/or identification of the <i>blaCTX-M-2</i> resistance gene
1429, 1430, 1431, 1432	for the detection and/or identification of the <i>blaIMP</i> resistance gene
1434, 1435	for the detection and/or identification of the <i>blaOXA2</i> resistance gene
1436, 1437	for the detection and/or identification of the <i>blaOXA10</i> resistance gene
1440, 1441	for the detection and/or identification of the <i>blaPER-1</i> resistance gene

1443, 1444	for the detection and/or identification of the <i>blaPER-2</i> resistance gene
1446, 1447, 1448, 1449	for the detection and/or identification of the <i>blaPER-1</i> and <i>blaPER-2</i> resistance genes
1450, 1451	for the detection and/or identification of the <i>dhfrA</i> resistance gene
1453, 1454, 1455, 1456	for the detection and/or identification of the <i>dhfrIa</i> and <i>dhfrXV</i> resistance genes
1457, 1458, 1459, 1460, 2253	for the detection and/or identification of the <i>dhfrIa</i> resistance gene
1462, 1463, 1464, 1465	for the detection and/or identification of the <i>dhfrIb</i> and <i>dhfrV</i> resistance genes
1466, 1467, 1468, 1469	for the detection and/or identification of the <i>dhfrIb</i> resistance gene
1471, 1472, 1473, 1474	for the detection and/or identification of the <i>dhfrV</i> resistance gene
1476, 1477, 1478, 1479	for the detection and/or identification of the <i>dhfrVI</i> resistance gene
1481, 1482, 1483, 1484	for the detection and/or identification of the <i>dhfrVII</i> and <i>dhfrXVII</i> resistance genes
1485, 1486, 1487, 1488	for the detection and/or identification of the <i>dhfrVII</i> resistance gene
1490, 1491, 1492, 1493	for the detection and/or identification of the <i>dhfrVIII</i> resistance gene
1495, 1496, 1497, 1498	for the detection and/or identification of the <i>dhfrIX</i> resistance gene
1500, 1501, 1502, 1503	for the detection and/or identification of the <i>dhfrXII</i> resistance gene
1505, 1506	for the detection and/or identification of the <i>dhfrXIII</i> resistance gene
1508, 1509, 1510, 1511	for the detection and/or identification of the <i>dhfrXV</i> resistance gene
1513, 1514, 1515, 1516	for the detection and/or identification of the <i>dhfrXVII</i> resistance gene

1528, 1529	for the detection and/or identification of the <i>ereA</i> and <i>ereA2</i> resistance genes
1531, 1532, 1533, 1534	for the detection and/or identification of the <i>ereB</i> resistance gene
1536, 1537, 1538, 1539	for the detection and/or identification of the <i>linA</i> and <i>linA'</i> resistance genes
1541, 1542, 1543, 1544	for the detection and/or identification of the <i>linB</i> resistance gene
1546, 1547	for the detection and/or identification of the <i>mefA</i> resistance gene
1549, 1550	for the detection and/or identification of the <i>mefE</i> resistance gene
1552, 1553, 1554, 1555	for the detection and/or identification of the <i>mefA</i> and <i>mefE</i> resistance genes
1556, 1557, 1558, 1559	for the detection and/or identification of the <i>mphA</i> and <i>mphK</i> resistance genes
1581, 1582, 1583, 1584	for the detection and/or identification of the <i>satG</i> resistance gene
1586, 1587, 1588, 1589, 2254	for the detection and/or identification of the <i>tetM</i> resistance gene
1591, 1592, 1593, 2297	for the detection and/or identification of the <i>vanD</i> resistance gene
1595, 1596, 1597, 1598, 1599	for the detection and/or identification of the <i>vanE</i> resistance gene
1609, 1610, 1611, 1612	for the detection and/or identification of the <i>vatB</i> resistance gene
1614, 1615, 1616, 1617	for the detection and/or identification of the <i>vatC</i> resistance gene
1619, 1620, 1621, 1622	for the detection and/or identification of the <i>vga</i> resistance gene
1624, 1625, 1626, 1627	for the detection and/or identification of the <i>vgaB</i> resistance gene
1629, 1630, 1631, 1632	for the detection and/or identification of the <i>vgb</i> and <i>vgh</i> resistance genes

1634, 1635, 1636, 1637	for the detection and/or identification of the <i>vgbB</i> resistance gene
1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898	for the detection and/or identification of the <i>blaSHV</i> resistance gene
1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 2006, 2007, 2008, 2009, 2141	for the detection and/or identification of the <i>blaTEM</i> resistance gene
1961, 1962, 1963, 1964	for the detection and/or identification of the <i>sulII</i> resistance gene
1966, 1967, 1968, 1969	for the detection and/or identification of the <i>tetB</i> resistance gene
2065, 2066, 2067, 2068, 2069, 2070, 2071	for the detection and/or identification of the <i>rhoB</i> resistance gene
2098, 2099, 2100	for the detection and/or identification of the <i>inhA</i> resistance gene
2102, 2103, 2104	for the detection and/or identification of the <i>embB</i> resistance gene
2123, 2124, 2125	for the detection and/or identification of the <i>C. difficile cdtA</i> toxin gene
2126, 2127, 2128	for the detection and/or identification of the <i>C. difficile cdtB</i> toxin gene
2142, 2143	for the detection and/or identification of the <i>mupA</i> resistance gene
2145, 2146	for the detection and/or identification of the <i>catI</i> resistance gene
2148, 2149	for the detection and/or identification of the <i>catII</i> resistance gene

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- | | |
|------------------------|--|
| 2151, 2152 | for the detection and/or identification of the <i>catIII</i> resistance gene |
| 2154, 2155 | for the detection and/or identification of the <i>catP</i> resistance gene |
| 2157, 2158, 2160, 2161 | for the detection and/or identification of the <i>cat</i> resistance gene |
| 2163, 2164 | for the detection and/or identification of the <i>ppflo</i> -like resistance gene. |

22. A composition of matter comprising a specific nucleic acid as set forth in claim 10 or 11, which is specific for a bacterial, fungal or parasitical species, genus, family, or group, or a nucleic acid as set forth in claim 8 or 9 which is universal for a bacterium, fungus or parasite, or both specific and universal nucleic acids, in conjunction with a nucleic acid sequence of at least 12 nucleotides capable of hybridizing with an antimicrobial agent resistance gene and/or toxin gene.

23. A composition as set forth in claim 22, wherein the nucleic acid capable of hybridizing with an antimicrobial agent resistance gene and/or toxin gene is any one of:

- | | |
|--|---|
| 1078, 1079, 1085 | for the detection and/or identification of the <i>E. coli</i> Shiga-like toxin 2 (<i>stx</i> ₂) gene |
| 1080, 1081, 1084, 2012 | for the detection and/or identification of the <i>E. coli</i> Shiga-like toxin 1 (<i>stx</i> ₁) gene |
| 1082, 1083 | for the detection and/or identification of <i>E. coli</i> Shiga-like toxins 1 and 2 (<i>stx</i>) genes |
| 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1170, 1239, 1240, 2292 | for the detection and/or identification of the <i>vanA</i> resistance gene |
| 1095, 1096, 1171, 1241, 2294, 2295 | for the detection and/or identification of the <i>vanB</i> resistance gene |
| 1111, 1112, 1113, 1114, 1115, 1116, 1118, 1119, 1120, 1121, 1123, 1124 | for the detection and/or identification of the <i>vanAB</i> resistance genes |

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1103, 1104, 1109, 1110	for the detection and/or identification of the <i>vanC1</i> resistance gene
1105, 1106, 1107, 1108	for the detection and/or identification of the <i>vanC2</i> and <i>vanC3</i> resistance genes
1097, 1098, 1099, 1100, 1101, 1102	for the detection and/or identification of the <i>vanC1</i> , <i>vanC2</i> and <i>vanC3</i> resistance genes
1150, 1153, 1154, 1155	for the detection and/or identification of the <i>vanAXY</i> resistance genes
1094, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1192, 1193, 1194, 1195, 1196, 1197, 1214, 1216, 1217, 1218, 1219, 1220, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039	for the detection and/or identification of the <i>S. pneumoniae pbp1a</i> gene
1142, 1143, 1144, 1145	for the detection and/or identification of the <i>S. pneumoniae pbp2b</i> gene
1146, 1147, 1148, 1149	for the detection and/or identification of the <i>S. pneumoniae pbp2x</i> gene
1177, 1231	for the detection and/or identification of the <i>mecA</i> resistance gene
1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1333, 1334, 1335, 1340, 1341, 1936, 1937, 1940, 1942, 1943, 1945, 1946, 1947, 1948, 1949, 2040, 2041, 2042, 2043, 2250, 2251	for the detection and/or identification of the <i>gyrA</i> resistance gene

1301, 1302, 1303, 1304, 1305, 1306	for the detection and/or identification of the <i>gyrB</i> resistance gene
1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1336, 1337, 1338, 1339, 1342, 1343, 1934, 1935, 1938, 1939, 1941, 1944, 1950, 1951, 1952, 1953, 1955, 2044, 2045, 2046	for the detection and/or identification of the <i>parC</i> resistance gene
1322, 1323, 1324, 1325, 1326, 1327	for the detection and/or identification of the <i>parE</i> resistance gene
1344, 1345, 1346, 1347	for the detection and/or identification of the <i>aac(2')-Ia</i> resistance gene
1349, 1350	for the detection and/or identification of the <i>aac(3')-Ib</i> resistance gene
1352, 1353, 1354, 1355	for the detection and/or identification of the <i>aac(3')-IIb</i> resistance gene
1357, 1358, 1359, 1360	for the detection and/or identification of the <i>aac(3')-IVa</i> resistance gene
1362, 1363, 1364, 1365	for the detection and/or identification of the <i>aac(3')-VIa</i> resistance gene
1367, 1368, 1369, 1370	for the detection and/or identification of the <i>aac(6')-Ia</i> resistance gene
1372, 1373, 1374, 1375	for the detection and/or identification of the <i>aac(6')-Ic</i> resistance gene
1377, 1378, 1379, 1380	for the detection and/or identification of the <i>ant(3')-Ia</i> resistance gene
1382, 1383, 1384, 1385	for the detection and/or identification of the <i>ant(4')-Ia</i> resistance gene
1387, 1388, 1389, 1390	for the detection and/or identification of the <i>aph(3')-Ia</i> resistance gene
1392, 1393, 1394, 1395	for the detection and/or identification of the <i>aph(3')-IIa</i> resistance gene
1397, 1398, 1399, 1400	for the detection and/or identification of the <i>aph(3')-IIIa</i> resistance gene

1402, 1403, 1404, 1405, 2252	for the detection and/or identification of the <i>aph(3')-VIa</i> resistance gene
1407, 1408, 1409 1410	for the detection and/or identification of the <i>blaCARB</i> resistance gene
1412, 1413, 1414, 1415	for the detection and/or identification of the <i>blaCMY-2</i> resistance gene
1417, 1418	for the detection and/or identification of the <i>blaCTX-M-1</i> and <i>blaCTX-M-2</i> resistance genes
1419, 1420, 1421, 1422	for the detection and/or identification of the <i>blaCTX-M-1</i> resistance gene
1424, 1425, 1426, 1427	for the detection and/or identification of the <i>blaCTX-M-2</i> resistance gene
1429, 1430, 1431, 1432	for the detection and/or identification of the <i>blaIMP</i> resistance gene
1434, 1435	for the detection and/or identification of the <i>blaOXA2</i> resistance gene
1436, 1437	for the detection and/or identification of the <i>blaOXA10</i> resistance gene
1440, 1441	for the detection and/or identification of the <i>blaPER-1</i> resistance gene
1443, 1444	for the detection and/or identification of the <i>blaPER-2</i> resistance gene
1446, 1447, 1448, ~~1449~~	for the detection and/or identification of the <i>blaPER-1</i> and <i>blaPER-2</i> resistance genes
1450, 1451	for the detection and/or identification of the <i>dhfrA</i> resistance gene
1453, 1454, 1455, 1456	for the detection and/or identification of the <i>dhfrIa</i> and <i>dhfrXV</i> resistance genes
1457, 1458, 1459, 1460, 2253	for the detection and/or identification of the <i>dhfrIa</i> resistance gene
1462, 1463, 1464, 1465	for the detection and/or identification of the <i>dhfrIb</i> and <i>dhfrV</i> resistance genes
1466, 1467, 1468, 1469	for the detection and/or identification of the <i>dhfrIb</i> resistance gene

