

■ **Table 1**

Currently published genera of organisms able to grow using hydrocarbons as sole or major carbon source

Genus	Typical substrate	References ^a
Phylum Actinobacteria		
Order Actinomycetales		
<i>Actinomyces</i> Harz (1877)	Crude oil	ZoBell (1946)
<i>Aeromicrobium</i> Miller et al. (1991)	Crude oil	Chaillan et al. (2004)
<i>Arthrobacter</i> Conn & Dimmick (1947)	Gas oil	Le Petit et al. (1975)
<i>Brevibacterium</i> Breed (1953)	Alkanes	Pirnik et al. (1974)
<i>Cellulomonas</i> Bergey et al. (1923)	Biphenyl	Plotnikova et al. (2006)
<i>Cellulosimicrobium</i> Schumann et al. (2001)	Crude oil	Dashti et al. (2009)
<i>Citricoccus</i> Altenburger et al. (2002)	Crude oil	Al-Awadhi et al. (2007)
<i>Clavibacter</i> Davis et al. (1984)	Naphthalene	Dore et al. (2003)
<i>Corynebacterium</i> Lehmann and Neumann (1896)	Fuel oil	Chaîneau et al. (1999)
<i>Dietzia</i> Rainey et al. (1995)	Alkanes	Yumoto et al. (2002)
<i>Georgenia</i> Altenburger et al. (2002)	Crude oil	Al-Awadhi et al. (2007)
<i>Gordonia</i> Stackebrandt et al. (1989)	Alkanes	Kummer et al. (1999)
<i>Isophtericola</i> Stackebrandt et al. (2004)	Crude oil	Al-Awadhi et al. (2007)
<i>Janibacter</i> Martin et al. (1997)	Phenanthrene	Yamazoe et al. (2004)
<i>Kocuria</i> Stackebrandt et al. (1995)	Crude oil	Dashti et al. (2009)
<i>Kytococcus</i> Stackebrandt et al. (1995)	Crude oil	Al-Saleh et al. (2009)
<i>Leifsonia</i> Evtushenko et al. (2000)	Crude oil	Dashti et al. (2009)
<i>Microbacterium</i> Orla-Jensen (1919)	Pyrene	Gauthier et al. (2003)
<i>Micrococcus</i> Cohn (1872)	Hexadecane	Ilori et al. (2000)
<i>Mycobacterium</i> Lehmann and Neumann (1896)	Phenanthrene	Willumsen et al. (2001)
<i>Nocardia</i> Trevisan (1889)	Alkanes	Mikolasch et al. (2003)
<i>Nocardioides</i> Prauser (1976)	Alkanes	Hamamura and Arp (2000)
<i>Nocardiosis</i> Brocq-Rousseau (1904)	Crude oil	Dixit and Pant (2000)
<i>Pseudonocardia</i> Henssen (1957)	Toluene	Juteau et al. (1999)
<i>Rhodococcus</i> Zopf (1891)	Phenanthrene	Meyer et al. (1999)
<i>Smaragdicoscus</i> Adachi et al. (2007)	Crude oil	Adachi et al. (2007)
<i>Streptomyces</i> Waksman and Henrici (1943)	Alkanes	Barabas et al. (2001)
<i>Terrabacter</i> Collins et al. (1989)	Fluorene	Iida et al. (2003)
<i>Williamsia</i> Kampfer et al. (1999)	Crude oil	Obuekwe et al. (2009)
Order Rubrobacterales		
<i>Thermoleophilum</i> Zarilla and Perry (1984)	Alkanes	Zarilla and Perry (1984)
Phylum Bacteroidetes		
Order Flavobacteriales		
<i>Chryseobacterium</i> Vandamme et al. (1994)	Kerosene	Szoboszlay et al. (2008)
<i>Flavobacterium</i> Bergey et al. (1923)	Diesel oil	Stucki and Alexander (1987)