1471, 1472, 1473, 1474	for the detection and/or identification of the <i>dhfrV</i> resistance gene
1476, 1477, 1478, 1479	for the detection and/or identification of the <i>dhfrVI</i> resistance gene
1481, 1482, 1483, 1484	for the detection and/or identification of the <i>dhfrVII</i> and <i>dhfrXVII</i> resistance genes
1485, 1486, 1487, 1488	for the detection and/or identification of the <i>dhfrVII</i> resistance gene
1490, 1491, 1492, 1493	for the detection and/or identification of the <i>dhfrVIII</i> resistance gene
1495, 1496, 1497, 1498	for the detection and/or identification of the <i>dhfrIX</i> resistance gene
1500, 1501, 1502, 1503	for the detection and/or identification of the <i>dhfrXII</i> resistance gene
1505, 1506	for the detection and/or identification of the <i>dhfrXIII</i> resistance gene
1508, 1509, 1510, 1511	for the detection and/or identification of the <i>dhfrXV</i> resistance gene
1513, 1514, 1515, 1516	for the detection and/or identification of the <i>dhfrXVII</i> resistance gene
1528, 1529	for the detection and/or identification of the <i>ereA</i> and <i>ereA2</i> resistance genes
1531, 1532, 1533, 1534	for the detection and/or identification of the <i>ereB</i> resistance gene
1536, 1537, 1538, 1539	for the detection and/or identification of the <i>linA</i> and <i>linA'</i> resistance genes
1541, 1542, 1543, 1544	for the detection and/or identification of the <i>linB</i> resistance gene
1546, 1547	for the detection and/or identification of the <i>mefA</i> resistance gene
1549, 1550	for the detection and/or identification of the <i>mefE</i> resistance gene
1552, 1553, 1554, 1555	for the detection and/or identification of the <i>mefA</i> and <i>mefE</i> resistance genes

1556, 1557, 1558, 1559	for the detection and/or identification of the <i>mphA</i> and <i>mphK</i> resistance genes
1581, 1582, 1583, 1584	for the detection and/or identification of the <i>satG</i> resistance gene
1586, 1587, 1588, 1589, 2254	for the detection and/or identification of the <i>tetM</i> resistance gene
1591, 1592, 1593, 2297	for the detection and/or identification of the <i>vanD</i> resistance gene
1595, 1596, 1597, 1598	for the detection and/or identification of the <i>vanE</i> resistance gene
1609, 1610, 1611, 1612	for the detection and/or identification of the <i>vatB</i> resistance gene
1614, 1615, 1616, 1617	for the detection and/or identification of the <i>vatC</i> resistance gene
1619, 1620, 1621, 1622	for the detection and/or identification of the <i>vga</i> resistance gene
1624, 1625, 1626, 1627	for the detection and/or identification of the <i>vgaB</i> resistance gene
1629, 1630, 1631, 1632	for the detection and/or identification of the <i>vgb</i> and <i>vgh</i> resistance genes
1634, 1635, 1636, 1637	for the detection and/or identification of the <i>vgbB</i> resistance gene
1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898	for the detection and/or identification of the <i>blaSHV</i> resistance gene
1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 2006, 2007, 2008, 2009, 2141	for the detection and/or identification of the <i>blaTEM</i> resistance gene
1961, 1962, 1963, 1964	for the detection and/or identification of the <i>sulII</i> resistance gene

1966, 1967, 1968, 1969	for the detection and/or identification of the <i>tetB</i> resistance gene
2065, 2066, 2067, 2068, 2069, 2070, 2071	for the detection and/or identification of the <i>rpoB</i> resistance gene
2098, 2099, 2100	for the detection and/or identification of the <i>inhA</i> resistance gene
2102, 2103, 2104	for the detection and/or identification of the <i>embB</i> resistance gene
2123, 2124, 2125	for the detection and/or identification of the <i>C. difficile cdtA</i> toxin gene
2126, 2127, 2128	for the detection and/or identification of the <i>C. difficile cdtB</i> toxin gene
2142, 2143	for the detection and/or identification of the <i>mupA</i> resistance gene
2145, 2146	for the detection and/or identification of the <i>catI</i> resistance gene
2148, 2149	for the detection and/or identification of the <i>catII</i> resistance gene
2151, 2152	for the detection and/or identification of the <i>catIII</i> resistance gene
2154, 2155	for the detection and/or identification of the <i>catP</i> resistance gene
2157, 2158, 2160, 2161	for the detection and/or identification of the <i>cat</i> resistance gene
2163, 2164	for the detection and/or identification of the <i>ppflo</i> -like resistance gene

24. A nucleic acid having at least 12 nucleotides in length, capable of hybridizing with the nucleotide sequence of any one of the *tuf* sequences defined in SEQ ID NOs.: 1-73, 75-241, 399-457, 498-529, 612-618, 621-624, 675, 677, 717-736, 779-792, 840-855, 865, 868-888, 897-910, 932, 967-989, 992, 1266-1287, 1518-1526, 1561-1575, 1578-1580, 1662-1664, 1666-1667, 1669-1670, 1673-1683, 1685-1689, 1786-1843, 1874-1881, 1956-1960, 2183-2185, 2187-2188, 2193-2201, 2214-2249, 2255-2272.

25. A nucleic acid having at least 12 nucleotides in length, capable of hybridizing with the nucleotide sequence of any one of the *atpD* sequences defined in SEQ ID NOs.: 242-270, 272-398, 458-497, 530-538, 663, 667, 673, 674, 676, 678-680, 737-778, 827-832, 834-839, 856-862, 866-867, 889-896, 929-931, 941-966, 1245-1254, 1256-1265, 1527, 1576-1577, 1600-1604, 1638-1647, 1649-1660, 1671, 1684, 1844-1848, 1849-1865, 2189-2192.

26. A nucleic acid having at least 12 nucleotides in length, capable of hybridizing with the nucleotide sequence of any one of the *recA* sequences defined in SEQ ID NOs.: 990-991, 1003, 1288-1289, 1714, 1756-1763, 1866-1873 and 2202-2212.

27. A nucleic acid having at least 12 nucleotides in length, capable of selectively hybridizing with the nucleotide sequence of any one of the antimicrobial agent resistance gene sequences defined in SEQ ID NOs.: 1004-1075, 1255, 1607-1608, 1648, 1764-1785, 2013-2014, 2056-2064, 2273-2280.

28. The nucleic acid sequences of the nucleic acids of any one of claims 24 to 27.

29. The use of a nucleic acid having at least 12 nucleotides in length capable of hybridizing with the nucleic acids of any one of the antimicrobial agent resistance genes sequences defined in SEQ ID NOs.: 1004-1075, 1255, 1607-1608, 1648, 1764-1785, 2013-2014, 2056-2064, 2273-2280 for the detection and identification of microbial species.

30. The use of a nucleic acid having at least 12 nucleotides in length capable of hybridizing with the nucleic acids of any one of the toxin genes defined in SEQ ID NOs.: 1078-1085, 2012 and 2123 to 2128 for the detection and identification of microbial species.

31. A repertory of *hexA* nucleic acids used for the detection and/or identification of *Streptococcus pneumoniae*, which repertory is created by amplifying

the nucleic acids of any streptococcal species with any combination of primers SEQ ID NOs.: 1179, 1181 and 1182.

32. A repertory as defined in claim 31, which comprises the nucleic acids having a nucleotide sequence defined in SEQ ID NOs.: 1184 to 1191.

33. A repertory of nucleic acid sequences derived from the repertory of claim 31 or 32.

34. A nucleic acid used for the specific and ubiquitous detection and for identification of *Streptococcus pneumoniae*, which is derived from the repertory of claim 31.

35. A nucleic acid as set forth in claim 34 which has a nucleic acid sequence of at least 12 nucleotides capable of hybridizing with said any *Streptococcus pneumoniae* and with any one of SEQ ID NOs.: 1184 to 1187.

36. A nucleic acid as set forth in claim 34, which has a nucleic acid sequence of at least 12 nucleotides capable of hybridizing with the nucleic acids of *Streptococcus pneumoniae* and with any one of the nucleic acids having SEQ ID NOs.: 1179, 1180, 1181, 1182.

37. A peptide derived from the translation of the nucleic acids from the repertory obtained from the method of claim 1, 31 or 32, or of the nucleic acids defined in any one of claims 24 to 27, 35 and 36.

38. A peptide sequence derived from the peptide of claim 37.

39. A recombinant vector comprising a nucleic acid obtained from the method of claim 1, 31 or 32, or from the nucleic acids defined in any one of claims 24 to 27, 35 and 36.

40. A recombinant vector as defined in claim 39 which is an expression vector.

41. A recombinant host cell comprising the recombinant vector defined in claim 39 or 40.

42. The use of the nucleic acid sequences defined in claim 28 or 33, or obtained from the method of claim 2 and of the protein sequences deduced from said nucleic acid sequences, for the design of a therapeutic agent effective against said microorganisms.

43. The use as defined in claim 42, wherein said therapeutic agent is an antimicrobial agent, a vaccine or a genic therapeutic agent.

44. A method for identification of a microorganism in a test sample, comprising the steps of:

- a) obtaining a nucleic acid sequence for a *tuf*, *atpD*, and/or *recA* genes of said microorganisms, and
- b) comparing said nucleic acid sequence with the nucleic acid sequences of a bank as defined in claim 5, said repertory comprising a nucleic acid sequence obtained from the nucleic acids of said microorganism, whereby said microorganism is identified when said comparison results in a match between said sequences.

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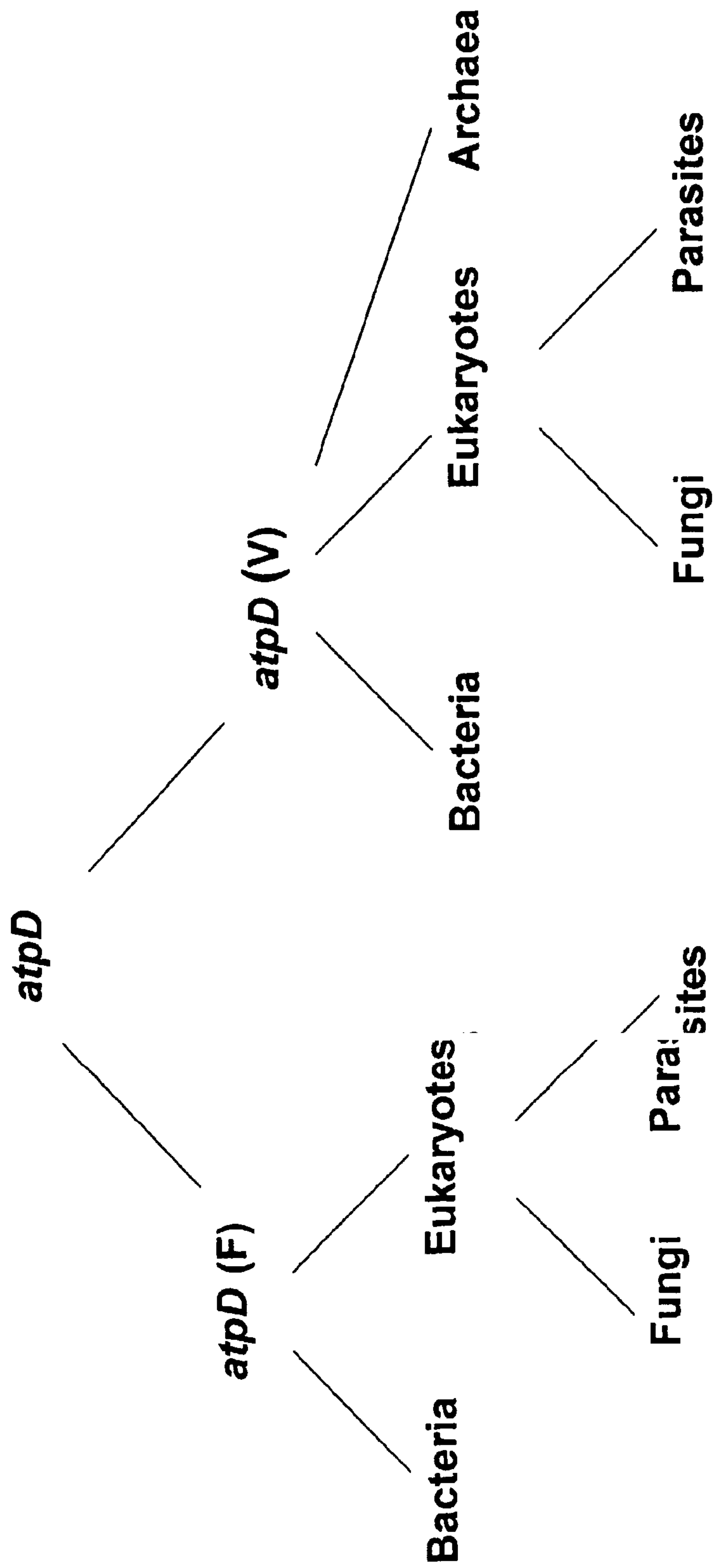
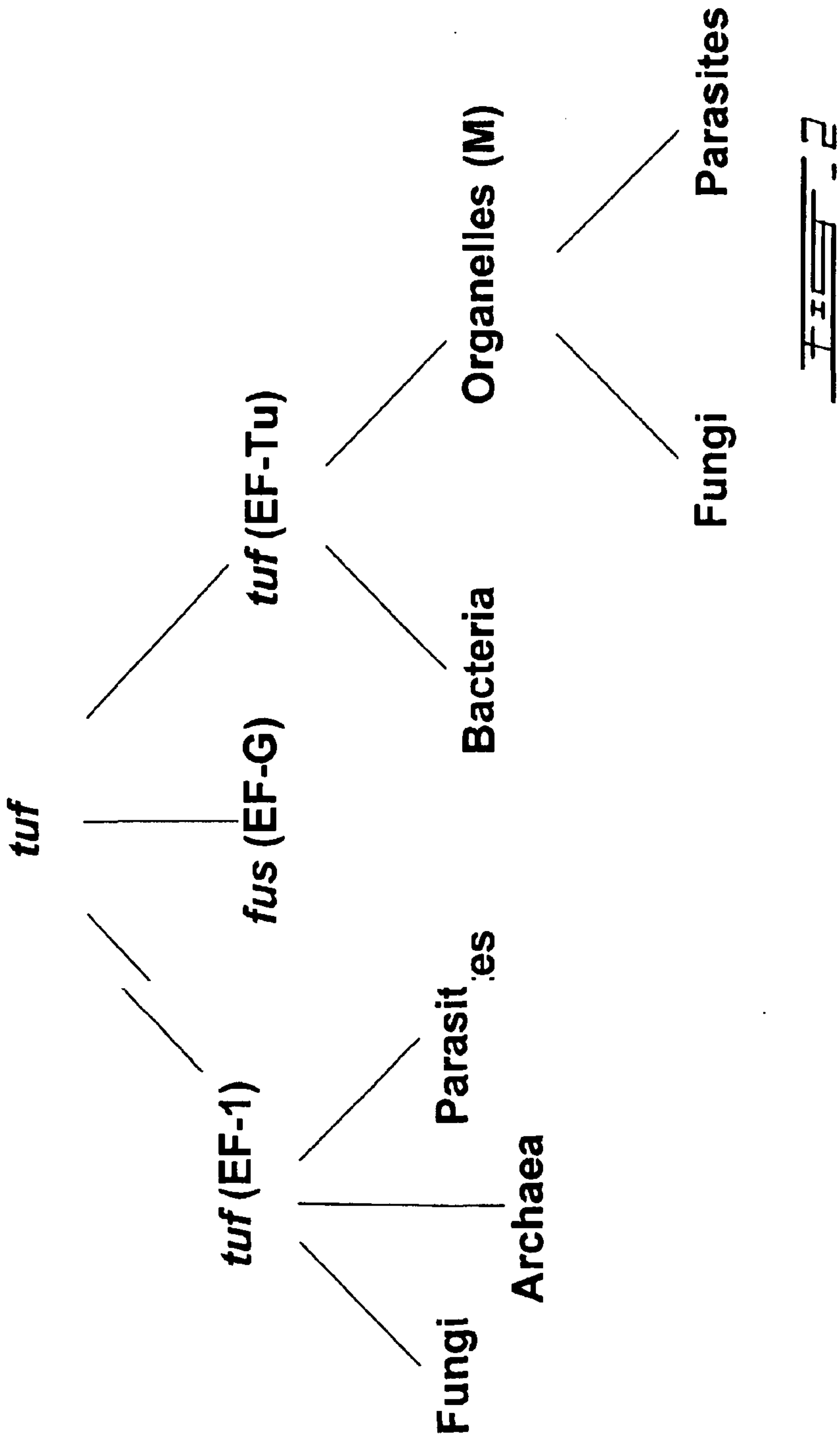
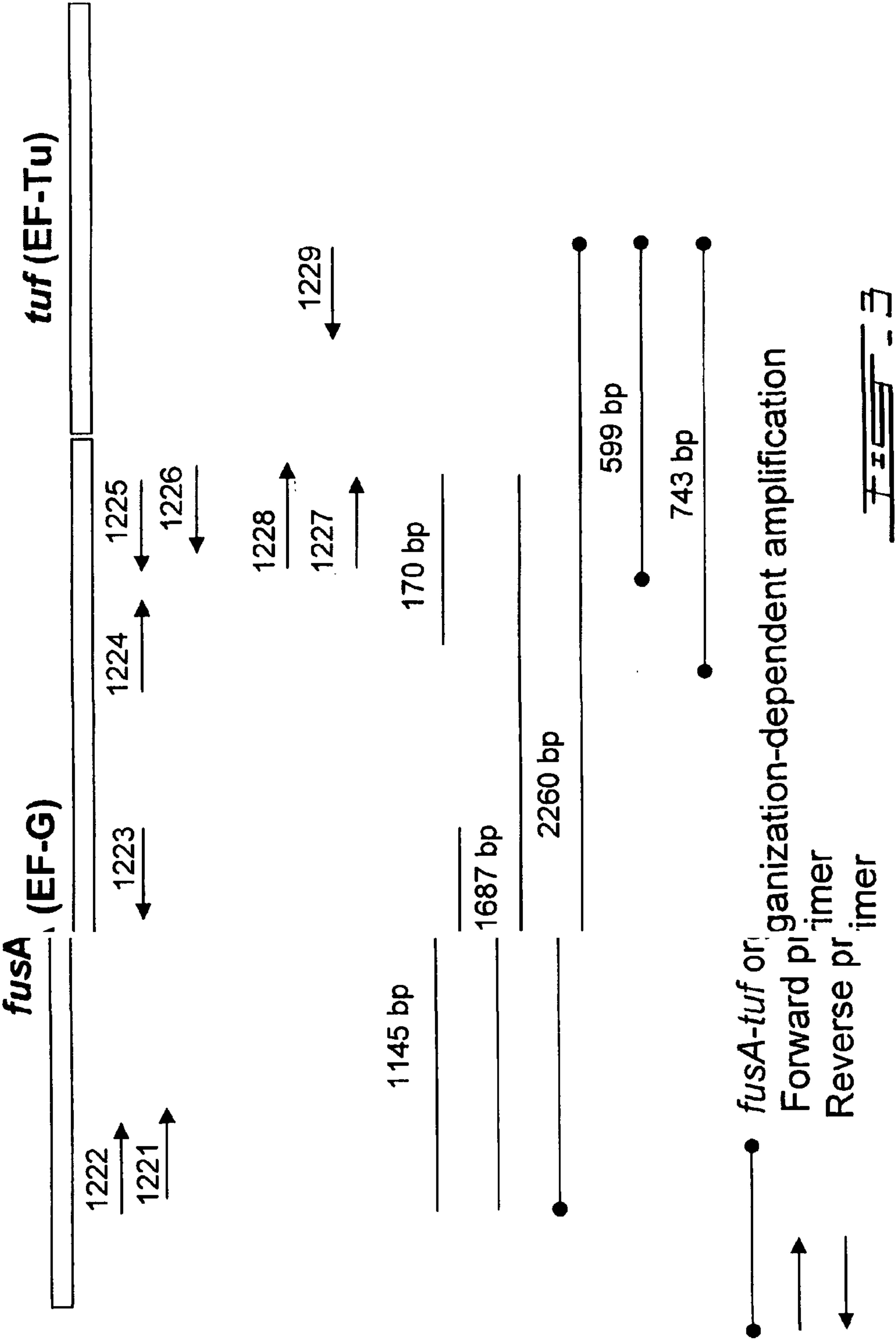


FIG. 1

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<i>S. aureus</i>	120	REHLLSRNVGVPYIWF	130	INKMDMVDDEELLELVEMEVRD	140	INKMDMVDDEELLELVEMEVRD	150	INKMDMVDDEELLELVEMEVRD	160	INKMDMVDDEELLELVEMEVRD	170	INKMDMVDDEELLELVEMEVRD	180	INKMDMVDDEELLELVEMEVRD	190	INKMDMVDDEELLELVEMEVRD	200	INKMDMVDDEELLELVEMEVRD
<i>S. epidermidis</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. durans (A)</i>		REHLLSRQVGPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. hirae (A)</i>		REHLLSRQVGPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. mundtii (A)</i>		REHLLSRQVGPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. faecium (A)</i>		REHLLSRQVGPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. cecorum</i>		REHLLSRNVGVPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. columbae</i>		REHLLSRNVGVPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. cassel. flavus (A)</i>		REHLLSRNVGVPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. gallinarum (A)</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. faecalis</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. avium (A)</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. raffinosus (A)</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. dispar (A)</i>		REHLLSRNVGVPYIWF		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV		LLTEYDFPGDDVPV
<i>E. malodoratus (A)</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. pseudoavium (A)</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. sulfureus</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. saccharolyticus</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV
<i>E. solitarius</i>		REHLLSRNVGVPYIWF		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV		LLSEYDFPGDDVPV

4a

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<i>S. aureus</i>	210	220	230	240	250	260	270	280	290
<i>S. epidermidis</i>	TPERDSKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGLH.DTSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. durans (A)</i>	TPERDSKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. hirae (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. mundtii (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. faecium (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. cecorum</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. columbae</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. cassel. flavus (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. gallinarum (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. faecalis</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. avium (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. raffinosus (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. dispar (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. malodoratus (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. pseudoavium (A)</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. sulfureus</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. saccharolyticus</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						
<i>E. solitarius</i>	TPERDNDKPFMPVEDVI	SITGRGTIVATGRVERGQIKVGEEVEIIGMH.ETSKTTVTGVMFRKLLDYAEAGDNI	GALLRGVAREDVQRGVLA						