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Genus	Typical substrate	References ^a
<i>Myroides</i> Vancanneyt et al. (1996)	Crude oil	Maneerat et al. (2006)
<i>Weeksella</i> Holmes et al. (1987)	Crude oil	Yuste et al. (2000)
<i>Yeosuana</i> Kwon et al. (2006)	Benzo[a]pyrene	Kwon et al. (2006)
Order Sphingobacteriales		
<i>Cytophaga</i> Winogradsky (1929)	Crude oil	Bossert and Bartha (1984)
<i>Pedobacter</i> Steyn et al. (1998)	Diesel	Margesin et al. (2003)
Phylum Chlamydiae		
Order Verrucomicrobia		
'Methylocidiphilum'	Methane	Hou et al. (2008)
Phylum Cyanobacteria		
Order Chroococcales		
<i>Agmenellum</i> De Brebisson (1839)	Phenanthrene	Narro et al. (1992)
<i>Aphanocapsa</i> Nägeli (1849)	Crude oil	Raghukumar et al. (2001)
<i>Aphanothece</i> Nägeli (1849)	Alkanes	Abed et al. (2005)
<i>Coccochloris</i> Sprengel (1807)	Naphthalene	Cerniglia (1979)
Order Nostocales		
<i>Anabaena</i> St. Vincent (1886)	Alkanes	Gamila et al. (2003)
<i>Nostoc</i> Vaucher (1888)	Naphthalene	Cerniglia et al. (1992)
Order Oscillatoriales		
<i>Dactylococcopsis</i> Hansgirg (1893)	Alkanes	Abed et al. (2005)
<i>Halothece</i> Margheri et al. (2008)	Alkanes	Abed et al. (2005)
<i>Microcoleus</i> Desmazières (1892)	Alkanes	Al-Hasan et al. (1998)
<i>Oscillatoria</i> Vaucher (1892)	Alkanes	Gamila et al. (2003)
<i>Phormidium</i> Kutzing (1892)	Alkanes	Al-Hasan et al. (1998)
<i>Plectonema</i> Thuret (1892)	Crude oil	Raghukumar et al. (2001)
Phylum Deinococcus-Thermus		
Order Thermales		
<i>Thermus</i> Brock and Freeze (1969)	Pyrene	Feitkenhauer et al. (2003)
Phylum Firmicutes		
Order Bacillales		
<i>Bacillus</i> Cohn (1872)	Toluene	Li et al. (2008)
<i>Brevibacillus</i> Shida et al. (1996)	Crude oil	Dashti et al. (2009)
<i>Exiguobacterium</i> Collins et al. (1984)	Diesel oil	Mohanty and Mukherji (2008)
<i>Geobacillus</i> Nazina et al. (2001)	Crude oil	Nazina et al. (2001)
<i>Oceanobacillus</i> Lu et al. (2002)	Crude oil	Al-Awadhi et al. (2007)
<i>Paenibacillus</i> Ash et al. (1994)	Phenanthrene	Meyer et al. (1999)
<i>Planococcus</i> Migula (1894)	Benzene	Li et al. (2006)
<i>Planomicrobium</i> Yoon et al. (2001)	Alkanes	Engelhardt et al. (2001)
<i>Staphylococcus</i> Rosenbach (1884)	Diesel	Saadoun et al. (1999)