L.	<i>monocytogenes</i>	REHLLSRQVGVPYIV	FNKC	MVDDEEL	ELVEMEIR	DLLEYE	FP	GDDI	PV	IKGS	ALKALQ	.....	GEADWEAK	IDEL	MEAV	DSYIP	
E.	<i>cassel. flavus</i> (B)	REHLLSRQVGVRHLIV	FNKTD	LVDDDEL	IDLVEMEVR	ELLTEYDF	PGDDI	PV	IKGS	ALKALE	.....	GDPDAEAA	IL	TLM	DTV	DEYIP	
E.	<i>gallinarum</i> (B)	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYNF	PGDDI	PV	IKGS	ALKALE	.....	GDPDAEAA	IMEL	MD	TV	DSYIP	
E.	<i>durans</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDT	PV	IKGS	ALKALQ	.....	GDPDAEAA	IMEL	T	DTV	DEYIP	
E.	<i>faecium</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDT	PV	IKGS	ALKALQ	.....	GDPDAEAA	IMEL	MD	TV	DEYIP	
E.	<i>hiraе</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDT	PV	IKGS	ALKALQ	.....	GDPDAEAA	IMEL	MD	TV	DEYIP	
E.	<i>mundtii</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDT	PV	IKGS	ALKALQ	.....	GDPDAEAA	IMEL	MD	TV	DEYIP	
E.	<i>avium</i> (B)	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDT	PV	IKGS	ALKALQ	.....	GDPEAEAA	INEL	ME	TV	DDYIP	
E.	<i>pseudoavium</i> (B)	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDI	PV	IKGS	ALKALE	.....	GDPEQEQV	IL	DL	MD	TV	DEYIP
E.	<i>malodoratus</i> (B)	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDI	PV	IKGS	ALKALE	.....	GDPEQEQV	IL	DL	MD	TV	DEYIP
E.	<i>raffinosis</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDI	PV	IKGS	ALKALE	.....	GDPEQEQV	IL	DL	MD	TV	DEYIP
E.	<i>dispar</i> (B)	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	IDLVEMEVR	ELLSEYGF	PGDDI	PV	IKGS	ALKALE	.....	GDPEQEQV	IM	DL	MD	TV	DEYIP
S.	<i>pneumoniae</i>	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	ELVEMEVR	ELLSEYNF	PGDDI	PV	IRGS	ALKALE	.....	GDPEQEEV	IM	NL	MD	TV	DEYIP
S.	<i>suis</i>	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	ELVEMEIR	DLLEYDF	PGDDI	PV	IQGS	ALKALE	.....	GDSKYED	IV	ME	LM	TV	DEYIP
S.	<i>pyogenes</i>	REHLLSRQVGVRHLIV	FNKID	LVDDDEL	ELVEMEIR	DLLEYDF	PGDDI	PV	IQGS	ALKALE	.....	GDSKYED	IV	ME	LM	TV	DEYIP
S.	<i>mutans</i>	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	ELVEMEIR	DLLEYDF	PGDDI	PV	IQGS	ALKALE	.....	GDTKFED	I	IMEL	MD	TV	DSYIP
L.	<i>lactis</i>	REHLLSRQVGVRKYLIV	FNKID	LVDDDEL	ELVEMEIR	DLLEYDF	PGDDI	PV	IQGS	ALKALE	.....	GDTAQED	I	IMEL	M	TV	DDYIP
T.	<i>aquaticus</i>	REHLLSRQVGVPYIV	FNKAD	LVDDDEL	ELVEMEVR	DLLEYDF	PGDDI	PV	IRGS	ALGAIN	.....	GEPOWAK	VEEL	MD	IV	DEYIP	
E.	<i>coli</i>	REHLLSRQVGVPYIV	FNKID	LVDDDEL	ELVEMEVR	DLINQYEF	PGDEVP	IRGS	ALLALE	EMHKNP	TKRGENE	WVDKI	WE	LL	DA	IDEYIP	
		REHLLSRQVGVPYIV	FNKID	MVDDEEL	ELVEMEVR	ELLSEQ	DF	PGDDT	PV	IRGS	ALKALE		GDAEWEAK	ILE	LAG	FL	DSYIP

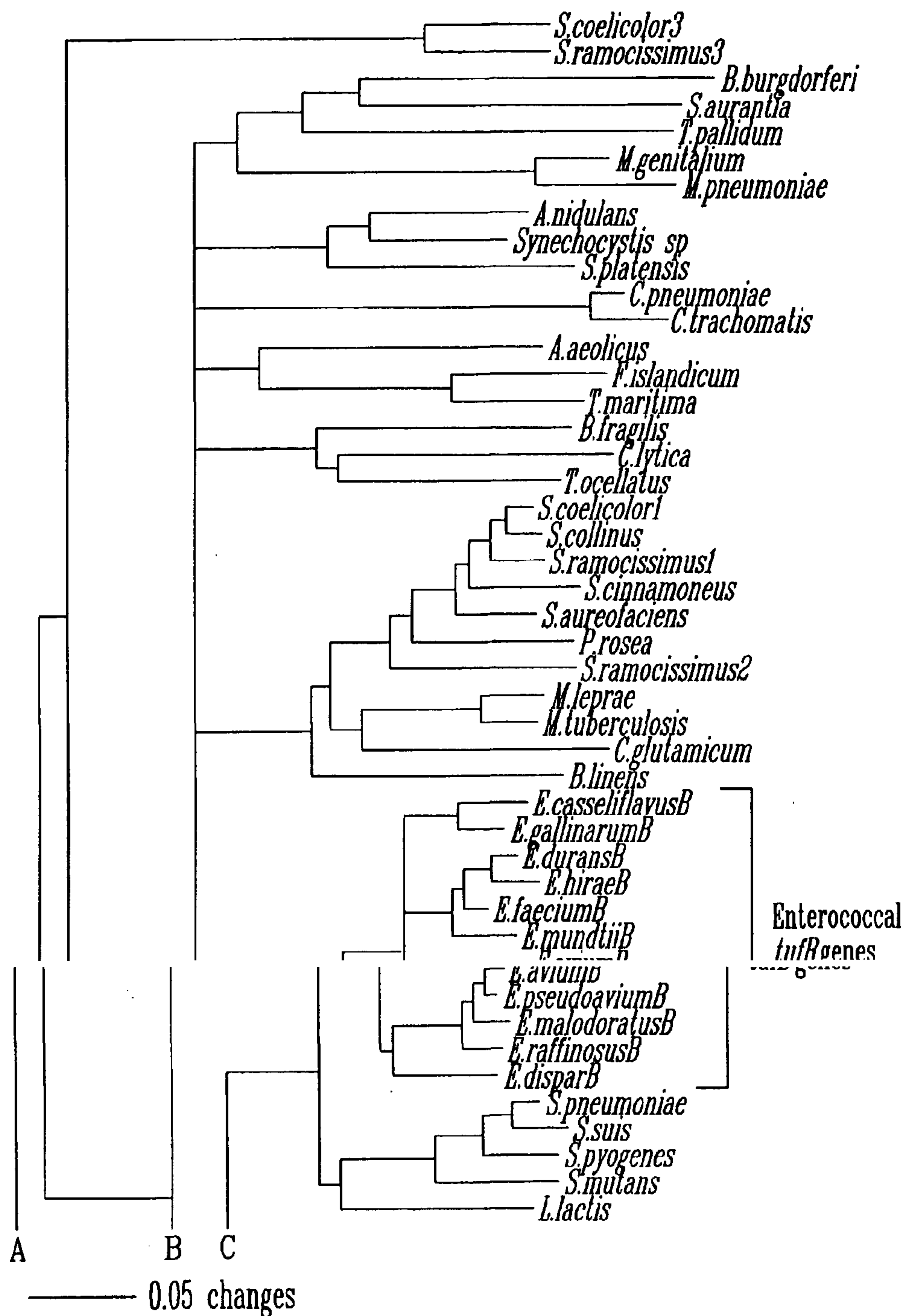
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<i>L. monocytogenes</i>	TPERTDKPFLMPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. cassel. flavus (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. gallinarum (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. durans (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. faecium (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. hiraе (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. mundtii (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. avium (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. pseudoavium (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. malodoratus (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. raffinosus (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. dispar (B)</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>S. pneumoniae</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>S. suis</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>S. pyogenes</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>S. mutans</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>L. lactis</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>T. aquaticus</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA
<i>E. coli</i>	TPERTDKPFLLPVED	VFSITGRCTVATGRVERGOVKVGDEVEVIGIEEESKVVVTGVEMFRKLLDYAEAGDNIGALLRGVAREDIORGQVLA

$\Rightarrow$ a2 $\Rightarrow$ b2 $\Rightarrow$ c2 $\Rightarrow$ d2 $\Rightarrow$ e2 $\Rightarrow$ f2 $\Rightarrow$ g2 $\Rightarrow$ h2 $\Rightarrow$ i2 $\Rightarrow$ j2 $\Rightarrow$ k2

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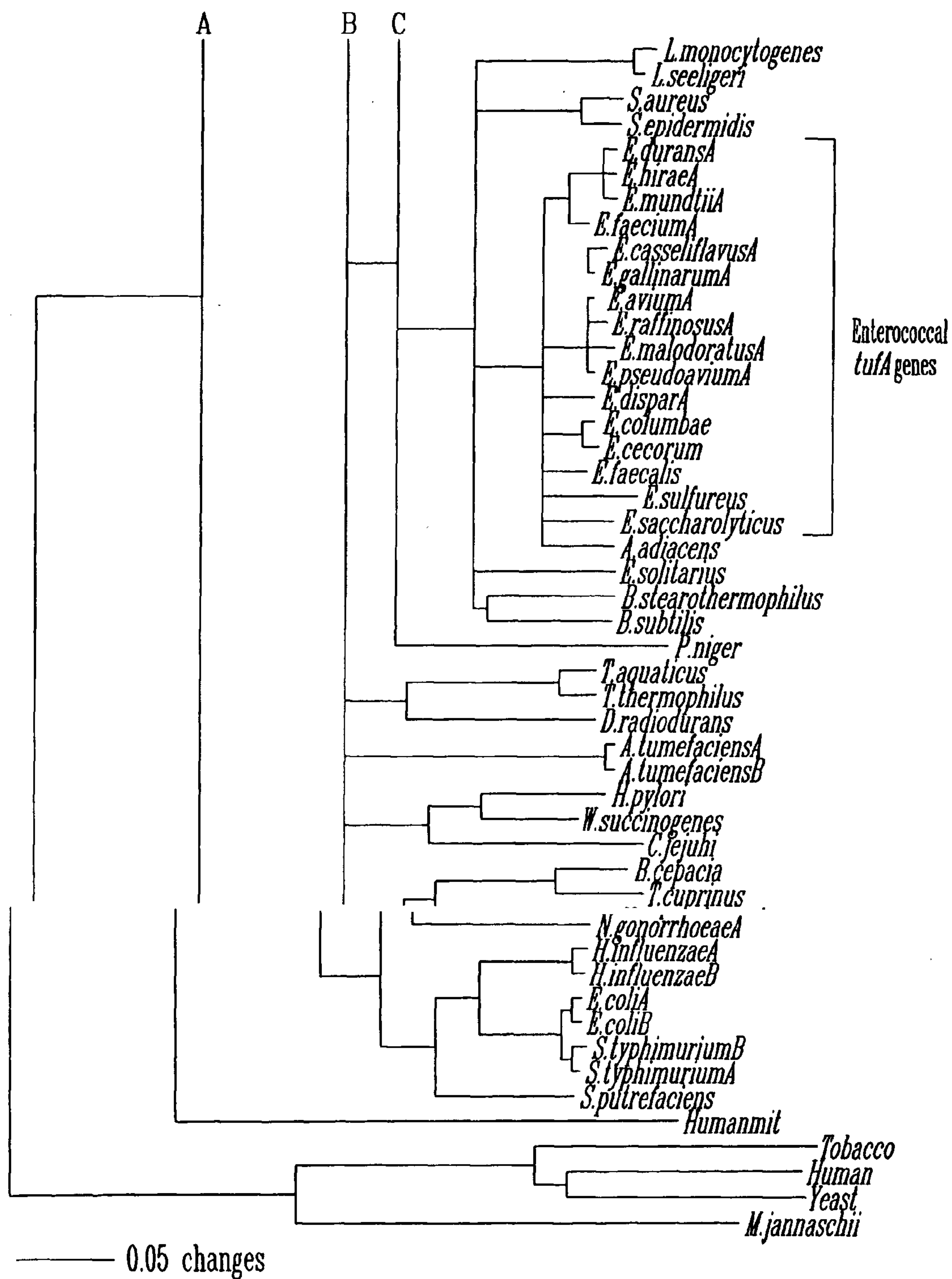
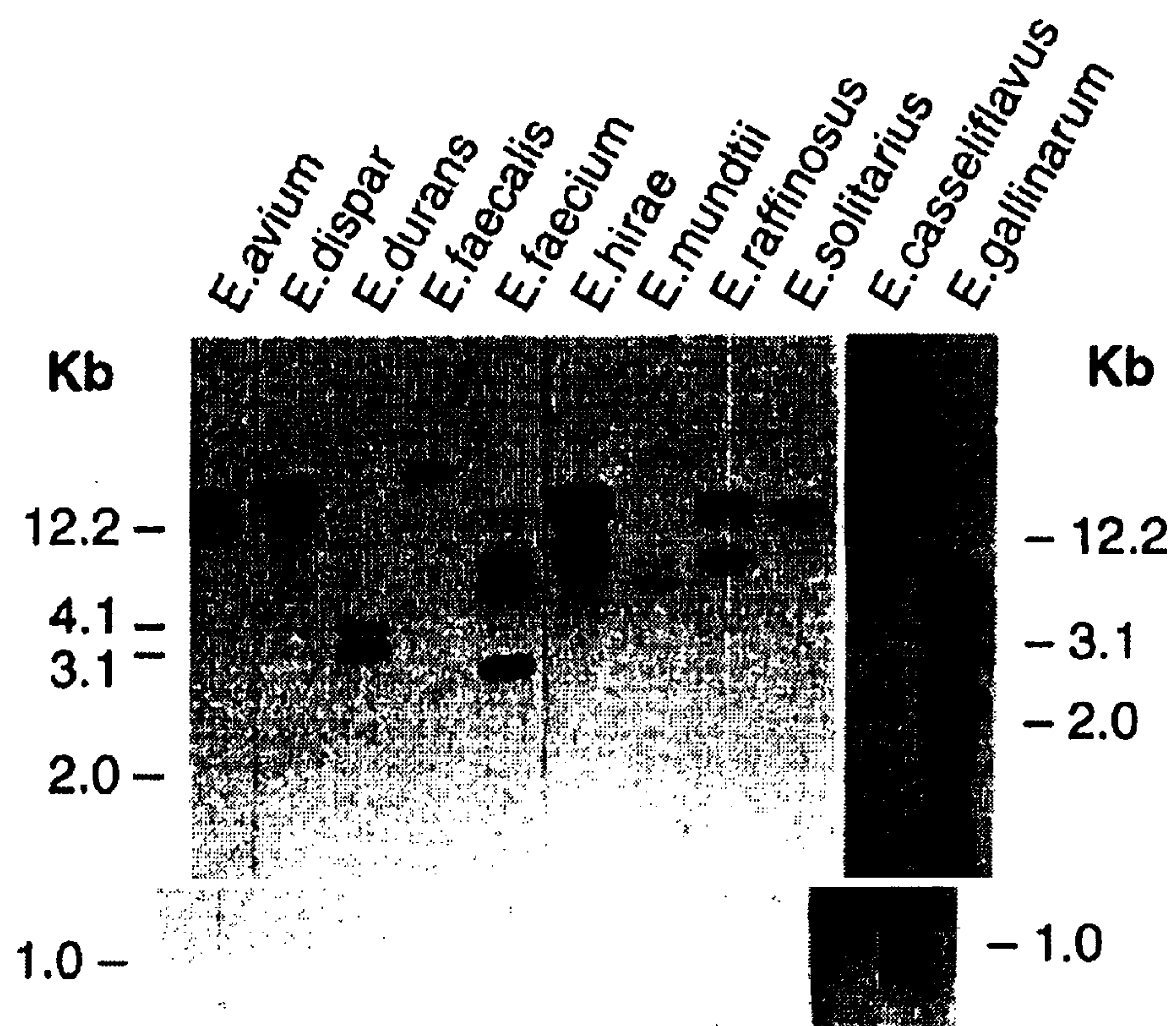