■ **Table 1 (Continued)**

Genus	Typical substrate	References ^a
Order Lactobacillales		
<i>Lactobacillus</i> Beijerinck (1901)	Crude oil	Floodgate (1984)
Order Clostridiales		
<i>Desulfotomaculum</i> Campbell and Postgate (1965)	<i>o</i> -Xylene	Morasch et al. (2004)
<i>Desulfosporosinus</i> Stackebrandt et al. (1997)	Gasoline	Robertson et al. (2001)
<i>Peptococcus</i> Kluyver and van Niel (1936)	Crude oil	Floodgate (1984)
<i>Sarcina</i> Goodsir (1842)	Crude oil	Bossert and Bartha (1984)
Phylum Proteobacteria		
Class Alpha Proteobacteria		
Order Caulobacteriales		
<i>Brevundimonas</i> Segers et al. (1994)	Fuel oil	Chaineau et al. (1999)
Order Kordiimonadales		
<i>Kordiimonas</i> Kwon et al. (2006)	Benzo[a]pyrene	Kwon et al. (2005)
Order Rhizobiales		
<i>Afipia</i> Brenner et al. (1992)	Phenanthrene	Bodour et al. (2003)
<i>Agrobacterium</i> Conn (1942)	Gasoline	Prantera et al. (2002)
<i>Beijerinckia</i> Derx (1950)	Phenanthrene	Surovtseva et al. (1999)
<i>Blastochloris</i> Hiraishi (1997)	Toluene	Zengler et al. (1999)
<i>Hyphomicrobium</i> Stutzer and Hartleb (1898)	Crude oil	Ozaki et al. (2006)
<i>Methylobacterium</i> Patt et al. (1976)	Phenanthrene	Bodour et al. (2003)
<i>Methylocapsa</i> Dedysh et al. (2002)	Methane	Dedysh et al. (2002)
<i>Methylocella</i> Dedysh et al. (2000)	Methane	Dedysh et al. (2000)
<i>Methylocystis</i> Bowman et al. (1993)	Methane	Bowman et al. (1993)
<i>Methylosinus</i> Bowman et al. (1993)	Methane	Bowman et al. (1993)
<i>Ochrobactrum</i> Holmes et al. (1988)	Crude oil	Peressutti et al. (2003)
<i>Parvibaculum</i> Schleheck et al. (2004)	Linear alkanes	Schleheck et al. (2004)
<i>Rhizobium</i> Frank (1889)	Phenanthrene	Bodour et al. (2003)
<i>Sinorhizobium</i> Chen et al. (1988)	Phenanthrene	Bodour et al. (2003)
<i>Xanthobacter</i> Wiegel et al. (1978)	Dibenzothiophene	Padden et al. (1997)
Order Rhodobacterales		
<i>Stappia</i> Uchino et al. (1999)	Crude oil	Al-Awadhi et al. (2007)
<i>Tranquillimonas</i> Harwati et al. (2008)	Alkanes	Harwati et al. (2008)
<i>Tropicibacter</i> Harwati et al. (2009b)	Naphthalene	Harwati et al. (2009b)
<i>Tropicimonas</i> Harwati et al. (2009a)	Alkanes	Harwati et al. (2009a)
Order Rhodospirillales		
<i>Acidocella</i> Kishimoto et al. (1995)	Naphthalene	Dore et al. (2003)
<i>Azospirillum</i> Tarrand et al. (1979)	Alkane	Roy et al. (1988)
<i>Magnetospirillum</i> Schleifer et al. (1992)	Toluene	Shinoda et al. (2005)

Table 1 (Continued)

Genus	Typical substrate	References ^a
'Oleomonas' Kanamori et al. (2002)	Toluene, alkanes	Kanamori et al. (2002)
<i>Thalassospira</i> Lopez-Lopez et al. (2002)	Pyrene	Kodama et al. (2008)
Order Sphingomonadales		
' <i>Lutibacterium</i> ' Chung and King (2001)	Phenanthrene	Chung and King (2001)
<i>Novosphingobium</i> Takeuchi et al. (2001)	Phenanthrene	Shi et al. (2001)
<i>Porphyrobacter</i> Fuerst et al. (1993)	Phenanthrene	Gauthier et al. (2003)
<i>Sphingobium</i> Takeuchi et al. (2001)	Phenanthrene	Prakash and Lal (2006)
<i>Sphingomonas</i> Yabuuchi et al. (1990)	Dibenzofuran	Halden et al. (1999)
Class Beta Proteobacteria		
Order Burkholderiales		
<i>Achromobacter</i> Yabuuchi and Yano (1981)	Gas oil	Le Petit et al. (1975)
<i>Acidovorax</i> Willems et al. (1990)	Phenanthrene	Meyer et al. (1999)
<i>Alcaligenes</i> Castellani and Chalmers (1919)	Gas oil	Le Petit et al. (1975)
<i>Alicyciphilus</i> Mechichi et al. (2003)	Benzene	Weelink et al. (2008)
<i>Brachymonas</i> Hiraishi et al. (1995)	Cyclohexane	Brzostowicz et al. (2005)
<i>Burkholderia</i> Yabuuchi et al. (1993)	Toluene	Parales et al. (2000)
<i>Castellaniella</i> Kämpfer et al. (2006)	α -Pinene	Kämpfer et al. (2006)
<i>Comamonas</i> De Vos et al. (1985)	Phenanthrene	Meyer et al. (1999)
<i>Cupriavidus</i> Makkar and Casida (1987)	Biphenyl	Wittich and Wolff (2007)
<i>Hydrogenophaga</i> Willems et al. (1989)	Benzene	Fahy et al. (2008)
<i>Janthinobacterium</i> De Ley et al. (1978)	Phenanthrene	Bodour et al. (2003)
<i>Leptothrix</i> Kutzing (1843)	Phenanthrene	Bodour et al. (2003)
<i>Massilia</i> La Scola et al. (2000)	Phenanthrene	Bodour et al. (2003)
<i>Methylibium</i> Nakatsu et al. (2006)	Toluene	Nakatsu et al. (2006)
<i>Pandoraea</i> Coenye et al. (2000)	Crude oil	Ozaki et al. (2006)
<i>Polaromonas</i> Irgens et al. (1996)	Naphthalene	Jeon et al. (2004)
<i>Ralstonia</i> Yabuuchi et al. (1996)	Toluene	Parales et al. (2000)
<i>Rhodoferax</i> Hiraishi et al. (1992)	Propylbenzene	Eriksson et al. (2005)
<i>Sphaerotilus</i> Kutzing (1833)	Crude oil	Austin et al. (1977)
Order Hydrogenophilales		
<i>Thiobacillus</i> Beijerinck (1904)	Phenanthrene	Bodour et al. (2003)
Order Nitrosomonadales		
<i>Spirillum</i> Ehrenberg (1832)	Crude oil	Bossert and Bartha (1984)
Order Rhodocyclales		
' <i>Aromatoleum</i> '	Ethylbenzene	Trautwein et al. (2008)
<i>Azoarcus</i> Reinhold-Hurek et al. (1993)	Toluene	Hess et al. (1997)
<i>Dechloromonas</i> Achenbach et al. (2001)	Benzene	Coates et al. (2001b)
<i>Georgfuchsia</i> Weelink (2008)	Toluene	Weelink (2008)
<i>Thauera</i> Macy et al. (1993)	Toluene	Shinoda et al. (2004)

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Genus	Typical substrate	References ^a
Class Gamma Proteobacteria		
Order Aeromonadales		
<i>Aeromonas</i> Stanier (1943)	Diesel	Odokumal and Dickson (2003)
Order Alteromonadales		
<i>Alteromonas</i> Baumann et al. (1972)	Crude oil	Iwabuchi et al. (2002)
<i>Marinobacter</i> Gauthier et al. (1992)	Crude oil	Gauthier et al. (1992)
<i>Microbulbifer</i> Gonzalez et al. (1997)	Crude oil	Brito et al. (2006)
<i>Shewanella</i> MacDonell and Colwell (1986)	Crude oil	Gentile et al. (2003)
Order Enterobacteriales		
<i>Enterobacter</i> Hormaeche and Edwards (1960)	Alkanes	Saadoun et al. (1999)
<i>Erwinia</i> Winslow et al. (1920)	Alkanes	Saadoun et al. (1999)
<i>Klebsiella</i> Trevisan (1885)	Crude oil	Odokumal and Dickson (2003)
<i>Leclercia</i> Tamura et al. (1987)	Pyrene	Sarma et al. (2004)
<i>Pantoea</i> Gavini et al. (1989)	Crude oil	Obuekwe et al. (2009)
<i>Proteus</i> Hauser (1885)	Crude oil	Odokumal and Dickson (2003)
<i>Rahnella</i> Izard et al. (1981)	Naphthalene	Ma et al. (2006)
<i>Serratia</i> Bizio (1823)	Crude oil	Odokumal and Dickson (2003)
Order Methylococcales		
<i>Clonothrix</i> Roze (1896)	Methane	Vigliotta et al. (2007)
<i>Crenothrix</i> Cohn (1870)	Methane	Stoecker et al. (2006)
<i>Methylobacter</i> Bowman et al. (1993)	Methane	Bowman et al. (1993)
<i>Methylocaldum</i> Bodrossy et al. (1998)	Methane	Bodrossy et al. (1998)
<i>Methylococcus</i> Foster and Davis (1966)	Methane	Bowman et al. (1993)
<i>Methylohalobius</i> Heyer et al. (2005)	Methane	Heyer et al. (2005)
<i>Methylomonas</i> Leadbetter (1974)	Methane	Bowman et al. (1993)
<i>Methylothermus</i> Tsubota et al. (2005)	Methane	Tsubota et al. (2005)
<i>Methylomicrobium</i> Bowman et al. (1995)	Methane	Kalyuzhnaya et al. (2008)
<i>Methylosarcina</i> Wise et al. (2001)	Methane	Wise et al. (2001)
<i>Methylosoma</i> Rahalkar et al. (2007)	Methane	Rahalkar et al. (2007)
<i>Methylosphaera</i> Bowman et al. (1997)	Methane	Bowman et al. (1997)
Order Oceanospirillales		
<i>Alcanivorax</i> Yakimov et al. (1998)	Alkanes	Yakimov et al. (1998)
<i>Halomonas</i> Vreeland et al. (1980)	Crude oil	Wang et al. (2007)
<i>Neptunomonas</i> Hedlund et al. (1999)	Naphthalenes	Hedlund et al. (1999)
<i>Oleiphilus</i> Golyshin et al. (2002)	Alkanes	Golyshin et al. (2002)
<i>Oleispira</i> Yakimov et al. (2003)	Alkanes	Yakimov et al. (2003)
<i>Salinicola</i> Anan'ina et al. (2007)	Naphthalene	Anan'ina et al. (2007)
<i>Thalassolituus</i> Yakimov et al. (2004)	Alkanes	Yakimov et al. (2004)
Order Pasteurellales		
<i>Pasteurella</i> Trevisan (1887)	Fluoranthene	Sepic et al. (1997)