FIG. 5b

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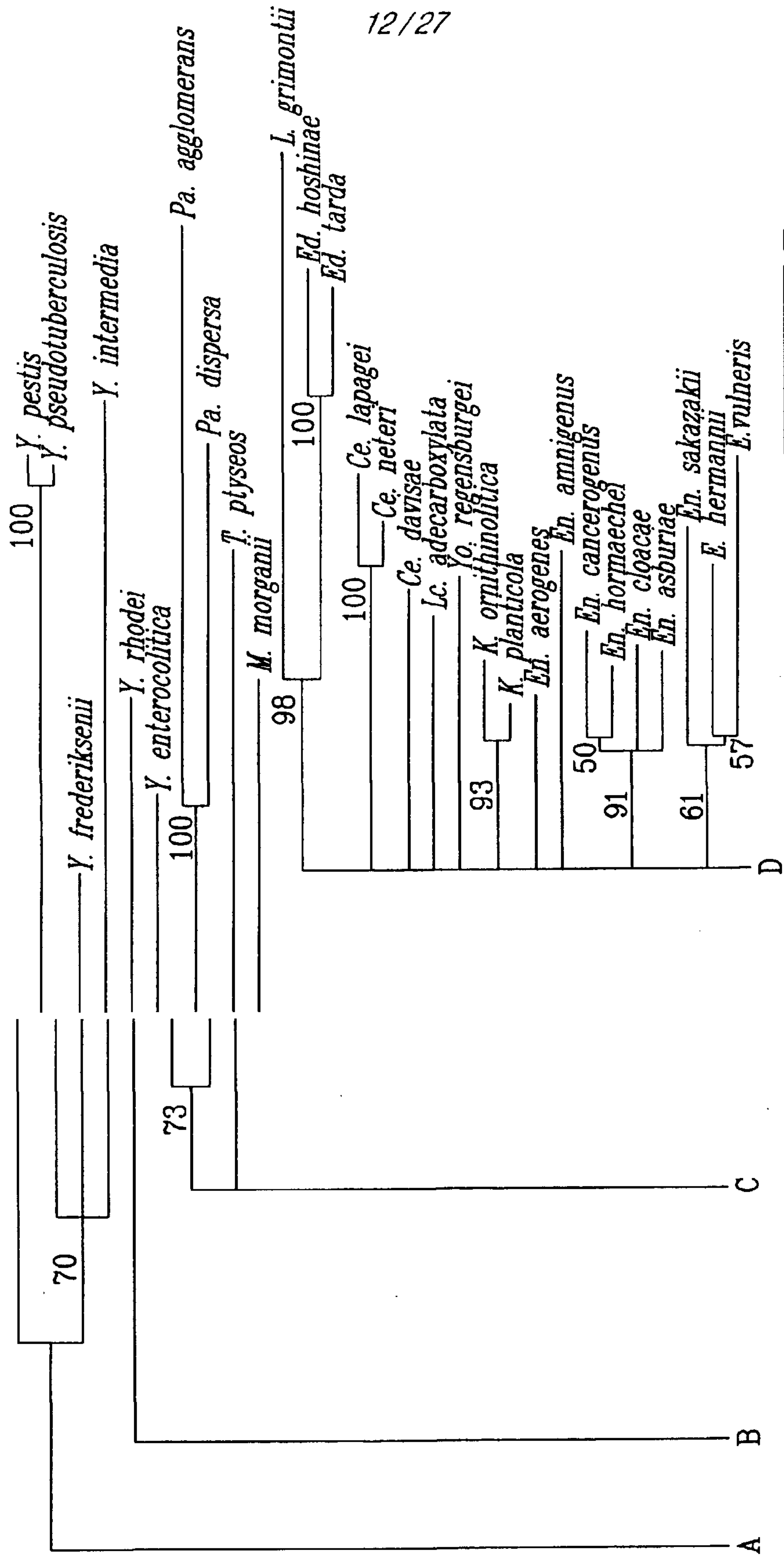
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FIG. 6

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	301	311	321	331
E. coli	GAGATCGGT	AAGAAGAGCG	TTGGG	CGATTCACCG
E. agglomerans	GACATCGGT	AAGAAGAGCG	TTGGG	CGATCCACCG
P. agglomerans	GAGCTGAAA	AAGAAGATGG	CAGCGCAGTA	CTATTCACCG
P. dispersa	GACCTGAAA	AAGAAGACGG	CAGCGCTGTA	CTATTCATCG
T. ptyseos	GACCTGAAG	ACGAAGATGG	TAGCAATGTT	CTATTCACCG
E. coli	~I~G~E~	E~E~R~W	~A~	I~H~R~
E. agglomerans	~I~G~E~	E~E~R~W	~A~	I~H~R~
P. agglomerans	~L~K~E~	E~D~G~S	~A~V~E~	I~H~R~
P. dispersa	~L~K~E~	E~D~G~S	~A~V~E~	I~H~R~
T. ptyseos	~L~K~N~	E~D~G~S	~N~V~E~	I~H~R~

FIG. 7



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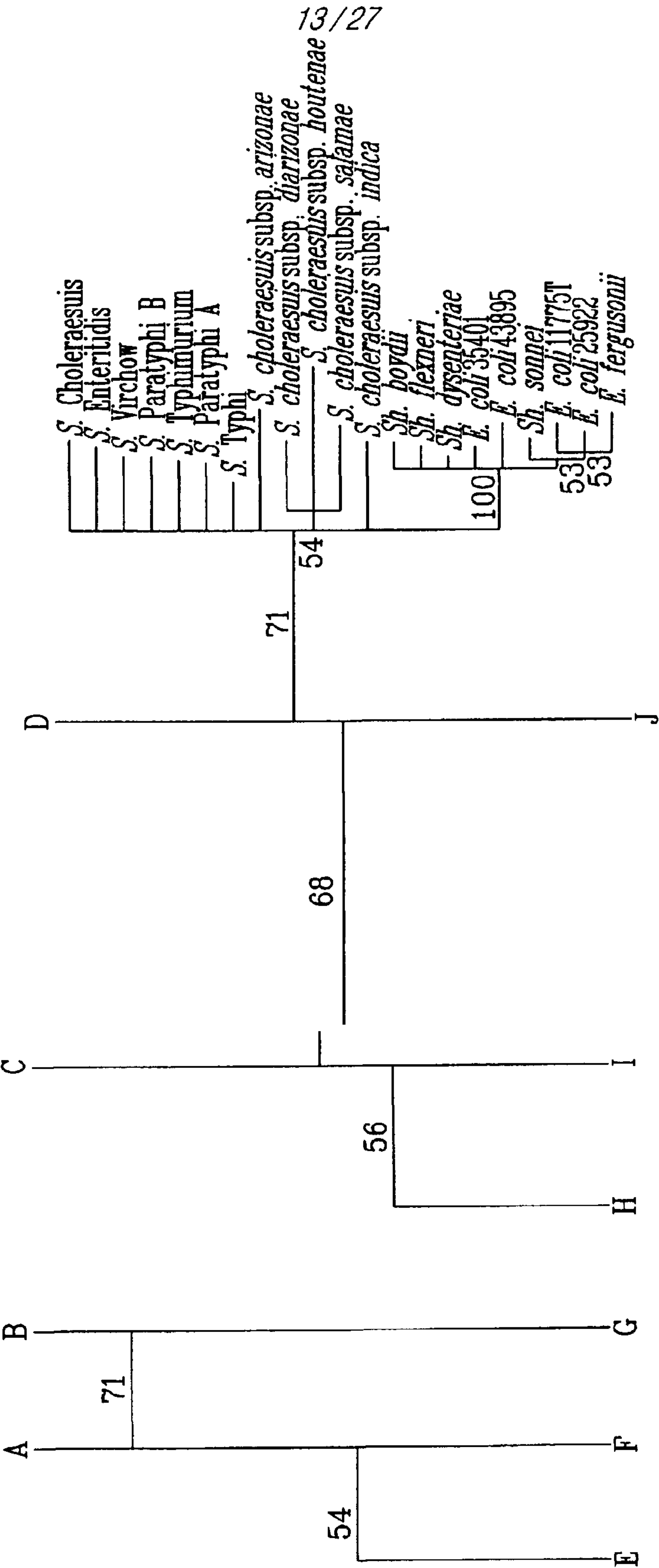


Fig. 1 - 8b

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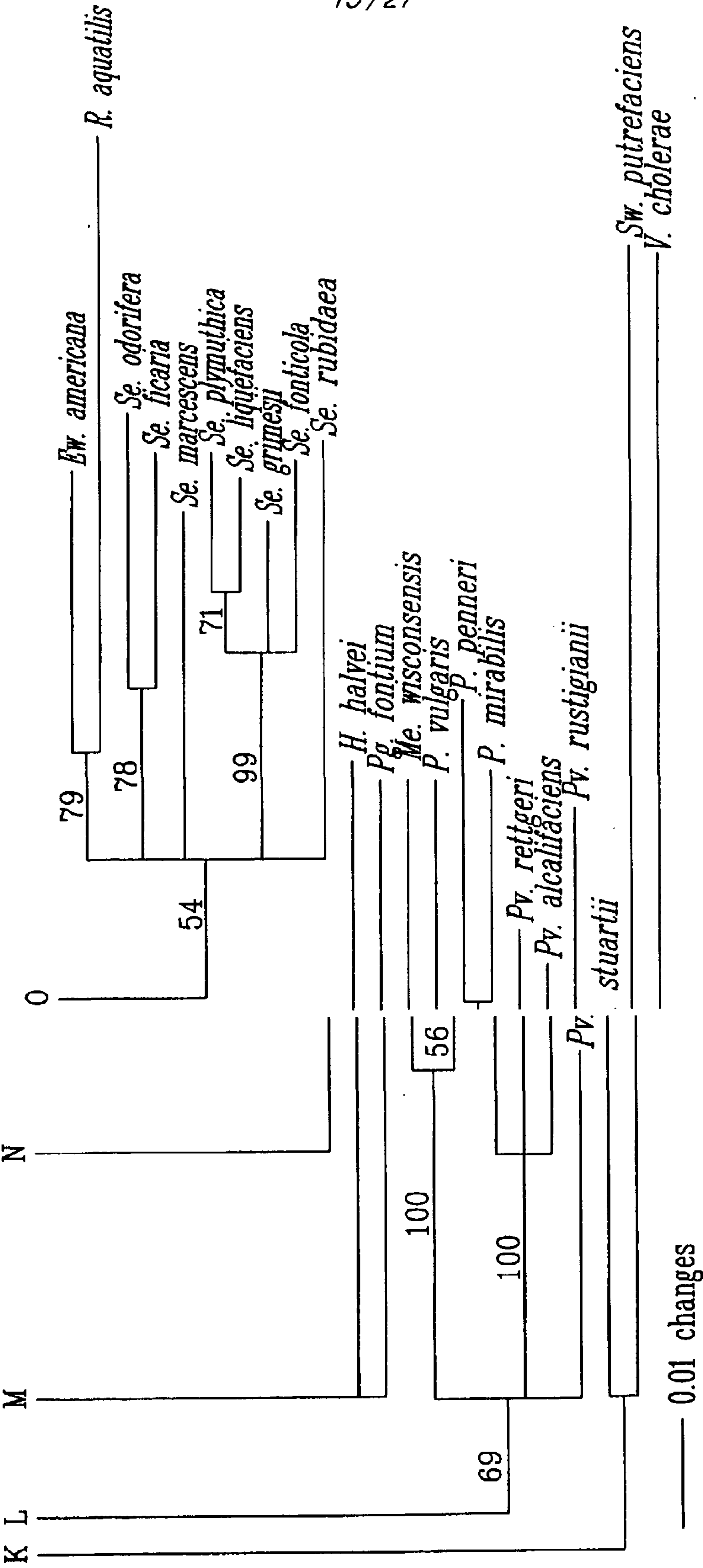
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		<i>Kv. georgiana</i>	
		<i>Kv. ascorbata</i>	
		<i>Kv. cryocrescens</i>	
		<i>K. oxytoca</i>	
52	98	<i>K. pneumoniae</i> subsp. <i>rhinoscleromatis</i>	
		<i>K. pneumoniae</i> subsp. <i>pneumoniae</i>	
		<i>K. pneumoniae</i> subsp. <i>ozanae</i>	
		<i>En. gergoviae</i>	
		<i>En. agglomerans</i>	
		<i>C. koseri</i>	
		<i>C. sedlakii</i>	
69		<i>C. braakii</i>	
51		<i>C. werkmanii</i>	
		<i>C. freundi</i>	
		<i>C. youngae</i>	
71		<i>C. farneri</i>	
		<i>Tr. guamensis</i>	
		<i>C. amalonaticus</i>	

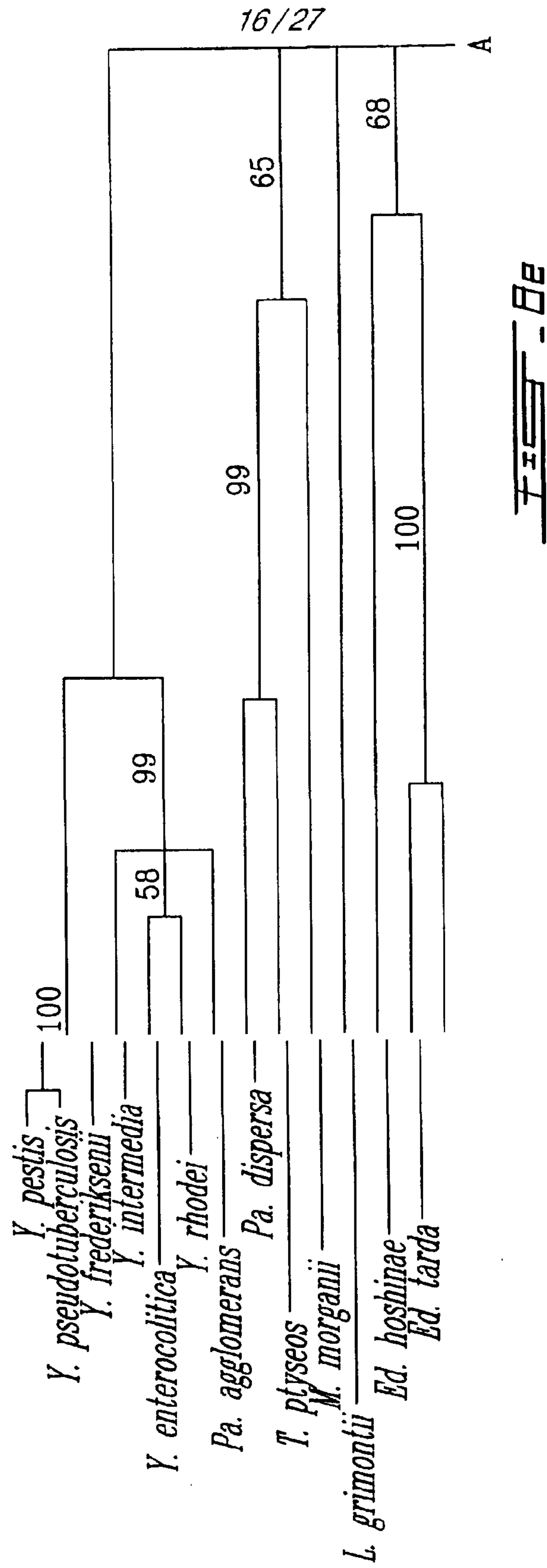
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SUBSTITUTE SHEET (RULE 26)

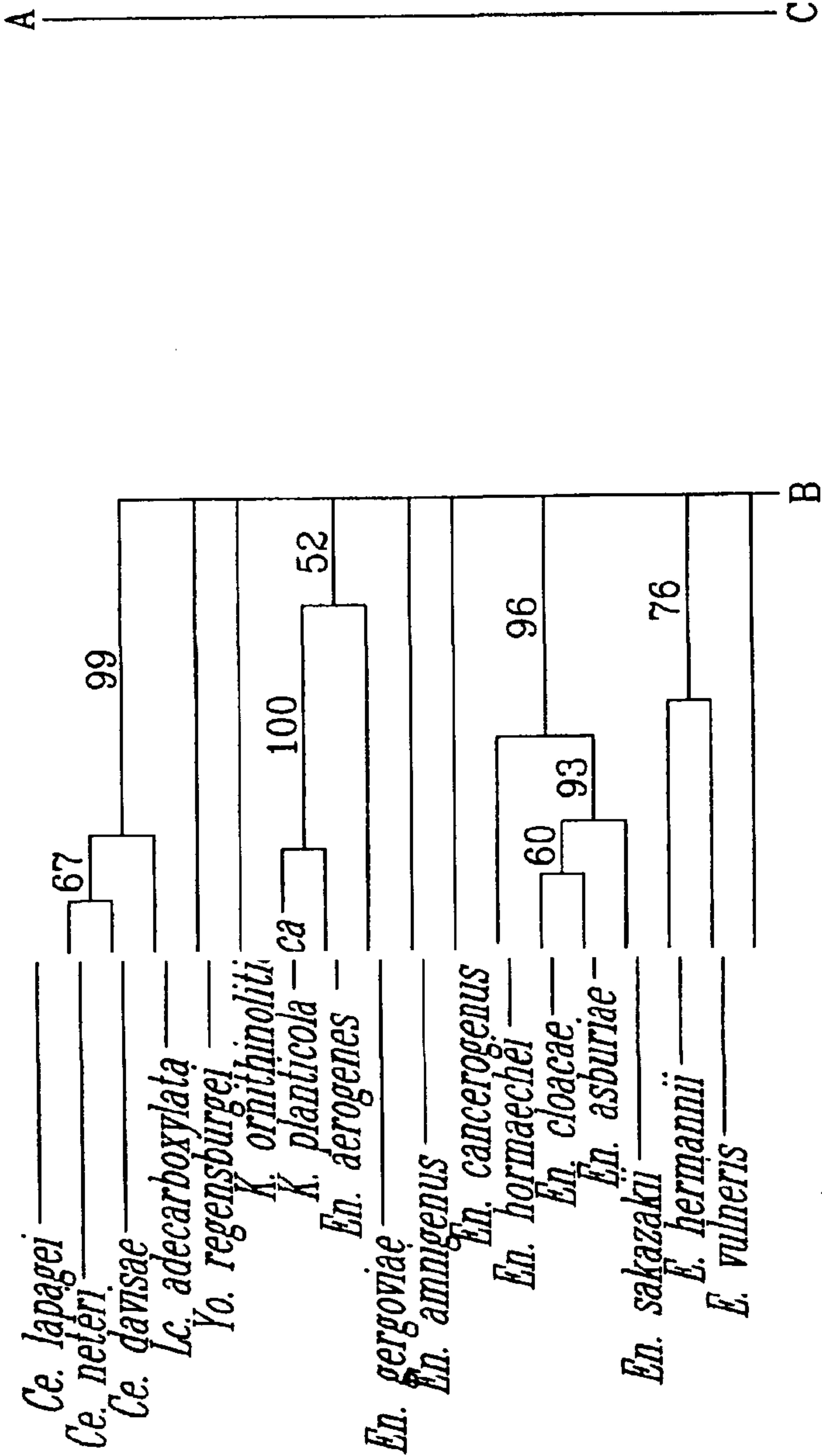
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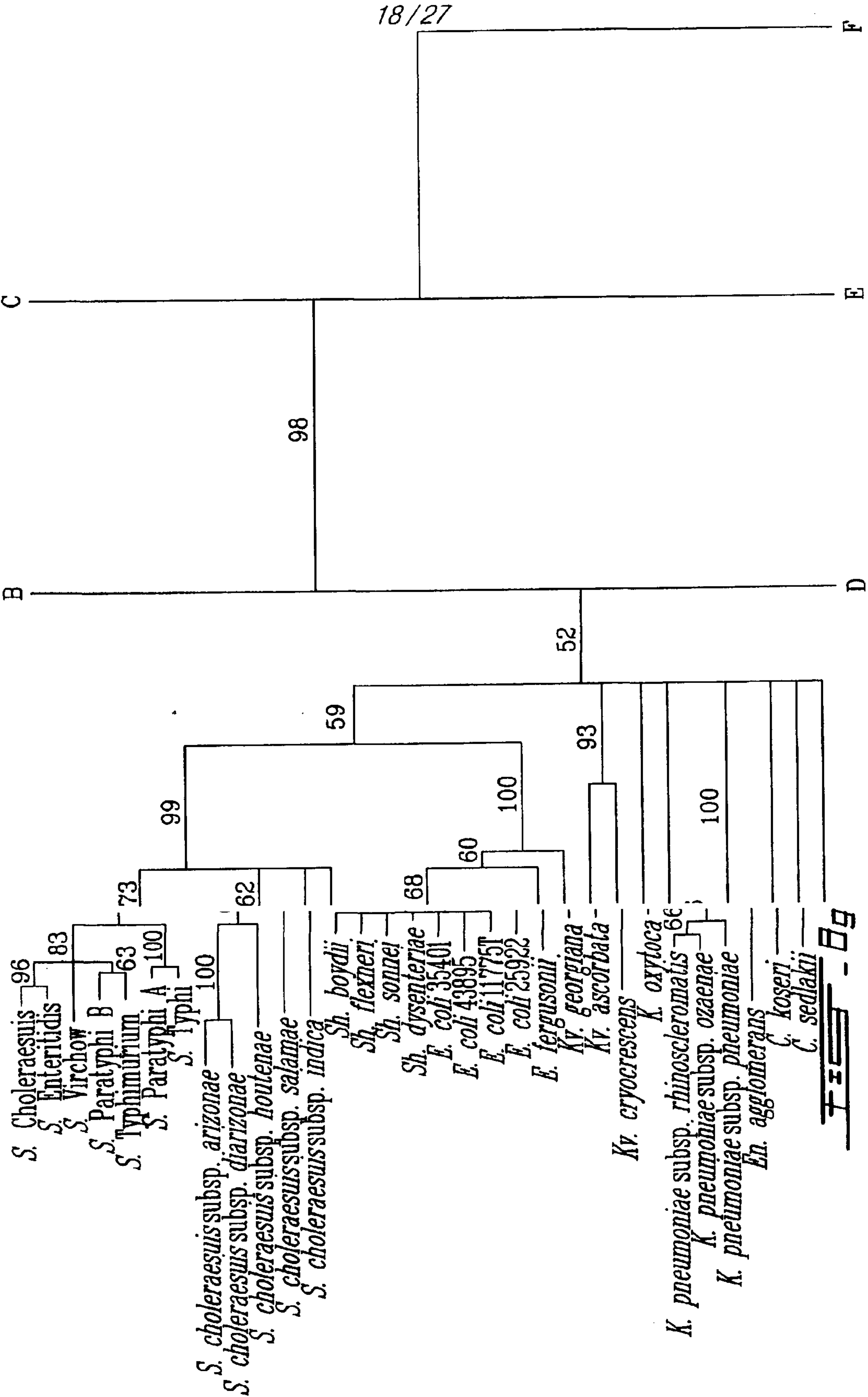
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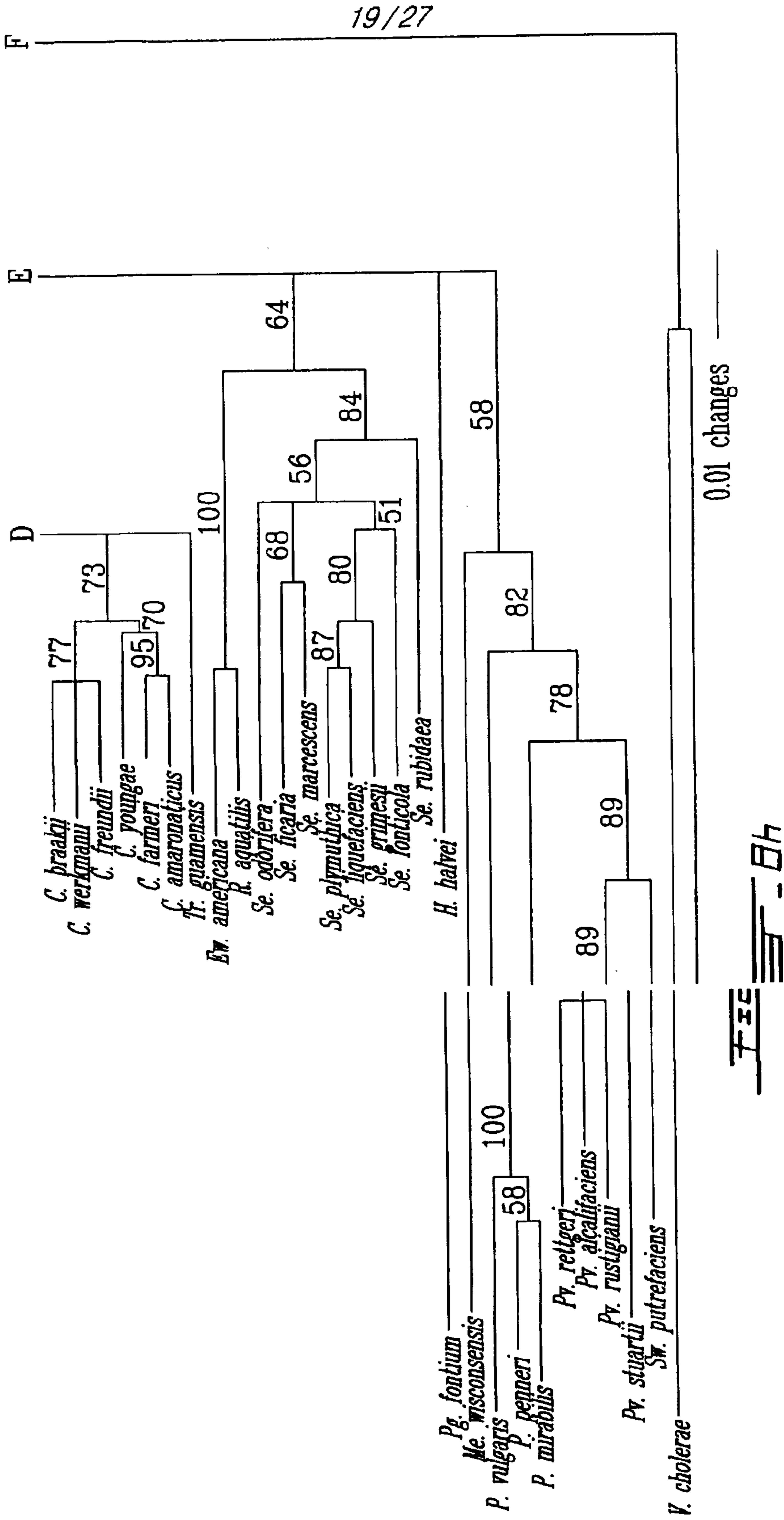