Table 1 (Continued)

Genus	Typical substrate	References ^a
Order Pseudomonadales		
<i>Acinetobacter</i> Brisou & Prévot (1954)	Gas oil	Le Petit et al. (1975)
<i>Alkanindiges</i> Bogan et al. (2003)	Alkanes	Bogan et al. (2003)
<i>Azotobacter</i> Beijerinck (1901)	Paraffins	Gradova et al. (2003)
<i>Moraxella</i> Lwoff (1939)	Biphenyl	Stucki and Alexander (1987)
<i>Pseudomonas</i> Migula (1894)	Gas oil	Le Petit et al. (1975)
Order Thiotrichales		
<i>Cycloclasticus</i> Dyksterhouse et al. (1995)	Biphenyl	Dyksterhouse et al. (1995)
<i>Leucothrix</i> Oersted (1844)	Crude oil	Floodgate 1984)
Order Vibrionales		
<i>Vibrio</i> Pacini (1854)	Phenanthrene	Hedlund and Staley (2001)
Order Xanthomonadales		
<i>Alkanibacter</i> Friedrich and Lipski (2008)	Hexane	Friedrich and Lipski (2008)
<i>Hydrocarboniphaga</i> Palleroni et al. (2004)	Alkanes	Palleroni et al. (2004)
<i>Nevskia</i> Famintzin (1892)	Toluene	Juteau et al. (1999)
<i>Pseudoxanthomonas</i> Finkmann et al. (2000)	Toluene	Kim et al. (2008)
<i>Singularimonas</i> Friedrich and Lipski (2008)	Hexane	Friedrich and Lipski (2008)
<i>Stenotrophomonas</i> Palleroni and Bradbury (1993)	Pyrene	Juhasz et al. (2000)
<i>Xanthomonas</i> Dowson (1939)	Phenanthrene	Hamann et al. (1999)
<i>Xylella</i> Wells et al. (1987)	Alkanes	Yuste et al. (2000)
Class Delta Proteobacteria		
Order Desulfobacterales		
<i>Desulfatibacillum</i> Cravo-Laureau et al. (2004)	Alkanes	Cravo-Laureau et al. (2004)
<i>Desulfatiferula</i> Cravo-Laureau et al. (2007)	Alkenes	Cravo-Laureau et al. (2007)
<i>Desulfobacterium</i> Bak and Widdel (1988)	Xylene	Harms et al. (1999)
<i>Desulfobacula</i> Rabus et al. (2000)	Toluene	Rabus et al. (1993)
<i>Desulfosarcina</i> Widdel (1981)	Xylene	Harms et al. (1999)
<i>Desulfotignum</i> Kuever et al. (2001)	Toluene	Ommedal and Torsvik (2007)
Order Desulfovibrionales		
<i>Desulfothermus</i> Kuever et al. (2005)	alkanes	Kuever et al. (2005)
Order Desulfuromonadales		
<i>Geobacter</i> Lovley et al. (1995)	Toluene	Coates et al. (2001a)
<i>Pelobacter</i> Schink and Pfennig (1983)	Acetylene	Schink (1985)
Order Syntrophobacterales		
<i>Desulfoglaeba</i> Davidova et al. (2006)	Alkanes	Davidova et al. (2006)

^areferences are to a 'typical' reference, not necessarily the first, last or best

Notes: Early work ascribed several hydrocarbon degraders to *Sphingomonas*, but this genus has undergone taxonomic scrutiny, and most have been moved to *Sphingobium* or *Novosphingobium*. *Lutibacterium* is closely allied [Leys et al. (2004); Pal et al. (2006); Kim et al. (2007); Kertesz and Kawasaki (2009)]. 'Aromatoleum', 'Lutibacterium', 'Oleomonas' and 'Methylacidiphilum' do not seem to have been validly published. *Crenothrix* was originally thought to be an alga [Cohn (1873)]