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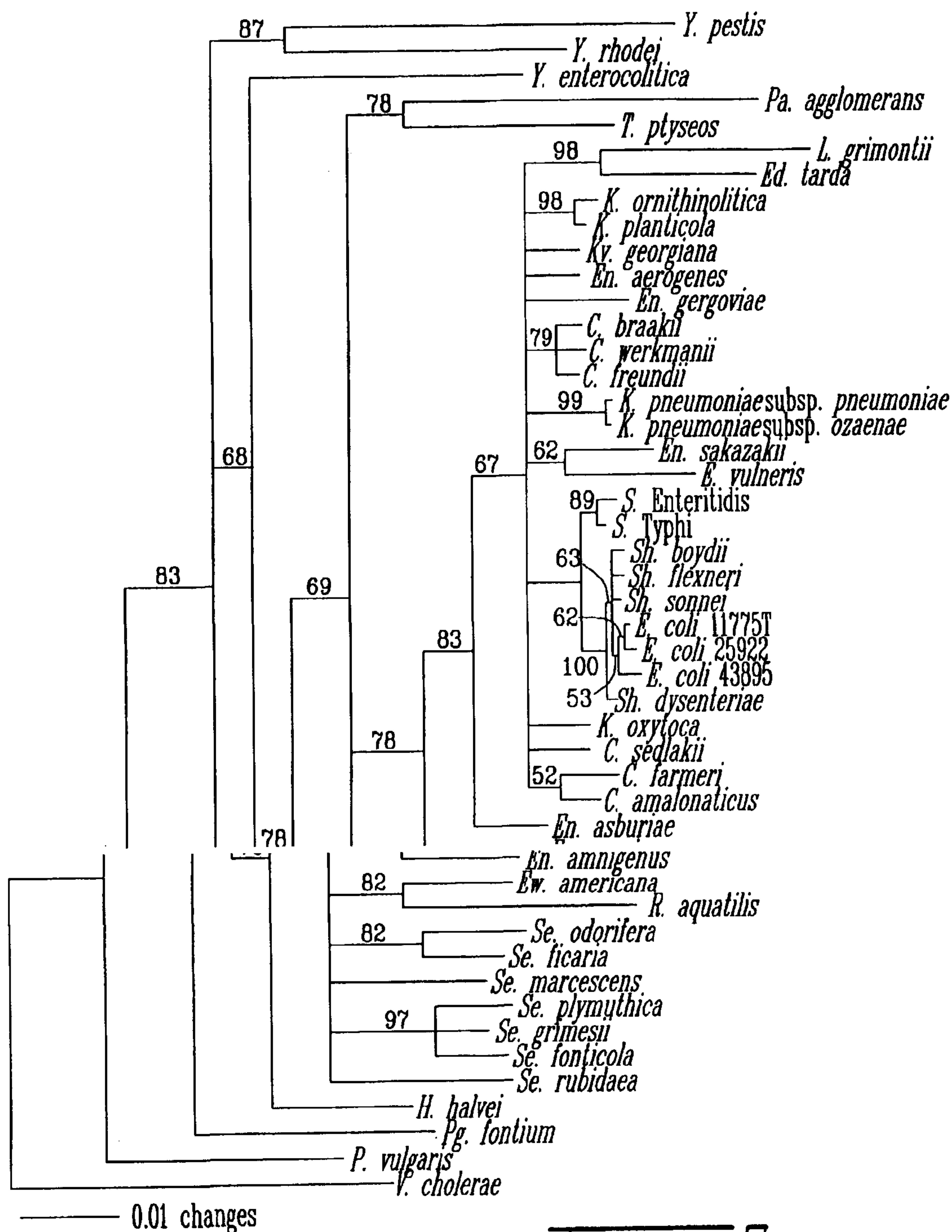


FEF - BF

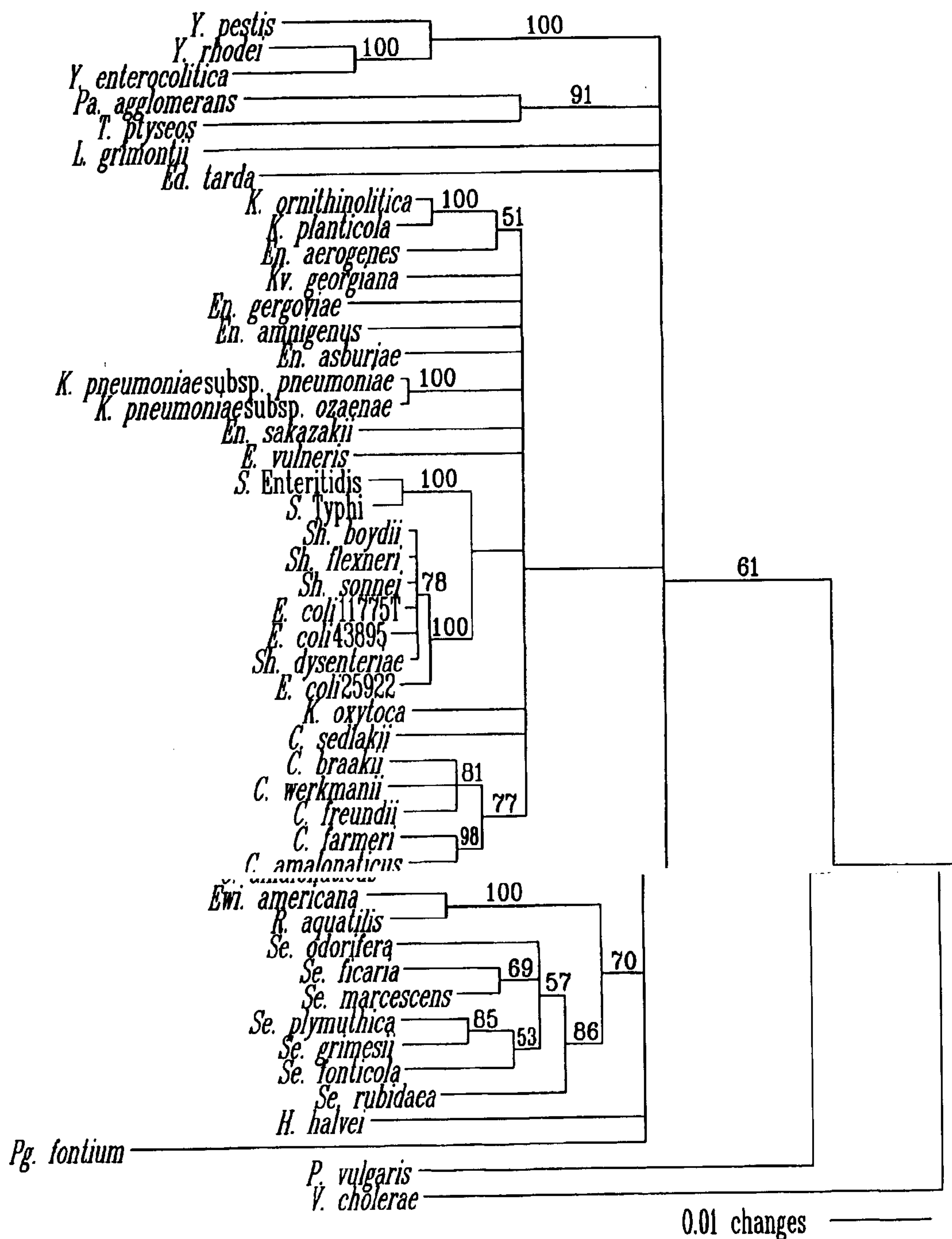




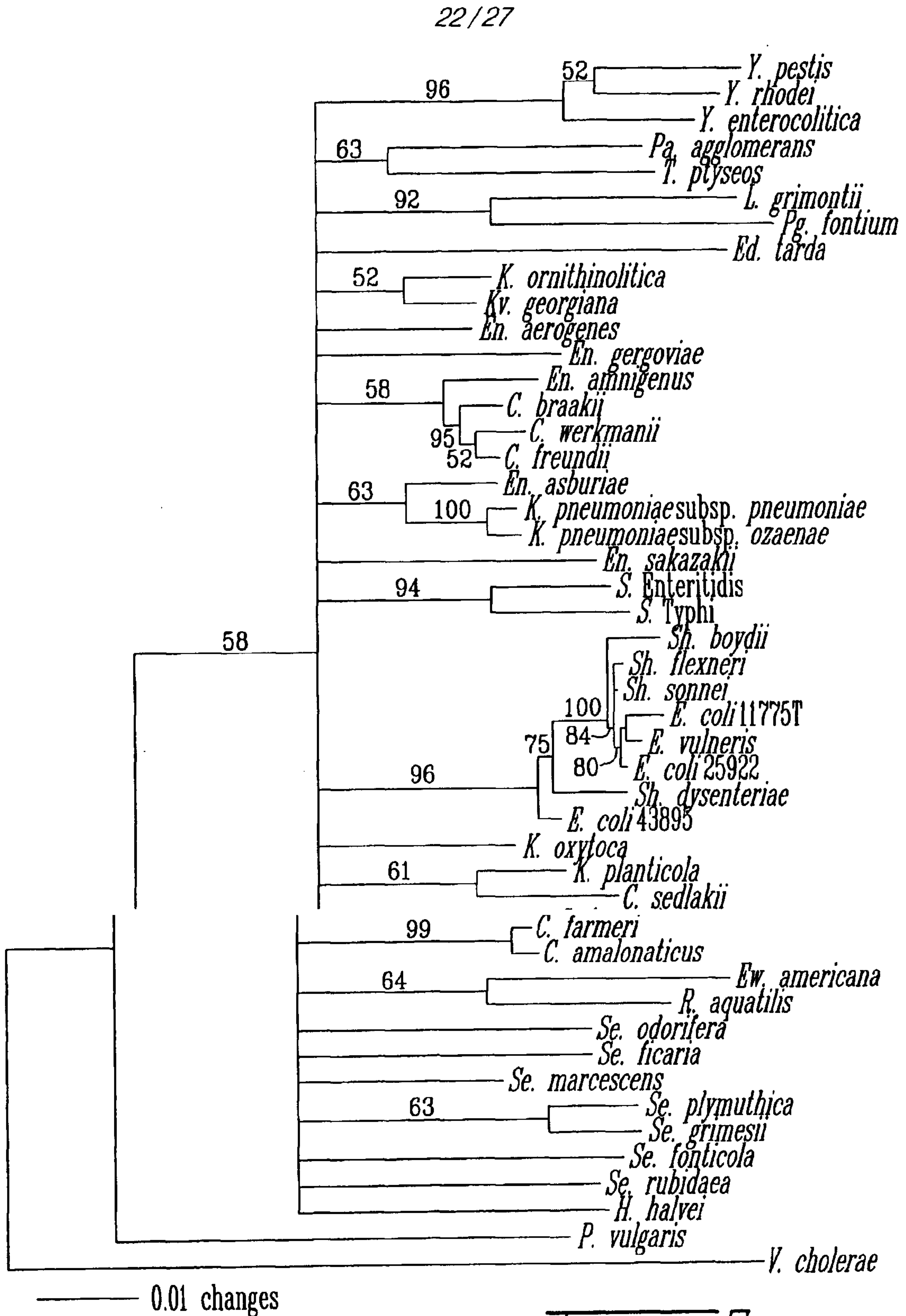
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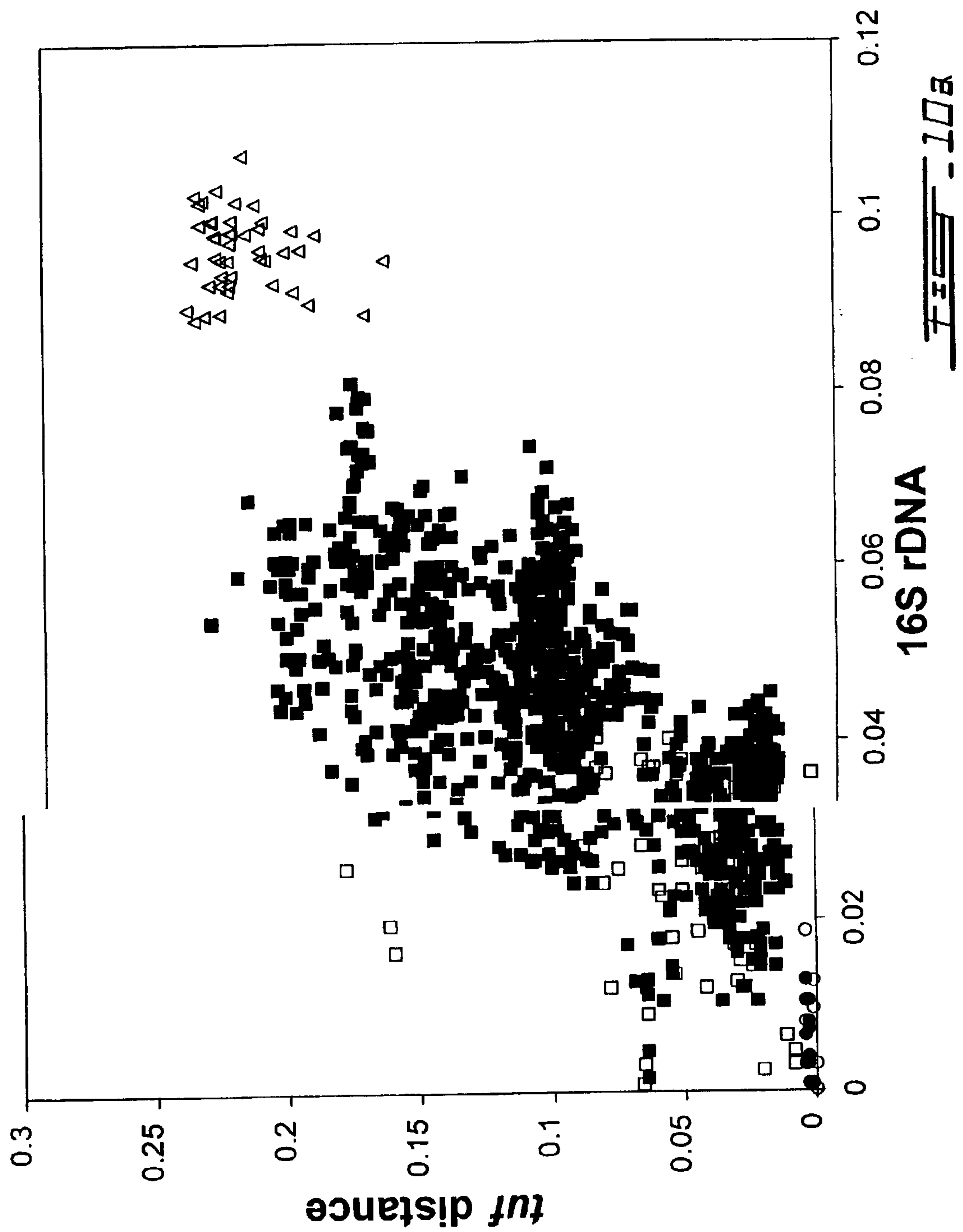
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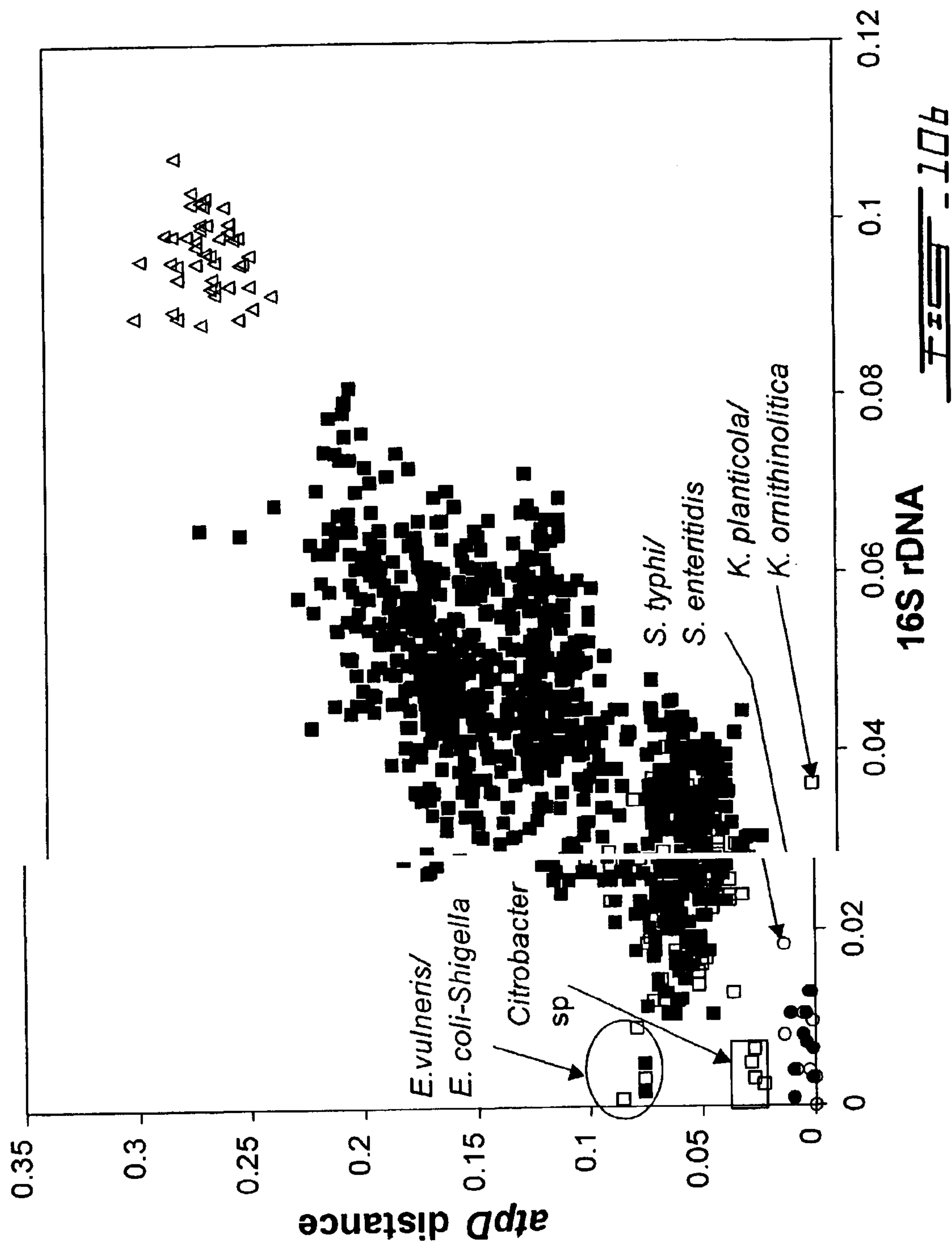
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